Thames Tideway Tunnel
Thames Water Utilities Limited

Development Consent Order

Application Reference Number: WWO10001

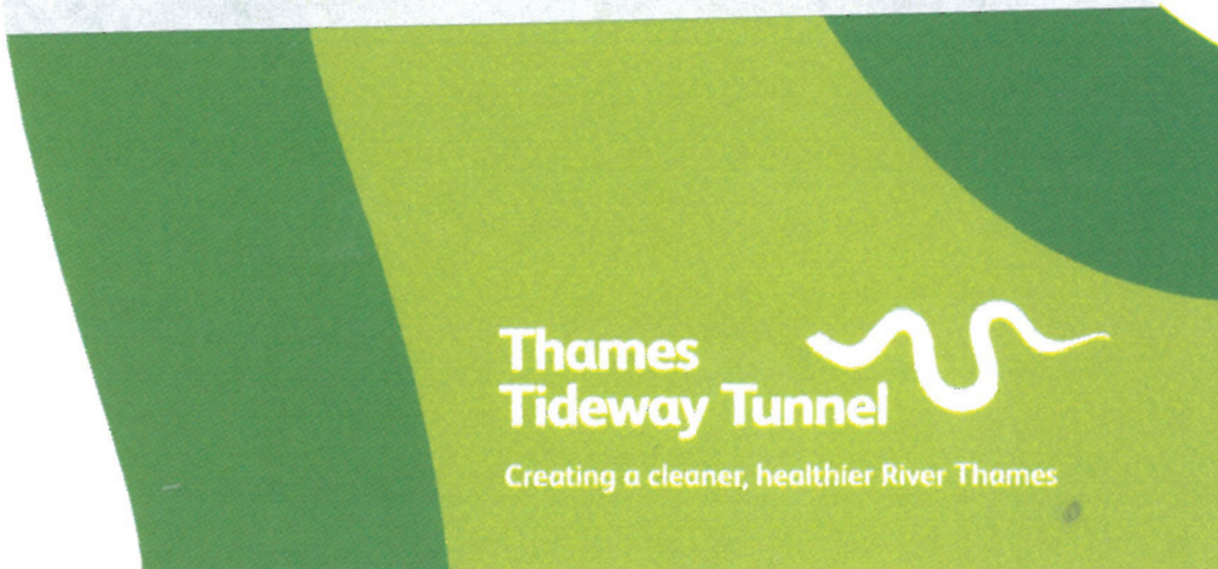
Documents for Certification
September 2014

We, Lindsay Speed and Sarah Fairbrother hereby certify that this is a true copy of the environmental statement referred to in Article 61 (1) (f) of the Thames Water Utilities Limited (Thames Tideway Tunnel) Order 2014.

Lindsay Speed

Sarah Fairbrother

September 2014



Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.03**

Volume 3: Project-wide effects assessment appendices

APFP Regulations 2009: Regulation **5(2)(a)**

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January 2013

Thames Tideway Tunnel

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Thames Tideway Tunnel

Environmental Statement

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Appendix A.4; Annex D.1: EMOS Barrington Quarry

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1 Introduction

1.1.1 The construction of the Thames Tideway Tunnel would require the excavation of a large volume of material at multiple sites throughout London. To identify the preferred options for the management of the excavated material a detailed options assessment has been undertaken.

1.1.2 The methodology for assessment of the excavated material options is based on the Sustainability Appraisal methodology[1]. The assessment has taken a phased approach and at each stage the least preferred options have been eliminated until the final most viable and sustainable options have been selected to form the planning stage preferred list. The options on the planning stage preferred list demonstrate the potential capacity to manage the excavated material in a sustainable manner. The assessment is based on the consistent assessment of options against agreed evaluation objectives throughout the process.

1.1.3 The steps informing the assessment process were:

a. Development of a long list of potential options for the treatment, reuse, recycling or disposal of excavated materials.

b. Viability filter involving the assessment of the long list against the operational evaluation objective associated with viability of the options.

c. Preliminary assessment to develop a short list of options which perform sufficiently well against all the evaluation objectives (environmental, social, operational, policy and health and safety).

d. Detailed assessment in which the options on the short list was further scrutinised to produce a planning stage preferred list of options which perform best against the full suite of evaluation objectives.

1.1.4 For each short listed option whose viability has been confirmed a detailed *Excavated Materials Option Suitability (EMOS) report* has been produced. The *EMOS* reports provide a summary of the site operations and the overall performance of the option against the evaluation objectives.

1.1.5 This *EMOS* report sets out the detail assessment for Barrington Quarry, in Cambridgeshire. The report provides the information gained during the detailed assessment stage of the *Excavated material options assessment (EMOA)* and the grades awarded against each evaluation indicator as part of this assessment. A grade is provided for each evaluation indicator, using an agreed set of evaluation criteria, against seven grades of impact (ranging from --- to +++). The *EMOS* report also provides a risk profile for the site identifying the key risks associated with the option in relation to accepting the Thames Tideway Tunnel project excavated material.

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2 Site description

2.1 Site location

2.1.1 Barrington Quarry is located southwest of Cambridge. The receptor site consists of an old working quarry, which is cut into the hillside above the village of Barrington. The receptor site is owned and operated by CEMEX.

2.1.2 The receptor site is located off Chapel Hill and is 1km north of the village of Barrington, Haslingfield is 1km to the northeast and Harlton is 650m to the northwest of the receptor site.

2.1.3 The receptor site is surrounded by agricultural land.

2.1.4 The nearest property is Wilsmere Down Farm which is 300m to the west of the western boundary of the receptor site. The quarry is well screened from surrounding viewpoints (mainly footpaths) by a combination of the topography and vegetation.

2.1.5 Barrington Quarry site location is shown in Plate 3.1 Barrington Quarry site location.

2.2 Site operations

2.2.1 Barrington Quarry was formally a quarry and cement works. Cement works at the receptor site were suspended in 2008 and all operations ceased in 2012. The suspension of the cement manufacture has resulted in cement kiln dust no longer being available to backfill the prepared cells. This means inert material is needed to restore the quarry. Over the coming years it is envisaged that the quarry will be progressively restored to agricultural land.

2.2.2 The receptor site currently has planning consent to infill the quarry void with 1.2million m^3 of material. There is the potential that more of the quarry would need restoring in the future this would be dependent on CEMEX need to fill the remaining void and whether planning consent can be obtained.

2.2.3 Thames Tideway Tunnel project material would need to be delivered by rail and arrive at the site by the existing Barrington railway link from the Foxton Sidings to the Barrington Cement Works. It would be unloaded into a tipper vehicle from a platform and then delivered to the deposit area.

2.2.4 The Foxton Sidings require refurbishment in order for deliveries of material to occur. CEMEX have confirmed that this infrastructure upgrade would be completed prior to receipt of any Thames Tideway Tunnel project material.

2.3 Planning consent

2.3.1 Planning consent for quarrying the chalk was first granted in 1948 with planning consents for extensions in 1950 and 1957. The quarrying consents are subject to conditions imposed following statutory reviews in 1993 and 1997 and include restoration obligations. Parts of the quarry void have been infilled with cement production wastes, capped by overburden and soils with two areas now restored to agricultural use.

2.3.2 Planning consent (Ref: S/01080/10/CW) was granted in August 2011 by Cambridgeshire County Council and is for the importation by rail of suitable restoration material over a period of 5 years to partially infill the existing quarry void.

2.3.3 The consent is time limited and expires in December 2018 by which time restoration of the permitted area is required to be complete.

2.3.4 The existing sidings and railway lines that will be used need to be improved before operations can start at the receptor site. The improvements include:

a. the refurbishment and re-laying of the existing rail track from the mainline junction at Foxton Sidings to the Barrington Cement Works site.

b. the extension of the existing rail link within the quarry site to provide for the unloading of incoming trains carrying inert material; together with a new siding layout.

2.3.5 There are time restrictions on when the trains can move up and down the railway line. These are 7am to 8pm Monday to Friday and the receptor site can only receive three trains a day.

2.3.6 Material can be unloaded, transported to the restoration area, and levelled between the hours of 7am and 10pm Monday to Friday and between 6am and 1pm on Saturdays.

2.4 Permitting

2.4.1 The environmental permit (EA permit number: EPR/BV1461IV) was issued in April 2004 and a variation was issued in December 2011.

2.4.2 The environmental permit allows for the receptor site to receive 700,000tpa of inert and non hazardous wastes.

2.4.3 The receptor site can accept inert construction and demolition waste, and soils arising from construction and demolition that are classified as non-hazardous.

2.4.4 Table 14.2 details the European Waste Catalogue (EWC) codes of the permitted waste types that can be accepted at Barrington Quarry.

2.4.5 Barrington Quarry has the necessary environmental permit in place to accept excavated Thames Tideway Tunnel project material for quarry restoration.

3 Overall site summary

3.1.1 Table 3.1 below provides a summary of the Barrington Quarry site and an assessment of its suitability against the evaluation objectives. Sections 4 to 18 of this *EMOS report* gives more detail on each evaluation objective.

Table 3.1 Summary of Barrington Quarry and its overall suitability

Site name:	Barrington Quarry (CEM.7)		**Owner/Operator:**		CEMEX		
Planning consent	Yes, until 2018 S/01080/10/CW		**Permit**		Yes EPR/BV1461IV		
Void capacity	1.2million m^3		**Throughput**		700,000tpa		
Recovery/disposal	Recovery						
Materials	**London clay**	✓	**Lambeth group**	✓	**Chalk**	✓	
Transport type	**Road**	X	**Rail**	✓	**Marine transport**	X	

Receptor site overview

Barrington Quarry is a former chalk quarry and cement works located in Cambridgeshire. The cement work activities at the receptor site were suspended in 2008 and all operations ceased in 2012. The receptor site currently has planning consent to infill part of the quarry void by December 2018. The Thames Tideway Tunnel project material would be used in this restoration operation. This would restore the western and northwestern areas of Barrington Quarry back to agricultural use. This restoration activity has not yet commenced but it is anticipated that it would be underway prior to the Thames Tideway Tunnel project timeframe. Thames Tideway Tunnel project material would be delivered to the receptor site by rail. The receptor site is approximately 73km from the Thames Tideway Tunnel main drive sites.

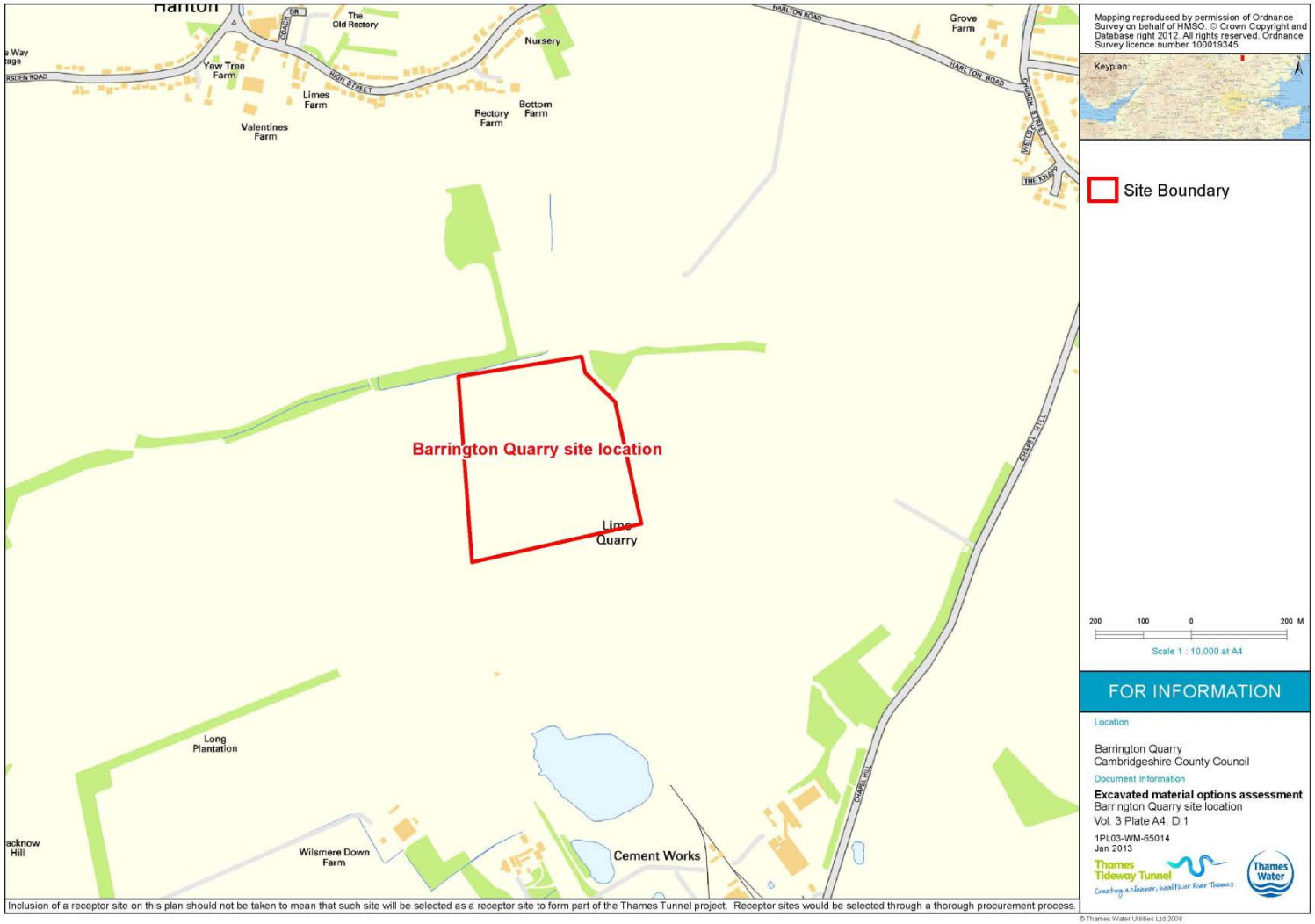
Assessment

1. Land and other resources	a)	**0**	8. Cultural heritage	a)	**0**
	b)	**0**	9. Employment opportunities	a)	**++**
2. Climate change	a)	**+**		b)	**0**
	b)	**0**	10. Cost	a)	**+**
	c)	**0**	11. Operational suitability of the receptor site.	a)	**-**
3. Local amenity	a)	**0**		b)	**+++**
4. Landscapes and townscapes	a)	**0**		c)	**--**
	b)	**++**		d)	**-**
5. Access to open space	a)	**0**		e)	**+++**
	b)	**+**		f)	**--**
6.Water quality	a)	**0**	12. Waste hierarchy	a)	**+++**
	b)	**0**	13. Proximity principle	a)	**-**
7.Biodiversity	a)	**0**	14. Sustainable transport policy	a)	**0**
	b)	**+**	15. Health and safety good practice	a)	**n/a**

Environmental summary
The acceptance of Thames Tideway Tunnel project material is within the receptor site's existing consents. Thames Tideway Tunnel project material would form part of the permitted operations at the receptor site. In the short term the use of Thames Tideway Tunnel project material for the restoration of Barrington Quarry is likely to have no or negligible effect on any local receptors. Part of the receptor site has been designated a geological Site of Special Scientific Interest (SSSI) but this area of the receptor site would not be restored. In the long term the receptor site will be restored to agricultural use, similar to the surrounding area. This would have a beneficial effect with respect to visual and local amenity. The receptor site is located approximately 73km from the Thames Tideway Tunnel but material would be transferred using rail which is in line with sustainable transport policies.
Social summary
The restoration activities at the receptor site, to which Thames Tideway Tunnel project material would contribute, would lead to minor job gains over the short term. The receptor site will employ between ten and twelve full time jobs. Some of these jobs may be directly attributable to the acceptance of Thames Tideway Tunnel project material as a result of an increased input rate at the receptor site. If the restoration phase is extended these jobs would be retained.
Operational summary
It is probable that the receptor site would be able to accept approximately 1.48million tonnes of the Thames Tideway Tunnel project material until 2018. However, CEMEX is currently seeking to complete the restoration of the consented void prior to 2018. This receptor site may be available beyond 2018 as other large parts of the receptor site still need restoring. This would be dependent on the planning consent being granted for the extended area. The receptor site should be able to accept all types of excavated materials produced by the Thames Tideway Tunnel. The receptor site can only accept material by rail. Barrington Quarry restoration back to agricultural land would be considered as beneficial use for all material accepted by the site[I]. CEMEX operate under ISO18001 and have health and safety procedures at their operational sites.
Overall suitability
Barrington Quarry has the ability to receive only 28% of the Thames Tideway Tunnel project material up to 2018. The receptor site is on schedule to be completed before the deadline set in the planning consent. The receptor site has the potential to accept material beyond 2018 if further restoration is required and appropriate consents are obtained. The receptor site has a beneficial or neutral grading for all evaluation indicators with the exception of some operational indicators and the proximity principle indicator. Barrington Quarry is included on the planning stage preferred list.

[I] Based on the *Excavated material options assessment* (*EMOA*) beneficial use test

Plate 3.1 Barrington Quarry site location



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4 Evaluation objective 1: To ensure prudent use of land and other resources

4.1.1 The receptor site has not started receiving material but it is envisaged that material would be sourced from other extraction and construction projects e.g. the Crossrail project.

4.1.2 The Thames Tideway Tunnel project material would be used to restore the receptor site and to make it available for agricultural uses. The use of Thames Tideway Tunnel project material would replace the use of other reusable materials that would be used to infill the quarry.

4.1.3 The use of Thames Tideway Tunnel project material would not contribute to any requirement for additional land extending the receptor site's boundary.

4.1.4 Table 4.1 provides the grade given for evaluation objective 1 and the justification for the grade.

Table 4.1 Evaluation objective 1 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
1. To ensure prudent use of land and other resources	a) Extent to which resources such as sand, gravel and chalk are conserved by processing or storage of Thames Tideway Tunnel project material at receptor sites.	0	Thames Tideway Tunnel project material is unlikely to affect virgin material use e.g. material replaces other reusable materials or no material substitution required.	Thames Tideway Tunnel project material would be used in the quarry restoration. Thames Tideway Tunnel project material would replace the use of other reusable material.
	b) Extent to which Thames Tideway Tunnel project material would effect landtake at (footprint of) receptor sites in the long term.	0	The acceptance of Thames Tideway Tunnel project material would not contribute to the requirement for additional land extending the receptor site's boundary.	The Thames Tideway Tunnel project material would be used within the existing receptor site boundary and would not contribute to a need for the receptor to expand.

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5 Evaluation objective 2: To reduce climate change impacts

5.1.1 CEMEX has systems in place to reduce greenhouse gas (GhG) emissions including transporting the material by rail and making sure that all machinery at the receptor site complies with current emission standards.

5.1.2 CEMEX also has a Carbon Strategy which promotes the reduction of the overall carbon footprint of their operations.

5.1.3 The excavated material would not be reprocessed into aggregate at the receptor site. Based on data from the EA's WRATE, the overall GhG emissions for deposition of excavated material to land is 3.17kg CO_2 eq per tonne of excavated material. The excavation material is assumed to be inert soil and the emissions associated with material reception and spreading have been assumed.

5.1.4 The figures for GhG emissions from transport have been estimated based on:

a. the average CO_2 emissions for the different types of transport; and

b. the distance travelled from the Thames Tideway Tunnel sites to the receptor site.

5.1.5 The GhG emissions calculated are for comparative purposes only and do not provide an exact representation of the transport emissions associated with the Thames Tideway Tunnel excavated material. Full GhG methodology and assumptions can be found in Appendix B.10.

5.1.6 It has been estimated that using Barrington Quarry would produce 5.73kg CO_2 eq per tonne of excavated material accepted.

5.1.7 The EA flood risk maps indicate that Barrington Quarry is outside the floodplain. CEMEX also stated that Barrington Quarry was not within an area at risk of flooding. There is a drainage management scheme for the receptor site.

5.1.8 It is not anticipated that the flood risk at the receptor site would change when the receptor site is restored.

5.1.9 Table 5.1 provides the grade given for evaluation objective 2 and the justification for the grade.

Table 5.1 Evaluation objective 2 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
2. To reduce climate change impacts	a) Greenhouse gases emitted through material treatment, handling and use at receptor sites (excludes transport).	+	There is a Carbon Management Plan in place with systems in place to offset GhG emissions from treatment, handling and use of Thames Tideway Tunnel project material.	CEMEX has a Carbon Strategy and ensure that all machinery at the receptor site complies with current emission standards.
	b) Extent to which flood risk is altered by Thames Tideway Tunnel project material at the receptor site (or in the local catchment).	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not change flood risk (from any source or a combination of sources) to the site and surroundings.	The EA flood risk maps indicate that Barrington Quarry is outside the floodplain.
	c) Greenhouse gases emitted through transport of Thames Tideway Tunnel project material to the receptor sites.	0	Through the transport of Thames Tideway Tunnel project material between 4 and less than or equal to 6kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.	Through the transport of Thames Tideway Tunnel project material it is estimated that 5.73kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.

6 Evaluation objective 3: To protect local amenity

6.1.1 The receptor site is not located within an Air Quality Management Area (AQMA).

6.1.2 CEMEX stated that, when the receptor site is operational, they would ensure that all machinery at the receptor site complies with current emission standards. In order to minimise effects on local air quality CEMEX would seek to source a rail haulage operator who utilise "low emission" locomotives for use to transport material.

6.1.3 There are three monitoring stations in place at the receptor site for odour, noise and dust.

6.1.4 There is a dust management plan in place for the receptor site, which includes measures (e.g. spraying haul roads) to deal with dust should the issue arise.

6.1.5 Thames Tideway Tunnel project material would be similar in nature to any other material that would be accepted at the receptor site for restoration purposes and would be accepted as part of the existing operations at the receptor site.

6.1.6 Table 6.1 provides the grade given for evaluation objective 3 and the justification for the grade.

Table 6.1 Evaluation objective 3 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
3. To protect local amenity	a) Extent of potential effects on local amenity from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have an effect on the local amenity or any effect would be negligible.	Thames Tideway Tunnel project material would form part of the existing operations at the receptor site and this material would replace the use of reusable material that would be accepted at the receptor site for restoration purposes. The receptor site has measures in place to minimise nuisance effects such as a dust management plan.

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7 Evaluation objective 4: To conserve landscape and townscapes at receiving locations

7.1.1 The receptor site is not located in an Area of Outstanding Natural Beauty (AONB).

7.1.2 The cement works at Barrington was established in 1918, the land to the north of the cement works has been quarried for chalk for many years. The proposed restoration area is well screened from surrounding viewpoints. The Cambridge Green Belt is located to the north and east of the receptor site.

7.1.3 Thames Tideway Tunnel project material would form part of the permitted operations at the receptor site. The type of visual effects from site operations (rail and vehicle movements, rail wagon unloading works, deposit operations, land forming, bund excavation/soil spreading, restoration works, cultivation, seeding and planting works) would not be of an adverse nature within the overall context of the existing site and cement plant.

7.1.4 In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would be no more or less visible given the overall context of the existing site and cement works.

7.1.5 In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape changing the area from a quarry and cement plant to agricultural land.

7.1.6 Table 7.1 provides the grade given for evaluation objective 4 and the justification for the grade.

Table 7.1 Evaluation objective 4 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
4. To conserve landscapes and townscapes at receiving locations	a) Extent of short term visual and landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have a short term effect on the local visual amenity at the receptor site or any effect would be negligible.	In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would be no more or less visible given the overall context of the existing site and cement works.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of permanent visual and landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a permanent moderate beneficial visual effect on the landscape, based on a 'do nothing' view of the site.	In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape changing the area from a quarry and cement plant to agricultural land.

8 Evaluation objective 5: To protect quality of and access to open space

8.1.1 There is a Public Right of Way (PRoW) that runs along the northern boundary of the receptor site and 800m to the west of the receptor site.

8.1.2 The receptor site is currently accessible to geological and palaeontology groups due to its geological interest. In both the short and long term these groups would continue to have access to the relevant areas of the receptor site.

8.1.3 The operator has confirmed that when the receptor site is restored there would be a small portion of land, set aside for recreation uses which would slightly increase public access, although public access for the whole receptor site is not proposed. Access would be maintained for the geological and paleontological groups at the receptor site. The restoration plans for the receptor site to which Thames Tideway Tunnel project material would contribute, would slightly enhance the PRoW to the northern boundary of the receptor site. This is because instead of the PRoW bordering a former quarry and cement plant or an operational materials deposition site, once the receptor site is restored it will border and also become agricultural land.

8.1.4 Table 8.1 provides the grade given for evaluation objective 5 and the justification for the grade.

Table 8.1 Evaluation objective 5 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
5. To protect quality of and access to open space	a) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the short term?	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or a negligible effect on access to and quality of open space and PRoWs.	The restoration works at the receptor site to which the Thames Tideway Tunnel project material would contribute would not disrupt the existing PRoW on the northern boundary of the receptor site.
	b) Would Thames Tideway Tunnel project material enhance quality of and	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material	It is unlikely that the receptor site would be widely accessible to the public in the long term as it is being restored primarily to agricultural land with a small provision of

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	access to open space in the long term?		would contribute, would slightly enhance a PRoW or improve the quality of and access to public open space.	recreational land. The receptor site would remain accessible to geological and paleontological groups. The restoration plans for the receptor site which Thames Tideway Tunnel material would contribute, would slightly enhance views from the PRoW to the northern boundary of the receptor site and some of the land will be set aside for recreational uses.

9 Evaluation objective 6: To protect water quality

9.1.1 The River Cam runs 1.4km to the south and southeast of the receptor site.

9.1.2 A water management scheme exists at the receptor site to drain surface water that accumulates in the quarry void and to ensure that it is managed appropriately.

9.1.3 The receptor site is on a chalk aquifer which needs to be protected from any potential contamination associated with the infilling of the quarry. The cells that will be in filled would have a clay liner installed. In line with the receptor site permit conditions leachate removal infrastructure will be installed on site and any leachate will be taken off site for treatment. Thus no leachate would be discharged into the local water courses.

9.1.4 The receptor site is not in a groundwater Source Protection Zone (SPZ), which highlights groundwater sources such as wells, boreholes and springs used for public drinking water supply.

9.1.5 Based on the water management measures in place at the receptor site and the inert nature of the Thames Tideway Tunnel project material it is not anticipated that accepting Thames Tideway Tunnel project material would have an effect on the surrounding water courses and/or groundwater.

9.1.6 Table 9.1 provides the grade given for evaluation objective 6 and the justification for the grade.

Table 9.1 Evaluation objective 6 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
6. To protect water quality	a) Extent of potential effects on fluvial water quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on the local watercourses.	There is a water management scheme in place at the receptor site. It is not anticipated that the treatment, handling or use of the Thames Tideway Tunnel project material would have an effect on the local water course as it is approximately 1.4km from the site.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of potential effects on groundwater quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on groundwater.	There is a water management scheme in place at the receptor site. The cells of the quarry that will be infilled would be lined to reduce the risk of any groundwater contamination. The receptor site is not in a groundwater SPZ and the treatment, handling or use of the Thames Tideway Tunnel project material at the receptor site is likely to have no or negligible effect on groundwater.

10 Evaluation objective 7: To protect biodiversity

10.1.1 There are no areas designated as special interest with regards to biodiversity within 2km of the receptor site. Therefore restoration of the receptor site would have no effect on any designated site.

10.1.2 The nature of habitats at the receptor site would change following restoration. Most of the area currently proposed for restoration comprises unfilled quarry areas. Although the remainder of the site is currently derelict, it is likely to have some ecological value.

10.1.3 The receptor site will be restored in phases so that some areas would be returned to agricultural use more quickly than other areas. The restoration plans for the receptor site whilst predominantly agricultural include areas of native hedgerow plants and woodland.

10.1.4 In the long term the exact nature of the habitats created will be dependent on the material used to restore the site. The Environmental Statement which accompanied the planning application of the receptor site confirms that it is considered that restoration proposals would result in a minor beneficial effect on ecological species and habitats once the receptor site has been restored.

10.1.5 Table 10.1 provides the grade given for evaluation objective 7 and the justification for the grade.

Table 10.1 Evaluation objective 7 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
7. To protect biodiversity	a) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the short term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	Thames Tideway Tunnel project material would form part of the restoration plans for the receptor site and would have no or negligible effect on a designated site as there are no designated sites within 2km of the receptor site.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the long term.	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a minor beneficial effect on a designated site and/or creation/improvement of habitats	The Environmental Statement which accompanied the receptor site's planning application found the restoration plans would contribute a minor beneficial effect on ecological species and habitats.

11 Evaluation objective 8: To protect cultural heritage

11.1.1 There are Scheduled Ancient Monuments (SAMs) 1.3km to the northwest of the receptor site and 1.2km northeast of the receptor site. There are no registered parks gardens or battlefields within 2km of the receptor site.

11.1.2 There are also a number of Listed Buildings in the village of Barrington which is 1km to the south of the receptor site.

11.1.3 Part of the receptor site has been designated a geological Site of Special Scientific Interest (SSSI) because of the geological interest at the receptor site. It is designated for Cretaceous stratigraphy, exposing the uppermost part of the Gault Clay, the Cambridge Greensand, the West Melbury Chalk Formation, the Totternhoe Stone and part of the Zig Zag Chalk Formation.

11.1.4 The geological SSSI at the receptor site would not be included in the quarry restoration and would be left exposed.

11.1.5 There is another area designated as a geological SSSI, Barrington Pit. This is located 1.5km to the southwest of the receptor site.

11.1.6 The treatment, handling or use of Thames Tideway Tunnel project material at the receptor site is likely to have no or negligible effect on the SAMs as there are none within 1km of the site.

11.1.7 Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on the geological SSSI located on the receptor site or the geological SSSI located near the receptor site.

11.1.8 Table 11.1 provides the grade given for evaluation objective 8 and the justification for the grade.

Table 11.1 Evaluation objective 8 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
8. To protect cultural heritage	a) Extent of potential effects on designated or nominated archaeological sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	There is a geological SSSI on the receptor site that would be left exposed for research purposes. The operations at the receptor site, to which the treatment, handling and use of the Thames Tideway Tunnel project material would contribute, are likely to have no or negligible effect on the geological SSSI's.

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12 Evaluation objective 9: To provide employment opportunities

12.1.1 Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would employ between ten and twelve staff over the short term. CEMEX have indicated that some of these jobs may be directly attributable to the acceptance of Thames Tideway Tunnel project material as a result of an increased input rate at the receptor site.

12.1.2 In the long term it is unlikely that any more jobs would be created. It is considered that if restoration was to continue beyond 2018 and the same staff would be used at the receptor site.

12.1.3 CEMEX confirmed that there would be the potential that one or two staff would be required at the receptor site immediately after restoration is complete for short term aftercare. However this cannot be confirmed as yet and so has not been considered for this assessment.

12.1.4 Table 12.1 provides the grade given for evaluation objective 9 and the justification for the grade.

Table 12.1 Evaluation objective 9 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
9. To provide employment opportunities	a) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the short term.	++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would lead to moderate job gains over the short term of between ten and less than or equal to 20 jobs	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would generate between ten and twelve jobs over the short term and the operator has indicated that some of these jobs may be directly attributable to the acceptance of Thames Tideway Tunnel project material.
	b) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material	It is anticipated that restoration would continue at the site beyond 2018 and therefore that staff would be retained.

	available at the receptor sites in the long term.		would contribute, would not lead to job losses or gains in the long term.	

13 Evaluation objective 10: To minimise the cost associated with the management of excavated material

13.1.1 In order to compare the likely cost associated with transport and acceptance of the Thames Tideway Tunnel project material at each receptor site a cost model is used.

13.1.2 The cost of transporting the excavated material has been calculated from the distance travelled and a cost per tonne/ km for the transport mode. The road, transport haulage cost have been calculated from the quotes gathered from operators based on today's prices. A gate fee of £4 per tonne is assumed based on current prices. Full details of the assumptions made can be found at Appendix B.10.

13.1.3 It has been estimated that the cost of transporting and managing excavated material at Barrington Quarry is £14.46 per tonne of excavated material that can be accepted at the receptor site. These costs are predominantly associated with transfer of the material from the Thames Tideway Tunnel sites to the receptor sites. This cost is an estimated cost for comparison purposes within the *EMOA* and may differ from the actual cost which would be agreed at the procurement stage if Thames Tideway Tunnel project material were taken to this receptor site.

13.1.4 Table 13.1 provides the grade given for evaluation objective 10 and the justification for the grade.

Table 13.1 Evaluation objective 10 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
10. To minimise the cost associated with the management of excavated material.	a) Costs of transportation, treatment, handling and use of Thames Tideway Tunnel project material.	+	The transportation, treatment, handling and use of Thames Tideway Tunnel project material would cost between £13 and less than or equal to £16 per tonne.	The cost of transportation, treatment, handling and use of Thames Tideway Tunnel project material has been estimated (using the *EMOA* cost model) to be £14.46 per tonne.

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14 Evaluation objective 11: To ensure operational suitability of the receptor site

14.1 Evaluation indicator 11a) Timescales

14.1.1 The receptor site has planning consent until 2018, however CEMEX has stated that if insufficient material has been sourced to complete the restoration by 2018, they would seek to extend the planning consent.

14.1.2 CEMEX is seeking to fill the consented void at Barrington Quarry at the present time and is in discussions with Crossrail with the aim of filling the consented void prior to 2018.

14.1.3 The operator has indicated that Cambridgeshire County Council has been in contact with CEMEX encouraging the full restoration of the receptor site if all quarrying operations have permanently ceased at the site.

14.1.4 Based on Thames Tideway Tunnel timescales of 2016 to 2021 and the existing planning consent for the site, Barrington Quarry would be available for use for Thames Tideway Tunnel project material for three years of the six year timetable. It is however considered likely that a further consent would be sought to fill additional void in subsequent years.

14.1.5 Table 14.1 provides the grade given for evaluation objective 11a and the justification for the grade.

Table 14.1 Evaluation objective 11a grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	a) Likelihood of implementation within the required timescale.	-	The receptor site would be available for use for Thames Tunnel project material for greater than or equal to 40% but less than 60% of the required timescale	Planning consent for the receptor site requires work to be completed by 2018. The receptor site would be available to accept Thames Tideway Tunnel project material for three years out of the six year timetable.

14.2 Evaluation indicator 11b) Material characteristics

14.2.1 Barrington Quarry would be able to accept London Clay, chalk and Lambeth Group with sands, gravels and inert tunnel construction materials (piling and diaphragm wall arisings) for restoration.

14.2.2 The receptor site is permitted to accept a range of inert construction and demolition wastes. Table 14.2 details the EWC Codes relating to the materials permitted under Barrington Quarry's environmental permit most

relevant to the acceptance of the Thames Tideway Tunnel project excavated materials.

Table 14.2 Permitted waste types for Barrington Quarry

EWC codes	Description
17 05	Soil (including excavated soil from contamination sites), stones and dredging spoil.
17 05 04	Soil and stones other than those mentioned in 17 05 03.

14.2.3 The operator has expressed concerns relating to the transport of chalk to the receptor site. Providing that the chalk was transportable by rail, CEMEX would, in principle, be happy to accept this material. The Thames Tideway Tunnel is proposing to put in place chalk dewatering facilities at the drive sites to produce a material which is transportable.

14.2.4 The receptor site has the potential to receive all Thames Tideway Tunnel non-hazardous excavated project material types. The material would be subject to acceptance criteria testing to ensure that the material is inert. Details are set out in the environmental permit. It is assumed that most, if not all, of the Thames Tideway Tunnel excavated material would be inert.

14.2.5 Table 14.3 provides the grade given for evaluation objective 11b and the justification for the grade.

Table 14.3 Evaluation objective 11b grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	b) Acceptability of material with Thames Tideway Tunnel project material characteristics by the receptor sites.	+++	The receptor site could accept for use all of the Thames Tideway Tunnel project material types based on their characteristics.	The receptor site is permitted to accept all clean non hazardous material produced by the Thames Tideway Tunnel.

14.3 Evaluation indicator 11c) Capacity

14.3.1 The receptor site is permitted to accept 700,000tpa.

14.3.2 The planning consent has granted the importation of a total of 1.2million m^3 (approximately 1.48million tonnes). This volume has been determined by an assessment carried out by CEMEX of the volume required to complete the restoration of Cells 1 and 2 to appropriate levels.

14.3.3 Table 14.4 details the permitted capacity for the receptor site in relation to the material that will be produced by the Thames Tideway Tunnel.

14.3.4 Table 14.4 also sets out the potential tonnage of Thames Tideway Tunnel project material accepted at the receptor site each year based on the

assumptions used in the EMOA cost and GhG model. The receptor site would be able to accept 28% of the Thames Tideway Tunnel project excavated materials, based on the total amount of restoration material that it can accept and tonnages which are likely to be produced by the Thames Tideway Tunnel during the three years that it is available.

Table 14.4 Capacity for inert material at Barrington Quarry (tonnes[II])

	Year						Total
	2016	2017	2018	2019	2020	2021	
Total Thames Tideway Tunnel production (tonnes)	63,000	549,000	1,938,000	1,852,000	147,000	155,000	4,704,000
Maximum permitted per annum (tonnes).	700,000	700,000	700,000	-	-	-	-
Potential Thames Tideway Tunnel project material accepted (tonnes).	63,000	549,000	694,000	-	-	-	1,306,000
Potential Thames Tideway Tunnel project material accepted (%).	100%	100%	36%	0%	0%	0%	28%

14.3.5 Table 14.5 provides the grade given for evaluation objective 11c and the justification for the grade.

Table 14.5 Evaluation objective 11c grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	c) Capacity of the receptor site to accept the required volume of Thames Tideway Tunnel project material (based on likely tonnage accepted/	--	The receptor site has capacity to accept material greater than or equal to 15% but less than 30% of Thames Tideway Tunnel.	The receptor site has the potential to accept approximately 1.3million tonnes or 28% of the excavated material that would be produced by the Thames Tideway

[II] Figures quoted to the nearest 1,000 tonnes

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	%).			Tunnel.

14.4 Evaluation indicator 11d) Receptor site throughput

14.4.1 Thames Tideway Tunnel project material would be delivered to the receptor site by rail only.

14.4.2 The receptor site has consent for three trains a day to be delivered. CEMEX has stated that it would be using trains with a capacity of 1,500t. The receptor site has the ability to receive 4,500t per day.

14.4.3 The amount of material produced by the Thames Tideway Tunnel would vary on a daily and monthly basis. The assessment of throughput has been based on both the mean and peak production rates over the Thames Tideway Tunnel construction period. The mean rate is taken as the mean monthly production rate taken over each year in the period 2016 to 2021. The peak rate is based on the month producing the maximum tonnage of excavated material in each year.

14.4.4 Table 14.6 details the proportion of the Thames Tideway Tunnel project material which would be accepted by Barrington Quarry over time.

14.4.5 In Year 1 and 2 of the excavation process Barrington Quarry's limit of 4,500t per day is sufficient to accept all of the Thames Tideway Tunnel project material produced. However, in Year 3 and beyond, if other areas of the quarry are restored after 2018, this receptor site could only accept a fraction of the total Thames Tideway Tunnel project material produced based on the current permit limits.

Table 14.6 Throughput of material at Barrington Quarry

	Year					
	2016	2017	2018	2019	2020	2021
Maximum allowable number of daily train movements at receptor site (A).	3	3	3	-	-	-
Capacity per Train (tonnes)	1,500	1,500	1,500	-	-	-
Thames Tideway Tunnel average daily tonnage*.	250	2,050	7,200	6,850	550	550
Required number of trains to transport average daily tonnage (B).	0.2	1.4	4.8	4.6	0.4	0.4
Allowable vs Average Required Number of trains at receptor site (A ÷ B).	1,800%	220%	63%	0%	0%	0%
Thames Tideway Tunnel peak daily tonnage**.	350	3,050	10,750	10,300	800	850
Required number of trains to transport peak rate (C).	0.2	2.0	7.2	6.9	0.5	0.6

	Year					
Allowable vs Peak Number of trains at receptor site (A ÷ C).	1,286%	148%	42%	0%	0%	0%

** The Thames Tideway Tunnel average daily tonnage for each year is calculated as the mean of the daily rate each month assuming 22.5 days in each month.*
*** The peak daily tonnage is based on the average daily tonnage (assuming a 22.5 day month) for the peak month of production in each year.*

14.4.6 Table 14.7 provides the grade given for evaluation objective 11d and the justification for the grade.

Table 14.7 Evaluation objective 11d grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	d) Ability of the receptor sites to accept Thames Tideway Tunnel project material at the anticipated rate (speed of material generation vs acceptance rate).	-	The receptor site could take greater than or equal to 2,800 but less than 4,600t per day of Thames Tideway Tunnel project material.	The receptor site has the ability to receive 4,500t per day, based on the delivery of three trains a day each with a capacity of 1,500t.

14.5 Evaluation indicator 11e) Planning consent and permitting

14.5.1 Barrington Quarry has the necessary planning consent and environmental permit in place to accept excavated Thames Tideway Tunnel project material for quarry restoration.

14.5.2 Further information on the receptor site's planning consent and environmental permit can be found in Section 2.2 and 2.3.

14.5.3 Table 14.8 provides the grade given for evaluation objective 11e and the justification for the grade.

Table 14.8 Evaluation objective 11e grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	e) Site operations have appropriate planning and permitting consents.	+++	The receptor site has planning consent and an EA permit.	The receptor site has the relevant planning consent and environmental permit in place to be able to accept Thames Tideway Tunnel project material.

14.6 Evaluation indicator 11f) Transport modes

14.6.1 The receptor site would only accept Thames Tideway Tunnel project material via rail. The planning consent has restrictions on the number and operating times that the trains can run.

14.6.2 The railway line infrastructure requires some upgrading to bring it up to the required standards. This should be completed by 2016 and so upgrades would be in place prior to Thames Tideway Tunnel project material being accepted at the receptor site.

14.6.3 Table 14.9 provides the grade given for evaluation objective 11f and the justification for the grade.

Table 14.9 Evaluation objective 11f grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	f) Can accept excavated material from multiple transport modes.	--	The receptor site is only accessible by one transport mode.	The receptor site can only accept material for restoration via rail.

15 Evaluation objective 12: To conform to the waste hierarchy

15.1.1 The Thames Tideway Tunnel *Excavated materials and waste (EM&W) strategy* contains an objective to 'To minimise waste arisings, maximise re-use, recovery, recycling and beneficial use and minimise the impact of waste on the environment and communities'.

15.1.2 The Thames Tideway Tunnel project material would be used to restore Barrington Quarry to agricultural use by infilling the existing quarry void. This is considered to be beneficial use in line with the *EMOA* beneficial use test. Table 15.1 details the application of the *EMOA* beneficial use test applied to Barrington Quarry.

Table 15.1 Quarry restoration performance against *EMOA* beneficial use test

***EMOA* test**	**Does the receptor site comply with test?**	**Comment**
The activity would bring land back into use or provide ecological benefit.	Yes	Barrington Quarry will be restored to agricultural use.
In the case of quarries or landfill sites that the activity has a planning requirement to be restored.	Yes	There is a planning requirement for Barrington Quarry to be restored.
Landfill Tax would not be charged on the material.	Yes	Barrington Quarry would be exempt from landfill tax because it is a quarry restoration project.
That the material is suitable for its intended use and would not harm human health or the environment.	Yes	Barrington Quarry would be able to accept all Thames Tideway Tunnel non-hazardous excavated project material, and if managed in accordance with the environmental permit the activities should not harm human health or the environment.

EMOA test	Does the receptor site comply with test?	Comment
That the minimum amount of material is being used.	Yes	The material is being used to return the receptor site back to the agreed contours through the planning consent.
That alternative material (whether waste or non-waste) would be required if Thames Tideway Tunnel project material wasn't used.	Yes	Material would be sourced from elsewhere to restore that quarry if Thames Tideway Tunnel project material was not available.

15.1.3 All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 28% of the total Thames Tideway Tunnel project material.

15.1.4 Table 15.2 provides the grade given for evaluation objective 12 and the justification for the grade.

Table 15.2 Evaluation objective 12 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
12. To conform to the waste hierarchy.	a) Extent to which the option meets the *EM&W strategy* targets.	+++	Performance of receptor site substantially exceeds target.	All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 28% of the total Thames project Tunnel material.

16 Evaluation objective 13: To conform to the proximity principle

16.1.1 Material would need to be delivered to the receptor site by rail and it has been measured that the distance from Bow East to Foxton Sidings is 88km[III]. The indicative transhipment point used in the *EMOA* modelling is 11km from Bow East and Thames Tideway Tunnel CSO and drive sites are located an average of 15km from Bow East by road.

16.1.2 For this evaluation objective the receptor site was assessed using a straight line distance from the main drive sites. Using a straight line distance provides a consistent measure for assessment purposes. As the receptor site would be able to receive excavated materials from more than one drive site, the mean distance has been calculated. The receptor site was then graded according to this mean figure.

16.1.3 The receptor site is approximately 73km in a straight line from the main drive sites.

16.1.4 Table 16.1 provides the grade given for evaluation objective 13 and the justification for the grade.

Table 16.1 Evaluation objective 13 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
13. To conform to proximity principle.	a) Average distance from main tunnel drive sites.	-	The receptor site is between 80km and 60km from source of Thames Tideway Tunnel project material.	The receptor site is approximately 73km (straight line distance) from the main drive sites.

[III] Distances quoted are those used in the *EMOA* GhG model. Details of the assumptions used in this model can be found in Appendix B.10. These distances are for context only and do not reflect the exact routes that would be used should this receptor site be used to accept Thames Tideway Tunnel project material.

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17 Evaluation objective 14: To conform to sustainable transport policy

17.1.1 The receptor site would only be accessed by rail. The use of rail to transport material is encouraged in the London Plan, Cambridgeshire and Peterborough Waste Local Plan and Cambridgeshire and Peterborough Minerals and Waste Development Plan Core Strategy Development Plan Document.

17.1.2 *The London Plan 2011*[2] Policy 5.18 Construction, excavation and demolition states "that waste should be removed from construction sites, and materials brought to the site, by water or rail transport wherever that is practicable".

17.1.3 *Cambridgeshire & Peterborough Waste Local Plan*[3] WLP6 favours waste developments accessible, where possible by rail, where this accords with the proximity principle. Cambridgeshire and Peterborough Minerals and Waste Development Plan Core Strategy Development Plan Document[4] (submission draft 2010) policy CS2 also encourages the long distance movement of waste by rail.

17.1.4 As part of the planning requirements the railway line infrastructure will be upgraded to bring it up to the required standards. This should be completed by 2016 and so upgrades would be in place prior to Thames Tideway Tunnel project material being accepted at the receptor site.

17.1.5 The current planning and environmental permit conditions require the excavated material to be delivered to the receptor site by rail and therefore the excavated material would not be delivered to this receptor site by road or by marine transport. For excavated material to be delivered by rail to Barrington Quarry a rail head for loading purposes would be required. Material would be delivered to the rail head via road or barge.

17.1.6 Table 17.1 provides the grade given for evaluation objective 14 and the justification for the grade.

Table 17.1 Evaluation objective 14 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
14. To conform to sustainable transport policy.	a) Conforms to policy objective to move transport of materials from road to rail or marine transport.	**0**	The receptor site has the potential to be accessed by rail or marine transport but may require some double handling or transhipment.	The receptor site can be directly accessed by rail.

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18 Evaluation objective 15: To conform to health and safety good practice

18.1.1 In 2008 when operational Barrington Quarry, was acknowledged by CEMEX as having the best overall health and safety performance by a CEMEX UK business unit. The operating quarry and cement plant had four years without a lost time injury.

18.1.2 Since the operating quarry and cement plant ceased operations there have been no health and safety incidents. As a result of the receptor site not being operational in recent years, this objective has not been graded.

18.1.3 CEMEX has an overall health and safety policy and a health and safety policy for operations. They are also ISO18001 accredited. CEMEX would implement its corporate health and safety procedures at the receptor site.

18.1.4 One of CEMEX's responsible sourcing key performance indicators is to maintain zero injuries per 100,000 direct employees each year. CEMEX is currently reporting zero injuries per 100,000 direct employees. It has the same target for 2012.

18.1.5 Table 18.1 provides the grade given for evaluation objective 15 and the justification for the grade.

Table 18.1 Evaluation objective 15 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
15. To conform to health and safety good practice.	a) Health and safety performance conforms to good practice.	**N/A**	N/A	The receptor site has no health and safety track record as it is not yet operational so this objective has not been scored.

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References

[1] *A Practical Guide to the Strategic Environmental Assessment Directive* ODPM (September 2005); *Strategic Planning for Sustainable Waste Management: Guidance on Option Development and Appraisal* Department for Communities and Local Government (2002)

[2] *The London Plan* Greater London Authority 2011

[3] *The Cambridgeshire and Peterborough Waste Local Plan* Cambridge County Council 2003

[4] *Cambridgeshire and Peterborough Minerals and Waste Development Plan Core Strategy Development Plan Document (submission draft 2010)* Cambridge County Council 2010

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.03**

Volume 3: Project-wide effects assessment appendices

Appendix A.4; Annex D.2: EMOS Rainham Landfill

APFP Regulations 2009: Regulation **5(2)(a)**

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January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Environmental Statement

Volume 3 Appendices: Project-wide effects assessment

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1 Introduction

1.1.1 The construction of the Thames Tideway Tunnel would require the excavation of a large volume of material at multiple sites throughout London. To identify the preferred options for the management of the excavated material a detailed options assessment has been undertaken.

1.1.2 The methodology for assessment of the excavated material options is based on the Sustainability Appraisal methodology[1]. The assessment has taken a phased approach and at each stage the least preferred options have been eliminated until the final most viable and sustainable options have been selected to form the planning stage preferred list. The options on the planning stage preferred list demonstrate the potential capacity to manage the excavated material in a sustainable manner. The assessment is based on the consistent assessment of options against agreed evaluation objectives throughout the process.

1.1.3 The steps informing the assessment process were:

a. Development of a long list of potential options for the treatment, reuse, recycling or disposal of excavated materials.

b. Viability filter involving the assessment of the long list against the operational evaluation objective associated with viability of the options.

c. Preliminary assessment to develop a short list of options which perform sufficiently well against all the evaluation objectives (environmental, social, operational, policy and health and safety).

d. Detailed assessment in which the options on the short list was further scrutinised to produce a planning stage preferred list of options which performs best against the full suite of evaluation objectives.

1.1.4 For each short listed option whose viability has been confirmed a detailed *Excavated Materials Option Suitability (EMOS) report* has been produced. The *EMOS reports* provide a summary of the site operations and the overall performance of the option against the evaluation objectives.

1.1.5 This *EMOS report* sets out the detail assessment for Rainham Landfill, in Essex. The report provides the information gained during the detailed assessment stage of the excavated material options assessment (options assessment) and the grades awarded against each evaluation indicator as part of this assessment. A grade is provided for each evaluation indicator, using an agreed set of evaluation criteria, against seven grades of impact (ranging from --- to +++). The *EMOS report* also provides a risk profile for the site identifying the key risks associated with the option in relation to accepting the Thames Tideway Tunnel project excavated material.

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2 Site description

2.1 Site location

2.1.1 Rainham Landfill is located adjacent to the River Thames at Rainham Marshes, Essex, with some light industry less than 1.5km to the northwest of the receptor site. Rainham Marshes RSPB Nature Reserve is located to the north and east of the receptor site.

2.1.2 Rainham Landfill is operated by Veolia Environmental Services.

2.1.3 There are residential properties located 1.2km to the north of the receptor site boundary, in the village of Rainham.

2.1.4 The receptor site can be accessed via a private access road from the A13, or via the receptor site's jetty on the River Thames.

2.1.5 The receptor site has accepted biodegradable municipal and commercial and industrial waste from London and the South East Region.

2.1.6 Rainham Landfill site location is shown in Plate 3.1 Rainham Landfill site location.

2.1.7 In addition to the landfill, other waste management activities are located at the receptor site, these include a material recycling facility, composting facility and soil washing plant, all of which will be decommissioned as the receptor site is restored.

2.2 Site operations

2.2.1 Rainham Landfill is an active landfill which receives biodegradable municipal, commercial and industrial non hazardous wastes. It has planning consent to receive these materials until December 2018, when it will cease receiving material.

2.2.2 Thames Tideway Tunnel project material would be delivered to the receptor site either by marine transport using the receptor site's dedicated jetty or by road. If delivered by the jetty, it would be unloaded by crane and placed in to tipping vehicles for transfer to the restoration area. The site operator indicated that if the Thames Tideway Tunnel project material (soils, sands and gravels) were deemed to be of a suitable quality, they would be stockpiled in the restoration area prior to direct placement for restoration. If however they were not considered of a suitable quality, the soils, sands and gravels would be delivered to the Coldharbour Lane soil washing plant, where the material would be screened prior to it being stockpiled to be used for restoration.

2.2.3 The receptor site's management plan allows clay material to be used for restoration and potentially landfill capping, dependent on its quality which would be determined based on criteria defined by the operator. The clay can only be laid in situ between the months of April and October each year to ensure that it meets the planning requirement that restoration material used is deposited when in a dry and friable condition. Outside of this

period the clay would be stockpiled until the following April, which could impact the delivery of Thames Tideway Tunnel project material, if the area designated for stockpiling is of insufficient capacity to accept the required quantities of Thames Tideway Tunnel project material outside the deposit period.

2.2.4 It is considered by the site operator that the chalk material would either be stockpiled (as in spread over a designated area until it hardens and more material could be deposited in layers) or delivered direct to where it is required, dependent on the receptor site restoration requirements at the time of its delivery.

2.2.5 The operator confirmed that wherever possible, materials would be stockpiled in close proximity to the restoration areas where they would be used, in order to minimise the impact of double handling plant movements.

2.2.6 The site operator has confirmed that all Thames Tideway Tunnel project material would be used for restoration and engineering purposes and not used for disposal in the landfill void.

2.3 Planning consent

2.3.1 Planning consent (P1275.96) was granted in February 1998 by the London Borough of Havering and includes information relating to restoration schemes. The final phase of the landfill must be restored by 2018.

2.3.2 A Section 106 agreement[1] (P1295.11) has been signed, allowing 300 vehicle movements per day at the receptor site. From the Section 106 agreement Veolia have calculated that approximately 1.7million m^3 (estimated to be or 2.1million tonnes) of material would be required to complete restoration of the receptor site.

2.3.3 In addition to the restoration material140,000m^3 of soil is required as a protection layer below the landfill cap, however the placement of this material would be classified as disposal and so have not included within the total restoration tonnage required.

2.3.4 The receptor site is being restored into a wildlife park, known as the “Wildspace Conservation Park”.

2.4 Permitting

2.4.1 EA permit number: EP3136GK

2.4.2 The receptor site has an environmental permit for landfilling and restoration. The receptor site also holds a waste management licence to operate the jetty (WML100154).

[1] A Section 106 Agreement includes additional requirements made by a Planning Authority when granting a development planning permission. Additional requirements may relate to restrictions on operations, or mitigation measures to be put in place to limit any adverse impacts the new development may have on its surroundings.

2.4.3 The receptor site is permitted to accept 700,000t of inert waste annually. The jetty is permitted to accept 234,000tpa.

2.4.4 Section 14.2 details the type of materials which can be received at the receptor site.

2.4.5 Rainham Landfill has the necessary environmental permit in place to accept excavated Thames Tideway Tunnel project material for landfill restoration

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3 Overall site summary

3.1.1 Table 3.1 below provides a summary of Rainham Landfill and an assessment of its suitability against the evaluation objectives. Sections 4 to 18 of this *EMOS report* provide more detail on each evaluation objective.

Table 3.1 Summary of Rainham Landfill and its overall suitability

Site name:	Rainham Landfill (VEO.1)		**Operator:**	Veolia Environmental Services			
Planning consent	Yes, until 2018 PL127596		**Permit**	Yes - EP3136GK			
Void capacity	1.7million m^3		**Throughput**	700,000tpa			
Recovery/disposal	Recovery						
Materials	**London clay**	✓	**Lambeth group**	✓	**Chalk**	✓	
Transport type	**Road**	✓	**Rail**	X	**Marine transport**	✓	

Receptor site overview

Veolia Environmental Services (Veolia) operate a municipal waste landfill at Rainham Marshes, Essex. The receptor site has a planning consent requiring the receptor site to be restored by December 2018. Large areas of the receptor site are currently being restored to become a wildlife park, known as the "Wildspace Conservation Park", which is being developed by the London Thames Gateway Development Corporation. The Thames Tideway Tunnel project material would be used to restore the landfill. The receptor site would be accessed by road and marine transport. The receptor site is approximately 23km from the Thames Tideway Tunnel project main drive sites.

Assessment

1. Land and other resources	a)	0	8. Cultural heritage	a)	0
	b)	-	9. Employment opportunities	a)	0
2. Climate change	a)	0		b)	0
	b)	0	10. Cost	a)	+++
	c)	++	11. Operational suitability of the receptor site.	a)	0
3. Local amenity	a)	+		b)	+++
4. Landscapes and townscapes	a)	0		c)	--
	b)	++		d)	-
5. Access to open space	a)	0		e)	+++
	b)	+++		f)	0
6. Water quality	a)	0	12. Waste hierarchy	a)	+++
	b)	0	13. Proximity principle	a)	+
7. Biodiversity	a)	0	14. Sustainable transport policy	a)	+++
	b)	0	15. Health and safety good practice	a)	+

Environmental summary
Rainham Landfill requires inert material to restore the municipal waste landfill for nature conservation and controlled public access. The deposition of material for restoration would have some minor adverse short term visual effects at the receptor site. In the long term it is considered that there would be a beneficial effect on the visual landscape and biodiversity when compared to its previous operations as an active landfill. The receptor site is located approximately 23km from the Thames Tideway Tunnel project main drive sites and would be accessed using the marine transport which is in line with sustainable transport policies.
Social summary
Veolia anticipate managing the acceptance of restoration material using current staff. In the long term current staff are likely to be transferred to other sites run by the operator. The creation of the proposed conservation area "Wildspace Conservation Park" would lead to ongoing employment at the receptor site.
Operational summary
It is probable that the receptor site would be able to accept approximately 1.3million tonnes (28%) of the Thames Tideway Tunnel project material at the rates required up until 2018. If restoration is not complete by 2018 the operator would apply for an extension to the existing planning consent. The receptor site should be able to accept all types of excavated materials produced by the Thames Tideway Tunnel project. The receptor site is accessible by road and marine transport. Rainham Landfill restoration would be considered as beneficial use for all material that it accepts[I]. Veolia operate under ISO18001 and have a carbon management plan which covers Rainham landfill. The receptor site has had one reported Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) incident in the past three years of operations.
Overall suitability
Rainham Landfill has the ability to receive 28% of the Thames Tideway Tunnel project material, and is available up to 2018. The quantity of material required for the restoration is approximately 2.1million tonnes, however due to the restrictions on the receptor site's throughput and availability it would only be able to receive 1.3million tonnes of Thames Tideway Tunnel project material. It has been assumed that all Thames Tideway Tunnel project material would be placed for restoration at the receptor site and not for disposal below the engineered landfill cap. Thames Tideway Tunnel project material can be delivered to the receptor site by marine transport and by road. The receptor site has a beneficial or neutral grading for all evaluation indicators with the exception of two of the operational indicators and the effect on landtake indicator. Rainham Landfill is included on the planning stage preferred list.

[I] Based on the *Excavated material options assessment* (*EMOA*) beneficial use test

Plate 3.1 Rainham Landfill site location

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4 Evaluation objective 1: To ensure prudent use of land and other resources

4.1.1 The receptor site currently sources material for the engineered cap and restoration purposes from construction, demolition and excavation projects around London and the South East of England.

4.1.2 The agreed contouring of the restored landfill requires some restoration material to be used outside the receptor site boundary. This is to reduce the visual impact of the agreed restoration contours from outside the receptor site boundary.

4.1.3 The use of Thames Tideway Tunnel project material would contribute to this extension of the receptor site boundary. This increase in the receptor site boundary is not as a result of accepting Thames Tideway Tunnel project material but a requirement of the restoration plans for the receptor site.

4.1.4 Table 4.1 provides the grade given for evaluation objective 1 and the justification for the grade.

Table 4.1 Evaluation objective 1 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
1. To ensure prudent use of land and other resources.	a) Extent to which resources such as sand, gravel and chalk are conserved by processing or storage of Thames Tideway Tunnel project material at receptor sites.	**0**	Thames Tideway Tunnel project material is unlikely to affect virgin material use e.g. material replaces other reusable materials or no material substitution required.	Thames Tideway Tunnel project material would be used for restoration. Currently materials used for this purpose are sourced from other construction, demolition and excavation projects within the region, and therefore there would be no impact on the use of virgin materials at the receptor site.
	b) Extent to which Thames Tideway Tunnel project material would effect landtake at (footprint of) receptor sites in the long term.	**-**	The acceptance of Thames Tideway Tunnel project material would contribute to the requirement for additional land extending the receptor site's boundary by up to 0.5x.	The use of Thames Tideway Tunnel project material at the receptor site would contribute to extending the receptor site boundary, although the acceptance of the material is not the cause of the boundary extension, which is a requirement of the restoration plans for the receptor site.

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5 Evaluation objective 2: To reduce climate change impacts

5.1.1 The operator requires that the soils, sands and gravels, which are to be used for restoration purposes, are treated (e.g. grading) prior to being used for capping on the receptor site. This active processing will require energy use and therefore have associated carbon impacts.

5.1.2 Clay material can only be laid for restoration at certain times of the year (April to October) and outside the defined period the material would be stockpiled before being used during the next deposit period. This would therefore require mechanical plant to double handle materials, which would result in increased carbon emissions, when compared to material being directly deposited on delivery. Wherever possible, the operator would stockpile materials in close proximity to where they are required for restoration in order to mitigate this effect.

5.1.3 The receptor site operates under the Veolia's Corporate Carbon Management Plan, which includes measures to reduce the receptor site's GhG emissions produced from its operations, such as using vehicles with low emissions, or as producing renewable energy through the operator's Energy from Waste facilities which to some extent offset the energy requirements for mobile and soil treatment plant at the receptor site.

5.1.4 The excavated material would not be reprocessed into aggregate at the receptor site. However if any Thames Tideway Tunnel project material did not meet the required specification to be used as restoration material, it would be delivered to the Coldharbour Lane soil washing facility where it would be screened into material suitable for restoration. Where stones are removed in this screening process these would be mixed with other aggregates and exported as a product. Due to the unknown quantity of Thames Tideway Tunnel project material which would require this processing, the potential impact this would have on GhG emissions has not been assessed.

5.1.5 The excavated material would not be reprocessed into aggregate at the receptor site. Based on data from the Environment Agency's (EA) lifecycle analysis tool WRATE, the overall GhG emissions for deposition of excavated material to land is 3.17kg CO_2 eq per tonne of excavated material. The excavation material is assumed to be inert soil and the EA's WRATE emissions associated with material reception and spreading have been assumed.

5.1.6 The figures for GhG emissions from transport have been estimated based on:

a. the average CO_2 emissions for the different types of transport; and

b. the distance travelled from the Thames Tideway Tunnel project sites to the receptor site.

5.1.7 The GhG emissions calculated are for comparative purposes only and do not provide an exact representation of the transport emissions associated

with the Thames Tideway Tunnel project excavated material. Full GhG methodology and assumptions can be found in Appendix B.10.

5.1.8 It has been estimated that using Rainham Landfill would produce 1.49kg CO_2 eq per tonne of excavated material accepted.

5.1.9 Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would form part of, are in an area that is not at risk of flooding. The receptor site has systems in place for the management of water on site.

5.1.10 Table 5.1 provides the grade given for evaluation objective 2 and the justification for the grade.

Table 5.1 Evaluation objective 2 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
2. To reduce climate change impacts.	a) Greenhouse gases emitted through material treatment, handling and use at receptor sites (excludes transport).	**0**	Thames Tideway Tunnel project material would not require treatment and minimal handling required e.g. passive drying used and material moved by conveyor where possible.	Some of the Thames Tideway Tunnel project material would be processed prior to it being used for restoration. However this would be offset at the receptor site through Veolia's Corporate Carbon Management Plan which has measures to offset the handling of all material at the receptor site, including Thames Tideway Tunnel project material.
	b) Extent to which flood risk is altered by Thames Tideway Tunnel project material at the receptor site (or in the local catchment).	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not change flood risk (from any source or a combination of sources) to the site and surroundings.	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would form part of, are in an area that is not at risk of flooding.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	c) Greenhouse gases emitted through transport of Thames Tideway Tunnel project material to the receptor sites.	++	Through the transport of Thames Tideway Tunnel project material between 1 and less than or equal to 2kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced	Through the transport of Thames Tideway Tunnel project material it is estimated that 1.49kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.

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6 Evaluation objective 3: To protect local amenity

6.1.1 The receptor site is not located within an Air Quality Management Area (AQMA).

6.1.2 There is the potential for dust to be generated from the delivery of Thames Tideway Tunnel project material. There are dust suppressant measures at the receptor site, including spraying haul roads and wheel washing. Regular dust monitoring is carried out at the receptor site and is reported to the EA.

6.1.3 Thames Tideway Tunnel project material would be similar in nature to any other material that would be accepted for restoration purposes and would form part of the existing operations at the receptor site.

6.1.4 The restoration of the landfill, which the Thames Tideway Tunnel project material would contribute to, would include capping the landfill. This would reduce the release of odours from the closed landfill. The use of Thames Tideway Tunnel project material at this receptor site would contribute to this beneficial effect.

6.1.5 Table 6.1 provides the grade given for evaluation objective 3 and the justification for the grade.

Table 6.1 Evaluation objective 3 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
3. To protect local amenity.	a) Extent of potential effects on local amenity from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a minor beneficial effect on the local amenity.	Operations at the receptor site to which the receipt of Thames Tideway Tunnel project material would contribute, would be used for restoration and where appropriate capping material. This would prevent the release of odours emitting from the closed landfill. There are operational measures at the receptor site such as spraying haul roads for dust suppression to reduce impacts of nuisance on surrounding receptors.

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7 Evaluation objective 4: To conserve landscape and townscapes at receiving locations

7.1.1 The receptor site is not located within an Area of Outstanding Natural Beauty (AONB).

7.1.2 There is a nature conservation area to the north and east of the receptor site and the River Thames forms the receptor site boundary to the south and west. Residential properties are located 1.2km to the north in the village of Rainham and 800m south in Crayford Ness and 700m west in Bexley on the opposite side of the River Thames. There are three schools and one hospital located within 2km of the receptor site's boundary.

7.1.3 The top of the landfill is visible from surrounding receptors; however, the rest of the receptor site is screened so restoration operations are not visible from nearby receptors.

7.1.4 In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape, changing the area from an operating landfill to a nature conservation area and public space for mountain biking and sailing.

7.1.5 Table 7.1 provides the grade given for evaluation objective 4 and the justification for the grade.

Table 7.1 Evaluation objective 4 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
4. To conserve landscapes and townscapes at receiving locations.	a) Extent of short term visual and landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have a short term effect on the local visual amenity at the receptor site or any effect would be negligible	The restoration activities to which Thames Tideway Tunnel project material would contribute would be screened from local visual receptors and would not have any short term affect on local visual amenity.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of permanent visual and landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a permanent moderate beneficial visual effect on the landscape, based on a 'do nothing' view of the site.	In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape. Changing the area from an operating landfill to a nature conservation area and public space for mountain biking and sailing.

8 Evaluation objective 5: To protect quality of and access to open space

8.1.1 A Public Right of Way (PRoW) runs along the southwest boundary of the receptor site. As each section of the landfill is restored and handed over to the Wildspace Conservation Park operator these areas would be opened up for public access.

8.1.2 In the short term it is not envisaged that receiving Thames Tideway Tunnel project material at the receptor site would affect the PRoWs that run along the receptor site boundaries, as the operator believes during restoration these PRoWs would remain accessible to the public.

8.1.3 The restoration plans for the receptor site which Thames Tideway Tunnel project material would contribute, would result in substantially increasing accessibility to public open space. When the receptor site is fully restored, some of the land would be available for public access. Some areas would have restricted public access in order to protect the newly created habitats. The receptor site covers an area of approximately 177hectares (ha) and the Wildspace Conservation Park will cover in the region of 650ha in total.

8.1.4 Table 8.1 provides the grade given for evaluation objective 5 and the justification for the grade.

Table 8.1 Evaluation objective 5 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
5. To protect quality of and access to open space.	a) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the short term?	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or a negligible effect on access to and quality of open space and PRoWs.	The restoration works at the receptor site to which the Thames Tideway Tunnel project material would contribute would not disrupt the existing PRoW that runs along the southwest boundary of the receptor site.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the long term?	+++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would constitute a major enhancement to the PRoW and substantially increase accessibility to public open space.	The restoration plans for the receptor site, to which Thames Tideway Tunnel project material would contribute, would result in substantially increasing accessibility to public open space. The receptor site will be restored to form the Wildspace Conversation Park.

9 Evaluation objective 6: To protect water quality

9.1.1 The River Thames borders the southern and western boundary of the receptor site.

9.1.2 The landfill has been lined and the Thames Tideway Tunnel project material would be used for restoration and engineered landfill capping (where appropriate). Landfill capping would potentially reduce the production of leachate. The receptor site has water management systems and landfill engineering systems (e.g. lining).

9.1.3 The receptor site is within a 'total catchment' groundwater Source Protection Zone (SPZ), which highlights groundwater sources such as wells, boreholes and springs used for public drinking water supply.

9.1.4 Based on the water management measures in place at the receptor site and the inert nature of the Thames Tideway Tunnel project material it is not anticipated that accepting Thames Tideway Tunnel project material would have an effect on the surrounding water courses and/or groundwater.

9.1.5 Table 9.1 provides the grade given for evaluation objective 6 and the justification for the grade.

Table 9.1 Evaluation objective 6 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
6. To protect water quality.	a) Extent of potential effects on fluvial water quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on the local watercourses.	There are currently management plans to prevent the impact on local watercourses. These management plans would continue to be used throughout the delivery of Thames Tideway Tunnel project material to the receptor site.
	b) Extent of potential effects on groundwater quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on groundwater.	The receptor site is within a 'total catchment' groundwater SPZ. The landfill is clay lined and is managed to prevent leachate produced at the receptor site from entering the local groundwater.

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10 Evaluation objective 7: To protect biodiversity

10.1.1 The Inner Thames Marshes, of which Rainham Marshes form 77%, is a Site of Special Scientific Interest (SSSI) and borders the receptor site to the north. There are no habitats identified within the receptor site which would affect the delivery of Thames Tideway Tunnel project material.

10.1.2 There are a number of operational management plans in place for the receptor site to reduce the potential for impacts on the SSSI. These include restricting plant access to parts of the receptor site closest to the SSSI.

10.1.3 There are also measures on the receptor site to discourage biodiversity, such as, newt fencing to prevent species migration from the SSSI in to the receptor site.

10.1.4 In the short term, the handling and use of the Thames Tideway Tunnel project material as part of the existing operations at the receptor site is likely to have no or negligible effects on the SSSI.

10.1.5 In the long term, restoration of the receptor site would lead to the incorporation of the SSSI into the proposed wildlife park. New habitats would be created and species will be actively encouraged onto the receptor site. The exact nature of the habitats created will be dependent on the material used to restore the site. At this stage it is uncertain whether the habitats created through the restoration would have more or less ecological value than those currently present on the receptor site. The effect on the designated site of the change in use from an operational landfill to a wildlife park and public space for mountain biking and sailing is also uncertain. Although it is considered unlikely that there would be an adverse effect on the designated site in the long term.

10.1.6 Table 10.1 provides the grade given for evaluation objective 7 and the justification for the grade.

Table 10.1 Evaluation objective 7 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
7. To protect biodiversity.	a) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the short term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	There are no habitats identified within the receptor site which would affect the delivery of Thames Tideway Tunnel project material. Operational plans are in place to prevent any adverse effect on the adjacent SSSI.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the long term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	In the long term when fully restored the receptor site will be developed to create habitats for wildlife. Habitats would be created through the restoration of the receptor site. It is not possible to assess whether these would be of higher ecological value than the existing habitats and what the effect would be on the designated site in close proximity to the receptor site.

11 Evaluation objective 8: To protect cultural heritage

11.1.1 The closest Scheduled Ancient Monument (SAM) to the receptor site is Purfleet Magazine which is located just over 2km from the receptor site boundary. There are no Registered Parks and Gardens within 2km of the receptor site.

11.1.2 It is not anticipated that the operations at the receptor site would have an impact on any designated sites.

11.1.3 It is not anticipated that the operations at the receptor site which Thames Tideway Tunnel project material would contribute to would have an impact with regards to cultural heritage.

11.1.4 Table 11.1 provides the grade given for evaluation objective 8 and the justification for the grade.

Table 11.1 Evaluation objective 8 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
8. To protect cultural heritage.	a) Extent of potential effects on designated or nominated archaeological sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	The receipt of Thames Tideway Tunnel project material would not have an impact on cultural heritage receptors, the nearest designated site is over 2km from the receptor site boundary.

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12 Evaluation objective 9: To provide employment opportunities

12.1.1 The receptor site is already operational and it is unlikely that additional jobs would be created at the site. Although it is possible that additional staff would be required to receive Thames Tideway Tunnel project material, it is assumed at this stage that no additional jobs would be directly attributable to the acceptance of Thames Tideway Tunnel project material.

12.1.2 In the long term it is unlikely that any jobs would be created or lost. When the receptor site is fully restored, the staff at the receptor site are likely to be transferred to other Veolia operated sites, such as Ockendon Landfill. It has been assumed at this stage that no additional jobs would be created at the wildlife park.

12.1.3 Table 12.1provides the grade given for evaluation objective 9 and the justification for the grade.

Table 12.1 Evaluation objective 9 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
9. To provide employment opportunities.	a) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the short term.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the short term.	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material forms part of would contribute to no job gains in the short term.
	b) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the long term.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the long term.	In the long term it is unlikely that any jobs would be created or lost. When the receptor site is fully restored, the staff at the receptor site are likely to be transferred to other Veolia operated sites, such as Ockendon Landfill.

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13 Evaluation objective 10: To minimise the cost associated with the management of excavated material

13.1.1 The operator was not able to provide indicative costs at this time for the receipt of material, as this was considered to be confidential.

13.1.2 However, the receptor site did confirm that it would charge a gate fee to receive material and that this charge would be 'reasonable' and would be negotiated through procurement.

13.1.3 In order to compare the likely cost associated with transport and acceptance of the Thames Tideway Tunnel project material at each receptor site a cost model has been used.

13.1.4 The cost of transporting the excavated material has been calculated from the distance travelled and a cost per tonne/ km for each of the transport mode (road, marine transport and rail). The road and marine transport cost have been calculated from the quotes gathered from operators based on today's prices. A gate fee of £4 per tonne is assumed based on current prices. Full details of the assumptions made can be found at Appendix B.10.

13.1.5 It has been estimated that the cost of transporting and managing excavated material at Rainham Landfill is £9.08 per tonne of excavated material that can be accepted at the receptor site. These costs are predominantly associated with transfer of the material from the Thames Tideway Tunnel sites to the receptor sites. This cost is an estimated cost for comparison purposes within the *EMOA* and may differ from the actual cost which would be incurred if Thames Tideway Tunnel project material were taken to this receptor site.

13.1.6 Table 13.1 provides the grade given for evaluation objective 10 and the justification for the grade.

Table 13.1 Evaluation objective 10 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
10. To minimise the costs associated with the management of excavated material.	a) Costs of transportation, treatment, handling and use of Thames Tideway Tunnel project material.	+++	The transportation, treatment, handling and use of Thames Tideway Tunnel project material would cost less than £10 per tonne.	The cost of transportation, treatment, handling and use of Thames Tideway Tunnel project material has been estimated (using the *EMOA* cost model) to be £9.08 per tonne.

14 Evaluation objective 11: To ensure operational suitability of the receptor site

14.1 Evaluation indicator 11a) Timescales

14.1.1 The receptor site has planning consent that states that restoration of the receptor site shall be completed by 31st December 2018.

14.1.2 The operator believes the receptor site is likely to be fully restored by December 2018. If restoration is not complete by this date the operator would apply for an extension to the existing planning consent.

14.1.3 Based on Thames Tideway Tunnel project excavation timescales of 2016 to 2021 and the existing planning consent for the receptor site, the receptor site would be available to receive Thames Tideway Tunnel project material for approximately three full years of the six year timetable.

14.1.4 Table 13.1 provides the grade given for evaluation objective 11a and the justification for the grade

Table 14.1 Evaluation objective 11a grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	a) Likelihood of implementation within the required timescale.	-	The receptor site would be available for use for Thames Tunnel project material for greater than or equal to 40% but less than 60% of the required timescale	Planning consent for the receptor site requires work to be completed by 31st December 2018. The receptor site would be available to accept Thames Tunnel material for three years out of the six year timetable.

14.2 Evaluation indicator 11b) Material characteristics

14.2.1 Rainham Landfill would be able to accept London Clay, chalk, Lambeth Group with sands and gravels for the receptor site restoration purposes under the European Waste Catalogue (EWC) code 17 05 04.

14.2.2 The materials delivered to the receptor site would be subject to standard waste acceptance criteria (WAC) testing to ensure that it is inert material and therefore suitable to be accepted at the receptor site. It is assumed that most, if not all, of the Thames Tideway Tunnel project excavated material would be inert.

14.2.3 With respect to the moisture content of the Thames Tideway Tunnel project materials, is understood that the EA would allow the receptor site to accept chalk slurry provided it passes a standard ‘stick test’. This test relates to using a stick to check whether a waste is a liquid by seeing if the

waste "flows near instantaneously into a hollow in the surface of the waste". This test is set out in the EA guidance on waste acceptance procedures and criteria[2]. The guidance states that if a waste is not liquid it must be a sludge, or solid. A waste that flows only slowly, rather than near instantaneously, into a hollow will be a sludge or a fine-grained solid and it is therefore not prohibited.

14.2.4 Rainham Landfill has the necessary environmental permit in place to accept clean inert excavated Thames Tideway Tunnel project material for landfill restoration. Details are set out in the receptor site's environmental permit.

14.2.5 Table 14.2 provides the grade given for evaluation objective 11b and the justification for the grade.

Table 14.2 Evaluation objective 11b grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	b) Acceptability of material with Thames Tideway Tunnel project material characteristics by the receptor sites.	+++	The receptor site could accept for use all of the Thames Tideway Tunnel project material types based on their characteristics.	The receptor site is permitted to accept all types of clean non hazardous material produced by the Thames Tideway Tunnel project.

14.3 Evaluation indicator 11c) Capacity

14.3.1 The receptor site has permitted capacity to receive 700,000t of inert material per annum.

14.3.2 The planning consent of the receptor site allows the import of material for restoration, estimated by the operator to be approximately 1.7million m^3 of material (approximately 2.1million tonnes). Table 14.3 details the permitted capacity for the receptor site in relation to the material that will be produced by the Thames Tideway Tunnel.

14.3.3 Table 14.3 also sets out the potential tonnage of Thames Tideway Tunnel project material accepted at the receptor site each year based on the assumptions used in the *EMOA* cost and GhG model. The receptor site would be able to accept 28% of the Thames Tideway Tunnel excavated materials, based on the total amount of restoration material that it can accept and tonnages which are likely to be produced by the Thames Tideway Tunnel during the three years that it is available.

Table 14.3 Capacity for inert material at Rainham Landfill (tonnes[II])

	Year						Total
	2016	2017	2018	2019	2020	2021	
Total Thames Tideway Tunnel production (tonnes)	63,000	549,000	1,938,000	1,852,000	147,000	155,000	4,704,000
Maximum permitted per annum (tonnes).	700,000	700,000	700,000	-	-	-	-
Potential Thames Tideway Tunnel project material accepted (tonnes).	63,000	549,000	694,000	-	-	-	1,306,000
Potential Thames Tideway Tunnel project material accepted (%).	100%	100%	36%	0%	0%	0%	28%

14.3.4 Table 14.4 provides the grade given for evaluation objective 11c and the justification for the grade.

Table 14.4 Evaluation objective 11c grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	c) Capacity of the receptor site to accept the required volume of Thames Tideway Tunnel project material (based on likely tonnes accepted/ %).	--	The receptor site has capacity to accept material greater than or equal to 15% but less than 30% of Thames Tideway Tunnel project.	The receptor has the potential to accept approximately 1.3million tonnes or 28% of the excavated material that would be produced by the Thames Tideway Tunnel.

14.4 Evaluation indicator 11d) Receptor site throughput

14.4.1 Thames Tideway Tunnel project material would be delivered to the receptor site by road or by marine transport. The operator has a

[II] Figures quoted to the nearest 1,000 tonnes

preference for material to be delivered to the receptor site by marine transport.

14.4.2 The jetty is not restricted by tides and has the potential for 24hour access, although currently the receptor site does not operate at this level. The jetty would be able to receive two 1,000t barges per day of Thames Tideway Tunnel project material. However, the jetty operations are covered by an environmental permit that allows a maximum of 234,000tpa to be accepted, via the jetty which will restrict the input level by marine transport.

14.4.3 The receptor site also has the ability to receive some deliveries of Thames Tideway Tunnel project material by road. However, there are restrictions on HGV movements, limiting the receptor site to 300 vehicle movements per day (150 in and 150 out).

14.4.4 When the throughput from the barge access and HGV movements is combined, this gives the receptor site the ability to receive 4,400t of Thames Tideway Tunnel project material per day.

14.4.5 The amount of material produced by the Thames Tideway Tunnel project would vary on a daily and monthly basis. The assessment of throughput has been based on both the mean and peak production rates over the Thames Tideway Tunnel project construction period. The mean rate is taken as the mean monthly production rate taken over each year in the period 2016 to 2021. The peak rate is based on the month producing the maximum tonnage of excavated material in each year.

14.4.6 Table 14.5 details the proportion of the Thames Tideway Tunnel project material which would be accepted by Rainham over time[III].

14.4.7 In Year 1 and 2 of the excavation process Rainham Landfill's limit of 4,400t per day is sufficient to accept all of the Thames Tideway Tunnel project material produced and an average and peak daily basis. In Year 3 the receptor site would be able to accept under half of the peak total Thames Tideway Tunnel project material produced.

[III] These figures are to be used as an indication of potential throughput at the site and do not provide exact production rates or requirements relating to outputs from the Thames Tunnel.

Table 14.5 Throughput of material at Rainham Landfill

	Year					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Maximum allowable number of barge movements at receptor site per day.	2	2	2	0	0	0
Capacity per barge (tonnes).	1000	1000	1000	-	-	-
Maximum allowable number of HGVs at receptor site per day.	150	150	150	0	0	0
Capacity per HGV (tonnes).	16	16	16	-	-	-
Potential daily capacity at the receptor site (A).	4,400	4,400	4,400	0	0	0
Thames Tideway Tunnel average daily tonnage*(B).	250	2,050	7,200	6,850	550	550
Allowable vs Average Required Number of barge at receptor site (A ÷ B).	1,760%	215%	61%	0%	0%	0%
Thames Tideway Tunnel peak daily tonnage**(C).	350	3,050	10,750	10,300	800	850
Allowable vs Peak Number of barges at receptor site (A ÷ C).	1257%	144%	41%	0%	0%	0%

***** *The Thames Tideway Tunnel average daily tonnage for each year is calculated as the mean of the daily rate each month assuming 22.5 days in each month.*

****** *The peak daily tonnage is based on the average daily tonnage (assuming a 22.5 day month) for the peak month of production in each year.*

14.4.8 Table 14.6 provides the grade given for evaluation objective 11d and the justification for the grade.

Table 14.6 Evaluation objective 11d grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	d) Ability of the receptor sites to accept Thames Tideway Tunnel project material at the anticipated rate (speed of material generation vs acceptance rate).	-	The receptor site could take greater than or equal to 2,800t but less than 4,600t per day of Thames Tideway Tunnel project material.	The receptor site has the ability to receive 4,400t per day, based on the delivery of marine transport and road deliveries.

14.5 Evaluation indicator 11e) Planning consent and permitting

14.5.1 Rainham Landfill has the necessary planning consent and environmental permit in place to accept excavated Thames Tideway Tunnel project material for landfill restoration.

14.5.2 Further information on the receptor site's planning consent and permit can be found in Section 2.3 and 2.4.

14.5.3 Table 14.7 provides the grade given for evaluation objective 11e and the justification for the grade.

Table 14.7 Evaluation objective 11e grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	e) Site operations have appropriate planning and permitting consents.	+++	The receptor site has planning consent and an EA permit.	The receptor site has the relevant planning consent and environmental permit in place to be able to accept Thames Tideway Tunnel project material.

14.6 Evaluation indicator 11f) Transport modes

14.6.1 The receptor site has marine transport and road access.

14.6.2 Currently one 700 tonne barge per day of material is being delivered to the jetty. The operator has confirmed that the jetty is to be upgraded prior to 2016, with a clam attachment on the crane used to unload material from the barges. This would mean that the site could accept two 1,000 tonne barge deliveries per day.

14.6.3 The receptor site also has the ability to receive some deliveries of Thames Tideway Tunnel project material by road. However, restrictions on HGV movements limit the receptor site to 300 vehicle movements per day (150 in and 150 out).

14.6.4 Table 14.8 provides the grade given for evaluation objective 11f and the justification for the grade.

Table 14.8 Evaluation objective 11f grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	f) Can accept excavated material from multiple transport modes.	0	The receptor site is accessible by two transport modes with no infrastructure upgrades.	The receptor site has marine transport access as well as being accessible by road.

15 Evaluation objective 12: To conform to the waste hierarchy

15.1.1 The Thames Tideway Tunnel *Excavated materials and waste (EM&W) strategy* contains an objective to 'To minimise waste arisings, maximise re-use, recovery, recycling and beneficial use and minimise the impact of waste on the environment and communities''. The Thames Tideway Tunnel project material would be used to restore Rainham Landfill to a wildlife park with public access by capping and contouring the receptor site. This is considered to be beneficial use in line with the *EMOA* beneficial use test. Table 15.1 details the application of the *EMOA* beneficial use test applied to Rainham Landfill.

15.1.2 The operator has indicated that a proportion of all restoration material accepted at the receptor site could be used as part of the landfill cap protection layer. The site operator also confirmed that due to changes in the materials that are subject to landfill tax, material used as part of the landfill cap protection layer which was previously considered for use for restoration, is now considered as being disposed of, and therefore would incur landfill tax.

15.1.3 In order to comply with the beneficial use test, the Thames Tideway Tunnel project would need to ensure that any excavated material delivered to the receptor site would only be used for restoration purposes and not as protection layer. If a proportion of the excavated material was used as material for the protection layer, that martial could not count towards the target for beneficially reusing excavated material.

Table 15.1 Rainham Landfill performance against *EMOA* beneficial use test

***EMOA* Test**	**Does the receptor site comply with test?**	**Comment**
The activity will lead to a beneficial reuse and bring land back into use or provide ecological benefit.	Yes	Rainham Landfill will be restored and form part of the Wildspace Conservation Park.
In the case of quarries or landfill sites that the activity has a planning requirement to be restored.	Yes	Rainham Landfill has a planning requirement to be restored.
Landfill Tax would not be charged on the material.	Yes	Only if all Thames Tideway Tunnel project material is used for restoration and none of it is used for disposal.

***EMOA* Test**	**Does the receptor site comply with test?**	**Comment**
That the material is suitable for its intended use and would not harm human health or the environment.	Yes	Rainham Landfill would be able to receive non-hazardous excavated Thames Tideway Tunnel project material for use in restoration, and if managed in accordance with the environmental permit the activities should not harm human health or the environment
That the minimum amount of material is being used.	Possibly	The total amount of material required for restoring the receptor site is still to be confirmed with the Planning Authority. The proposed contours are designed to ensure they manage settlement of the waste contained within the landfill and where possible are sensitive to the surrounding area's visual amenity.
That alternative material (whether waste or non-waste) would be required if Thames Tideway Tunnel project material wasn't used.	Yes	Material would be sourced from other construction, demolition and excavation projects within London.

15.1.4 All the material accepted at the receptor site would be considered as beneficial use, if it were used for restoration. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 28% of the total Thames Tideway Tunnel project material.

15.1.5 Table 15.2 provides the grade given for evaluation objective 12 and the justification for the grade.

Table 15.2 Evaluation objective 12 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
12. To conform to waste hierarchy.	a) Extent to which the option meets the *EM&W strategy* targets.	+++	Performance of receptor site substantially exceeds target.	If the Thames Tideway Tunnel project ensured that all of the material delivered to the receptor site would be used for restoration and not disposal. It should be noted that this receptor site can only accept 28% of the total Thames Tideway Tunnel material.

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16 Evaluation objective 13: To conform to the proximity principle

16.1.1 The receptor site is 27km from Carnwath Road Riverside drive site, 24km from Kirtling Street drive site and 17km from Chambers Wharf drive site. All distances are by marine transport, and do not include a transhipment point, as material would be delivered direct from the drive site wharfs to the jetty at Rainham[IV]. Rainham is on average 23km by road from the CSO sites from which material would be removed.

16.1.2 For this evaluation objective the receptor site was assessed using a straight line distance from the main drive sites. Using a straight line distance provides a consistent measure for assessment purposes. As the receptor site would be able to receive excavated materials from more than one drive site, the mean distance has been calculated. The receptor site was then graded according to this mean figure.

16.1.3 The receptor site is approximately 23km in a straight line from the main drive sites.

16.1.4 Table 16.1 provides the grade given for evaluation objective 13 and the justification for the grade.

Table 16.1 Evaluation objective 13 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
13. To conform to Proximity Principle.	a) Average distance from main tunnel drive sites.	+	The receptor site is between 40km and 20km from source of the Thames Tideway Tunnel project material.	The receptor site is approximately 23km (straight line distance) from the main drive sites.

[IV] Distances quoted are those used in the *EMOA* GhG model. Details of the assumptions used in this model can be found in Appendix B.10. These distances are for context only and do not reflect the exact routes that would be used should this receptor site be used to accept Thames Tunnel project material.

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17 Evaluation objective 14: To conform to sustainable transport policy

17.1.1 The receptor site has jetty access and it is likely that material would be delivered by marine transport to the receptor site.

17.1.2 The receptor site is also accessible by road and it is envisaged that material would be delivered by road for restoration.

17.1.3 *The London Plan 2011*[3] Policy 5.18 Construction, excavation and demolition states that "waste should be removed from construction sites, and materials brought to the receptor site, by water or rail transport wherever that is practicable". The receptor site meets this criterion.

17.1.4 Furthermore *London Borough of Havering Development Plan Document*[4] requires to "maximise the use of the river and rail freight facilities within and outside the borough where this represents the most sustainable option". The receptor site meets this policy objective.

17.1.5 Table 17.1 provides the grade given for evaluation objective 14 and the justification for the grade.

Table 17.1 Evaluation objective 14 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
14. To conform to Sustainable Transport Policy.	a) Conforms to policy objective to move transport of materials from road to rail or marine transport.	+++	The receptor site can be directly accessed from marine transport or rail and requires no double handling	The receptor site has its own operational jetty and for material coming by marine transport would not require double handling. The receptor site is also accessible by road.

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18 Evaluation objective 15: To conform to health and safety good practice

18.1.1 The receptor site operates under the Veolia's corporate health and safety management system to report and record accidents or safety related incidents.

18.1.2 The management system applicable to this receptor site is ISO18001 accredited.

18.1.3 There has been one reported RIDDOR incident in the last three years at the receptor site.

18.1.4 Table 18.1 provides the grade given for evaluation objective 15 and the justification for the grade.

Table 18.1 Evaluation objective 15 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
15. To conform to Health and Safety Good Practice.	a) Health and safety performance conforms to good practice.	+	The receptor sites health and safety system is accredited and there have been five or less RIDDOR incidents in three years recorded at the receptor site.	The receptor site is ISO 18001 accredited. However, there has been one RIDDOR incident in the past three years.

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References

[1] *A Practical Guide to the Strategic Environmental Assessment Directive* ODPM (September 2005); *Strategic Planning for Sustainable Waste Management: Guidance on Option Development and Appraisal* Department for Communities and Local Government (2002)

[2] *Waste acceptance at landfills: Guidance on waste acceptance procedures and criteria* Environment Agency (Nov 2010)

[3] *The London Plan* Greater London Authority 2011

[4] *Core Strategy and Development Control Policies Development Plan Document* London Borough of Havering (2008)

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.03**

Volume 3: Project-wide effects assessment appendices

Appendix A.4; Annex D.3: EMOS Calvert landfill

APFP Regulations 2009: Regulation **5(2)(a)**

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Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Environmental Statement

Volume 3 Appendices: Project-wide effects assessment

Appendix A.4: Excavated materials options assessment

Annex D.3: Excavated materials options suitability report – Calvert Landfill

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1 Introduction

1.1.1 The construction of the Thames Tideway Tunnel project would require the excavation of a large volume of material at multiple sites throughout London. To identify the preferred options for the management of the excavated material a detailed options assessment has been undertaken.

1.1.2 The methodology for assessment of the excavated material options is based on the Sustainability Appraisal methodology[1]. The assessment has taken a phased approach and at each stage the least preferred options have been eliminated until the final most viable and sustainable options have been selected to form the planning stage preferred list. The options on the planning stage preferred list demonstrate the potential capacity to manage the excavated material in a sustainable manner. The assessment is based on the consistent assessment of options against agreed evaluation objectives throughout the process.

1.1.3 The steps informing the assessment process were:

a. Development of a long list of potential options for the treatment, reuse, recycling or disposal of excavated materials.

b. Viability filter involving the assessment of the long list against the operational evaluation objective associated with viability of the options.

c. Preliminary assessment to develop a short list of options which perform sufficiently well against all the evaluation objectives (environmental, social, operational, policy and health and safety).

d. Detailed assessment in which the options on the short list was further scrutinised to produce a planning stage preferred list of options which score best against the full suite of evaluation objectives.

1.1.4 For each short listed option whose viability has been confirmed a detailed *Excavated Materials Option Suitability (EMOS) report* has been produced. The *EMOS reports* provide a summary of the site operations and the overall performance of the option against the evaluation objectives.

1.1.5 This *EMOS report* sets out the detail assessment for Calvert Landfill in Buckinghamshire. The report provides the information gained during the detailed assessment stage of the *Excavated material options assessment* (*EMOA*) and the grades awarded against each evaluation indicator as part of this assessment. A grade is provided for each evaluation indicator, using an agreed set of evaluation criteria, against seven grades of impact (ranging from --- to +++). The *EMOS report* also provides a risk profile for the site identifying the key risks associated with the option in relation to accepting the Thames Tideway Tunnel project excavated material

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2 Site description

2.1 Site location

2.1.1 Calvert Landfill is situated directly southeast of the village of Calvert Green, with the nearest village residential property located 270m from the receptor site.

2.1.2 The site is operated by FCC Environment.

2.1.3 The nearest properties to the receptor site are Lower and Upper Greatmoor Farms which are located within the receptor site boundary and Prune Farm and Edgcott House which are located on the western boundary of the receptor site. HM Young Offender Institution (Grendon) is located 700m to the west of the receptor site.

2.1.4 Calvert Landfill site location is shown in Plate 3.1 Calvert Landfill site location.

2.1.5 The Aylesbury – Bletchley railway line runs along the eastern boundary of the receptor site.

2.1.6 The receptor site is surrounded by agricultural land and woodland.

2.2 Site operations

2.2.1 The receptor site is an active landfill which receives non-hazardous municipal, commercial and industrial waste. The existing planning consent for the receptor site (97/2002/AMI) permits further extraction of clay from the areas known as Pits 6, 7 and 8 with restoration by landfill of waste until 21 September 2047. The receptor site also has consent for further clay extraction but there is no extraction currently being undertaken.

2.2.2 The receptor site can only accept Thames Tideway Tunnel project material by rail and it is currently receiving two deliveries of municipal waste for landfilling by rail per day. A grab would be used to unload the trains; material would be taken straight to its final location for deposit.

2.2.3 The receptor site would accept the London clays and Lambeth group with sands and gravels, subject to standard chemical and physical analysis of the material to ensure it is fit for purpose. The receptor site would also accept the chalk but they would not want to accept 100% of the chalk on its own, as the site operator would prefer to accept the chalk mixed with other materials.

2.2.4 The site operator has confirmed that all Thames Tideway Tunnel project material would be used for restoration and engineering purposes and not used for disposal in the landfill void.

2.2.5 Other activities located at the receptor site are:

a. an in-vessel composting facility with a capacity of 50,000tpa

b. an energy from waste facility with a capacity of 300,000tpa (due to be operational 2014); and

c. a dedicated on-site power plant that captures landfill gas to generate over 17MW which is connected directly to the national grid.

2.3 Planning consent

2.3.1 Planning consent: 97/2002/AMI

2.3.2 Landfilling with controlled waste commenced in Pit 4 in 1980, and has continued since that date to substantially complete Pits 4 and 5 to the approved contours. Planning consent to revise the pre-settlement and post-settlement contours for Pits 4 and 5 to achieve a more satisfactory restoration solution was granted by Buckinghamshire County Council in February 2009.

2.3.3 A summary of all the planning consent that have been granted on the site including:

a. 1955 Mineral Planning Consent (BR/642/54) – This granted consent for clay extraction from Pits 4, 5 and 6. The conditions required all overburden and waste materials to be returned to the excavation together with such other materials as may be agreed.

b. 1977 Waste Planning Consent (BR/200/73) – This provided for the filling and restoration of Pits 4, 5 and 6. The reason why a fresh application was made for the deposit of waste, rather than relying on the conditions on the 1955 consent is not apparent. However, filling continued under this consent, which had more detailed conditions than the 1955 mineral consent.

c. 1987 Mineral Planning Consent (AV/1432/84) – This provided for the excavation and subsequent backfilling with “controlled waste” of Pits 7 and 8. It also includes a small part of what is now referred to as the excavated Pit 6. Whilst only the area in Pit 6 was worked, it was sufficient to implement the consent, thereby keeping the consent active on Pits 7 and 8.

d. 1998 ROMP Consent (97/2002/AMI) – This was a consent for updating planning conditions under the procedures for Review of Minerals Permissions. It consolidated and replaced the 1955 and 1987 mineral consents, but the 1977 Waste Planning Consent remained in force for the deposit of waste, since waste consents were not covered by the review. The consent expires in 2047.

e. 2009 Waste Planning Consent (07/20003 AWD) – This was a consent for a revised restoration scheme on Pits 4 and 5, which included revised (increased) restoration contours to achieve satisfactory slopes in accordance with modern waste management guidance.

2.3.4 The landfill operations in Pits, 4 and 5 are governed by the 2009 Waste Planning Consent.

2.3.5 The filling of Pit 6 is still covered by the 1977 Waste Planning Consent in conjunction with the 1998 ROMP consent, which requires the excavations

to be restored in accordance with the scheme approved under the 1977 consent.

2.3.6 The extraction and filling of Pits 7 and 8 is permitted by virtue of the ROMP consent, but as yet these areas remain unworked.

2.3.7 A planning application (11/20000/AWD) has been submitted for an Energy from Waste Facility and ancillary development. The proposals include:

a. Amendment to and re-contouring of Pit 6 of the existing landfill site including mono-cell, surface water and habitat management within Pits 7 and 8. The proposal is for full permanent consent with the operational life defined for 35 years.

2.4 Permitting

2.4.1 The receptor site has been issued with an environmental permit (EPR/BS86051Q).

2.4.2 The receptor site is permitted to accept 1million tpa of inert waste.

2.4.3 Calvert Landfill has the necessary environmental permit in place to accept excavated Thames Tideway Tunnel project material for landfill restoration.

2.4.4 Table 14.2 details the key permitted waste types that can be accepted at Calvert Landfill.

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3 Overall site summary

3.1.1 Table 3.1 below provides a summary of the Calvert Landfill site and an assessment of its suitability against the evaluation objectives. Sections 4 to 18 of this *EMOS report* provides more detail on each evaluation objective.

Table 3.1 Summary of Calvert Landfill and its overall suitability

Site name:	Calvert Landfill (WRG.3)		**Owner/operator:**	FCC Environment			
Planning consent	Yes, until 2047 97/2002/AMI		**Permit**	Yes EPR/BS86051Q			
Void capacity	Approximately 20 million m^3		**Throughput**	1,000,000tpa			
Recovery/ disposal	Recovery						
Materials	**London clay**	✓	**Lambeth group**	✓	**Chalk**	✓	
Transport type	**Road**	X	**Rail**	✓	**Marine transport**	X	

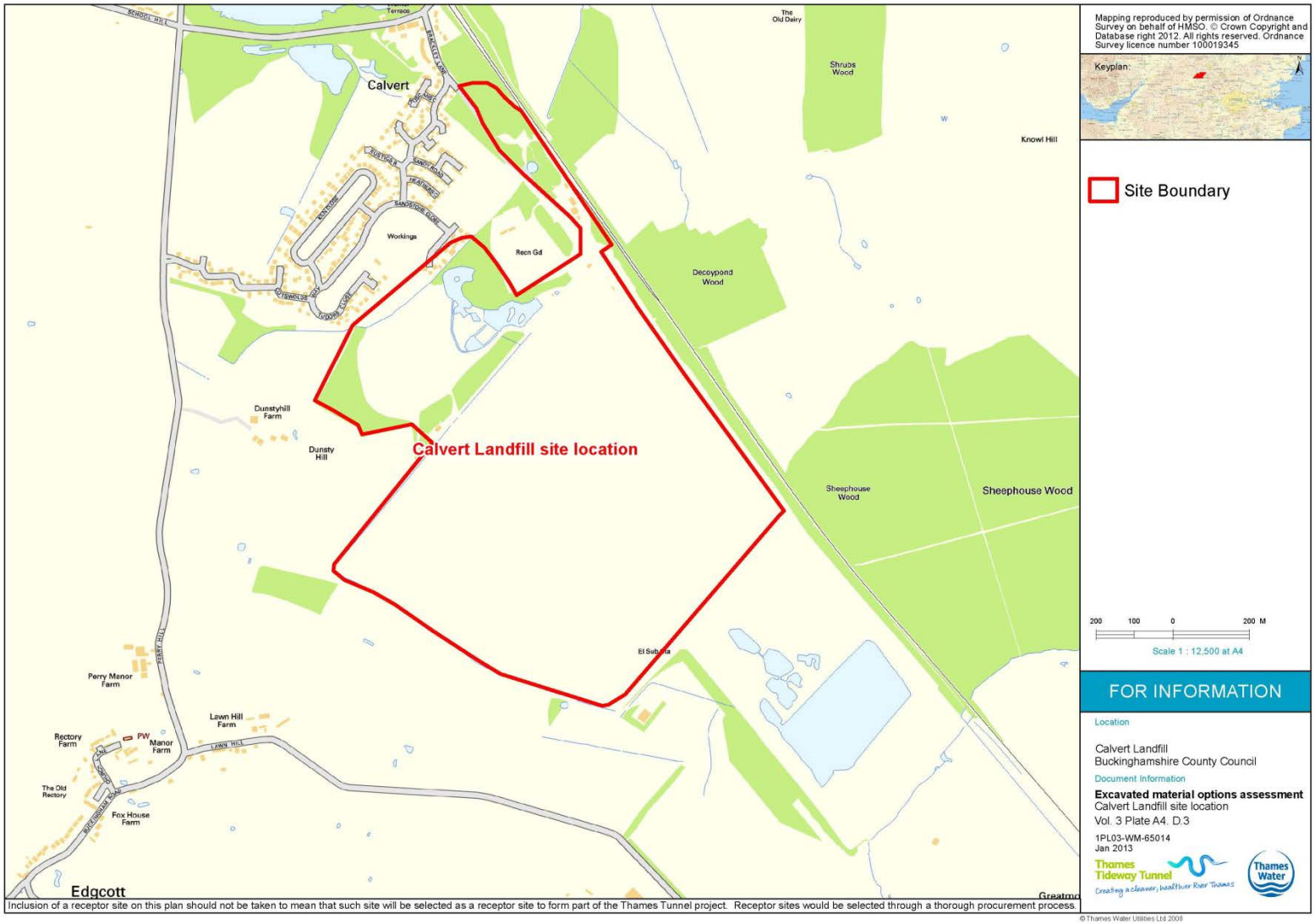
Receptor site overview
FCC Environment operate a municipal waste landfill at Calvert, Buckinghamshire. The receptor site has been a clay extraction site since the 1950s and the landfill currently accepts non-hazardous and inert waste. The Thames Tideway Tunnel project material would be used in the restoration operation. Once the receptor site has reached capacity it will restored to agricultural land and woodland. The receptor site currently has planning consent until September 2047. Thames Tideway Tunnel project material would be delivered to the receptor site by rail. The receptor site is approximately 75km from the Thames Tideway Tunnel main drive sites.

Assessment					
1. Land and other resources	a)	**0**	8. Cultural heritage	a)	**0**
	b)	**0**	9. Employment opportunities	a)	**0**
2. Climate change	a)	**+**		b)	**0**
	b)	**0**	10. Cost	a)	**+**
	c)	**-**	11. Operational suitability of the receptor site.	a)	**+++**
3. Local amenity	a)	**+**		b)	**++**
4. Landscapes and townscapes	a)	**0**		c)	**+**
	b)	**+**		d)	**-**
5. Access to open space	a)	**0**		e)	**+++**
	b)	**++**		f)	**--**
6.Water quality	a)	**0**	12. Waste hierarchy	a)	**+++**
	b)	**0**	13. Proximity principle	a)	**-**
7.Biodiversity	a)	**0**	14. Sustainable transport policy	a)	**0**
	b)	**0**	15. Health and safety good practice	a)	**+**

Environmental summary
The acceptance of Thames Tideway Tunnel project material is within the receptor site's existing consents. Thames Tideway Tunnel material would form part of the permitted operations at the receptor site to restore areas of the municipal waste landfill to agricultural land and woodland. The deposition of material for restoration is unlikely to have a short term effect on the local visual amenity as the receptor site is already an operating landfill and stockpiling of material is not envisaged. In the long term the restoration of the receptor site will have a beneficial effect on the landscape changing the visual impacts of the area from an operating landfill to agricultural land and woodland. There are a number of designated sites within close proximity to the receptor site. In the long term the restoration of the receptor site offers opportunities for the creation and restoration of habitats, particularly to preserve and enhance existing hedgerows and provide ecological links with the designated sites. The receptor site is located approximately 75km from the Thames Tideway Tunnel project main drive sites but material would be transferred using rail which is in line with sustainable transport policies.
Social summary
The restoration activities at the receptor site, to which Thames Tideway Tunnel project material would contribute, would not lead to any job losses or gains over the short and long term.
Operational summary
The receptor site requires approximately 20million m^3 of material to restore the receptor site. It is probable that the receptor site would be able to accept a large proportion of Thames Tideway Tunnel project material beyond the Thames Tideway Tunnel project timescales. The receptor site would accept the London clays and Lambeth group. The receptor site would also accept the chalk but they would not want to accept 100% of the chalk on its own, as the site operator would prefer to accept the chalk mixed with other materials. The receptor site can only accept material by rail. Calvert Landfill restoration to agricultural land and woodland would be considered as beneficial use for all material accepted by the receptor site[I]. FCC Environment has health and safety policies and management systems in place. Calvert Landfill has International Organisation for Standardisation (ISO) 18001 accreditation. The receptor site has two reported Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) incidents in the past three years of operations.
Overall suitability
Calvert Landfill has the ability to receive Thames Tideway Tunnel project material for the whole lifetime of the Thames Tideway Tunnel project. It is anticipated that approximately 20million m^3 of material is needed to restore the receptor site. However the receptor site has a limited throughput based on its permitted capacity of 1million tpa. It is also located approximately 77km (in a straight line distance) from the Thames Tideway Tunnel drive sites but material would be delivered by rail. The receptor site has a beneficial or neutral grading for all other evaluation indicators (with the exception of GhG emissions). Calvert Landfill is included on the planning stage preferred list.

[I] Based on the *Excavated material options assessment (EMOA)* beneficial use test

Plate 3.1 Calvert Landfill site location



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4 Evaluation objective 1: To ensure prudent use of land and other resources

4.1.1 The receptor site currently sources material for restoration and capping purposes from construction and development projects.

4.1.2 Where possible the receptor site will use reclaimed material avoiding the use of virgin material for restoration.

4.1.3 The Thames Tideway Tunnel project material would be used to restore the receptor site and to make it available for other uses. Restoration proposals would create agricultural land and woodland.

4.1.4 The use of Thames Tideway Tunnel project material would not contribute to any requirement for additional land extending the receptor site's boundary.

4.1.5 Table 4.1 provides the grade given for evaluation objective 1 and the justification for the grade.

Table 4.1 Evaluation objective 1 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
1. To ensure prudent use of land and other resources	a) Extent to which resources such as sand, gravel and chalk are conserved by processing or storage of Thames Tideway Tunnel project material at receptor sites.	0	Thames Tideway Tunnel project material is unlikely to affect virgin material use e.g. material replaces other reusable materials or no material substitution required.	Thames Tideway Tunnel project material would be used in the landfill restoration. Thames Tideway Tunnel project material would replace the use of other reusable material.
	b) Extent to which Thames Tideway Tunnel project material would effect landtake at (footprint of) receptor sites in the long term.	0	The acceptance of Thames Tideway Tunnel project material would not contribute to the requirement for additional land extending the receptor site's boundary.	The Thames Tideway Tunnel project material would be used within the existing receptor site boundary and would not contribute to a need to expand the receptor site.

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5 Evaluation objective 2: To reduce climate change impacts

5.1.1 Thames Tideway Tunnel project material would arrive at the receptor site by rail. A grab would be used to unload the trains; material would be taken straight to its final location for deposit.

5.1.2 FCC Environment will have a Carbon Management Plan in place during 2012 and have greenhouse gas (GhG) offset plans in place.

5.1.3 The excavated material would not be reprocessed into aggregate at the receptor site. Based on data from the Environment Agency's (EA) lifecycle analysis tool WRATE, the overall GhG emissions for deposition of excavated material to land is 3.17kg CO_2 eq per tonne of excavated material. The excavation material is assumed to be inert soil and the EA's WRATE emissions associated with material reception and spreading have been assumed.

5.1.4 The figures for GhG emissions from transport have been estimated based on:

a. the average CO_2 emissions for the different types of transport; and

b. the distance travelled from the Thames Tideway Tunnel project sites to the receptor site.

5.1.5 The GhG emissions calculated are for comparative purposes only and do not provide an exact representation of the transport emissions associated with the Thames Tideway Tunnel project excavated material. Full GhG methodology and assumptions can be found in Appendix B.10.

5.1.6 It has been estimated that using Calvert Landfill would produce 6.07kg CO_2 eq per tonne of excavated material accepted.

5.1.7 An area of the receptor site is situated within the floodplain of the River Ray passing northeast to southwest across the centre of the receptor site.

5.1.8 Environment Agency (EA) mapping indicates that parts of the receptor site falls within areas that would potentially be affected by surface water flooding. These areas are primarily in the vicinity of surface waterbodies and / or within flood zone 3. The risk of surface water flooding may present the possibility for cumulative flooding effects at the receptor site.

5.1.9 The receptor site has a water management plan with measures in place to ensure flood risk is managed at the receptor site. The water management plan is updated annually. It is not anticipated that the flood risk at the receptor site would change as a result of using Thames Tideway Tunnel project material and when the receptor site is restored.

5.1.10 Work in any new area at the receptor site requires consideration of water storage capacity impacts before it can commence.

5.1.11 Table 5.1 provides the grade given for evaluation objective 2 and the justification for the grade.

Table 5.1 Evaluation objective 2 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
2. To reduce climate change impacts	a) Greenhouse gases emitted through material treatment, handling and use at receptor sites (excludes transport).	+	There is a Carbon Management Plan in place with systems in place to offset GhG emissions from treatment, handling and use of Thames Tideway Tunnel project material.	FCC Environment are planning to have a Carbon Management Plan in place during 2012 and have GhG offset plans in place for the handling of material at the receptor sites.
	b) Extent to which flood risk is altered by Thames Tideway Tunnel project material at the receptor site (or in the local catchment).	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not change flood risk (from any source or a combination of sources) to the site and surroundings.	Part of the receptor site is located on a flood plain. It is not anticipated that the flood risk would be affected as the receipt of the Thames Tideway Tunnel project material would be considered in the water management plan.
	c) Greenhouse gases emitted through transport of Thames Tideway Tunnel material to the receptor sites.	-	Through the transport of Thames Tideway Tunnel project material between 6 and less than or equal to 8kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced	Through the transport of Thames Tideway Tunnel project material it is estimated 6.07kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.

6 Evaluation objective 3: To protect local amenity

6.1.1 The receptor site is not located in an Air Quality Management Area (AQMA) and there are none in the vicinity of the receptor site.

6.1.2 The receptor site is an operational landfill. The receptor site currently accepts material similar to the Thames Tideway Tunnel project materials for restoration purposes.

6.1.3 The Thames Tideway Tunnel project material would be used material for restoration; this would also act as a barrier to emissions that might be produced from the active waste deposited at the landfill site helping to reduce odour effects.

6.1.4 There is a dust management plan for the receptor site, which includes mitigation measures to deal with dust should the issue arise, the measure include spraying haul roads and wheel washing.

6.1.5 There are noise monitoring stations and a noise management plan in place at the receptor site to limit the effect from operations on the local amenity.

6.1.6 Table 6.1 provides the grade given for evaluation objective 3 and the justification for the grade.

Table 6.1 Evaluation objective 3 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
3. To protect local amenity	a) Extent of potential effects on local amenity from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a minor beneficial effect on the local amenity.	Operations at the receptor site to which the receipt of Thames Tideway Tunnel project material would contribute, would comprise restoration and where appropriate capping of the existing landfill. This would prevent the release of odours from the closed landfill. There are operational measures at the receptor site such as spraying haul roads and wheel washing for dust suppression, as well as a noise management plan to reduce impacts of nuisance on surrounding receptors.

7 Evaluation objective 4: To conserve landscape and townscapes at receiving locations

7.1.1 The receptor site is not in an Area of Outstanding Natural Beauty (AONB)

7.1.2 The local landscape is low-lying, flat or gently undulating with mature hedgerows and patchy woodland cover.

7.1.3 The receptor site adjoins the village of Calvert, north of the A41, west of Winslow and adjacent to the Aylesbury – Bletchley railway line.

7.1.4 In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute would be no more or less visible given the overall context of the existing landfill.

7.1.5 In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a minor beneficial effect on the landscape changing the area from an operating landfill to agricultural land and woodland.

7.1.6 Table 7.1 provides the grade given for evaluation objective 4 and the justification for the grade.

Table 7.1 Evaluation objective 4 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
4. To conserve landscapes and townscapes at receiving locations	a) Extent of short term visual & landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have a short term effect on the local visual amenity at the receptor site or any effect would be negligible.	In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute would be no more or less visible given the overall context of the existing site as an operational landfill.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of permanent visual & landscape impacts from treatment, handling and use of Thames Tideway Tunnel material at receptor sites.	++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a permanent minor beneficial visual effect on the landscape, based on a 'do nothing' view of the site.	In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape changing the area from an operating landfill to agricultural land and some woodland.

8 Evaluation objective 5: To protect quality of and access to open space

8.1.1 There is a Public Right of Way (PRoW) that passes across the northern part of the receptor site in a northeast southwest direction. Bridleways follow the north eastern boundary along the side of the existing railway line, the south eastern boundary and part of the south western boundary. There are a number of footpaths that follow the remaining south western boundary of the receptor site.

8.1.2 A footpath has been diverted around the receptor site as part of developing the landfill site. No PRoWs would be affected as a result of the receptor site receiving Thames Tideway Tunnel project material.

8.1.3 In the short term it is not envisaged that receiving Thames Tideway Tunnel project material at the receptor site would affect the PRoWs that run along the boundary of the receptor site.

8.1.4 The receptor site will be restored to agricultural land and woodland. All footpaths that have been diverted should be reinstated. It is proposed that wherever possible, routes would be developed within the receptor site, not just around its boundary. It is also proposed that a network of bridleways is created across the receptor site and that access improvements providing both short and long circular walks from the village of Calvert Green into the receptor site are put in place[2].

8.1.5 Table 8.1 provides the grade given for evaluation objective 5 and the justification for the grade.

Table 8.1 Evaluation objective 5 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
5. To protect quality of and access to open space	a) Would Thames Tideway Tunnel material enhance quality of and access to open space in the short term?	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or a negligible effect on access to and quality of open space and PRoWs.	The restoration works at the receptor site to which the Thames Tideway Tunnel project material would contribute would not disrupt the existing PRoWs that run along the boundary of the receptor site.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the long term?	++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would moderately enhance a PRoW or improve the quality of and access to public open space.	The restoration plans for the receptor site, to which Thames Tideway Tunnel project material would contribute, would result in moderately increasing accessibility to public open space. The receptor site will likely be restored to agricultural land and woodland. All footpaths would be reinstated and it is envisaged that new PRoWs including bridleways will be created.

9 Evaluation objective 6: To protect water quality

9.1.1 The receptor site is located in the River Ray catchment at the boundary of the catchment to the Great Ouse.

9.1.2 The Muxwell Brook, a main river and tributary of the River Ray, crosses the centre of the receptor site, running from the northeast to the southwest. The channel is disused, having been diverted around the southeast boundary of the receptor site, forming the Greatmoor Ditch (or Mega Ditch). Greatmoor Ditch is also a main river.

9.1.3 Waterbodies (within the former clay pit workings) are present in the centre of the receptor site. Several small ponds are also located across the receptor site.

9.1.4 There are settlement lagoons at the receptor site. There is a surface water management plan for the receptor site.

9.1.5 The landfill has been lined, and the receipt of Thames Tideway Tunnel project material will be used for restoration and landfill capping. There is leachate management and treatment at the receptor site.

9.1.6 The receptor site is not in a groundwater Source Protection Zone (SPZ), which highlights groundwater sources such as wells, boreholes and springs used for public drinking water supply.

9.1.7 Based on the water management measures in place at the receptor site and the inert nature of the Thames Tideway Tunnel project material it is not anticipated that accepting Thames Tideway Tunnel project material would have an effect on the surrounding water courses and/or groundwater.

9.1.8 Table 9.1 provides the grade given for evaluation objective 6 and the justification for the grade.

Table 9.1 Evaluation objective 6 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
6. To protect water quality	a) Extent of potential effects on fluvial water quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on the local watercourses.	The treatment, handling or use of the Thames Tideway Tunnel project material at the receptor site is likely to have no or negligible effect on the local watercourses given that there is a water management system in place at the receptor site.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of potential effects on groundwater quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on groundwater.	The receptor site is not in a groundwater SPZ and the treatment, handling or use of the Thames Tideway Tunnel project material at the receptor site is likely to have no or negligible effect on groundwater given that the receptor site has a water management system in place.

10 Evaluation objective 7: To protect biodiversity

10.1.1 There are no environmental designations within the receptor site boundary but there are a number in close proximity to the receptor site including:

a. Sheephouse Wood SSSI, situated adjacent to the eastern boundary

b. Grendon and Doddershal Woods, 50m southwest of the receptor site; and

c. Finmere Wood, 300m east of the receptor site.

10.1.2 There are number of Local Wildlife Sites with close proximity to the receptor site, including:

a. Woodland between Lawn Hill & Dunsty Hill, adjacent to the western boundary;

b. Decoypond Wood, adjacent to the north eastern boundary;

c. Romer Wood, 500m southeast of the receptor site;

d. Greatsea Wood, 550m southeast of the receptor site;

e. Grendon Underwood Meadows, less than 500m southwest;

f. Shrubs Wood, 600m northeast; and

g. Calvert Jubilee Nature Reserve, within 800m north.

10.1.3 The receptor site lies within the Bernwood Biodiversity Opportunity Area (BOA).

10.1.4 The receptor site contains a number of species including great crested newts, bats, and badgers.

10.1.5 In the short term, the handling and use of the Thames Tideway Tunnel project material as part of the existing operations at the receptor site is likely to have no or negligible effects on the designated sites.

10.1.6 The Thames Tideway Tunnel project material would be used to restore the receptor site and to make it available for other uses. Restoration of the receptor site also offers opportunities for the creation and restoration of habitats, particularly to preserve and enhance existing hedgerows and provide ecological links with the designated sites within close proximity to the receptor site.

10.1.7 However the exact nature of the habitats created will be dependent on the material used to restore the site. At this stage it is not possible to assess whether the habitats created through the restoration would have more or less ecological value than those currently present on the receptor site.

10.1.8 Table 10.1 provides the grade given for evaluation objective 7 and the justification for the grade.

Table 10.1 Evaluation objective 7 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
7. To protect biodiversity.	a) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the short term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	The treatment, handling or use of the Thames Tideway Tunnel project material at the receptor site is likely to have no or negligible effect on any designated site. There are no designated sites within the boundary of the receptor site. There are measures in place to reduce any impacts that receiving restoration material might have on designated sites within close proximity to the receptor site.
	b) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the long term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	Thames Tideway Tunnel project material would form part of the restoration plans for the receptor site. Habitats would be created through the restoration of the receptor site. It is not possible to assess whether these would be of higher ecological value than the existing habitats.

11 Evaluation objective 8: To protect cultural heritage

11.1.1 There are a number of historic and archaeological important areas within close proximity to the receptor site including:

a. Grade II listed 17th century farmhouse (Greatmoor Farm) is located toward the southern end of the receptor site;

b. Archaeological Notification Areas located adjacent to the northwest & northeast boundaries and within 500m to the south of the receptor site; and

c. The southern part of the receptor site includes a mixture of pre 18th century, 19th century and 20th century hedged fields. These and other hedgerows may be of historic interest.

11.1.2 Claydon, a Registered Parks and Garden, is 2.4km northeast of the receptor site.

11.1.3 The closest Scheduled Ancient Monument (SAM) to the receptor site is a moated site near St Leonard's Church which is located just over 2km from the receptor site boundary.

11.1.4 It is not anticipated that the operations at the receptor site would not have an effect on any of the historic and archaeological important areas within close proximity to the receptor site. The receptor site has measures in place to ensure that any impacts are reduced.

11.1.5 Table 11.1 provides the grade given for evaluation objective 8 and the justification for the grade.

Table 11.1 Evaluation objective 8 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
8. To protect cultural heritage	a) Extent of potential effects on designated or nominated archaeological sites from receipt, treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	It is not anticipated that the operations at the receptor site would have an effect on any of the historic and archaeological important areas within close proximity to the receptor site. The receptor site has measures in place to ensure that any effects are reduced.

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12 Evaluation objective 9: To provide employment opportunities

12.1.1 The receptor site is currently operational and receiving two deliveries of municipal waste by rail per day. Current staff would be used to accept and deposit Thames Tideway Tunnel project material.

12.1.2 If deliveries of Thames Tideway Tunnel project material were agreed to arrive in three rather than two trains per day, it is likely that four to five additional staff would be required to manage this delivery. As this extra staffing provision is guaranteed, this objective has been assessed based on current staffing levels.

12.1.3 In the long term it is unlikely that there would be any jobs created or lost at the receptor site as a result of accepting Thames Tideway Tunnel project material.

12.1.4 Table 12.1 provides the grade given for evaluation objective 9 and the justification for the grade.

Table 12.1 Evaluation objective 9 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
9. To provide employment opportunities.	a) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the short term.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the short term.	Acceptance of Thames Tideway Tunnel project material would not contribute to any job gains in the short term.
	b) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the long term.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the long term.	In the long term it is unlikely that any jobs would be created or lost.

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13 Evaluation objective 10: To minimise the cost of waste management

13.1.1 The receptor site did confirm that it would charge a gate fee to receive material and that this charge would be 'reasonable' and would be negotiated through procurement.

13.1.2 In order to compare the likely cost associated with transport and acceptance of the Thames Tideway Tunnel project material at each receptor site a cost model was used.

13.1.3 The cost of transporting the excavated material has been calculated from the distance travelled and a cost per tonne/ km for each of the transport mode (road, marine transport and rail). The road and marine transport costs have been calculated from the quotes gathered from operators based on today's prices. A gate fee of £4 per tonne is assumed based on current prices. Full details of the assumptions made can be found at Appendix B.10.

13.1.4 It has been estimated that the cost of transporting and managing excavated material at Calvert Landfill would be £15.55 per tonne of excavated material that can be accepted at the receptor site. These costs are predominantly associated with transfer of the material from the Thames Tideway Tunnel project sites to the receptor sites. This cost is an estimated cost for comparison purposes within the *EMOA* and may differ from the actual cost which would be incurred if Thames Tideway Tunnel project material were taken to this receptor site.

13.1.5 Table 13.1 provides the grade given for evaluation objective 10 and the justification for the grade.

Table 13.1 Evaluation objective 10 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
10. To minimise the costs associated with the management of excavated material.	a) Costs of transportation, treatment, handling and use of Thames Tideway Tunnel project material.	+	The transportation, treatment, handling and use of Thames Tideway Tunnel project material would cost between £13 and less than or equal to £16 per tonne.	The cost of transportation, treatment, handling and use of Thames Tideway Tunnel material has been estimated (using the *EMOA* cost model) to be £15.55 per tonne.

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14 Evaluation objective 11: To ensure operational suitability of the receptor site

14.1 Evaluation indicator 11a) Timescales

14.1.1 The planning consent for the receptor site states that restoration needs to be complete by 2047.

14.1.2 Based on Thames Tideway Tunnel project excavation timescales of 2016 to 2021 and the existing planning consent for the receptor site, the receptor site would be available to receive Thames Tideway Tunnel material for the entire project timetable.

14.1.3 Table 14.1 provides the grade given for evaluation objective 11a and the justification for the grade.

Table 14.1 Evaluation objective 11a grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	a) Likelihood of implementation within the required timescale.	+++	The receptor site would be available for use for Thames Tideway Tunnel project material for more than 100% of the required timescale.	The planning consent for the receptor site states that restoration needs to be complete by 2047. The receptor site would be available to accept Thames Tideway Tunnel project material for the entire project timetable.

14.2 Evaluation indicator 11b) Material characteristics

14.2.1 The receptor site would accept the London Clays and Lambeth Group with sands and gravels. The receptor site would also accept the chalk but they would not want to accept 100% of the chalk on its own, as the operator would prefer to accept the chalk mixed with other materials.

14.2.2 The materials delivered to the receptor site would be subject to standard waste acceptance criteria (WAC) testing to ensure that it is inert material and therefore suitable to be accepted at the receptor site. It is assumed that most, if not all, of the Thames Tideway Tunnel excavated material would be inert.

14.2.3 The receptor site is permitted to accept a range of inert wastes. Table 14.2 details the EWC Codes relating to the materials permitted under Calvert Landfill's environmental permit most relevant to the acceptance of the Thames Tideway Tunnel project excavated materials.

14.2.4 Calvert Landfill has the necessary environmental permit in place to accept clean inert excavated Thames Tideway Tunnel project material for landfill restoration.

Table 14.2 Permitted inert waste types for Calvert Landfill

EWC codes	Description
17 05 03*	Soil and stones containing dangerous substances
17 05 04	soil and stones other than those mentioned in 17 05 03
17 05 05*	Dredging spoil containing dangerous substances
17 05 06	dredging spoil other than those mentioned in 17 05 05

14.2.5 Table 14.3 provides the grade given for evaluation objective 11b and the justification for the grade.

Table 14.3 Evaluation objective 11b grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	b) Acceptability of material with Thames Tideway Tunnel project material characteristics by the receptor sites.	++	The receptor site could accept for use four Thames Tideway Tunnel project material types based on their characteristics including: London Clay, Lambeth Group and chalk.	The receptor site would be able to accept all the material types produced from the Thames Tideway Tunnel project. However the receptor site would not be able to accept the chalk on its own and it would need to be mixed with other materials.

14.3 Evaluation indicator 11c) Capacity

14.3.1 The receptor site has permitted capacity to receive 1,000,000tpa of inert waste.

14.3.2 The site operator estimates that approximately 20million m^3 (approximately 24.6million tonnes) of material would be needed to restore the receptor site. Table 14.4 details the permitted capacity for the receptor site in relation to the material that will be produced by the Thames Tideway Tunnel project.

Table 14.4 Capacity for inert material at Calvert Landfill (tonnes[II])

	Year						Total
	2016	2017	2018	2019	2020	2021	
Total Thames Tideway Tunnel production (tonnes)	63,000	549,000	1,938,000	1,852,000	147,000	155,000	4,704,000
Maximum permitted per annum (tonnes)	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	-
Potential Thames Tideway Tunnel material accepted (tonnes)	63,000	549,000	1,000,000	1,005,000	147,000	155,000	2,919,000
Potential Thames Tideway Tunnel material accepted (%)	100%	100%	52%	54%	100%	100%	62%

14.3.3 Table 14.5 also sets out the potential tonnage of Thames Tideway Tunnel project material accepted at the receptor site each year based on the assumptions used in the *EMOA* cost and GhG model. The receptor site would be able to accept 62% of the Thames Tideway Tunnel project excavated materials, based on the total amount of restoration material that it can accept and tonnages which are likely to be produced by the Thames Tideway Tunnel project during the four years that it is available.

14.3.4 Table 14.5 provides the grade given for evaluation objective 11c and the justification for the grade.

[II] Figures quoted to the nearest 1,000 tonnes

Table 14.5 Evaluation objective 11c grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	c) Capacity of the receptor site to accept the required volume of Thames Tideway Tunnel project material (based on likely tonnes accepted/ %).	+	The receptor site has capacity to accept greater than or equal to 60% but less than 85% of Thames Tideway Tunnel project material.	The receptor site would have the potential to accept approximately 62% of the excavated material that would be produced by the Thames Tideway Tunnel project.

14.4 Evaluation indicator 11d) Receptor site throughput

14.4.1 Thames Tideway Tunnel project material would be delivered to the receptor site by rail.

14.4.2 The operator has confirmed that it would be able to effectively manage two rail deliveries per day of Thames Tideway Tunnel project material, based on its current operations.

14.4.3 The sidings could potentially receive three rail deliveries per day. However this would require changes to operational procedures which would require further consideration. This objective has therefore been assessed on the assumption that the receptor site receives two rail deliveries per day. Each train has a capacity of 1,500t; as a result the receptor site has the ability to receive 3,000t per day.

14.4.4 The amount of material produced by the Thames Tideway Tunnel project would vary on a daily and monthly basis. The assessment of throughput has been based on both the mean and peak production rates over the Thames Tideway Tunnel construction period. The mean rate is taken as the mean monthly production rate taken over each year in the period 2016 to 2021. The peak rate is based on the month producing the maximum tonnage of excavated material in each year.

14.4.5 Table 14.6 details the proportion of the Thames Tideway Tunnel project material which would be accepted by Calvert Landfill over time.

14.4.6 In Years 1, 2, 5 and 6 of the excavation process Calvert Landfill's limit of 3,000t per day is sufficient to accept all of the Thames Tideway Tunnel project material produced. In Years 3 and 4 however the receptor site would only be able to less than half of the average daily total Thames Tideway Tunnel project material produced.

Table 14.6 Throughput of material at Calvert Landfill

	Year					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Available number of train deliveries at receptor site per day (A)	2	2	2	2	2	2
Capacity per Train (tonnes)	1,500	1,500	1,500	1,500	1,500	1,500
Thames Tideway Tunnel average daily tonnage*	250	2,050	7,200	6,850	550	550
Required number of trains to transport average daily tonnage (B)	0.2	1.4	4.8	4.6	0.4	0.4
Available vs Average Required Number of trains at receptor site (A ÷ B)	1,200%	146%	42%	44%	546%	546%
Thames Tideway Tunnel peak daily tonnage**	350	3,050	10,750	10,300	800	850
Required number of trains to transport peak rate (C)	0.2	2.0	7.2	6.9	0.5	0.6
Available vs Peak Number of trains at receptor site (A ÷ C)	857%	98%	28%	29%	375%	353%

***** *The Thames Tideway Tunnel average daily tonnage for each year is calculated as the mean of the daily rate each month assuming 22.5 days in each month.*

****** *The peak daily tonnage is based on the average daily tonnage (assuming a 22.5 day month) for the peak month of production in each year.*

14.4.7 Table 14.7 provides the grade given for evaluation objective 11d and the justification for the grade.

Table 14.7 Evaluation objective 11d grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	d) Ability of the receptor sites to accept Thames Tideway Tunnel project material at the anticipated rate (speed of material generation vs acceptance rate).	-	The receptor site could take greater than or equal to 2,800 but less than 4,600t per day of Thames Tideway Tunnel project material.	The receptor site has the ability to receive 3,000t per day, based on the delivery of two trains a day each with a capacity of 1,500t.

14.5 Evaluation indicator 11e) Planning Consent and Permitting

14.5.1 Calvert Landfill has the necessary planning consents and environmental permit in place to accept excavated Thames Tideway Tunnel project material for landfill restoration.

14.5.2 Further information on the receptor site's planning consent and Environmental Permit can be found in Section 2.3 and 2.4.

14.5.3 Table 14.8 provides the grade given for evaluation objective 11e and the justification for the grade.

Table 14.8 Evaluation objective 11e grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	e) Site operations have appropriate planning and permitting consents.	+++	The receptor site has planning consent and an EA permit.	The receptor site has the relevant planning consent and environmental permit in place to be able to accept Thames Tideway Tunnel project material.

14.6 Evaluation indicator 11f) Transport modes

14.6.1 The receptor site would only accept Thames Tideway Tunnel project material via rail.

14.6.2 Rail borne waste is transported along the Aylesbury-Bletchley railway line, delivered and off-loaded via sidings along the eastern boundary at the northern end of the receptor site.

14.6.3 Table 14.9 provides the grade given for evaluation objective 11f and the justification for the grade.

Table 14.9 Evaluation objective 11f grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	f) Can accept excavated material from multiple transport modes.	--	The receptor site is only accessible by one transport mode.	The receptor site can only accept material for restoration via rail.

15 Evaluation objective 12: To conform to the waste hierarchy

15.1.1 The Thames Tideway Tunnel *Excavated materials and waste (EM&W) strategy* contains an objective to 'To minimise waste arisings, maximise re-use, recovery, recycling and beneficial use and minimise the impact of waste on the environment and communities'.

15.1.2 The Thames Tideway Tunnel project material would be used to restore Calvert Landfill to agricultural land and woodland. This is considered to be beneficial use in line with the *EMOA* beneficial use test. Table 15.1 details the application of the *EMOA* beneficial use test applied to Calvert Landfill.

15.1.3 The site operator confirmed that the material would not be subject to landfill tax as it is being used for restoration purposes.

Table 15.1 Landfill restoration performance against *EMOA* beneficial use test

***EMOA* test**	**Does receptor site comply with test?**	**Comment**
The activity will lead to a beneficial reuse and bring land back into use or provide ecological benefit	Yes	Calvert Landfill will be restored to agricultural land and woodland.
In the case of quarries or landfill sites that the activity has a planning requirement to be restored	Yes	Calvert Landfill has a planning requirement to be restored.
Landfill Tax would not be charged on the material	Yes	The operator has stated that landfill tax will not be charged on the restoration of Calvert Landfill.
That the material is suitable for its intended use and would not harm human health or the environment	Yes	Calvert Landfill would be able to receive inert excavated Thames Tideway Tunnel project material for use in restoration, and if managed in accordance with the environmental permit the activities should not harm human health or the environment.
That the minimum amount of waste is being used	Yes	The proposed contours are in keeping with the final end use and visual amenity of the surrounding area.

EMOA test	Does receptor site comply with test?	Comment
That alternative material (whether waste or non-waste) would be required if Thames Tideway Tunnel project material wasn't used	Yes	Material required to fulfil restoration requirements would be sourced from other projects.

15.1.4 All the material accepted at the receptor site would be considered as recovery. Thus this receptor site would achieve 100% recovery for all clean materials accepted. It should be noted that this receptor site can only accept 62% of the total Thames Tideway Tunnel project material.

15.1.5 Table 15.2 provides the grade given for evaluation objective 12 and the justification for the grade.

Table 15.2 Evaluation objective 12 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
12. To conform to waste hierarchy.	a) Extent to which the option meets the *EM&W strategy* targets.	+++	Performance of receptor site substantially exceeds target.	All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 62% of the total Thames Tideway Tunnel project material.

16 Evaluation objective 13: To conform to the proximity principle

16.1.1 Material would need to be delivered to the receptor site by rail and it has been estimated that the distance from Bow East to the receptor site railway sidings is 92km[III]. The indicative transhipment point used in the *EMOA* modelling is 11km from Bow East and Thames Tideway Tunnel project CSO and drive sites are located an average of 15km from Bow East by road.

16.1.2 For this evaluation objective the receptor site was assessed using a straight line distance from the main drive sites. Using a straight line distance provides a consistent measure for assessment purposes. As the receptor site would be able to receive excavated materials from more than one drive site, the mean distance has been calculated. The receptor site was then graded according to this mean figure.

16.1.3 The receptor site is approximately 75km in a straight line from the main drive sites.

16.1.4 Table 16.1 provides the grade given for evaluation objective 13 and the justification for the grade.

Table 16.1 Evaluation objective 13 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
13. To conform to Proximity Principle.	a) Average distance from main tunnel drive sites.	-	The receptor site is between 80km and 60km from source of Thames Tideway Tunnel project material.	The receptor site is approximately 75km (straight line distance) from the main drive sites.

[III] Distances quoted are those used in the *EMOA* GhG model. Details of the assumptions used in this model can be found in Appendix B.10. These distances are for context only and do not reflect the exact routes that would be used should this receptor site be used to accept Thames Tideway Tunnel material.

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17 Evaluation objective 14: To conform to sustainable transport policy

17.1.1 The receptor site would only be accessed by rail. Thames Tideway Tunnel project material cannot be delivered to this receptor site by road due to planning restrictions or by marine transport.

17.1.2 The use of rail to transport material is encouraged in the London Plan. T*he London Plan 2011* Policy 5.18 Construction, excavation and demolition states that "waste should be removed from construction sites, and materials brought to the site, by water or rail transport wherever that is practicable".

17.1.3 *Buckinghamshire Minerals and Waste Local Development Framework: Minerals and Waste Core Strategy Preferred Options Consultation Report 2011*[3] states that "existing rail depots and wharves used in the transportation of waste or minerals, and other sites with the potential for such a use, should be safeguarded in order to keep down the need to extract primary minerals from within the county, and to encourage these more sustainable methods of transport".

17.1.4 Table 17.1 provides the grade given for evaluation objective 14 and the justification for the grade.

Table 17.1 Evaluation objective 14 grade and justification

Evaluation Objective	Evaluation indicator	Grade	Evaluation criteria	Justification
14. To conform to Sustainable Transport Policy.	a) Conforms to policy objective to move transport of materials from road to rail or marine transport.	**0**	The receptor site has the potential to be accessed by rail or marine transport but may require some double handling or transhipment.	The receptor site can be directly accessed by rail.

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18 Evaluation objective 15: To conform to health and safety good practice

18.1.1 FCC Environment has a dedicated health and safety team. FCC Environment has health and safety policies and management systems in place. Calvert Landfill has ISO 18001 accreditation.

18.1.2 There has been two reported RIDDOR incidents in the last three years at the receptor site.

18.1.3 Table 18.1 provides the grade given for evaluation objective 15 and the justification for the grade.

Table 18.1 Evaluation objective 15 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
15. To conform to Health and Safety Good Practice.	a) Health and safety performance conforms to good practice.	+	The receptor sites health and safety system is accredited and there have been five or less RIDDOR incidents in three year recorded at the receptor site.	The receptor site is ISO 18001 accredited. However, there have been two RIDDOR incidents in the past three years.

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References

[1] *A Practical Guide to the Strategic Environmental Assessment Directive* ODPM (September 2005); *Strategic Planning for Sustainable Waste Management: Guidance on Option Development and Appraisal* Department for Communities and Local Government (2002)

[2] *Buckinghamshire County Council Rights of Way Improvement Plan 2008 – 2018* Buckinghamshire County Council (2008) http://www.buckscc.gov.uk/assets/content/bcc/docs/row/BCC_RoWIP_2008_2018_Web.pdf

[3] *Buckinghamshire Minerals and Waste Local Development Framework: Minerals and Waste Core Strategy Preferred Options Consultation Report 2011.* Buckinghamshire County Council (2011)

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.03**

Volume 3: Project-wide effects assessment appendices

Appendix A.4; Annex D.4: EMOS Sutton Courtenay Landfill

APFP Regulations 2009: Regulation **5(2)(a)**

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Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Environmental Statement

Volume 3 Appendices: Project-wide effects assessment

Appendix A.4: Excavated materials options assessment

Annex D.4: Excavated materials options suitability report – Sutton Courtenay Landfill

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1 Introduction

1.1.1 The construction of the Thames Tideway Tunnel project would require the excavation of a large volume of material at multiple sites throughout London. To identify the preferred options for the management of the excavated material a detailed options assessment has been undertaken.

1.1.2 The methodology for assessment of the excavated material options is based on the Sustainability Appraisal methodology[1]. The assessment has taken a phased approach and at each stage the least preferred options have been eliminated until the final most viable and sustainable options have been selected to form the planning stage preferred list. The options on the planning stage preferred list demonstrate the potential capacity to manage the excavated material in a sustainable manner. The assessment is based on the consistent assessment of options against agreed evaluation objectives throughout the process.

1.1.3 The steps informing the assessment process were:

a. Development of a long list of potential options for the treatment, reuse, recycling or disposal of excavated materials.

b. Viability filter involving the assessment of the long list against the operational evaluation objective associated with viability of the options.

c. Preliminary assessment to develop a short list of options which perform sufficiently well against all the evaluation objectives (environmental, social, operational, policy and health and safety).

d. Detailed assessment in which the options on the short list was further scrutinised to produce a planning stage preferred list of options which perform best against the full suite of evaluation objectives.

1.1.4 For each short listed option whose viability has been confirmed a detailed *Excavated materials option suitability (EMOS) report* has been produced. The *EMOS reports* provide a summary of the site operations and the overall performance of the option against the evaluation objectives.

1.1.5 This *EMOS report* sets out the detail assessment for Sutton Courtenay Landfill, in Oxfordshire. The report provides the information gained during the detailed assessment stage of the *Excavated material options assessment* (*EMOA*) and the grades awarded against each evaluation indicator as part of this assessment. A grade is provided for each evaluation indicator, using an agreed set of evaluation criteria, against seven grades of impact (ranging from --- to +++). The *EMOS report* also provides a risk profile for the site identifying the key risks associated with the option in relation to accepting the Thames Tideway Tunnel project excavated material.

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2 Site description

2.1 Site location

2.1.1 Sutton Courtenay Landfill is located northeast of Didcot Power Station in Oxfordshire and covers an area of approximately 264ha. Agricultural land is located to the north and east of the receptor site. The receptor site is bordered by the B4016 to the north and the Oxford to Reading railway line to the east.

2.1.2 The village of Sutton Courtenay is located 300m west of the receptor site and Appleford is located 300m to the northeast. The receptor site is located 500m northwest of Didcot.

2.1.3 There are schools located 1.5km from the southeast of the receptor site, and 1.7km from the northern boundary of the receptor site.

2.1.4 Sutton Courtenay Landfill site location is shown in Plate 3.1 Sutton Courtenay Landfill site location.

2.2 Site operations

2.2.1 Sutton Courtenay Landfill is a sand and gravel pit from which material has been excavated since the 1970s. Some extraction still occurs at the receptor site. The receptor site is an active landfill which receives non-hazardous municipal, commercial and industrial wastes. The receptor site also accepts pulverised fuel ash (PFA) from Didcot Power Station.

2.2.2 Thames Tideway Tunnel project material would arrive at the receptor site by rail and it is currently receiving two deliveries of non hazardous material non by rail per day. The railhead at the receptor site is a safeguarded aggregates site[I] for the importation of aggregates to the County. Thames Tideway Tunnel project material would be unloaded from the trains by crane into tipping vehicles.

2.2.3 The site operator has indicated that the material would either be stockpiled or delivered direct to where it is required, dependent on the receptor site restoration requirements at the time of its delivery.

2.2.4 It was confirmed by the site operator that all Thames Tideway Tunnel project material would be used for restoration and engineering purposes and not used for disposal in the landfill void.

2.3 Planning consent

2.3.1 The receptor site has a long history of sand, gravel and clay extraction and landfilling. It appears that the most relevant existing planning consents

[I] Oxfordshire Minerals and Waste Core Strategy Policy M4: Aggregates rail depots states that existing and permitted rail depots will be safeguarded for importing aggregates; this includes Sutton Courtenay (Appleford Sidings).

are those listed above. Consent was granted by Oxfordshire County Council in March 2010 (SUT/616/59-CM) to accept waste until 31 December 2030. The final phase of restoration (capping) of the receptor site must be completed by 30 September 2031.

2.3.2 The consent (SUT/616/59-CM) states that no more than 600,000t of waste shall be delivered to the receptor site in any calendar year, of which not more than 350,000t shall be delivered by road. The reason for this limit is to encourage delivery of waste from London by rail.

2.3.3 The planning consent limits operations to between 0700 and 1800 hours Mondays to Fridays and 0700 and 1300 hours Saturdays. Trains delivering material can arrive in the sidings outside of these hours; however they can only be unloaded within the operating hours.

2.4 Permitting

2.4.1 EA environmental permit number: BV7001

2.4.2 The permit was issued in September 2004.

2.4.3 The environmental permit allows for the receptor site to receive 600,000tpa of inert and non hazardous wastes.

2.4.4 Table 14.2 details the key permitted waste types that can be accepted at Sutton Courtenay Landfill.

2.4.5 Sutton Courtenay has the necessary environmental permit in place to accept excavated Thames Tideway Tunnel project material for landfill restoration.

3 Overall site summary

3.1.1 Table 3.1below provides a summary of Sutton Courtenay Landfill and an assessment of its suitability against the evaluation objectives. Sections 4 to 18 of this *EMOS report* provides more detail on each evaluation objective.

Table 3.1 Summary of Sutton Courtenay Landfill and its overall suitability

Site name:	Sutton Courtenay Landfill (WRG.5)		**Owner/operator:**		FCC Environment		
Planning consent	Yes, until 2031 SUT/616/59-CM		**Permit**		Yes - BV7001		
Void capacity	Approximately 1 to 2million m^3		**Throughput**		400,000tpa[II]		
Recovery/ disposal	Recovery						
Materials	**London clay**	✓	**Lambeth group**	✓	**Chalk**	✓	
Transport type	**Road**	X	**Rail**	✓	**Marine transport**	X	

Receptor site review

Sutton Courtenay Landfill in Oxfordshire is a sand and gravel pit from which material has been excavated since the 1970s. Some extraction still occurs at the receptor site. The receptor site is an active landfill which receives non-hazardous municipal, commercial and industrial wastes. The receptor site also accepts pulverised fuel ash (PFA) from Didcot Power Station. The receptor site has a planning requirement to be restored by 2031. Thames Tideway Tunnel project material would be used for restoration of the landfill. The receptor site is located approximately 77km from London; Thames Tideway Tunnel project material would arrive at the receptor site by rail.

Assessment

1. Land and other resources	a)	0	8. Cultural heritage	a)	0
	b)	0	9. Employment opportunities	a)	0
2. Climate change	a)	+		b)	0
	b)	0	10. Cost	a)	+
	c)	-	11. Operational suitability of the receptor site.	a)	+++
3. Local amenity	a)	+		b)	++
4. Landscapes and townscapes	a)	0		c)	-
	b)	++		d)	-
5. Access to open space	a)	0		e)	+++
	b)	+		f)	--
6.Water quality	a)	0	12. Waste hierarchy	a)	+++
	b)	0	13. Proximity principle	a)	-
7.Biodiversity	a)	0	14. Sustainable transport policy	a)	0
	b)	0	15. Health and safety good practice	a)	+

[II] Based on the amount of material the operator has confirmed would be made available for the Thames Tideway Tunnel project.

Environmental summary
The acceptance of Thames Tideway Tunnel project material is within the receptor site's existing consents. Thames Tideway Tunnel project material would form part of the permitted operations at the receptor site to restore areas of the municipal waste landfill to agricultural land and some woodland. The deposition of material for restoration is unlikely to have a short term effect on the local amenity as the receptor site is already an operating landfill. In the long term the restoration of the receptor site will have a beneficial effect changing the area from an operating landfill to agricultural land and some woodland. The receptor site is located approximately 77km from the Thames Tideway Tunnel project drive sites but material would be transferred using rail which is in line with sustainable transport policies.
Social summary
The restoration activities at the receptor site, to which Thames Tideway Tunnel project material would contribute, would not lead to any job losses or gains over the short and long term.
Operational summary
The receptor site requires between 1 and 2million m^3 of material to restore the receptor site. It is probable that the receptor site would be able to accept a large proportion of Thames Tideway Tunnel project material during and beyond the Thames Tideway Tunnel project timescales. The receptor site would accept the London clays and Lambeth group. The receptor site would also accept the chalk but they would not want to accept the chalk on its own, as the site operator would prefer to accept the chalk mixed with other materials. The receptor site can only accept material by rail. The restoration of Sutton Courtenay Landfill back to agricultural land and some woodland would result in a beneficial use for all material accepted by the site[III]. The Thames Tideway Tunnel project material would be used to create a geophysical capping layer for the landfill to help reduce the generation of leachate and the emissions of gases from the municipal waste deposited within the landfill. FCC Environment has health and safety policies and management systems in place. Sutton Courtenay Landfill has International Organisation for Standardisation (ISO) 18001 accreditation. The receptor site has no reported Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) incidents in the past three years of operations.
Overall suitability
Sutton Courtenay Landfill has the ability to receive Thames Tideway Tunnel project material for the whole lifetime of the Thames Tideway Tunnel project. It is anticipated that between 1 and 2million m^3 of material is needed to restore the receptor site. However the receptor site has a permitted capacity of 600,000tpa of active and inert wastes, and has confirmed that 400,000tpa would be made available for Thames Tideway Tunnel project material thus limiting its capacity and throughput. It is also located approximately 77km (in a straight line distance) from the Thames Tideway Tunnel drive sites but material would be delivered by rail. The receptor site has a beneficial or neutral grading for all other evaluation indicators (with the exception of GhG emissions). Sutton Courtenay Landfill is included on the planning stage preferred list.

[III] Based on the *Excavated material options assessment (EMOA)* beneficial use test

Plate 3.1 Sutton Courtenay Landfill site location

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4 Evaluation objective 1: To ensure prudent use of land and other resources

4.1.1 The receptor site currently sources material for restoration and capping purposes from construction projects around London and the southeast of England.

4.1.2 Where possible the receptor site will use reclaimed material avoiding the use of virgin material for restoration.

4.1.3 The Thames Tideway Tunnel project material would be used to restore the receptor site and to make it available for other uses. The receptor site would be restored to agricultural land and some woodland.

4.1.4 The use of Thames Tideway Tunnel material project would not contribute to any requirement for additional land extending the receptor site's boundary.

4.1.5 Table 4.1 provides the grade given for evaluation objective 1 and the justification for the grade.

Table 4.1 Evaluation objective 1 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
1. To ensure prudent use of land and other resources	a) Extent to which resources such as sand, gravel and chalk are conserved by processing or storage of Thames Tideway Tunnel project material at receptor sites.	0	Thames Tideway Tunnel project material is unlikely to affect virgin material use e.g. material replaces other reusable materials or no material substitution required.	Thames Tideway Tunnel project material would be used in the landfill restoration. Thames Tideway Tunnel material would replace the use of other reusable material.
	b) Extent to which Thames Tideway Tunnel project material would effect landtake at (footprint of) receptor sites in the long term.	0	The acceptance of Thames Tideway Tunnel project material would not contribute to the requirement for additional land extending the receptor site's boundary.	The Thames Tideway Tunnel project material would be used within the existing receptor site boundary and would not contribute to a need for the receptor site to expand.

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5 Evaluation objective 2: To reduce climate change impacts

5.1.1 Thames Tideway Tunnel project material would arrive at the receptor site by rail. Material may be stockpiled but there is a general presumption by the site operator that material would be delivered directly to where it is required within the receptor site (using tipping vehicles).

5.1.2 WRG will have a Carbon Management Plan in place during 2012 and have greenhouse gas (GhG) offset plans in place.

5.1.3 The excavated material would not be reprocessed into aggregate at the receptor site. Based on data from the Environment Agency's (EA) lifecycle analysis tool WRATE, the overall GhG emissions for deposition of excavated material to land is 3.17kg CO_2 eq per tonne of excavated material. The excavation material is assumed to be inert soil and the EA's WRATE emissions associated with material reception and spreading have been assumed.

5.1.4 The figures for GhG emissions from transport have been estimated based on:

a. the average CO_2 emissions for the different types of transport; and

b. the distance travelled from the Thames Tideway Tunnel project sites to the receptor site.

5.1.5 The GhG emissions calculated are for comparative purposes only and do not provide an exact representation of the transport emissions associated with the Thames Tideway Tunnel excavated material. Full GhG methodology and assumptions can be found in Appendix B.10.

5.1.6 It has been estimated that using Sutton Courtenay would produce 6.36kg CO_2 eq per tonne of excavated material accepted.

5.1.7 The receptor site is not located in an area considered at risk of flooding by the Environment Agency.

5.1.8 Stockpiling and final positioning of Thames Tideway Tunnel material could affect ground levels and therefore affect flood risk. The receptor site has a water management plan which is updated annually. Work in any new area requires consideration of storage capacity impacts.

5.1.9 It is not anticipated that the flood risk at the receptor site would change when the receptor site is restored.

5.1.10 Table 5.1 provides the grade given for evaluation objective 2 and the justification for the grade.

Table 5.1 Evaluation objective 2 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
2. To reduce climate change impacts	a) Greenhouse gases emitted through material treatment, handling and use at receptor sites (excludes transport).	+	There is a Carbon Management Plan in place with systems in place to offset GhG emissions from treatment, handling and use of Thames Tideway Tunnel project material.	FCC Environment will have a Carbon Management Plan in place during 2012 and have GhG offset plans in place for the handling of material at the receptor sites.
	b) Extent to which flood risk is altered by Thames Tideway Tunnel material at the receptor site (or in the local catchment).	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not change flood risk (from any source or a combination of sources) to the site and surroundings.	The receptor site is not in a flood risk zone. It is not anticipated that the flood risk would be affected as the receipt of the Thames Tideway Tunnel project material would be considered in the water management plan.
	c) Greenhouse gases emitted through transport of Thames Tideway Tunnel material to the receptor sites.	-	Through the transport of Thames Tideway Tunnel project material between 6 and less than or equal to 8kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced	Through the transport of Thames Tideway Tunnel project material it is estimated 6.36kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.

6 Evaluation objective 3: To protect local amenity

6.1.1 The receptor site is not located within an Air Quality Management Area (AQMA).

6.1.2 The receptor site is an operational landfill. The receptor site currently accepts material similar to the Thames Tideway Tunnel project materials for restoration purposes.

6.1.3 The Thames Tideway Tunnel project material would be used as material for restoration; this would also act as a barrier to emissions that might be produced from the active waste deposited at the landfill site helping to reduce odour impacts.

6.1.4 There is a dust and odour management plan for the receptor site, which includes measures to deal with dust should the issue arise, the measures include spraying haul roads and wheel washing.

6.1.5 There are noise monitoring stations located at the receptor site and a noise management plan to limit the effect operational noise would have on local receptors. Tipping is not carried out to the east of the receptor site during certain times of year to reduce effects on Hill Farm which is 450m from the receptor site boundary.

6.1.6 Table 6.1 provides the grade given for evaluation objective 3 and the justification for the grade.

Table 6.1 Evaluation objective 3 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
3. To protect local amenity	a) Extent of potential effects on local amenity from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a minor beneficial effect on the local amenity	Operations at the receptor site to which the receipt of Thames Tideway Tunnel project material would contribute, would comprise restoration and where appropriate capping of the existing landfill. This would prevent the release of odours from the closed landfill. There are operational measures at the receptor site such as spraying haul roads and wheel washing for dust suppression, as well as a noise management plan to reduce impacts of nuisance on surrounding receptors

7 Evaluation objective 4: To conserve landscape and townscapes at receiving locations

7.1.1 The nearest Area of Outstanding Natural Beauty (AONB) is 2.2km northwest of the receptor site.

7.1.2 The receptor site is located 500m northwest of Didcot. A power station is located to the south and farmland is located to the north and east of the receptor site. The village of Sutton Courtenay is located 200m west of the receptor site and Appleford is located 500m to the northeast. Hill Farm is located 450m to the east of the receptor site.

7.1.3 Didcot Power Station which dominates views looking towards the south is located next to the receptor site.

7.1.4 Restoration material would replace temporary grass cover, which would therefore result in some minor adverse visual impacts. However stockpiled materials may be used to screen views thus in the short term, any effect from using Thames Tideway Tunnel material would probably be negligible.

7.1.5 In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape changing the area from an operating landfill to agricultural land and some woodland.

7.1.6 Table 7.1 provides the grade given for evaluation objective 4 and the justification for the grade.

Table 7.1 Evaluation objective 4 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
4. To conserve landscapes and townscapes at receiving locations	a) Extent of short term visual & landscape impacts from receipt, treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have a short term effect on the local visual amenity at the receptor site or any effect would be negligible.	In the short term restoration material would replace temporary grass cover however stockpiled materials may be used to screen views thus the use of Thames Tideway Tunnel project material would probably be negligible.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of permanent visual & landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a permanent minor beneficial visual effect on the landscape, based on a 'do nothing' view of the site.	In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape changing the area from an operating landfill to agricultural land and some woodland.

8 Evaluation objective 5: To protect quality of and access to open space

8.1.1 A public bridleway runs along the southern boundary of the receptor site and a footpath runs to the west of the receptor site. To the north of the receptor site boundary is a byway which is open to all traffic.

8.1.2 In the short term it is not envisaged that receiving Thames Tideway Tunnel project material at the receptor site would affect the Public Rights of Way (PRoWs) that run along the boundary of the receptor site.

8.1.3 In the long term when the receptor site is fully restored to agricultural land and some woodland, site access would be determined by the land owner.

8.1.4 The restoration plans for the receptor site to which Thames Tideway Tunnel project material would contribute, would slightly enhance the PRoWs on the boundary of the receptor site in the long term. This is because instead of the PRoW bordering an operational landfill it will border agricultural land and some woodland.

8.1.5 Table 8.1 provides the grade given for evaluation objective 5 and the justification for the grade.

Table 8.1 Evaluation objective 5 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
5. To protect quality of and access to open space	a) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the short term?	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel material would contribute, would have no or a negligible effect on access to and quality of open space and PRoWs.	The restoration works at the receptor site to which the Thames Tideway Tunnel project material would contribute would not disrupt the existing PRoWs that run along the boundary of the receptor site.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the long term?	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would slightly enhance a PRoW or improve the quality of and access to public open space.	The restoration plans for the receptor which Thames Tideway Tunnel project material would contribute, would slightly enhance the PRoWs to on the boundary of the receptor site. The receptor site would likely be restored to agricultural land and some woodland therefore access would be determined by the land owner.

9 Evaluation objective 6: To protect water quality

9.1.1 The River Thames runs 700m to the north of the receptor site and a small water course runs through the centre of the receptor site.

9.1.2 The receptor site is not located within a groundwater Source Protection Zone (SPZ), which highlights groundwater sources such as wells, boreholes and springs used for public drinking water supply.

9.1.3 The receptor site would only receive clean inert Thames Tideway Tunnel project materials and these are unlikely to impact on local water quality. The landfill has been lined, and the receipt of Thames Tideway Tunnel project material would be used for landfill capping.

9.1.4 The receptor site has a surface water management plan and water is directed to clean lagoons prior to discharge into local water courses.

9.1.5 Based on the water management systems at the receptor site and the inert nature of the Thames Tideway Tunnel project material it is not anticipated that accepting Thames Tideway Tunnel project material would have an effect on the surrounding water courses and/or groundwater.

9.1.6 Table 9.1 provides the grade given for evaluation objective 6 and the justification for the grade.

Table 9.1 Evaluation objective 6 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
6. To protect water quality	a) Extent of potential effects on fluvial water quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on the local watercourses.	The treatment, handling or use of the Thames Tideway Tunnel project material at the receptor site is likely to have no or negligible effect on the local watercourses given that there is a water management plan in place at the receptor site.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of potential effects on groundwater quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on groundwater.	The receptor site is not in a groundwater SPZ and the treatment, handling or use of the Thames Tideway Tunnel project material at the receptor site is likely to have no or negligible effect on groundwater given that the receptor site has a water management plan in place.

10 Evaluation objective 7: To protect biodiversity

10.1.1 There are no environmental designations with regards to biodiversity within 2km of the receptor site.

10.1.2 In the short term, the handling and use of the Thames Tideway Tunnel project material as part of the existing operations at the receptor site is likely to have no or negligible effects on a designated site as there are no designated sites within 2km of the receptor site.

10.1.3 The exact nature of the habitats created will be dependent on the material used to restore the receptor site. At this stage it is not possible to assess whether the habitats created through the restoration would have more or less ecological value than those currently present on the receptor site.

10.1.4 Table 10.1 provides the grade given for evaluation objective 7 and the justification for the grade.

Table 10.1 Evaluation objective 7 grades and justification

Evaluation objective	Evaluation Indicator	Grade	Evaluation criteria	Justification
7. To protect biodiversity.	a) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the short term.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	Thames Tideway Tunnel project material would form part of the restoration plans for the receptor site and would have no or negligible effect on a designated site as there are no designated sites within 2km of the receptor site.
	b) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the long term.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	Thames Tideway Tunnel project material would form part of the restoration plans for the receptor site and would have no or negligible effect on a designated site as there are no designated sites within 2km of the receptor site. Habitats would be created through the restoration of the receptor site. It is not possible to assess whether these would be of higher ecological value than the existing habitats.

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11 Evaluation objective 8: To protect cultural heritage

11.1.1 Three Scheduled Ancient Monuments (SAM) are located within 1km of the receptor site. However, these are all located more than 250m from the receptor site boundary.

11.1.2 Sutton Courtenay Manor, a Registered Parks and Gardens are over 1km from the receptor site boundary.

11.1.3 It is not anticipated that the operations at the receptor site which Thames Tideway Tunnel project material would have an effect on cultural heritage.

11.1.4 Table 11.1 provides the grade given for evaluation objective 8 and the justification for the grade.

Table 11.1 Evaluation objective 8 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
8. To protect cultural heritage.	a) Extent of potential effects on designated or nominated archaeological sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	The receipt of Thames Tideway Tunnel project material would have no or negligible effect on cultural heritage receptors within close proximity to the receptor site.

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12 Evaluation objective 9: To provide employment opportunities

12.1.1 The receptor site is currently operational and receiving two deliveries of non hazardous material by rail per day. Current staff would be used to accept and deposit Thames Tideway Tunnel project material.

12.1.2 If deliveries of Thames Tideway Tunnel project material were agreed to arrive in three rather than two trains per day, it is likely that four to five additional staff would be required to manage this delivery. As this extra staffing provision is not guaranteed, this objective has been assessed based on current staffing levels.

12.1.3 FCC Environment is keen to provide local people with job opportunities. If additional staff were required FCC Environment would look to hire a local firm to offload the rail stock.

12.1.4 In the long term it would be unlikely that any jobs would be created or lost at the receptor site as a result of accepting Thames Tideway Tunnel project material.

12.1.5 Table 12.1 provides the grade given for evaluation objective 9 and the justification for the grade.

Table 12.1 Evaluation objective 9 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
9. To provide employment opportunities.	a) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the short term.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the short term.	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material forms part of, would contribute to no job gains in the short term.
	b) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the long term.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the long term.	In the long term it is unlikely that any jobs would be created or lost.

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13 Evaluation objective 10: To minimise the cost of waste management

13.1.1 FCC Environment have estimated that the cost of rail transport from west London and placement of material at the receptor site. This cost would be finalised if appropriate through procurement.

13.1.2 In order to compare the likely cost associated with transport and acceptance of the Thames Tideway Tunnel project material at each receptor site a cost model is used.

13.1.3 The cost of transporting the excavated material has been calculated from the distance travelled and a cost per tonne/ km for each of the transport mode (road, marine transport and rail). The road and marine transport costs have been calculated from the quotes gathered from operators based on today's prices. A gate fee of £4 per tonne has been assumed based on current prices. Full details of the assumptions made can be found at Appendix B.8.

13.1.4 It has been estimated that the cost of transporting and managing excavated material at Sutton Courtenay Landfill would be £15.19 per tonne of excavated material accepted at the receptor site. These costs are predominantly associated with transfer of the material from the Thames Tideway Tunnel project sites to the receptor sites. This cost is an estimated cost for comparison purposes within the *EMOA* and may differ from the actual cost which would be incurred if Thames Tideway Tunnel project material were taken to this receptor site.

13.1.5 Table 13.1 provides the grade given for evaluation objective 10 and the justification for the grade.

Table 13.1 Evaluation objective 10 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
10. To minimise the costs associated with the management of excavated material.	a) Costs of transportation, treatment, handling and use of Thames Tideway Tunnel project material.	+	The transportation, treatment, handling and use of Thames Tideway Tunnel material would cost between £13 and less than or equal to £16 per tonne	The cost of transportation, treatment, handling and use of Thames Tideway Tunnel material has been estimated (using the *EMOA* cost model) to be £15.19 per tonne.

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14 Evaluation objective 11: To ensure operational suitability of the receptor site

14.1 Evaluation indicator 11a) Timescales

14.1.1 The receptor site has planning consent to receive material for restoration until 31st December 2030.

14.1.2 Based on Thames Tideway Tunnel project excavation timescales of 2016 to 2021, Sutton Courtenay would be available for use for Thames Tideway Tunnel project material for the entire project timetable.

14.1.3 Table 14.1provides the grade given for evaluation objective 11a and the justification for the grade.

Table 14.1 Evaluation objective 11a grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	a) Likelihood of implementation within the required timescale.	+++	The receptor site would be available for use for Thames Tideway Tunnel project material for more than 100% of the required timescale	The planning consent for the receptor site states that restoration needs to be complete by 2031. The receptor site would be available to accept Thames Tideway Tunnel project material for the entire project timetable.

14.2 Evaluation indicator 11b) Material characteristics

14.2.1 Sutton Courtenay Landfill would be able to accept London Clay, chalk and Lambeth Group with sands, gravels and inert tunnel construction materials (piling and diaphragm wall arisings) for restoration.

14.2.2 Chalk would not be accepted on its own but could potentially be accommodated with other materials.

14.2.3 Table 14.2 shows the information from the receptor site's environmental permit detailing that it can accept inert materials.

Table 14.2 Wastes accepted for disposal at Sutton Courtenay Landfill

Wastes accepted for disposal	
Waste category or type	**Permitted or not permitted**
Hazardous	Not permitted.

Wastes accepted for disposal	
Non-hazardous	Permitted. Excluding waste types where the European Waste Catalogue classification given ends in ‘’99’’. Excluding 18 01 09 and 18 02 08.
Stable non-reactive hazardous	Not permitted.
Inert	Permitted. Excluding waste types where the European Waste Catalogue classification given ends in ‘’99’’.

14.2.4 The receptor site has the potential to receive all Thames Tideway Tunnel project excavated material types. The material would be subject to acceptance criteria testing to ensure that the material is inert. It is assumed that most, if not all, of the Thames Tideway Tunnel project excavated material would be inert. Details of the acceptance criteria are set out in the environmental permit.

14.2.5 Table 14.3 provides the grade given for evaluation objective 11b and the justification for the grade.

Table 14.3 Evaluation objective 11b grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	b) Acceptability of material with Thames Tideway Tunnel project material characteristics by the receptor sites.	++	The receptor site could accept for use four Thames Tideway Tunnel project material types based on their characteristics including: London Clay, Lambeth Group and chalk	The receptor site would be able to accept all the material types produced from the Thames Tideway Tunnel project. However the receptor site would not be able to accept the chalk on its own and it would need to be mixed with other materials.

14.3 Evaluation Indicator 11c) Capacity

14.3.1 The site operator has stated that the receptor site has capacity for between 1 and 2million m^3 (approximately 1.23 to 2.46million tonnes) of material for restoration. It is permitted to accept 600,000tpa of material including active and inert wastes. The site operator has stated that the receptor site is likely to be able to accept up to 400,000tpa of inert material. Table 14.4 details the permitted capacity for the receptor site in

relation to the material that will be produced by the Thames Tideway Tunnel project.

14.3.2 Table 14.4 also sets out the potential tonnage of Thames Tideway Tunnel project material accepted at the receptor site each year based on the assumptions used in the *EMOA* cost and GhG model. The receptor has the potential to accept 33% of the excavated material that would be produced by the Thames Tideway Tunnel project based on the tonnage it can accept and when material is produced by the Thames Tideway Tunnel project during the project.

Table 14.4 Capacity for inert material at Sutton Courtenay Landfill (tonnes[IV])

	Year						Total
	2016	2017	2018	2019	2020	2021	
Total Thames Tideway Tunnel production (tonnes)	63,000	549,000	1,938,000	1,852,000	147,000	155,000	4,704,000
Maximum capacity granted by operator per annum (tonnes)	400,000	400,000	400,000	400,000	400,000	400,000	-
Potential Thames Tideway Tunnel project material accepted (tonnes)	63,000	400,000	400,000	400,000	147,000	155,000	1,565,000
Potential Thames Tideway Tunnel project material accepted (%)	100%	73%	21%	22%	100%	100%	33%

14.3.3 Table 14.5 provides the grade given for evaluation objective 11c and the justification for the grade.

Table 14.5 Evaluation objective 11c grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	c) Capacity of the receptor site to accept the required volume of Thames Tideway Tunnel project material (based on likely tonnes accepted/	-	The receptor site has capacity to accept greater than or equal to 30% but less than 45% of Thames Tideway Tunnel project material	The receptor site has the potential to accept approximately 33% of the excavated material that would be produced by the Thames Tideway Tunnel project.

[IV] Figures quoted to the nearest 1,000 tonnes

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	%).			

14.4 Evaluation indicator 11d) Receptor site throughput

14.4.1 Thames Tideway Tunnel project material would be delivered to the receptor site by rail only.

14.4.2 The operator has confirmed that it would be able to effectively manage two rail deliveries per day of Thames Tideway Tunnel project material, based on its current operations.

14.4.3 The sidings could potentially receive three rail deliveries per day. However this would require changes to operational procedures which would require further consideration. This objective has therefore been assessed on the assumption that the receptor site receives two rail deliveries per day. Each train has a capacity of 1,500t; as a result the receptor site has the ability to receive 3,000t per day.

14.4.4 The amount of material produced by the Thames Tideway Tunnel project would vary on a daily and monthly basis. The assessment of throughput has been based on both the mean and peak production rates over the Thames Tideway Tunnel construction period. The mean rate is taken as the mean monthly production rate taken over each year in the period 2016 to 2021. The peak rate is based on the month producing the maximum tonnage of excavated material in each year.

14.4.5 Table 14.6 details the proportion of the Thames Tideway Tunnel project material which would be accepted by Sutton Courtenay Landfill over time.

14.4.6 In Years 1, 2, 5 and 6 of the excavation process, Sutton Courtenay Landfill's limit of 3,000t per day is sufficient to accept the average daily tonnage of the Thames Tideway Tunnel project material produced however in year 2 it would not be able to receive the peak daily tonnage of Thames Tideway Tunnel project material produced. In Years 3 and 4 the receptor site would only be able to accept just under half the average daily tonnage of Thames Tideway Tunnel project material.

Table 14.6 Excavated material acceptance rate at Sutton Courtenay (tonnes)

	2016	2017	2018	2019	2020	2021
Available number of train deliveries at receptor site per day (A)	2	2	2	2	2	2
Capacity per train (tonnes)	1,500	1,500	1,500	1,500	1,500	1,500
Thames Tideway Tunnel average daily tonnage*	250	2,050	7,200	6,850	550	550
Required number of trains to transport average daily tonnage (B)	0.2	1.4	4.8	4.6	0.4	0.4

	2016	2017	2018	2019	2020	2021
Available vs average required number of trains at receptor site (A ÷ B)	1,200%	146%	42%	44%	546%	546%
Thames Tideway Tunnel peak daily tonnage**	350	3,050	10,750	10,300	800	850
Required number of trains to transport peak rate (C)	0.2	2.0	7.2	6.9	0.5	0.6
Available vs Peak Number of trains at receptor site (A ÷ C)	857%	98%	28%	29%	375%	353%

***** *The Thames Tideway Tunnel average daily tonnage for each year is calculated as the mean of the daily rate each month assuming 22.5 days in each month.*

****** *The peak daily tonnage is based on the average daily tonnage (assuming a 22.5 day month) for the peak month of production in each year.*

14.4.7 Table 14.7 provides the grade given for evaluation objective 11d and the justification for the grade.

Table 14.7 Evaluation objective 11d grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	d) Ability of the receptor sites to accept Thames Tideway Tunnel project material at the anticipated rate (speed of material generation vs acceptance rate).	-	The receptor site could take greater than or equal to 2,800 but less than 4,600t per day of Thames Tideway Tunnel project material.	The receptor site has the ability to receive 3,000t per day, based on the delivery of three trains a day each with a capacity of 1,500t.

14.5 Evaluation indicator 11e) Planning consent and permitting

14.5.1 Sutton Courtenay has the necessary planning consent and environmental permit in place to accept excavated Thames Tideway Tunnel project material for landfill restoration.

14.5.2 Further information on the receptor site's planning consent and environmental permit can be found in Section 2.3 and 2.4.

14.5.3 Table 14.8 provides the grade given for evaluation objective 11e and the justification for the grade.

Table 14.8 Evaluation objective 11e grade and justification

Evaluation Objective	Evaluation Indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	e) Site operations have appropriate planning and permitting consents.	+++	The receptor site has planning consent and an EA permit.	The receptor site has the relevant planning consent and environmental permit in place to be able to accept Thames Tideway Tunnel project material.

14.6 Evaluation indicator 11f) Transport modes

14.6.1 The receptor site would only accept Thames Tideway Tunnel project material via rail. The receptor site's planning consent states that any material entering the receptor site from outside the County (Oxfordshire) should use rail.

14.6.2 Table 14.9 provides the grade given for evaluation objective 11f and the justification for the grade.

Table 14.9 Evaluation objective 11f grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	f) Can accept excavated material from multiple transport modes.	--	The receptor site is only accessible by one transport mode.	The receptor site can only accept material for restoration via rail.

15 Evaluation objective 12: To conform to the waste hierarchy

15.1.1 The Thames Tideway Tunnel *Excavated materials and waste (EM&W) strategy* contains an objective to 'To minimise waste arisings, maximise re-use, recovery, recycling and beneficial use and minimise the impact of waste on the environment and communities'.

15.1.2 The Thames Tideway Tunnel project material would be used to restore Sutton Courtenay Landfill to agricultural land and some woodland. This is considered to be beneficial use in line with the *EMOA* beneficial use test. Table 15.1details the application of the *EMOA* beneficial use test applied to Sutton Courtenay Landfill.

15.1.3 The site operator confirmed that the material would not be subject to landfill tax as it is being used for restoration purposes.

Table 15.1 Landfill restoration performance against *EMOA* beneficial use test

***EMOA* Test**	**Does the receptor site comply with test?**	**Comment**
The activity will lead to a beneficial use and bring land back into use or provide ecological benefit	Yes	Sutton Courtenay will be restored to agricultural land and some woodland with some areas reserved for habitats such as wetlands.
In the case of quarries or landfill sites, the activity has a planning requirement to be restored	Yes	Sutton Courtenay has a planning requirement to be restored.
The activity does not attract landfill tax	Yes	The material will be used for site restoration and will be exempt from landfill tax.
The material is suitable for its intended use and would not harm human health or the environment	Yes	Sutton Courtenay would be able to receive non-hazardous excavated Thames Tideway Tunnel project material for use in restoration, and if managed in accordance with the environmental permit the activities should not harm human health or the environment.
The minimum amount of material will being used	Yes	The existing planning provides consent for suitable contours based on the proposed restoration plan.

EMOA Test	Does the receptor site comply with test?	Comment
Alternative material (whether waste or not) would be required if Thames Tideway Tunnel project material was not to be used	Yes	The receptor site must be restored so alternative inert materials would be needed.

15.1.4 All the material accepted at the receptor site would be considered as recovery. Thus this receptor site would achieve 100% recovery for all clean materials accepted. It should be noted that this receptor site can only accept 33% of the total Thames Tideway Tunnel project material.

15.1.5 Table 15.2 provides the grade given for evaluation objective 12 and the justification for the grade.

Table 15.2 Evaluation objective 12 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
12. To conform to waste hierarchy.	a) Extent to which the option meets the *EM&W strategy* targets.	+++	Performance of receptor site substantially exceeds target.	All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 33% of the total Thames Tideway Tunnel project material.

16 Evaluation objective 13: To conform to the proximity principle

16.1.1 Material would need to be delivered to the receptor site by rail and it has been estimated that the distance from Acton Main Line to Appleford Sidings is 82km and from Bow East to Appleford Sidings is 112km[V]. The indicative transhipment point used in the *EMOA* modelling is 11km from Bow East and Thames Tideway Tunnel CSO and drive sites are located an average of 15km from Bow East by road.

16.1.2 For this evaluation objective the receptor site was assessed using a straight line distance from the main drive sites. Using a straight line distance provides a consistent measure for assessment purposes. As the receptor site would be able to receive excavated materials from more than one drive site, the mean distance has been calculated. The receptor site was then graded according to this mean figure.

16.1.3 The receptor site is approximately 77km in a straight line from the main drive sites.

16.1.4 Table 16.1 provides the grade given for evaluation objective 13 and the justification for the grade.

Table 16.1 Evaluation objective 13 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
13. To conform to Proximity Principle.	a) Average distance from main tunnel drive sites.	-	The receptor site is between 80km and 60km from source of Thames Tideway Tunnel project material.	The receptor site is approximately 77km (straight line distance) from the main drive sites.

[V] Distances quoted are those used in the *EMOA* GhG model. Details of the assumptions used in this model can be found in Appendix B.10. These distances are for context only and do not reflect the exact routes that would be used should this receptor site be used to accept Thames Tideway Tunnel material.

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17 Evaluation objective 14: To conform to sustainable transport policy

17.1.1 The receptor site would only be accessed by rail. Material cannot be delivered to this receptor site by road or by marine transport, due to planning restrictions.

17.1.2 The use of rail to transport material is encouraged in the London Plan, and the new Oxfordshire Minerals and Waste Core Strategy which is currently under consultation.

17.1.3 *The London Plan 2011*[2] Policy 5.18 Construction, excavation and demolition states "that waste should be removed from construction sites, and materials brought to the site, by water or rail transport wherever that is practicable".

17.1.4 *The Oxfordshire Waste Planning Strategy Consultation Draft, September 2011*[3] C7 states that "proposals for mineral working and waste facilities should: wherever possible, transport minerals or waste by rail, water, pipeline or conveyor, rather than by road."

17.1.5 Appleford Sidings are "proposed as a safeguarded depot for importing aggregates into the county" in the *Oxfordshire Minerals Planning Strategy Consultation Draft*, September 2011.

17.1.6 Table 17.1 provides the grade given for evaluation objective 14 and the justification for the grade.

Table 17.1 Evaluation objective 14 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
14. To conform to Sustainable Transport Policy.	a) Conforms to policy objective to move transport of materials from road to rail or marine transport.	**0**	The receptor site has the potential to be accessed by rail or marine transport but may require some double handling or transhipment.	The receptor site can be directly accessed by rail.

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18 Evaluation objective 15: To conform to health and safety good practice

18.1.1 FCC Environment has a dedicated health and safety team. FCC Environment has health and safety policies and management systems in place. The Sutton Courtenay Landfill has ISO 18001 accreditation.

18.1.2 There have been no reported RIDDOR incidents in the last three years at the receptor site.

Table 18.1 provides the grade given for evaluation objective 15 and the justification for the grade.

Table 18.1 Evaluation objective 15 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
15. To conform to Health and Safety Good Practice.	a) Health and safety performance conforms to good practice.	+	The receptor sites health and safety system is accredited and there have been five or less RIDDOR incidents in three year recorded at the receptor site.	The receptor site is ISO 18001 accredited. There have been no reported RIDDOR incidents in the past three years.

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References

[1] *A Practical Guide to the Strategic Environmental Assessment Directive* ODPM (September 2005); *Strategic Planning for Sustainable Waste Management: Guidance on Option Development and Appraisal* Department for Communities and Local Government (2002)

[2] *The London Plan* Greater London Authority (2011)

[3] *The Oxfordshire Waste Planning Strategy Consultation Draft.* Oxfordshire County Council *(*September 2011)

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.03**

Volume 3: Project-wide effects assessment appendices

Appendix A.4; Annex D.5: EMOS Kingsmead Quarry

APFP Regulations 2009: Regulation **5(2)(a)**

Hard copy available in

Box **17.2** Folder **A**
January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

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1 Introduction

1.1.1 The construction of the Thames Tideway Tunnel would require the excavation of a large volume of material at multiple sites throughout London. To identify the preferred options for the management of the excavated material a detailed options assessment has been undertaken.

1.1.2 The methodology for assessment of the excavated material options is based on the Sustainability Appraisal methodology[1]. The assessment has taken a phased approach and at each stage the least preferred options have been eliminated until the final most viable and sustainable options have been selected to form the planning stage preferred list. The options on the planning stage preferred list demonstrate the potential capacity to manage the excavated material in a sustainable manner. The assessment is based on the consistent assessment of options against agreed evaluation objectives throughout the process.

1.1.3 The steps informing the assessment process were:

a. Development of a long list of potential options for the treatment, reuse, recycling or disposal of excavated materials.

b. Viability filter involving the assessment of the long list against the operational evaluation objective associated with viability of the options.

c. Preliminary assessment to develop a short list of options which perform sufficiently well against all the evaluation objectives (environmental, social, operational, policy and health and safety).

d. Detailed assessment in which the options on the short list was further scrutinised to produce a planning stage preferred list of options which perform best against the full suite of evaluation objectives.

1.1.4 For each short listed option whose viability has been confirmed a detailed *Excavated materials option suitability (EMOS) report* has been produced. The *EMOS reports* provide a summary of the site operations and the overall performance of the option against the evaluation objectives.

1.1.5 This *EMOS report* sets out the detail assessment for Kingsmead Quarry in Berkshire. The report provides the information gained during the detailed assessment stage of the excavated material options assessment (options assessment) and the grades awarded against each evaluation indicator as part of this assessment. A grade is provided for each evaluation indicator, using an agreed set of evaluation criteria, against seven grades of impact (ranging from --- to +++). The *EMOS report* also provides a risk profile for the site identifying the key risks associated with the option in relation to accepting the Thames Tideway Tunnel project excavated material.

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2 Site description

2.1 Site location

2.1.1 The village of Horton is situated on the northern and western boundary of Kingsmead Quarry.

2.1.2 The receptor site is bounded to the north by Stanwell Road and to the east by Coppermill Road. The Colne Brook runs between the receptor site and Coppermill Road to the east of the receptor site. Wraysbury Reservoir is 450m to the east of the receptor site. There are a number of lakes to the west of the receptor site. A railway line runs along the southern boundary of the receptor site.

2.1.3 The receptor site is 1.7km from junction 14 of the M25. Access to the motorway can be achieved via Stanwell Road and Horton Road. Heathrow Airport is 3km to the east of the receptor site.

2.1.4 Kingsmead Quarry site location is shown in Plate 3.1 Kingsmead Quarry site location.

2.2 Site operations

2.2.1 CEMEX operate Kingsmead Quarry, which is an active sand and gravel quarry. There are sand and gravel processing activities currently being carried out on site. There are also concrete production facilities at the receptor site, producing ready-mix concrete.

2.2.2 Extraction is currently taking place at the eastern and southern end of the receptor. The receptor site currently has a planning requirement to infill the quarry void. The timescales for restoration have not yet been finalised however the site operator indicated that restoration is likely to commence in about 2017.

2.2.3 The site operator has stated that they believe there is capacity at the receptor site for between 5 and 6million tonnes. For this assessment, a figure of 5million tonnes has been used as the total capacity available at the receptor site.

2.2.4 Thames Tideway Tunnel project material would arrive at the receptor site by road and be taken directly to the tipping face.

2.3 Planning consent

2.3.1 A number of planning consents for the extraction and restoration of the receptor site have been issued. Mineral extraction at Kingsmead Quarry was approved through a series of planning consents granted between the mid 1940s and the late 1960s. In 1994 updated conditions covering the whole of the receptor site were issued under application number 471893 (covering approximately the eastern three quarters of the quarry) and 471894 (covering the remainder).

2.3.2 Condition 1 states that that the winning and workings of minerals and deposit of waste material should crease and the site restored by 21 February 2042. Condition 18 states that the site should be progressively extracted, backfilled and restored to original levels. Condition 20 specifies that waste used to restore the site should be inert.

2.3.3 CEMEX have submitted a number of variations including:

a. Currently the receptor site is still excavating material and working under 06/00505/FULL - Installation of sand and gravel processing plant, two ready-mixed concrete plants, office/mess room and building and ancillary structures;

b. Variation 06/00685/VAR, which changed a number of conditions in approval 471893:

   i. Conditions 15 related to disposal of mineral waste [silt] from the processing plant only within the area shown on the approved plan P1/208/13/1;

   ii. Conditions 24 and 26 which delineating the margins of the extraction area and the phases of development in accordance with a revised plan ref. P1/208/28,

   iii. Removal of conditions 34 and 35 on the dewatering of the site; and

   iv. The variation of conditions 42 and 44 related to dates for commencement of filling and for the submission of a scheme for the progress, filling and restoration of the site.

c. 06/00684/VAR - Variation of Condition 18 and 19 of approval 471894 to allow the progress, infilling and restoration of the site in accordance with a revised scheme and to replace the approved drawings P1/208/14/1; and

d. 07/02388/VAR - Installation of sand and gravel processing plant, two ready-mixed concrete plants, office/mess room building and ancillary structures without complying with conditions 3 (phasing scheme), 11 (ecological report) and 25 (restoration scheme) of planning consent 06/00505/FUL;

2.3.4 It is envisaged that a variation or additional information would be required before the whole of the receptor site could be fully restored.

2.4 Permitting

2.4.1 Kingsmead Quarry does not currently have an environmental permit for quarry restoration.

2.4.2 CEMEX is currently in the process of preparing an environmental permit application and is anticipating submission to the Environment Agency before to the end of 2012.

3 Overall site summary

3.1.1 Table 3.1 below provides a summary of Kingsmead Quarry and an assessment of its suitability against the evaluation objectives. Sections 4 to 18 of this *EMOS report* provides more detail on each evaluation objective.

Table 3.1 Summary of Kingsmead Quarry and its overall suitability

Site name:	Kingsmead Quarry (CEM.6)		**Owner/operator:**	CEMEX			
Planning consent	Yes, until 2042 Application number 06/00505/FULL		**Permit**	No			
Void capacity	5million tonnes[I]		**Throughput**	Currently no restrictions assessment based on 400,000tpa[II]			
Recovery/ disposal	Recovery						
Materials	**London clay**	✓	**Lambeth group**	✓	**Chalk**	✓	
Transport type	**Road**	✓	**Rail**	X	**Marine transport**	X	

Receptor site overview

Kingsmead Quarry is a sand and gravel quarry that is currently extracting material. The receptor site has a planning requirement to be restored by 2042. Restoration activities have not yet started at the receptor site. Thames Tideway Tunnel project material would be used for the restoration of the quarry to agricultural land with lakes. The receptor site is located approximately 29km from London; Thames Tideway Tunnel project material would arrive at the receptor site by road.

Assessment

1. Land and other resources	a)	0	8. Cultural heritage	a)	0
	b)	0	9. Employment opportunities	a)	+
2. Climate change	a)	+		b)	0
	b)	0	10. Cost	a)	--
	c)	-	11. Operational suitability of the receptor site.	a)	+++
3. Local amenity	a)	0		b)	+++
4. Landscapes and townscapes	a)	0		c)	-
	b)	++		d)	N/A
5. Access to open space	a)	0		e)	0
	b)	++		f)	--
6.Water quality	a)	0	12. Waste hierarchy	a)	+++
	b)	0	13. Proximity principle	a)	+
7.Biodiversity	a)	0	14. Sustainable transport policy	a)	---

[I] Operator has provided estimate on capacity in tonnage and m^3 estimate is not available.

[II] The capacity assessment has assumed a maximum input rate for restoration material to be the same as the current aggregate extraction rate of 400,000tpa.

	b)	0	15. Health and safety good practice	a)	+

Environmental summary

Thames Tideway Tunnel project excavated material would form part of the material required for the restoration operations at the receptor site. In the short term the use of Thames Tideway Tunnel project material for the restoration of Kingsmead Quarry is likely to have no or negligible effect on any designated areas in close proximity to the quarry. In the long term the restoration of the site will have a beneficial visual effect on the area once it is restored to agricultural land and lakes. The restoration of the receptor will be in keeping with the surrounding area where the old quarry to the west of the current site has been restored to a lakeland area. The receptor site is approximately 29km from the main drive sites and can only accept material by road. The distance from the transhipment point to the site is 65km which affects the grade awarded to this site for carbon emissions from transport.

Socio-economic summary

The use of Thames Tideway Tunnel project material at the receptor site is likely to generate a small number of jobs in the short term. In the long term it is unlikely that there would be any jobs created or lost at the receptor site.

Operational summary

The site operator has stated that the receptor site requires between 5 and 6million tonnes of material to restore the site. The receptor site has planning consent until 2042. It is likely that the receptor site would be able to accept all of the non-hazardous excavated materials produced by the Thames Tideway Tunnel. The receptor site does not currently have an environmental permit. The operator proposes to obtain the necessary consents to commence restoration of the site by 2017. The receptor site can only accept material by road. Kingsmead Quarry restoration to agricultural land and lakes would be considered as beneficial use for all material accepted by the receptor site[III].

CEMEX has an overall health & safety policy and a H&S policy for operations. They are also ISO 18001 accredited. CEMEX implement their corporate H&S procedures at the receptor site. The receptor site has no reported Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) incidents in the past three years of operations.

Overall suitability

Kingsmead Quarry will be restored to agricultural land and lakes which would provide a long term beneficial effect with respect to environmental and policy objectives. The receptor site has the potential to receive Thames Tideway Tunnel project material for the whole lifetime of the Thames Tideway Tunnel project. The receptor site does not yet have an environmental permit for restoration activities. It is estimated by the operator that between 5 and 6million tonnes of material is needed to restore the receptor site. The receptor site is over 60km by road from the transhipment point. Kingsmead Quarry included on the planning stage preferred list.

[III] Based on the *Excavated material options assessment (EMOA)* beneficial use test

Plate 3.1 Kingsmead Quarry site location

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4 Evaluation objective 1: To ensure prudent use of land and other resources

4.1.1 The receptor site has not started receiving material for restoration and is still extracting gravels.

4.1.2 The site operator stated that Thames Tideway Tunnel project material would be used for restoration.

4.1.3 Where possible the receptor site will use reclaimed material avoiding the use of virgin material for restoration.

4.1.4 The use of Thames Tideway Tunnel project material would not contribute to any requirement for additional land extending the receptor site's boundary.

4.1.5 Table 4.1 provides the grade given for evaluation objective 1 and the justification for the grade.

Table 4.1 Evaluation objective 1 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
1. To ensure prudent use of land and other resources	a) Extent to which resources such as sand, gravel and chalk are conserved by processing or storage of Thames Tideway Tunnel project material at receptor sites.	0	Thames Tideway Tunnel project material is unlikely to affect virgin material use e.g. material replaces other reusable materials or no material substitution required.	Thames Tideway Tunnel project material would be used in the quarry restoration. Thames Tideway Tunnel project material would replace the use of other reusable material.
	b) Extent to which Thames Tideway Tunnel project material would effect landtake at (footprint of) receptor sites in the long term.	0	The acceptance of Thames Tideway Tunnel project material would not contribute to the requirement for additional land extending the receptor site's boundary.	The Thames Tideway Tunnel project material would be used within the existing receptor site boundary and would not contribute to a need for the receptor site to expand.

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5 Evaluation objective 2: To reduce climate change impacts

5.1.1 CEMEX has a carbon strategy which promotes the reduction of the overall carbon footprint of their operations.

5.1.2 The excavated material would not be reprocessed into aggregate at the receptor site. Based on data from the Environment Agency's (EA) lifecycle analysis tool WRATE, the overall GhG emissions for deposition of excavated material to land is 3.17kg CO_2 eq per tonne of excavated material. The excavation material is assumed to be inert soil and the EA's WRATE emissions associated with material reception and spreading have been assumed.

5.1.3 The figures for GhG emissions from transport have been estimated based on:

a. the average CO_2 emissions for the different types of transport; and

b. the distance travelled from the Thames Tideway Tunnel sites to the receptor site.

5.1.4 The GhG emissions calculated are for comparative purposes only and do not provide an exact representation of the transport emissions associated with the Thames Tideway Tunnel excavated material. Full GhG methodology and assumptions can be found in Appendix B.10.

5.1.5 It has been estimated that using Kingsmead Quarry would produce 6.42kg CO_2 eq per tonne of excavated material accepted. These emissions are predominantly associated with transfer of the material from the Thames Tideway Tunnel sites to the receptor sites. The model assumes that material would be taken from the Thames Tideway Tunnel sites by marine transport in line with the *Transport strategy*. The modelled emissions include transport of material by road from the transhipment point in Barking.

5.1.6 The receptor site is located in an area that has been designated by the EA as a moderate to significant chance of flooding

5.1.7 The restoration to the west of the site has developed a series of lakes which will offset some of the potential flood risk

5.1.8 A flood risk assessment has been carried out for the construction of the concrete plant. A mitigation scheme was developed that compensates for the loss of flood storage. It also ensures that the flood regime at the receptor site remains unchanged by maintaining flood water flow routes out of the flood plain via culverts. The flood risk assessment concluded that as long as the mitigation measures are maintained there would be no impact on the flood risk. Hence it is not anticipated that the flood risk at the receptor site would change when the receptor site is restored.

5.1.9 Table 5.1 provides the grade given for evaluation objective 2 and the justification for the grade.

Table 5.1 Evaluation objective 2 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
2. To reduce climate change impacts	a) Greenhouse gases emitted through material treatment, handling and use at receptor sites (excludes transport).	+	There is a Carbon Management Plan in place with systems in place to offset GhG emissions from treatment, handling and use of Thames Tideway Tunnel project material.	CEMEX have a carbon strategy and there would be minimal handling of Thames Tideway Tunnel project material at the receptor site.
	b) Extent to which flood risk is altered by Thames Tideway Tunnel project material at the receptor site (or in the local catchment).	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not change flood risk (from any source or a combination of sources) to the site and surroundings.	It is unlikely that the flood risk at the receptor site would be changed by the use of Thames Tideway Tunnel project material as there are measures at the receptor site to ensure that flood risk is not affected.
	c) Greenhouse gases emitted through transport of Thames Tideway Tunnel project material to the receptor sites.	-	Through the transport of Thames Tideway Tunnel project material between 6 and less than or equal to 8kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.	Through the transport of Thames Tideway Tunnel project material it is estimated that 6.42kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.

6 Evaluation objective 3: To protect local amenity

6.1.1 The receptor site is on the edge of an Air Quality Management Area (AQMA). The AQMA is at Brands Hill on the A4, which is approximately 2km to the north of the receptor site. However HGVs would not take this route when delivering excavated material to the receptor site because the planning consent stipulates the routes of the HGVs to and from the receptor site.

6.1.2 There are currently screening bunds at the receptor site to screen operations visually and acoustically from residential properties on Stanwell Road and Coppermill Road.

6.1.3 Restoration has not yet started at the receptor site but it is not envisaged that odour will be a problem given the types of restoration material that will be used at the receptor site.

6.1.4 There are wheel washers on the entrance road of the receptor site for any vehicles leaving the receptor site.

6.1.5 There are measures at the receptor site to reduce any effects on air quality, noise and odour thus the Thames Tideway Tunnel project material is likely to have a negligible or no effect on sensitive receptors in comparison to baseline conditions.

6.1.6 Table 6.1 provides the grade given for evaluation objective 3 and the justification for the grade.

Table 6.1 Evaluation objective 3 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
3. To protect local amenity	a) Extent of potential effects on local amenity from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have an effect on the local amenity or any effect would be negligible.	There are measures at the receptor site to reduce any environmental nuisance impacts thus Thames Tideway Tunnel project material is likely to have a negligible or no effect on sensitive receptors in comparison to baseline conditions.

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7 Evaluation objective 4: To conserve landscape and townscapes at receiving locations

7.1.1 Mineral extraction operations have been carried out at Kingsmead Quarry since the mid 1940's.

7.1.2 Extraction from the western part of the Kingsmead Quarry has been completed and this area has been restored to lakes.

7.1.3 Some restoration has taken place at the receptor site but once the receptor site has been fully extracted of sands and gravels further restoration will be required.

7.1.4 There are currently screening bunds at the receptor site to screen operations visually from residential properties and the road.

7.1.5 The receptor site is within the Green Belt but not within an Area of Outstanding Natural Beauty (AONB).

7.1.6 In the short term the receptor site would be no more or less visible if it was to accept Thames Tideway Tunnel project material.

7.1.7 In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape changing the area from a quarry to agricultural land and lakes.

7.1.8 Table 7.1 provides the grade given for evaluation objective 4 and the justification for the grade.

Table 7.1 Evaluation objective 4 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
4. To conserve landscapes and townscapes at receiving locations	a) Extent of short term visual and landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have a short term effect on the local visual amenity at the receptor site or any effect would be negligible.	In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute would be no more or less visible given the overall context of the existing site.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of permanent visual and landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a permanent moderate beneficial visual effect on the landscape, based on a 'do nothing' view of the site.	In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape changing the area from a quarry to agricultural land and lakes.

8 Evaluation objective 5: To protect quality of and access to open space

8.1.1 The receptor site is not currently accessible to the public.

8.1.2 There is a PRoW that runs along the western boundary of the receptor site. The lakes to the western side of the receptor site are used by anglers.

8.1.3 The receptor site will be restored to agricultural land with lakes so some areas of the receptor site would be accessible to the public once the receptor site is fully restored as with the western area.

8.1.4 The restoration plans for the receptor site to which Thames Tideway Tunnel project material would contribute, would moderately enhance the PRoW on the western boundary of the receptor site in the long term. This is because instead of the PRoW bordering an operational quarry it will border agricultural land and lakes.

8.1.5 In addition, current restoration plans are for the development of additional PRoWs on the restored receptor site to link existing PRoWs surrounding its boundary.

8.1.6 Table 8.1 provides the grade given for evaluation objective 5 and the justification for the grade.

Table 8.1 Evaluation objective 5 grades and justification

Evaluation Objective	Evaluation Indicator	Grade	Evaluation criteria	Justification
5. To protect quality of and access to open space	a) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the short term?	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or a negligible effect on access to and quality of open space and PRoWs.	The receptor site is not accessible to the public and therefore Thames Tideway Tunnel project material would not affect the quality of open space and PRoWs.

Evaluation Objective	Evaluation Indicator	Grade	Evaluation criteria	Justification
	b) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the long term?	++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would moderately enhance a PRoW or improve the quality of and access to public open space.	Some areas of the receptor site are likely to be made accessible to public following restoration. The restoration plans for the receptor which Thames Tideway Tunnel project material would contribute, would moderately enhance the PRoW on the western boundary of the receptor site.

9 Evaluation objective 6: To protect water quality

9.1.1 There are a number of lakes to the west of the receptor site that have been created through the restoration of previous quarrying activities.

9.1.2 The Colne Brook runs down the eastern boundary of the receptor site

9.1.3 Measures are in place at the receptor site to ensure that the flood risk is not compromised; this is achieved by maintaining flood flow routes into and out of the flood plain via culverts.

9.1.4 The receptor site is not in a groundwater Source Protection Zone (SPZ), which highlights groundwater sources such as wells, boreholes and springs used for public drinking water supply.

9.1.5 The site operator stated that it is anticipated that the base of the receptor site would be lined with clay to provide an infill layer. The clay liner will be installed as a precautionary measure to protect groundwater.

9.1.6 It is not anticipated that accepting Thames Tideway Tunnel project material would have an effect on the surrounding water courses and/or groundwater given the management implemented at the receptor site.

9.1.7 Table 9.1 provides the grade given for evaluation objective 6 and the justification for the grade.

Table 9.1 Evaluation objective 6 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
6. To protect water quality	a) Extent of potential effects on fluvial water quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on the local watercourses.	It is not anticipated that the treatment, handling or use of the Thames Tideway Tunnel project material would have an effect on the local water courses as drainage is managed at the receptor site.
	b) Extent of potential effects on groundwater quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on	The receptor site is not in a groundwater SPZ and the treatment, handling or use of the Thames Tideway Tunnel project material at the receptor site is likely to have no or negligible effect on groundwater. It is anticipated that the quarry would be lined

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
			groundwater.	with clay to protect groundwater.

10 Evaluation objective 7: To protect biodiversity

10.1.1 There is a local nature reserve, Arthur Jacob Nature Reserve, 750m northeast of the receptor site on the opposite side of Stanwell Road.

10.1.2 There is a number of Site of Scientific Special Interests (SSSI) close to the receptor site.

- Wraysbury Reservoir SSSI is 450m to the east;
- Wraysbury No. 1 Gravel Pit SSSI is 1km to the west; and
- Wraysbury & Hythe End Gravel Pits SSSI is 1km to the southwest.

10.1.3 All these are wetland sites and included in the southwest London Waterbodies Special Protection Area (SPA). These are also designated as Important Bird Areas.

10.1.4 The lakes to the western area of the receptor site have also been designated as an Important Bird Area.

10.1.5 The receptor site lies within the Green Belt.

10.1.6 The receptor site will be restored to agricultural land and lakes. The site operator envisages that once the receptor site is restored that areas could potentially become part of the southwest London Waterbodies Special Protection Area (SPA). This however has not yet been confirmed with English Nature.

10.1.7 CEMEX understand the need to conserve the site and thus will ensure that any effects on the surrounding area are minimised.

10.1.8 In the long term the exact nature of the habitats created will be dependent on the material used to restore the site. At this stage it is uncertain whether the habitats created through the restoration would have more or less ecological value than those currently present on the receptor site. The restoration plan includes some areas to encourage wildlife such as wetland areas. The effect on the designated ancient woodland of the change in use from an operational quarry to agricultural land is also uncertain. Although it is considered unlikely that there would be an adverse effect on the SSSIs in close proximity in the long term.

10.1.9 Table 10.1 provides the grade given for evaluation objective 7 and the justification for the grade.

Table 10.1 Evaluation objective 7 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
7. To protect biodiversity.	a) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the short term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	It is likely that the Thames Tideway Tunnel project material will have no or a negligible effect on the designated sites near the receptor site given that CEMEX understand the need to conserve the site and thus will ensure that any effects on the surrounding area are minimised.
	b) Extent of potential effects on designated sites from receipt, treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the long term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would no or negligible effect on a designated site.	Thames Tideway Tunnel project material would form part of the restoration plans for the receptor site. The effect on the designated sites of the change in use from an operational quarry to agricultural land is uncertain. Although it is considered unlikely that there would be an adverse effect on the designated sites in the long term.

11 Evaluation objective 8: To protect cultural heritage

11.1.1 There is an early palace and associated monuments which have been designated as a Scheduled Ancient Monument (SAM) 1.7km to the west of the receptor site at Kingsbury.

11.1.2 Wessex Archaeology is currently carrying out archaeological investigations at the receptor site. These investigations have revealed a vast archaeological landscape at the receptor site, identifying an extensive history dating from Late Glacial (12,000 BC) to the post-medieval period.

11.1.3 Once excavations at the receptor site have ceased and all archaeological investigations have finished the receptor site can be restored.

11.1.4 The treatment, handling or use of Thames Tideway Tunnel project material at the receptor site is likely to have no or negligible effect on the SAM to the west of the receptor site as they are almost 2km away and the earlier quarry restoration (which lies between the receptor site the SAM) included measures e.g. screening bunds to ensure that any nuisance is minimised.

11.1.5 Table 11.1 provides the grade given for evaluation objective 8 and the justification for the grade.

Table 11.1 Evaluation objective 8 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
8. To protect cultural heritage.	a) Extent of potential effects on designated or nominated archaeological sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	The receipt of Thames Tideway Tunnel project material would have no or negligible effect on cultural heritage receptors within close proximity to the receptor site. The receptor site has measures in place including screening bunds to ensure that any effects are minimised.

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12 Evaluation objective 9: To provide employment opportunities

12.1.1 CEMEX has stated that in the short term it is likely that there would be the potential for a small number of jobs to be created from the restoration of the quarry as a result of accepting Thames Tideway Tunnel project material. This would include an additional bulldozer driver and weighbridge clerk.

12.1.2 In the long term it would be unlikely that there would be any jobs created or lost. It is possible that staff at the receptor site could be transferred to other CEMEX operations.

12.1.3 Table 12.1 provides the grade given for evaluation objective 9 and the justification for the grade.

Table 12.1 Evaluation objective 9 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
9. To provide employment opportunities	a) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the short term.	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would lead to minor job gains over the short term of less than 10 jobs.	There is the potential for a small number of jobs to be created from the infilling of the quarry.
	b) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the long term.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the long term.	In the long term it is unlikely that any jobs would be created or lost.

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13 Evaluation objective 10: To minimise the cost of waste management

13.1.1 In order to compare the likely cost associated with transport and acceptance of the Thames Tideway Tunnel project material at each receptor site a cost model is used.

13.1.2 The cost of transporting the excavated material has been calculated from the distance travelled and a cost per tonne/ km for each of the transport mode (road, marine transport and rail). The road and marine transport costs have been calculated from the quotes gathered from operators based on today's prices. A gate fee of £4 per tonne is assumed based on current prices. Full details of the assumptions made can be found at Appendix B.10.

13.1.3 It has been estimated that the cost of transporting and managing excavated material at Kingsmead Quarry would be £22.88 per tonne of excavated material accepted at the receptor site. These costs are predominantly associated with transfer of the material from the Thames Tideway Tunnel sites to the receptor sites. The model assumes that material would be taken from the Thames Tideway Tunnel sites by marine transport in line with the *Transport strategy*. The modelled costs include transport of material by road from the transhipment point in Barking. This cost is an estimated cost for comparison purposes within the *EMOA* and may differ from the actual cost which would be incurred if Thames Tideway Tunnel project material were taken to this receptor site.

13.1.4 Table 13.1 provides the grade given for evaluation objective 10 and the justification for the grade.

Table 13.1 Evaluation objective 10 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
10. To minimise the costs associated with the management of excavated material.	a) Costs of transportation, treatment, handling and use of Thames Tideway Tunnel project material.	--	The transportation, treatment, handling and use of Thames Tideway Tunnel project material would cost between £22 and less than or equal to £25 per tonne.	The cost of transportation, treatment, handling and use of Thames Tideway Tunnel project material has been estimated (using the *EMOA* cost model) to be £22.88 per tonne.

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14 Evaluation objective 11: To ensure operational suitability of the receptor site

14.1 Evaluation indicator 11a) Timescales

14.1.1 The receptor site has planning consent until 2042.

14.1.2 Based on Thames Tideway Tunnel timescales of 2016 to 2021 and the existing planning consent for the site, Kingsmead Quarry would be available for use for Thames Tideway Tunnel project material for the entire six year timetable.

14.1.3 Table 14.1 provides the grade given for evaluation objective 11a and the justification for the grade.

Table 14.1 Evaluation objective 11a grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To operational suitability of the receptor site.	a) Likelihood of implementation within the required timescale.	+++	The receptor site would be available for use for Thames Tideway Tunnel project material for more than 100% of the required timescale.	The planning consent for the receptor site states that restoration needs to be complete by 2042. The receptor site would be available to accept Thames Tideway Tunnel project material for the entire project timetable.

14.2 Evaluation indicator 11b) Material characteristics

14.2.1 CEMEX have stated that they anticipate that Kingsmead Quarry would be able to accept London Clay, chalk and Lambeth Group with sands, gravels and inert tunnel construction materials (piling and diaphragm wall arisings) for restoration.

14.2.2 The receptor site anticipates that chalk could be accepted, though it would need to be in a physical form that would allow it to be transported. Thames Tideway Tunnel project is proposing to put in place chalk dewatering facilities at the drive sites which would reduce the water content in the chalk to below 30%. This level should be suitable for road transport.

14.2.3 The receptor currently does not have an environmental permit but CEMEX will be applying for one in the future for restoration. The environmental permit will detail the waste and material types that the receptor site can accept.

14.2.4 Table 14.2 provides the grade given for evaluation objective 11b and the justification for the grade.

Table 14.2 Evaluation objective 11b grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To operational suitability of the receptor site.	b) Acceptability of material with Thames Tideway Tunnel project material characteristics by the receptor sites.	+++	The receptor site could accept for use all of the Thames Tideway Tunnel project material types based on their characteristics.	The operator is anticipating that the receptor site would be able to accept all the excavated material types produced by the Thames Tideway Tunnel.

14.3 Evaluation indicator 11c) Capacity

14.3.1 CEMEX estimate that it would require between 5 and 6million tonnes of material to restore the whole quarry. For assessment of this objective, a capacity of 5million tonnes has been used.

14.3.2 The operator is still to determine the input rate of the receptor site and currently believes that the input rate would be greater than the current level of material removed from the receptor site as a result of aggregate extraction activities. However until the input rate for restoration material has been confirmed, the capacity assessment has assumed a maximum input rate for restoration material to be the same as the current aggregate extraction rate of 400,000tpa.

14.3.3 Table 14.3 details the estimated capacity for the receptor site in relation to the material that will be produced by the Thames Tideway Tunnel.

14.3.4 Table 14.3 also sets out the potential tonnage of Thames Tideway Tunnel project material accepted at the receptor site each year based on the assumptions used in the *EMOA* cost and GhG model. Based on the operator's estimate, the receptor site would be able to accept 33% of the excavated materials that would be produced by the Thames Tideway Tunnel based on the annual tonnage that the operator anticipates the site would be able to accept and tonnages which are likely to be produced by the Thames Tideway Tunnel during the project.

Table 14.3 Capacity of material at Kingsmead Quarry (tonnes[IV])

	Year						Total
	2016	2017	2018	2019	2020	2021	
Total Thames Tideway Tunnel production	63,000	549,000	1,938,000	1,852,000	147,000	155,000	4,704,000
Operator's anticipated	400,000	400,000	400,000	400,000	400,000	400,000	-

[IV] Figures quoted to the nearest 1,000 tonnes

	Year						Total
	2016	2017	2018	2019	2020	2021	
permitted per annum (tonnes)							
Potential Thames Tideway Tunnel project material accepted (tonnes)	63,000	400,000	400,000	400,000	147,000	155,000	1,565,000
Potential Thames Tideway Tunnel project material accepted (%)	100%	73%	21%	22%	100%	100%	33%

14.3.5 Table 14.4 provides the grade given for evaluation objective 11c and the justification for the grade.

Table 14.4 Evaluation objective 11c grade and justification

Evaluation objective	Evaluation indicator	Grade	Performance threshold	Justification
11. To operational suitability of the receptor site.	c) Capacity of the receptor site to accept the required volume of Thames Tideway Tunnel project material (based on likely tonnes accepted/ %).	-	The receptor site has capacity to accept greater than or equal to 30% but less than 45% of Thames Tideway Tunnel project material.	The receptor would have the potential to accept approximately 33% of the excavated material that would be produced by the Thames Tideway Tunnel.

14.4 Evaluation indicator 11d) Receptor site throughput

14.4.1 At the present time there are no limits on vehicles movements, or limits on the maximum annual tonnage permitted to be accepted at the receptor site. The receptor site does have a planning requirement for the receptor site to be restored.

14.4.2 The receptor site does not have an environmental permit currently, but the operator is anticipating submitting an application for an environmental permit to the EA before the end of 2012. It is anticipated in line with current practice that once they have consent specifically for restoration that this would limit vehicle movements or cap annual tonnage. At this

stage it is not possible to estimate vehicle movement levels so this evaluation indicator has not been assessed.

14.4.3 Table 14.5 provides the grade given for evaluation objective 11d and the justification for the grade.

Table 14.5 Evaluation objective 11d grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To operational suitability of the receptor site.	d) Ability of the receptor sites to accept Thames Tideway Tunnel project material at the anticipated rate (speed of material generation vs acceptance rate).	N/A	N/A	At this stage it is not possible to estimate vehicle movement levels so this evaluation indicator has not been assessed.

14.5 Evaluation indicator 11e) Planning consent and permitting

14.5.1 Kingsmead Quarry has the necessary planning consent in place to accept excavated Thames Tideway Tunnel project material for quarry restoration.

14.5.2 Kingsmead Quarry does not currently have an environmental permit for quarry restoration. CEMEX is in the process of preparing an environmental permit application and intend to submit an application before the end of 2012.

14.5.3 Further information on the receptor site's planning consent can be found in Section 2.3.

14.5.4 Table 14.6 provides the grade given for evaluation objective 11e and the justification for the grade.

Table 14.6 Evaluation objective 11e grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To operational suitability of the receptor site.	e) Site operations have appropriate planning and permitting consents.	**0**	The receptor site has either planning consent or a relevant EA permit.	The receptor site has the relevant planning consent, but does currently not have an environmental permit.

14.6 Evaluation indicator 11f) Transport modes

14.6.1 The receptor site can only accept Thames Tideway Tunnel project material via road.

14.6.2 There are currently no restrictions on HGV movements associated with the quarry restoration. However it is envisaged that when a planning variation is submitted for the restoration that restrictions on vehicle movements will be imposed.

14.6.3 Table 14.7 provides the grade given for evaluation objective 11f and the justification for the grade.

Table 14.7 Evaluation objective 11f grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure delivery.	f) Can accept excavated material from multiple transport modes.	**--**	The receptor site is only accessible by one transport mode.	The receptor site can only accept material for restoration via road.

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15 Evaluation objective 12: To conform to the waste hierarchy

15.1.1 The Thames Tideway Tunnel *Excavated materials and waste (EM&W) strategy* contains an objective to 'To minimise waste arisings, maximise re-use, recovery, recycling and beneficial use and minimise the impact of waste on the environment and communities'.

15.1.2 The Thames Tideway Tunnel project material would be used to restore Kingsmead Quarry to agricultural land and lakes. This is considered to be beneficial use in line with the *EMOA* beneficial use test. Table 15.1 details the application of the *EMOA* beneficial use test applied to Kingsmead Quarry.

15.1.3 The site operator confirmed that the material would not be subject to landfill tax as it is being used for restoration purposes.

Table 15.1 Quarry restoration performance against *EMOA* beneficial use test

***EMOA* test**	**Does receptor site comply with the test?**	**Comment**
The activity will lead to a beneficial use and bring land back into use or provide ecological benefit	Yes	Kingsmead Quarry will be restored to agricultural use and the development of lakes.
In the case of quarries or landfill sites, the activity has a planning requirement to be restored	Yes	There is a planning requirement for Kingsmead Quarry to be restored.
The activity does not attract landfill tax	Yes	It is anticipated that Kingsmead Quarry would be exempt from landfill tax because it is a quarry restoration project.
The material is suitable for its intended use and would not harm human health or the environment	Yes	It is anticipated that Kingsmead Quarry would be able to accept all types of Thames Tideway Tunnel project non-hazardous excavated material, and if managed in accordance with an environmental permit the activities should not harm human health or the environment.
The minimum amount of material will being used	Yes	The material is being used to restore the quarry in line with the planning consent.

***EMOA* test**	**Does receptor site comply with the test?**	**Comment**
Alternative material (whether waste or not) would be required if Thames Tideway Tunnel project material was not to be used	Yes	Material would be sourced from elsewhere to restore that quarry if Thames Tideway Tunnel project material was not available.

15.1.4 All the material accepted at the receptor site would be considered as recovery. Thus this receptor site would achieve 100% recovery for all clean materials accepted. It should be noted that this receptor site can only accept 33% of the total Thames Tideway Tunnel project material.

15.1.5 Table 15.2 provides the grade given for evaluation objective 12 and the justification for the grade.

Table 15.2 Evaluation objective 12 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
12. To conform to waste hierarchy.	a) Extent to which the option meets the Thames Tideway Tunnel *EM&W strategy* targets.	**+++**	Performance of receptor site substantially exceeds target.	All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 33% of the total Thames Tideway Tunnel project material.

16 Evaluation objective 13: To conform to the proximity principle

16.1.1 The receptor site is located 31km from Carnwath Road Riverside (clay), 33km from Kirtling Street (Lambeth Group and Thanet Sands) and 38km from Chambers Wharf (chalk) by road.

16.1.2 In accordance with the Thames Tideway Tunnel project *Transport Strategy* excavated material produced at these sites would be removed by marine transport and not by road. For the purposes of this assessment it has been assumed that the material would be taken from the drive sites by marine transport to a transhipment point and transferred to road at this location (IG11 0EG). The mean distance to the transhipment point from the drive sites is 20km by marine transport. The transhipment point is 65km from Kingsmead Quarry by road[V].

16.1.3 For this evaluation objective the receptor site was assessed using a straight line distance from the main drive sites. Using a straight line distance provides a consistent measure for assessment purposes. As the receptor site would be able to receive excavated materials from more than one drive site, the mean distance has been calculated. The receptor site was then graded according to this mean figure.

16.1.4 The receptor site is approximately 29km in a straight line from the main drive sites.

16.1.5 Table 16.1 provides the grade given for evaluation objective 13 and the justification for the grade.

Table 16.1 Evaluation objective 13 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
13. To conform to proximity principle	a) Average distance from main tunnel drive sites.	+	The receptor site is between 40km and 20km from source of Thames Tideway Tunnel project material.	The receptor site is approximately 29km (straight line distance) from the main drive sites.

[V] Distances quoted are those used in the *EMOA* GhG model. Details of the assumptions used in this model can be found in Appendix B.10. These distances are for context only and do not reflect the exact routes that would be used should this receptor site be used to accept Thames Tideway Tunnel project material.

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17 Evaluation objective 14: To conform to sustainable transport policy

17.1.1 The receptor site can only be accessed by road.

17.1.2 *The London Plan 2011*[2] Policy 5.18 Construction, excavation and demolition states "that waste should be removed from construction sites, and materials brought to the site, by water or rail transport wherever that is practicable." The receptor site does not meet this requirement.

17.1.3 The receptor is 1.7km from Junction 14 of the M25. Access to the motorway can be achieved via Stanwell Road and Horton Road, which are not strategic highways.

17.1.4 Material cannot be delivered by marine transport or rail.

17.1.5 Table 17.1 provides the grade given for evaluation objective 14 and the justification for the grade.

Table 17.1 Evaluation objective 14 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
14. To conform to sustainable transport policy	a) Conforms to policy objective to move transport of materials from road to rail or marine transport.	---	The receptor site can only be accessed by road and there is no direct access to a strategic highway.	The receptor site can only be accessed by road and is 1.7km from a strategic highway.

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18 Evaluation objective 15: To conform to health and safety good practice

18.1.1 CEMEX has an overall health and safety policy and a health and safety policy for operations. It is also ISO18001 accredited. CEMEX would implement its corporate health and safety procedures at the receptor site.

18.1.2 One of CEMEX's Responsible Sourcing KPIs is to maintain zero injuries per 100,000 direct employees each year. In 2011, CEMEX reported zero injuries per 100,000 direct employees and have the same target for 2012.

18.1.3 There have been no reported RIDDOR incidents in the last three years at the receptor site.

18.1.4 Table 18.1 provides the grade given for evaluation objective 15 and the justification for the grade.

Table 18.1 Evaluation objective 15 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
15. To conform to health and safety good practice	a) Health and Safety performance conforms to good practice.	+	The receptor sites H&S system is accredited and there have been five or less RIDDOR incidents in three year recorded at the receptor site.	CEMEX operate under ISO 18001 and have a good Health and Safety record. There have been no RIDDOR incidents recorded in the past three years.

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References

[1]ODPM SEA Guidance “A Practical Guide to the Strategic Environmental Assessment Directive”; Department for Communities and Local Government guidance “Strategic Planning for Sustainable Waste Management: Guidance on Option Development and Appraisal.

2 The London *Plan* Greater London Authority 2011

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.03**

Volume 3: Project-wide effects assessment appendices

Appendix A.4; Annex D.6: EMOS Borough Green Quarry

APFP Regulations 2009: Regulation **5(2)(a)**

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Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Environmental Statement

Volume 3 Appendices: Project-wide effects assessment

Appendix A.4: Excavated materials options assessment

Annex D.6: Excavated Materials options suitability report – Borough Green Quarry

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1 Introduction

1.1.1 The construction of the Thames Tideway Tunnel would require the excavation of a large volume of material at multiple sites throughout London. To identify the preferred options for the management of the excavated material a detailed options assessment has been undertaken.

1.1.2 The methodology for assessment of the excavated material options is based on the Sustainability Appraisal methodology[1]. The assessment has taken a phased approach and at each stage the least preferred options have been eliminated until the final most viable and sustainable options have been selected to form the planning stage preferred list. The options on the planning stage preferred list demonstrate the potential capacity to manage the excavated material in a sustainable manner. The assessment is based on the consistent assessment of options against agreed evaluation objectives throughout the process.

1.1.3 The steps informing the assessment process were:

a. Development of a long list of potential options for the treatment, reuse, recycling or disposal of excavated materials.

b. Viability filter involving the assessment of the long list against the operational evaluation objective associated with viability of the options.

c. Preliminary assessment to develop a short list of options which perform sufficiently well against all the evaluation objectives (environmental, social, operational, policy and health and safety).

d. Detailed assessment in which the options on the short list was further scrutinised to produce a planning stage preferred list of options which perform best against the full suite of evaluation objectives.

1.1.4 For each short listed option whose viability has been confirmed a detailed *Excavated materials option suitability (EMOS) report* has been produced. The *EMOS reports* provide a summary of the site operations and the overall performance of the option against the evaluation objectives.

1.1.5 This *EMOS report* sets out the detail assessment for Borough Green Quarry in Kent. The report provides the information gained during the detailed assessment stage of the *Excavated material options assessment* (*EMOA*) and the grades awarded against each evaluation indicator as part of this assessment. A grade is provided for each evaluation indicator, using an agreed set of evaluation criteria, against seven grades of impact (ranging from --- to +++). The *EMOS report* also provides a risk profile for the site identifying the key risks associated with the option in relation to accepting the Thames Tideway Tunnel project excavated material.

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2 Site description

2.1 Site location

2.1.1 Borough Green Quarry is a former sand quarry, situated north of Borough Green village near Sevenoaks in Kent.

2.1.2 The receptor site is bounded to the north by open farmland, beyond which lies the M20. To the northeast there is a small woodland and a sports ground on the northeastern boundary of the receptor site. There is a housing estate on the eastern side of the A227. There are also a number of residential properties fronting the A227 and Wrotham School, which lies approximately 270m northeast of the receptor site. Adjacent to the southern edge of the quarry is a residential area (Fairfield Road), an industrial unit and a nursing home. To the west of the receptor site is another sand quarry, Igtham Sandpit that is no longer quarried and requires restoration.

2.1.3 The receptor site lies within the Metropolitan Green Belt and adjoins the Kent Downs Area of Outstanding Natural Beauty (AONB) on its northern and western boundaries.

2.1.4 Borough Green Quarry site location is shown in Plate 3.1 Borough Green Quarry site location.

2.2 Site operations

2.2.1 Borough Green Quarry is an old mineral site that has been extracting sand for over 50 years but extraction operations have now ceased. The receptor site had previously begun receiving material for restoration, however these activities have been temporarily suspended since March 2012.

2.2.2 The receptor site currently has planning consent to infill the quarry void with inert material. The site has an environmental permit, which allows the site to accept 450,000tpa of inert material.

2.2.3 Thames Tideway Tunnel project material would arrive at the receptor site by road and taken directly to the tipping face. There are restrictions on vehicle movements due to the close proximity of Wrotham School.

2.2.4 There are recycling operations carried out on part of the receptor site. It is unlikely that Thames Tideway Tunnel project material would be processed through the recycling operations. The recycling operations are positioned within an area which is due to be infilled. This means that the recycling equipment and stockpiles are positioned below the original and permitted ground levels. In this way, the surrounding landform assists in shielding recycling operations and any noise, dust and visual effects are minimised.

2.3 Planning consent

2.3.1 The site is operated by CEMEX under mineral planning consents TM/93/305 and TM/01/1205/MR86, as amended by TM/08/2981 and TM/08/3175 (which provide for amendments to the access arrangements).

2.3.2 Extraction has ceased and the consents provide for restoration.

2.3.3 In October 2006 planning consent was granted for inert waste recycling at the site (TM/06/2171).

2.3.4 In February 2009 planning consent (TM/08/3715) was granted for a variation of condition 6 of planning consent TM/06/2171 to allow additional vehicle (HGV) movements to/from the site (an increase from 110 to 182 movements per day). This application was considered at the Planning Applications Committee meeting on 17 February 2009. Consent TM/08/3715 was granted subject to ten conditions. These conditions largely repeated those on planning consent TM/06/2171 and included condition 8 that required a Dust Control Scheme to be submitted to and approved by the County Planning Authority before recycling/crushing plant or machinery could be operated on the site.

2.3.5 The recycling site is positioned within an area which is due to be infilled. The surrounding landform assists in providing protection from noise, dust and visual impacts associated with operations on site. Final restoration of the site is to be completed before 2042.

2.4 Permitting

2.4.1 EA permit number: BX4313

2.4.2 The permit was issued in November 2004 allows for the receptor site to receive 450,000tpa of inert wastes.

2.4.3 Table 14.2 details the European Waste Catalogue (EWC) codes of the permitted waste types that can be accepted at Borough Green Quarry.

2.4.4 Borough Green has the necessary environmental permit in place to accept excavated Thames Tideway Tunnel project material for quarry restoration.

3 Overall site summary

3.1.1 Table 3.1 below provides a summary of Borough Green Quarry and an assessment of its suitability against the evaluation objectives. Sections 4 to 18 of this *EMOS report* provide more detail on each evaluation objective.

Table 3.1 Summary of Borough Green Quarry and its overall suitability

Site name:	Borough Green Quarry (CEM.1)		**Owner/operator:**	CEMEX			
Planning consent	Yes, until 2042 TM/08/3715		**Permit**	Yes, BX4313			
Void capacity	5million tonnes[I]		**Throughput**	450,000tpa			
Recovery/disposal	Recovery						
Materials	**London Clay**	✓	**Lambeth group**	✓	**Chalk**	✓	
Transport type	**Road**	✓	**Rail**	X	**Marine transport**	X	

Receptor site overview

Borough Green Quarry is situated north of Borough Green village near Sevenoaks in Kent. It is an old mineral site that has been extracting sand for over 50 years. The quarry forms a deep pit (approximately 30m deep) and covers approximately 20 hectares. Extraction operations have now ceased and the planning consent requires for restoration to occur using inert waste. The receptor site had previously begun receiving material for restoration, however these activities have been temporarily suspended since March 2012. The receptor site will be restored to agricultural land which is simliar to the current land use in the area. The receptor site is located approximately 37km from London; Thames Tideway Tunnel project material would arrive at the receptor site by road.

Assessment

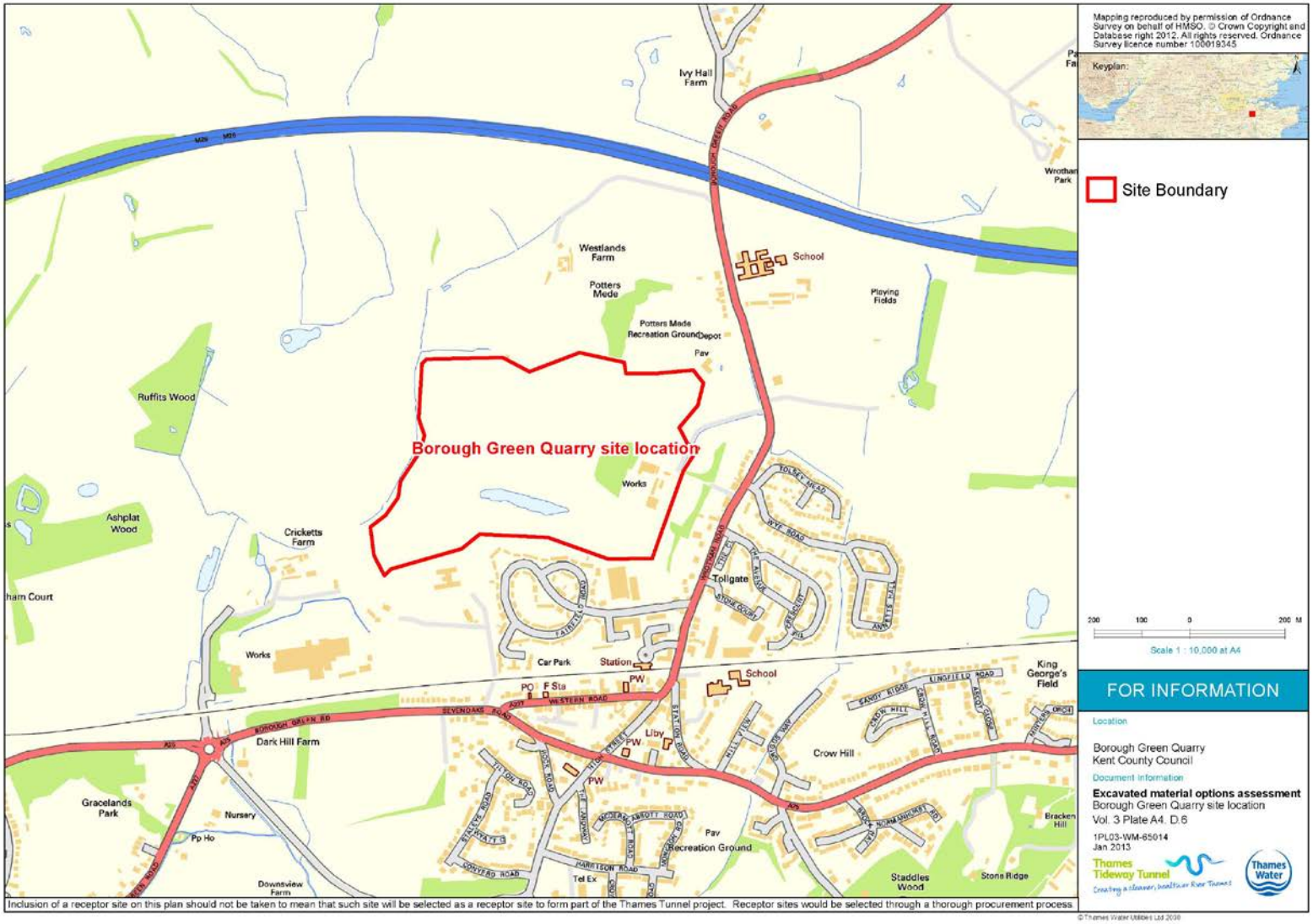
1. Land and other resources	a)	**0**	8. Cultural heritage	a)	**0**
	b)	**0**	9. Employment opportunities	a)	**0**
2. Climate change	a)	**+**		b)	**0**
	b)	**0**	10. Cost	a)	**-**
	c)	**0**	11. Operational suitability of the receptor site.	a)	**+++**
3. Local amenity	a)	**0**		b)	**+++**
4. Landscapes and townscapes	a)	**0**		c)	**-**
	b)	**++**		d)	**--**
5. Access to open space	a)	**0**		e)	**+++**
	b)	**+**		f)	**--**
6.Water quality	a)	**0**	12. Waste hierarchy	a)	**+++**
	b)	**0**	13. Proximity principle	a)	**+**
7.Biodiversity	a)	**0**	14. Sustainable transport policy	a)	**--**
	b)	**0**	15. Health and safety good practice	a)	**+**

[I] Void capacity was provided by the operator in tonnes rather than m^3.

Environmental summary
The acceptance of Thames Tideway Tunnel project material is within the receptor site's existing consents. Thames Tideway Tunnel project material would form part of the permitted operations at the receptor site to restore areas of the quarry to agricultural land. In the short term the use of Thames Tideway Tunnel project material for the restoration of Borough Green Quarry is likely to have no or negligible effect on any designated areas in close proximity to the quarry. The receptor site lies within the Metropolitan Green Belt with the Kent Downs Area of Outstanding Natural Beauty (AONB) adjoining the site on its northern and western sides. In the long term the restoration of the site would have a permanent beneficial visual effect on the area once the receptor site is restored to agricultural land. The receptor site is on average 37km from the main drive sites and can only accept material by road.
Social summary
The restoration activities at the receptor site, to which Thames Tideway Tunnel project material would contribute, would not lead to any job losses or gains over the short and long term.
Operational objectives
The receptor site has permitted capacity of 450,000tpa. CEMEX believe that the whole quarry would require a maximum capacity of 5million tonnes to complete the restoration. The receptor site has planning consent until 2042 and would be available for the entire Thames Tideway Tunnel timescales. It is probable that the receptor site would be able to accept a large proportion of Thames Tideway Tunnel project material during and beyond the Thames Tideway Tunnel timescales. The receptor site should be able to accept all of the excavated materials produced by the Thames Tideway Tunnel. The receptor site can only accept material by road. Borough Green Quarry restoration to agricultural land would comprise beneficial use for all material accepted by the receptor site[II]. CEMEX has an overall health & safety policy and an H&S policy for operations. The receptor site has International Organisation for Standardisation (ISO) 18001 accreditation. The receptor site has no reported Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) incidents in the past three years of operations.
Overall suitability
Borough Green Quarry would be able to accept a maximum of 450,000tpa of Thames Tideway Tunnel project material over the entire proposed Thames Tideway Tunnel project timeframe. The receptor site is on average 37km from the main drive sites and can only accept material by road. The receptor site will be restored to agricultural land which would provide a long term beneficial effect with respect to environmental and policy objectives. The receptor site has the ability to receive Thames Tideway Tunnel project material for the whole lifetime of the Thames Tideway Tunnel project. The receptor site has a beneficial or neutral grading for all evaluation indicators with the exception of some operational indicators, costs and sustainable transport mode indicator. Borough Green Quarry is included on the planning stage preferred list.

[II] Based on the *Excavated material options assessment* (*EMOA*) beneficial use test

Plate 3.1 Borough Green Quarry site location



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4 Evaluation objective 1: To ensure prudent use of land and other resources

4.1.1 Thames Tideway Tunnel project material would be used for restoration purposes at the receptor site. The use of Thames Tideway Tunnel project material would replace the use of other reusable materials that could be used to restore the quarry.

4.1.2 The material would be used to restore the receptor site, in line with the approved restoration scheme and to make it available for other uses i.e. agricultural.

4.1.3 The use of Thames Tideway Tunnel project material would not contribute to any requirement for additional land extending the receptor site's boundary.

4.1.4 Table 4.1 provides the grade given for evaluation objective 1 and the justification for the grade.

Table 4.1 Evaluation objective 1 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
1. To ensure prudent use of land and other resources	a) Extent to which resources such as sand, gravel and chalk are conserved by processing or storage of Thames Tideway Tunnel project material at receptor sites.	0	Thames Tideway Tunnel project material is unlikely to affect virgin material use e.g. material replaces other reusable materials or no material substitution required.	Thames Tideway Tunnel project material would be used in the quarry restoration. Thames Tideway Tunnel project material would replace the use of other reusable material.
	b) Extent to which Thames Tideway Tunnel project material would effect landtake at (footprint of) receptor sites in the long term.	0	The acceptance of Thames Tideway Tunnel project material would not contribute to the requirement for additional land extending the receptor site's boundary.	The Thames Tideway Tunnel project material would be used within the existing receptor site boundary and would not contribute to a need for the receptor site to expand.

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5 Evaluation objective 2: To reduce climate change impacts

5.1.1 CEMEX has a carbon strategy which promotes the reduction of the overall carbon footprint of their operations.

5.1.2 The excavated material would not be reprocessed into aggregate at the receptor site. Based on data from the Environment Agency's (EA) lifecycle analysis tool WRATE, the overall GhG emissions for deposition of excavated material to land is 3.17kg CO_2 eq per tonne of excavated material. The excavation material is assumed to be inert soil and the EA's WRATE emissions associated with material reception and spreading have been assumed.

5.1.3 The figures for GhG emissions from transport have been estimated based on:

a. the average CO_2 emissions for the different types of transport; and

b. the distance travelled from the Thames Tideway Tunnel sites to the receptor site.

5.1.4 The GhG emissions calculated are for comparative purposes only and do not provide an exact representation of the transport emissions associated with the Thames Tideway Tunnel excavated material. Full GhG methodology and assumptions can be found in Appendix B.10.

5.1.5 It has been estimated that using Borough Green Quarry would produce 5.25kg CO_2 eq per tonne of excavated material accepted.

5.1.6 The material would be delivered by road to the receptor site and there would be minimal handling on the receptor site.

5.1.7 The receptor site is located in an area that has been designated by the EA as unlikely to flood. It is not anticipated that the flood risk at the receptor site would change when the receptor site is restored.

5.1.8 Table 5.1 provides the grade given for evaluation objective 2 and the justification for the grade.

Table 5.1 Evaluation objective 2 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
2. To reduce climate change impacts	a) Greenhouse gases emitted through material treatment, handling and use at receptor sites (excludes transport).	+	There is a Carbon Management Plan in place with systems in place to offset GhG emissions from treatment, handling and use of Thames Tideway Tunnel project material.	CEMEX has a carbon strategy and ensure that all machinery at the receptor site complies with current emission standards.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent to which flood risk is altered by Thames Tideway Tunnel project material at the receptor site (or in the local catchment).	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not change flood risk (from any source or a combination of sources) to the site and surroundings.	It is unlikely that the flood risk at the receptor site would be changed by the use of Thames Tideway Tunnel project material because it has been designated by the EA in an area that is unlikely to flood.
	c) Greenhouse gases emitted through transport of Thames Tideway Tunnel project material to the receptor sites.	**0**	Through the transport of Thames Tideway Tunnel project material between 4 and less than or equal to 6kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.	Through the transport of Thames Tideway Tunnel project material it is estimated that 5.25kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.

6 Evaluation objective 3: To protect local amenity

6.1.1 The receptor site is not located in an Air Quality Management Area (AQMA).

6.1.2 There are no reported issues with odour at the receptor site.

6.1.3 The receptor site has a 4m noise attenuation fence along its southern boundary to reduce any noise generated from the recycling and restoration operations.

6.1.4 The receptor site has a dust control scheme, which mainly relates to the recycling operations that are being carried out at the receptor site.

6.1.5 Currently the recycling equipment and stockpiles are positioned below the original and permitted ground levels. In this way, the surrounding landform assists in shielding site operations and any noise, dust and visual impacts are minimised.

6.1.6 There have been complaints from local residents with regards to mud being deposited on the A227, the main access road. However the receptor site now has an extensive wheel washing facilities to minimise mud deposits on the highway.

6.1.7 Thames Tideway Tunnel project material would be similar in nature to any other material that would be accepted at the receptor site for restoration purposes and would be accepted as part of the existing operations at the receptor site.

6.1.8 There are measures at the receptor site to reduce any effects on air quality, noise and odour thus the Thames Tideway Tunnel project material is likely to have a negligible or no effect on sensitive receptors in comparison to baseline conditions.

6.1.9 Table 6.1 provides the grade given for evaluation objective 3 and the justification for the grade.

Table 6.1 Evaluation objective 3 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
3. To protect local amenity	a) Extent of potential effects on local amenity from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have an effect on the local amenity or any effect would be negligible.	Thames Tideway Tunnel project material would form part of the existing operations at the receptor site and there are measures at the receptor site to reduce any impacts of noise and dust. Thus Thames Tideway Tunnel project material is likely to have a negligible or no effect on sensitive receptors in comparison to baseline conditions.

7 Evaluation objective 4: To conserve landscape and townscapes at receiving locations

7.1.1 Borough Green Quarry is an old mineral site from which sand has been extracted for over 50 years.

7.1.2 These operations have now ceased and the site is currently being restored. The quarry forms a deep pit (approximately 30m deep) and covers approximately 20 hectares.

7.1.3 The receptor site is well screened from the road and other receptors. Currently the restoration of the quarry is below original and permitted ground levels. There is also a line of trees around the whole receptor site.

7.1.4 The site lies within the Metropolitan Green Belt and adjoins the Kent Downs Area of Outstanding Natural Beauty (AONB) on its northern and western sides.

7.1.5 There is a school close to the entrance of the site but there are restrictions on vehicle movements during school opening and closing times.

7.1.6 The restoration of the receptor site would reduce the physical impression on the landscape and would assist in restoring the rural setting of Borough Green.

7.1.7 In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute would be no more or less visible given the overall context of the existing site.

7.1.8 In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape changing the area from a quarry to agricultural land.

7.1.9 Table 7.1 provides the grade given for evaluation objective 4 and the justification for the grade.

Table 7.1 Evaluation objective 4 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
4. To conserve landscapes and townscapes at receiving locations	a) Extent of short term visual and landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have a short term effect on the local visual amenity at the receptor site or any effect would be negligible.	In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute would be no more or less visible given the overall context of the existing site.
	b) Extent of permanent visual and landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a permanent moderate beneficial visual effect on the landscape, based on a 'do nothing' view of the site.	In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape changing the area from a quarry to agricultural land.

8 Evaluation objective 5: To protect local amenity at receiving locations

8.1.1 The receptor site is not currently accessible to the public. There are no PRoWs on the receptor site. There is a footpath that runs along the northwest and western boundary of the site

8.1.2 It is unlikely that the receptor site would be widely accessible to the public in the long term as it is being restored to agricultural land and site access would be determined by the land owner.

8.1.3 Table 8.1 provides the grade given for evaluation objective 5 and the justification for the grade.

Table 8.1 Evaluation objective 5 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
5. To protect quality of and access to open space	a) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the short term?	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or a negligible effect on access to and quality of open space and PRoWs.	The restoration works at the receptor site to which the Thames Tideway Tunnel project material would contribute would not disrupt the existing PRoW on the northwest and western boundary of the receptor site.
	b) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the long term?	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would slightly enhance a PRoW or improve the quality of and access to public open space.	It is unlikely that the receptor site would be widely accessible to the public in the long term as it is being restored to agricultural land. The restoration plans for the receptor which Thames Tideway Tunnel project material would contribute, would slightly enhance views from the PRoW on the northwest and western boundary of the receptor site.

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9 Evaluation objective 6: To protect water quality

9.1.1 There are some streams and springs to the north of the receptor site.

9.1.2 Surface water collects in ditches around the receptor site that either infiltrate the ground through base of the ditch or are discharged to adjacent ditches and drains located off site. A soakaway has been constructed in the southern eastern corner of the receptor site to collect the contents of the ditches on the southern and eastern boundaries.

9.1.3 The base of the receptor site has been lined with clay to provide an infill layer. The clay liner has been installed as a precautionary measure to reduce the potential for groundwater contamination.

9.1.4 The southern edge of the receptor site is located within a zone of total source catchment. The northern part of the receptor site is not in a groundwater Source Protection Zone (SPZ) which highlights groundwater sources such as wells, boreholes and springs used for public drinking water supply.

9.1.5 Based on the water management measures in place including the soakaway and ditches at the receptor site and the inert nature of the Thames Tideway Tunnel project material it is not anticipated that accepting Thames Tideway Tunnel project material would have an effect on the surrounding water courses and/or groundwater.

9.1.6 Table 9.1 provides the grade given for evaluation objective 6 and the justification for the grade.

Table 9.1 Evaluation objective 6 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
6. To protect water quality	a) Extent of potential effects on fluvial water quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on the local watercourses.	It is not anticipated that the treatment, handling or use of the Thames Tideway Tunnel project material would have an effect on the local water courses as drainage is managed on the receptor site.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of potential effects on groundwater quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on groundwater.	The receptor site's southern tip is located within a total source protection zone. The rest of the receptor site is not in a groundwater SPZ and it is not anticipated that the treatment, handling or use of the Thames Tideway Tunnel project material at the receptor site is likely to have an effect on groundwater. The quarry is lined with clay to reduce the risk of groundwater contamination.

10 Evaluation objective 7: To protect biodiversity

10.1.1 The nearest designated site is a SSSI called Halling to Trottiscliffe Escarpment and the site is a Nature Conservation Review site. It is located approximately 2.1km to the northeast of the receptor site.

10.1.2 The receptor site lies within the Metropolitan Green Belt and adjoins the Kent Downs Area of Outstanding Natural Beauty (AONB) on its northern and western sides.

10.1.3 The receptor site will be restored to agricultural use, with a field pattern defined using hedgerows. This would create habitats at the receptor site. In the long term the exact nature of the habitats created will be dependent on the material used to restore the site. At this stage it is uncertain whether the habitats created through the restoration would have more or less ecological value than those currently present on the receptor site. The effect on the designated SSSI of the change in use from an operational quarry to agricultural land is also uncertain. Although it is considered unlikely that there would be an adverse effect on the SSSI in the long term.

10.1.4 Table 10.1 provides the grade given for evaluation objective 7 and the justification for the grade.

Table 10.1 Evaluation objective 7 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
7. To protect biodiversity	a) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the short term.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	Thames Tideway Tunnel project material would form part of the restoration plans for the receptor site and would have no or negligible effect on a designated site as there are no designated sites within 2km of the receptor site.
	b) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or	Thames Tideway Tunnel project material would form part of the restoration plans for the receptor site. The effect on the designated SSSI of the change in use from an operational quarry and landfill to agricultural land is uncertain. Although it is considered unlikely that there would be an

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	the long term.		negligible effect on a designated site.	adverse effect on the SSSI in the long term.

11 Evaluation objective 8: To protect cultural heritage

11.1.1 Ightham Court, a Registered Parks and Garden is located 500m southwest of the receptor site. There are also a number of ancient woodlands located within 2km of the site, the nearest are 700m to the east and the west of the receptor site.

11.1.2 The treatment, handling or use of Thames Tideway Tunnel project material at the receptor site is likely to have no or negligible effect on the Registered Parks and Garden site to the southwest of the receptor site because there is another quarry, Igtham Sandpit located between the receptor site and Ightham Court.

11.1.3 Restoration has already commenced at the receptor site and there are measures being carried out at the receptor site including dust and noise control measures to ensure that any nuisance is minimised.

11.1.4 Table 11.1 provides the grade given for evaluation objective 8 and the justification for the grade.

Table 11.1 Evaluation objective 8 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
8. To protect cultural heritage	a) Extent of potential effects on designated or nominated archaeological sites from receipt, treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	The receipt of Thames Tideway Tunnel project material at the receptor site is likely to have no or negligible effect on the Registered Parks and Garden site to the southwest of the receptor site because there is another quarry located between the receptor site and Ightham Court.

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12 Evaluation objective 9: To provide employment opportunities

12.1.1 It is unlikely that the receptor site would require additional staff that would be attributable to the use of Thames Tideway Tunnel project material as the receptor site is already operating and carrying out restoration.

12.1.2 In the long term it is also unlikely that there would be any jobs created or lost. It is possible that staff at the receptor site would be transferred to other CEMEX operations.

12.1.3 Table 12.1 provides the grade given for evaluation objective 9 and the justification for the grade.

Table 12.1 Evaluation objective 9 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
9. To provide employment opportunities.	a) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the short term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the short term.	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material forms part of, would contribute to no job gains in the short term.
	b) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the long term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the long term.	In the long term it is unlikely that any jobs would be created or lost.

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13 Evaluation objective 10: To minimise the cost of waste management

13.1.1 In order to compare the likely cost associated with transport and acceptance of the Thames Tideway Tunnel project material at each receptor site a cost model is used.

13.1.2 The cost of transporting the excavated material has been calculated from the distance travelled and a cost per tonne/ km for each of the transport mode (road, marine transport and rail). The road and marine transport costs have been calculated from the quotes gathered from operators based on today's prices. A gate fee of £4 per tonne is assumed based on current prices. Full details of the assumptions made can be found at Appendix B.10.

13.1.3 It has been estimated that the cost of transporting and managing excavated material at Borough Green Quarry would be £19.55per tonne of excavated material accepted at the receptor site. These costs are predominantly associated with transfer of the material from the Thames Tideway Tunnel sites to the receptor sites. This cost is an estimated cost for comparison purposes within the *EMOA* and may differ from the actual cost which would be incurred if Thames Tideway Tunnel project material were taken to this receptor site.

13.1.4 Table 13.1 provides the grade given for evaluation objective 10 and the justification for the grade.

Table 13.1 Evaluation objective 10 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
10. To minimise the costs associated with the management of excavated material.	a) Costs of transportation, treatment, handling and use of Thames Tideway Tunnel project material.	-	The transportation, treatment, handling and use of Thames Tideway Tunnel project material would cost between £19 and less than or equal to £22 per tonne	The cost of transportation, treatment, handling and use of Thames Tideway Tunnel project material has been estimated (using the *EMOA* cost model) to be £19.55 per tonne.

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14 Evaluation objective 11: To ensure operational suitability of the receptor site

14.1 Evaluation indicator 11a) Timescales

14.1.1 The receptor site has planning consent until 2042.

14.1.2 CEMEX are in discussions with various companies to try and secure material so that Borough Green Quarry can be restored.

14.1.3 Based on Thames Tideway Tunnel timescales of 2016 to 2021 and the existing planning consent for the site, Borough Green Quarry would be available for use for Thames Tideway Tunnel project material for the entire six year timetable.

14.1.4 Table 14.1 provides the grade given for evaluation objective 11a and the justification for the grade.

Table 14.1 Evaluation objective 11a grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	a) Likelihood of implementation within the required timescale.	+++	The receptor site would be available for use for Thames Tideway Tunnel project material for more than 100% of the required timescale.	The planning consent for the receptor site states that restoration needs to be complete by 2042. The receptor site would be available to accept Thames Tideway Tunnel project material for the entire project timetable.

14.2 Evaluation indicator 11b) Material characteristics

14.2.1 Borough Green Quarry would be able to accept London Clay, chalk and Lambeth Group with sands, gravels and inert tunnel construction materials (piling and diaphragm wall arisings) for restoration.

14.2.2 The receptor site can accept chalk though it would need to be in a physical form that would allow it to be transported. Thames Tideway Tunnel project is proposing to put in place chalk dewatering facilities at the drive sites which would reduce the water content in the chalk to below 30%. This level should be suitable for road transport.

14.2.3 The receptor site has the potential to receive all inert Thames Tideway Tunnel excavated material types. Table 14.2 details the EWC Codes

relating to the materials permitted under Borough Green's Environmental Permit most relevant to the acceptance of the Thames Tideway Tunnel project excavated materials. The material would be subject to acceptance criteria testing to ensure that the material is inert. Details are set out in the environmental permit.

Table 14.2 Permitted waste types for Borough Green Quarry

EWC code	Description	Restrictions
17 01 01	Concrete	Selected C&D waste only
17 01 02	Bricks	Selected C&D waste only
17 05 04	Soil and stones	Excluding topsoil, peat; excluding soil and stones from contaminated sites
20 02 02	Soil and stones	From gardens and parks waste; excluding topsoil and peat

N.B soil includes naturally occurring sands and clay. Selected Construction & Demolition (C&D) waste only with low contents of the other materials (metal, plastics, wood, rubber, and organics). No C&D waste from buildings polluted with dangerous substances or from buildings treated, covered or painted with materials containing dangerous substances.

14.2.4 Table 14.3 provides the grade given for evaluation objective 11b and the justification for the grade.

Table 14.3 Evaluation objective 11b grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	b) Acceptability of material with Thames Tideway Tunnel project material characteristics by the receptor sites.	+++	The receptor site could accept for use all of the Thames Tideway Tunnel project material types based on their characteristics.	The receptor site would be able to accept all the excavated material produced by the Thames Tideway Tunnel.

14.3 Evaluation indicator 11c) Capacity

14.3.1 The receptor site has permitted capacity is 450,000tpa.

14.3.2 CEMEX believe that the whole quarry would require a maximum capacity of 5milion tonnes to complete the restoration. Table 14.4 details the permitted capacity for the site in relation to the material that would be produced by the Thames Tideway Tunnel.

14.3.3 Table 14.4 also sets out the potential tonnage of Thames Tideway Tunnel project material accepted at the receptor site each year based on the

assumptions used in the *EMOA* cost and GhG model. The receptor site would be able to accept 36% of the excavated materials that would be produced by the Thames Tideway Tunnel based on the annual tonnage that it can accept and tonnages which are likely to be produced by the Thames Tideway Tunnel during the project.

Table 14.4 Capacity for inert material at Borough Green Quarry (tonnes[III])

	Year						Total
	2016	2017	2018	2019	2020	2021	
Total Thames Tideway Tunnel production (tonnes)	63,000	549,000	1,938,000	1,852,000	147,000	155,000	4,704,000
Maximum permitted per annum (tonnes)	450,000	450,000	450,000	450,000	450,000	450,000	-
Potential Thames Tideway Tunnel project material accepted (tonnes)	63,000	450,000	450,000	450,000	147,000	155,000	1,715,000
Potential Thames Tideway Tunnel project material accepted (%)	100%	82%	23%	24%	100%	100%	36%

14.3.4 Table 14.5 provides the grade given for evaluation objective 11c and the justification for the grade.

Table 14.5 Evaluation objective 11c grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	c) Capacity of the receptor site to accept the required volume of Thames Tideway Tunnel project material.	-	The receptor site has capacity to accept greater than or equal to 30% but less than 45% of Thames Tideway Tunnel project material	The receptor site has the potential to accept approximately 36% of the excavated material that would be produced by the Thames Tideway Tunnel.

14.4 Evaluation indicator 11d) Receptor site throughput

14.4.1 Thames Tideway Tunnel project material would be delivered to the receptor site by road. There are restrictions in the planning consent on HGV movements associated with the quarry restoration and recycling

[III] Figures quoted to the nearest 1,000 tonnes

operations which together shall not exceed 182 HGV movements per day (91 in / 91 out).

14.4.2 There are also time restrictions on movements during the day including HGVs shall not leave the receptor site during school term time at Wrotham School between the hours of 8.00am and 8.45am and 15.00pm and 15.45pm Monday to Friday. The receptor site can receive deliveries on a Saturday 7.00am to 13.00pm.

14.4.3 The receptor site has the ability to receive approximately 1,460t per day based on the permitted vehicle movements.

14.4.4 It has been assumed that all vehicle movements would be delivering material to the receptor site for restoration.

14.4.5 The amount of material produced by the Thames Tideway Tunnel would vary on a daily and monthly basis. The assessment of throughput has been based on both the mean and peak production rates over the Thames Tideway Tunnel construction period. The mean rate is taken as the mean monthly production rate taken over each year in the period 2016 to 2021. The peak rate is based on the month producing the maximum tonnage of excavated material in each year

14.4.6 Table 14.6 details the proportion of the Thames Tideway Tunnel project material which would be accepted by Borough Green Quarry over time.

14.4.7 In Years 1, 5 and 6 of the excavation process, Borough Green Quarry's limit of 1,460t per day is sufficient to accept the average daily tonnage of the Thames Tideway Tunnel project material produced. In Year 2 the receptor site would be able to accept approximately 72%. In Year 3 and 4 the receptor site would only be able to accept just a fraction of the average daily tonnage of Thames Tideway Tunnel project material.

14.4.8 In terms of peak production tonnages, the receptor site would be able to accept the peak daily tonnage in Years 1, 5 and 6 and less than half in Years 2, 3 and 4.

Table 14.6 Excavated material acceptance rate at Borough Green Quarry (tonnes)

	Year					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Maximum allowable number of HGV deliveries at receptor site per day (A)	91	91	91	91	91	91
Capacity per HGV (tonnes)	16	16	16	16	16	16
Thames Tideway Tunnel average daily tonnage*	250	2,050	7,200	6,850	550	550
Required number of HGV to transport average daily tonnage (B)	16	129	450	429	35	35
Allowable vs Average Required	582%	71%	20%	21%	265%	265%

	Year					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Number of HGV at receptor site (A ÷ B)						
Thames Tideway Tunnel peak daily tonnage**	350	3,050	10,750	10,300	800	850
Required number of HGV to transport peak rate (C)	22	191	672	644	50	54
Allowable vs Peak Number of HGV at receptor site (A ÷ C)	416%	48%	14%	14%	182%	171%

***** *The Thames Tideway Tunnel average daily tonnage for each year is calculated as the mean of the daily rate each month assuming 22.5 days in each month.*

****** *The peak daily tonnage is based on the average daily tonnage (assuming a 22.5 day month) for the peak month of production in each year.*

14.4.9 Table 14.7 provides the grade given for evaluation objective 11d and the justification for the grade.

Table 14.7 Evaluation objective 11d grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	d) Ability of the receptor sites to accept Thames Tideway Tunnel project material at the anticipated rate (speed of material generation vs acceptance rate).	--	The receptor site could take greater than or equal to 1,000 but less than 2,800t per day of Thames Tideway Tunnel project material.	The receptor site has the ability to receive approximately 1,460t per day.

14.5 Evaluation indicator 11e) Planning consent and permitting

14.5.1 Borough Green Quarry has the necessary planning consent and environmental permit in place to accept excavated Thames Tideway Tunnel project material for quarry restoration.

14.5.2 Further information on the receptor site's planning consent and Environmental Permit can be found in Section 2.3 and 2.4.

14.5.3 Table 14.6 provides the grade given for evaluation objective 11e and the justification for the grade.

Table 14.8 Evaluation objective 11e grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	e) Site operations have appropriate planning and permitting consents.	+++	The receptor site has planning consent and an EA permit.	The receptor site has the relevant planning consent and environmental permit in place to be able to accept Thames Tideway Tunnel project material.

14.6 Evaluation indicator 11f) Transport modes

14.6.1 The receptor site can only accept Thames Tideway Tunnel project material via road. There are restrictions on HGV movements associated with the quarry restoration and recycling operations.

14.6.2 Table 14.9 provides the grade given for evaluation objective 11f and the justification for the grade.

Table 14.9 Evaluation objective 11f grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	f) Can accept excavated material from multiple transport modes.	--	The receptor site is only accessible by one transport mode.	The receptor site can only accept material for restoration via road.

15 Evaluation objective 12: To conform to the waste hierarchy

15.1.1 The Thames Tideway Tunnel *Excavated materials and waste (EM&W) strategy* contains an objective to 'To minimise waste arisings, maximise re-use, recovery, recycling and beneficial use and minimise the impact of waste on the environment and communities'.

15.1.2 The Thames Tideway Tunnel project material would be used to restore Borough Green Quarry to agricultural land by restoring the existing quarry. This is considered to be beneficial use in line with the *EMOA* beneficial use test. Table 15.1 details the application of the *EMOA* beneficial use test applied to Borough Green Quarry.

Table 15.1 Quarry restoration performance against *EMOA* recovery test

***EMOA* test**	**Does receptor site comply with the test?**	**Comment**
The activity will lead to a beneficial use and bring land back into use or provide ecological benefit	Yes	Borough Green Quarry will be restored to agricultural land.
In the case of quarries or landfill sites, the activity has a planning requirement to be restored	Yes	There is a planning requirement for Borough Green Quarry to be restored.
The activity does not attract landfill tax	Yes	Borough Green Quarry would be exempt from landfill tax because it is a quarry restoration project.
The material is suitable for its intended use and would not harm human health or the environment	Yes	Borough Green Quarry would be able to accept all Thames Tideway Tunnel project non-hazardous excavated material, and if managed in accordance with the Environmental Permit the activities should not harm human health or the environment
The minimum amount of material will being used	Yes	The material is being used to restore the quarry in line with the planning consent.
Alternative material (whether waste or not) would be required if Thames Tideway Tunnel project material was not to be used	Yes	Material would be sourced from elsewhere to restore that quarry if Thames Tideway Tunnel project material was not available.

15.1.3 All the material accepted at the receptor site would be considered as recovery. Thus this receptor site would achieve 100% recovery for all clean materials accepted. It should be noted that this receptor site can only accept 36% of the total Thames Tideway Tunnel project material.

Table 15.2 Evaluation objective 12 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
12. To conform to waste hierarchy.	a) Extent to which the option meets the Thames Tideway Tunnel *EM&W strategy* targets.	+++	Performance of receptor site substantially exceeds target.	All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 36% of the total Thames Tideway Tunnel project material.

16 Evaluation objective 13: To conform to the proximity principle

16.1.1 The receptor site is located 49km from Carnwath Road Riverside (clay), 44km from Kirtling Street (Lambeth Beds and Thanet Sands) and 41km from Chambers Wharf (chalk).

16.1.2 In accordance with the Thames Tideway Tunnel project *Transport Strategy* excavated material produced at these sites would be removed by marine transport and not by road. For the purposes of this assessment it has been assumed that the material would be taken from the drive sites by marine transport to a transhipment point and transferred to road at this location (IG11 0EG). The mean distance to the transhipment point from the drive sites is 20km by marine transport. The transhipment point is 45km from Borough Green Quarry by road[IV].

16.1.3 For this evaluation objective the receptor site was assessed using a straight line distance from the main drive sites. Using a straight line distance provides a consistent measure for assessment purposes. As the receptor site would be able to receive excavated materials from more than one drive site, the mean distance has been calculated. The receptor site was then graded according to this mean figure.

16.1.4 The receptor site is approximately 37km in a straight line from the main drive sites.

16.1.5 Table 16.1 provides the grade given for evaluation objective 13 and the justification for the grade.

Table 16.1 Evaluation objective 13 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
13. To conform to proximity principle	a) Average distance from main tunnel drive sites.	+	The receptor site is between 40km and 20km from source of Thames Tideway Tunnel project material.	The receptor site is approximately 37km (straight line distance) from the main drive sites.

[IV] Distances quoted are those used in the *EMOA* GhG model. Details of the assumptions used in this model can be found in Appendix B.10. These distances are for context only and do not reflect the exact routes that would be used should this receptor site be used to accept Thames Tideway Tunnel project material.

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17 Evaluation objective 14: To conform to sustainable transport policy

17.1.1 The receptor site can only be accessed by road.

17.1.2 *The London Plan 2011*[2] Policy 5.18 Construction, excavation and demolition states that "waste should be removed from construction sites, and materials brought to the site, by water or rail transport wherever that is practicable." The receptor site does not meet this requirement.

17.1.3 *The Kent Minerals Local Plan*[3]*: Construction Aggregates (27 September 2007)* includes policies on how developments must consider access and the effects of vehicles travelling to and from the site to ensure that it would not adversely affect in a material way the safety and capacity of the highway network.

17.1.4 The receptor site has good access to the strategic highway. Access to the receptor site is via the A227 Wrotham Road. It is also within 6km of the M20.

17.1.5 Material cannot be delivered by marine transport or rail.

17.1.6 Table 17.1 provides the grade given for evaluation objective 14 and the justification for the grade.

Table 17.1 Evaluation objective 14 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
14. To conform to sustainable transport policy	a) Conforms to policy objective to move transport of materials from road to rail or marine transport	--	The receptor site can only be accessed by road and there is direct access to a strategic highway	The receptor site can only be accessed by road. It also has access to the strategic highway.

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18 Evaluation objective 15: To conform to health and safety good practice

18.1.1 CEMEX has an overall health and safety policy and a health and safety policy for operations. They are also ISO18001 accredited. CEMEX would implement its corporate health and safety procedures at the receptor site.

18.1.2 One of CEMEX's Responsible Sourcing KPIs is to maintain zero injuries per 100,000 direct employees each year. CEMEX are currently reporting zero injuries per 100,000 direct employees. They have the same target for 2012.

18.1.3 There have been no reported RIDDOR incidents in the last three years at the receptor site.

18.1.4 Table 18.1 provides the grade given for evaluation objective 15 and the justification for the grade.

Table 18.1 Evaluation objective 15 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
15. To conform to health and safety good practice	a) Health and Safety performance conforms to good practice	+	The receptor sites H&S system is accredited and there have been five or less RIDDOR incidents in three year recorded at the receptor site	CEMEX operate under ISO 18001 and have a good Health and safety record. There have been no RIDDOR incidents recorded in the past three years.

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References

[1] *A Practical Guide to the Strategic Environmental Assessment Directive* ODPM (September 2005); *Strategic Planning for Sustainable Waste Management: Guidance on Option Development and Appraisal* Department for Communities and Local Government (2002)

[2] *The London Plan* Greater London Authority (2011)

[3] *The Kent Minerals Local Plan: Construction Aggregates (Adopted December 1993): Policies Saved After 27 September 2007* Kent County Council (2007)

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.03**

Volume 3: Project-wide effects assessment appendices

Appendix A.4; Annex D.7: EMOS Wallasea Island

APFP Regulations 2009: Regulation **5(2)(a)**

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Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Environmental Statement

Volume 3 Appendices: Project-wide effects assessment

Appendix A.4: Excavated materials options assessment

Annex D.7: Excavated materials options suitability report – Wallasea Island

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1 Introduction

1.1.1 The construction of the Thames Tideway Tunnel would require the excavation of a large volume of material at multiple sites throughout London. To identify the preferred options for the management of the excavated material a detailed options assessment has been undertaken.

1.1.2 The methodology for assessment of the excavated material options is based on the Sustainability Appraisal methodology[1]. The assessment has taken a phased approach and at each stage the least preferred options have been eliminated until the final most viable and sustainable options have been selected to form the planning stage preferred list. The options on the planning stage preferred list demonstrate the potential capacity to manage the excavated material in a sustainable manner. The assessment is based on the consistent assessment of options against agreed evaluation objectives throughout the process.

1.1.3 The steps informing the assessment process were:

a. Development of a long list of potential options for the treatment, reuse, recycling or disposal of excavated materials.

b. Viability filter involving the assessment of the long list against the operational evaluation objective associated with viability of the options.

c. Preliminary assessment to develop a short list of options which perform sufficiently well against all the evaluation objectives (environmental, social, operational, policy and health and safety).

d. Detailed assessment in which the options on the short list was further scrutinised to produce a planning stage preferred list of options which grade best against the full suite of evaluation objectives.

1.1.4 For each short listed option whose viability has been confirmed a detailed *Excavated Materials Option Suitability (EMOS) report* has been produced. The *EMOS reports* provide a summary of the site operations and the overall performance of the option against the evaluation objectives.

1.1.5 This *EMOS report* sets out the detail assessment for Wallasea Island in Essex. The report provides the information gained during the detailed assessment stage of the *Excavated material options assessment* (*EMOA*) and the grades awarded against each evaluation indicator as part of this assessment. A grade is provided for each evaluation indicator, using an agreed set of evaluation criteria, against seven grades of impact (ranging from --- to +++). The *EMOS report* also provides a risk profile for the site identifying the key risks associated with the option in relation to accepting the Thames Tideway Tunnel project excavated material.

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2 Site description

2.1 Site location

2.1.1 The receptor site is located on Wallasea Island which lies at the junction of the Crouch and Roach Estuaries in Essex. The receptor site is currently low lying (approximately 1mOD[l]) flat arable farm surrounded by a sea wall which is between 5.5mOD and 4.5mOD. There are a number of farm tracks crossing the area and there are 22 properties located towards the west of the Island. The closest built up area is Burnham-on-Crouch located approximately 500m across the river to the north. The area is rural and agricultural in character.

2.1.2 The Royal Society for the Protection of Birds (RSPB) is progressively purchasing the site and is converting it into the Wallasea Wetland Creation project. This will return the bulk of the Island into a diverse range of coastal habitats which will be rich in birds, fish and invertebrates. In order to do this the RSPB need to build up the level of the existing land in places such that when the sea wall is removed a mosaic of coastal habitat is created.

2.1.3 The receptor site can currently be accessed via a narrow lane from the village of Canewdon. All material delivered to the receptor site for the Wetland Creation project will be delivered by ship. The receptor site has a jetty pontoon and conveyor belt to receive materials.

2.1.4 Wallasea Island site location is shown in Plate 3.1 Wallasea Island site location.

2.2 Site operations

2.2.1 The receptor site began operations in September 2012. The first phase of works at the receptor site is being managed by Crossrail and their contractors. Crossrail has committed to supporting the RSPB project and the planning application was submitted on the basis that Crossrail would be providing the majority of the material for the project and the operations for receiving and positioning material are based on anticipated Crossrail operations. Once Crossrail have completed their operations at the receptor site the environmental permit would be transferred to a new contractor, who would manage the continued delivery of other materials, which could include Thames Tideway Tunnel project material.

2.2.2 The receptor site has a jetty pontoon which is permitted for 24hour operations, seven days a week. The jetty pontoon is sized to allow the unloading of two ships simultaneously. The operator anticipates that operations would allow three ships to be unloaded on a daily basis if required.

[l] Metres above Ordnance Datum (UK sea level measurement)

2.2.3 The Wallasea Island Environmental Statement (ES) sets out a phased development based around 5 independent cells. The planning application identifies Crossrail as the source of the majority of the required fill material. However, Crossrail are only committed to delivering material to complete Cell 1 and may provide material for Cell 2. This would mean that material would still be required to complete Cell 2 as well as all material required for Cell 4. Cells 3 and 5 do not require any imported material for fill. Table 2.1 shows the volume of excavated material required for each cell.

Table 2.1 Excavated material required for each cell at Wallasea Island[II]

Cell	Volume ('000s m^3)	Tonnage ('000s tonnes)[III]
Cell 1	2,360	2,925
Cell 2	2,350	2,914
Cell 4	2,610	3,236
Material required to account for settlement[IV]	c. 200	c.248
Total material required	7,500	9,300
Anticipated quantity to be provided by Crossrail[V]	c. 3,650	4,526
Additional material required to complete all cells	c. 3,850	4,774

2.2.4 Crossrail material will be delivered to the receptor site until 2016 at the latest. The peak delivery period for the Crossrail material would be 2013. It is proposed that the Crossrail material would be delivered by an average of two ships per day with a maximum of three ships per day during peak production times[VI]. Material would be stockpiled in a designated area until it is placed in its final location. Material would be delivered to the stockpile area from the jetty by both dump trucks; and conveyor belt from the jetty. Once at the stockpile area, material would then be moved by bulldozer or loaded onto dump trucks and transported on the receptor site and landscaped by bulldozer. A roller would be used to compact structural parts of the wetlands such as cell division walls.

[II] Source: Planning Application, Environmental Statement Main Report.

[III] The operator prefers to only use volume estimates. Therefore the purpose of this assessment tonnages are approximate and calculated using Thames Tideway Tunnel project bulking factors detailed in the *EMOA*.

[IV] Additional 2,00m3 required to account for settlement as stated in the ES.

[V] Site operator estimate.

[VI] It is likely that any limits set by the Environmental Permit are based on Crossrail delivery rates.

2.3 Planning consent

2.3.1 Planning consent (ESS/54/08/ROC) for the receptor site was issued by Essex County Council on 9 July 2009.

2.3.2 The receptor site has permission for "Importation by sea of 7.5 million cubic metres of high quality recovered inert material to achieve, by phased extraction and landraising, a change of use from agricultural land to 677 hectares of coastal nature reserve, ..., car park and associated off shore unloading facility, conveyor and pipeline, material handling area, sea wall engineering works and modification of Footpath Number 21, to be completed by 2019 at Land at Wallasea Island, Rochford."

2.3.3 The planning consent states that "the consent will expire on the 31 December 2019 by which time operations shall have ceased and the site shall have been reinstated and restored to a coastal nature reserve".

2.3.4 Although the hours of operation for the site are limited, the permission allows unloading of restoration material at the unloading facility and transfer by conveyor/pump 24 hours a day.

2.3.5 Waste material can only be imported to the receptor site on ships via the River Crouch and deposited via the unloading facility. No waste material shall be imported to the site via the public highway.

2.3.6 The stockpiles of heights of any material on the receptor site shall not exceed the height of the existing sea wall or proposed cell dividing walls.

2.3.7 There are strict provisions for the limitation of noise.

2.3.8 No importation of waste will be permitted until a Shipping Management Plan (to include details of how the applicant will share the river with other river users) has been submitted and approved.

2.4 Permitting

2.4.1 An environmental permit (EPR/DP3798VD) was granted for the receptor site in May 2012.

2.4.2 The permit allows for the management of materials produced by the Crossrail project. Therefore, the permit would need to be transferred to new contractor for the management, receipt and placement of Thames Tideway Tunnel material at the receptor site.

2.4.3 The permit allows for 3million tonnes of material to be delivered per annum to the receptor site and used for a recovery operation.

2.4.4 Table 14.2 details the European Waste catalogue (EWC) codes relating to the materials permitted under Wallasea Island's environmental permit, which is most relevant to the acceptance of the Thames Tideway Tunnel project excavated materials.

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3 Overall site summary

3.1.1 Table 3.1 below provides a summary of Wallasea Island site and an assessment of its suitability against the evaluation objectives. Sections 4 to 18 of this *EMOS report* give more detail on each evaluation objective.

Table 3.1 Summary of Wallasea Island and its overall suitability

Site name:	Wallasea Island (RSP)		**Owner/operator:**			RSPB	
Planning consent	Yes, until 2019 ESS/54/08/ROC		**Permit**			Yes EPR/DP3798VD	
Void capacity	7.5million m^3		**Throughput**			2.7million tpa[VII]	
Recovery/disposal	Recovery						
Materials	**London clay**	✓	**Lambeth group**	✓	**Chalk**	✓ with other materials	
Transport type	**Road**	**X**	**Rail**	**X**	**Marine transport**	✓	

Receptor site review

The RSPB is carrying out the Wallasea Wetland Creation project. This project will turn the bulk of the Wallasea Island into a diverse range of coastal habitats. The receptor site began receiving material in August 2012. The Wallasea Island ES sets out a phased development based around five independent cells. Crossrail are providing material for at least Cell 1. Another operator would be needed to complete the Wetland Creation project. The Thames Tideway Tunnel project material would be used in this habitats creation operation. Thames Tideway Tunnel project material would be delivered to the receptor site by ship. The receptor site is approximately 69km from the Thames Tideway Tunnel main drive sites.

Assessment

1. Land and other resources	a)	**0**	8. Cultural heritage	a)	**0**
	b)	**0**	9. Employment opportunities	a)	**++**
2. Climate change	a)	**-**		b)	**++**
	b)	**+++**	10. Cost	a)	**0**
	c)	**+**	11. Operational suitability of the receptor site.	a)	**0**
3. Local amenity	a)	**0**		b)	**+++**
4. Landscapes and townscapes	a)	**-**		c)	**++**
	b)	**+**		d)	**+**
5. Access to open space	a)	**0**		e)	**+++**
	b)	**+++**		f)	**--**
6.Water quality	a)	**+**	12. Waste hierarchy	a)	**+++**
	b)	**0**	13. Proximity principle	a)	**-**
7.Biodiversity	a)	**0**	14. Sustainable transport policy	a)	**0**
	b)	**++**	15. Health and safety good	a)	**n/a**

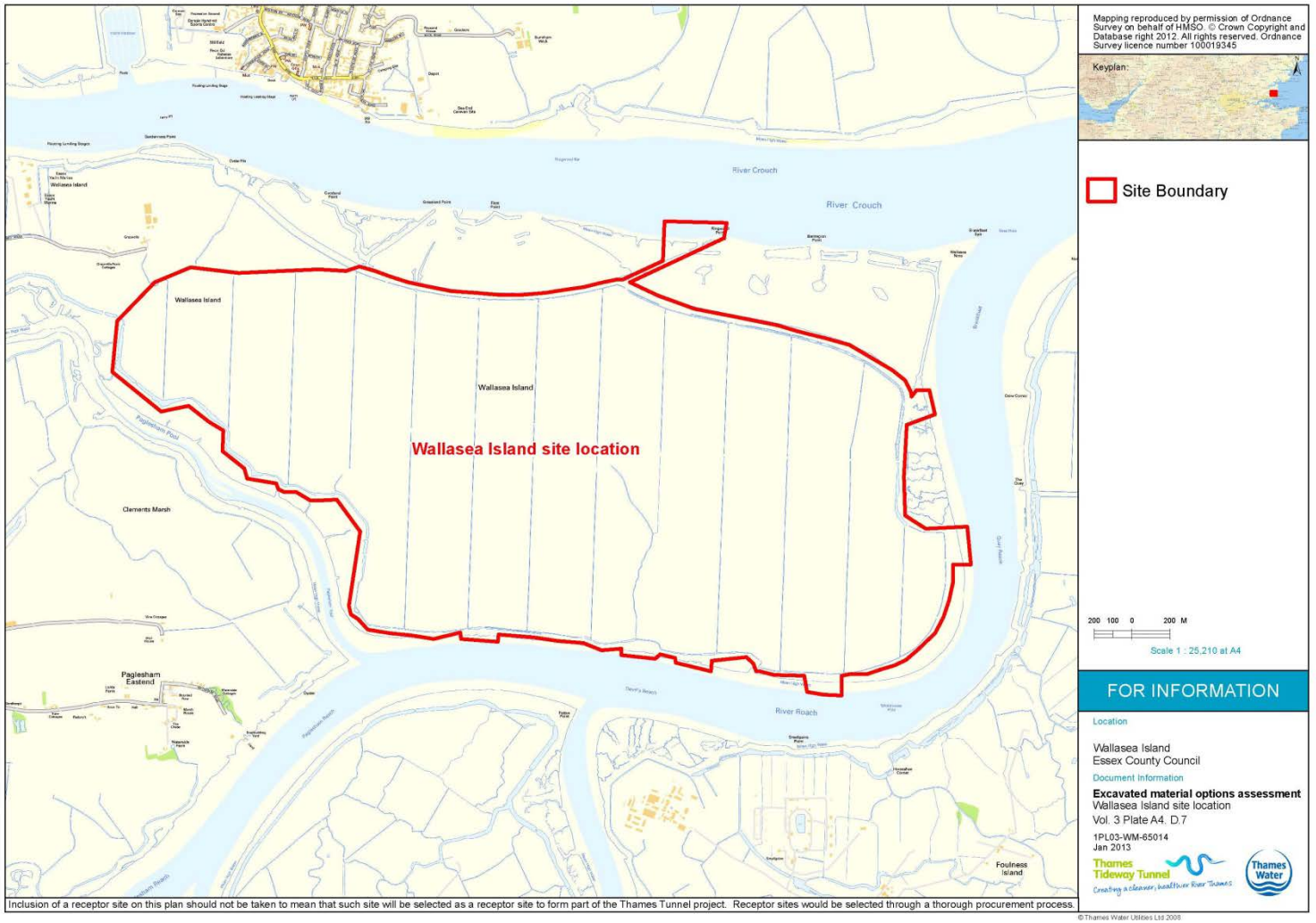
[VII] Based on Crossrail's anticipated peak deliveries of three ships a day with a capacity of 2,500 tonnes each

			practice		

Environmental summary
In the short term the use of Thames Tideway Tunnel project material as part of the Wallasea Wetland Creation project may have a minor adverse effect. In particular through climate impacts associated with the handling and transport of the material and potential to disturb important bird habitats. This would be outweighed by the long term major beneficial effects with respect to habitats creation, improved amenity and reduced flood risk associated with uncontrolled sea wall breaches.
Social summary
The use of Thames Tideway Tunnel project material at the receptor site would have a minor beneficial effect through the creation of approximately 20 full time equivalent jobs in the short to longer term. The project may also contribute to maintaining jobs in the wider area through protection of jobs associated with the Rivers Crouch and Roach. Access to the site in the long term for recreation such as walking, fishing and bird watching would also have beneficial effects.
Operational summary
It is probable that the receptor site would be able to accept a large proportion of the Thames Tideway Tunnel project material at the rates required up until 2019. If the wetland creation project is not completed by the end of 2019, the site would require an extension to the existing planning consent for restoration activities to continue. The receptor site would be able to accept all types of the excavated materials produced by the Thames Tideway Tunnel based on the planning consent. The operator has indicated that the site could not accept chalk alone, and it would be required to be mixed with other inert materials. Wallasea Island would be considered as a recovery option for all material accepted by the receptor site[VIII]. The site is located 69km from London which is not in line with the London Plan self sufficiency policies. However, the site can be accessed by ship which is in line with sustainable transport objectives. Health and safety cannot be fully assessed as the operator of the receptor site is not confirmed to remain after the Crossrail project as ceased delivering material. Therefore a new operator with different health and safety management procedures to those currently in place could be managing the receipt of non-Crossrail material to the receptor site.
Overall suitability
This receptor site would provide a long term beneficial effect with respect to environmental, socio-economic and policy objectives. The receptor site has the potential to provide a beneficial use for the excavated material received at the site. However the receptor site is located over 69km from Thames Tideway Tunnel project drive sites. Wallasea Island is included on the planning stage preferred list.

[VIII] Based on the *Excavated material options assessment (EMOA)* beneficial use test

Plate 3.1 Wallasea Island site location



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4 Evaluation objective 1: To ensure prudent use of land and other resources

4.1.1 The planning consent for the receptor site stipulates the use of 'high quality recovered inert material'. The receptor site is not yet operational but the first phase of works will be managed by Crossrail. Crossrail would provide the material from their rail upgrade operations.

4.1.2 The use of Thames Tideway Tunnel project material would replace the use of other reusable materials that would be used to restore the receptor site.

4.1.3 The entire receptor site is due to be changed from agricultural land to a coastal nature reserve, the Thames Tideway Tunnel project material would therefore be used for habitat creation.

4.1.4 Table 4.1 provides the grade given for evaluation objective 1 and the justification for the grade.

Table 4.1 Evaluation objective 1 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
1. To ensure prudent use of land and other resources	a) Extent to which resources such as sand, gravel and chalk are conserved by processing or storage of Thames Tideway Tunnel project material at receptor sites.	0	Thames Tideway Tunnel project material is unlikely to affect virgin material use e.g. material replaces other reusable materials or no material substitution required.	Thames Tideway Tunnel project material would be used for changing the receptor site to agricultural land to a coastal nature reserve. Thames Tideway Tunnel project material would replace the use of other reusable material.
	b) Extent to which Thames Tideway Tunnel project material would effect landtake at (footprint of) receptor sites in the long term.	0	The acceptance of Thames Tideway Tunnel project material would not contribute to the requirement for additional land extending the receptor site's boundary.	The Wetland Creation project has a specific landtake defined. Using the Thames Tideway Tunnel project material and would not contribute to a need for the receptor site to expand.

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5 Evaluation objective 2: To reduce climate change impacts

5.1.1 The documents submitted with the Wallasea Island planning application present the case that the intertidal mudflats will have a carbon sequestration effect through the carbon and nutrient processing function of coastal habitats[2]. The estimated carbon capture for coastal habitat is one tonne (1,000kg) of carbon per hectare per year. The proposals for the receptor site comprise the creation of over 478 hectares of coastal habitat. There is currently no carbon management plan for the receptor site to mitigate the emissions produced by the equipment used for the acceptance and deposit of material at the receptor site.

5.1.2 Based on data from the Environment Agency's (EA) lifecycle analysis tool WRATE, the overall GhG emissions for deposition of excavated material to land is 3.17kg CO_2 eq per tonne of excavated material. The excavation material is assumed to be inert soil and the EA's WRATE emissions associated with material reception and spreading have been assumed.

5.1.3 The figures for GhG emissions from transport have been estimated based on:

a. the average CO_2 emissions for the different types of transport; and

b. the distance travelled from the Thames Tideway Tunnel sites to the receptor site.

5.1.4 The GhG emissions calculated are for comparative purposes only and do not provide an exact representation of the transport emissions associated with the Thames Tideway Tunnel excavated material. Full GhG methodology and assumptions can be found in Appendix B.10.

5.1.5 It has been estimated that using Wallasea Island would produce 2.63kg CO_2 eq per tonne of excavated material accepted.

5.1.6 The Wallasea Wetland Creation project is closely linked to the maintenance of the flood management requirements for the adjacent estuary. The project involves the deliberate breaching of the existing sea walls to enable some waters to encroach on the existing landform (controlled by the placement of imported material).

5.1.7 At present it is believed that uncontrolled breaches in the existing sea walls could lead to significant flooding of the island and adverse effect on the hydrodynamics of the estuary and remaining defences. The island is approximately 1mOD and high tides regularly reach over 2mOD. The existing sea walls are in poor condition and there is a risk that these could breach without considerable investment in improvements.

5.1.8 The project should reduce the risks associated with this uncontrolled breaching and provide additional flood defence for buildings on the west of the Island.

5.1.9 Table 5.1 provides the grade given for evaluation objective 2 and the justification for the grade.

Table 5.1 Evaluation objective 2 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
2. To reduce climate change impacts	a) Greenhouse gases emitted through treatment, handling and use of Thames Tideway Tunnel project material at receptor sites (excludes transport).	-	Thames Tideway Tunnel project material requires active treatment at receptor sites (e.g. turning, washing, grading); material would be double handled and/or no process to reduce transport by vehicle on site	Material would be deposited by dump truck or by conveyor into a stockpile area and then moved by bulldozer to the required location on the receptor site.
	b) Extent to which flood risk is altered by Thames Tideway Tunnel project material at the receptor site (or in the local catchment).	+++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would substantially reduce flood risk (from any source or a combination of sources) resulting in beneficial effects to the site and surroundings.	The Thames Tideway Tunnel project material would be used to raise the level of the land as part of the flood management proposals. Controlled flooding of the island will be allowed to remove the potential adverse effects associated with uncontrolled breaches of the existing sea wall.
	c) Greenhouse gases emitted through transport of Thames Tideway Tunnel project material to the receptor sites.	+	Through the transport of Thames Tideway Tunnel project material between 2 and less than or equal to 4kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced	Through the transport of Thames Tideway Tunnel material it is estimated that 2.63kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.

6 Evaluation objective 3: To protect local amenity

6.1.1 The receptor site is not located within an Air Quality Management Area (AQMA).

6.1.2 The Wallasea Island planning application assessed effects associated with air quality during the construction phase of the Wetland Creation project to be negligible. The effects of dust were considered negligible with the use of water bowsers during dry windy conditions and based on the nearest receptors being 1.5km away from the receptor site.

6.1.3 There is likely to be negligible effect on sensitive receptors from dust generated from the delivery of Thames Tideway Tunnel project material because of the use of proposed dust suppression procedures at the receptor site.

6.1.4 Table 6.1 provides the grade given for evaluation objective 3 and the justification for the grade.

Table 6.1 Evaluation objective 3 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
3. To protect local amenity	a) Extent of potential effects on local amenity from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have an effect on the local amenity or any effect would be negligible.	The use of Thames Tideway Tunnel project material at the receptor site is likely to have a negligible or no effect on sensitive receptors which are 1.5km away. There are also procedures proposed at the receptor site to reduce any nuisance effects e.g. dust suppression.

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7 Evaluation objective 4: To conserve landscape and townscapes at receiving locations

7.1.1 The receptor site is not located within an Area of Outstanding Natural Beauty (ANOB).

7.1.2 The surrounding land is farmland, marshland and mud flats. The nearest notable population area is Burnham-on-Crouch which is 1km to the north of the receptor site, where there is a school. There are 22 residential properties are located on west of the island.

7.1.3 The Wetland Creation project is designed to give consideration "to creating a landscape that is in keeping with the existing environs and one that mirrors as closely as is possible the historical landforms of the Island."

7.1.4 The scheme will not involve any visually imposing structures and most of the receptor site will not be easily visible beyond the existing site boundaries, particularly from the north, as it will be screened by the retained sea wall along the northern edge of the receptor site.

7.1.5 Works would be mostly hidden behind the sea wall which is between 4m and 5m high around the island. Material would not be stockpiled higher than the wall. However the engineered landscape may be slightly visible for up to a mile away, having some minor adverse impact on visual receptors.

7.1.6 In the short term the jetty may be visible from the north of the receptor site. The ES for the receptor site did identify that there would be a change in visual appearance as a result of the operations at the receptor site and as such the Thames Tideway Tunnel project material would have an adverse affect on visual amenity, albeit minor. The ES states that Crossrail will ensure that where appropriate, "construction activities will be screened to protect nature conservation sites and the amenity value of recreational facilities," [3] and it is assumed that similar measures would be introduced by the operator of the receptor site when receiving non Crossrail project material.

7.1.7 In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a beneficial effect on the landscape changing the area from open farmland to coastal habitat in keeping with the surrounding area. The ES states that the restored receptor site would not involve any visually imposing elevated structures (bar one seawall hide) and will not be easily visible beyond the existing site boundaries. The result of this will have a beneficial effect on a large area of landscape.

7.1.8 Table 7.1 provides the grade given for evaluation objective 4 and the justification for the grade.

Table 7.1 Evaluation objective 4 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
4. To conserve landscapes and townscapes at receiving locations	a) Extent of short term visual & landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	-	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would change the landscape in the short term and would have a minor adverse effect on sensitive receptors	The use of Thames Tideway Tunnel project material at the receptor site would have a minor adverse effect on visual receptors as operations would be visible at a distance up to a mile away.
	b) Extent of permanent visual & landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a permanent minor beneficial visual effect on the landscape, based on a 'do nothing' view of the site.	The final use of the Thames Tideway Tunnel project material would have a permanent minor beneficial visual effect on the area as the receptor site will be transformed from a uniform agricultural landscape to a coastal habitat in keeping with the surrounding area.

8 Evaluation objective 5: To protect quality of and access to open space

8.1.1 A shipping management plan for the Wetland Creation project will minimise effects on the local sailing community.

8.1.2 The planning application states that a small section of Public Footpath No. 21 which goes along the sea wall around the receptor site will be closed at the location of one of the sea wall breaches and a bridge will be put in place over the material conveyor which brings material from the ships to the receptor site.

8.1.3 The new reserve will lead to improved access to open space with 15km of footpaths included in the Wetland Creation plans. A visitor's centre and facilities for fishing and bird watching is also part of the Wetland Creation project.

8.1.4 In the short term the accessibility to Wallasea Island will be restricted, although public footpaths will be retained.

8.1.5 In the long term when the receptor site is fully restored to marshland public access will be considerably improved.

Table 8.1 Evaluation objective 5 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
5. To protect quality of and access to open space	a) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the short term?	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or a negligible effect on access to and quality of open space and PRoWs.	The use of Thames Tideway Tunnel project material would have no or negligible effect on access to open space and Public Rights of Way (PRoW) as the site will be operational prior to the receipt of Thames Tideway Tunnel project material.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the long term?	+++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would constitute a major enhancement to the PRoW and substantially increase accessibility to public open space.	The use of Thames Tideway Tunnel project material on the receptor site would facilitate the Wetland Creation project and the associated improved access. This includes enhancement of the PRoW and an increase in public open space.

9 Evaluation objective 6: To protect water quality

9.1.1 Wallasea Island lies at the junction of the Crouch and Roach Estuaries and the proposed changes will include controlled breaches of the sea wall to allow ingress of water to the site.

9.1.2 The receptor site will be managed to ensure material is placed carefully to avoid contamination of the local water courses. The ES, submitted to support the planning application, assesses the effect on water quality from placement of material, spillages from ships delivering material and disturbance of sediments as negligible.

9.1.3 The receptor site is not in a groundwater Source Protection Zone (SPZ), which highlights groundwater sources such as wells, boreholes and springs used for public drinking water supply.

9.1.4 In general the move from agriculture to coastal habitat is considered likely to have a minor beneficial effect on water quality through the action of the saltmarsh to filter and retain sediments. It is also likely that the reduction in intensive agriculture will remove a source of fertiliser and the associated leaching of nitrates into local water courses.

9.1.5 The Thames Tideway Tunnel project material would have no or negligible effect on groundwater given the management that would be implemented on the receptor site.

9.1.6 Table 9.1 provides the grade given for evaluation objective 6 and the justification for the grade.

Table 9.1 Evaluation objective 6 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
6. To protect water quality	a) Extent of potential effects on fluvial water quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a minor beneficial effect on local watercourses.	The use of Thames Tideway Tunnel project material on the receptor site would facilitate the Wetland Creation project and is likely to have a minor beneficial effect on water quality through a reduction in intensive agriculture and reinstatement of saltmarsh.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of potential effects on groundwater quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on groundwater.	The receptor site is not located within a ground SPZ and effects on groundwater are not anticipated.

10 Evaluation objective 7: To protect biodiversity

10.1.1 Wallasea Island is surrounded by the Crouch and Roach Estuaries (Mid-Essex Coast Phase 3) Ramsar and Special Protection Areas (SPA). The Ramsar designation indicates a wetland of international importance as outlined in the Convention on Wetlands of International Importance, known as the Ramsar Convention. The SPA designation is intended to protect all wild birds, their eggs, nests and habitats within the European Community as set out under the EC Directive on the Conservation of Wild Birds (the Birds Directive, 79/409/EEC).

10.1.2 The area directly to the north of the site is the 110 hectare Defra managed realignment scheme (coastal habitat creation), completed in 2006 on Wallasea Island. The Defra scheme was created as compensation for wintering bird sites lost to development. The site was designed to mirror the habitats that were lost, with the area providing a mosaic of mudflats and lagoons with islands.

10.1.3 The planning application for the Wetland Creation project identified a number of noteworthy species on the site including Water Voles, Badgers and Corn Buntings. Measures will be put in place to limit any adverse effects to these species.

10.1.4 The planning application identifies noise as having the potential to disturb breeding bird populations. With appropriate timing of works and construction, effects of the scheme would be minor adverse during the construction phase. The ES states that due to phased construction, by maintaining some grassland and mudflat areas during cell construction this would lead to algae and other plants growing which would have a negligible to moderately beneficial impact on biodiversity. Overall, the ES finds that the effects of the construction phase on overwintering birds and the surrounding habitats would be negligible with the mitigation measures, such as the phasing of the works, proposed.

10.1.5 However when Thames Tideway Tunnel project material is anticipated to be delivered to the receptor site, all infrastructures would be in place and the receptor site would have been operational for several years. Therefore it is considered that the impact of handling Thames Tideway Tunnel project material would have no or a negligible impact on the designated Ramsar and SPA.

10.1.6 The planning application states that “the scheme will create a rich mosaic of new habitats which will enhance the site’s value for terrestrial and aquatic invertebrate species. With the mitigation habitats in place the impacts are considered to be of moderate beneficial significance over the longer term’’.

10.1.7 Table 10.1 provides the grade given for evaluation objective 7 and the justification for the grade.

Table 10.1 Evaluation objective 7 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
7. To protect biodiversity	a) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the short term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site	The treatment, handling or use of the Thames Tideway Tunnel material at the receptor site is likely to have no effect on a designated site as operations would have already commenced prior to the acceptance of Thames Tideway Tunnel material. There are also measures in place at the receptor site to mitigate any impacts, such as the phasing of construction works.
	b) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the long term.	**++**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on a designated site and/or creation/ improvement of habitats	The treatment, handling or use of the Thames Tideway Tunnel project material at the receptor site would have a beneficial effect on a designated site of international importance through the creation of a mosaic of coastal habitats.

11 Evaluation objective 8: To protect cultural heritage

11.1.1 There are no Scheduled Ancient Monuments (SAMs), Registered Parks and Gardens or battlefields which would be affected by the Wetland Creation project.

11.1.2 As part of the planning application, an archaeological assessment was carried out and determined that this receptor site was unlikely to contain areas of archaeological significance. The sea walls may have medieval origins and will be breached in a few locations which are not designated or nominated archaeological sites. This will be kept under review during any excavation work and work halted and any potential findings inspected by qualified personnel if anything with archaeological potential is uncovered.

11.1.3 It is not anticipated that the operations at the receptor site would have an effect with regards to cultural heritage.

11.1.4 Table 11.1 provides the grade given for evaluation objective 8 and the justification for the grade.

Table 11.1 Evaluation objective 8 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
8. To protect cultural heritage	a) Extent of potential effects on designated or nominated archaeological sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	The treatment, handling or use of the Thames Tideway Tunnel project material at the receptor site is would have no effect on designated archaeological site, as none have been identified on or near the site.

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12 Evaluation objective 9: To provide employment opportunities

12.1.1 It is projected that that the Wetland Creation project would maintain between 16 and 21 full time equivalent jobs in the construction phase as a result of accepting other material, such as Thames Tideway Tunnel project material, once delivery of Crossrail material ceases.

12.1.2 These positions cannot be solely attributable to the receipt of Thames Tideway Tunnel project material as they would be required to manage delivery of material if sourced from other projects.

12.1.3 The number of staff required to manage the delivery of non Crossrail material to the receptor site would be determined by the operator selected to manage the receipt of material, if not the same as that managing Crossrail material.

12.1.4 In the longer term it is estimated that between 10 and 20 full time equivalent jobs would be created through the visitors centre. It is also estimated in the planning application that the project will help safeguard in the region of 110 jobs in areas such as the oyster fishery on the estuary.

12.1.5 Table 12.1 provides the grade given for evaluation objective 9 and the justification for the grade.

Table 12.1 Evaluation objective 9 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
9. To provide employment opportunities	a) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the short term.	++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would lead to moderate job gains over the short term of between 10 and less than or equal to 20 jobs.	The use of Thames Tideway Tunnel project material on the receptor site would contribute to 16 – 21 full time equivalent jobs, but these would not be solely attributable to its receipt.
	b) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites	++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would lead to moderate job	The use of Thames Tideway Tunnel project material on the receptor site would contribute to 10 – 20 full time equivalent jobs over the long term.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	in the long term.		gains over the long term of between 10 and less than or equal to 20 jobs.	

13 Evaluation objective 10: To minimise the cost of waste management

13.1.1 The RSPB would not charge for the material taken to Wallasea Island. However, Thames Water would be expected to cover the costs of transport and deposit of the material within the cells.

13.1.2 It is understood that the cost of developing the jetty would have been covered by the Crossrail project.

13.1.3 In order to compare the likely cost associated with transport and acceptance of the Thames Tideway Tunnel project material at each receptor site a cost model is used.

13.1.4 The cost of transporting the excavated material has been calculated from the distance travelled and a cost per tonne/ km for each of the transport mode (road, ship and rail). The road and marine transport costs have been calculated from the quotes gathered from operators based on today's prices. A material placement cost of £4 per tonne is assumed based on current prices. Full details of the assumptions made can be found at Appendix B.10.

13.1.5 It has been estimated that the cost of transporting and managing excavated material at Wallasea Island would be £17.72 per tonne of excavated material accepted at the receptor site. These costs are predominantly associated with transfer of the material from the Thames Tideway Tunnel sites to the receptor sites. This cost is an estimated cost for comparison purposes within the *EMOA* and may differ from the actual cost which would be incurred if Thames Tideway Tunnel project material were taken to this receptor site.

13.1.6 Table 13.1 provides the grade given for evaluation objective 10 and the justification for the grade.

Table 13.1 Evaluation objective 10 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
10. To minimise the costs associated with the management of excavated material	a) Costs of transporting, handling, treating, reusing, managing and disposal.	**0**	The transportation, treatment, handling and use of Thames Tideway Tunnel project material would cost between £16 and less than or equal to £19 per tonne	The cost of transportation, treatment, handling and use of Thames Tideway Tunnel project material has been estimated (using the *EMOA* cost model) to be £17.72 per tonne.

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14 Evaluation objective 11: To ensure operational suitability of the receptor site

14.1 Evaluation indicator 11a) Timescales

14.1.1 The receptor site has planning consent until 2019.

14.1.2 The operator recognises that the date of 2019 is dependent on whether all the required material can be sourced and therefore is subject to material supply. The operator has met with the Local Planning Authority who have agreed in principle that if the required amount of material for restoration is not sourced prior to 2019 than an extension is likely to be granted until restoration is complete. For this assessment however, it has been assumed that the time limit of the receptor site operations would be 2019.

14.1.3 Based on Thames Tideway Tunnel excavation timescales of 2016 to 2021, Wallasea Island would be available for use for Thames Tideway Tunnel project material for four years of the project timetable, provide sufficient material is not secured to complete the Wetland Creation project in advance of the planning deadline.

14.1.4 Table 14.1 provides the grade given for evaluation objective 11a and the justification for the grade.

Table 14.1 Evaluation objective 11a grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	a) Likelihood of implementation within the required timescale.	**0**	The receptor site would be available for use for Thames Tunnel project material for greater than or equal to 60% but less than 80% of the required timescale	The planning consent for the receptor site requires work to be completed by the end of 2019.

14.2 Evaluation indicator 11b) Material characteristics

14.2.1 The Wetland Creation project is based on the acceptance of London Clay, chalk and Lambeth Group with sands, gravels and inert tunnel construction materials (piling and diaphragm wall arisings) for restoration.

14.2.2 Chalk would only be accepted at the site if it is buried below other material.

14.2.3 The receptor site has the potential to receive all types of Thames Tideway Tunnel project excavated material. The material would be subject to acceptance criteria testing to ensure that the material is inert.

14.2.4 Table 14.2 details the European Waste catalogue (EWC) codes relating to the materials permitted under Wallasea Island's environmental permit, which is most relevant to the acceptance of the Thames Tideway Tunnel project excavated materials.

Table 14.2 Permitted waste types accepted at Wallasea Island

Exclusions Wastes having any of the following characteristics shall not be accepted: • consisting solely or mainly of dusts, powders or loose fibres • hazardous wastes • wastes that are in a form which is either sludge or liquid	
Waste code	**Description**
17	**Construction and demolition wastes (including excavated soil from contaminated sites)**
17 01	Concrete, bricks, tiles and ceramics
17 01 01	Concrete
17 01 07	Mixtures of concrete bricks, tiles and ceramics other than those mentioned in 17 01 06
17 05	Soils (including excavated soil from contaminated sites), stones and dredging spoil
17 05 04	Soils and stones (including naturally occurring clay and sand) other than those mentioned in 17 05 03

14.2.5 Table 14.3 provides the grade given for evaluation objective 11b and the justification for the grade.

Table 14.3 Evaluation objective 11b grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	b) Acceptability of material with Thames Tideway Tunnel project material characteristics by the receptor sites.	+++	The receptor site could accept for use all of the Thames Tideway Tunnel project material types based on their characteristics.	The planning consent allows acceptance of high quality inert material such as that from the Thames Tideway Tunnel. All types of Thames Tideway Tunnel project material should be acceptable, although chalk would need to be placed below other materials.

14.3 Evaluation indicator 11c) Capacity

14.3.1 The receptor site has capacity to receive 7.5million m^3 of which Crossrail have committed at least 3.65million m^3. This would leave approximately 3.85million m^3 capacity available assuming that the RSPB do not accept any additional material from other operators. It is understood that Wallasea Island are actively looking for other sources of inert material to complete the project. At the present time Wallasea Island still believe they have capacity for all of the Thames Tideway Tunnel project material produced during the period of the Wetland Coastal project.

14.3.2 Table 14.4 details the estimated permitted capacity for the receptor site in relation to the material that would be produced by the Thames Tideway Tunnel. The environmental permit allows for a maximum throughput of 3million tpa.

14.3.3 Table 14.4 also sets out the potential tonnage of Thames Tideway Tunnel project material accepted at the receptor site each year based on the assumptions used in the *EMOA* cost and GhG model. The receptor site would be able to accept 94% of the Thames Tideway Tunnel project excavated materials, based on the total amount of material that it can accept and tonnages which are likely to be produced by the Thames Tideway Tunnel during the four years that it is available.

Table 14.4 Capacity for inert material at Wallasea (tonnes[IX])

	Year						Total
	2016	2017	2018	2019	2020	2021	
Total Thames Tideway Tunnel production (tonnes)	63,000	549,000	1,938,000	1,852,000	147,000	155,000	4,704,000
Maximum permitted per annum (tonnes)	3,000,000	3,000,000	3,000,000	3,000,000	-	-	-
Potential Thames Tideway Tunnel project material accepted (tonnes)	63,000	549,000	1,938,000	1,852,000	-	-	4,402,000
Potential Thames Tideway	100%	100%	100%	100%	0%	0%	94%

[IX] Figures quoted to the nearest 1,000 tonnes

	Year						Total
	2016	2017	2018	2019	2020	2021	
Tunnel project material accepted (%)							

14.3.4 Table 14.5 provides the grade given for evaluation objective 11c and the justification for the grade.

Table 14.5 Evaluation objective 11c grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	c) Capacity of the receptor site to accept the required volume of Thames Tideway Tunnel project material (based on likely tonnage accepted).	++	The receptor site has capacity to accept greater than or equal to 85% but less than 100% of Thames Tideway Tunnel project material	The receptor would have the potential to accept 94% of the excavated material that would be produced by the Thames Tideway Tunnel.

14.4 Evaluation indicator 11d) Receptor site throughput

14.4.1 Crossrail have confirmed that the jetty will have the ability to accept three 90m long ships, each with a capacity of approximately 2,500t.

14.4.2 The amount of material produced by the Thames Tideway Tunnel would vary on a daily and monthly basis. The assessment of throughput has been based on both the mean and peak production rates over the Thames Tideway Tunnel construction period. The mean rate is taken as the mean monthly production rate taken over each year in the period 2016 to 2021. The peak rate is based on the month producing the maximum tonnage of excavated material in each year.

14.4.3 Table 14.6 details the proportion of the Thames Tideway Tunnel project material which could be accepted by Wallasea Island over time. This calculation is based on the use of three 2,500t ships.

14.4.4 In Years 1, 2, 3 and 4 of the excavation process, Wallasea Island's limit of 7,500t per day is sufficient to accept the average daily tonnage of the Thames Tideway Tunnel project material produced.

14.4.5 The receptor site also has the ability to receive the peak daily tonnages for Year 1 and 2, 70% of the peak daily tonnages in Year 3 and 73% of the peak daily tonnages in Year 4.

Table 14.6 Throughput of material at Wallasea Island (tonnes[X])

	Year					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Maximum allowable number of ship deliveries at receptor site per day (A)	3	3	3	3	0	0
Capacity per ship (tonnes)	2,500	2,500	2,500	2,500	2,500	2,500
Thames Tideway Tunnel average daily tonnage*	250	2,050	7,200	6,850	550	550
Required number of ships to transport average daily tonnage (B)	0.1	0.8	2.9	2.7	0.2	0.2
Allowable vs average required number of ships at receptor site (A ÷ B)	3,000%	366%	104%	110%	0%	0%
Thames Tideway Tunnel peak daily tonnage**	350	3,050	10,750	10,300	800	850
Required number of ships to transport peak rate (C)	0.1	1.2	4.3	4.1	0.3	0.3
Allowable vs Peak Number of ships at receptor site (A ÷ C)	2143%	246%	70 %	73%	0%	0%

***** *The Thames Tideway Tunnel average daily tonnage for each year is calculated as the mean of the daily rate each month assuming 22.5 days in each month.*

****** *The peak daily tonnage is based on the average daily tonnage (assuming a 22.5 day month) for the peak month of production in each year.*

14.4.6 Table 14.8 provides the grade given for evaluation objective 11d and the justification for the grade.

[X] Figures quoted to the nearest 1,000 tonnes

Table 14.7 Evaluation objective 11d grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	d) Ability of the receptor sites to accept Thames Tideway Tunnel project material at the anticipated rate (speed of material generation vs acceptance rate)	+	The receptor site could take greater than or equal to 6,400 but less than 8,200t per day of Thames Tideway Tunnel project material	The receptor site has the ability to receive 7,500t per day, based on the delivery of three ships a day each with a capacity of 2,500t.

14.5 Evaluation indicator 11e) Planning consent and permitting

14.5.1 Wallasea Island has the necessary planning consent and environmental permit in place to accept excavated Thames Tideway Tunnel project material for recovery and habitat creation.

14.5.2 The environmental permit allows for the management of materials produced by the Crossrail project. Therefore, the permit would need to be transferred to new contractor for the management, receipt and placement of Thames Tideway Tunnel material at the receptor site.

14.5.3 Further information on the receptor site's planning consent and environmental permit status can be found in Section 2.3 and 2.4.

14.5.4 Table 14.8 provides the grade given for evaluation objective 11e and the justification for the grade.

Table 14.8 Evaluation objective 11e grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	e) Site operations have appropriate planning/permitting consent.	+++	The receptor site has planning consent and a relevant EA permit	The receptor site has the relevant planning consent and environmental permit in place. However the environmental permit would need to be transferred to a new contractor prior to acceptance of Thames Tideway Tunnel project material.

14.6 Evaluation indicator 11f) Transport modes

14.6.1 Thames Tideway Tunnel project excavated material would only be delivered to the receptor site by ship via the River Crouch. The jetty

should be left in place once Crossrail have finished delivering material in 2016 until the Wallasea Wetland Coastal project is completed.

14.6.2 Table 14.9 provides the grade given for evaluation objective 11f and the justification for the grade.

Table 14.9 Evaluation objective 11f grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	f) Can accept excavated material from multiple transport modes.	--	The receptor site is only accessible by one transport mode.	The receptor site can only accept material by sea going vessel.

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15 Evaluation objective 12: To conform to the waste hierarchy

15.1.1 The Thames Tideway Tunnel *Excavated materials and waste (EM&W) strategy* contain an objective to 'To minimise waste arisings, maximise re-use, recovery, recycling and beneficial use and minimise the impact of waste on the environment and communities'.

15.1.2 The Thames Tideway Tunnel project excavated material would be used as an integral part of the habitat creation scheme. The restoration of Wallasea Island involves the ecological improvement of the area which will enhance ecosystem performance and increase biodiversity. This is considered to be beneficial use in line with the *EMOA* beneficial use test. Table 15.1 details the application of the *EMOA* beneficial use test applied to Wallasea Island.

Table 15.1 Habitat creation performance against *EMOA* beneficial use test

***EMOA* test**	**Does the receptor site comply with the test?**	**Comment**
The activity will lead to a beneficial reuse and bring land back into use or provide ecological benefit	Yes	Wallsea will be restored back to a coastal nature reserve and it is anticipated that there will be a beneficial effect on local biodiversity.
In the case of quarries or landfill sites that the activity has a planning requirement to be restored	Yes	Wallasea Island has planning consent for wetland creation.
Landfill Tax would not be charged on the material	Yes	Wallasea Island is not recognised as a landfill operation as a result no landfill tax will be charged.
That the material is suitable for its intended use and would not harm human health or the environment	Yes	Wallasea Island would be able to accept all the types of Thames Tideway Tunnel project material. Chalk would need to be accepted with other materials.
That the minimum amount of waste is being used	Probably	The material is being used for landraising in line with those agreed contours through the planning consent.
That alternative material (whether waste or non-	Yes	Material would be sourced from elsewhere for the project if Thames

EMOA test	Does the receptor site comply with the test?	Comment
waste) would be required if Thames Tideway Tunnel project material was not used		Tideway Tunnel project material was not available. .

15.1.3 All the material accepted at the receptor site would be considered as recovery. Thus this receptor site would achieve 100% recovery for all clean materials accepted. It should be noted that this receptor site can only accept 94% of the total Thames Tideway Tunnel project material.

15.1.4 Table 15.2 provides the grade given for evaluation objective 12 and the justification for the grade.

Table 15.2 Evaluation objective 12 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
12. To conform to waste hierarchy	a) Extent to which the option meets the *EM&W strategy* targets.	+++	Performance of receptor site substantially exceeds target.	All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 94% of the total Thames Tideway Tunnel project material.

16 Evaluation objective 13: To conform to the proximity principle

16.1.1 Material would need to be delivered to the receptor site by seagoing ship. The ships would transport excavated material down the River Thames to Southend–on-Sea. They would then travel north passing Foulness Island before turning west into the River Crouch to reach Wallasea Island. It has been estimated that the distance from the transhipment point in Barking to Wallasea Island is 84 km[XI]. The transhipment point used in the *EMOA* modelling is an average 20km from the Thames Tideway Tunnel CSO and drive sites by road or ship.

16.1.2 For this evaluation objective the receptor site was assessed using a straight line distance from the main drive sites. Using a straight line distance provides a consistent measure for assessment purposes. As the receptor site would be able to receive excavated materials from more than one drive site, the mean distance has been calculated. The receptor site was then graded according to this mean figure.

16.1.3 The receptor site is approximately 69km in a straight line from the main drive sites.

16.1.4 Table 16.1 provides the grade given for evaluation objective 13 and the justification for the grade.

Table 16.1 Evaluation objective 13 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
13. To conform to Proximity Principle	a) Average distance from main tunnel drive sites.	-	The receptor site is between 80km and 60km from source of the Thames Tideway Tunnel project material.	The receptor site is approximately 69km (straight line distance) from the main drive sites.

[XI] Distances quoted are those used in the *EMOA* GhG model. Details of the assumptions used in this model can be found in Appendix B.10. These distances are for context only and do not reflect the exact routes that would be used should this receptor site be used to accept Thames Tideway Tunnel project material.

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17 Evaluation objective 14: To conform to sustainable transport policy

17.1.1 The receptor site would only be accessed by ship.

17.1.2 *The London Plan 2011*[4] Policy 5.18 Construction, excavation and demolition states that "waste should be removed from construction sites and materials brought to the receptor site, by water or rail transport wherever that is practicable." The receptor site meets this criterion.

17.1.3 Excavated material may only be delivered to this site via the River Crouch. Jetty facilities are available for ships up to 2,500t. The planning consent allows for 24 hour delivery based on deliveries coinciding with high tide. In order to reach Wallasea Island sea going vessels would be required and therefore material would need to be transferred from dumb barges to a sea going vessel prior to delivery. It may be possible for sea going vessels with a capacity of up to 1,500t to be directly loaded from some of the Thames Tideway Tunnel sites.

17.1.4 Material cannot be delivered by HGV or by rail.

17.1.5 Table 17.1 provides the grade given for evaluation objective 14 and the justification for the grade.

Table 17.1 Evaluation objective 14 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
14. To conform to sustainable transport policy	a) Conforms to policy objective to move transport of materials from road to rail or marine transport.	**0**	The receptor site has the potential to be accessed by rail or marine transport but may require some double handling or transhipment.	The receptor site can be directly accessed from marine transport. However, some material would require transhipment into sea going vessels prior to transport to Wallasea Island.

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18 Evaluation objective 15: To conform to health and safety good practice

18.1.1 The receptor site began operations in September 2012. The contractor chosen for managing the Crossrail material currently being delivered to the receptor site may not be the same as that selected to manage the receipt of other restoration material required for the project, such as Thames Tideway tunnel project material..

18.1.2 As the contractor selected for managing the delivery of non Crossrail project material at the receptor site is currently unknown, health and safety systems cannot be assessed

18.1.3 Table 18.1 provides the grade given for evaluation objective 14 and the justification for the grade.

Table 18.1 Evaluation objective 15 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
15. To conform to Health and Safety Good Practice.	a) Health and safety performance conforms to good practice.	**N/A**	N/A	A different contractor than that currently managing the receipt of material at the receptor site may be chosen for future delivery of material such as that from the Thames Tideway Tunnel project, therefore this evaluation objective has not been graded.

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References

[1] *A Practical Guide to the Strategic Environmental Assessment Directive* ODPM (September 2005); *Strategic Planning for Sustainable Waste Management: Guidance on Option Development and Appraisal* Department for Communities and Local Government (2002)

[2] *RSPB Wallasea Island Wild Coast Project: Supplementary submission about the carbon sequestration potential of the proposed scheme* ABPmer 2009

[3] *RSPB Wallasea Island Wild Coast Project: Planning Consent Key Documents* ABPmer 2009

[4] *The London Plan* Greater London Authority 2011

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.03**

Volume 3: Project-wide effects assessment appendices

Appendix A.4; Annex D.8: EMOS Bournewood Inert landfill Site

APFP Regulations 2009: Regulation **5(2)(a)**

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January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Environmental Statement

Volume 3 Appendices: Project-wide effects assessment

Appendix A.4: Excavated materials options assessment

Annex D.8: Excavated materials options suitability report – Bournewood Inert Landfill Site

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1 Introduction

1.1.1 The construction of the Thames Tideway Tunnel project would require the excavation of a large volume of material at multiple sites throughout London. To identify the preferred options for the management of the excavated material a detailed options assessment has been undertaken.

1.1.2 The methodology for assessment of the excavated material options is based on the Sustainability Appraisal methodology[1]. The assessment has taken a phased approach and at each stage the least preferred options have been eliminated until the final most viable and sustainable options have been selected to form the planning stage preferred list. The options on the planning stage preferred list demonstrate the potential capacity to manage the excavated material in a sustainable manner. The assessment is based on the consistent assessment of options against agreed evaluation objectives throughout the process.

1.1.3 The steps informing the assessment process are:

a. Development of a long list of potential options for the treatment, reuse, recycling or disposal of excavated materials.

b. Viability filter involving the assessment of the long list against the operational evaluation objective associated with viability of the options.

c. Preliminary assessment to develop a short list of options which perform sufficiently well against all the evaluation objectives (environmental, social, operational, policy and health and safety).

d. Detailed assessment in which the options on the short list was further scrutinised to produce a planning stage preferred list of options which performance best against the full suite of evaluation objectives.

1.1.4 For each short listed option whose viability has been confirmed a detailed *Excavated materials option suitability (EMOS) report* has been produced. The *EMOS reports* provide a summary of the site operations and the overall performance of the option against the evaluation objectives.

1.1.5 This *EMOS report* sets out the detail assessment for Bournewood Inert Landfill, in Kent. The report provides the information gained during the detailed assessment stage of the *Excavated material options assessment* (*EMOA*) and the grades awarded against each evaluation indicator as part of this assessment. A grade is provided for each evaluation indicator, using an agreed set of evaluation criteria, against seven grades of impact (ranging from --- to +++). The *EMOS report* also provides a risk profile for the site identifying the key risks associated with the option in relation to accepting the Thames Tideway Tunnel project excavated material.

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2 Site description

2.1 Site location

2.1.1 Bournewood Inert Landfill is located to the west of Swanley in Kent. The site is accessed off the west bound carriage of the A20 and is less than 2.5km from junction 3 of the M25. It consists of a working Thanet Sand extraction quarry operated by Bournewood Sand & Gravel Ltd.

2.1.2 There is farmland on the northern and southern boundary of the receptor site. There is a school located approximately 500m to the south of the receptor site boundary. The ancient woodland of Bourne Wood is located on the western boundary of the receptor site. The receptor site is bounded to the east by the A20, the other side of which is the town of Swanley, with the nearest properties being less that 200m from the receptor site.

2.1.3 Bournewood Inert Landfill site location is shown in Plate 3.1.

2.2 Site operations

2.2.1 Extraction of Thanet sands continues at the receptor site. Material is needed to restore the extraction cells at the receptor site, including the area where the road and weighbridge are currently located.

2.2.2 Thames Tideway Tunnel project material would arrive at the receptor site by road and be driven directly to the restoration area of the required cell where it would then be tipped. Initial discussion with the site operator suggests that vehicles entering the receptor site would not pass over a weighbridge and deliveries would be managed on load by load basis, rather than on a weight basis.

2.3 Planning consent

2.3.1 The original planning consent for the receptor site was granted in October 2000 (DC/00/02071/FULL1) for the extraction of sands and subsequent restoration of the site by January 2011.

2.3.2 A variation to the planning consent was applied for in March 2010 (DC/10/00657/VAR). The variation was for the extraction of Thanet sand and restoration by disposal of inert (category A) waste without complying with conditions attached to planning consent DC/00/02071/FULL1.

2.3.3 The conditions in dispute were Conditions 1, 12 and 13 which related to time limit of the planning consent.

2.3.4 The variation was refused on 13 January 2011. Bournewood Sand and Gravel Ltd appealed against the decision. The Planning Inspectorate allowed the appeal and granted the planning permission on 21 June 2011 (decision reference: APP/G5180/A/11/2145860).

2.3.5 The consent is time limited and expires in January 2018. However the operator has commented that if the restoration of the receptor site has not

been completed by this date, then an extension would be sought from the Local Planning Authority.

2.3.6 The original consent allows material to be delivered between the hours of 7am and 7pm Monday to Friday and between 7am and 1pm on Saturdays.

2.4 Permitting

2.4.1 An EA permit (number: LP3335UG) was issued on 31July 2010.

2.4.2 The permit allows for the receptor site to receive 200,000tpa of inert and non hazardous wastes.

2.4.3 The receptor site can accept inert construction and demolition waste, and soils arising from construction and demolition waste that are classified as non-hazardous.

2.4.4 Section 14.2 details the type of materials which can be received at the receptor site.

3 Overall site summary

3.1.1 Table 3.1 below provides a summary of the Bournewood Inert Landfill and an assessment of its suitability against the evaluation objectives. Sections 4 to 18 of this *EMOS report* provide more detail on each evaluation objective.

Table 3.1 Summary of Bournewood Inert Landfill and its overall suitability

Site name:	Bournewood Inert Landfill Site (BOU)		**Owner/operator:**		Bournewood Sand & Gravel Ltd.		
Planning consent	Yes, until January 2018 - DC/00/02071/FULL1 and Ref DC/10/00657/VAR		**Permit**		Yes - LP3335UG		
Void capacity	1.7million m^3		**Throughput**		200,000tpa		
Recovery/disposal	Recovery						
Materials	**London clay**	✓	**Lambeth group**	✓	**Chalk**	✓	
Transport type	**Road**	✓	**Rail**	**X**	**Marine transport**	**X**	

Receptor site overview

Bournewood Sand & Gravel Ltd. operate a Thanet sand extraction quarry and inert landfill. It is accessed from the A20 bypass in Swanley, Kent. There are two cells within the receptor site; one of which remains in use for the extraction of sands and the other is currently in the process of being restored after available sands have previously been extracted. The receptor site requires the Thames Tideway Tunnel project material for restoration purposes. The receptor site has already started receiving material for restoration. The receptor site will be restored to agricultural land. Thames Tideway Tunnel project material would be delivered to the receptor site by road. The receptor site is approximately 23km from the Thames Tideway Tunnel project main tunnel drive sites.

Assessment

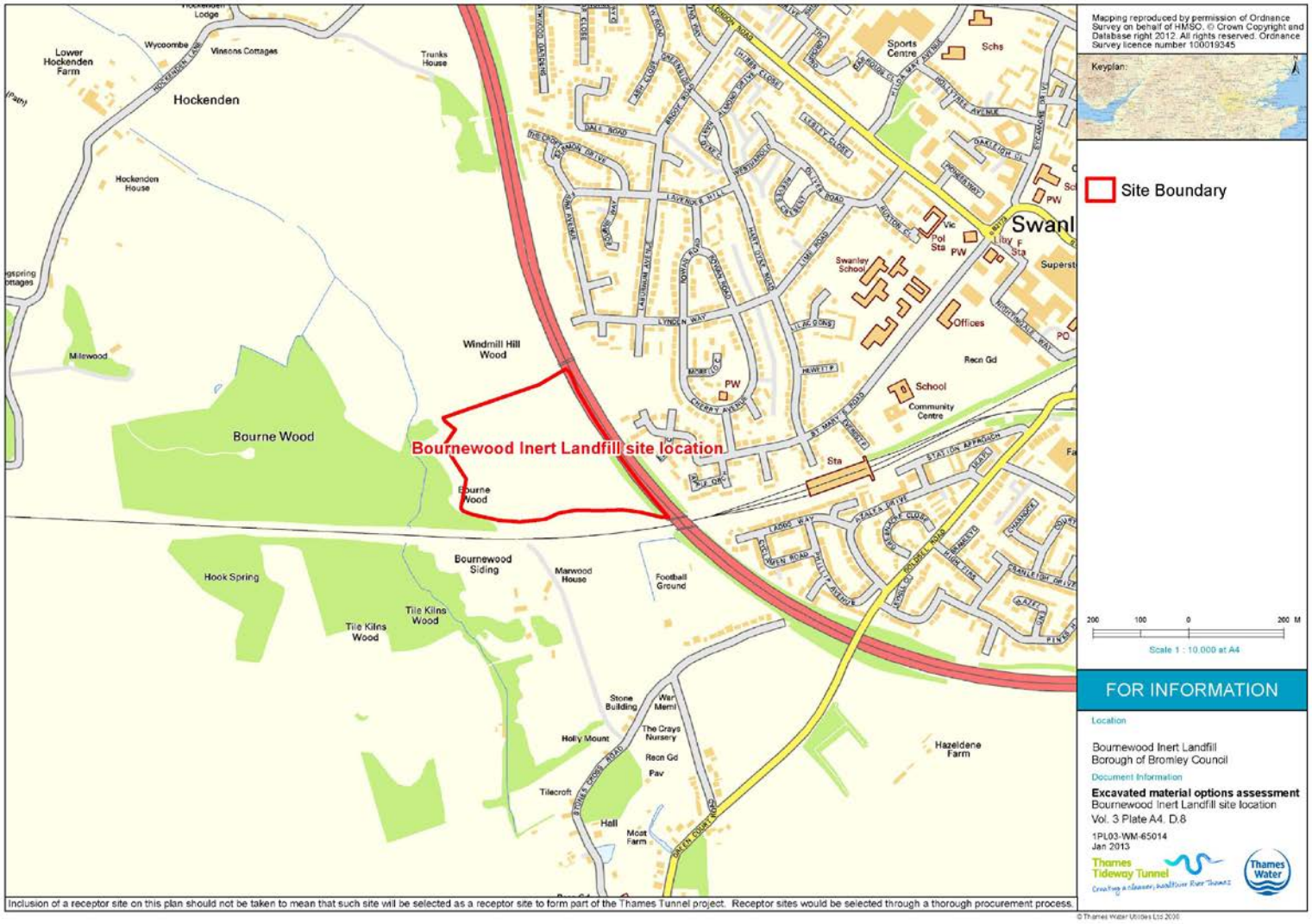
1. Land and other resources	a)	**0**	8. Cultural heritage	a)	**0**
	b)	**0**	9. Employment opportunities	a)	**0**
2. Climate change	a)	**0**		b)	**0**
	b)	**0**	10. Cost	a)	**++**
	c)	**+**	11. Operational suitability of the receptor site.	a)	**--**
3. Local amenity	a)	**0**		b)	**+++**
4. Landscapes and townscapes	a)	**0**		c)	**---**
	b)	**+**		d)	**-**
5. Access to open space	a)	**0**		e)	**+++**
	b)	**+**		f)	**--**
6.Water quality	a)	**0**	12. Waste hierarchy	a)	**+++**
	b)	**0**	13. Proximity principle	a)	**+**
7.Biodiversity	a)	**0**	14. Sustainable transport policy	a)	**--**
	b)	**0**	15. Health and safety good	a)	**0**

			practice		

Environmental summary
The acceptance of Thames Tideway Tunnel project material is within the receptor site's existing consents. Thames Tideway Tunnel project material would form part of the permitted operations at the receptor site. The deposition of material for restoration is unlikely to have a short term effect on the local amenity as the receptor site is already an operating quarry and inert landfill. In the long term the restoration of the receptor site will have a beneficial effect changing the area to agricultural land. The receptor site is approximately 23km from the Thames Tideway Tunnel project main tunnel drive sites.
Social summary
The restoration activities at the receptor site, to which Thames Tideway Tunnel project material would contribute, would lead to no job losses or gains over the short term. In the long term the operator would endeavour to transfer staff to an alternative site.
Operational summary
The receptor site would be available for two years of the Thames Tideway Tunnel project. Therefore, it is probable that the receptor site would be able to accept approximately 263,000t (6%) of the Thames Tideway Tunnel project material. The receptor site would be able to accept all of the inert excavated materials produced by the Thames Tideway Tunnel project. The receptor site does have the potential to process Thanet sands but given that there will be no Thanet sands produced in 2016 and only small amount produced in 2017 this is unlikely to be viable. The receptor site can only accept excavated material by road; however, it is connected to a strategic highway. The restoration of Bournewood Inert Landfill back to agricultural land would result in a beneficial use for all material accepted by the site[I]. Bournewood Sand & Gravel Ltd. operates a health and safety management plan at the receptor site. The receptor site has had no reported Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) incidents in the past three years of operations.
Overall suitability
The receptor site has the potential to provide a beneficial use for the excavated material received at the site. The receptor site has the ability to receive 6% of the Thames Tideway Tunnel project material up to January 2018. The receptor site has a beneficial or neutral grading for all evaluation indicators with the exception of some operational indicators and sustainable transport mode indicator. Bournewood Inert Landfill is included on the planning stage preferred list.

[I] Based on the *Excavated material options assessment (EMOA)* beneficial use test

Plate 3.1 Bournewood Inert Landfill site location



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4 Evaluation objective 1: To ensure prudent use of land and other resources

4.1.1 The receptor site currently sources material for quarry void fill and restoration from other construction projects around London and the South East of England.

4.1.2 Thames Tideway Tunnel project material would be used for restoration purposes. Thames Tideway Tunnel project material would replace the use of other reusable material.

4.1.3 The use of Thames Tideway Tunnel project material would not contribute to the requirement for additional land extending the receptor site's boundary.

4.1.4 The material would be used to restore the receptor site and to make it available for other uses e.g. agricultural.

4.1.5 Table 4.1 provides the grade given for evaluation objective 1 and the justification for the grade.

Table 4.1 Evaluation objective 1 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
1. To ensure prudent use of land and other resources	a) Extent to which resources such as sand, gravel and chalk are conserved by processing or storage of Thames Tideway Tunnel project material at receptor sites	0	Thames Tideway Tunnel project material is unlikely to affect virgin material use e.g. material replaces other reusable materials or no material substitution required.	Thames Tideway Tunnel project material would be used in the quarry restoration. Thames Tideway Tunnel project material would replace the use of other reusable material.
	b) Extent to which Thames Tideway Tunnel project material would effect landtake at (footprint of) receptor sites in the long term	0	The acceptance of Thames Tideway Tunnel project material would not contribute to the requirement for additional land extending the receptor site's boundary.	The Thames Tideway Tunnel project material would be used within the existing site boundary and would not contribute to a need for the receptor site to expand.

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5 Evaluation objective 2: To reduce climate change impacts

5.1.1 There is no carbon management plan currently in place at the receptor site nor are there measures to actively reduce any carbon emissions produced by the plant and equipment at the receptor site.

5.1.2 The excavated material would not be reprocessed into aggregate at the receptor site. Based on data from the Environment Agency's (EA) lifecycle analysis tool WRATE, the overall GhG emissions for deposition of excavated material to land is 3.17kg CO_2 eq per tonne of excavated material. The excavation material is assumed to be inert soil and the EA's WRATE emissions associated with material reception and spreading have been assumed.

5.1.3 The figures for GhG emissions from transport have been estimated based on:

a. the average CO_2 emissions for the different types of transport; and

b. the distance travelled from the Thames Tideway Tunnel sites to the receptor site.

5.1.4 The GhG emissions calculated are for comparative purposes only and do not provide an exact representation of the transport emissions associated with the Thames Tideway Tunnel project excavated material. Full GhG methodology and assumptions can be found in Appendix B.10

5.1.5 It has been estimated that using Bournewood Inert Landfill would produce 2.96kg CO_2 eq per tonne of excavated material accepted.

5.1.6 The EA flood risk maps indicate that the receptor site is located in an area that is unlikely to flood, therefore it is not anticipated that the restoration of the receptor site would have an effect on the flood risk at the receptor site.

5.1.7 Table 5.1 provides the grade given for evaluation objective 2 and the justification for the grade.

Table 5.1 Evaluation objective 2 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
2. To reduce climate change impacts	a) Greenhouse gases emitted through treatment, handling and use of Thames Tideway Tunnel project material at receptor sites (excludes transport)	**0**	Thames Tideway Tunnel project material would not require treatment and minimal handling required e.g. passive drying used and material moved by conveyor where possible.	There is no carbon management plan currently in place at the receptor site. The material would not require any treatment and there would be minimal handling.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent to which flood risk is altered by Thames Tideway Tunnel project material at the receptor site (or in the local catchment)	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not change flood risk (from any source or a combination of sources) to the site and surroundings.	The EA flood risk maps indicate that Bournewood Inert Landfill is outside the floodplain.
	c) Greenhouse gases emitted through transport of Thames Tideway Tunnel project material to the receptor sites	**+**	Through the transport of Thames Tideway Tunnel project material between 2 and less than or equal to 4kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.	Through the transport of Thames Tideway Tunnel project material 2.96kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.

6 Evaluation objective 3: To protect local amenity

6.1.1 The receptor site is not located within an Air Quality Management Area (AQMA).

6.1.2 There is a dust management plan in place for the receptor site, with measures to reduce the impact of dust including spraying haul roads and wheel washing.

6.1.3 The operator regularly maintains and/or replaces plant and equipment at the receptor site in order to reduce excessive noise or emissions these may produce.

6.1.4 The site operator suggested that there have not been any previous complaints with regards to amenity issues or dust at the receptor site.

6.1.5 Thames Tideway Tunnel project material is similar to material that is accepted at the receptor site and it is not anticipated that this would create any additional noise or air quality issues at the receptor site.

6.1.6 Table 6.1 provides the grade given for evaluation objective 3 and the justification for the grade.

Table 6.1 Evaluation objective 3 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
3. To protect local amenity	a) Extent of potential effects on local amenity from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have an effect on the local amenity or any effect would be negligible.	Thames Tideway Tunnel project material would form part of the existing operations at the receptor site. All material accepted at the receptor site would be within the consented levels thus would pose no additional nuisance impacts at the receptor site.

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7 Evaluation objective 4: To conserve landscape and townscapes at receiving locations

7.1.1 There is a housing estate less than 200m from the receptor site on the opposite side of the A20. There is screening along the boundary of the receptor site with the A20, which means the receptor site is not visible from the road.

7.1.2 The acceptance/deposit of Thames Tideway Tunnel project material would not be visible from the housing estate, with the exception of the visual impact of vehicles entering and exiting the site from the A20 carriageway.

7.1.3 In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute would be no more or less visible given the overall context of the existing site.

7.1.4 In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a minor beneficial effect on the landscape changing the area from a quarry and inert landfill to agricultural land. The receptor site is not visible from the nearby roads or receptors.

7.1.5 Table 7.1 provides the grade given for evaluation objective 4 and the justification for the grade.

Table 7.1 Evaluation objective 4 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
4. To conserve landscapes and townscapes at receiving locations	a) Extent of short term visual & landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have a short term effect on the local visual amenity at the receptor site or any effect would be negligible.	In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute would be no more or less visible given the overall context of the existing site.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of permanent visual & landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a permanent minor beneficial visual effect on the landscape, based on a 'do nothing' view of the site.	In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a minor beneficial effect on the landscape, changing the area from a quarry and inert landfill to agricultural land. The receptor site is not visible from the nearby roads or receptors.

8 Evaluation objective 5: To protect quality of and access to open space

8.1.1 There is a Public Right of Way (PRoW) that runs along the northeast and eastern boundary of the receptor site.

8.1.2 The receptor site is not currently accessible to the public. A PRoW which was previously on the receptor site was diverted in order to accommodate the receptor site operations.

8.1.3 In the short term the accessibility of the receptor site to the public will not change. It is not envisaged that the restoration works at the receptor site would disrupt the existing PRoW on the northeast and eastern boundary of the receptor site.

8.1.4 In the long term the receptor site would be restored to agricultural land so it would not be fully accessible to the public. However, it is anticipated that the diverted PRoW would be reinstated.

8.1.5 Table 8.1 provides the grade given for evaluation objective 5 and the justification for the grade.

Table 8.1 Evaluation objective 5 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
5. To protect quality of and access to open space	a) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the short term?	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or a negligible effect on access to and quality of open space and PRoWs.	The restoration works at the receptor site to which the Thames Tideway Tunnel project material would contribute would not disrupt the existing PRoW on the northeast and eastern boundary of the receptor site.
	b) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the long term?	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would slightly enhance a PRoW or improve the quality of and access to public open space.	When the receptor site is restored, it is anticipated that the diverted PRoW will be reinstated, providing access across part of the site. However the receptor site is to be restored to agricultural land so would not be fully accessible to the public.

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9 Evaluation objective 6: To protect water quality

9.1.1 There is a stream on the southern boundary of the receptor site and regular water monitoring tests are carried out on this watercourse to ensure that the quality is not affected by the receptor site operations.

9.1.2 Underlying the Thanet sands which are extracted by the quarry is chalk, which is classified by the EA as a major aquifer which needs to be protected from any potential contamination. The receptor site has a clay liner installed to protect the major aquifer.

9.1.3 There is also a drainage management scheme for the receptor site.

9.1.4 The receptor site is within a groundwater Source Protection Zone, which highlights groundwater sources such as wells, boreholes and springs used for public drinking water supply.

9.1.5 Based on the water management measures in place at the receptor site and the inert nature of the Thames Tideway Tunnel project material it is not anticipated that accepting Thames Tideway Tunnel project material would have an effect on the surrounding water courses and/or groundwater.

9.1.6 Table 9.1 provides the grade given for evaluation objective 6 and the justification for the grade.

Table 9.1 Evaluation objective 6 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
6. To protect water quality	a) Extent of potential effects on fluvial water quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on the local watercourses.	There is a stream to the southern boundary of the receptor site. It is not anticipated that the treatment, handling or use of the Thames Tideway Tunnel project material would have an effect on this watercourse. There are management operations in place which limit the impact of onsite activities on this watercourse.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of potential effects on groundwater quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on groundwater.	The receptor site is within a 'total catchment' groundwater SPZ. The landfill is clay lined and is managed to protect the groundwater.

10 Evaluation objective 7: To protect biodiversity

10.1.1 There are seven ancient woodlands within 2km of the receptor site, with the nearest being Bourne Wood which is located on the western boundary of the receptor site.

10.1.2 The closest Site of Special Scientific Interest (SSSI) with safeguarded biodiversity habitats is Ruxley Gravel Pits, which is situated 3km northwest of the receptor site.

10.1.3 In the short term, the handling and use of the Thames Tideway Tunnel project material as part of the existing operations at the receptor site is likely to have no or negligible effects on the ancient woodland on the western boundary of the receptor site. This is because there are measures including a dust management plan in place at the receptor site to minimise the effect on the woodlands within close proximity to the receptor site.

10.1.4 In the long term the exact nature of the habitats created will be dependent on the material used to restore the site. At this stage it is uncertain whether the habitats created through the restoration would have more or less ecological value than those currently present on the receptor site. The effect on the designated ancient woodland of the change in use from an operational quarry and landfill to agricultural land is also uncertain. Although it is considered unlikely that there would be an adverse effect on the woodland in the long term.

10.1.5 Table 10.1 provides the grade given for evaluation objective 7 and the justification for the grade.

Table 10.1 Evaluation objective 7 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
7. To protect biodiversity	a) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the short term	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	Thames Tideway Tunnel project material would form part of the restoration plans for the receptor site. There are measures in place at the receptor site including dust management to minimise the effect on the woodlands that are in close proximity to the receptor site.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the long term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would no or negligible effect on a designated site.	Thames Tideway Tunnel project material would form part of the restoration plans for the receptor site. The effect on the designated ancient woodland of the change in use from an operational quarry and landfill to agricultural land is uncertain. Although it is considered unlikely that there would be an adverse effect on the woodland in the long term.

11 Evaluation objective 8: To protect cultural heritage

11.1.1 There are no historic assets with 2km of the receptor site.

11.1.2 The nearest Scheduled Ancient Monument (SAM), Farningham Fort, is approximately 3km to the east of the receptor site.

11.1.3 It is not anticipated that the operations at the receptor site which Thames Tideway Tunnel project material would contribute to would have an impact with regards to cultural heritage as there are no historic assets with 2km of the receptor site.

11.1.4 Table 11.1 provides the grade given for evaluation objective 8 and the justification for the grade.

Table 11.1 Evaluation objective 8 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
8. To protect cultural heritage	a) Extent of potential effects on designated or nominated archaeological sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	The receipt of Thames Tideway Tunnel project material would not have an impact on cultural heritage receptors, as there are none identified within 2km of the receptor site.

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12 Evaluation objective 9: To provide employment opportunities

12.1.1 Operations at the receptor site have already commenced and there is a sufficient level of staff currently employed at the receptor site to manage the receipt and deposit of material at its current throughput.

12.1.2 The operator has commented that if during the delivery of Thames Tideway Tunnel project material additional staff were required to manage the throughput, then the operator would look to secure additional staff.

12.1.3 In the long term it is unlikely that any more jobs would be created at the site. In the future, it is likely that Bournewood Sand & Gravel Ltd would look to operate another site and transfer staff from the receptor site to this new site.

12.1.4 Table 12.1 provides the grade given for evaluation objective 9 and the justification for the grade.

Table 12.1 Evaluation objective 9 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
9. To provide employment opportunities	a) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the short term	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the short term.	Acceptance of Thames Tideway Tunnel project material would not contribute to any job gains in the short term.
	b) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the long term	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the long term.	In the long term it is unlikely that any jobs would be created or lost. When the receptor site is fully restored, the staff at the receptor site are likely to be transferred to other Bournewood Sand & Gravel Ltd sites.

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13 Evaluation objective 10: To minimise the cost of waste management

13.1.1 In order to compare the likely cost associated with transport and acceptance of the Thames Tideway Tunnel project material at each receptor site, a cost model was used.

13.1.2 The cost of transporting the excavated material has been calculated from the distance travelled and a cost per tonne/ km for the transport mode. The road transport haulage costs have been calculated from the quotes gathered from operators based on today's prices. A gate fee of £4 per tonne is assumed based on current prices. Full details of the assumptions made can be found at Appendix B.10.

13.1.3 It has been estimated that the cost of transporting and managing excavated material at Bournewood Inert Landfill is £12.74 per tonne of excavated material that can be accepted at the receptor site. These costs are predominantly associated with transfer of the material from the Thames Tideway Tunnel sites to the receptor site. This cost is an estimated cost for comparison purposes within the *EMOA* and may differ from the actual cost which would be agreed at the procurement stage if Thames Tideway Tunnel project material were to be taken to this receptor site.

13.1.4 Table 13.1 provides the grade given for evaluation objective 10 and the justification for the grade.

Table 13.1 Evaluation objective 10 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
10. To minimise the costs associated with the management of excavated material	a) Costs of transporting, handling, treating, reusing, managing and disposal	++	The transportation, treatment, handling and use of Thames Tideway Tunnel project material would cost between £10 and less than or equal to £13 per tonne	The cost of transportation, treatment, handling and use of Thames Tideway Tunnel project material has been estimated (using the *EMOA* cost model) to be £12.74 per tonne.

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14 Evaluation objective 11: To ensure operational suitability of the receptor site

14.1 Evaluation Indicator 11a) Timescales

14.1.1 The receptor site has planning consent for current activities to continue until January 2018.

14.1.2 Based on Thames Tideway Tunnel timescales of 2016 to 2021 and the existing throughput of the receptor site, Bournewood Inert Landfill would be available for use for Thames Tideway Tunnel project material for two years of the six year timetable.

14.1.3 Table 14.1 provides the grade given for evaluation objective 11a and the justification for the grade.

Table 14.1 Evaluation objective 11a grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	a) Likelihood of implementation within the required timescale.	--	The receptor site would be available for use for Thames Tideway Tunnel project material for greater than or equal to 20% but less than 40% of the required timescale	It is anticipated that the receptor site would be available to accept material until the end of 2017. The receptor site would be available to accept Thames Tideway Tunnel project material for two years out of the six year timetable.

14.2 Evaluation indicator 11b) Material characteristics

14.2.1 Bournewood Inert Landfill would be able to accept London Clay, chalk and Lambeth Group with sands, gravels and inert tunnel construction materials (piling and diaphragm wall arisings) for restoration.

14.2.2 Bournewood Inert Landfill has the necessary consent in place to accept excavated Thames Tideway Tunnel project material for quarry restoration, subject to chalk delivered meeting the ‘stick test’ requirements.

14.2.3 The materials delivered to the receptor site would be subject to standard WAC testing to ensure that it is inert material and therefore suitable to be accepted at the receptor site.

14.2.4 The site operator has agreed with the EA that chalk slurry can be accepted by the receptor site, subject to it passing a standard ‘stick test’. This test uses a stick to check whether a waste is a liquid by seeing if the waste “flows near instantaneously into a hollow in the surface of the waste”. This test is set out in the EA guidance on waste acceptance

procedures and criteria[2]. If a waste is not liquid it must be a sludge or solid. A waste that flows only slowly, rather than near instantaneously, into a hollow will be a sludge or a fine-grained solid and it is therefore not prohibited.

14.2.5 Table 14.2 details the European Waste Catalogue (EWC) codes relating to the materials permitted under Bournewood Inert Landfill's environmental permit, which are most relevant to the acceptance of the Thames Tideway Tunnel project excavated materials.

Table 14.2 Permitted inert waste types for Bournewood Inert Landfill

EWC code	Description
17 05 04	Soil and stones
17 09 04	Mixed constructions and demolition wastes other than those mentioned in 17 09 11, 17 09 02 and 17 09 03

14.2.6 Table 14.3 provides the grade given for evaluation objective 11b and the justification for the grade.

Table 14.3 Evaluation objective 11b grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	b) Acceptability of material with Thames Tideway Tunnel project material characteristics by the receptor sites	+++	The receptor site could accept for use all of the Thames Tideway Tunnel project material types based on their characteristics	The receptor site would be able to accept all the material types produced by the Thames Tideway Tunnel.

14.3 Evaluation indicator 11c) Capacity

14.3.1 The receptor site has permitted capacity to receive 200,000tpa of inert and non hazardous wastes. The receptor site is only available for Thames Tideway Tunnel project material in 2016 and 2017, thus the receptor site would be able to accept 400,000t in total. Table 14.4 details the permitted capacity for the receptor site in relation to the material that will be produced by the Thames Tideway Tunnel.

14.3.2 Table 14.4 also sets out the potential tonnage of Thames Tideway Tunnel project material accepted at the receptor site each year based on the assumptions used in the *EMOA* cost and GhG model. The receptor site would be able to accept 6% of the Thames Tideway Tunnel project excavated materials, based on the total amount of restoration material that it can accept and tonnages which are likely to be produced by the Thames Tideway Tunnel during the two years that it is available.

Table 14.4 Capacity for inert material at Bournewood Inert Landfill (tonnes[II])

	Year						Total
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	
Total Thames Tideway Tunnel production (tonnes)	63,000	549,000	1,938,000	1,852,000	147,000	155,000	4,704,000
Maximum permitted per annum (tonnes)	200,000	200,000	-	-	-	-	-
Potential Thames Tideway Tunnel project material accepted (tonnes)	63,000	200,000	-	-	-	-	263,000
Potential Thames Tideway Tunnel project material accepted (%)	100%	36%	0%	0%	0%	0%	6%

14.3.3 Table 14.5 provides the grade given for evaluation objective 11c and the justification for the grade.

Table 14.5 Evaluation objective 11c grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	c) Capacity of the receptor site to accept the required volume of Thames Tideway Tunnel project material (based on likely tonnage accepted)	---	The receptor site has capacity to accept material greater than or equal to 0% but less than 15% of Thames Tideway Tunnel	The receptor site has the potential to accept approximately 6% of the excavated material that would be produced by the Thames Tideway Tunnel.

14.4 Evaluation indicator 11d) Receptor site throughput

14.4.1 Thames Tideway Tunnel project material would be delivered to the receptor site by road.

14.4.2 The operator has suggested that the receptor site has previously managed over 350 vehicle movements (175 movements in, 175 movements out) in one day and there are no planning restrictions limiting the number of vehicle movements to and from the receptor site. For this assessment it is

[II] Figures quoted to the nearest 1,000 tonnes

assumed that the receptor site would receive 175 HGV deliveries of Thames Tideway Tunnel project material per day. On the basis that a HGV has capacity of 16t, and on current site traffic arrangements, the receptor site has the ability to receive 2,800t per day.

14.4.3 The amount of material produced by the Thames Tideway Tunnel project would vary on a daily and monthly basis. The assessment of throughput has been based on both the mean and peak production rates over the Thames Tideway Tunnel project construction period. The mean rate is taken as the mean monthly production rate taken over each year in the period 2016 to 2021. The peak rate is based on the month producing the maximum tonnage of excavated material in each year.

14.4.4 Table 14.6 details the proportion of the Thames Tideway Tunnel project material which would be accepted by Bournewood Inert Landfill over time.

14.4.5 In Year 1 of the excavation process Bournewood Inert Landfill's limit of 2,800t per day is sufficient to accept all average and peak tonnages produced during 2016. However, the receptor site would only be able to accept 200,000t of the 549,000t produced in 2017. In this year, the receptor site would be able to receive the average tonnage of Thames Tideway Tunnel project material, but not the peak daily tonnage. In Years 3 to 6, the receptor site would not be able to accept any Thames Tideway Tunnel project material produced based on the timescale.

Table 14.6 Throughput of material at Bournewood Inert Landfill

	Year					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Assumed HGV deliveries at receptor site per day (A)	175	175	-	-	-	-
Capacity per HGV (tonnes)	16	16	16	16	16	16
Thames Tideway Tunnel average daily tonnage*	250	2,050	7,200	6,850	550	550
Required number of HGVs to transport average daily tonnage (B)	16	128	450	429	35	35
Assumed vs Average Required Number of HGVs at receptor site (A ÷ B)	1120%	137%	0%	0%	0%	0%
Thames Tideway Tunnel peak daily tonnage**	350	3,050	10,750	10,300	800	850
Required number of HGVs to transport peak rate (C)	22	191	672	644	50	54
Assumed vs Peak number of HGVs at receptor site (A ÷ C)	800%	92%	0%	0%	0%	0%

***** *The Thames Tideway Tunnel average daily tonnage for each year is calculated as the mean of the daily rate each month assuming 22.5 days in each month.*

****** *The peak daily tonnage is based on the average daily tonnage (assuming a 22.5 day month) for the peak month of production in each year.*

14.4.6 Table 14.7 provides the grade given for evaluation objective 11d and the justification for the grade.

Table 14.7 Evaluation objective 11d grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	d) Ability of the receptor sites to accept Thames Tideway Tunnel project material at the anticipated rate (speed of material generation vs acceptance rate)	-	The receptor site could take greater than or equal to 2,800 but less than 4,600t per day of Thames Tideway Tunnel project material	The receptor site has the ability to receive 2,800t per day, based on the delivery of Thames Tideway Tunnel project material by HGV.

14.5 Evaluation indicator 11e) planning consent and permitting

14.5.1 Bournewood Inert Landfill has the necessary planning consent and environmental permit in place to accept excavated Thames Tideway Tunnel project material for restoration purposes.

14.5.2 Further information on the receptor site's planning consent and environmental permit can be found in Section 2.3 and 2.4.

14.5.3 Table 14.8 provides the grade given for evaluation objective 11e and the justification for the grade.

Table 14.8 Evaluation objective 11e grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	e) Site operations have appropriate planning/permitting consent	+++	The receptor site has planning consent and a relevant EA permit.	The receptor site has the relevant planning consent and environmental permit in place to be able to accept Thames Tideway Tunnel project material.

14.6 Evaluation indicator 11f) Transport modes

14.6.1 The receptor site would only accept Thames Tideway Tunnel project material via road.

14.6.2 The planning consent has restrictions on operating times that material can be delivered to the receptor site.

14.6.3 Table 14.9 provides the grade given for evaluation objective 11f and the justification for the grade.

Table 14.9 Evaluation objective 11f grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	f) Can accept excavated material from multiple transport modes	--	The receptor site is only accessible by one transport mode.	The receptor site can only accept material for restoration via road.

15 Evaluation objective 12: To conform to the waste hierarchy

15.1.1 The Thames Tideway Tunnel *Excavated materials and waste (EM&W) strategy* contains an objective to 'minimise waste arisings, maximise re-use, recovery, recycling and beneficial use and minimise the impact of waste on the environment and communities'.

15.1.2 The Thames Tideway Tunnel project material would be used to restore Bournewood Inert Landfill to agricultural land. This is considered to be beneficial use in line with the *EMOA* beneficial use test. Table 15.1 details the application of the *EMOA* beneficial use test applied to Bournewood Inert Landfill.

Table 15.1 Landfill restoration performance against *EMOA* beneficial use test

***EMOA* test**	**Does the receptor site comply with the test?**	**Comment**
The activity will lead to a beneficial use and bring land back into use or provide ecological benefit	Yes	Bournewood Inert Landfill will be restored to agricultural land.
In the case of quarries or landfill sites, the activity has a planning requirement to be restored	Yes	There is a planning requirement at Bournewood Inert Landfill to restore the Thanet Sands quarry.
The activity does not attract landfill tax	Yes	Bournewood Inert Landfill should be exempt from landfill tax because it is a quarry restoration project.
The material is suitable for its intended use and would not harm human health or the environment	Yes	Bournewood Inert Landfill would be able to accept all Thames Tideway Tunnel project non-hazardous excavated material, and if managed in accordance with the environmental permit the activities should not harm human health or the environment.
The minimum amount of material will being used	Yes	The material is being used for landraising in line with those agreed contours through the planning consent.
Alternative material (whether waste or not) would be required if Thames Tideway Tunnel project material was not to be used	Yes	Material would be sourced from elsewhere to restore this landfill.

15.1.3 All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 6% of the total Thames Tideway Tunnel project material.

15.1.4 Table 15.2 provides the grade given for evaluation objective 12 and the justification for the grade.

Table 15.2 Evaluation objective 12 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
12. To conform to waste hierarchy	a) Extent to which the option meets the *EM&W strategy* targets.	**+++**	Performance of receptor site substantially exceeds target.	All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 6% of the total Thames Tideway Tunnel project material.

16 Evaluation objective 13: To conform to the proximity principle

16.1.1 The receptor site is located 31km from Carnwath Road Riverside (clay), 25km from Kirtling Street (Lambeth Beds and Thanet Sands) and 22km from Chambers Wharf (chalk).

16.1.2 In accordance with the Thames Tideway Tunnel project *Transport Strategy* excavated material produced at these sites would be removed by marine transport and not by road. For the purposes of this assessment it has been assumed that the material would be taken from the drive sites by marine transport to a transhipment point and transferred to road at this location (IG11 0EG). The mean distance to the transhipment point from the drive sites is 20km by marine transport. The transhipment point is 30km from Bournewood Inert Landfill by road[III].

16.1.3 For this evaluation objective the receptor site was assessed using a straight line distance from the main drive sites. Using a straight line distance provides a consistent measure for assessment purposes. As the receptor site would be able to receive excavated materials from more than one drive site, the mean distance has been calculated. The receptor site was then graded according to this mean figure. The receptor site is approximately 23km in a straight line from the main drive sites.

16.1.4 Table 16.1 provides the grade given for evaluation objective 13 and the justification for the grade.

Table 16.1 Evaluation objective 13 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
13. To conform to proximity principle	a) Average distance from main tunnel drive sites.	+	The receptor site is between 40km and 20km from source of the Thames Tideway Tunnel project material.	The receptor site is approximately 23km (straight line distance) from the main drive sites.

[III] Distances quoted are those used in the *EMOA* GhG model. Details of the assumptions used in this model can be found in Appendix B.10. These distances are for context only and do not reflect the exact routes that would be used should this receptor site be used to accept Thames Tideway Tunnel project material.

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17 Evaluation objective 14: To conform to sustainable transport policy

17.1.1 The receptor site would only be accessed by road. However the receptor site does have direct access to a strategic highway, the A20.

17.1.2 *The London Plan 2011*[3] Policy 5.18 Construction, excavation and demolition states that "waste should be removed from construction sites and materials brought to the site, by water or rail transport wherever that is practicable." Thames Tideway Tunnel project material would need to be transferred to road at an intermodal transfer station to comply with this requirement.

17.1.3 *The Kent Minerals Local Plan: Construction Aggregates*[4] includes policies on how developments must consider access and the effects of vehicles travelling to and from the site to ensure that they would not adversely affect in a material way the safety and capacity of the highway network.

17.1.4 Material cannot be delivered by marine transport or rail.

17.1.5 Table 17.1 provides the grade given for evaluation objective 14 and the justification for the grade.

Table 17.1 Evaluation objective 14 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
14. To conform to sustainable transport policy	a) Conforms to policy objective to move transport of materials from road to rail or marine transport.	--	The receptor site can only be accessed by road and there is direct access to a strategic highway.	The receptor site can only be accessed by road and there is direct access to the A20, a strategic highway.

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18 Evaluation objective 15: To conform to health and safety good practice

18.1.1 Bournewood Sand & Gravel Ltd operates under health and safety procedures at the receptor site and also has a Health and Safety Management Plan in place.

18.1.2 Bournewood Sand & Gravel Ltd is not accredited to ISO18001.

18.1.3 There has been no reported RIDDOR incidents in the last three years at the receptor site.

18.1.4 Table 18.1 provides the grade given for evaluation objective 15 and the justification for the grade.

Table 18.1 Evaluation objective 15 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
15. To conform to health and safety good practice.	a) Health and safety performance conforms to good practice.	**0**	The receptor sites H&S system is not accredited and there have been five or less RIDDOR incidents in three years recorded at the receptor site.	The receptor site is not ISO 18001 accredited. However, there is a health and safety management plan and there have been no RIDDOR incidents in the past three years.

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References

[1] *A Practical Guide to the Strategic Environmental Assessment Directive* ODPM (September 2005); *Strategic Planning for Sustainable Waste Management: Guidance on Option Development and Appraisal* Department for Communities and Local Government (2002)

[2] Waste acceptance at landfills: Guidance on waste acceptance procedures and criteria, Environment Agency (Nov 2010)

[3] *The London Plan* Greater London Authority (2011)

[4] *The Kent Minerals Local Plan: Construction Aggregates (Adopted December 1993): Policies Saved After 27 September 2007* Kent County Council (2007)

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.03**

Volume 3: Project-wide effects assessment appendices

Appendix A.4; Annex D.9: EMOS Denham Quarry

APFP Regulations 2009: Regulation **5(2)(a)**

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Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Environmental Statement

Volume 3 Appendices: Project-wide effects assessment

Appendix A.4: Excavated materials options assessment

Annex D.9: Excavated materials options suitability report – Denham Quarry

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1 Introduction

1.1.1 The construction of the Thames Tideway Tunnel project would require the excavation of a large volume of material at multiple sites throughout London. To identify the preferred options for the management of the excavated material a detailed options assessment has been undertaken.

1.1.2 The methodology for assessment of the excavated material options is based on the Sustainability Appraisal methodology[1]. The assessment has taken a phased approach and at each stage the least preferred options have been eliminated until the final most viable and sustainable options have been selected to form the planning stage preferred list. The options on the planning stage preferred list demonstrate the potential capacity to manage the excavated material in a sustainable manner. The assessment is based on the consistent assessment of options against agreed evaluation objectives throughout the process.

1.1.3 The steps informing the assessment process were:

a. Development of a long list of potential options for the treatment, reuse, recycling or disposal of excavated materials.

b. Viability filter involving the assessment of the long list against the operational evaluation objective associated with viability of the options.

c. Preliminary assessment to develop a short list of options which perform sufficiently well against all the evaluation objectives (environmental, social, operational, policy and health and safety).

d. Detailed assessment in which the options on the short list was further scrutinised to produce a planning stage preferred list of options which performance best against the full suite of evaluation objectives.

1.1.4 For each short listed option whose viability has been confirmed a detailed *Excavated materials option suitability (EMOS) report* has been produced. The *EMOS reports* provide a summary of the site operations and the overall performance of the option against the evaluation objectives.

1.1.5 This *EMOS report* sets out the detail assessment for Denham Quarry, Buckinghamshire. The report provides the information gained during the detailed assessment stage of the *Excavated material options assessment (EMOA)* and the grades awarded against each evaluation indicator as part of this assessment. A grade is provided for each evaluation indicator, using an agreed set of evaluation criteria, against seven grades of impact (ranging from --- to +++). The *EMOS report* also provides a risk profile for the site identifying the key risks associated with the option in relation to accepting the Thames Tideway Tunnel project excavated material.

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2 Site description

2.1 Site location

2.1.1 Denham Quarry is located in Buckinghamshire approximately 26km from the Thames Tideway Tunnel drive sites and covers an area of approximately 60ha. The receptor site is located off Denham Road (A412), on land southwest of New Denham and south of the A412 between Junction 1 of the M40 motorway and Iver Heath.

2.1.2 The quarry is located in an agricultural and woodland setting.

2.1.3 The nearest properties to the receptor site are: Southland Manor 100m to the northwest; Brickfield Farm located on the northern boundary; and Watergate Farm approximately 250m to the south.

2.1.4 The centre of the receptor site is approximately 1km northwest of Uxbridge town centre.

2.1.5 Denham Quarry site location is shown in Plate 3.1 Denham Quarry site location.

2.2 Site operations

2.2.1 Planning consent was granted on 30 March 2007 to extract 2.4million tonnes of high-quality sand and gravel.

2.2.2 Denham Quarry will be progressively restored to a nature conservation and recreational area, including lakes.

2.2.3 On completion of the restoration work, Buckinghamshire County Council, as the landowner, will take on full responsibility for the long-term management and use of the site, including the development of recreational lakes and improvement of land for nature conservation purposes.

2.2.4 The site operator has also had discussions with the County Council to restore the land to agricultural land.

2.2.5 Thames Tideway Tunnel project material would arrive to the receptor site by road. The material would pass over the weighbridge and would be directed to the deposit location.

2.2.6 The receptor site currently extracts sand and gravel which are processed and sold. The receptor site would potentially process Thames Tideway Tunnel project materials, which are of suitable quality, through their existing infrastructure to produce an aggregate suitable for sale.

2.2.7 The receptor site has a requirement to import 644,000m^3 of inert material in order for it to be restored. The receptor site is currently receiving inert material from other construction, demolition and excavation projects within London and surrounding regions. Therefore in 2016 when the Thames Tideway Tunnel project would begin producing material, the total amount

of inert material still required for restoration is expected to be considerably reduced.

2.2.8 The receptor site has planning consent until March 2021 by which time the importation of inert material for restoration would be completed.

2.2.9 This *EMOS rep*ort is based on the receptor site using the Thames Tideway Tunnel project excavated material for restoration only and not processing the material in to graded aggregate product. This is due to the fact that the quality of the sands and gravels that would be produced by the Thames Tideway Tunnel project cannot currently be confirmed as suitable for processing. If the receptor site were to receive Thames Tideway Tunnel project material, an assessment would be made on its suitability to be processed on a load by load basis.

2.3 Planning consent

2.3.1 Planning consent for the extraction of sand and gravel at Denham Quarry was granted on 30th March 2007 (SBD/8201/06). The consent was subject to an undertaking from the Cabinet Member for Resources at Buckinghamshire County Council to control the restoration and aftercare of the site in terms of a Bird Management Plan. Further conditions were set in the planning consent which included requirements, amongst other items: to define the completion date for the site, control the hours of working, define and control the minimum depth of subsoil and topsoil, control the number of vehicle movements, and define landscaping, drainage and archaeological works.

2.3.2 The planning consent states the maximum daily vehicle movements shall not exceed 296 (148 in, 148 out). The site operator has confirmed that not all these movements would be made available for Thames Tideway Tunnel project material, as an average of 88 movements would be safeguarded for the export of aggregate from the receptor site. However, the site operator suggested that it might be possible to obtain consent for additional movements.

2.3.3 The hours of operation are 7:00am to 6:00pm Mondays to Fridays and 7:00am to 1:00pm on Saturdays and no operations on Sundays or Bank Holidays.

2.3.4 Development Control Committee Reports[2] state that it is proposed that inert waste materials would be imported to the site for restoration purposes.

2.3.5 The current planning consent was varied (11/01460/CM) to allow for the increase in the extraction of sands and gravels from the receptor site, and to extend the extraction date of the receptor site to 2020, but the required date for completion of restoration is 2021.

2.3.6 To allow for restoration the total quantity of inert material required to be imported to the receptor site for restoration is 644,000m^3.

2.4 Permitting

2.4.1 The environmental permit (BP3693MY) was issued in 2010. The permit allowed the deposit of 467,000m^3 of inert waste as a recovery operation.

2.4.2 The environmental permit was varied in March 2012 to increase the total permitted quantity, as part of the recovery operation, from 467,000m^3 to 644,000m^3.

2.4.3 Table 14.2 details the European Waste Catalogue (EWC) codes relating to the materials permitted under Denham Quarry's environmental permit, which is most relevant to the acceptance of the Thames Tideway Tunnel project excavated materials.

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3 Overall site summary

3.1.1 Table 3.1 below provides a summary of the Denham Quarry site and an assessment of its suitability against the evaluation objectives. Sections 4 to 18 of this *EMOS report* provide more detail on each evaluation objective.

Table 3.1 Summary of Denham Quarry and its overall suitability

Site name:	Denham Quarry (SUM)		**Owner/operator:**		Summerleaze	
Planning consent	Yes, until 2021 SBD/8201/06		**Permit**		Yes BP3693MY/A001	
Void capacity	644,000m^3		**Throughput**		1,664t per day[l]	
Recovery/ disposal	Recovery					
Materials	**London clay**	✓	**Lambeth group**	✓	**Chalk**	✓
Transport type	**Road**	✓	**Rail**	X	**Marine transport**	X

Receptor site overview

Denham Quarry is an operation sand and gravel quarry in Buckinghamshire, which is being progressively restored. Thames Tideway Tunnel project material would be used in the receptor site restoration. Planning consent for the receptor require restoration to be complete by 2021. The receptor site will be restored to a nature conservation and recreational area including lakes. Excavated material can be delivered by road and the site is located approximately 26km of the Thames Tideway Tunnel project main drive sites.

Assessment

1. Land and other resources	a)	0	8. Cultural heritage	a)	0
	b)	0	9. Employment opportunities	a)	+
2. Climate change	a)	0		b)	0
	b)	0	10. Cost	a)	0
	c)	0	11. Operational suitability of the receptor site	a)	++
3. Local amenity	a)	0		b)	++
4. Landscapes and townscapes	a)	0		c)	--
	b)	++		d)	--
5. Access to open space	a)	0		e)	+++
	b)	+++		f)	--
6.Water quality	a)	0	12. Waste hierarchy	a)	+++
	b)	0	13. Proximity principle	a)	+
7.Biodiversity	a)	0	14. Sustainable transport policy	a)	---
	b)	0	15. Health and safety good practice	a)	0

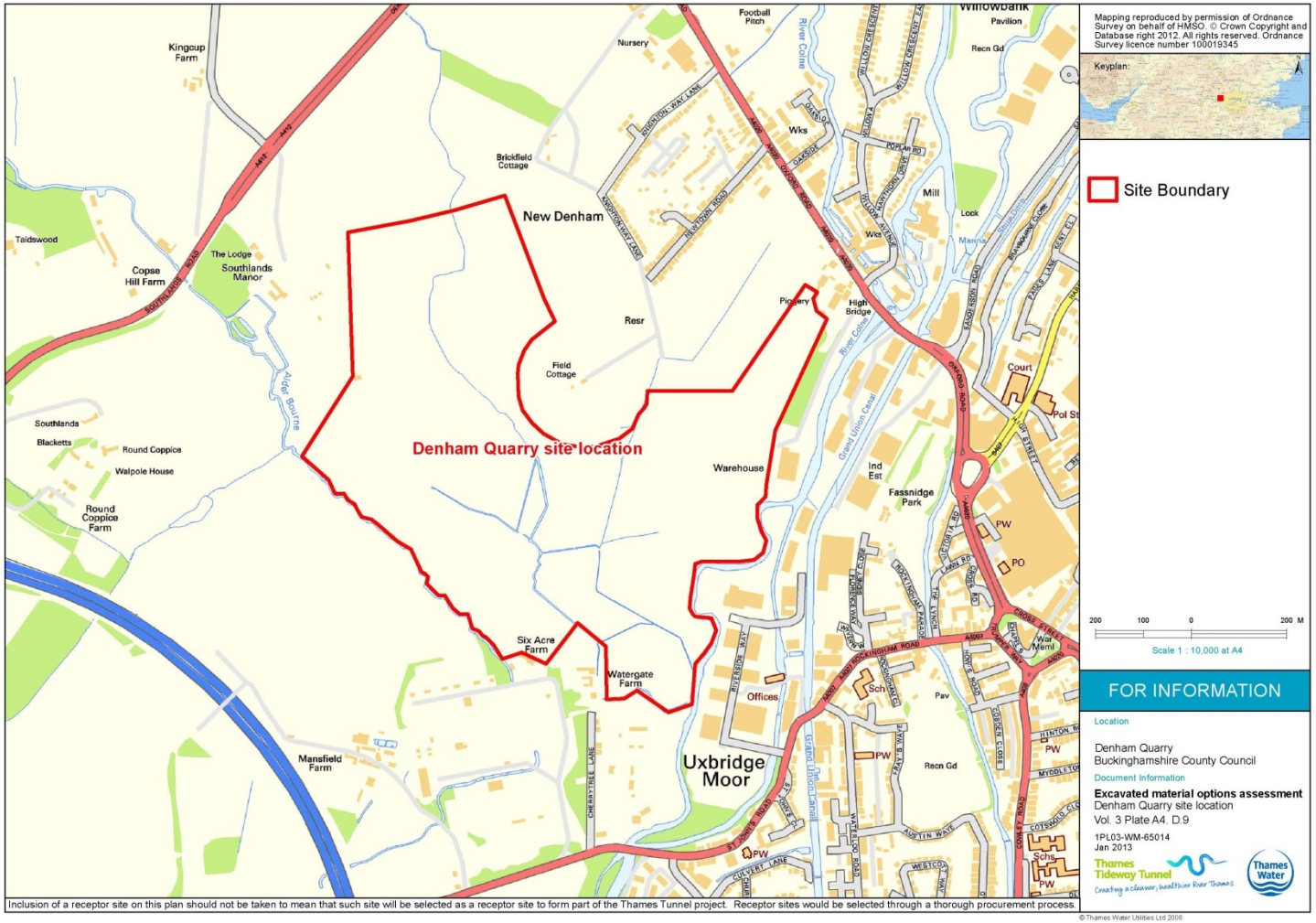
[l] Based on the consented vehicle movements that the operator would make available for Thames Tideway Tunnel project material. No maximum tonnage per annum is set in receptor site's environmental permit.

Environmental summary
The acceptance of Thames Tideway Tunnel project material is within the receptor site's existing consents and would form part of the permitted operations at the receptor site. In the short term it is therefore anticipated that the acceptance of Thames Tideway Tunnel project material is unlikely to have an additional effect on the environment beyond those of the existing operations. In the longer term, once the receptor site is fully restored it is anticipated that the creation of a nature conservation and recreational area including lakes would have a beneficial effect in creating and improving habitats, improve visual and local amenity, and increase public access to open space. The receptor site is a mean 26km from the main drive sites and can only accept material by road.
Social summary
The restoration activities at the receptor site, to which Thames Tideway Tunnel project material would contribute, would lead to minor job gains over the short term. It is likely that the receptor site will require two additional staff to handle and place of the Thames Tideway Tunnel project material. In the long term it is unlikely that there would be any jobs created or lost as it is possible that staff at the receptor site could be transferred to other Summerleaze operations. As part of the restoration scheme, routes for new footpaths/bridleways are proposed within the receptor site.
Operational summary
The receptor site has planning consent until March 2021. The receptor site has permitted capacity for a total of 644,000m^3 of inert material for restoration. The receptor site has already started accepting material for restoration thus the total amount of inert material required for restoration could be considerably reduced by the time the Thames Tideway Tunnel project starts producing material in 2016. It is anticipated that the receptor site would potentially be able to accept only 15% of the Thames Tideway Tunnel project material during the lifetime of Thames Tideway Tunnel project. The receptor site would be able to accept all types of the excavated materials produced by the Thames Tideway Tunnel project based on the planning consent and permit. Denham Quarry has a recovery permit issued by the Environment Agency. All Thames Tideway Tunnel project material accepted for restoration purposes at the receptor site and would be considered as beneficial use for all material accepted at the site[II]. The receptor site has a full health and safety management plan. Summerleaze do not operate to International Organisation for Standardisation (ISO):18001. The receptor site has had no reported Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) in the past three years of operations.
Overall suitability
Denham Quarry has the ability to receive only 15% of the Thames Tideway Tunnel project material up to 2021. The receptor site is on schedule to be completed before the deadline set in the planning consent. The receptor site has commenced restoration operations and thus the need for restoration material beyond 2016 is considerably reduced. However the receptor site could provide some capacity in the early years of the Thames Tideway Tunnel project. The receptor site has a beneficial

[II] Based on the *Excavated material options assessment (EMOA)* beneficial use test

or neutral grading for all other evaluation indicators with the exception of some of the operational indicators and the sustainable transport mode indicator). Denham Quarry is included on the planning stage preferred list.

Plate 3.1 Denham Quarry site location



4 Evaluation objective 1: To ensure prudent use of land and other resources

4.1.1 Currently material for the receptor site is sourced from other extraction projects around London, e.g. Crossrail. All material imported is excavated inert material from London and the surrounding areas.

4.1.2 Thames Tideway Tunnel project material would be used to restore the receptor site and to the site available for nature conservation and recreational use including lakes. The use of Thames Tideway Tunnel project material would replace the use of other reusable materials that would be used to infill the quarry.

4.1.3 The use of Thames Tideway Tunnel project material would not contribute to any requirement for additional land extending the receptor site's boundary.

4.1.4 Table 4.1 provides the grade given for evaluation objective 1 and the justification for the grade.

Table 4.1 Evaluation objective 1 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
1. To ensure prudent use of land and other resources	a) Extent to which resources such as sand, gravel and chalk are conserved by processing or storage of Thames Tideway Tunnel project material at receptor sites.	0	Thames Tideway Tunnel project material is unlikely to affect virgin material use e.g. material replaces other reusable materials or no material substitution required.	Thames Tideway Tunnel project material would be used in the quarry restoration. Thames Tideway Tunnel project material would replace the use of other reusable material.
	b) Extent to which Thames Tideway Tunnel project material would effect landtake at (footprint of) receptor sites in the long term.	0	The acceptance of Thames Tideway Tunnel project material would not contribute to the requirement for additional land extending the receptor site's boundary.	The Thames Tideway Tunnel project material would be used within the existing site boundary and would not contribute to a need for the receptor site to expand.

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5 Evaluation objective 2: To reduce climate change impacts

5.1.1 There are no systems at the receptor site to offset GhG. The receptor site has an Environmental Management System in place

5.1.2 The final restoration plans for the receptor site includes the provision of planting trees for the production of a biomass fuel.

5.1.3 The excavated material is unlikely to be reprocessed into aggregate at the receptor site. Based on data from the Environment Agency's (EA) lifecycle analysis tool WRATE, the overall GhG emissions for deposition of excavated material to land is 3.17kg CO_2 eq per tonne of excavated material. The excavation material is assumed to be inert soil and the EA's WRATE emissions associated with material reception and spreading have been assumed.

5.1.4 The figures for GhG emissions from transport have been estimated based on:

a. the average CO_2 emissions for the different types of transport; and

b. the distance travelled from the Thames Tideway Tunnel sites to the receptor site.

5.1.5 The GhG emissions calculated are for comparative purposes only and do not provide an exact representation of the transport emissions associated with the Thames Tideway Tunnel excavated material. Full GhG methodology and assumptions can be found in Appendix B.10.

5.1.6 It has been estimated that using Denham Quarry would produce 4.31kg CO_2 eq per tonne of excavated material accepted.

5.1.7 The receptor site is located in an area that has been designated by the Environment Agency with significant risk of flooding.

5.1.8 A flood risk assessment was carried out at the receptor site and following a detailed flood risk assessment the planning consent requires the site operator to provide flood water storage.

5.1.9 It is not anticipated that the flood risk at the receptor site would change when the receptor site is restored.

5.1.10 Table 5.1 provides the grade given for evaluation objective 2 and the justification for the grade.

Table 5.1 Evaluation objective 2 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
2. To reduce climate change impacts	a) Greenhouse gases emitted through treatment, handling and use of Thames Tideway Tunnel project material at receptor sites (excludes transport)	**0**	Thames Tideway Tunnel project material would not require treatment and minimal handling required e.g. passive drying used and material moved by conveyor where possible.	Thames Tideway Tunnel project material would not require any treatment and there would be minimal handling required at the receptor site.
	b) Extent to which flood risk is altered by Thames Tideway Tunnel project material at the receptor site (or in the local catchment).	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not change flood risk (from any source or a combination of sources) to the site and surroundings.	A flood risk assessment has been carried out at the receptor site and flood water storage areas will be provided to ensure that flood risks are reduced.
	c) Greenhouse gases emitted through transport of Thames Tideway Tunnel project material to the receptor sites.	**0**	Through the transport of Thames Tideway Tunnel project material between 4 and less than or equal to 6kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced	Through the transport of Thames Tideway Tunnel project material 4.31kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.

6 Evaluation objective 3: To protect local amenity

6.1.1 The receptor site is not located within an Air Quality Management Area (AQMA).

6.1.2 There are three monitoring stations at the receptor site for noise and dust.

6.1.3 There is the potential for dust to be generated from the delivery of Thames Tideway Tunnel project material but measures in at the receptor site to ensure that any effects are managed. This includes spraying haul roads and wheel washing. All receptor site roads are made roads to reduce any dust generation.

6.1.4 There are measures at the receptor site to reduce any effects on air quality and noise thus the Thames Tideway Tunnel material project is likely to have a negligible or no effect on nearby receptors in comparison to baseline conditions, as material would be imported for restoration regardless of whether it would be sourced from Thames Tideway Tunnel project activities.

6.1.5 Table 6.1 provides the grade given for evaluation objective 3 and the justification for the grade.

Table 6.1 Evaluation objective 3 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
3. To protect local amenity	a) Extent of potential effects on local amenity from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have an effect on the local amenity or any effect would be negligible.	Thames Tideway Tunnel project material would form part of the existing operations at the receptor site. All material accepted at the receptor site would be within the consented levels thus would pose no additional nuisance impacts at the receptor site. There are operational measures at the receptor site such as spraying haul roads for dust suppression to reduce nuisance to surrounding receptors.

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7 Evaluation objective 4: To conserve landscape and townscapes at receiving locations

7.1.1 The receptor site has been operational since 2009 and is well screened so operations are not visible to local receptors.

7.1.2 New Denham is 350m to the east of the receptor site and there are other residential properties to the west of the receptor site. The site is in close proximity to the major road network including the M40 and M25.

7.1.3 The receptor site is not in an Area of Outstanding Natural Beauty (AONB).

7.1.4 In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would be no more or less visible given that there are bunds and mature trees located along the receptor site boundary in place to screen the receptor site operations.

7.1.5 In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape changing the area from a nature conservation and recreational area, including lakes.

7.1.6 Table 7.1 provides the grade given for evaluation objective 4 and the justification for the grade.

Table 7.1 Evaluation objective 4 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
4. To conserve landscapes and townscapes at receiving locations.	a) Extent of short term visual and landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have a short term effect on the local visual amenity at the receptor site or any effect would be negligible.	In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would be no more or less visible given that there are bunds in place to screen the receptor site operations.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of permanent visual and landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a permanent moderate beneficial visual effect on the landscape, based on a 'do nothing' view of the site.	In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape changing the area from a quarry to a nature conservation and recreational area, including lakes.

8 Evaluation objective 5: To protect quality of and access to open space

8.1.1 There are no Public Rights of Way (PRoWs) within the receptor site. However there is a public footpath that runs along the receptor site's northern boundary.

8.1.2 There is currently no public access to the receptor site.

8.1.3 In the short term during restoration, there would be no change to public access to the receptor site.

8.1.4 In the long term, the receptor site will be restored to a nature conservation and recreational area, including lakes and the public will have access to the receptor site. As part of the restoration scheme routes for new footpaths/bridleways are proposed within the receptor site.

8.1.5 Table 8.1 provides the grade given for evaluation objective 5 and the justification for the grade.

Table 8.1 Evaluation objective 5 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
5. To protect quality of and access to open space	a) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the short term?	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or a negligible effect on access to and quality of open space and PRoWs.	The receptor site is not accessible to the public and therefore the use of Thames Tideway Tunnel project material would not affect the quality of open space and PRoWs.
	b) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the long term?	+++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would constitute a major enhancement to the PRoW and substantially increase accessibility to public open space.	The receptor site will be restored to a nature conservation and recreational area, including lakes, with full public access. This will substantially increase the public accessibility to the receptor site which has previously, and during its restoration not been accessible to the public.

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9 Evaluation objective 6: To protect water quality

9.1.1 There are three large lakes on the receptor site, which are the result of the gravel and sand extraction operations.

9.1.2 The River Colne runs along the eastern boundary of the receptor site. The River Alderbourne forms the western receptor site boundary. Rusholt Brook that used to flow southward through the receptor site has permanently been diverted around the eastern boundary of the receptor site.

9.1.3 To prevent material entering the rivers there is a 30m buffer zone between the receptor site operations and River Colne and Alderbourne.

9.1.4 There is a surface water management plan on the receptor site including creating settlement ponds, temporary sumps and catch pits to ensure that drainage and water is managed appropriately at the receptor site.

9.1.5 The receptor site is not in a groundwater Source Protection Zone (SPZ), which highlights groundwater sources such as wells, boreholes and springs used for public drinking water supply.

9.1.6 Based on the water management systems in place at the receptor site and the inert nature of the Thames Tideway Tunnel project material it is not anticipated that accepting Thames Tideway Tunnel project material would have an effect on the surrounding water courses and/or groundwater.

9.1.7 Table 9.1 provides the grade given for evaluation objective 6 and the justification for the grade.

Table 9.1 Evaluation objective 6 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
6. To protect water quality	a) Extent of potential effects on fluvial water quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on the local watercourses.	There are surface water management practices carried out at the receptor site. It is not anticipated that the treatment, handling or use of the Thames Tideway Tunnel project material would have an effect on the local water courses.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of potential effects on groundwater quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on groundwater.	There are water management systems in place at the receptor site. The receptor site is not in a groundwater SPZ and the treatment, handling or use of the Thames Tideway Tunnel project material at the receptor site is likely to have no or negligible effect on groundwater.

10 Evaluation objective 7: To protect biodiversity

10.1.1 The Kingcup Meadows a Site of Special Scientific Interest (SSSI) lies approximately 200 metres to the northwest of the receptor site.

10.1.2 The land on the eastern side of the River Colne opposite the receptor site forms part of a 'Site of Borough Importance' for nature conservation within the Borough of Hillingdon (Uxbridge Moor).

10.1.3 The receptor site is under the flight path of RAF Northolt, and therefore birds are actively discouraged from the receptor site to prevent bird strike. This does include bird scaring and shooting.

10.1.4 Restoration of the receptor site to a nature conservation and recreational area, including lakes will maximise its ecological potential.

10.1.5 To assist in minimising the risk of bird strike the receptor site will have deep areas of water with limited vegetation to reduce the potential for use by large, flocking, water birds. Woodland and grassland will also reduce the use of the receptor site by water fowl and large flocks of birds.

10.1.6 In the short term, the handling and use of the Thames Tideway Tunnel project material as part of the existing operations at the receptor site is likely to have no or negligible effects on the designated site or habitats in close proximity to the receptor site. There are management plans on site to prevent impact on habitats whilst restoration occurs

10.1.7 In the long term the receptor site will be restored to a nature conservation and recreational area, including lakes. New habitats would be created and species will be actively encouraged onto the receptor site. However the exact nature of the habitats created will be dependent on the material used to restore the site. At this stage it is not possible to assess whether the habitats created through the restoration would have more or less ecological value than those currently present on the receptor site.

10.1.8 Table 10.1 provides the grade given for evaluation objective 7 and the justification for the grade.

Table 10.1 Evaluation objective 7 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
7. To protect biodiversity	a) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the short term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on	Thames Tideway Tunnel project material would form part of the restoration plans for the receptor site. There are management plans on site to prevent impact on habitats whilst restoration occurs.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
			a designated site.	
	b) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the long term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	In the long term, the receptor site will be restored to a nature conservation and recreational area, including lakes. Habitats would be created through the restoration of the receptor site. It is not possible to assess whether these would be of higher ecological value than the existing habitats.

11 Evaluation objective 8: To protect cultural heritage

11.1.1 There are no Scheduled Ancient Monuments (SAMs) within 2km of the receptor site.

11.1.2 There are no Registered Parks and Gardens or Battlefields within 2km of the receptor site.

11.1.3 There are two listed buildings approximately 150m from the receptor site; these are Southlands Manor and a barn part of the Southlands Manor complex.

11.1.4 The receptor site is screened from the Manor by existing hedges and a two metre fence. It is not anticipated that the operations at the receptor site would not have an impact on either the listed buildings or their setting.

11.1.5 The receptor site is of some archaeological interest and includes areas where prehistoric flint scatters have been found. In discussions with Buckinghamshire County Council, an outline management programme been drawn up to ensure that any archaeological areas found at the receptor site are protected.

11.1.6 Restoration has already commenced at the receptor site and there are measures in place at the receptor site including dust and noise control measures to ensure that any nuisance is minimised.

11.1.7 Table 11.1 provides the grade given for evaluation objective 8 and the justification for the grade.

Table 11.1 Evaluation objective 8 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
8. To protect cultural heritage	a) Extent of potential effects on designated or nominated archaeological sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	The treatment, handling or use of Thames Tideway Tunnel project material at the receptor site is likely to have no or negligible impact on the listed buildings in close proximity to the receptor site as there are measures in place to ensure that any nuisance is minimised.

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12 Evaluation objective 9: To provide employment opportunities

12.1.1 It is likely that the receptor site will require two additional staff at the receptor site to manage the handling and placement of Thames Tideway Tunnel project material.

12.1.2 In the long term it is unlikely that there would be any jobs created or lost. It is possible that staff at the receptor site could be transferred to other Summerleaze operations. It is anticipated that new jobs would be created at the nature conservation area. However details of these positions and the numbers which may be required are not currently confirmed.

12.1.3 Table 12.1 provides the grade given for evaluation objective 9 and the justification for the grade.

Table 12.1 Evaluation objective 9 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
9. To provide employment opportunities	a) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the short term	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would lead to minor job gains over the short term of less than ten jobs.	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would generate two jobs over the short term.
	b) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the long term	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the long term.	In the long term it is unlikely that any jobs would be created or lost as staff would be transferred to other Summerleaze sites.

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13 Evaluation objective 10: To minimise the cost of waste management

13.1.1 In order to compare the likely cost associated with transport and acceptance of the Thames Tideway Tunnel project material at each receptor site a cost model was used.

13.1.2 The cost of transporting the excavated material is calculated from the distance travelled and a cost per tonne/ km for each of the transport modes (road, marine transport and rail). The road, rail and marine transport haulage costs are calculated from the quotes gathered from operators based on today's prices. A gate fee of £4 per tonne is assumed based on current prices. Full details of the assumptions made can be found at Appendix B.10.

13.1.3 It has been estimated that the cost of transporting and managing excavated material at Denham Quarry is £16.70 per tonne of excavated material that can be accepted at the receptor site. These costs are predominantly associated with transfer of the material from the Thames Tideway Tunnel sites to the receptor sites. This cost is an estimated cost for comparison purposes within the *EMOA* and may differ from the actual cost which would be agreed at the procurement stage if Thames Tideway Tunnel project material were taken to this receptor site.

13.1.4 Table 13.1 provides the grade given for evaluation objective 10 and the justification for the grade.

Table 13.1 Evaluation objective 10 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
10. To minimise the costs associated with the management of excavated material	a) Costs of transporting, handling, treating, reusing, managing and disposal.	**0**	The transportation, treatment, handling and use of Thames Tideway Tunnel project material would cost between £16 and less than or equal to £19 per tonne	The cost of transportation, treatment, handling and use of Thames Tideway Tunnel material has been estimated (using the EMOA cost model) to be £16.70 per tonne.

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14 Evaluation objective 11: To ensure operational suitability of the receptor site

14.1 Evaluation indicator 11a) Timescales

14.1.1 The receptor site has planning consent until March 2021.

14.1.2 Based on Thames Tideway Tunnel excavation timescales of 2016 to 2021, Denham Quarry would be available for use for Thames Tideway Tunnel project material for five years.

14.1.3 However the receptor site has already started accepting material for restoration and in 2016 when the Thames Tideway Tunnel project begins producing material, the quantity of inert material required to complete the restoration is likely to be considerably reduced.

14.1.4 Table 14.1 provides the grade given for evaluation objective 11a and the justification for the grade

Table 14.1 Evaluation objective 11a grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	a) Likelihood of implementation within the required timescale.	++	The receptor site would be available for use for Thames Tideway Tunnel project material for 100% of the required timescale	The receptor site has planning consent until the beginning of 2021. Based on the receptor sites planning consent it would be available to accept Thames Tideway Tunnel material for five years.

14.2 Evaluation indicator 11b) Material characteristics

14.2.1 Denham Quarry would be able to accept London Clay, chalk and Lambeth Group with sands, gravels for restoration.

14.2.2 The receptor site has the potential to receive all inert Thames Tideway Tunnel project excavated material types. The material would be subject to acceptance criteria testing to ensure that the material is inert.

14.2.3 Denham Quarry has the necessary environmental permit in place to accept clean inert excavated Thames Tideway Tunnel project material for landfill restoration. Details are set out in the receptor site's environmental permit.

14.2.4 Table 14.2 details the European Waste Catalogue (EWC) codes relating to the materials permitted under Denham Quarry's environmental permit, which is most relevant to the acceptance of the Thames Tideway Tunnel project excavated materials.

Table 14.2 Permitted waste types and quantities accepted at Denham Quarry

Exclusions Wastes having any of the following characteristics shall not be accepted: a. Consisting mainly or solely of dusts, powders or loose fibres b. Hazardous wastes c. Wastes in liquid form	
Maximum quantities 644,000m^3	
Waste code	**Description**
01	**Wastes resulting from exploration, mining, quarrying and physical and chemical treatment of minerals**
01 01	Wastes from mineral excavation
01 01 02	Wastes from non- metaliferous excavation
01 04	Wastes from physical and chemical processing of non-metaliferous minerals
01 04 08	Waste gravel and crushed rocks other than those mentioned in 01 04 07
01 04 09	Waste sand and clays
17	**Construction and demolition wastes (including excavated soil from contaminated land)**
17 01	Concrete, bricks, tiles and ceramics
17 01 01	Concrete
17 01 02	Bricks
17 01 03	Tiles and ceramics
17 01 07	Mixtures of concrete bricks, tiles and ceramics other than those mentioned in 17 01 06
17 05	Soils (excluding soils from excavated sites), stones and dredgings
17 05 04	Soils and stones including chalk other than those mentioned in 17 05 03
19	**Wastes from waste management facilities, off site waste water treatment plants and preparation of water intended for human consumption / industrial waste**
19 12	Wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, palletising) not otherwise specified
19 12 09	Minerals (for example sand and stones)
20	**Municipal wastes (household waste and similar commercial industrial and institutional wastes) including separately collected fractions**
20 02	Garden and park wastes (including cemetery waste)
20 02 02	Soils and stones

14.2.5 Denham Quarry has the necessary consent in place to accept excavated Thames Tideway Tunnel project material for restoration.

14.2.6 Table 14.3 provides the grade given for evaluation objective 11b and the justification for the grade.

Table 14.3 Evaluation objective 11b grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	b) Acceptability of material with Thames Tideway Tunnel project material characteristics by the receptor sites.	++	The receptor site could accept for use four Thames Tideway Tunnel project material types based on their characteristics including: London Clay, Lambeth Group and chalk.	The receptor site can only accept excavated Thames Tideway Tunnel project material.

14.3 Evaluation indicator 11c) Capacity

14.3.1 The receptor site is permitted to accept 644,000m^3 (approximately 792,000t) of inert material for restoration. The site operator believes that they may have used a proportion of this capacity prior to 2017, but this is dependent on both the market demand for aggregates and restoration capacity. For this assessment it is assumed that there would remain a capacity of 644,000m^3 of inert material for restoration at the receptor site.

14.3.2 Table 14.4 details the estimated capacity for the receptor site in relation to the material that would be produced by the Thames Tideway Tunnel project.

14.3.3 It could be considered that annual capacity of the receptor site would be determined by the throughput capacity, assesses in indicator 11d below.

14.3.4 Table 14.4 also sets out the potential tonnage of Thames Tideway Tunnel project material accepted at the receptor site each year based on the assumptions used in the *EMOA* cost and GhG model. The model assumed that restoration material would be accepted directly by road from the CSO sites and that materials barged to the transhipment point would not taken to Denham Quarry as it is 55km by road.

14.3.5 The receptor site would therefore be able to accept 15% of the Thames Tideway Tunnel project excavated materials, based on the total amount of restoration material that it can accept and tonnages which are likely to be produced by the Thames Tideway Tunnel project during the five years that it is available.

Table 14.4 Capacity for inert material at Denham Quarry (tonnes[III])

	Year						Total
	2016	2017	2018	2019	2020	2021	
Total Thames Tideway Tunnel production (tonnes)	63,000	549,000	1,938,000	1,852,000	147,000	155,000	4,704,000
Estimated tpa[IV]	450,000	450,000	450,000	450,000	450,000	450,000	Up to a maximum of 715,000
Potential Thames Tideway Tunnel project material accepted (tonnes)	63,000	175,000	262,000	199,000	8,000	-	707,000
Potential Thames Tideway Tunnel project material accepted (%)	100%	32%	14%	11%	5%	0%	15%

14.3.6 Table 14.5 provides the grade given for evaluation objective 11c and the justification for the grade.

Table 14.5 Evaluation objective 11c grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	c) Capacity of the receptor site to accept the required volume of Thames Tideway Tunnel project material (based on likely tonnage accepted).	--	The receptor site has capacity to accept material greater than or equal to 15% but less than 30% of Thames Tideway Tunnel project material.	The receptor site would have the potential to accept approximately 15% of the excavated material that would be produced by the Thames Tideway Tunnel.

[III] Figures quoted to the nearest 1,000 tonnes

[IV] Tonnage estimates are based on available vehicle numbers

14.4 Evaluation indicator 11d) Receptor site throughput

14.4.1 Thames Tideway Tunnel project material would be delivered by road to the receptor site. The receptor site has planning consent for 296 HGV movements per day (148 in / 148 out).

14.4.2 These vehicle movements will include those delivering material for reprocessing at the site, as well as those exporting the extracted aggregate. The operator confirmed that on average there are 88 HGV movements per day which relate to these materials and would safeguard these movements during the Thames Tideway Tunnel project. Therefore the site could accept 104 HGV deliveries per day of Thames Tideway Tunnel project material.

14.4.3 Based on an average HGV capacity of 16t per vehicle the receptor site has the ability to receive approximately 1,700t per day.

14.4.4 The amount of material produced by the Thames Tideway Tunnel project would vary on a daily and monthly basis. The assessment of throughput has been based on both the mean and peak production rates over the Thames Tideway Tunnel project construction period. The mean rate is taken as the mean monthly production rate taken over each year in the period 2016 to 2021. The peak rate is based on the month producing the maximum tonnage of excavated material in each year.

14.4.5 Table 14.6 details the proportion of the Thames Tideway Tunnel project material which could be accepted by Denham Quarry over time.

14.4.6 In Years 1 and 5 of the excavation process, Denham Quarry's limit of approximately 1,700t per day is sufficient to accept all of the average and peak daily deliveries of Thames Tideway Tunnel project material produced. However, in Years 2, 3 and 4 the receptor site would not be able to receive either the peak or average daily amount of Thames Tideway Tunnel project material produced.

Table 14.6 Throughput of material at Denham Quarry

	Year					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Maximum allowable number of HGV deliveries at receptor site per day (A)	104	104	104	104	104	-
Capacity per HGV (tonnes)	16	16	16	16	16	16
Thames Tideway Tunnel project average daily tonnage*.	250	2,050	7,200	6,850	550	550
Required number of HGVs to transport average daily tonnage (B).	16	128	450	428	34	34
Allowable vs Average Required Number of HGVs at receptor site (A ÷ B).	666%	81%	23%	24%	302%	0%

	Year					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Thames Tideway Tunnel peak daily tonnage**.	350	3,050	10,750	10,300	800	850
Required number of HGVs to transport peak rate (C).	22	191	672	644	50	53
Allowable vs Peak Number of trains at receptor site (A ÷ C).	475%	55%	16%	16%	208%	0%

***** *The Thames Tideway Tunnel average daily tonnage for each year is calculated as the mean of the daily rate each month assuming 22.5 days in each month.*

****** *The peak daily tonnage is based on the mean daily tonnage (assuming a 22.5 day month) for the peak month of production in each year.*

14.4.7 Table 14.7 provides the grade given for evaluation objective 11d and the justification for the grade.

Table 14.7 Evaluation objective 11d grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	d) Ability of the receptor sites to accept Thames Tideway Tunnel project material at the anticipated rate (speed of material generation vs acceptance rate)	--	The receptor site could take greater than or equal to 1,000 but less than 2,800t per day of Thames Tideway Tunnel project material	The receptor site has the ability to receive approximately 1,700t per day, based on the delivery of Thames Tideway Tunnel project material by HGV.

14.5 Evaluation indicator 11e) Planning consent and permitting

14.5.1 Denham Quarry has the necessary planning consent and Environmental Permit in place to accept excavated Thames Tideway Tunnel material for quarry restoration.

14.5.2 Further information on the receptor site's planning consent and permit can be found in Section 2.3 and 2.4.

14.5.3 Table 14.8 provides the grade given for evaluation objective 11e and the justification for the grade.

Table 14.8 Evaluation objective 11e grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	e) Site operations have appropriate planning/permitting consent.	+++	The receptor site has planning consent and a relevant EA permit.	The receptor site has the relevant planning consent and environmental permit in place to be able to accept Thames Tideway Tunnel project material.

14.6 Evaluation indicator 11f) Transport modes

14.6.1 The receptor site can only accept Thames Tideway Tunnel project material via road.

14.6.2 There are restrictions on HGV movements which shall not exceed 296 HGV movements per day (148 in / 148 out). After safeguarding a proportion of these movements for exporting aggregate from the receptor site, 208 HGV movements per day would be made available for the delivery of Thames Tideway Tunnel project material.

14.6.3 Table 14.9 provides the grade given for evaluation objective 11f and the justification for the grade.

Table 14.9 Evaluation objective 11f grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	f) Can accept excavated material from multiple transport modes.	--	The receptor site is only accessible by one transport mode.	The receptor site can only accept material for restoration via road.

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15 Evaluation objective 12: To conform to the waste hierarchy

15.1.1 The Thames Tideway Tunnel *Excavated materials and waste (EM&W) strategy* contains an objective to 'To minimise waste arisings, maximise re-use, recovery, recycling and beneficial use and minimise the impact of waste on the environment and communities'.

15.1.2 The Thames Tideway Tunnel project material would be used to restore Denham Quarry to a nature conservation and recreational area, including lakes by infilling the existing quarry void. This is considered to be beneficial use in line with the *EMOA* beneficial use test. Table 15.1 details the application of the *EMOA* beneficial use test applied to Denham Quarry.

15.1.3 Denham Quarry has been issued with a recovery permit by the Environment Agency.

Table 15.1 Quarry restoration performance against *EMOA* beneficial use test

***EMOA* test**	**Does the receptor site comply with test?**	**Comment**
The activity will lead to a beneficial use and bring land back into use or provide ecological benefit	Yes	Denham Quarry will be restored to a nature conservation and recreational area, including lakes.
In the case of quarries or landfill sites, the activity has a planning requirement to be restored	Yes	There is a planning requirement for Denham Quarry to be restored.
The activity does not attract landfill tax	Yes	Denham Quarry would be exempt from landfill tax because it is a quarry restoration project and has a recovery permit issued by the Environment Agency.
The material is suitable for its intended use and would not harm human health or the environment	Yes	Denham Quarry would be able to accept all Thames Tideway Tunnel project non-hazardous excavated material, and if managed in accordance with the environmental permit the activities should not harm human health or the environment.
The minimum amount of material will being used	Yes	The material is being used to restore the quarry in line with the planning consent.

EMOA test	Does the receptor site comply with test?	Comment
Alternative material (whether waste or not) would be required if Thames Tideway Tunnel project material was not to be used	Yes	Material would be sourced from elsewhere to restore that quarry if Thames Tideway Tunnel project material was not available.

15.1.4 All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 15% of the total Thames Tideway Tunnel project material.

15.1.5 Table 15.2 provides the grade given for evaluation objective 12 and the justification for the grade.

Table 15.2 Evaluation objective 12 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
12. To conform to waste hierarchy.	a) Extent to which the option meets the *EM&W strategy* Targets.	+++	Performance of receptor site substantially exceeds target.	All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 15% of the total Thames Tideway Tunnel project material.

16 Evaluation objective 13: To conform to the proximity principle

16.1.1 The receptor site is located 41km from Carnwath Road Riverside site (clay), 36km from Kirtling Street (Lambeth Beds and Thanet Sands) and 30km from Chambers Wharf (chalk).

16.1.2 In accordance with the Thames Tideway Tunnel project *Transport Strategy* excavated material produced at these sites would be removed by marine transport and not by road. For the purposes of this assessment it has been assumed that the material would be taken from the drive sites by marine transport to a transhipment point and transferred to road at this location (IG11 0EG). The mean distance to the transhipment point from the drive sites is 20km by marine transport. The transhipment point is 56km from Denham Quarry by road[V].

16.1.3 For this evaluation objective the receptor site was assessed using a straight line distance from the main drive sites. Using a straight line distance provides a consistent measure for assessment purposes. As the receptor site would be able to receive excavated materials from more than one drive site, the mean distance has been calculated. The receptor site was then graded according to this mean figure.

16.1.4 The receptor site is approximately 26km in a straight line from the main drive sites.

16.1.5 Table 16.1 provides the grade given for evaluation objective 13 and the justification for the grade.

Table 16.1 Evaluation objective 13 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
13. To conform to proximity principle	a) Average distance from main tunnel drive sites.	+	The receptor site is between 40km and 20km from source of Thames Tideway Tunnel material.	The receptor site is approximately 26km (straight line distance) from the main drive sites.

[V] Distances quoted are those used in the *EMOA* GhG model. Details of the assumptions used in this model can be found in Appendix B.10. These distances are for context only and do not reflect the exact routes that would be used should this receptor site be used to accept Thames Tideway Tunnel project material.

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17 Evaluation objective 14: To conform to Sustainable Transport Policy

17.1.1 The receptor site can only be accessed by road and does not have direct access to the strategic highway.

17.1.2 The site lies within the circle of the M25, and south of the M40. In relation to the principal road network it is within the triangle formed by the A412 (Slough – M40/Denham), A4020 (M40/Denham – Uxbridge) and A4007 (Uxbridge – Iver Heath) roads.

17.1.3 Material cannot be delivered by marine transport or rail.

17.1.4 *The London Plan 2011*[3] Policy 5.18 Construction, excavation and demolition states that "waste should be removed from construction sites, and materials brought to the site, by water or rail transport wherever that is practicable." Thames Tideway Tunnel material would need to be transferred to road at an intermodal transfer station to comply with this requirement.

17.1.5 Table 17.1 provides the grade given for evaluation objective 14 and the justification for the grade.

Table 17.1 Evaluation objective 14 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
14. To conform to sustainable transport policy	a) Conforms to policy objective to move transport of materials from road to rail or marine transport.	---	The receptor site can only be accessed by road and there is no direct access to a strategic highway.	The receptor site can be only be accessed by road and has no direct access to a strategic highway.

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18 Evaluation objective 15: To conform to health and safety good practice

18.1.1 Summerleaze do not operate to ISO18001.

18.1.2 The receptor site has a full Health and Safety Management Plan.

18.1.3 Under RIDDOR Denham Quarry have recorded no incidents since operations started in 2009.

18.1.4 Table 18.1 provides the grade given for evaluation objective 15 and the justification for the grade.

Table 18.1 Evaluation objective 15 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
15. To conform to Health and Safety good practice	a) Health and Safety performance conforms to good practice.	**0**	The receptor sites H&S system is not accredited and there have been five or less RIDDOR incidents in three years recorded at the receptor site.	The receptor site is not ISO18001 accredited. The receptor site has a full Health and Safety Management Plan. There have been no RIDDOR incidents recorded at the receptor site since operations started in 2009.

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References

[1]*A Practical Guide to the Strategic Environmental Assessment Directive* ODPM (September 2005); *Strategic Planning for Sustainable Waste Management: Guidance on Option Development and Appraisal* Department for Communities and Local Government (2002)

2 Development Control Committee Report. Buckinghamshire County Council (2006) http://www.buckscc.gov.uk/moderngov/Data/Development%20Control%20Committee/20061017/Agenda/Item04.pdf

[3] *The London Plan* Greater London Authority 2011

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.03**

Volume 3: Project-wide effects assessment appendices

Appendix A.4; Annex D.10: EMOS Little Belhus

APFP Regulations 2009: Regulation **5(2)(a)**

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Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Environmental Statement

Volume 3 Appendices: Project-wide effects assessment

Appendix A.4: Excavated materials options assessment

Annex D.10: Excavated materials options suitability report – Little Belhus

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1 Introduction

1.1.1 The construction of the Thames Tideway Tunnel project would require the excavation of a large volume of material at multiple sites throughout London. To identify the preferred options for the management of the excavated material a detailed options assessment has been undertaken.

1.1.2 The methodology for assessment of the excavated material options is based on the Sustainability Appraisal methodology[1]. The assessment has taken a phased approach and at each stage the least preferred options have been eliminated until the final most viable and sustainable options have been selected to form the planning stage preferred list. The options on the planning stage preferred list demonstrate the potential capacity to manage the excavated material in a sustainable manner. The assessment is based on the consistent assessment of options against agreed evaluation objectives throughout the process.

1.1.3 The steps informing the assessment process were:

a. Development of a long list of potential options for the treatment, reuse, recycling or disposal of excavated materials.

b. Viability filter involving the assessment of the long list against the operational evaluation objective associated with viability of the options.

c. Preliminary assessment to develop a short list of options which perform sufficiently well against all the evaluation objectives (environmental, social, operational, policy and health and safety).

d. Detailed assessment in which the options on the short list was further scrutinised to produce a planning stage preferred list of options which performance best against the full suite of evaluation objectives.

1.1.4 For each short listed option whose viability has been confirmed a detailed *Excavated materials option suitability (EMOS) report* has been produced. The *EMOS reports* provide a summary of the site operations and the overall performance of the option against the evaluation objectives.

1.1.5 This *EMOS report* sets out the detail assessment for Little Belhus, Essex. The report provides the information gained during the detailed assessment stage of the *Excavated material options assessment (EMOA)* and the grades awarded against each evaluation indicator as part of this assessment. A grade is provided for each evaluation indicator, using an agreed set of evaluation criteria, against seven grades of impact (ranging from --- to +++). The *EMOS report* also provides a risk profile for the site identifying the key risks associated with the option in relation to accepting the Thames Tideway Tunnel project excavated material.

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2 Site description

2.1 Site location

2.1.1 Little Belhus is located to the northwest of South Ockendon in Essex and consists of a former sand and gravel extraction quarry and landfill which operated until 1974. The current receptor site operator indicated that the layer of topsoil used to restore the landfill was thin and, since the restoration, the settlement of the site has resulted in the landfilled waste becoming exposed.

2.1.2 The receptor site is bordered by the M25 to the west and agricultural land to the north and northwest. There is a primary school to the south and light industry and housing to the west of the receptor site.

2.1.3 Rural Arisings Ltd the site operator has introduced short term soil bunds at locations adjacent to the receptor site boundary to screen the receptor site operations from surrounding visual receptors.

2.1.4 Little Belhus Landfill site location is shown in Plate 3.1 Little Belhus site location.

2.2 Site operations

2.2.1 Little Belhus was formally a quarry and landfill. Excavation and landfill operations ceased in 1974. When the landfill was restored a thin layer of soil capping was used and since this time, subsidence has occurred due to settling of the waste and some of the landfilled waste has become exposed. To remediate and restore the land for alternative uses, inert material is required to cap and restore the former landfill. Over the coming years the receptor site would be progressively restored to a country park with multiple ecological habitats created.

2.2.2 The receptor site currently has planning consent to import 1.67million m^3 of material. The receptor site formally commenced the importation of restoration material in October 2011 and the operator has estimated importing 150,000m^3 of material per year, based on current market conditions.

2.2.3 All material, including the Thames Tideway Tunnel project excavated material, would be delivered by road. The clays and sands and gravels would be unloaded directly to the area requiring the material for restoration. The chalk slurry would be delivered to a drying area, where it would be spread on the land until it is dry, it would then be relocated by mobile plant to the required restoration areas. Some of the sands and gravels may be blended with other onsite soils to create a surface soil prior to being laid for final placement. This blending would be carried out at the receptor site, in a designated area.

2.3 Planning consent

2.3.1 Planning consent (Ref: 08/00125/TTGFUL) for the restoration of the receptor site was granted in 2009.

2.3.2 All equipment, roads and buildings required to manage the restoration are required to be removed no less than 3 months of the restoration being completed or the 10 year anniversary from restoration activities commencing on the receptor site, whichever is sooner. Restoration activities began at the receptor site in October 2011 and therefore operations are consented until 2021.

2.3.3 The receptor site is limited to receiving material by road. There are restrictions on the number of HGVs permitted to enter the receptor site each day:

a. 200 HGV movements (100 in, 100 out) on Monday – Friday;

b. 130 HGV movements (65 in and 65 out) on Saturdays; and

c. no HGV movements on Sundays and Bank Holidays

2.3.4 Deliveries of material to the receptor site are restricted to 07:30 to18:00 hours Monday to Friday, 07:30 to 13:00 Saturdays and no working on Sundays and or Bank Holidays, except for emergency operations.

2.3.5 Material can be unloaded, transported to the restoration area, and levelled between the hours of 08:00 and 18:00 Monday to Friday and between 08:00 and 13:00 on Saturdays. No works operations are to take place on Sundays and or Bank Holidays, except for emergency operations.

2.4 Permitting

2.4.1 Since April 2012, the receptor site is undertaking all restoration operations under exemptions issued by the Environment Agency (EA).

2.4.2 Rural Arisings Ltd. has applied to the EA for an environmental permit. The EA has stated that operations at Little Belhus can be undertaken under exemptions until the environmental permit is issued. The operator expects the environmental permit to be granted by the end of 2012.

2.4.3 The exemptions the receptor site are currently working under limit the volume of material deposited on the receptor site, on the basis of the receptor site's area and the depth of material.

2.4.4 The receptor site is currently operating under three exemptions as detailed in Schedule 3 of the Environmental Permitting (England and Wales) Regulations 2007:

a. Paragraph 7 (waste for the benefit of land) the receptor site can accept up to 250t per hectare in any 12 month period

b. Paragraph 9 (land reclamation or improvement) the receptor site allows for the spreading of material no more than 2m in depth

c. Paragraph 19 (waste for construction) which allows for receptor site to accept excavated soil and stones as well as concrete, bricks and ceramics

2.4.5 With no environmental permit, the accepted throughput and tonnage required for restoration is, for the purposes of this assessment, based on the information provided within the receptor site's planning consent (Ref: 08/00125/TTGFUL).

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3 Overall site summary

3.1.1 Table 3.1 below provides a summary of the Little Belhus site and an assessment of its suitability against the evaluation objectives. Sections 4 to 18 of this *EMOS report* gives more detail on each evaluation objective.

Table 3.1 Summary of Little Belhus and its overall suitability

Site name:	Little Belhus (RAR)		**Owner/ operator:**	Rural Arisings Ltd.			
Planning consent	Yes, until 2021 08/00125/TTGFUL		**Permit**	No, operating under an exemption, permit submitted			
Void capacity	1.67million m^3		**Throughput**	Estimated at 200,000tpa			
Recovery/disposal	Recovery						
Materials	**London clay**	✓	**Lambeth group**	✓	**Chalk**	✓	
Transport type	**Road**	✓	**Rail**	X	**Marine transport**	X	

Receptor site overview

Little Belhus is a former sand and gravel quarry and landfill in South Ockendon in Essex. The void space, created by sand and gravel extraction activities, was used as landfill until 1974. The landfill was restored with a thin cap of soil and since its closure settlement of the waste has lead to some of the waste becoming exposed. Remediation of the whole site is required. The receptor site will be restored to a county park. The Thames Tideway Tunnel project material would be used in this restoration operation. Restoration activity commenced in 2011 and is scheduled over a ten year period. Thames Tideway Tunnel project material would be delivered to the receptor site by road. The receptor site is approximately 29km from the Thames Tideway Tunnel project main drive sites.

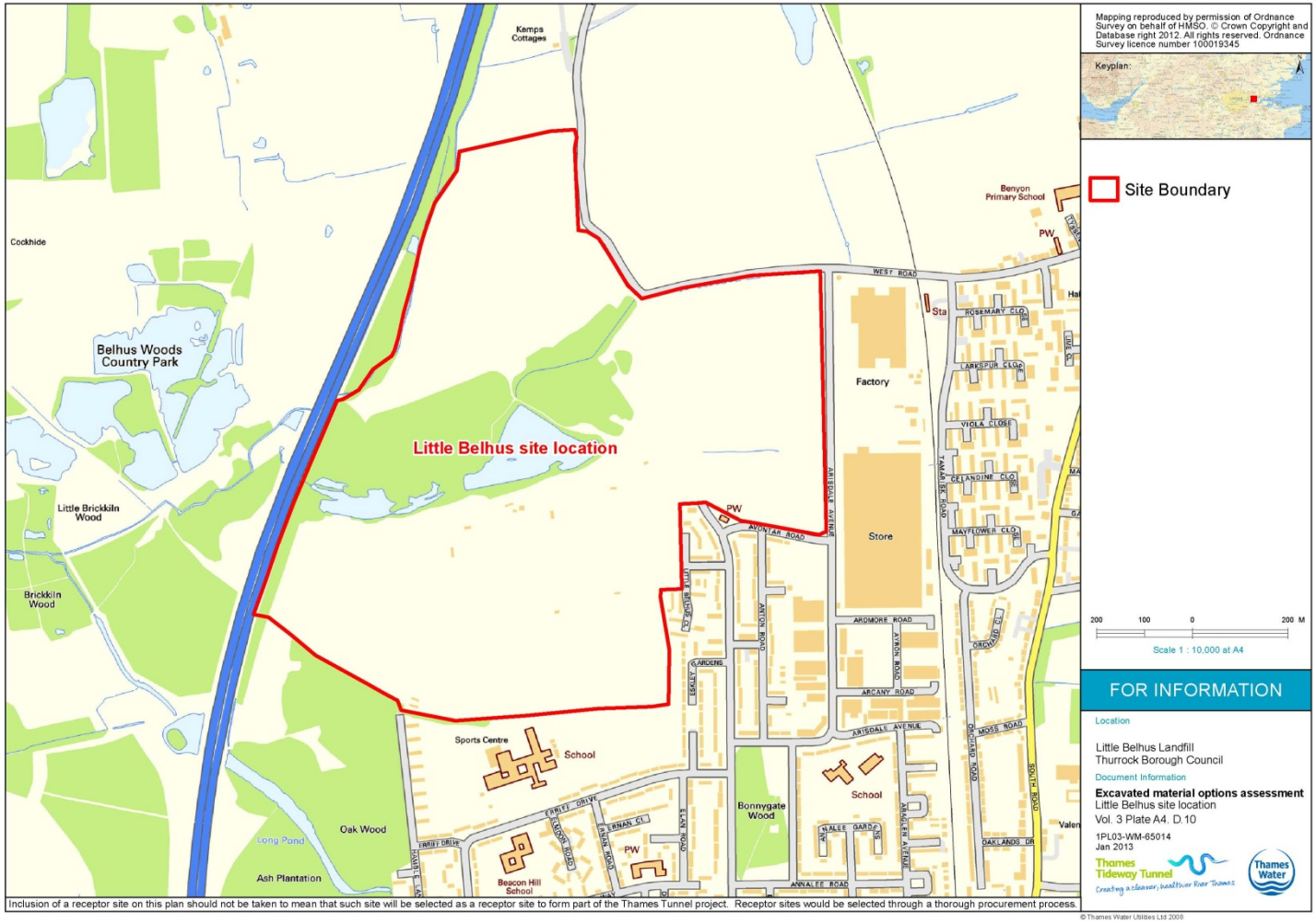
Assessment

1. Land and other resources	a)	**0**	8. Cultural heritage	a)	**0**
	b)	**0**	9. Employment opportunities	a)	**+**
2. Climate change	a)	**0**		b)	**0**
	b)	**0**	10. Cost	a)	**+**
	c)	**+**	11. Operational suitability of the receptor site.	a)	**+**
3. Local amenity	a)	**0**		b)	**+++**
4. Landscapes and townscapes	a)	**0**		c)	**--**
	b)	**++**		d)	**--**
5. Access to open space	a)	**0**		e)	**0**
	b)	**+++**		f)	**--**
6.Water quality	a)	**0**	12. Waste hierarchy	a)	**+++**
	b)	**0**	13. Proximity principle	a)	**+**
7.Biodiversity	a)	**0**	14. Sustainable transport policy	a)	**---**
	b)	**0**	15. Health and safety good practice	a)	**0**

Environmental summary
Thames Tideway Tunnel project excavated material would form part of the material required for the restoration operations at the receptor site. The acceptance of Thames Tideway Tunnel project material is within the receptor site's existing consents and would form part of the permitted operations at the receptor site. In the short term it is therefore anticipated that the acceptance of Thames Tideway Tunnel project material is unlikely to have an additional effect on the environment beyond those of the existing operations. In the long term the receptor site will be restored to a country park, and landscape management plans are in place to create different ecological habitats within the country park. This would have a beneficial effect with respect to visual and local amenity.
Social summary
Rural Arisings Ltd. the site operator anticipates managing the acceptance of restoration material, which the Thames Tideway Tunnel project material would form part of, using current staff. In the long term current staff are likely to be transferred to other sites run by the operator. The created country park will be incorporated into the adjacent Belhus Country Park and be managed by the organisation that runs the Country Park.
Operational summary
Based on an annual input of 150,000m^3 of material required for restoration at the receptor site, it is probable that the receptor site would be able to accept approximately 923,000t of the Thames Tideway Tunnel material between October 2016 and 2021 to complete the restoration within the ten year period allowed under the planning permission. The receptor site has applied to the EA for an environmental permit, but as of August 2012 it has not been issued. The EA has stated that operations at Little Belhus can be undertaken under exemptions until the environmental permit is issued. The receptor site should be able to accept all types of excavated materials produced by the Thames Tideway Tunnel project. The receptor site is accessible by road only. Little Belhus restoration to a country park would be considered as beneficial use for all material accepted by the receptor site[l]. Rural Arisings Ltd has health and safety procedures at the receptor site, but these are not accredited to ISO18001. Since restoration operations commenced at the receptor site in October 2011, there have not been any Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) incidents recorded.
Overall suitability
The receptor site will be restored to a Country Park which would have a long term beneficial effect with respect to environmental and policy objectives. Little Belhus has the potential to receive 19% of Thames Tideway Tunnel material between 2016 and 2021. The receptor site is located approximately 29km from the drive site; however it is limited with regards to sustainable transport policies as it is only accessible by road. The receptor site has a beneficial or neutral grading for all other evaluation indicators except for some of the operational indicators. Little Belhus is included on the planning stage preferred list.

[l] Based on the *Excavated material options assessment* (*EMOA*) beneficial use test

Plate 3.1 Little Belhus site location



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4 Evaluation objective 1: To ensure prudent use of land and other resources

4.1.1 The receptor site has started receiving material sourced from other extraction and construction projects in London.

4.1.2 Where possible the receptor site will use reclaimed material avoiding the use of virgin material for restoration.

4.1.3 The Thames Tideway Tunnel project material would be used to restore the receptor site to a country park incorporating new habitats. The use of Thames Tideway Tunnel project material would replace the use of other reusable materials that would be used to restore the receptor site.

4.1.4 The use of Thames Tideway Tunnel project material would not contribute to any requirement for additional land extending the receptor site's boundary.

4.1.5 Table 4.1 provides the grade given for evaluation objective 1 and the justification for the grade.

Table 4.1 Evaluation objective 1 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
1. To ensure prudent use of land and other resources	a) Extent to which resources such as sand, gravel and chalk are conserved by processing or storage of Thames Tideway Tunnel project material at receptor sites.	0	Thames Tideway Tunnel project material is unlikely to affect virgin material use e.g. material replaces other reusable materials or no material substitution required	Thames Tideway Tunnel project material would be used for restoration of the receptor site. Currently materials used for this purpose are sourced from other excavation and construction projects within London, and therefore there would be no effect on the use of virgin materials at the receptor site.
	b) Extent to which Thames Tideway Tunnel project material would effect landtake at (footprint of) receptor sites in the long term.	0	The acceptance of Thames Tideway Tunnel project material would not contribute to the requirement for additional land extending the receptor site's boundary	The Thames Tideway Tunnel project material would be used within the existing receptor site boundary and would not contribute to a need for the receptor site to expand.

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5 Evaluation objective 2: To reduce climate change impacts

5.1.1 A large proportion of clays, sands and gravels delivered to the receptor site would be used directly and not stockpiled prior use. HGVs would deliver material directly to where it is required on the receptor site. However some material may be blended with soil currently stored on the receptor site to produce a final topsoil layer.

5.1.2 Chalk slurry would be delivered to an area on the receptor site where it would be spread on the ground and dried. When the chalk is dry, it would be relocated by mobile plant to the required restoration areas. If the operator considers the chalk to be suitably dry on arrival, it would be delivered direct to where it would be used without drying. This would be determined on a load by load basis.

5.1.3 The receptor site does not have a Carbon Management Plan and there are no specific measures to offset carbon emissions for restoration activities taking place at the receptor site.

5.1.4 Based on data from the EA's lifecycle analysis tool WRATE, the overall GhG emissions for deposition of excavated material to land is 3.16kg CO_2 eq per tonne of excavated material. The excavation material is assumed to be inert soil and the EA's WRATE emissions associated with material reception and spreading have been assumed.

5.1.5 The figures for GhG emissions from transport have been estimated based on:

a. the average CO_2 emissions for the different types of transport; and

b. the distance travelled from the Thames Tideway Tunnel sites to the receptor site.

5.1.6 The GhG emissions calculated are for comparative purposes only and do not provide an exact representation of the transport emissions associated with the Thames Tideway Tunnel excavated material. Full GhG methodology and assumptions can be found in Appendix B.8.

5.1.7 It has been estimated that using Little Belhus would produce 3.18kg CO_2 eq per tonne of excavated material accepted.

5.1.8 The EA flood risk maps indicate that Little Belhus is outside the floodplain.

5.1.9 There is a small area on the west/northwest boundary of the receptor site where a stream runs which has been designated by the EA in an area that has a significant chance of flooding.

5.1.10 It is not anticipated that the acceptance of Thames Tideway Tunnel project material would increase the risk of flooding.

5.1.11 Table 5.1 provides the grade given for evaluation objective 2 and the justification for the grade.

Table 5.1 Evaluation objective 2 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
2. To reduce climate change impacts	a) Greenhouse gases emitted through material treatment, handling and use at receptor sites (excludes transport).	**0**	Thames Tideway Tunnel project material would not require treatment and minimal handling required e.g. passive drying used and material moved by conveyor where possible.	Thames Tideway Tunnel project material would not require any treatment, with the exception of passive drying of chalk, and there would be minimal handling required at the receptor site.
	b) Extent to which flood risk is altered by Thames Tideway Tunnel project material at the receptor site (or in the local catchment).	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not change flood risk (from any source or a combination of sources) to the site and surroundings.	The EA flood risk maps indicate that Little Belhus is outside the floodplain and while there is a small area on the west/ northwest boundary of the receptor site which has been designated by the EA in an area that has a significant chance of flooding. It is not anticipated that the acceptance of Thames Tideway Tunnel project materials would not increase the risk of flooding.
	c) Greenhouse gases emitted through transport of Thames Tideway Tunnel project material to the receptor sites.	**+**	Through the transport of Thames Tideway Tunnel project material between 2 and less than or equal to 4kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced	Through the transport of Thames Tideway Tunnel project material it is estimated 3.16kg CO_2 per tonne of excavated material accepted by the receptor site would be produced

6 Evaluation objective 3: To protect local amenity

6.1.1 The receptor site is not located within in an Air Quality Management Area (AQMA).

6.1.2 There are three monitoring stations at the receptor site for noise and dust.

6.1.3 There is a dust management plan for the receptor site, which includes measures (e.g. spraying haul roads) to mitigate dust should the issue arise.

6.1.4 Information on the receptor sites pollution incidents have been obtained from the EA, since June 2001, 23 pollution incidents have been recorded, one of which since restoration activities begun on site. Principally the pollution incidents relate to the poor restoration of the original landfill site. The incident, recorded since Rural Arisings Ltd took over ownership of the receptor site and restoration activities begun, was stated by the operator as being related to the receipt of compost which did not meet the agreed specification the receptor site could accept for restoration purposes. This material is no longer accepted from this supplier due to its heterogeneous nature and risk of further pollution.

6.1.5 There are noise attenuation measures in the receptor site's operating procedures to prevent noise being generated during certain times of the day at the receptor site in those areas which are in close proximity to sensitive receptors such as houses and the adjacent school.

6.1.6 Thames Tideway Tunnel project material would be similar in nature to other material that would be accepted at the receptor site for restoration purposes and would be accepted as part of the existing operations at the receptor site.

6.1.7 Table 6.1 provides the grade given for evaluation objective 3 and the justification for the grade.

Table 6.1 Evaluation objective 3 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
3. To protect local amenity	a) Extent of potential effects on local amenity from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have an effect on the local amenity or any effect would be negligible.	Thames Tideway Tunnel project material would form part of the existing operations at the receptor site. All material accepted at the receptor site would be within the consented levels thus would pose no additional nuisance effects at the receptor site. There are operational measures at the receptor site such as spraying haul roads for dust suppression to reduce the effects of nuisance on surrounding receptors.

7 Evaluation objective 4: To conserve landscape and townscapes at receiving locations

7.1.1 The receptor site is not in an Area of Outstanding Natural Beauty (AONB).

7.1.2 The sand and gravel quarry and landfill ceased operations in 1974. Since this time, the land has become scrubland.

7.1.3 The receptor site is located in the green belt and is bordered by the M25 motorway to the west with agricultural land to the north. Light industry and housing is to the east and south of the receptor site.

7.1.4 Thames Tideway Tunnel project material would form part of the consented operations at the receptor site. The type of visual effects from site operations (vehicle movements, deposit operations, land forming, bund excavation/soil spreading, restoration works, cultivation, seeding and planting works) would not be of an adverse nature within the overall context of the existing site.

7.1.5 Temporary soil bunds have been placed adjacent to the receptor site's boundary in locations where sensitive receptors are in close proximity.

7.1.6 In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute would be no more or less visible given the overall context of the existing site.

7.1.7 In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape, changing the area from an old quarry and landfill to a country park incorporating ecological habitats.

7.1.8 Table 7.1 provides the grade given for evaluation objective 4 and the justification for the grade.

Table 7.1 Evaluation objective 4 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
4. To conserve landscapes and townscapes at receiving locations	a) Extent of short term visual and landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have a short term effect on the local visual amenity at the receptor site or any effect would be negligible.	In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute would be no more or less visible given the overall context of the existing site. Site management measures such as temporary soil bunds and restriction on delivery of materials would minimise any effects on the receptors site.
	b) Extent of permanent visual and landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a permanent moderate beneficial visual effect on the landscape, based on a 'do nothing' view of the site.	In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape changing the area from scrub land to a managed country park.

8 Evaluation objective 5: To protect quality of and access to open space

8.1.1 There is a Public Right of Way (PRoW) located on the northern boundary of the receptor site.

8.1.2 There are no PRoWs located on the receptor site however previously there have been limited measures to prevent access to the land by the public.

8.1.3 Since the receipt of material at the receptor site for restoration, the site has been secured to prevent public access. In the short term during restoration, including the receipt of Thames Tideway Tunnel project material, there would be no effect on public access to the receptor site.

8.1.4 The restoration plans for the receptor site to which Thames Tideway Tunnel project material would contribute, would constitute a major enhancement to the accessibility to public open space in the long term.

8.1.5 Table 8.1 provides the grade given for evaluation objective 5 and the justification for the grade.

Table 8.1 Evaluation objective 5 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
5. To protect quality of and access to open space	a) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the short term?	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or a negligible effect on access to and quality of open space and PRoWs.	The restoration works at the receptor site to which the Thames Tideway Tunnel project material would contribute would not disrupt the existing PRoW on the northern boundary of the receptor site.
	b) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the long term?	+++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would constitute a major enhancement to the PRoW and substantially increase accessibility to public open space	The receptor site will be restored to a country park, with full public access. This would substantially increase the public accessibility to the receptor site which has previously, and during its restoration not been accessible to the public.

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9 Evaluation objective 6: To protect water quality

9.1.1 There is a stream on the west/northwestern boundary of the receptor site, and two lakes within the receptor site's boundary.

9.1.2 A water management scheme exists at the receptor site to prevent silt from entering the water bodies.

9.1.3 The receptor site is not in a groundwater Source Protection Zone (SPZ), which highlights groundwater sources such as wells, boreholes and springs used for public drinking water supply.

9.1.4 Based on the water management measures in place at the receptor site and the inert nature of the Thames Tideway Tunnel project material it is not anticipated that accepting Thames Tideway Tunnel project material would have an effect on the surrounding water courses and/or groundwater.

9.1.5 Table 9.1 provides the grade given for evaluation objective 6 and the justification for the grade.

Table 9.1 Evaluation objective 6 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
6. To protect water quality	a) Extent of potential effects on fluvial water quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on the local watercourses.	There is a water management scheme in place at the receptor site. It is not anticipated that the treatment, handling or use of the Thames Tideway Tunnel project material would have an effect on the local water course or lakes located on the receptor site.
	b) Extent of potential effects on groundwater quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on groundwater.	There is a water management scheme in place at the receptor site. The receptor site is not in a groundwater SPZ and the treatment, handling or use of the Thames Tideway Tunnel project material at the receptor site is likely to have no or negligible effect on groundwater.

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10 Evaluation objective 7: To protect biodiversity

10.1.1 The eastern side of the receptor site forms part of a Local Wildlife Site due to its important invertebrate population.

10.1.2 Currently, a population of water voles inhabit the lakes and some of the reed bed areas on the receptor site. Common lizards have been found in the northern section of the receptor site. Measures are in place to prevent these habitats being affected by the receipt of materials for restoring the receptor site.

10.1.3 In the short term, as a result of the site measures, the handling and use of the Thames Tideway Tunnel project material as part of the existing operations at the receptor site is likely to have no or negligible effects on the habitats in the lakes and the Local Wildlife Site on the eastern boundary of the receptor site.

10.1.4 In the long term the restoration of the landfill cap and creation of a country park would be incorporated into the boundary of the adjacent Local Wildlife Site. New habitats would be created, and enhanced, at the receptor site where species would be actively encouraged onto the receptor site through the provision of invertebrate meadows.

10.1.5 However the exact nature of the habitats created would be dependent on the material used to restore the site. At this stage it is not possible to assess whether the habitats created through the restoration would have more or less ecological value than those currently present on the receptor site.

10.1.6 Table 10.1 provides the grade given for evaluation objective 7 and the justification for the grade.

Table 10.1 Evaluation objective 7 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
7. To protect biodiversity	a) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the short term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	Thames Tideway Tunnel project material would form part of the restoration plans for the receptor site. There are management plans on site to prevent any effects on habitats whilst restoration occurs.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the long term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	In the long term, the receptor site will be restored to a country park. Thames Tideway Tunnel project material would form part of the restoration plans for the receptor site. Habitats would be created through the restoration of the receptor site. It is not possible to assess whether these would be of higher ecological value than the existing habitats.

11 Evaluation objective 8: To protect cultural heritage

11.1.1 There are two Scheduled Ancient Monuments (SAMs) within 2km to the north east of the receptor site. These are the Roman Barrow 260m to the north east of the receptor site and South Ockenden Hall gatehouse and moat which is approximately 1.2km north east of the receptor site.

11.1.2 Belhus Park, which is a Registered Parks and Garden, is on the south western boundary of the receptor site. The restored receptor site would be incorporated in to the footprint of this country park.

11.1.3 There are three ancient woodlands (500m, 750m and 1.3km) to the west of the receptor site.

11.1.4 It is not anticipated that the operations at the receptor site which Thames Tideway Tunnel project material would contribute to would have an effect on cultural heritage.

11.1.5 Table 11.1 provides the grade given for evaluation objective 8 and the justification for the grade.

Table 11.1 Evaluation objective 8 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
8. To protect cultural heritage	a) Extent of potential effects on designated or nominated archaeological sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	The receipt of Thames Tideway Tunnel project material would have no or negligible effect on cultural heritage receptors, the nearest designated site is over 250m from the receptor site boundary.

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12 Evaluation objective 9: To provide employment opportunities

12.1.1 The receptor site is already operational. The operator has confirmed that it is likely that an additional one or two extra staff would be required at the receptor site in order to manage the delivery and placement for drying and final restoration of chalk slurry.

12.1.2 In the long term it is unlikely that any jobs would be created or lost. When the receptor site is fully restored, the staff at the receptor site are likely to be transferred to other Rural Arisings Ltd operated sites. Table 12.1 provides the grade given for evaluation objective 9 and the justification for the grade.

Table 12.1 Evaluation objective 9 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
9. To provide employment opportunities	a) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the short term.	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would lead to minor job gains over the short term of less than 10 jobs	In the short term an additional one or two extra staff would be required at the receptor site.
	b) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the long term.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the long term.	In the long term it is unlikely that any jobs would be created or lost. When the receptor site is fully restored, the staff at the receptor site are likely to be transferred to other Rural Arisings Ltd operated sites.

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13 Evaluation objective 10: To minimise the cost associated with the management of excavated material

13.1.1 In order to compare the likely cost associated with transport and acceptance of the Thames Tideway Tunnel project material at each receptor site a cost model was used.

13.1.2 The cost of transporting the excavated material has been calculated from the distance travelled and a cost per tonne/ km for the transport mode. The road, transport haulage cost have been calculated from the quotes gathered from operators based on today's prices. A gate fee of £4 per tonne is assumed based on current prices. Full details of the assumptions made can be found at Appendix B.8.

13.1.3 It has been estimated that the cost of transporting and managing excavated material at Little Belhus is £13.27 per tonne of excavated material accepted at the receptor site. These costs are predominantly associated with transfer of the material from the Thames Tideway Tunnel project sites to the receptor sites. This cost is an estimated cost for comparison purposes within the *EMOA* and may differ from the actual cost which would be agreed at the procurement stage if Thames Tideway Tunnel project material were taken to this receptor site.

13.1.4 Table 13.1 provides the grade given for evaluation objective 10 and the justification for the grade.

Table 13.1 Evaluation objective 10 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
10. To minimise the cost associated with the management of excavated material.	a) Costs of transportation, treatment, handling and use of Thames Tideway Tunnel project material.	+	The transportation, treatment, handling and use of Thames Tideway Tunnel project material would cost between £13 and less than or equal to £16 per tonne	The cost of transportation, treatment, handling and use of Thames Tideway Tunnel project material has been estimated (using the *EMOA* cost model) to be £13.27 per tonne.

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14 Evaluation objective 11: To ensure operational suitability of the receptor site.

14.1 Evaluation indicator 11a) Timescales

14.1.1 The receptor site has planning consent to complete all restoration activities by the 10th anniversary of the start of restoration activities. Restoration activities commenced in October 2011 and therefore the restoration needs to be completed by October 2021.

14.1.2 The restoration management plan for the receptor site is based on the phasing of activities, scheduled to take the allocated 10 years in the planning consent.

14.1.3 The site operator has indicated that receptor site has started receiving material for restoration and might be restored prior to 2021.

14.1.4 The receptor site is currently working under a number of exemptions and is waiting for their environmental permit to be issued. It is anticipated that operations at the receptor site would continue under the same rate of input once the environmental permit is issued. Thus the estimated maximum permitted tonnage per annum would be 200,000tpa.

14.1.5 If the environmental permit issued allows for a greater annual throughput the receptor site would be completed earlier than anticipated.

14.1.6 Based on Thames Tideway Tunnel project timescales of 2016 to 2021 and the existing throughput of the receptor site, Little Belhus would be available for use for Thames Tideway Tunnel project material for between five and six years, of the six year timetable.

14.1.7 Table 14.1 provides the grade given for evaluation objective 11a and the justification for the grade.

Table 14.1 Evaluation objective 11a grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	a) Likelihood of implementation within the required timescale.	+	The receptor site would be available for use for Thames Tunnel project material for greater than or equal to 80% but less than 100% of the required timescale	The receptor site has planning consent until 2021. The receptor site would be available to accept Thames Tideway Tunnel project material for between five years and six years of the Thames Tideway Tunnel project timetable.

14.2 Evaluation indicator 11b) Material characteristics

14.2.1 Based on the receptor site operating under exemptions, Little Belhus would be able to accept London Clay, chalk and Lambeth Group with sands, gravels and inert tunnel construction materials (piling and diaphragm wall arisings) for restoration.

14.2.2 The receptor site has the potential to receive all Thames Tideway Tunnel project non-hazardous excavated material types. It is assumed that most, if not all, of the Thames Tideway Tunnel project excavated material would be inert.

14.2.3 Table 14.2 provides the grade given for evaluation objective 11b and the justification for the grade.

Table 14.2 Evaluation objective 11b grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	b) Acceptability of material with Thames Tideway Tunnel project material characteristics by the receptor sites.	+++	The receptor site could accept for use all of the Thames Tideway Tunnel project material types based on their characteristics.	It is anticipated that based on the types of material the receptor site currently receives that it would be able to accept all clean non hazardous material produced by the Thames Tideway Tunnel project. The chalk delivered to the receptor site would need to be dried before it was used for restoration purposes.

14.3 Evaluation indicator 11c) Capacity

14.3.1 The receptor site has planning consent to accept 1.67million m^3 (2.07million tonnes[II]) of material for restoration.

14.3.2 Rural Arisings Ltd. anticipates receiving 186,000t of material for restoration every year until 2017. This tonnage is not committed but is based on current market trends. Based on this input, from 2017 it has been assumed that there would be capacity for a total of 922,500t or 750,000m^3 required in order to compete the restoration of the receptor site by 2021.

14.3.3 The receptor site is currently working under a number of exemptions and is waiting for their environmental permit to be issued. It is anticipated that operations at the receptor site would continue under the same rate of input once the environmental permit is issued. Thus the estimated maximum permitted tonnage per annum would be 200,000tpa. Table 14.3 details

[II] Based on 1.24 conversation rate to tonnes

the input capacity for the receptor site in relation to the material that would be produced by the Thames Tideway Tunnel project.

14.3.4 Table 14.4 also sets out the potential tonnage of Thames Tideway Tunnel project material accepted at the receptor site each year based on the assumptions used in the *EMOA* cost and GhG model. The model assumed that restoration material would be accepted directly by road from the CSO sites and the transhipment point.

14.3.5 The receptor site would therefore be able to accept 19% of the Thames Tideway Tunnel project excavated materials, based on the total amount of restoration material that it can accept and tonnages which are likely to be produced by the Thames Tideway Tunnel during the four years that it is available.

Table 14.3 Capacity for inert material at Little Belhus (tonnes[III])

	Year						Total
	2016	2017	2018	2019	2020	2021	
Total Thames Tideway Tunnel production (tonnes)	63,000	549,000	1,938,000	1,852,000	147,000	155,000	4,704,000
Maximum permitted per annum (tonnes)	-	200,000	200,000	200,000	200,000	200,000	-
Potential Thames Tideway Tunnel project material accepted (tonnes)	-	198,000	200,000	200,000	147,000	155,000	900,000
Potential Thames Tideway Tunnel project material accepted (%)	0%	36%	10%	11%	100%	100%	19%

14.3.6 Table 14.4 provides the grade given for evaluation objective 11c and the justification for the grade.

Table 14.4 Evaluation objective 11c grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of	c) Capacity of the receptor site to accept the required volume of	--	The receptor site has capacity to accept material greater than or	The receptor site has the potential to accept approximately 19% of the excavated material

[III] Figures quoted to the nearest 1,000 tonnes

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
the receptor site.	Thames Tideway Tunnel project material (based on likely tonnage accepted/ %).		equal to 15% but less than 30% of Thames Tideway Tunnel project material	that would be produced by the Thames Tideway Tunnel project.

14.4 Evaluation indicator 11d) Receptor site throughput

14.4.1 Thames Tideway Tunnel project material would be delivered to the receptor site by road. The receptor site has consent for 100 HGV deliveries per day, Monday to Friday and 65 HGV deliveries on Saturdays.

14.4.2 Based on an average HGV capacity of 16t per vehicle the receptor site has the ability to receive 1,600t per day on weekdays and 1,040t on Saturdays.

14.4.3 The amount of material produced by the Thames Tideway Tunnel project would vary on a daily and monthly basis. The assessment of throughput has been based on both the mean and peak production rates over the Thames Tideway Tunnel project construction period. The mean rate is taken as the mean monthly production rate taken over each year in the period 2016 to 2021. The peak rate is based on the month producing the maximum tonnage of excavated material in each year.

14.4.4 Table 14.5 details the proportion of the Thames Tideway Tunnel material which could be accepted by Little Belhus over time.

14.4.5 In Years 5 and 6 Little Belhus' limit of 1,600t per day is sufficient to accept all of the average and peak rate of Thames Tideway Tunnel project material produced. In Year 2, the receptor site would be able to receive 78% of the daily average amount of Thames Tideway Tunnel project material produced but only 53% of the peak day rate. Furthermore in Years 3 and 4 this receptor site would only be able to receive a limited amount of the total Thames Tideway Tunnel project material both as an average and peak rate of daily production.

Table 14.5 Throughput of material at Little Belhus

	Year					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Maximum allowable number of vehicle deliveries per day at receptor site (based on week day movements) (A)	-	100	100	100	100	100
Capacity per HGV (tonnes)	16	16	16	16	16	16
Thames Tideway Tunnel average daily tonnage*.	250	2,050	7,200	6,850	550	550

	Year					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Required number of HGVs to transport average daily tonnage (B).	16	128	450	428	34	34
Allowable vs Average Required Number of HGVs at receptor site (A ÷ B).	0%	78%	22%	23%	291%	291%
Thames Tideway Tunnel peak daily tonnage**.	350	3,050	10,750	10,300	800	850
Required number of HGVs to transport peak rate (C).	21.9	191	672	644	50	53
Allowable vs Peak Number of HGVs at receptor site (A ÷ C).	0%	53%	15%	16%	200%	188%

***** *The Thames Tideway Tunnel average daily tonnage for each year is calculated as the mean of the daily rate each month assuming 22.5 days in each month.*
****** *The peak daily tonnage is based on the average daily tonnage (assuming a 22.5 day month) for the peak month of production in each year.*

14.4.6 Table 14.6 provides the grade given for evaluation objective 11d and the justification for the grade.

Table 14.6 Evaluation objective 11d grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	d) Ability of the receptor sites to accept Thames Tideway Tunnel project material at the anticipated rate (speed of material generation vs acceptance rate).	--	The receptor site could take greater than or equal to 1,000 but less than 2,800t per day of Thames Tideway Tunnel project material	The receptor site has the ability to receive an average of 1,600t per day, based on the delivery of Thames Tideway Tunnel project material by road.

14.5 Evaluation indicator 11e) Planning consent and permitting

14.5.1 Little Belhus has the necessary planning consent to accept excavated Thames Tideway Tunnel material for restoration purposes.

14.5.2 Little Belhus does not operate under an environmental permit, and is currently operating under exemptions issued by the EA.

14.5.3 Further information on the receptor site's planning consent and Environmental Permit status can be found in Section 2.3 and 2.4.

14.5.4 Table 14.7 provides the grade given for evaluation objective 11e and the justification for the grade.

Table 14.7 Evaluation objective 11e grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	e) Site operations have appropriate planning and permitting consents.	**0**	The receptor site has either planning consent or a relevant EA permit	The receptor site has the relevant planning consent, but does currently not have an environmental permit.

14.6 Evaluation indicator 11f) Transport modes

14.6.1 The receptor site would only accept Thames Tideway Tunnel project material via road. The planning consent has restrictions on the number of HGVs and operating times that material can be delivered to the receptor site.

14.6.2 Table 14.8 provides the grade given for evaluation objective 11f and the justification for the grade.

Table 14.8 Evaluation objective 11f grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	f) Can accept excavated material from multiple transport modes.	--	The receptor site is only accessible by one transport mode.	The receptor site can only accept material for restoration via road.

15 Evaluation objective 12: To conform to the waste hierarchy

15.1.1 The Thames Tideway Tunnel *Excavated materials and waste (EM&W) strategy* contains an objective to 'To minimise waste arisings, maximise re-use, recovery, recycling and beneficial use and minimise the impact of waste on the environment and communities'.

15.1.2 The Thames Tideway Tunnel project material would be used to restore Little Belhus to a country park through ground remediation and restoration of the receptor site by laying of an inert material cap on top of the landfill. This is considered to be beneficial use in line with the *EMOA* beneficial use test. Table 15.1 details the application of the *EMO*A beneficial use test applied to Little Belhus.

15.1.3 Rural Arisings Ltd. confirmed that the acceptance of Thames Tideway Tunnel material for restoration at the receptor site would not be applicable to Landfill Tax.

Table 15.1 Landfill restoration performance against *EMOA* beneficial use test

***EMOA* test**	**Does the receptor site comply with test?**	**Comment**
The activity will lead to a beneficial use and bring land back into use or provide ecological benefit	Yes	Little Belhus will be restored to a country park which will incorporate managed ecological habitats.
In the case of quarries or landfill sites, the activity has a planning requirement to be restored	Yes	There is a planning requirement for Little Belhus to be remediated and restored.
The activity does not attract landfill tax	Yes	Little Belhus would be exempt from landfill tax because it is a restoration project.
The material is suitable for its intended use and would not harm human health or the environment	Yes	Little Belhus would be able to accept all Thames Tideway Tunnel project non-hazardous excavated material, and if managed in accordance with the environmental permit (once issued) the activities should not harm human health or the environment.

***EMOA* test**	**Does the receptor site comply with test?**	**Comment**
The minimum amount of material will being used	Yes	The material is being used to return the receptor site back to the agreed contours through the planning consent.
Alternative material (whether waste or not) would be required if Thames Tideway Tunnel project material was not to be used	Yes	Material would be sourced from elsewhere to restore the receptor site if Thames Tideway Tunnel project material was not available.

15.1.4 All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 19% of the total Thames Tideway Tunnel project material.

15.1.5 Table 15.2 provides the grade given for evaluation objective 12 and the justification for the grade.

Table 15.2 Evaluation objective 12 grade and justification

Evaluation objective	**Evaluation indicator**	**Grade**	**Evaluation criteria**	**Justification**
12. To conform to waste hierarchy.	a) Extent to which the option meets the *EM&W strategy* targets.	**+++**	Performance of receptor site substantially exceeds target.	All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only approximately accept 19% of the total Thames Tideway Tunnel material.

16 Evaluation objective 13: To conform to the proximity principle

16.1.1 The receptor site is located 33km from Carnwath Road Riverside site (clay), 29km from Kirtling Street (Lambeth Beds and Thanet Sands) and 25km from Chambers Wharf (chalk).

16.1.2 In accordance with the Thames Tideway Tunnel project *Transport Strategy* excavated material produced at these sites would be removed by marine transport and not by road. For the purposes of this assessment it has been assumed that the material would be taken from the drive sites by marine transport to a transhipment point and transferred to road at this location (IG11 0EG). The mean distance to the transhipment point from the drive sites is 20km by marine transport. The transhipment point is 18km from Little Belhus by road[IV].

16.1.3 For this evaluation objective the receptor site was assessed using a straight line distance from the main drive sites. Using a straight line distance provides a consistent measure for assessment purposes. As the receptor site would be able to receive excavated materials from more than one drive site, the mean distance has been calculated. The receptor site was then graded according to this mean figure.

16.1.4 The receptor site is approximately 29km in a straight line from the main drive sites.

16.1.5 Table 16.1 provides the grade given for evaluation objective 13 and the justification for the grade.

Table 16.1 Evaluation objective 13 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
13. To conform to Proximity Principle.	a) Average distance from main tunnel drive sites.	+	The receptor site is between 40km and 20km from source of the Thames Tideway Tunnel material	The receptor site is approximately 29km (straight line distance) from the main drive sites.

[IV] Distances quoted are those used in the *EMOA* GhG model. Details of the assumptions used in this model can be found in Appendix B.10. These distances are for context only and do not reflect the exact routes that would be used should this receptor site be used to accept Thames Tunnel project material.

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17 Evaluation objective 14: To conform to sustainable transport policy

17.1.1 The receptor site would only be accessed by road. There is no direct access to a strategic highway to the receptor site.

17.1.2 Material cannot be delivered by marine transport or rail.

17.1.3 *The London Plan 2011*[2] Policy 5.18 Construction, excavation and demolition states that "waste should be removed from construction sites, and materials brought to the site, by water or rail transport wherever that is practicable." Thames Tideway Tunnel project material would need to be transferred to road at an intermodal transfer station to comply with this requirement.

17.1.4 Table 17.1 provides the grade given for evaluation objective 14 and the justification for the grade.

Table 17.1 Evaluation objective 14 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
14. To conform to Sustainable Transport Policy.	a) Conforms to policy objective to move transport of materials from road to rail or marine transport.	---	The receptor site can only be accessed by road and there is no direct access to a strategic highway	The receptor site can only be accessed by road and it is not located on a strategic highway.

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18 Evaluation objective 15: To conform to health and safety good practice

18.1.1 Rural Arisings Ltd. are not accredited to ISO18001, however the receptor site does have a health and safety management plan.

18.1.2 The receptor site has been operational since October 2011 and there have been no reported RIDDOR incidents since that date.

18.1.3 Table 18.1provides the grade given for evaluation objective 15 and the justification for the grade.

Table 18.1 Evaluation objective 15 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
15. To conform to Health and Safety Good Practice.	a) Health and safety performance conforms to good practice.	**0**	The receptor sites H&S system is not accredited and there have been five or less RIDDOR incidents in three years recorded at the receptor site	The receptor site is not ISO18001 accredited. However, there is a health and safety management plan and there have been no RIDDOR incidents reported since the receptor site has been operational.

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References

[1] *A Practical Guide to the Strategic Environmental Assessment Directive* ODPM (September 2005); *Strategic Planning for Sustainable Waste Management: Guidance on Option Development and Appraisal* Department for Communities and Local Government (2002).

[2] *The London Plan* Greater London Authority (2011)

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.03**

Volume 3: Project-wide effects assessment appendices

Appendix A.4; Annex D.11: EMOS Shipton-on-Cherwell Quarry

APFP Regulations 2009: Regulation **5(2)(a)**

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January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Environmental Statement

Volume 3 Appendices: Project-wide effects assessment

Appendix A.4: Excavated materials options assessment

Annex D.11: Excavated materials options suitability report – Shipton-on-Cherwell Quarry

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1 Introduction

1.1.1 The construction of the Thames Tideway Tunnel project would require the excavation of a large volume of material at multiple sites throughout London. To identify the preferred options for the management of the excavated material a detailed options assessment has been undertaken.

1.1.2 The methodology for assessment of the excavated material options is based on the Sustainability Appraisal methodology[1]. The assessment has taken a phased approach and at each stage the least preferred options have been eliminated until the final most viable and sustainable options have been selected to form the planning stage preferred list. The options on the planning stage preferred list demonstrate the potential capacity to manage the excavated material in a sustainable manner. The assessment is based on the consistent assessment of options against agreed evaluation objectives throughout the process.

1.1.3 The steps informing the assessment process were:

a. Development of a long list of potential options for the treatment, reuse, recycling or disposal of excavated materials.

b. Viability filter involving the assessment of the long list against the operational evaluation objective associated with viability of the options.

c. Preliminary assessment to develop a short list of options which perform sufficiently well against all the evaluation objectives (environmental, social, operational, policy and health and safety).

d. Detailed assessment in which the options on the short list was further scrutinised to produce a planning stage preferred list of options which perform best against the full suite of evaluation objectives.

1.1.4 For each short listed option whose viability has been confirmed a detailed *Excavated Materials Option Suitability (EMOS) report* has been produced. The *EMOS* reports provide a summary of the site operations and the overall performance of the option against the evaluation objectives.

1.1.5 This *EMOS* report sets out the detail assessment for Shipton-on-Cherwell Quarry, in Oxfordshire. The report provides the information gained during the detailed assessment stage of the *Excavated material options assessment (EMOA)* and the grades awarded against each evaluation indicator as part of this assessment. A grade is provided for each evaluation indicator, using an agreed set of evaluation criteria, against seven grades of impact (ranging from --- to +++). The *EMOS* report also provides a risk profile for the site identifying the key risks associated with the option in relation to accepting the Thames Tideway Tunnel project excavated material.

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2 Site description

2.1 Site location

2.1.1 Shipton-on-Cherwell Quarry is located approximately 10km northwest of Oxford, and immediately north to the village of Shipton-on-Cherwell, within the Oxford Green Belt. The receptor site consists of an old working quarry and a proposed aggregate recycling facility. Earthline Limited is the operator of the receptor site and they have joint ownership with Shipton Limited.

2.1.2 The quarry is located in open countryside and covers 71 hectares, of which 67 hectares comprise of limestone quarry, which is largely worked out. The proposed aggregate recycling facility is at the centre of this dormant quarry, and the receptor site has planning consent to restore the quarry to a nature conservation area.

2.1.3 The quarry has been designated as a County Wildlife Site and parts of the receptor site are designated as a geological Sites of Special Scientific Interest (SSSI).

2.1.4 The nearest dwellings to the receptor site are in Jerome Way, in Shipton-on-Cherwell village, 400metres to the northwest.

2.1.5 Shipton-on-Cherwell Quarry site location is shown in Plate 3.1 Shipton-On-Cherwell Quarry site location.

2.2 Site operations

2.2.1 Shipton-on-Cherwell Quarry was formally a limestone quarry and cement works.

2.2.2 The receptor site currently has planning consent to infill the quarry void with inert material in order to restore the receptor site to a nature conservation area. The total capacity of the receptor site for restoration material is 2.2million m^3.

2.2.3 Currently, inert material can only be delivered to the receptor site via road. The receptor site does have planning consent to receive delivery of inert material by rail. However there is currently no infrastructure at the receptor site to facilitate delivery by rail, and additional investment would be required to allow delivery by rail.

2.2.4 If material is received by road, HGVs would enter the receptor site, and at the weighbridge be directed, wherever possible to an area of the quarry adjacent to where the material would be used for restoration prior to placement.

2.2.5 If material is delivered by rail, it would be unloaded from the trains in to temporary stockpiles, where it would then be transferred by mobile plant directly to where it would be used for restoration.

2.2.6 The operator has confirmed that if the delivered chalk has a high moisture content it would be deposited in an area at the receptor site where it would be dried, prior to then being collected and delivered to where it would be required for restoration.

2.2.7 The receptor site has planning consent for an aggregate recycling facility to be included within the site boundary. The operator has suggested that when Thames Tideway Tunnel project material arrives at the receptor site, either by road or by rail, the material would be assessed for its suitability to be recycled. This assessment would be visual on a load by load basis, and the receptor site's staff would determine whether the aggregate recycling facility would be able to grade the Thames Tideway Tunnel project material. If it were deemed suitable, the aggregate plant would grade the material into various sized aggregate product streams, which would then be exported from the site. Any material rejected by the recycling plant as not suitable to be processed, would be collected and used for restoration at the receptor site.

2.2.8 As the actual nature of the Thames Tideway Tunnel project material would only be determined once excavated, it is not possible to determine the amount of Thames Tideway Tunnel project material that would be recycled at the receptor site. Therefore for this site assessment, it has been considered that all Thames Tideway Tunnel project material delivered to the receptor site would be used for restoration purposes rather than be recycled.

2.3 Planning consent

2.3.1 Planning consent for restoring and developing the quarry, including the re-establishment of rail sidings, demolition of existing structures on site and construction of a rail aggregates and rail storage depots, was approved by the County Council in September 2006 (06/02046/CM).

2.3.2 A further conditional planning consent was granted by the County Council with reference 11/01372/CM in 2012 as a result of a need to change the total volume required for restoration and the time limit for the completion of the restoration.

2.3.3 The importation of material required for restoration must cease 10 years from the when the planning consent was granted i.e. by 2022.

2.3.4 The planning consent allows for the importation of 250,000tpa of material to the receptor site. However the consent allows a maximum of 750,000t of material to be delivered by road in total, throughout its operational lifespan. Any additional material required by the receptor site for restoration would therefore need to be delivered by rail.

2.3.5 There are time restrictions on when operations can occur at the receptor site, including deliveries of material by HGV and laying of material for restoration. These are 7am to 6pm Monday to Friday and 7am to 1pm Saturdays. No operations can occur on Sundays or Bank Holidays.

2.3.6 In addition, whilst deliveries by rail may take place at any time, no unloading or loading of wagons can occur outside the operating times of the receptor site.

2.3.7 For the purposes of this assessment it has been assumed that Thames Tideway Tunnel project material would be delivered by rail. This is because if the receptor site accepts 250,00tpa each year up to 2016 it would have accepted over 750,000t prior to receiving any material from the Thames Tideway Tunnel project.

2.4 Permitting

2.4.1 The environmental permit (EA permit number: AP3399VF) was issued in June 2009 and the transfer to new operators, Earthline Limited, was made in April 2012 (EA permit number: GB3431AD).

2.4.2 The environmental permit allows the receptor site to accept 250,000tpa of inert wastes.

2.4.3 The environmental permit states the receptor site's total capacity is to be less than 2.2million m^3.

2.4.4 Table 14.2 details the European Waste Catalogue (EWC) codes of the permitted waste types that can be accepted at Shipton-on-Cherwell.

2.4.5 Shipton-on-Cherwell Quarry has the necessary environmental permit in place to accept excavated Thames Tideway Tunnel project material for quarry restoration.

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3 Overall site summary

3.1.1 Table 3.1 below provides a summary of the Shipton-on-Cherwell Quarry and an assessment of its suitability against the evaluation objectives. Sections 4 to 18 of this *EMOS report* gives more detail on each evaluation objective.

Table 3.1 Summary of Shipton-on-Cherwell Quarry and its overall suitability

Site name:	Shipton-on-Cherwell Quarry (HAN.1)		**Owner/Operator:**	Earthline Limited			
Planning consent	Yes, until 2022 (06/02046/CM)		**Permit**	Yes, (AP3399VF)			
Void capacity	2.2million m^3		**Throughput**	250,000tpa			
Recovery/disposal	Recovery						
Materials	**London clay**	✓	**Lambeth group**	✓	**Chalk**	✓	
Transport type	**Road**	✓	**Rail**	✓	**Marine transport**	X	

Receptor site overview

Shipton-on-Cherwell Quarry is a former limestone quarry and cement works located in Oxfordshire. The receptor site currently has planning consent to infill part of the quarry void by 2022. The Thames Tideway Tunnel project material would be used in this restoration operation. This would restore the central area of Shipton-on-Cherwell Quarry to a nature habitat of grass and woodland. Thames Tideway Tunnel project material would be delivered to the receptor site by road, however the receptor site has planning consent for rail deliveries but there is currently no infrastructure in place to allow rail deliveries. The operator has stated that this infrastructure is likely to be developed during the receptor sites operational lifespan. The receptor site is approximately 90km from the Thames Tideway Tunnel main drive sites.

Assessment

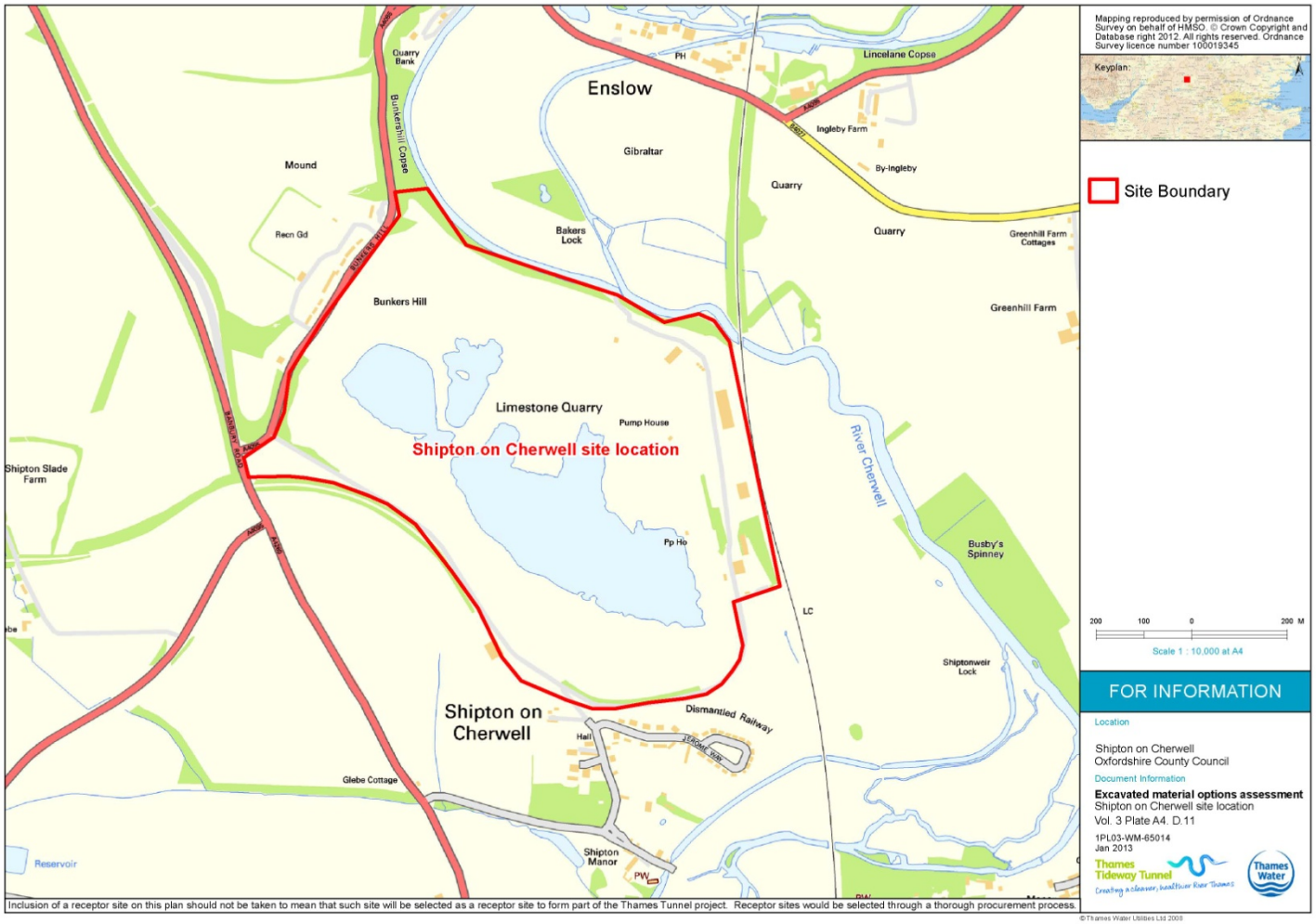
1. Land and other resources	a)	**0**	8. Cultural heritage	a)	**0**
	b)	**0**	9. Employment opportunities	a)	**+**
2. Climate change	a)	**-**		b)	**0**
	b)	**0**	10. Cost	a)	**0**
	c)	**-**	11. Operational suitability of the receptor site.	a)	**+++**
3. Local amenity	a)	**0**		b)	**+++**
4. Landscapes and townscapes	a)	**0**		c)	**--**
	b)	**++**		d)	**-**
5. Access to open space	a)	**0**		e)	**+++**
	b)	**++**		f)	**--**
6.Water quality	a)	**0**	12. Waste hierarchy	a)	**+++**
	b)	**0**	13. Proximity principle	a)	**--**
7.Biodiversity	a)	**0**	14. Sustainable transport policy	a)	**0**
	b)	**++**	15. Health and safety good	a)	**0**

			practice		

Environmental summary
The acceptance of Thames Tideway Tunnel project material is within the receptor site's existing consents. In the short term the use of Thames Tideway Tunnel project material for the restoration of Shipton-on-Cherwell Quarry is likely to have no or negligible effect on any local receptors. Part of the receptor site has been designated as a geological Site of Special Scientific Interest (SSSI) but this area of the receptor site would not be restored. In the long term the receptor site will be restored to a nature habitat with grass and woodland, similar to the surrounding area. This would have no or negligible effect with respect to visual and local amenity, as the receptor site is not currently visible to local receptors nor is accessible to the public without permission, nor is it planned to be when restored. The receptor site is located approximately 90km from the Thames Tideway Tunnel but material would be transferred using road, with the potential for transport by rail which is in line with sustainable transport policies.
Social summary
The restoration activities at the receptor site, to which Thames Tideway Tunnel project material would contribute, would lead to minor job gains over the short term. Some of these jobs may be directly attributable to the acceptance of Thames Tideway Tunnel project material as a result of an increased input rate at the receptor site.
Operational summary
The operator has confirmed that there is a requirement to accept approximately 2.2million m^3 of material for restoration. The receptor site is required to complete restoration by 2022, which would be after the Thames Tideway Tunnel project is anticipated to be completed. The receptor site would be able to accept all types of excavated materials produced by the Thames Tideway Tunnel project. For this assessment, it has been assumed that the receptor site would be able to receive deliveries of Thames Tideway Tunnel project material by rail. Shipton-on-Cherwell Quarry restoration back to natural habitats would be considered as beneficial use for all material accepted by the receptor site[l]. Earthline Limited is not accredited to ISO18001; however an operational health and safety plan is in place at the receptor site.
Overall suitability
Shipton-on-Cherwell Quarry has the ability to receive 24% of the Thames Tideway Tunnel project material up to 2022. Although, the receptor site needs to develop its rail infrastructure which it is assumed would occur for the receptor site to receive Thames Tideway Tunnel project material. The receptor site has a beneficial or neutral grading for all other evaluation indicators with the exception of some of the operational indicators and the proximity principle indicator). Shipton-on-Cherwell Quarry is included on the planning stage preferred list.

[l] Based on the *Excavated material options assessment* (*EMOA*) beneficial use test

Plate 3.1 Shipton-On-Cherwell Quarry site location



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4 Evaluation objective 1: To ensure prudent use of land and other resources

4.1.1 The receptor site receives inert excavation, construction and demolition material from other local projects in the Oxfordshire area.

4.1.2 The Thames Tideway Tunnel project material would be used to restore the receptor site to grassland and woodland habitats. The use of Thames Tideway Tunnel project material would replace the use of other reusable materials that would be used to infill the quarry.

4.1.3 The use of Thames Tideway Tunnel project material would not contribute to any requirement for additional land extending the receptor site's boundary.

4.1.4 Table 4.1 provides the grade given for evaluation objective 1 and the justification for the grade.

Table 4.1 Evaluation objective 1 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
1. To ensure prudent use of land and other resources	a) Extent to which resources such as sand, gravel and chalk are conserved by processing or storage of Thames Tideway Tunnel project material at receptor sites.	0	Thames Tideway Tunnel project material is unlikely to affect virgin material use e.g. material replaces other reusable materials or no material substitution required.	Thames Tideway Tunnel project material would be used in the quarry restoration. Thames Tideway Tunnel project material would replace the use of other reusable material.
	b) Extent to which Thames Tideway Tunnel project material would effect landtake at (footprint of) receptor sites in the long term.	0	The acceptance of Thames Tideway Tunnel project material would not contribute to the requirement for additional land extending the receptor site's boundary.	The Thames Tideway Tunnel project material would be used within the existing receptor site boundary and would not contribute to a need to expand the receptor site.

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5 Evaluation objective 2: To reduce climate change impacts

5.1.1 There is no carbon management plan currently in place at the receptor site. The operator has confirmed that plant emissions associated with the recycling facility and mobile plant would be mitigated by the use of modern plant and vehicles.

5.1.2 For this assessment, it has been assumed that no Thames Tideway Tunnel Project material would be recycled in to aggregate at the receptor site; rather it would all be used for restoration of the quarry. Based on data from the EA's WRATE, the overall GhG emissions for deposition of excavated material to land is 3.17kg CO_2 eq per tonne of excavated material. The excavation material is assumed to be inert soil and the emissions associated with material reception and spreading have been assumed.

5.1.3 The figures for GhG emissions from transport have been estimated based on:

a. the average CO_2 emissions for the different types of transport; and

b. the distance travelled from the Thames Tideway Tunnel sites to the receptor site.

5.1.4 The GhG emissions calculated are for comparative purposes only and do not provide an exact representation of the transport emissions associated with the Thames Tideway Tunnel excavated material. Full GhG methodology and assumptions can be found in Appendix B.10.

5.1.5 It has been estimated that using Shipton-on-Cherwell Quarry, and deliveries of Thames Tideway Tunnel project material being made by rail this would produce 7.65kg CO_2 eq per tonne of excavated material accepted.

5.1.6 The EA flood risk maps indicate that Shipton-on-Cherwell Quarry is outside the floodplain. However less than 400m to the eastern boundary of the receptor site, there is an area that has a significant chance of flooding.

5.1.7 The receptor site has a drainage management plan, where collected water is pumped off site to a discharge point.

5.1.8 It is not anticipated that the flood risk at the receptor site would change when the receptor site is restored.

5.1.9 Table 5.1 provides the grade given for evaluation objective 2 and the justification for the grade.

Table 5.1 Evaluation objective 2 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
2. To reduce climate change impacts	a) Greenhouse gases emitted through material treatment, handling and use at receptor sites (excludes transport).	-	Thames Tideway Tunnel project material requires active treatment at receptor sites (e.g. turning, washing, grading); material would be double handled and/or no process to reduce transport by vehicle on site	Thames Tideway Tunnel material would not require active treatment, however there will be some double handling. There is no carbon management plan at the receptor site.
	b) Extent to which flood risk is altered by Thames Tideway Tunnel project material at the receptor site (or in the local catchment).	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not change flood risk (from any source or a combination of sources) to the site and surroundings.	The receptor site is not in a flood zone and there is a drainage management plan in place.
	c) Greenhouse gases emitted through transport of Thames Tideway Tunnel project material to the receptor sites.	-	Through the transport of Thames Tideway Tunnel project material between 6 and less than or equal to 8kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced	Through the transport of Thames Tideway Tunnel material it is estimated that 7.65kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.

6 Evaluation objective 3: To protect local amenity

6.1.1 The receptor site is not located within an Air Quality Management Area (AQMA).

6.1.2 Earthline Limited stated that, when the receptor site is operational, they would ensure that all machinery at the receptor site would comply with current emission standards.

6.1.3 There are monitoring stations in place at the receptor site for odour, noise and dust.

6.1.4 There is a dust management plan in place for the receptor site, which includes measures (e.g. spraying haul roads) to deal with dust should the issue arise.

6.1.5 Thames Tideway Tunnel project material would be similar in nature to any other material that would be accepted at the receptor site for restoration purposes and would be accepted as part of the existing operations at the receptor site.

6.1.6 Table 6.1 provides the grade given for evaluation objective 3 and the justification for the grade.

Table 6.1 Evaluation objective 3 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
3. To protect local amenity	a) Extent of potential effects on local amenity from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have an effect on the local amenity or any effect would be negligible.	Thames Tideway Tunnel project material would form part of the existing operations at the receptor site and this material would replace the use of reusable material that would be accepted at the receptor site for restoration purposes. The receptor site has measures in place to minimise nuisance effects such as a dust management plan.

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7 Evaluation objective 4: To conserve landscape and townscapes at receiving locations

7.1.1 The receptor site lies within the Oxfordshire Green Belt but is not in an Area of Outstanding Natural Beauty (AONB).

7.1.2 The receptor site abuts Shipton-on-Cherwell village and lies approximately 5km from Kidlington.

7.1.3 The receptor site is a former quarry and where material has been excavated, the quarry is lower than the surrounding land with the edges of the receptor site are raised and lined with mature trees.

7.1.4 The former cement works on the receptor site include a large chimney. This chimney and buildings would be demolished prior to the receipt of Thames Tideway Tunnel project material.

7.1.5 The receptor site is well screened on all boundaries by mature trees and restoration activities would not visible from any local receptors.

7.1.6 Thames Tideway Tunnel project material would form part of the permitted operations at the receptor site. The type of visual effects from site operations (deposit operations, land forming, bund excavation/soil spreading, restoration works, aggregate recycling, cultivation, seeding and planting works) would not be of an adverse nature within the overall context of the existing site and former cement plant.

7.1.7 In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute would be no more or less visible given the overall context of the existing site.

7.1.8 In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape changing the area from a quarry and former cement plant to nature conservation area with grass and woodland. The final restoration scheme for the receptor site has yet to be confirmed.

7.1.9 Table 7.1 provides the grade given for evaluation objective 4 and the justification for the grade.

Table 7.1 Evaluation objective 4 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
4. To conserve landscapes and townscapes at receiving locations	a) Extent of short term visual and landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have a short term effect on the local visual amenity at the receptor site or any effect would be negligible.	In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute would be no more or less visible given the overall context of the existing site and quarry.
	b) Extent of permanent visual and landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**++**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a permanent moderate beneficial visual effect on the landscape, based on a 'do nothing' view of the site.	In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on the landscape changing the area from a quarry to a nature conservation area. Final restoration plans are yet to be confirmed.

8 Evaluation objective 5: To protect quality of and access to open space

8.1.1 A Public Rights of Way (PRoW) runs along the north eastern boundary and south western boundary of the receptor site.

8.1.2 The receptor site is currently accessible to paleontological groups due to its geological interest. In both the short and long term paleontological groups would continue to have access to the relevant areas of the receptor site, with prior agreed permission.

8.1.3 The planning consent for the receptor site requires provision to be made for public access when restored, including the provision of footpaths and a car park.

8.1.4 The operator has commented that when restored, parts of the receptor site would be restored to agriculture land, which is likely to have restricted access to the public.

8.1.5 Table 8.1 provides the grade given for evaluation objective 5 and the justification for the grade.

Table 8.1 Evaluation objective 5 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
5. To protect quality of and access to open space	a) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the short term?	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or a negligible effect on access to and quality of open space and PRoWs.	The restoration works at the receptor site to which the Thames Tideway Tunnel project material would contribute would not disrupt the existing PRoW on the north eastern and south western boundaries of the receptor site.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the long term?	++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would moderately enhance a PRoW or improve the quality of and access to public open space	The receptor site's planning consent requires some public access to the restored receptor site and the geological SSSI. However part of the receptor site will be restored to agriculture which is likely to have some limits to public access. All restoration measures proposed would both contribute to a moderate enhancement of public access.

9 Evaluation objective 6: To protect water quality

9.1.1 Beyond the north eastern boundary of the quarry the land falls away steeply to the Oxford Canal/River Cherwell which runs along the edge of the receptor site. The River Cherwell is located 200m to the east of the receptor site boundary, separated by fields.

9.1.2 A drainage management plan exists at the receptor site to manage the surface water that accumulates in the quarry void and to ensure that it is managed appropriately by being collected by tanker and discharged off site.

9.1.3 There are water bodies on the receptor site, but not within the area where Thames Tideway Tunnel project material would be handled or placed for restoration. The drainage management plan at the receptor site is designed to mitigate any impact material handling operations would have on these water bodies.

9.1.4 The receptor site is not in a groundwater Source Protection Zone (SPZ), which highlights groundwater sources such as wells, boreholes and springs used for public drinking water supply.

9.1.5 Based on the measures included within the drainage management plan in place at the receptor site and the inert nature of the Thames Tideway Tunnel project material it is not anticipated that accepting Thames Tideway Tunnel project material would have an effect on the surrounding water courses and/or groundwater.

9.1.6 Table 9.1 provides the grade given for evaluation objective 6 and the justification for the grade.

Table 9.1 Evaluation objective 6 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
6. To protect water quality	a) Extent of potential effects on fluvial water quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on the local watercourses.	There is a drainage management scheme in place at the receptor site. It is not anticipated that the treatment, handling or use of the Thames Tideway Tunnel project material would have an effect on the local water course which is adjacent to the receptor site's boundary.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of potential effects on groundwater quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on groundwater.	There is a drainage management scheme in place at the receptor site. The receptor site is not in a groundwater SPZ and the treatment, handling or use of the Thames Tideway Tunnel project material at the receptor site is likely to have no or negligible effect on groundwater.

10 Evaluation objective 7: To protect biodiversity

10.1.1 The Shipton-on-Cherwell and Whitehall Farm Quarries SSSI is within the boundary of the receptor site.

10.1.2 Earthline Limited is required by the receptor site's planning consent to develop an ecological mitigation and management plan to prevent onsite activities from effecting the natural environment.

10.1.3 The Ecological Assessment carried out as part of the receptor site's Environmental Assessment found that the impact of the receptor sites operations would be 'not significant' on the ecological receptors (including habitats, birds, bats, reptiles, flora and invertebrates), due to the mitigation measures proposed and that would be introduced and included in the ecological mitigation and management plan.

10.1.4 The restoration plans for the receptor site are not yet confirmed. Earthline Limited has commented that the plans are likely to include grassland and woodland to form different habitats as part of a nature conservation area.

10.1.5 The planning consent requires the restored receptor site to safeguard and protect existing areas of biodiversity, as well as to create new ecological habitats.

10.1.6 Table 10.1 provides the grade given for evaluation objective 7 and the justification for the grade.

Table 10.1 Evaluation objective 7 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
7. To protect biodiversity	a) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the short term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	An ecological mitigation and management plan (to include details of how Shipton-on-Cherwell Local Wildlife Site will be managed and monitored for the duration of the development to enhance biodiversity) would be in place to ensure that activities at the receptor site do not cause nuisance to the natural environment.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the long term.	++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on a designated site and/or creation/ improvement of habitats.	Thames Tideway Tunnel project material would form part of the restoration plans for the receptor site. Existing habitats at the receptor site are required to be maintained when the receptor site would be restored, and the restoration scheme would require new habitats to be created.

11 Evaluation objective 8: To protect cultural heritage

11.1.1 There are three Scheduled Ancient Monuments (SAMs) within 2km of the receptor site. Long barrow is 900m to the northwest, Shipton-on-Cherwell Churchyard Cross is1.2km to the south east and Whitehill medieval settlement is 1.8km to the north of the receptor site.

11.1.2 Blenheim Palace is located 2.7km southeast of the receptor site. There are listed buildings 300m from the site in Shipton-on-Cherwell village and on Bunkers Hill. The operator confirmed that there are no archaeological constraints at the receptor site.

11.1.3 Part of the receptor site has been designated as a geological Site of Special Scientific Interest (SSSI) because of the geological interest at the receptor site.

11.1.4 The geological SSSI at the receptor site would not be included in the quarry restoration and would be left exposed.

11.1.5 The treatment, handling or use of Thames Tideway Tunnel project material at the receptor site is likely to have no or negligible effect on the SAMs. There are vehicle routing plans in place at the receptor site to ensure that HGVs delivering material to the receptor site do not pass through the local villages and impact on these SAMs.

11.1.6 From the mitigation measures proposed, it is not anticipated that the operations at the receptor site which Thames Tideway Tunnel project material would have an effect on cultural heritage.

11.1.7 Table 11.1 provides the grade given for evaluation objective 8 and the justification for the grade.

Table 11.1 Evaluation objective 8 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
8. To protect cultural heritage	a) Extent of potential effects on designated or nominated archaeological sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	The receipt of Thames Tideway Tunnel project material at the receptor site is not anticipated to have no or negligible impact on local designated sites. The receptor site has measures in place to ensure that any effects are reduced.

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12 Evaluation objective 9: To provide employment opportunities

12.1.1 Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would employ an estimated four or five additional staff over the short term. Some of these jobs may be directly attributable to the acceptance of Thames Tideway Tunnel project material as a result of an increased input rate at the receptor site.

12.1.2 In the long term it is unlikely that any additional jobs would be created. It is considered that if restoration was to continue beyond 2022 then the same staff would be used at the receptor site.

12.1.3 Table 12.1 provides the grade given for evaluation objective 9 and the justification for the grade.

Table 12.1 Evaluation objective 9 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
9. To provide employment opportunities	a) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the short term.	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would lead to minor job gains over the short term of less than 10 jobs	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would generate less than 10 jobs over the short term.
	b) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the long term.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the long term.	It is anticipated that there would be no job losses or gains in the long term.

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13 Evaluation objective 10: To minimise the cost associated with the management of excavated material

13.1.1 In order to compare the likely cost associated with transport and acceptance of the Thames Tideway Tunnel project material at each receptor site a cost model is used.

13.1.2 The cost of transporting the excavated material has been calculated from the distance travelled and a cost per tonne/ km for the transport mode. The road, transport haulage cost have been calculated from the quotes gathered from operators based on today's prices. A gate fee of £4 per tonne is assumed based on current prices. Full details of the assumptions made can be found at Appendix B.10.

13.1.3 It has been estimated that the cost of transporting and managing excavated material at Shipton-on-Cherwell Quarry is £16.86 per tonne of excavated material that can be accepted at the receptor site. These costs are predominantly associated with transfer of the material from the Thames Tideway Tunnel sites to the receptor sites. This cost is an estimated cost for comparison purposes within the *EMOA* and may differ from the actual cost which would be agreed at the procurement stage if Thames Tideway Tunnel project material were taken to this receptor site.

13.1.4 Table 13.1 provides the grade given for evaluation objective 10 and the justification for the grade.

Table 13.1 Evaluation objective 10 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
10. To minimise the cost associated with the management of excavated material.	a) Costs of transportation, treatment, handling and use of Thames Tideway Tunnel project material.	**0**	The transportation, treatment, handling and use of Thames Tideway Tunnel project material would cost between £16 and less than or equal to £19 per tonne	The cost of transportation, treatment, handling and use of Thames Tideway Tunnel material has been estimated (using the *EMOA* cost model) to be £16.86 per tonne.

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14 Evaluation objective 11: To ensure operational suitability of the receptor site

14.1 Evaluation indicator 11a) Timescales

14.1.1 The receptor site has planning consent until 2022.

14.1.2 Based on Thames Tideway Tunnel project excavation timescales of 2016 to 2021, Shipton-on-Cherwell Quarry would be available for use for Thames Tideway Tunnel project material for the entire project timetable.

14.1.3 Additionally this timescale is also based on the assumption that rail infrastructure will be in place at the receptor site to receive material prior to 2016 in order for it to receive restoration material at the throughput required to complete restoration by 2022.

14.1.4 Table 14.1 provides the grade given for evaluation objective 11a and the justification for the grade.

Table 14.1 Evaluation objective 11a grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	a) Likelihood of implementation within the required timescale.	+++	The receptor site would be available for use for Thames Tideway Tunnel project material for more than 100% of the required timescale	Planning consent for the receptor site requires work to be completed by 2022. The receptor site would be available to accept Thames Tideway Tunnel project material for the entire project timetable.

14.2 Evaluation indicator 11b) Material characteristics

14.2.1 Shipton-on-Cherwell Quarry would be able to accept London Clay, chalk and Lambeth Group with sands, gravels and inert tunnel construction materials (piling and diaphragm wall arisings) for restoration.

14.2.2 The receptor site is permitted to accept a range of inert construction and demolition wastes. Table 14.2 details the EWC Codes relating to the materials permitted under Shipton-on-Cherwell Quarry's environmental permit most relevant to the acceptance of the Thames Tideway Tunnel project excavated materials.

Table 14.2 Permitted waste types for Shipton-on-Cherwell Quarry

EWC codes	Description
17 05 04	Soil and stones (Excluding topsoil, peat; excluding soil and stones from contaminated sites)
20 02 02	Soil and stones (only from garden and parks waste; Excluding top soil, peat)

14.2.3 The receptor site has the potential to receive all Thames Tideway Tunnel non-hazardous excavated project material types. The material would be subject to acceptance criteria testing to ensure that the material is inert. Details are set out in the environmental permit. It is assumed that most, if not all, of the Thames Tideway Tunnel excavated material would be inert.

14.2.4 Table 14.3 provides the grade given for evaluation objective 11b and the justification for the grade.

Table 14.3 Evaluation objective 11b grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	b) Acceptability of material with Thames Tideway Tunnel project material characteristics by the receptor sites.	+++	The receptor site could accept for use all of the Thames Tideway Tunnel project material types based on their characteristics.	The receptor site would be able to accept all the excavated material produced by the Thames Tideway Tunnel project

14.3 Evaluation indicator 11c) Capacity

14.3.1 The receptor site is permitted to accept 250,000tpa.

14.3.2 The planning consent has granted for the importation of a total of 2.2million m^3 (approximately 2.7million tonnes). This volume has been determined by an assessment carried out by Earthline Limited on the volume required to complete the restoration of the quarry to appropriate levels.

14.3.3 The planning consent limits deliveries by road to a total maximum of 750,000t of material throughout its operational time period and requires the remainder of the material to be imported by rail.

14.3.4 Table 14.4 details the permitted capacity for the receptor site in relation to the material that will be produced by the Thames Tideway Tunnel.

14.3.5 Table 14.4 also sets out the potential tonnage of Thames Tideway Tunnel project material accepted at the receptor site each year based on the assumptions used in the *EMOA* cost and GhG model. The receptor site would be able to accept 24% of the Thames Tideway Tunnel project excavated materials, based on the total amount of restoration material that

it can accept and tonnages which are likely to be produced by the Thames Tideway Tunnel during the three years that it is available.

Table 14.4 Capacity for inert material at Shipton-on-Cherwell Quarry (tonnes[II])

	Year						Total
	2016	2017	2018	2019	2020	2021	
Total Thames Tideway Tunnel production (tonnes)	63,000	549,000	1,938,000	1,852,000	147,000	155,000	4,704,000
Maximum permitted per annum (tonnes).	250,000	250,000	250,000	250,000	250,000	250,000	-
Potential Thames Tideway Tunnel project material accepted (tonnes).	63,000	250,000	250,000	243,000	147,000	155,000	1,108,000
Potential Thames Tideway Tunnel project material accepted (%).	100%	46%	13%	14%	100%	100%	24%

14.3.6 Table 14.5 provides the grade given for evaluation objective 11c and the justification for the grade.

Table 14.5 Evaluation objective 11c grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	c) Capacity of the receptor site to accept the required volume of Thames Tideway Tunnel project material (based on likely tonnage accepted/ %).	--	The receptor site has capacity to accept material greater than or equal to 15% but less than 30% of Thames Tideway Tunnel project material	The receptor site has the potential to accept approximately or 24% of the excavated material that would be produced by the Thames Tideway Tunnel.

[II] Figures quoted to the nearest 1,000 tonnes

14.4 Evaluation indicator 11d) Receptor site throughput

14.4.1 There are restrictions on the amount of material (750,000t) which can be imported to the receptor site by road, and the remaining material required to complete restoration requirements would therefore be required to be imported to the receptor site by rail.

14.4.2 For the purpose of this assessment, it has been assumed that Thames Tideway Tunnel project material would be delivered to the receptor site by rail. This is because prior to 2016, it is assumed that the receptor site would have used all its permitted road delivery tonnages. Therefore from 2016, when Thames Tideway Tunnel project material would be produced, it has been assumed that material can only be delivered by rail, and that this infrastructure has been put in place.

14.4.3 There are no restrictions on the daily number of rail movements allowed at the receptor site within its planning consent. As the infrastructure is currently not in place to manage the receipt of material by rail, the throughput capacity of the rail sidings cannot be confirmed. For assessment of this objective, it has been assumed that the receptor site would be able to manage two deliveries per day of Thames Tideway Tunnel project material by rail with each train having a capacity of 1,500t; as this is consistent with information provided by other receptor sites assessed with similar infrastructure in place.

14.4.4 The amount of material produced by the Thames Tideway Tunnel would vary on a daily and monthly basis. The assessment of throughput has been based on both the mean and peak production rates over the Thames Tideway Tunnel construction period. The mean rate is taken as the mean monthly production rate taken over each year in the period 2016 to 2021. The peak rate is based on the month producing the maximum tonnage of excavated material in each year.

14.4.5 Table 14.6 details the proportion of the Thames Tideway Tunnel project material which would be accepted by Shipton-on-Cherwell Quarry over time.

14.4.6 In Years 1, 5 and 6 of the excavation process Shipton-on-Cherwell Quarry's limit of 3,000t per day is sufficient to accept all average and peak Thames Tideway Tunnel project daily tonnages produced. However in Years 3 and 4 it would be able to receive less than half of the average Thames Tideway Tunnel project material produced and less than 30% of the peak tonnage produced.

Table 14.6 Throughput of material at Shipton-on-Cherwell Quarry

	Year					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Maximum allowable number of daily train movements at receptor site (A).	2	2	2	2	2	2

	Year					
Capacity per Train (tonnes)	1,500	1,500	1,500	1,500	1,500	1,500
Thames Tideway Tunnel average daily tonnage*.	250	2,050	7,200	6,850	550	550
Required number of trains to transport average daily tonnage (B).	0.2	1.4	4.8	4.6	0.4	0.4
Allowable vs Average Required Number of trains at receptor site (A ÷ B).	1,200%	146%	42%	44%	546%	546%
Thames Tideway Tunnel peak daily tonnage**.	350	3,050	10,750	10,300	800	850
Required number of trains to transport peak rate (C).	0.2	2.0	7.2	6.9	0.5	0.6
Allowable vs Peak Number of trains at receptor site (A ÷ C).	857%	98%	28%	29%	375%	353%

***** *The Thames Tideway Tunnel average daily tonnage for each year is calculated as the mean of the daily rate each month assuming 22.5 days in each month.*

****** *The peak daily tonnage is based on the average daily tonnage (assuming a 22.5 day month) for the peak month of production in each year.*

14.4.7 Table 14.7 provides the grade given for evaluation objective 11d and the justification for the grade.

Table 14.7 Evaluation objective 11d grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	d) Ability of the receptor sites to accept Thames Tideway Tunnel project material at the anticipated rate (speed of material generation vs acceptance rate).	-	The receptor site could take greater than or equal to 2,800 but less than 4,600t per day of Thames Tideway Tunnel project material.	The receptor site has the ability to receive 3,000t per day, based on the delivery of two trains a day each with a capacity of 1,500t.

14.5 Evaluation indicator 11e) Planning consent and permitting

14.5.1 Shipton-on-Cherwell Quarry has the necessary planning consent and environmental permit in place to accept excavated Thames Tideway Tunnel project material for quarry restoration.

14.5.2 Further information on the receptor site's planning consent and environmental permit can be found in Section 2.2 and 2.3.

14.5.3 Table 14.8 provides the grade given for evaluation objective 11e and the justification for the grade.

Table 14.8 Evaluation objective 11e grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	e) Site operations have appropriate planning and permitting consents.	+++	The receptor site has planning consent and an EA permit.	The receptor site has the relevant planning consent and environmental permit in place to be able to accept Thames Tideway Tunnel project material.

14.6 Evaluation indicator 11f) Transport modes

14.6.1 The receptor site is limited to accepting 750,000t of material by road only. Any additional material deliveries would be required to be made by rail.

14.6.2 The planning consent has restrictions on operating times that material can be delivered to the receptor site. This is 07:00-18:00 Mondays-Fridays, and 07:00-13:00 Saturdays. No operations to occur Sundays or Bank Holidays.

14.6.3 Notwithstanding the above times, rail deliveries can occur at any time; however the unloading of trains is restricted to the operational hours above.

14.6.4 There are no restrictions in the planning consent for number of rail deliveries allowed to be made to the receptor site per day. The assumption has been made that 2 trains per day would be managed at the site, as this is consistent with other receptor sites assessed.

14.6.5 The railway line infrastructure requires funding in order for a decision to be made whether it will be developed. This objective has been assessed assuming that the rail infrastructure is in place and that deliveries of Thames Tideway Tunnel project material can occur by rail only.

14.6.6 Table 14.9 provides the grade given for evaluation objective 11f and the justification for the grade.

Table 14.9 Evaluation objective 11f grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	f) Can accept excavated material from multiple transport modes.	--	The receptor site is only accessible by one transport mode	The receptor site has been assessed based on the assumption that rail infrastructure has been developed at the receptor site prior to 2016 and

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
				Thames Tideway Tunnel project material will be delivered by rail only.

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15 Evaluation objective 12: To conform to the waste hierarchy

15.1.1 The Thames Tideway Tunnel *Excavated materials and waste (EM&W) strategy* contains an objective to 'To minimise waste arisings, maximise re-use, recovery, recycling and beneficial use and minimise the impact of waste on the environment and communities'.

15.1.2 The Thames Tideway Tunnel project material would be used to restore Shipton-on-Cherwell to grass and woodland use by infilling the existing quarry void.

15.1.3 This is considered to be beneficial use in line with the *EMOA* beneficial use test. Table 15.1 details the application of the *EMOA* beneficial use test applied to Barrington Quarry.

Table 15.1 Quarry restoration performance against *EMOA* beneficial use test

***EMOA* test**	**Does the receptor site comply with test?**	**Comment**
The activity would bring land back into use or provide ecological benefit.	Yes	Shipton-on-Cherwell Quarry would be restored to grass and woodland for ecological nature habitats.
In the case of quarries or landfill sites that the activity has a planning requirement to be restored.	Yes	There is a planning requirement for Shipton-on-Cherwell Quarry to be restored.
Landfill Tax would not be charged on the material.	Yes	Shipton-on-Cherwell Quarry would be exempt from landfill tax because it is a quarry restoration project.
That the material is suitable for its intended use and would not harm human health or the environment.	Yes	Shipton-on-Cherwell Quarry would be able to accept all Thames Tideway Tunnel non-hazardous excavated project material, and if managed in accordance with the environmental permit the activities should not harm human health or the environment.
That the minimum amount of material is being used.	Yes	The material is being used to return the receptor site back to the agreed levels through the planning consent.
That alternative material (whether waste or non-waste) would be required if Thames Tideway Tunnel project material wasn't used.	Yes	Material would be sourced from elsewhere to restore that quarry if Thames Tideway Tunnel project material was not available.

15.1.4 All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 24% of the total Thames Tideway Tunnel project material.

15.1.5 Table 15.2 provides the grade given for evaluation objective 12 and the justification for the grade.

Table 15.2 Evaluation objective 12 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
12. To conform to the waste hierarchy.	a) Extent to which the option meets the *EM&W strategy* targets.	+++	Performance of receptor site substantially exceeds target.	All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 24% of the total Thames Tideway Tunnel project material.

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16 Evaluation objective 13: To conform to the proximity principle

16.1.1 In a straight line the receptor site is located 86km from Carnwath Road Riverside (Clay), 89km from Kirtling Street (Lambeth Beds and Thanet Sands) and 94km from Chambers Wharf (Chalk).

16.1.2 All Thames Tideway Tunnel project material would need to be delivered to sidings located at the receptor site by rail and it has been estimated that the distance from Acton Main Line to the receptor site would be is approximately 105km and from Bow East is 135km[III]. The indicative transhipment point used in the *EMOA* modelling is 11km from Bow East and Thames Tideway Tunnel CSO and drive sites are located an average of 15km from Bow East by road.

16.1.3 In accordance with the Thames Tideway Tunnel project *Transport Strategy* excavated material produced at these sites would be removed by marine transport and not by road. For the purposes of this assessment it has been assumed that the material would be taken from the drive sites by marine transport to a transhipment point and transferred to road at this location (IG11 0EG). The mean distance to the transhipment point from the drive sites is 20km by marine transport. The transhipment point is 104km from Shipton-on-Cherwell Quarry by road[IV].

16.1.4 The receptor site is approximately 90km in a straight line from the main drive sites.

16.1.5 Table 16.1 provides the grade given for evaluation objective 13 and the justification for the grade.

Table 16.1 Evaluation objective 13 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
13. To conform to proximity principle.	a) Average distance from main tunnel drive sites.	--	The receptor site between 100km and 80km from source of the Thames Tideway Tunnel project material	The receptor site is approximately 90km (straight line distance) from the main drive sites.

[III] Distances quoted are those used in the *EMOA* GhG model. Details of the assumptions used in this model can be found in Appendix B.10. These distances are for context only and do not reflect the exact routes that would be used should this receptor site be used to accept Thames Tideway Tunnel project material.

[IV] Distances quoted are those used in the *EMOA* GhG model. Details of the assumptions used in this model can be found in Appendix B.10. These distances are for context only and do not reflect the exact routes that would be used should this receptor site be used to accept Thames Tideway Tunnel project material.

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17 Evaluation objective 14: To conform to sustainable transport policy

17.1.1 The receptor site would only be accessed by road, unless rail infrastructure is developed. However the receptor site does have direct access to a strategic highway, the A4260.

17.1.2 *The London Plan 2011*[2] Policy 5.18 Construction, excavation and demolition states "that waste should be removed from construction sites, and materials brought to the site, by water or rail transport wherever that is practicable". Thames Tideway Tunnel project material would need to be transferred to road at an intermodal transfer station to comply with this requirement.

17.1.3 *The Oxfordshire Waste Planning Strategy Consultation Draft, September 2011*[3] C7 states that "proposals for mineral working and waste facilities should: wherever possible, transport minerals or waste by rail, water, pipeline or conveyor, rather than by road.''

17.1.4 The current planning consent allows for the delivery of material by both rail and road. However there is currently no infrastructure in place to facilitate delivery of material by rail. Earthline Limited confirmed that this option would be developed in the future and is currently examining opportunities to secure the necessary funding.

17.1.5 Table 17.1 provides the grade given for evaluation objective 14 and the justification for the grade.

Table 17.1 Evaluation objective 14 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
14. To conform to sustainable transport policy.	a) Conforms to policy objective to move transport of materials from road to rail or marine transport.	++	The receptor site has the potential to be directly accessed by rail or marine transport but additional infrastructure is required	The receptor site can be directly accessed by rail; however infrastructure upgrades would be required.

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18 Evaluation objective 15: To conform to health and safety good practice

18.1.1 The receptor site has been operated by Earthline Limited since March 2012.

18.1.2 Earthline Limited operates under health and safety procedures at the receptor site and also has a Health and Safety Management Plan in place.

18.1.3 Earthline Limited is not accredited to ISO18001.

18.1.4 There have been no reported RIDDOR incidents in the last six months at the receptor site.

18.1.5 Table 18.1 provides the grade given for evaluation objective 15 and the justification for the grade.

Table 18.1 Evaluation objective 15 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
15. To conform to health and safety good practice.	a) Health and safety performance conforms to good practice.	**0**	The receptor sites H&S system is not accredited and there have been five or less RIDDOR incidents in three years recorded at the receptor site	The receptor site has recently become operational (March 2012) and there have been no RIDDOR incidents during this period. Health and Safety Management Plans are in place at the receptor site.

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References

[1] *A Practical Guide to the Strategic Environmental Assessment Directive* ODPM (September 2005); *Strategic Planning for Sustainable Waste Management: Guidance on Option Development and Appraisal* Department for Communities and Local Government (2002)

[2] *The London Plan* Greater London Authority 2011

[3] *The Oxfordshire Waste Planning Strategy Consultation Draft.* Oxfordshire County Council *(*September 2011)

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.03**

Volume 3: Project-wide effects assessment appendices

Appendix A.4; Annex D.12: EMOS East Burnham Quarry

APFP Regulations 2009: Regulation **5(2)(a)**

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Thames Tideway Tunnel

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Thames Tideway Tunnel

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Annex D.12: Excavated materials options suitability report – East Burnham Quarry

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1 Introduction

1.1.1 The construction of the Thames Tideway Tunnel project would require the excavation of a large volume of material at multiple sites throughout London. To identify the preferred options for the management of the excavated material a detailed options assessment has been undertaken.

1.1.2 The methodology for assessment of the excavated material options is based on the Sustainability Appraisal methodology[1]. The assessment has taken a phased approach and at each stage the least preferred options have been eliminated until the final most viable and sustainable options have been selected to form the planning stage preferred list. The options on the planning stage preferred list demonstrate the potential capacity to manage the excavated material in a sustainable manner. The assessment is based on the consistent assessment of options against agreed evaluation objectives throughout the process.

1.1.3 The steps informing the assessment process were:

a. Development of a long list of potential options for the treatment, reuse, recycling or disposal of excavated materials.

b. Viability filter involving the assessment of the long list against the operational evaluation objective associated with viability of the options.

c. Preliminary assessment to develop a short list of options which perform sufficiently well against all the evaluation objectives (environmental, social, operational, policy and health and safety).

d. Detailed assessment in which the options on the short list was further scrutinised to produce a planning stage preferred list of options which performance best against the full suite of evaluation objectives.

1.1.4 For each short listed option whose viability has been confirmed a detailed *Excavated materials option suitability (EMOS) report* has been produced. The *EMOS reports* provide a summary of the site operations and the overall performance of the option against the evaluation objectives.

1.1.5 This *EMOS report* sets out the detail assessment for East Burnham Quarry, Berkshire. The report provides the information gained during the detailed assessment stage of the *Excavated material options assessment (EMOA)* and the grades awarded against each evaluation indicator as part of this assessment. A grade is provided for each evaluation indicator, using an agreed set of evaluation criteria, against seven grades of impact (ranging from --- to +++). The *EMOS report* also provides a risk profile for the site identifying the key risks associated with the option in relation to accepting the Thames Tideway Tunnel project excavated material.

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2 Site description

2.1 Site location

2.1.1 East Burnham Quarry is located in Berkshire approximately 34km from the Thames Tideway Tunnel drive sites and covers an area of approximately 52ha. The receptor site is on land located off Farnham Lane, which itself is located off the A355, approximately 400m south of Burnham Beeches Site of Special Scientific Interest (SSSI).

2.1.2 The quarry is located in green belt in an agricultural and woodland setting.

2.1.3 There are farm buildings adjacent to the northern boundary of the receptor site, which are owned by the operator.

2.1.4 The centre of the receptor site is less than 2km north of Slough Trading Estate.

2.1.5 East Burnham Quarry site location is shown in Plate 3.1 East Burnham Quarry site location.

2.2 Site operations

2.2.1 The receptor site's planning consent was originally granted in 1992 to extract aggregate from the quarry.

2.2.2 The consent requires East Burnham Quarry to be progressively restored to agricultural grassland once extraction of aggregate is complete.

2.2.3 Thames Tideway Tunnel project material would be delivered to the receptor site by road. The material would, wherever possible, be directed to where it would be required for restoration, rather than being stockpiled.

2.2.4 The receptor site is currently not operational, however it is anticipated that gravel extraction will recommence at the receptor site 2013.

2.2.5 The operator of the receptor site has estimated that there is a requirement to import approximately 600,000m^3 of inert material to meet restoration requirements. The operator anticipates to source inert material required for the receptor site's restoration from other construction, demolition and excavation projects within West London and the surrounding regions. The operator commented that the receptor site could begin receiving material for restoration from 2013, and it is likely to have received restoration material prior to 2016 but the quantity is currently unknown. The operator stated that both the date restoration material would begin to be received and the amount delivered prior to 2016 would be determined by market conditions.

2.2.6 The receptor site has planning consent until December 2021 by which time the importation of inert material for restoration must be completed.

2.3 Planning consent

2.3.1 Planning consent for the extraction of gravel at East Burnham Quarry was granted in 1992 (SBD/838/88). In July 2008 conditions on the receptor site's quarrying and restoration operations were set by the Planning Authority. Conditions set in this consent included requirements to:

a. define the completion date for the site;

b. control the hours of working;

c. define and control the minimum depth of subsoil and topsoil;

d. control the number of vehicle movements; and

e. define landscaping and drainage.

2.3.2 The planning consent states the maximum daily vehicle movements shall not exceed 190 (95 in, 95 out).

2.3.3 The hours of operation are 7:30am to 6:00pm Mondays to Fridays and 7:30am to 12:30pm on Saturdays, with no operations on Sundays or Bank Holidays.

2.3.4 To allow for restoration requirements to be met, the total quantity of inert material required to be imported to the receptor site for restoration is estimated by the operator to be 600,000 m^3.

2.4 Permitting

2.4.1 The receptor site's environmental permit (BU0605IR) was issued in 2005. The permit allows the deposit of up to 150,000tpa of inert waste as a recovery operation.

2.4.2 The environmental permit was varied in May 2009 to increase the size of the area which requires restoration. The 600,000m^3 estimated by the operator required to complete restoration, includes this increased area.

2.4.3 Table 14.2 details the European Waste Catalogue (EWC) codes relating to the materials permitted under East Burnham Quarry's environmental permit, which is most relevant to the acceptance of the Thames Tideway Tunnel project excavated materials.

3 Overall site summary

3.1.1 Table 3.1 below provides a summary of the East Burnham Quarry site and an assessment of its suitability against the evaluation objectives. Sections 4 to 18 of this *EMOS report* provide more detail on each evaluation objective.

Table 3.1 Summary of East Burnham Quarry and its overall suitability

Site name:	East Burnham Quarry (SUM.2)		**Owner/operator:**	Summerleaze		
Planning consent	Yes, until 2021 SBD/838/88)		**Permit**	Yes (BU0605IR)		
Void capacity	Estimated 600,000 m^3		**Throughput**	150,000tpa		
Recovery/ disposal	Recovery					
Materials	**London clay**	✓	**Lambeth group**	✓	**Chalk**	**X**
Transport type	**Road**	✓	**Rail**	**X**	**Marine transport**	**X**

Receptor site overview

East Burnham Quarry in Berkshire is currently not operational but is anticipated to recommence gravel extraction operations in 2013. Thames Tideway Tunnel project material would be used in restoring the receptor site to agricultural grassland. Planning consent for the receptor requires restoration to be complete by December 2021. Excavated material can be delivered by road and the site is located approximately 34km of the Thames Tideway Tunnel project main drive sites.

Assessment

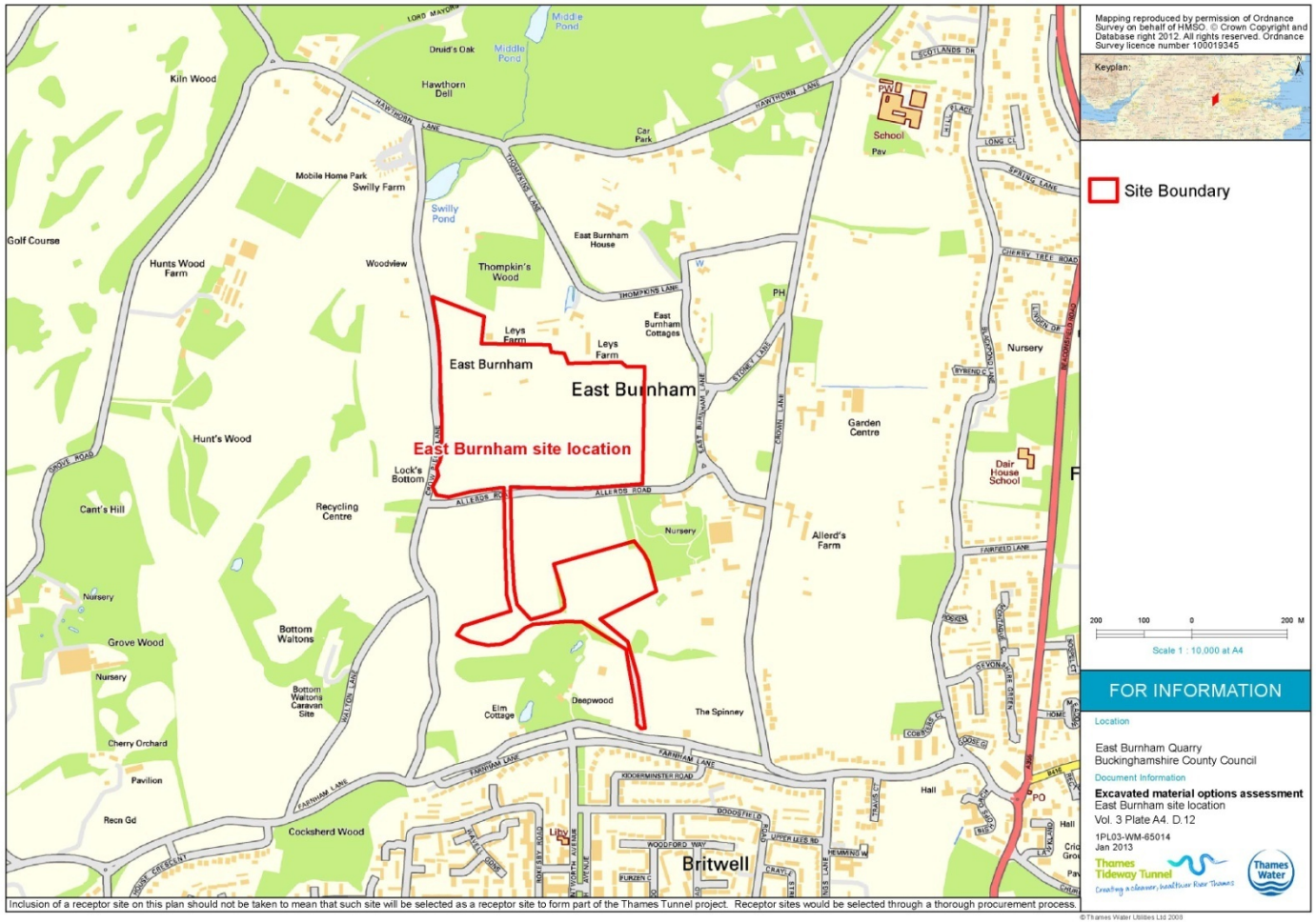
1. Land and other resources	a)	**0**	8. Cultural heritage	a)	**0**
	b)	**0**	9. Employment opportunities	a)	**0**
2. Climate change	a)	**0**		b)	**0**
	b)	**0**	10. Cost	a)	**--**
	c)	**-**	11. Operational suitability of the receptor site	a)	**++**
3. Local amenity	a)	**0**		b)	**-**
4. Landscapes and townscapes	a)	**0**		c)	**--**
	b)	**+**		d)	**--**
5. Access to open space	a)	**0**		e)	**+++**
	b)	**0**		f)	**--**
6.Water quality	a)	**0**	12. Waste hierarchy	a)	**+++**
	b)	**0**	13. Proximity principle	a)	**+**
7.Biodiversity	a)	**0**	14. Sustainable transport policy	a)	**---**
	b)	**0**	15. Health and safety good practice	a)	**N/A**

Environmental summary
The acceptance of Thames Tideway Tunnel project material is within the receptor site's existing consents and would form part of the permitted operations at the receptor site. In the short term it is therefore anticipated that the acceptance of Thames Tideway Tunnel project material is unlikely to have an additional effect on the environment beyond those of the existing operations. In the longer term, once the receptor site is fully restored it is anticipated that the creation of agricultural grassland would have no impact on an adjacent SSSI and have limited beneficial impact on local visual amenity as there are few local receptors. The receptor site is a mean 34km from the main drive sites and can only accept material by road.
Social summary
The restoration activities at the receptor site, to which Thames Tideway Tunnel project material would contribute is unlikely to lead to any job gains in the short term. The operator of the receptor site anticipates that planned staffing levels, which will be in place prior to the receipt of Thames Tideway Tunnel project material, would be sufficient to handle and place the Thames Tideway Tunnel project material. In the long term it is unlikely that there would be any jobs created or lost as it is possible that staff at the receptor site could be transferred to other Summerleaze operations. As part of the restoration scheme, no new footpaths/bridleways are proposed within the receptor site, and public access would remain restricted as it is currently.
Operational summary
The receptor site has planning consent until December 2021. The receptor site has permitted capacity to receive a total of 150,000tpa of inert material for restoration. Whilst currently not operational it is anticipated that the receptor site would begin accepting material for restoration after it recommences gravel extraction operations in 2013. Therefore the total amount of inert material required for restoration could be considerably reduced by the time the Thames Tideway Tunnel project starts producing material in 2016. It is anticipated that the receptor site would potentially be able to accept 16% of the Thames Tideway Tunnel project material during the lifetime of Thames Tideway Tunnel project. The receptor site would be able to accept all types of the excavated materials produced by the Thames Tideway Tunnel project based on the planning consent and permit. However, the operator has confirmed that there is insufficient space at the receptor site to allow the passive drying of chalk, and so would not seek to receive this material. East Burnham Quarry has a recovery permit issued by the Environment Agency. All Thames Tideway Tunnel project material accepted for restoration purposes at the receptor site and would be considered as beneficial use for all material accepted at the site[I]. The receptor site is proposing to have a full health and safety management plan when it recommences operations. Summerleaze do not operate to International Organisation for Standardisation (ISO)18001.
Overall suitability
East Burnham Quarry has the ability to receive only 16% of the Thames Tideway Tunnel project material up to 2021. The receptor site is not currently operational but

[I] Based on the *Excavated material options assessment (EMOA)* beneficial use test

would begin receiving material allocated for its restoration prior to 2016, and therefore its capacity to receive Thames Tideway Tunnel project excavated material could be considerably reduced. However the receptor site could provide some capacity in the early years of the Thames Tideway Tunnel project. The receptor site has a neutral grading for the majority of evaluation indicators (with the notable exceptions of sustainable transport mode, operational suitability, costs and GhG emissions). East Burnham Quarry is included on the planning stage preferred list.

Plate 3.1 East Burnham Quarry site location



4 Evaluation objective 1: To ensure prudent use of land and other resources

4.1.1 The receptor site is currently not operational. The operator intends to source inert material suitable for restoration purposes from construction, demolition and excavation projects from the surrounding area.

4.1.2 Thames Tideway Tunnel project material would be used to restore the receptor site and to make the site available for agricultural grassland. The use of Thames Tideway Tunnel project material would replace the use of other reusable materials that would be used restore the quarry.

4.1.3 The use of Thames Tideway Tunnel project material would not contribute to any requirement for additional land extending the receptor site's boundary.

4.1.4 Table 4.1 provides the grade given for evaluation objective 1 and the justification for the grade.

Table 4.1 Evaluation objective 1 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
1. To ensure prudent use of land and other resources	a) Extent to which resources such as sand, gravel and chalk are conserved by processing or storage of Thames Tideway Tunnel project material at receptor sites.	0	Thames Tideway Tunnel project material is unlikely to affect virgin material use e.g. material replaces other reusable materials or no material substitution required.	Thames Tideway Tunnel material would be used in the quarry restoration. Thames Tideway Tunnel material would replace the use of other reusable material.
	b) Extent to which Thames Tideway Tunnel project material would effect landtake at (footprint of) receptor sites in the long term.	0	The acceptance of Thames Tideway Tunnel project material would not contribute to the requirement for additional land extending the receptor site's boundary.	The Thames Tideway Tunnel project material would be used within the existing site boundary and would not contribute to a need to expand the receptor site.

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5 Evaluation objective 2: To reduce climate change impacts

5.1.1 The operator has stated that there would be minimal handling of Thames Tideway Tunnel project material when delivered to the receptor site. There are no systems at the receptor site to offset GhG.

5.1.2 Based on data from the Environment Agency's (EA) lifecycle analysis tool WRATE, the overall GhG emissions for deposition of excavated material to land is 3.17kg CO_2 eq per tonne of excavated material. The excavation material is assumed to be inert soil and the EA's WRATE emissions associated with material reception and spreading have been assumed.

5.1.3 The figures for GhG emissions from transport have been estimated based on:

a. the average CO_2 emissions for the different types of transport; and

b. the distance travelled from the Thames Tideway Tunnel sites to the receptor site.

5.1.4 The GhG emissions calculated are for comparative purposes only and do not provide an exact representation of the transport emissions associated with the Thames Tideway Tunnel excavated material. Full GhG methodology and assumptions can be found in Appendix B.10.

5.1.5 It has been estimated that using East Burnham Quarry would produce 6.32kg CO_2 eq per tonne of excavated material accepted.

5.1.6 The receptor site is located in an area that has been designated by the Environment Agency as unlikely to flood.

5.1.7 It is not anticipated that the flood risk at the receptor site would change when the receptor site is restored.

5.1.8 Table 5.1 provides the grade given for evaluation objective 2 and the justification for the grade.

Table 5.1 Evaluation objective 2 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
2. To reduce climate change impacts	a) Greenhouse gases emitted through treatment, handling and use of Thames Tideway Tunnel project material at receptor sites (excludes transport)	**0**	Thames Tideway Tunnel project material would not require treatment and minimal handling required e.g. passive drying used and material moved by conveyor where possible.	There is no Carbon Management Plan currently in place at the receptor site. The material would not require any treatment and there would be minimal handling.
	b) Extent to which flood risk is	**0**	Operations at the receptor site, to which	The EA flood risk maps indicate that

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	altered by Thames Tideway Tunnel project material at the receptor site (or in the local catchment).		the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not change flood risk (from any source or a combination of sources) to the site and surroundings.	East Burnham Quarry is outside the floodplain.
	c) Greenhouse gases emitted through transport of Thames Tideway Tunnel project material to the receptor sites.	-	Through the transport of Thames Tideway Tunnel project material between 6 and less than or equal to 8kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.	Through the transport of Thames Tideway Tunnel project material 6.32kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.

6 Evaluation objective 3: To protect local amenity

6.1.1 The receptor site is not located within an Air Quality Management Area (AQMA).

6.1.2 There are monitoring stations at the receptor site for noise and dust.

6.1.3 There is the potential for dust to be generated from the delivery of Thames Tideway Tunnel project material but measures in at the receptor site to ensure that any effects are managed. This includes spraying haul roads and wheel washing. All receptor site roads are made roads to reduce any dust generation.

6.1.4 The planning consent of the receptor site requires there to be measures in place to reduce any effects on air quality and noise as a result of operational activities. Thames Tideway Tunnel project material is similar to material that is accepted at the receptor site and it is not anticipated that this would create any additional noise or air quality issues at the receptor site.

6.1.5 Table 6.1 provides the grade given for evaluation objective 3 and the justification for the grade.

Table 6.1 Evaluation objective 3 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
3. To protect local amenity	a) Extent of potential effects on local amenity from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have an effect on the local amenity or any effect would be negligible.	Thames Tideway Tunnel project material would form part of the operations at the receptor site. All material accepted at the receptor site would be within the consented levels thus would pose no additional nuisance impacts at the receptor site.

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7 Evaluation objective 4: To conserve landscape and townscapes at receiving locations

7.1.1 The receptor site was granted consent in 1992 and extraction of material from some cells on the site has occurred, however currently it is not operational. Operations are expected to recommence 2013.

7.1.2 The receptor site is well screened so that operations are not visible to local receptors.

7.1.3 The receptor site is not in an Area of Outstanding Natural Beauty (AONB) however it is within the green belt.

7.1.4 Approximately 400m to the north of the receptor site is Burnham Beeches Nature Reserve, which is a SSSI. There are also a number of farm properties to the north of the receptor site, many of which are owned by the operator.

7.1.5 Less than 500m to the east of the receptor site is East Burnham Park which is an historical building.

7.1.6 The areas to the south and west of the receptor site that are undeveloped land, with trees and open space, with Slough 4km to the south of the receptor site.

7.1.7 In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would be no more or less visible given that there are natural screens such as trees and hedgerows in place to screen the receptor site operations. Road ways within the receptor site are below ground level and so provide additional screening from local receptors

7.1.8 The receptor site has consent to be restored to a domed landform which will rise above the current level of the land. This landform will be partially visible from receptors such as the Burnham Beeches Nature Reserve.

7.1.9 In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have an effect on the landscape changing the area from a quarry and inert landfill to agricultural land which would be partially visible.

7.1.10 Table 7.1 provides the grade given for evaluation objective 4 and the justification for the grade.

Table 7.1 Evaluation objective 4 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
4. To conserve landscapes and townscapes at receiving locations.	a) Extent of short term visual and landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have a short term effect on the local visual amenity at the receptor site or any effect would be negligible.	In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would be no more or less visible given the overall context of the existing site.
	b) Extent of permanent visual and landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**+**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a permanent minor beneficial visual effect on the landscape, based on a 'do nothing' view of the site.	In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have an effect on the landscape changing the area from a quarry and inert landfill to agricultural land which would be partially visible.

8 Evaluation objective 5: To protect quality of and access to open space

8.1.1 There are no Public Rights of Way (PRoWs) within the receptor site. However there is a public footpath that runs along the receptor site's northern and eastern boundaries.

8.1.2 There is currently no public access to the receptor site.

8.1.3 In the short term during restoration, there would be no change to public access to the receptor site.

8.1.4 In the long term, the receptor site will be restored to agricultural grassland. The restoration plans for the receptor site do not include any future provision of PRoWs on the receptor site when restored. Therefore there would be no impact on provision of public access to the receptor site in the long term.

8.1.5 Table 8.1 provides the grade given for evaluation objective 5 and the justification for the grade.

Table 8.1 Evaluation objective 5 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
5. To protect quality of and access to open space	a) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the short term?	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or a negligible effect on access to and quality of open space and PRoWs.	The restoration works at the receptor site to which the Thames Tideway Tunnel project material would contribute would not disrupt the existing PRoW on the northern and eastern boundary of the receptor site.
	b) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the long term?	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not affect the access to, and quality of, open space and PRoWs permanently.	When the receptor site is restored, it is anticipated there will be public access restrictions as the land will be used in agriculture. Therefore there is anticipated to be no change to the current restrictions on public access to the receptor site.

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9 Evaluation objective 6: To protect water quality

9.1.1 Swilly Pond is less than 300m to the north of the receptor site's boundary.

9.1.2 The planning consent requires a drainage management plan to be implemented at the receptor site in order to mitigate any adverse impacts operations may have on the wet heath, bog, springs and wet flushes located in parts of the Burnham Beeches Nature Reserve SSSI.

9.1.3 The receptor site is located in a groundwater outer protection zone of a groundwater Source Protection Zone (SPZ), which highlights groundwater sources such as wells, boreholes and springs used for public drinking water supply. This is defined by the Environment Agency as a zone with a minimum radius of 250m or 500m around a groundwater source, depending on the size of the abstraction.

9.1.4 Based on the drainage management systems in place at the receptor site and the inert nature of the Thames Tideway Tunnel project material it is not anticipated that accepting Thames Tideway Tunnel project material would have an effect on the surrounding water courses and/or groundwater.

9.1.5 Table 9.1 provides the grade given for evaluation objective 6 and the justification for the grade.

Table 9.1 Evaluation objective 6 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
6. To protect water quality	a) Extent of potential effects on fluvial water quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on the local watercourses.	It is not anticipated that the treatment, handling or use of the Thames Tideway Tunnel project material would have an effect on the local water course receptor site; however there are management operations in place which limit the impact of onsite activities on this watercourse.
	b) Extent of potential effects on groundwater quality from treatment, handling and use of Thames Tideway Tunnel project material	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible	The receptor site is in a groundwater outer protection zone. However there are water management systems in place at the receptor site and therefore the treatment, handling or use of the Thames

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	at receptor sites.		effect on groundwater.	Tideway Tunnel material at the receptor site is likely to have no or negligible effect on groundwater.

10 Evaluation objective 7: To protect biodiversity

10.1.1 Cocksherd Wood, a local nature reserve is located approximately 800m to the south west of the receptor site.

10.1.2 Haymill Valley, also a local nature reserve, is located approximately 1.8km to the south west of the receptor site.

10.1.3 Burnham Beeches Nature Reserve, which is a SSSI and also a European candidate Special Area of Conservation (SAC) is located approximately 400m to the north of the receptor site.

10.1.4 Restoration of the receptor site is to agricultural grassland, with hedgerows and trees surrounding the receptor site boundary.

10.1.5 In the short term, the handling and use of the Thames Tideway Tunnel project material as part of the existing operations at the receptor site is likely to have no or negligible effects on the designated site or habitats in close proximity to the receptor site. There are management plans on site to discourage great crested newt habitats in nearby ponds.

10.1.6 In the long term the receptor site will be restored to agricultural grassland. There are no requirements in the receptor site's consent to include measures to actively encourage biodiversity in the final restoration scheme. At this stage it is not possible to assess whether the habitats created through the restoration would have more or less ecological value than those currently present on the receptor site.

10.1.7 Table 10.1 provides the grade given for evaluation objective 7 and the justification for the grade.

Table 10.1 Evaluation objective 7 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
7. To protect biodiversity	a) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the short term.	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	Thames Tideway Tunnel project material would form part of the restoration plans for the receptor site. There are measures in place to discourage biodiversity at the receptor site during operations and these would have no or negligible effect impact on local designated sites.
	b) Extent of potential effects on designated sites from treatment, handling and use	0	Operations at the receptor site, to which the treatment, handling and use of Thames	The receptor site will be restored to agricultural land. This will not contribute or impact local designated sites. It is not possible to assess whether these

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	of Thames Tideway Tunnel project material at receptor sites in the long term.		Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	would be of higher ecological value than the existing habitats.

11 Evaluation objective 8: To protect cultural heritage

11.1.1 Stoke Park Registered Parks and Garden is located 1.4km to the south east of the receptor site.

11.1.2 There are two Scheduled Ancient Monuments (SAM) located near the receptor site:

a. a Slight Univallate Hillfort at Seven Ways Plain, Burnham Beeches located approximate 700m to the north of the receptor site.

b. East Burnham Animal Pound located approximately 500m to the north east of the receptor site, which is also a Grade II Listed Building.

11.1.3 There are 9 ancient woodlands within 2km of the receptor site, the nearest being 600m to the south west of the receptor site.

11.1.4 The receptor site is screened from local receptors by soil bunds, mature trees and hedgerows, the result of which is that it is not anticipated that the operations at the receptor site would have an impact on either these designated sites or their setting.

11.1.5 Traffic management measures are in place at the receptor site to ensure that vehicles enter and leave the receptor site along an agreed route to access the strategic road network and not through local villages.

11.1.6 Dust, noise and odour management plans are required the planning consent to be introduced when the receptor site becomes operational to ensure that any nuisance is minimised.

11.1.7 Table 11.1 provides the grade given for evaluation objective 8 and the justification for the grade.

Table 11.1 Evaluation objective 8 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
8. To protect cultural heritage	a) Extent of potential effects on designated or nominated archaeological sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	The receipt of Thames Tideway Tunnel project material is well screened from local visual receptors and there are traffic management plans in place to limit impact of vehicle movements on local designated sites

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12 Evaluation objective 9: To provide employment opportunities

12.1.1 In the short term the receptor site would use its current staff to manage the receipt and deposit of the Thames Tideway Tunnel material and no opportunities for employing additional staff have been identified.

12.1.2 In the long term it is unlikely that there would be any jobs created or lost. It is possible that staff at the receptor site could be transferred to other Summerleaze operations.

12.1.3 Table 12.1 provides the grade given for evaluation objective 9 and the justification for the grade.

Table 12.1 Evaluation objective 9 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
9. To provide employment opportunities	a) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the short term	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the short term	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel material forms part of would contribute to no job gains in the short term.
	b) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the long term	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the long term.	In the long term it is unlikely that any jobs would be created or lost. When the receptor site is fully restored, the staff at the receptor site are likely to be transferred to other Summerleaze sites.

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13 Evaluation objective 10: To minimise the cost of waste management

13.1.1 In order to compare the likely cost associated with transport and acceptance of the Thames Tideway Tunnel project material at each receptor site a cost model was used.

13.1.2 The cost of transporting the excavated material has been calculated from the distance travelled and a cost per tonne/ km for the transport mode. The road transport haulage costs have been calculated from the quotes gathered from operators based on today's prices. A gate fee of £4 per tonne is assumed based on current prices. Full details of the assumptions made can be found at Appendix B.10.

13.1.3 It has been estimated that the cost of transporting and managing excavated material at East Burnham Quarry is £22.53 per tonne of excavated material that can be accepted at the receptor site. These costs are predominantly associated with transfer of the material from the Thames Tideway Tunnel sites to the receptor sites. This cost is an estimated cost for comparison purposes within the *EMOA* and may differ from the actual cost which would be agreed at the procurement stage if Thames Tideway Tunnel project material were taken to this receptor site.

13.1.4 Table 13.1 provides the grade given for evaluation objective 10 and the justification for the grade.

Table 13.1 Evaluation objective 10 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
10. To minimise the costs associated with the management of excavated material	a) Costs of transporting, handling, treating, reusing, managing and disposal.	--	The transportation, treatment, handling and use of Thames Tideway Tunnel project material would cost between £22 and less than or equal to £25 per tonne	The cost of transportation, treatment, handling and use of Thames Tideway Tunnel project material has been estimated (using the *EMOA* cost model) to be £22.53 per tonne.

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14 Evaluation objective 11: To ensure operational suitability of the receptor site

14.1 Evaluation indicator 11a) Timescales

14.1.1 The receptor site has planning consent until December 2021.

14.1.2 Based on Thames Tideway Tunnel excavation timescales of 2016 to 2021, East Burnham Quarry would be available for use for Thames Tideway Tunnel project material for the entire project timetable.

14.1.3 However the receptor site would have already started accepting material for restoration and in 2016 when the Thames Tideway Tunnel project begins producing material, the quantity of inert material required to complete the restoration could be considerably reduced.

14.1.4 Table 14.1 provides the grade given for evaluation objective 11a and the justification for the grade

Table 14.1 Evaluation objective 11a grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	a) Likelihood of implementation within the required timescale.	++	The receptor site would be available for use for Thames Tideway Tunnel project material for 100% of the required timescale	The receptor site has planning consent until 2021. Based on the receptor sites planning consent it would be available to accept Thames Tideway Tunnel material for six years.

14.2 Evaluation indicator 11b) Material characteristics

14.2.1 East Burnham Quarry is permitted to be able to accept London Clay, chalk and Lambeth Group with sands, gravels for restoration.

14.2.2 However, the operator has confirmed that due to lack of space at the receptor site to allow for passive drying of chalk, this material would not be accepted at the receptor site.

14.2.3 The materials delivered to the receptor site would be subject to standard WAC testing to ensure that it is inert material and therefore suitable to be accepted at the receptor site.

14.2.4 East Burnham Quarry has the necessary environmental permit in place to accept clean inert excavated Thames Tideway Tunnel project material for landfill restoration. Details are set out in the receptor site's environmental permit.

14.2.5 Table 14.2 details the European Waste Catalogue (EWC) codes relating to the materials permitted under East Burnham Quarry's environmental permit, which are most relevant to the acceptance of the Thames Tideway Tunnel project excavated materials.

Table 14.2 Permitted waste types and quantities accepted at East Burnham Quarry

Waste code	Description
17	**Construction and demolition wastes**
17 01	Concrete, bricks, tiles and ceramics
17 01 01	Concrete
17 01 02	Bricks
17 01 03	Tiles and ceramics
17 01 07	Mixtures of concrete bricks, tiles and ceramics
17 05 04	Soils and stones. Excluding topsoil and peat; excluding soil and stones from contaminated sites
20	**Municipal wastes (household waste and similar commercial industrial and institutional wastes) including separately collected fractions**
20 02 02	Soils and stones

14.2.6 The environmental permit also specifies at:

a. wastes under Chapter 17 of the EWC (Construction and Demolition (C&D) waste) can only have 'low contents' of other materials (like metals, plastic, organics, wood, rubber etc) and the origin of the waste must be known.

b. no C&D waste can be accepted from constructions, polluted with inorganic or organic dangerous substances, e.g. because of production processes in the construction, soil pollution, storage and usage of pesticides or other dangerous substances etc, unless it is made clear that the demolished construction was not significantly polluted.

c. no C&D waste can be accepted from constructions treated, covered or painted with materials containing dangerous substances in significant amounts.

14.2.7 Table 14.3 provides the grade given for evaluation objective 11b and the justification for the grade.

Table 14.3 Evaluation objective 11b grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	b) Acceptability of material with Thames Tideway Tunnel project material characteristics by the receptor sites.	-	The receptor site could accept for use two Thames Tideway Tunnel project material types based on their characteristics comprising: London Clay, Lambeth Group or chalk	The receptor site would be able to accept all the material produced by the Thames Tideway Tunnel project, however the operator has confirmed that due to space restrictions, it would not seek to accept chalk.

14.3 Evaluation indicator 11c) Capacity

14.3.1 The receptor site is permitted to accept 150,000tpa of inert material for restoration. The operator estimates that for restoration to be completed to agreed contours, the receptor site would require 600,000 m^3 (equivalent to approximately 750,000t) of inert material.

14.3.2 The site operator believes that they will have used a proportion of this capacity prior to 2016. Table 14.4 details the estimated permitted capacity for the receptor site in relation to the material that would be produced by the Thames Tideway Tunnel project. Table 14.4 also sets out the potential tonnage of Thames Tideway Tunnel project material accepted at the receptor site each year based on the assumptions used in the EMOA cost and GhG model. The model assumed that restoration material would be accepted directly by road from the CSO sites and that materials barged to the transhipment point (IG11 0EG) would not be taken to East Burnham Quarry as it is 62km by road[II].

14.3.3 The receptor site would therefore be able to accept 16% of the Thames Tideway Tunnel project excavated materials, based on the total amount of restoration material that it can accept and tonnages which are likely to be produced by the Thames Tideway Tunnel project during the six years that it is available.

[II] Distances quoted are those used in the *EMOA* GhG model. Details of the assumptions used in this model can be found in Appendix B.10. These distances are for context only and do not reflect the exact routes that would be used should this receptor site be used to accept Thames Tideway Tunnel project material.

Table 14.4 Capacity for inert material at East Burnham Quarry (tonnes[III])

	Year						Total
	2016	2017	2018	2019	2020	2021	
Total Thames Tideway Tunnel production (tonnes)	63,000	549,000	1,938,000	1,852,000	147,000	155,000	4,704,000
Maximum permitted per annum (tonnes)	150,000	150,000	150,000	150,000	150,000	150,000	Up to a maximum of 750,000t
Potential Thames Tideway Tunnel project material accepted (tonnes)	63,000	144,00	142,000	143,000	110,000	148,000	Maximum of 750,000t
Potential Thames Tideway Tunnel project material accepted (%)	100%	26%	7%	8%	75%	96%	16%

14.3.4 Table 14.5 provides the grade given for evaluation objective 11c and the justification for the grade.

Table 14.5 Evaluation objective 11c grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	c) Capacity of the receptor site to accept the required volume of Thames Tideway Tunnel project material (based on likely tonnage accepted).	--	The receptor site has capacity to accept material greater than or equal to 15% but less than 30% of Thames Tideway Tunnel project material	The receptor site would have the potential to accept 16% of the excavated material that would be produced by the Thames Tideway Tunnel project.

14.4 Evaluation indicator 11d) Receptor site throughput

14.4.1 Thames Tideway Tunnel project material would be delivered by road to the receptor site. The receptor site has planning consent for 190 HGV movements per day (95 in / 95 out). Based on an average HGV capacity of 16t per vehicle the receptor site has the ability to receive approximately 1,520t per day.

[III] Figures quoted to the nearest 1,000 tonnes

14.4.2 The amount of material produced by the Thames Tideway Tunnel project would vary on a daily and monthly basis. The assessment of throughput has been based on both the mean and peak production rates over the Thames Tideway Tunnel project construction period. The mean rate is taken as the mean monthly production rate taken over each year in the period 2016 to 2021. The peak rate is based on the month producing the maximum tonnage of excavated material in each year.

14.4.3 Table 14.6 details the proportion of the Thames Tideway Tunnel project material which could be accepted by East Burnham Quarry over time.

Table 14.6 Throughput of material at East Burnham Quarry

	Year					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Maximum allowable number of HGV deliveries at receptor site per day (A)	95	95	95	95	95	95
Capacity per HGV (tonnes)	16	16	16	16	16	16
Thames Tideway Tunnel project average daily tonnage*.	250	2,050	7,200	6,850	550	550
Required number of HGVs to transport average daily tonnage (B).	16	128	450	428	34	34
Allowable vs Average Required Number of HGVs at receptor site (A ÷ B).	608%	174%	21%	22%	276%	276%
Thames Tideway Tunnel peak daily tonnage**.	350	3,050	10,750	10,300	800	850
Required number of HGVs to transport peak rate (C).	22	191	672	644	50	53
Allowable vs Peak Number of trains at receptor site (A ÷ C).	434%	50%	14%	15%	190%	178%

***** *The Thames Tideway Tunnel average daily tonnage for each year is calculated as the mean of the daily rate each month assuming 22.5 days in each month.*

****** *The peak daily tonnage is based on the mean daily tonnage (assuming a 22.5 day month) for the peak month of production in each year.*

14.4.4 In Years 1, 5 and 6 of the excavation process East Burnham Quarry's limit of 1,520t per day is sufficient to accept all of the Thames Tideway Tunnel project material produced. In Year 2 it could accept all the average daily Thames Tideway Tunnel project material produced, but not peak amount. In Years 3 and 4 it could accept less than half of both the peak and average daily Thames Tideway Tunnel project material produced.

14.4.5 Table 14.7 provides the grade given for evaluation objective 11d and the justification for the grade.

Table 14.7 Evaluation objective 11d grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	d) Ability of the receptor sites to accept Thames Tideway Tunnel project material at the anticipated rate (speed of material generation vs acceptance rate)	--	The receptor site could take greater than or equal to 1,000 but less than 2,800t per day of Thames Tideway Tunnel project material	The receptor site has the ability to receive approximately 1,520t per day, based on the delivery of Thames Tideway Tunnel project material by HGV.

14.5 Evaluation indicator 11e) Planning consent and permitting

14.5.1 East Burnham Quarry has the necessary planning consent and environmental permit in place to accept excavated Thames Tideway Tunnel material for quarry restoration.

14.5.2 Further information on the receptor site's planning consent and permit can be found in Section 2.3 and 2.4.

14.5.3 Table 14.8 provides the grade given for evaluation objective 11e and the justification for the grade.

Table 14.8 Evaluation objective 11e grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	e) Site operations have appropriate planning/permitting consent.	+++	The receptor site has planning consent and a relevant EA permit.	The receptor site has the relevant planning consent and environmental permit in place to be able to accept Thames Tideway Tunnel project material.

14.6 Evaluation indicator 11f) Transport modes

14.6.1 The receptor site can only accept Thames Tideway Tunnel project material via road.

14.6.2 There are restrictions on HGV movements which shall not exceed 190 HGV movements per day (95 in and 95 out).

14.6.3 Table 14.9 provides the grade given for evaluation objective 11f and the justification for the grade.

Table 14.9 Evaluation objective 11f grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	f) Can accept excavated material from multiple transport modes.	--	The receptor site is only accessible by one transport mode.	The receptor site can only accept material for restoration via road.

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15 Evaluation objective 12: To conform to the waste hierarchy

15.1.1 The Thames Tideway Tunnel *Excavated materials and waste (EM&W) strategy* contains an objective to 'To minimise waste arisings, maximise re-use, recovery, recycling and beneficial use and minimise the impact of waste on the environment and communities'.

15.1.2 The Thames Tideway Tunnel project material would be used to restore East Burnham Quarry to agricultural grassland. This is considered to be beneficial use in line with the *EMOA* beneficial use test. Table 15.1 details the application of the *EMO*A beneficial use test applied to East Burnham Quarry.

15.1.3 East Burnham Quarry has been issued with a recovery permit by the Environment Agency.

Table 15.1 Quarry restoration performance against *EMOA* beneficial use test

***EMOA* test**	**Does the receptor site comply with test?**	**Comment**
The activity will lead to a beneficial use and bring land back into use or provide ecological benefit	Yes	East Burnham Quarry will be restored to agricultural grassland.
In the case of quarries or landfill sites, the activity has a planning requirement to be restored	Yes	There is a planning requirement for East Burnham Quarry to be restored.
The activity does not attract landfill tax	Yes	East Burnham Quarry would be exempt from landfill tax because it is a quarry restoration project and has a recovery permit issued by the Environment Agency.
The material is suitable for its intended use and would not harm human health or the environment	Yes	East Burnham Quarry would be able to accept London clay and Lambeth Beds excavated from the Thames Tideway Tunnel project as well as non-hazardous excavated material, and if managed in accordance with the environmental permit the activities should not harm human health or the environment.
The minimum amount of material will being used	Yes	The material is being used to restore the quarry in line with the planning consent.

EMOA test	Does the receptor site comply with test?	Comment
Alternative material (whether waste or not) would be required if Thames Tideway Tunnel project material was not to be used	Yes	Material would be sourced from elsewhere to restore that quarry if Thames Tideway Tunnel project material was not available.

15.1.4 All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 16% of the total Thames Tideway Tunnel project material.

15.1.5 Table 15.2 provides the grade given for evaluation objective 12 and the justification for the grade.

Table 15.2 Evaluation objective 12 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
12. To conform to waste hierarchy.	a) Extent to which the option meets the *EM&W strategy* Targets.	+++	Performance of receptor site substantially exceeds target.	All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 16% of the total Thames Tideway Tunnel material.

16 Evaluation objective 13: To conform to the proximity principle

16.1.1 The receptor site is located 32km from Carnwath Road Riverside site (clay) and 35km from Kirtling Street (Lambeth Beds and Thanet Sands).

16.1.2 In accordance with the Thames Tideway Tunnel project *Transport Strategy* excavated material produced at these sites would be removed by marine transport and not by road. For the purposes of this assessment it has been assumed that the material would be taken from the drive sites by marine transport to a transhipment point and transferred to road at this location (IG11 0EG). The mean distance to the transhipment point from the drive sites is 20km by marine transport. The transhipment point is 62km from East Burnham Quarry by road[IV].

16.1.3 For this evaluation objective the receptor site was assessed using a straight line distance from the main drive sites. Using a straight line distance provides a consistent measure for assessment purposes. As the receptor site would be able to receive excavated materials from more than one drive site, the mean distance has been calculated. The receptor site was then graded according to this mean figure.

16.1.4 The receptor site is approximately 34km in a straight line from the main drive sites.

16.1.5 Table 16.1 provides the grade given for evaluation objective 13 and the justification for the grade.

Table 16.1 Evaluation objective 13 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
13. To conform to proximity principle	a) Average distance from main tunnel drive sites.	+	The receptor site is between 40km and 20km from source of Thames Tideway Tunnel material.	The receptor site is approximately 34km (straight line distance) from the main drive sites.

[IV] Distances quoted are those used in the *EMOA* GhG model. Details of the assumptions used in this model can be found in Appendix B.10. These distances are for context only and do not reflect the exact routes that would be used should this receptor site be used to accept Thames Tideway Tunnel project material.

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17 Evaluation objective 14: To conform to Sustainable Transport Policy

17.1.1 The receptor site can only be accessed by road and does not have direct access to the strategic highway.

17.1.2 Material cannot be delivered by marine transport or rail.

17.1.3 *The London Plan 2011*[2] Policy 5.18 Construction, excavation and demolition states that "waste should be removed from construction sites, and materials brought to the site, by water or rail transport wherever that is practicable." Thames Tideway Tunnel material would need to be transferred to road at an intermodal transfer station to comply with this requirement.

17.1.4 Table 17.1 provides the grade given for evaluation objective 14 and the justification for the grade.

Table 17.1 Evaluation objective 14 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
14. To conform to sustainable transport policy	a) Conforms to policy objective to move transport of materials from road to rail or marine transport.	---	The receptor site can only be accessed by road and there is no direct access to a strategic highway.	The receptor site can only be accessed by road and has no direct access to a strategic highway.

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18 Evaluation objective 15: To conform to health and safety good practice

18.1.1 The receptor site is currently not operational, however Summerleaze have stated that when it recommences operations the receptor site would have a full Health and Safety Management Plan, as at the operator's other sites.

18.1.2 Summerleaze do not operate to ISO18001.

18.1.3 The receptor site has no health and safety track record as it is currently not operational so this objective has not been graded.

18.1.4 Table 18.1 provides the grade given for evaluation objective 15 and the justification for the grade.

Table 18.1 Evaluation objective 15 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
15. To conform to Health and Safety good practice	a) Health and Safety performance conforms to good practice.	**N/A**	N/A	The receptor site has no health and safety track record as it is currently not operational so this objective has not been graded.

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References

[1] *A Practical Guide to the Strategic Environmental Assessment Directive* ODPM (September 2005); *Strategic Planning for Sustainable Waste Management: Guidance on Option Development and Appraisal* Department for Communities and Local Government (2002)

[2] *The London Plan* Greater London Authority 2011

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.03**

Volume 3: Project-wide effects assessment appendices

Appendix A.4; Annex D.13: EMOS Tyttenhanger Quarry

APFP Regulations 2009: Regulation **5(2)(a)**

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January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Environmental Statement

Volume 3 Appendices: Project-wide effects assessment

Appendix A.4: Excavated materials options assessment

Annex D.13: Excavated materials options suitability report – Tyttenhanger Quarry

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1 Introduction

1.1.1 The construction of the Thames Tideway Tunnel project would require the excavation of a large volume of material at multiple sites throughout London. To identify the preferred options for the management of the excavated material a detailed options assessment has been undertaken.

1.1.2 The methodology for assessment of the excavated material options is based on the Sustainability Appraisal methodology[1]. The assessment has taken a phased approach and at each stage the least preferred options have been eliminated until the final most viable and sustainable options have been selected to form the planning stage preferred list. The options on the planning stage preferred list demonstrate the potential capacity to manage the excavated material in a sustainable manner. The assessment is based on the consistent assessment of options against agreed evaluation objectives throughout the process.

1.1.3 The steps informing the assessment process are:

a. Development of a long list of potential options for the treatment, reuse, recycling or disposal of excavated materials.

b. Viability filter involving the assessment of the long list against the operational evaluation objective associated with viability of the options.

c. Preliminary assessment to develop a short list of options which perform sufficiently well against all the evaluation objectives (environmental, social, operational, policy and health and safety).

d. Detailed assessment in which the options on the short list was further scrutinised to produce a planning stage preferred list of options which performance best against the full suite of evaluation objectives.

1.1.4 For each short listed option whose viability has been confirmed a detailed *Excavated materials option suitability (EMOS) report* has been produced. The *EMOS reports* provide a summary of the site operations and the overall performance of the option against the evaluation objectives.

1.1.5 This *EMOS report* sets out the detail assessment for Tyttenhanger Quarry, in Hertfordshire. The report provides the information gained during the detailed assessment stage of the *Excavated material options assessment* (*EMOA*) and the grades awarded against each evaluation indicator as part of this assessment. A grade is provided for each evaluation indicator, using an agreed set of evaluation criteria, against seven grades of impact (ranging from --- to +++). The *EMOS report* also provides a risk profile for the site identifying the key risks associated with the option in relation to accepting the Thames Tideway Tunnel project excavated material.

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2 Site description

2.1 Site location

2.1.1 Tyttenhanger Quarry is located to the south east of St. Albans and east of London Colney village in Hertfordshire.

2.1.2 The receptor site consists of a quarry extracting sand and gravel and inert landfill. It is identified in the Adopted Hertfordshire Mineral Local Plan Review 2002-2016 as a “Preferred Area” for sand and gravel extraction.

2.1.3 The receptor site is accessed off Coursers Road which is less than 600metres from Junction 22 of the M25.

2.1.4 There is farmland surrounding the boundary of the receptor site. To the north of Coursers road, there is Colney Heath Local Nature Reserve, as well as The New Plantation and Walsingham Wood local wildlife sites.

2.1.5 Tyttenhanger Quarry location is shown in Plate 3.1.

2.2 Site operations

2.2.1 Sands and gravels are currently being extracted at the receptor site. Material is needed to restore the extracted cells back to agricultural land and grassland.

2.2.2 The receptor site is currently receiving material for restoration purposes. The operator estimates based on current throughput that by 2016, when Thames Tideway Tunnel project material would be produced, approximately 11million tonnes of material would be required to complete the restoration.

2.2.3 Thames Tideway Tunnel project material would arrive at the receptor site by road and be taken directly to the restoration area where it would be deposited. If the chalk requires drying before being laid for restoration, it would be directed to a designated area within the receptor site where it would be deposited for passive drying before being moved to where it would be used for restoration.

2.3 Planning consent

2.3.1 Initial planning consent for the extraction of minerals at the receptor site was granted in 2001(references: 5/0250-97 and 0/0085-9). There are two references as the site straddles both the St. Albans and Hertsmere districts).

2.3.2 A variation to the planning consent was applied for May 2007 (0/1353-06 & 5/2300-06). The variation was for the extension of the area extracted and the timescales for completion of activities.

2.3.3 The variation was approved in February 2011 and has the site reference of CM0105.

2.3.4 The consent is time limited and expires in 31st December 2032.

2.3.5 The consent allows operations including the delivery of material to the receptor site between the hours of 7am and 6:30pm Monday to Friday and between 7am and 12:30pm on Saturdays. No operations are to take place on Sundays or bank holidays.

2.3.6 The consent limits HGV movements to 210 (105 movements in, 105 movements out) Monday to Friday and 106 (53 movements in, 53 movements out) on Saturdays.

2.3.7 Permission has been granted by the local planning authority for a trial period of allowing 320 vehicle movements (160 movements in, 160 movements out) Monday to Saturday. The operator has noted however that as operations on Saturday is limited to half a day, vehicle movements for this day are trailed at 120 vehicle movements (60 movements in, 60 movements out).

2.3.8 It is anticipated by the operator that this trial, which is currently being undertaken, would be extended for future operations.

2.4 Permitting

2.4.1 A Pollution Prevention Control (PPC) permit (number:BX3368PN) was issued on 26 August 2005.

2.4.2 An environmental permit (number:BP3893EW) was granted in October 2009 to bring the PPC permit in line with new regulations. This was later varied 20 March 2012 to amend some of the conditions relating to monitoring and reporting on the previous permit issued.

2.4.3 The permit allows for the receptor site to receive 600,000tpa of inert wastes for restoration of the void created by aggregate extraction.

2.4.4 The receptor site can accept inert construction and demolition waste.

2.4.5 Section 14.2 details the type of materials which can be received at the receptor site.

3 Overall site summary

3.1.1 Table 3.1 below provides a summary of Tyttenhanger Quarry and an assessment of its suitability against the evaluation objectives. Sections 4 to 18 of this *EMOS report* provide more detail on each evaluation objective.

Table 3.1 Summary of Tyttenhanger Quarry and its overall suitability

Site name:	Tyttenhanger Quarry (LAF.4)		**Owner/operator:**	Lafarge			
Planning consent	Yes, until December 2032 (0/1353-06 & 5/2300-06)		**Permit**	Yes - BP3893EW			
Void capacity	Estimated 11million tonnes		**Throughput**	600,000tpa			
Recovery/disposal	Recovery						
Materials	**London clay**	✓	**Lambeth group**	✓	**Chalk**	✓	
Transport type	**Road**	✓	**Rail**	**X**	**Marine transport**	**X**	

Receptor site overview

Lafarge operate a sand and gravel extraction quarry and inert landfill. It is accessed from Coursers Road which is less than 600m from junction 22 of the M25. The receptor site requires the Thames Tideway Tunnel project material for restoration purposes. The receptor site has already started receiving material for restoration. The operator estimates based on current throughput that by 2016, when Thames Tideway Tunnel project material would be produced, approximately 11million tonnes of material would be required to complete the restoration. The receptor site will be restored to agriculture and grassland. Thames Tideway Tunnel project material would be delivered to the receptor site by road. The receptor site is approximately 29km from the Thames Tideway Tunnel project main tunnel drive sites.

Assessment

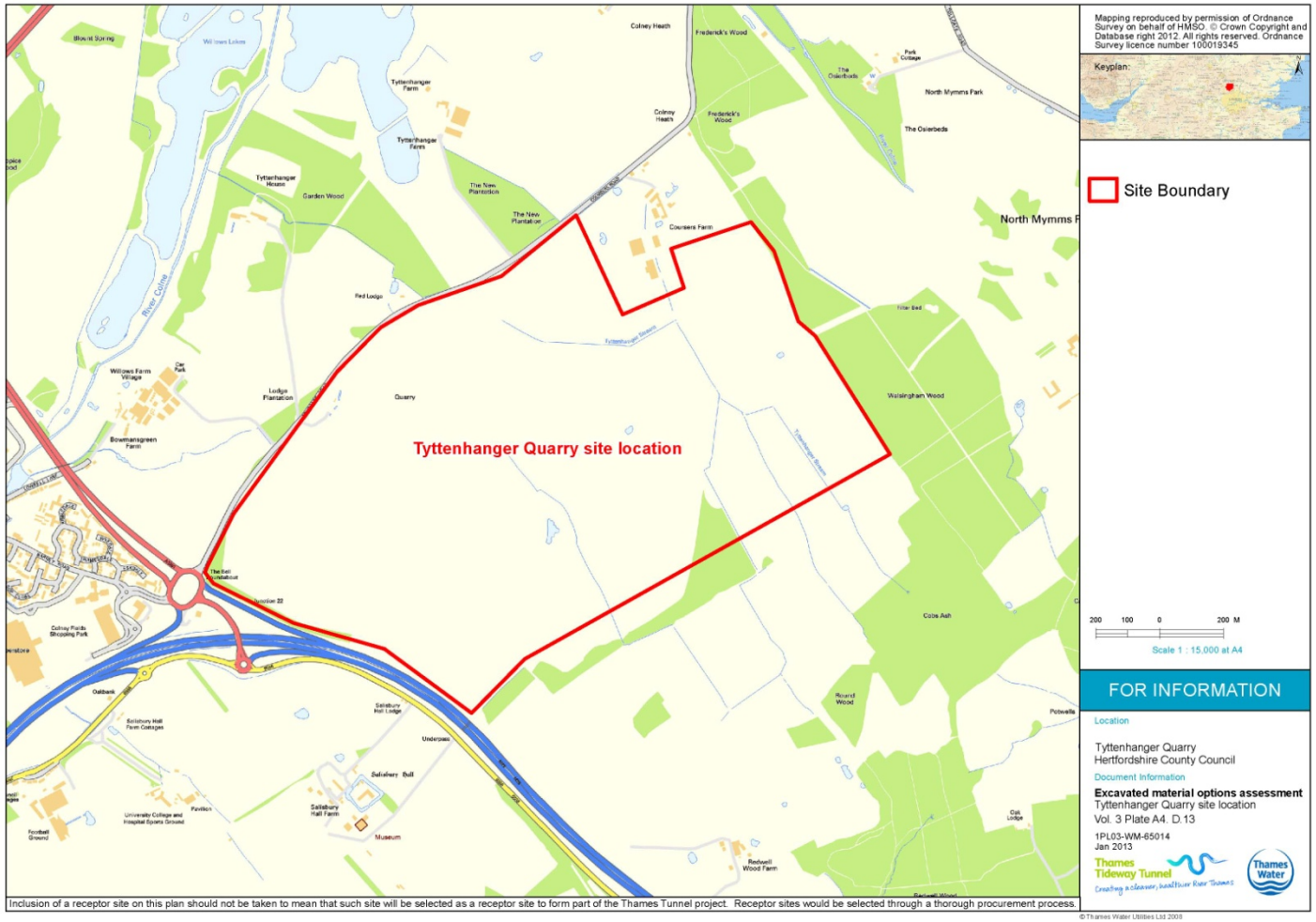
1. Land and other resources	a)	**0**	8. Cultural heritage	a)	**0**
	b)	**0**	9. Employment opportunities	a)	**0**
2. Climate change	a)	**+**		b)	**0**
	b)	**0**	10. Cost	a)	**-**
	c)	**0**	11. Operational suitability of the receptor site.	a)	**+++**
3. Local amenity	a)	**0**		b)	**+++**
4. Landscapes and townscapes	a)	**0**		c)	**0**
	b)	**+**		d)	**--**
5. Access to open space	a)	**0**		e)	**+++**
	b)	**+**		f)	**--**
6.Water quality	a)	**0**	12. Waste hierarchy	a)	**+++**
	b)	**0**	13. Proximity principle	a)	**+**
7.Biodiversity	a)	**0**	14. Sustainable transport policy	a)	**---**
	b)	**0**	15. Health and safety good	a)	**0**

			practice		

Environmental summary
The acceptance of Thames Tideway Tunnel project material is within the receptor site's existing consents. The deposition of material for restoration would be unlikely to have a short term effect on the local amenity as the receptor site is already an operating quarry and inert landfill and there are screening bunds in place to shield all operations from local receptors. In the long term the restoration of the receptor site will have a beneficial effect changing the area to agriculture and grassland. The receptor site is approximately 29km from the Thames Tideway Tunnel project main tunnel drive sites.
Social summary
The restoration activities at the receptor site, to which Thames Tideway Tunnel project material would contribute, would lead to no job losses or gains over the short term. In the long term the operator would endeavour to transfer staff to an alternative site.
Operational summary
The receptor site is not expected to complete operations until after the Thames Tideway Tunnel project is complete. Therefore, it is probable that the receptor site would be able to accept approximately 2.1million tonnes (45%) of the Thames Tideway Tunnel project material. The receptor site would be able to accept all of the inert excavated materials produced by the Thames Tideway Tunnel project. The receptor site can only accept excavated material by road; however, it is a short distance to a strategic highway. The restoration of Tyttenhanger Quarry back to agriculture and grassland would result in a beneficial use for all material accepted by the site[I]. Lafarge operate a corporate carbon management plan and health and safety management plan at the receptor site. The receptor site has had no reported Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) incidents in the past three years of operations.
Overall suitability
The receptor site has the potential to provide a beneficial use for the excavated material received at the site. The receptor site has the ability to receive 45% of the Thames Tideway Tunnel project material throughout the lifespan of the project. The receptor site has a positive or neutral grading for most evaluation indicators (with the exception of sustainable transport policy, transport mode, throughput and cost). Tyttenhanger Quarry is included on the planning stage preferred list.

[I] Based on the *Excavated material options assessment (EMOA)* beneficial use test

Plate 3.1 Tyttenhanger Quarry site location



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4 Evaluation objective 1: To ensure prudent use of land and other resources

4.1.1 The receptor site currently sources material for restoration from other construction and development projects around London and the South East of England.

4.1.2 Thames Tideway Tunnel project material would be used for restoration purposes. Thames Tideway Tunnel project material would replace the use of other reusable material.

4.1.3 The use of Thames Tideway Tunnel project material would not contribute to the requirement for additional land extending the receptor site's boundary.

4.1.4 The material would be used to restore the receptor site and to make it available for other uses e.g., agriculture and grassland.

4.1.5 Table 4.1 provides the grade given for evaluation objective 1 and the justification for the grade.

Table 4.1 Evaluation objective 1 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
1. To ensure prudent use of land and other resources	a) Extent to which resources such as sand, gravel and chalk are conserved by processing or storage of Thames Tideway Tunnel project material at receptor sites	0	Thames Tideway Tunnel project material is unlikely to affect virgin material use e.g. material replaces other reusable materials or no material substitution required.	Thames Tideway Tunnel project material would be used in the quarry restoration. Thames Tideway Tunnel project material would replace the use of other reusable material.
	b) Extent to which Thames Tideway Tunnel project material would effect landtake at (footprint of) receptor sites in the long term	0	The acceptance of Thames Tideway Tunnel project material would not contribute to the requirement for additional land extending the receptor site's boundary.	The Thames Tideway Tunnel project material would be used within the existing site boundary and would not contribute to a need for the receptor site to expand.

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5 Evaluation objective 2: To reduce climate change impacts

5.1.1 Lafarge operate Tyttenhanger Quarry to the corporate Carbon Management Plan. This plan aims to monitor emissions produced by onsite operations and where possible minimise them through measures such as use of plant with high efficiency specifications.

5.1.2 There would be limited handling of Thames Tideway Tunnel project material when delivered to the receptor site.

5.1.3 Based on data from the Environment Agency's (EA) lifecycle analysis tool WRATE, the overall GhG emissions for deposition of excavated material to land is 3.17kg CO_2 eq per tonne of excavated material. The excavation material is assumed to be inert soil and the EA's WRATE emissions associated with material reception and spreading have been assumed.

5.1.4 The figures for GhG emissions from transport have been estimated based on:

a. the average CO_2 emissions for the different types of transport; and

b. the distance travelled from the Thames Tideway Tunnel sites to the receptor site.

5.1.5 The GhG emissions calculated are for comparative purposes only and do not provide an exact representation of the transport emissions associated with the Thames Tideway Tunnel project excavated material. Full GhG methodology and assumptions can be found in Appendix B.10

5.1.6 It has been estimated that using Tyttenhanger Quarry would produce 5.43kg CO_2 eq per tonne of excavated material accepted.

5.1.7 The EA flood risk maps indicate that the receptor site is located in an area that is unlikely to flood. It is however located within the catchment of the River Colne although it is not situated in Flood Risk Zones 2 or 3. A drainage management scheme for the receptor site which includes measures for the protection of local groundwater and water courses management plan is in place at the receptor site.

5.1.8 Table 5.1 provides the grade given for evaluation objective 2 and the justification for the grade.

Table 5.1 Evaluation objective 2 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
2. To reduce climate change impacts	a) Greenhouse gases emitted through treatment, handling and use of Thames Tideway Tunnel project material at receptor sites (excludes transport)	+	There is a Carbon Management Plan in place with systems in place to offset GhG emissions from the treatment, handling and use of Thames Tideway Tunnel project material.	Lafarge have a corporate carbon management Plan and there would be minimal handling of Thames Tideway Tunnel material at the receptor site.
	b) Extent to which flood risk is altered by Thames Tideway Tunnel project material at the receptor site (or in the local catchment)	0	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not change flood risk (from any source or a combination of sources) to the site and surroundings.	The EA flood risk maps indicate that Tyttenhanger Quarry is outside the floodplain.
	c) Greenhouse gases emitted through transport of Thames Tideway Tunnel project material to the receptor sites	0	Through the transport of Thames Tideway Tunnel project material between 4 and less than or equal to 6 kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced	Through the transport of Thames Tideway Tunnel project material 5.43kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.

6 Evaluation objective 3: To protect local amenity

6.1.1 The receptor site is not located within an Air Quality Management Area (AQMA).

6.1.2 There is a dust management plan in place for the receptor site, with measures to reduce the impact of dust including spraying haul roads and wheel washing as well as maximising the use of made roads on the site.

6.1.3 The operator regularly maintains and/or replaces plant at the receptor site in order to reduce excessive noise or emissions these may produce.

6.1.4 The site operator indicated that there have not been any previous complaints with regards to noise or dust at the receptor site.

6.1.5 Thames Tideway Tunnel project material is similar to material that is accepted at the receptor site and it is not anticipated that this would create any additional noise or air quality issues at the receptor site.

6.1.6 Table 6.1 provides the grade given for evaluation objective 3 and the justification for the grade.

Table 6.1 Evaluation objective 3 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
3. To protect local amenity	a) Extent of potential effects on local amenity from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have an effect on the local amenity or any effect would be negligible.	Thames Tideway Tunnel project material would form part of the existing operations at the receptor site. There are measures at the receptor site to reduce environmental nuisance impacts. All material accepted at the receptor site would be within the consented levels thus would pose no additional nuisance impacts at the receptor site.

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7 Evaluation objective 4: To conserve landscape and townscapes at receiving locations

7.1.1 The receptor site is located south of the city of St. Albans and between the villages of London Colney to the west and Colney Heath to the east.

7.1.2 The receptor site is located on open agricultural land within the valley of the River Colne. Courser's Farm is on the eastern boundary of the receptor site, Bowmansgreen Farms is less than 400m to the north of the receptor site. Tyttenhanger House is within 500m to the north of the receptor site.

7.1.3 The acceptance/deposit of Thames Tideway Tunnel project material would not be visible from adjacent receptors, as there are large earth bunds which screen local receptors for onsite operations such as the delivery and placement of material.

7.1.4 In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute would be no more or less visible given the overall context of the existing site.

7.1.5 In the long term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute, would have a minor beneficial effect on the landscape changing the area from a quarry and inert landfill to agricultural land.

7.1.6 Table 7.1 provides the grade given for evaluation objective 4 and the justification for the grade.

Table 7.1 Evaluation objective 4 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
4. To conserve landscapes and townscapes at receiving locations	a) Extent of short term visual & landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have a short term effect on the local visual amenity at the receptor site or any effect would be negligible.	In the short term the operations at the receptor site to which Thames Tideway Tunnel project material would contribute would be no more or less visible given the overall context of the existing site.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of permanent visual & landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a permanent minor beneficial visual effect on the landscape, based on a 'do nothing' view of the site	In the long term the operations at the receptor site to which Thames Tideway Tunnel material would contribute, would have a minor beneficial effect on the landscape changing the area from an operating landfill to agricultural land and grassland.

8 Evaluation objective 5: To protect quality of and access to open space

8.1.1 There is a Public Right of Way (PRoW), Ridge Footpath 8 that crosses part of the receptor site. This is a gated footpath and there are management plans in place which ensure receptor site operations do not effect the PRoW.

8.1.2 The receptor site is currently operational and so the receipt of Thames Tideway Tunnel project material would have no additional impact on the PRoW when compared to current operations.

8.1.3 In the short term the accessibility of the receptor site to the public would not change. It is not envisaged that the restoration works at the receptor site would disrupt the existing PRoW on the receptor site.

8.1.4 In the long term the receptor site would be restored to agriculture and grassland land, and the level of public access would be determined by the landlord of the receptor site. However restoration plans include the addition of a new PRoW which will link current PRoWs on the receptor site boundary and will cross the receptor site. This will have a minor impact on public access to the receptor site in the long term.

8.1.5 Table 8.1 provides the grade given for evaluation objective 5 and the justification for the grade.

Table 8.1 Evaluation objective 5 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
5. To protect quality of and access to open space	a) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the short term?	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or a negligible effect on access to and quality of open space and PRoWs.	The restoration works at the receptor site to which the Thames Tideway Tunnel project material would not disrupt the existing PRoW which runs across part of the receptor site. There are measures in place currently to mitigate the impact operations at the receptor site would have on this PRoW, and these would not change as a result of receiving Thames Tideway Tunnel project material.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the long term?	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not affect the access to, and quality of, open space and PRoWs permanently	When the receptor site is restored, it is anticipated there would be public access restrictions as the land will be used in agriculture. However there is expected to be some minor provision of new PRoWs running across the receptor site, linking existing PRoWs on the receptor site boundary.

9 Evaluation objective 6: To protect water quality

9.1.1 The Tyttenhanger Stream (main river) and the Tyttenhanger stretch of the River Colne runs across part of the receptor site. There are buffer strips either side of these watercourses at the receptor site to protect the water courses.

9.1.2 The receptor site is within a groundwater Source Protection Zone (SPZ), which highlights groundwater sources such as wells, boreholes and springs used for public drinking water supply.

9.1.3 There is a drainage management scheme for the receptor site which includes measures for the protection of local groundwater and water courses.

9.1.4 Based on the water management measures in place at the receptor site and the inert nature of the Thames Tideway Tunnel project material it is not anticipated that accepting Thames Tideway Tunnel project material would have an effect on the surrounding water courses and/or groundwater.

9.1.5 Table 9.1 provides the grade given for evaluation objective 6 and the justification for the grade.

Table 9.1 Evaluation objective 6 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
6. To protect water quality	a) Extent of potential effects on fluvial water quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on the local watercourses.	There are water management measures in place which are designed to protect local groundwater and water courses. Therefore it is not anticipated that the treatment, handling or use of the Thames Tideway Tunnel project material would have an effect on the local water course receptor site.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of potential effects on groundwater quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on groundwater.	There are water management systems in place at the receptor site. The receptor site is in a groundwater Source Protection Zone and the treatment, handling or use of the Thames Tideway Tunnel material at the receptor site is likely to have no or negligible effect on groundwater.

10 Evaluation objective 7: To protect biodiversity

10.1.1 Colney Heath Local Nature Reserve is located to the north of the receptor site across Coursers Road. The New Plantation and Walsingham Wood local wildlife sites are also located to the north of the receptor site across Coursers Road.

10.1.2 The closest Site of Special Scientific Interest (SSSI) is Redwell Wood which is located approximately 700m to the south of the receptor site.

10.1.3 The operator noted that there is a colony of tree sparrows which are protected on the receptor site. This habitat has been safeguarded, with operations excluded from this area of the receptor site to prevent any negative effect they may have.

10.1.4 In the short term, the handling and use of the Thames Tideway Tunnel project material would be part of the existing operations at the receptor site and would therefore be likely to have no or negligible effects on the SSSI, nature reserve and local wildlife sites in proximity to the receptor site. There are management plans currently in place for managing the habitat which is on the receptor site, and this would continue throughout the duration of the receipt of Thames Tideway Tunnel project material if the habitat remains.

10.1.5 In the long term the exact nature of the habitats created will be dependent on the material used to restore the site. At this stage it is uncertain whether the habitats created through the restoration would have more or less ecological value than those currently present on the receptor site. The effect on the local wildlife areas of the change in use from an operational quarry and landfill to agriculture and grassland is also uncertain. Although it is considered unlikely that there would be an adverse effect on these habitats in the long term.

10.1.6 Table 10.1 provides the grade given for evaluation objective 7 and the justification for the grade.

Table 10.1 Evaluation objective 7 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
7. To protect biodiversity	a) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the short term	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	Thames Tideway Tunnel project material would form part of the restoration plans for the receptor site. There are measures in place to mitigate any impact operations would have on biodiversity and the receipt of Thames Tideway Tunnel project material would not change current operations.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the long term.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site	Thames Tideway Tunnel project material would form part of the restoration plans for the receptor site. There are measures in place to mitigate any impact operations would have on biodiversity and the receipt of Thames Tideway Tunnel project material would not change current operations.

11 Evaluation objective 8: To protect cultural heritage

11.1.1 Tyttenhanger House, a Grade I listed building is within 500m to the north of the receptor site and Salisbury Hall, a Grade II* listed building and aircraft museum, is approximately 400m to the southwest of the receptor site.

11.1.2 The receptor site is situated within an area of archaeological significance, as remains from the Mesolithic to the Tudor periods have been revealed at the receptor site.

11.1.3 There are ten ancient woodlands within 2km of the receptor site, the nearest being Cobs Ash/Cangsley woodland which is approximately 400m to the east of the receptor site.

11.1.4 The planning consent states that no soil stripping operations are allowed to occur at the receptor site without an archaeological investigation to ensure that any archaeological remains are not disturbed or removed without being recorded. This would mitigate any negative any impact any receipt of restoration material would have at the receptor site.

11.1.5 Traffic measures are in place to ensure that vehicles exiting the receptor site do not enter local villages. This in turn would ensure that there would be no impact from vehicles on any designated sites in the local villages.

11.1.6 It is not anticipated that the operations at the receptor site which Thames Tideway Tunnel project material would contribute, to would have an impact with regards to cultural heritage due to the measures in place to manage restoration activities.

11.1.7 Table 11.1 provides the grade given for evaluation objective 8 and the justification for the grade.

Table 11.1 Evaluation objective 8 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
8. To protect cultural heritage	a) Extent of potential effects on designated or nominated archaeological sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a designated site.	Measures are in place to ensure that any soil stripping activities at the receptor site are preceded by archaeological investigations to mitigate any impact these would have on cultural heritage. Also, there are traffic management plans in place to limit impact of vehicle movements on local villages and designated sites located within.

12 Evaluation objective 9: To provide employment opportunities

12.1.1 Operations at the receptor site have already commenced and there is a sufficient level of staff currently employed at the receptor site to manage the receipt and deposit of material at its current throughput.

12.1.2 In the long term it is unlikely that any more jobs would be created at the site. In the future, it is likely that Lafarge would look to operate another site and transfer staff from the receptor site to this new site.

12.1.3 Table 12.1 provides the grade given for evaluation objective 9 and the justification for the grade.

Table 12.1 Evaluation objective 9 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
9. To provide employment opportunities	a) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the short term	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the short term.	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel material forms part of would contribute to no job gains in the short term.
	b) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the long term	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not lead to job losses or gains in the long term.	In the long term it is unlikely that any jobs would be created or lost. When the receptor site is fully restored, the staff at the receptor site are likely to be transferred to other Lafarge sites.

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13 Evaluation objective 10: To minimise the cost of waste management

13.1.1 In order to compare the likely cost associated with transport and acceptance of the Thames Tideway Tunnel project material at each receptor site, a cost model was used.

13.1.2 The cost of transporting the excavated material has been calculated from the distance travelled and a cost per tonne/ km for the transport mode. The road transport haulage costs have been calculated from the quotes gathered from operators based on today's prices. A gate fee of £4 per tonne is assumed based on current prices. Full details of the assumptions made can be found at Appendix B.10.

13.1.3 It has been estimated that the cost of transporting and managing excavated material at Tyttenhanger Quarry is £20.00 per tonne of excavated material that can be accepted at the receptor site. These costs are predominantly associated with transfer of the material from the Thames Tideway Tunnel sites to the receptor site. This cost is an estimated cost for comparison purposes within the *EMOA* and may differ from the actual cost which would be agreed at the procurement stage if Thames Tideway Tunnel project material were to be taken to this receptor site.

13.1.4 Table 13.1 provides the grade given for evaluation objective 10 and the justification for the grade.

Table 13.1 Evaluation objective 10 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
10. To minimise the costs associated with the management of excavated material	a) Costs of transporting, handling, treating, reusing, managing and disposal	-	The transportation, treatment, handling and use of Thames Tideway Tunnel project material would cost between £19 and less than or equal to £22 per tonne	The cost of transportation, treatment, handling and use of Thames Tideway Tunnel project material has been estimated (using the *EMOA* cost model) to be £20.00 per tonne.

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14 Evaluation objective 11: To ensure operational suitability of the receptor site

14.1 Evaluation Indicator 11a) Timescales

14.1.1 The receptor site has planning consent for current activities to continue until 31st December 2032.

14.1.2 Based on Thames Tideway Tunnel timescales of 2016-2021 and the existing throughput of the receptor site, Tyttenhanger Quarry would be available for use for Thames Tideway Tunnel project material for all six years of the project timetable.

14.1.3 Table 14.1 provides the grade given for evaluation objective 11a and the justification for the grade.

Table 14.1 Evaluation objective 11a grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	a) Likelihood of implementation within the required timescale.	+++	The receptor site would be available for use for Thames Tideway Tunnel project material for more than 100% of the required timescale	The receptor site has planning consent until December 2032. The receptor site would be available to accept Thames Tideway Tunnel material for the entire project timetable.

14.2 Evaluation indicator 11b) Material characteristics

14.2.1 Tyttenhanger Quarry would be able to accept London Clay, chalk and Lambeth Group with sands, gravels and inert tunnel construction materials (piling and diaphragm wall arisings) for restoration.

14.2.2 Tyttenhanger Quarry has the necessary consent in place to accept excavated Thames Tideway Tunnel project material for quarry restoration, subject to all materials being delivered meeting receptor site acceptance criteria determined by chemical testing of preliminary deliveries of material and visual assessments upon delivery thereafter.

14.2.3 The materials delivered to the receptor site would be subject to standard WAC testing to ensure that it is inert material and therefore suitable to be accepted at the receptor site.

14.2.4 Table 14.2 details the European Waste Catalogue (EWC) codes relating to the materials permitted under Tyttenhanger Quarry's environmental permit, which are most relevant to the acceptance of the Thames Tideway Tunnel project excavated materials.

Table 14.2 Permitted inert waste types for Tyttenhanger Quarry

EWC code	Description
17	**Construction and demolition wastes (including excavated soil from contaminated land)**
17 01 01	Concrete
17 01 02	Bricks
17 01 03	Tiles and ceramics
17 01 07	Mixtures of concrete bricks, tiles and ceramics other than those mentioned in 17 01 06
17 05 04	Soils and stones including chalk other than those mentioned in 17 05 03

14.2.5 Table 14.3 provides the grade given for evaluation objective 11b and the justification for the grade.

Table 14.3 Evaluation objective 11b grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	b) Acceptability of material with Thames Tideway Tunnel project material characteristics by the receptor sites	+++	The receptor site could accept for use all of the Thames Tideway Tunnel project material types based on their characteristics	The receptor site would be able to accept all the material types produced by the Thames Tideway Tunnel.

14.3 Evaluation indicator 11c) Capacity

14.3.1 The planning consent of the receptor site requires the importation of a suitable amount of material to complete restoration to those levels indicated in the drawings submitted in the receptor site's planning application.

14.3.2 The receptor site is currently receiving material for restoration. Based on current throughput the operator estimates, that by 2016, when Thames Tideway Tunnel project material would be produced, approximately 11million tonnes of material would be required to complete the restoration.

14.3.3 The receptor site has permitted capacity to receive 600,000tpa of inert wastes for use in restoration of the void created by aggregate extraction. The receptor site is available to receive Thames Tideway Tunnel project material throughout the lifespan of the project, thus the receptor site would be able to accept 2.1million tonnes in total. Table 14.4 details the permitted capacity for the receptor site in relation to the material that will be produced by the Thames Tideway Tunnel.

14.3.4 Table 14.4 also sets out the potential tonnage of Thames Tideway Tunnel project material accepted at the receptor site each year based on the assumptions used in the *EMOA* cost and GhG model. The receptor site

would be able to accept 45% of the Thames Tideway Tunnel project excavated materials, based on the total amount of restoration material that it can accept and tonnages which are likely to be produced by the Thames Tideway Tunnel during the two years that it is available.

Table 14.4 Capacity for inert material at Tyttenhanger Quarry (tonnes[II])

	Year						Total
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	
Total Thames Tideway Tunnel production (tonnes)	63,000	549,000	1,938,000	1,852,000	147,000	155,000	4,704,000
Maximum permitted per annum (tonnes)	600,000	600,000	600,000	600,000	600,000	600,000	-
Potential Thames Tideway Tunnel project material accepted (tonnes)	63,000	549,000	600,000	593,000	147,000	155,000	2,107,000
Potential Thames Tideway Tunnel project material accepted (%)	100%	100%	31%	32%	100%	100%	45%

14.3.5 Table 14.5 provides the grade given for evaluation objective 11c and the justification for the grade.

Table 14.5 Evaluation objective 11c grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	c) Capacity of the receptor site to accept the required volume of Thames Tideway Tunnel project material (based on likely tonnage accepted)	**0**	The receptor site has capacity to accept greater than or equal to 45% but less than 60% of Thames Tideway Tunnel project material	The receptor site has the potential to accept approximately 45% of the excavated material that would be produced by the Thames Tideway Tunnel.

14.4 Evaluation indicator 11d) Receptor site throughput

14.4.1 Thames Tideway Tunnel project material would be delivered to the receptor site by road. There is no opportunity for Thames Tideway Tunnel project material to be delivered to the receptor site by rail or marine transport.

[II] Figures quoted to the nearest 1,000 tonnes

14.4.2 The planning consent limits HGV movements at the receptor site to 210 (105 movements in, 105 movements out) Monday to Friday and 106 (53 movements in, 53 movements out) on Saturdays.

14.4.3 Permission has been granted by the local planning authority for a trial period of allowing 320 vehicle movements (160 movements in, 160 movements out) Monday to Saturday. However as the receptor site has limited operating hours on Saturday this day's vehicle movements are practically limited to 120 (60 movements in, 60 movements out).

14.4.4 This trial period was operational at the receptor site at the time of this evaluation in September 2012. It was anticipated by the operator that this trail would result in the planning consent being varied to allow the increased number of HGV movements on a permanent basis as there had been no causes for concern noted during the trial. For this evaluation it is assumed that this trail will result in the consented HGV movements increasing to the trial amount on a permanent basis.

14.4.5 The amount of material produced by the Thames Tideway Tunnel would vary on a daily and monthly basis. The assessment of throughput has been based on both the mean and peak production rates over the Thames Tideway Tunnel construction period. The mean rate is taken as the mean monthly production rate taken over each year in the period 2016 to 2021. The peak rate is based on the month producing the maximum tonnage of excavated material in each year.

14.4.6 Table 14.6 details the proportion of the Thames Tideway Tunnel project material which would be accepted by Tyttenhanger Quarry over time.

14.4.7 In Years 1, 2, 5 and 6 of the excavation process Tyttenhanger Quarry's limit of approximately 2,300t per day is sufficient to accept all average and peak tonnages produced. However, the receptor site would not be able to receive all average or peak tonnages in Years 3 and 4 and not the peak tonnage in Year 2.

Table 14.6 Throughput of material at Tyttenhanger Quarry

	Year					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Average allowable number of HGV deliveries at receptor site per day (A)	143	143	143	143	143	143
Capacity per HGV (tonnes)	16	16	16	16	16	16
Thames Tideway Tunnel average daily tonnage*	250	2,050	7,200	6,850	550	550
Required number of HGVs to transport average daily tonnage (B)	16	129	450	429	35	35
Allowable vs Average Required Number of HGVs at receptor site (A ÷ B)	915%	112%	32%	33%	416%	416%

	Year					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Thames Tideway Tunnel peak daily tonnage**	350	3,050	10,750	10,300	800	850
Required number of HGVs to transport peak rate (C)	22	191	672	644	50	54
Allowable vs Peak number of HGVs at receptor site (A ÷ C)	653%	75%	21%	22%	286%	269%

***** *The Thames Tideway Tunnel average daily tonnage for each year is calculated as the mean of the daily rate each month assuming 22.5 days in each month.*

****** *The peak daily tonnage is based on the average daily tonnage (assuming a 22.5 day month) for the peak month of production in each year.*

14.4.8 Table 14.7 provides the grade given for evaluation objective 11d and the justification for the grade.

Table 14.7 Evaluation objective 11d grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	d) Ability of the receptor sites to accept Thames Tideway Tunnel project material at the anticipated rate (speed of material generation vs acceptance rate)	--	The receptor site could take greater than or equal to 1,000 but less than 2,800t per day of Thames Tideway Tunnel project material	The receptor site has the ability to receive approximately 2,300t per day, based on the delivery of Thames Tideway Tunnel project material by HGV.

14.5 Evaluation indicator 11e) planning consent and permitting

14.5.1 Tyttenhanger Quarry has the necessary planning consent and environmental permit in place to accept excavated Thames Tideway Tunnel project material for restoration purposes.

14.5.2 Further information on the receptor site's planning consent and environmental permit can be found in Section 2.3 and 2.4.

14.5.3 Table 14.8 provides the grade given for evaluation objective 11e and the justification for the grade.

Table 14.8 Evaluation objective 11e grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	e) Site operations have appropriate planning/permitting consent	+++	The receptor site has planning consent and a relevant EA permit.	The receptor site has the relevant planning consent and environmental permit in place to be able to accept Thames Tideway Tunnel project material.

14.6 Evaluation indicator 11f) Transport modes

14.6.1 The receptor site would only accept Thames Tideway Tunnel project material via road.

14.6.2 The planning consent has restrictions on operating times that material can be delivered to the receptor site.

14.6.3 Table 14.9 provides the grade given for evaluation objective 11f and the justification for the grade.

Table 14.9 Evaluation objective 11f grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	f) Can accept excavated material from multiple transport modes	--	The receptor site is only accessible by one transport mode.	The receptor site can only accept material for restoration via road.

15 Evaluation objective 12: To conform to the waste hierarchy

15.1.1 The Thames Tideway Tunnel *Excavated materials and waste (EM&W) strategy* contains an objective to 'minimise waste arisings, maximise re-use, recovery, recycling and beneficial use and minimise the impact of waste on the environment and communities'.

15.1.2 The Thames Tideway Tunnel project material would be used to restore Tyttenhanger Quarry to agriculture and grassland. This is considered to be beneficial use in line with the *EMOA* beneficial use test. Table 15.1 details the application of the *EMOA* beneficial use test applied to Tyttenhanger Quarry.

Table 15.1 Quarry restoration performance against *EMOA* beneficial use test

***EMOA* test**	**Does the receptor site comply with the test?**	**Comment**
The activity will lead to a beneficial use and bring land back into use or provide ecological benefit	Yes	Tyttenhanger Quarry will be restored to agriculture and grassland.
In the case of quarries or landfill sites, the activity has a planning requirement to be restored	Yes	There is a planning requirement at Tyttenhanger Quarry to restore the quarry.
The activity does not attract landfill tax	Yes	Tyttenhanger Quarry should be exempt from landfill tax because it is a quarry restoration project.
The material is suitable for its intended use and would not harm human health or the environment	Yes	Tyttenhanger Quarry would be able to accept all Thames Tideway Tunnel project non-hazardous excavated material, and if managed in accordance with the environmental permit the activities should not harm human health or the environment.
The minimum amount of material will being used	Yes	The material is being used for landraising in line with those agreed contours through the planning consent.
Alternative material (whether waste or not) would be required if Thames Tideway Tunnel project material was not to be used	Yes	Material would be sourced from elsewhere to restore this quarry.

15.1.3 All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 45% of the total Thames Tideway Tunnel project material.

15.1.4 Table 15.2 provides the grade given for evaluation objective 12 and the justification for the grade.

Table 15.2 Evaluation objective 12 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
12. To conform to waste hierarchy	a) Extent to which the option meets the *EM&W strategy* targets.	+++	Performance of receptor site substantially exceeds target.	All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 45% of the total Thames Tideway Tunnel material.

16 Evaluation objective 13: To conform to the proximity principle

16.1.1 The receptor site is located 29km from Carnwath Road (Clay), 28km from Kirtling Street (Lambeth Beds and Thanet Sands) and 29km from Chambers Wharf (Chalk).

16.1.2 In accordance with the Thames Tideway Tunnel project *Transport Strategy* excavated material produced at these sites would be removed by marine transport and not by road. For the purposes of this assessment it has been assumed that the material would be taken from the drive sites by marine transport to a transhipment point and transferred to road at this location (IG11 0EG). The mean distance to the transhipment point from the drive sites is 20km by marine transport. The transhipment point is 43km from Tyttenhanger Quarry by road[III].

16.1.3 For this evaluation objective the receptor site was assessed using a straight line distance from the main drive sites. Using a straight line distance provides a consistent measure for assessment purposes. As the receptor site would be able to receive excavated materials from more than one drive site, the mean distance has been calculated. The receptor site was then graded according to this mean figure. The receptor site is approximately 29km in a straight line from the main drive sites.

16.1.4 Table 16.1 provides the grade given for evaluation objective 13 and the justification for the grade.

Table 16.1 Evaluation objective 13 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
13. To conform to proximity principle	a) Average distance from main tunnel drive sites.	+	The receptor site is between 40km and 20km from source of the Thames Tideway Tunnel project material.	The receptor site is approximately 29km (straight line distance) from the main drive sites.

[III] Distances quoted are those used in the *EMOA* GhG model. Details of the assumptions used in this model can be found in Appendix B.10. These distances are for context only and do not reflect the exact routes that would be used should this receptor site be used to accept Thames Tideway Tunnel project material.

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17 Evaluation objective 14: To conform to sustainable transport policy

17.1.1 The receptor site would only be accessed by road. Coursers Road, off which the receptor site is accessed, is not a strategic highway. However the strategic highway, and junction 22 of the M25, is located less than 600m in the westbound direction of Coursers Road which all receptor site traffic must turn on to.

17.1.2 *The London Plan 2011*[2] Policy 5.18 Construction, excavation and demolition states that "waste should be removed from construction sites and materials brought to the site, by water or rail transport wherever that is practicable." Thames Tideway Tunnel project material would need to be transferred to road at an intermodal transfer station to comply with this requirement.

17.1.3 *The Hertfordshire Minerals Local Plan Review 2002-2016*[3] Policy 15 Transport states "proposals for mineral sites which include the transport of minerals to or from the development site by non-road transport such as water or rail will be supported. Additionally, mineral development will only be permitted when the provision for vehicle movement within the site, the access to the site, and the conditions of the local highways network are such that the traffic movements likely to be generated by the development including the proposed after use would not have an unacceptable impact on highway safety, the effective operation of the road network, residential amenity or the local environment."

17.1.4 Material cannot be delivered by marine transport or rail.

17.1.5 Table 17.1 provides the grade given for evaluation objective 14 and the justification for the grade.

Table 17.1 Evaluation objective 14 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
14. To conform to sustainable transport policy	a) Conforms to policy objective to move transport of materials from road to rail or marine transport.	---	The receptor site can only be accessed by road and there is no direct access to a strategic highway	The receptor site can only be accessed by road, and there is no direct access to a strategic highway, however the M25 is approximately 600m distance from the receptor site entrance.

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18 Evaluation objective 15: To conform to health and safety good practice

18.1.1 Lafarge operates under health and safety procedures at the receptor site and also has a Health and Safety Management Plan in place.

18.1.2 Tyttenhanger Quarry is not accredited to ISO18001.

18.1.3 There have been no reported RIDDOR incidents in the last three years at the receptor site.

18.1.4 Table 18.1 provides the grade given for evaluation objective 15 and the justification for the grade.

Table 18.1 Evaluation objective 15 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
15. To conform to health and safety good practice.	a) Health and safety performance conforms to good practice.	**0**	The receptor sites H&S system is not accredited and there have been five or less RIDDOR incidents in three years recorded at the receptor site.	The receptor site is not ISO18001 accredited. However, there is a health and safety management plan and there have been no RIDDOR incidents in the past three years.

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References

[1] *A Practical Guide to the Strategic Environmental Assessment Directive* ODPM (September 2005); *Strategic Planning for Sustainable Waste Management: Guidance on Option Development and Appraisal* Department for Communities and Local Government (2002)

[2] *The London Plan* Greater London Authority (2011)

[3] *The Hertfordshire Minerals Local Plan Review 2002-2016* Hertfordshire County Council (2007

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.03**

Volume 3: Project-wide effects assessment appendices

Appendix A.4; Annex D.14: EMOS Cliffe Pools

APFP Regulations 2009: Regulation **5(2)(a)**

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Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Environmental Statement

Volume 3 Appendices: Project-wide effects assessment

Appendix A.4: Excavated materials options assessment

Annex D.14: Excavated materials options suitability report – Cliffe Pools

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1 Introduction

1.1.1 The construction of the Thames Tideway Tunnel would require the excavation of a large volume of material at multiple sites throughout London. To identify the preferred options for the management of the excavated material a detailed options assessment has been undertaken.

1.1.2 The methodology for assessment of the excavated material options is based on the Sustainability Appraisal methodology[1]. The assessment has taken a phased approach and at each stage the least preferred options have been eliminated until the final most viable and sustainable options have been selected to form the planning stage preferred list. The options on the planning stage preferred list demonstrate the potential capacity to manage the excavated material in a sustainable manner. The assessment is based on the consistent assessment of options against agreed evaluation objectives throughout the process.

1.1.3 The steps informing the assessment process were:

a. Development of a long list of potential options for the treatment, reuse, recycling or disposal of excavated materials.

b. Viability filter involving the assessment of the long list against the operational evaluation objective associated with viability of the options.

c. Preliminary assessment to develop a short list of options which perform sufficiently well against all the evaluation objectives (environmental, social, operational, policy and health and safety).

d. Detailed assessment in which the options on the short list was further scrutinised to produce a planning stage preferred list of options which grade best against the full suite of evaluation objectives.

1.1.4 For each short listed option whose viability has been confirmed a detailed *Excavated Materials Option Suitability (EMOS) report* has been produced. The *EMOS reports* provide a summary of the site operations and the overall performance of the option against the evaluation objectives.

1.1.5 This *EMOS report* sets out the detail assessment for Cliffe Pools in Kent. The report provides the information gained during the detailed assessment stage of the *Excavated material options assessment* (*EMOA*) and the grades awarded against each evaluation indicator as part of this assessment. A grade is provided for each evaluation indicator, using an agreed set of evaluation criteria, against seven grades of impact (ranging from --- to +++). The *EMOS report* also provides a risk profile for the site identifying the key risks associated with the option in relation to accepting the Thames Tideway Tunnel project excavated material.

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2 Site description

2.1 Site location

2.1.1 The Cliffe Pools site comprises of saline lagoons, shallow pools and areas of scrub and rough grassland, covering an area of approximately 172 hectares. The River Thames is adjacent to the western boundary of the receptor site and to the north. To the east of the receptor site is Cliffe Marshes. Adjacent to the southern boundary of the receptor site is an aggregate processing facility.

2.1.2 The receptor site is used for the disposal of non–hazardous river dredging and is operated by Royal Boskalis Westminster (formerly Westminster Dredging Company). The Royal Society for the Protection of Birds (RSPB) owns the receptor site which is a designated nature reserve. The receptor site is within the South Thames Estuary and Marshes Site of Special Scientific Interest and Thames Estuary and Marshes Special Protection Area (SPA) and Ramsar site.

2.1.3 The RSPB are using river dredgings to develop the receptor site into a nature reserve of invertebrate and saline lagoon habitats by reducing the depth of the existing pools as well as creating islands and causeways within them. The aim of this is to significantly enhance and increase biodiversity in the area as well as improve the visitor experience and public amenity of the receptor site.

2.1.4 Cliffe Pools site location is shown in Plate 3.1 Cliffe Pools site location.

2.2 Site operations

2.2.1 The function of the receptor site is twofold. Firstly it is a nature reserve with public access which is managed by the RSPB. There are several Public Rights of Way running across the receptor site allowing visitors to view the saline habitats and the wildfowl which live and visit the local area during migratory seasons.

2.2.2 In addition to this it is a deposit location for river dredging material. Dredging material is delivered by barge to the receptor site's jetty, where water is used to pump dredging material out of the barges to the pools contained within the site via enclosed pipes. Sediment remains in the pools, whilst water drains back into the River Thames. This process is undertaken by the operators Boskalis Westminster Ltd.

2.2.3 The pipe outlets containing the pumped dredging material predominately occur beneath the waterline of the pools, resulting in very minimal visual impact of the onsite operations. However when required a 'fanning' of dredged material sprayed across the pools above the waterline can occur and would occur when creating islands and other landforms above the pools' waterline.

2.2.4 The receipt of dredging material does not occur continuously throughout the year, as operations at the receptor site are determined by the operator's dredging schedule.

2.2.5 Due to changes in dredging methods there has been a significant reduction in the requirement for depositing dredging material to land. The operator has commented that the tonnage of dredging material deposited at the receptor site on an annual basis is currently insignificant in volume and in the future is likely to continue to decrease.

2.2.6 There are no operational time restrictions in place at the receptor site. Currently when the operator undertakes a dredging campaign the receptor site operates 24hours a day.

2.2.7 The RSPB indicated that the receptor site could receive all Thames Tideway Tunnel project material types. However the receipt of chalk could result in practical difficulties in managing this material, as chalky liquor created through the pumping of the material from the barge to the lagoons may not be permitted to enter the River Thames without suitable levels of pre-treatment. Whilst the receptor site does not wish to rule out the possible receipt of this material, this assessment has been undertaken with the assumption that chalk would not be accepted at the receptor site.

2.3 Planning consent

2.3.1 Cement manufacturing and clay extraction has occurred at the receptor site since the nineteenth century. Planning consent was granted in 1952 for clay extraction to occur at the receptor site. In 1960, consent was granted for the deposit of river dredgings (TH/6/59/258). In the following years a number of consents were granted for the infilling of named areas within the receptor site.

2.3.2 TH/6/59/258 allows for the deposit of river dredgings and materials excavated from coffer dams and river banks; "in the course of conducting civil engineering contracts connected with river works".

2.3.3 The planning consent covers the whole site and there are no restrictions on vehicle access and hours of operation. There are no annual or maximum quantities of material which can be deposited on the receptor site, however the planning consent states that filling of areas should be to ground level.

2.3.4 According to the receptor site's working plan, in 2002, a legal agreement was signed between the RSPB and the operator to permit dredging deposit and the use of the material for the restoration of the nature reserve. This agreement is for a 40 year period.

2.3.5 To receive Thames Tideway Tunnel project material, which is unlikely to be considered as resulting from river works by the Planning Authority, an amendment in the planning consent may be required.

2.4 Permitting

2.4.1 The receptor site is divided in to north and south areas, both of which have planning consent for restoration. The north area currently has a requirement for 900,000m^3 of material. The north area of the receptor site operates under an Environmental Permit (EPR/CP3296LR/A001) which was transferred from the receptor site's Waste Management Licence (WML 19392). The permit allows the receptor site to accept the following waste types:-

- Dredging spoil other than those mentioned in EWC 17 05 05.
- Wastes from mineral non-metalliferous excavation 01 01 02 (sand and aggregate) – for bund construction only, as necessary.

2.4.2 The environmental permit covering the north area of the receptor site currently would not allow the site to accept Thames Tideway Tunnel project material. However during 2012, the RSPB has been in contact with the Environment Agency (EA) to discuss the potential of submitting a permit variation to allow the receptor site to accept material similar in nature to Thames Tideway Tunnel project material.

2.4.3 The south area of the receptor site has a requirement for 1million m^3 of material; however the operator is yet to apply for a permit for this part of the receptor site.

2.4.4 Both the EA and Natural England have been engaged in discussions about the restoration requirements at Cliffe Pools and are assisting in its restoration. The RSPB has commented that they are of the opinion that these two stakeholders are unlikely to raise any significant objections to a variation to the permit for the north part of the receptor site, or any application for the south area of the receptor site, as they have been involved in developing the restoration plans for the north area.

2.4.5 For the purposes of this assessment, it has been assumed the receptor site currently does not have an environmental permit that covers the Thames Tideway Tunnel project material and a permit variation would be required in order for it to do so.

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3 Overall site summary

3.1.1 Table 3.1 below provides a summary of the Cliffe Pools site and an assessment of its suitability against the evaluation objectives. Sections 4 to 18 of this *EMOS report* give more detail on each evaluation objective.

Table 3.1 Summary of Cliffe Pools and its overall suitability

Site name:	Cliffe Pools (WES)		**Owner/operator:**			RSPB/ Boskalis Westminster Ltd.	
Planning consent	Yes (TH/6/59/258), although an amendment may be required to receive Thames Tunnel project material.		**Permit**			Yes (EPR/CP3296LR/A001) for part of the receptor site, but requires variation	
Void capacity	1.9million m^3		**Throughput**			10,000t per day	
Recovery/disposal	Recovery						
Materials	**London clay**	✓	**Lambeth group**	✓	**Chalk**	**X** (preference)	
Transport type	**Road**	**X**	**Rail**	**X**	**Marine transport**	✓	

Receptor site review

The RSPB is developing the nature reserve at Cliffe Pools, which is located in the South Thames Estuary and Marshes Site of Special Scientific Interest and Thames Estuary and Marshes SPA and Ramsar site. The receptor site receives river dredging material, delivered by barge and pumped into the pools within the receptor site. This material is being used to create a managed landscape of islands, causeways and a shallowing of the pools currently within the receptor site boundary. When the restoration is complete, the RSPB believes this would significantly increase and enhance biodiversity as well as public amenity of the receptor site. Thames Tideway Tunnel project material would be delivered to the receptor site by barge. The receptor site is approximately 45km from the Thames Tideway Tunnel main drive sites.

Assessment

1. Land and other resources	a)	**0**	8. Cultural heritage	a)	**++**
	b)	**0**	9. Employment opportunities	a)	**+**
2. Climate change	a)	**0**		b)	**+**
	b)	**0**	10. Cost	a)	**++**
	c)	**++**	11. Operational suitability of the receptor site.	a)	**+++**
3. Local amenity	a)	**0**		b)	**0**
4. Landscapes and townscapes	a)	**0**		c)	**0**
	b)	**+**		d)	**+++**
5. Access to open space	a)	**-**		e)	**---**

	b)	+++		f)	--
6.Water quality	a)	0	12. Waste hierarchy	a)	+++
	b)	0	13. Proximity principle	a)	0
7.Biodiversity	a)	0	14. Sustainable transport policy	a)	+++
	b)	+++	15. Health and safety good practice	a)	+

Environmental summary

In the short term there is likely to be little or no impact on environmental receptors on the receipt of Thames Tideway Tunnel project material at the receptor site. This is due to the manner in which Thames Tideway Tunnel project material would be delivered and placed within the receptor site. In the long term there would be major beneficial effects at the receptor site with respect to habitats creation.

Social summary

The use of Thames Tideway Tunnel project material at the receptor site would have a minor beneficial effect through the creation of approximately one to ten jobs in the short to long term. There are Public Rights of Way within the receptor site, which may require temporary diversion, depending on the phasing of restoration. However the receptor site would manage this by making the receipt of Thames Tideway Tunnel project material a feature of the receptor site, educating visitors on how the material would be used to develop new habitats at the receptor site and emphasising that any short term adverse impacts will lead to long term beneficial improvements.

Operational summary

The receptor site would be operational throughout the lifespan of the Thames Tideway Tunnel project. The north part of the receptor site operates under an environmental permit but would require a variation to receive material similar to that produced by the Thames Tideway Tunnel project. The south part of the receptor site currently has no environmental permit. In total the two areas of the receptor site would require an estimated total of 1.9million m^3 of material to complete the proposed restoration. The RSPB has indicated that the receptor site could accept all Thames Tideway Tunnel project material, if a permit variation were to be agreed by the EA. However, both the operator and RSPB have commented that the receipt of chalk could be technically difficult and so for this assessment it has been assumed that the receptor site would not receive this material. The receptor site is located 45km from Thames Tideway Tunnel project drive sites and is accessible by barge and by road.

Overall suitability

Cliffe Pools has the ability to receive 50% of the Thames Tideway Tunnel project material, and is available beyond 2022. This receptor site would provide a long term beneficial effect with respect to environmental, social and policy objectives as it is being restored to a nature reserve. The receptor site has the potential to provide a beneficial use for the excavated material received at the site. The receptor site is located 45km from Thames Tideway Tunnel project drive sites and is accessible by barge. However the receptor site is likely to require an amendment to its planning consent and will also require a variation to its environmental permit to receive Thames Tideway Tunnel project material.
Cliffe Pools is included on the planning stage preferred list.

Plate 3.1 Cliffe Pools site location

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4 Evaluation objective 1: To ensure prudent use of land and other resources

4.1.1 The planning consent for the receptor site allows the deposit of river dredgings and materials excavated from coffer dams and river banks; “in the course of conducting civil engineering contracts connected with river works.

4.1.2 The use of Thames Tideway Tunnel project material would replace the use of this river dredgings material to partially fill the existing pools within the receptor site and to create causeways and islands within the saline pools in order to further improve onsite habitats.

4.1.3 The operator has commented that changes in dredging methods have resulted in a reduced demand for land on which to deposit dredging materials. Therefore if only dredging materials were used to complete the restoration of the receptor site, it could take longer than the 40 years agreed between the RSPB and receptor site operator. The RSPB therefore has preference for other material to be used to complete restoration of the receptor site.

4.1.4 The operator has commented that based on the annual dredgings arisings of the preceding five years, the small amount of dredging materials requiring deposit could be accommodated at Cliffe Pools even with the receipt of Thames Tideway Tunnel project material.

4.1.5 The Planning Authority may consider that Thames Tideway Tunnel project material is not covered by the existing planning consent. If this were the case, then a variation to the receptor site’s planning consent may be required.

4.1.6 The receipt of Thames Tideway Tunnel project material would not increase the receptor sites footprint.

4.1.7 Table 4.1 provides the grade given for evaluation objective 1 and the justification for the grade.

Table 4.1 Evaluation objective 1 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
1. To ensure prudent use of land and other resources	a) Extent to which resources such as sand, gravel and chalk are conserved by processing or storage of Thames Tideway Tunnel project material at receptor sites.	**0**	Thames Tideway Tunnel project material is unlikely to affect virgin material use e.g. material replaces other reusable materials or no material substitution required.	Thames Tideway Tunnel project material would be used to further develop the nature reserve within the receptor site and create new landforms. Thames Tideway Tunnel project material would replace the use of dredging material which demand

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
				for land disposal has significantly fallen due to changes in dredging methods.
	b) Extent to which Thames Tideway Tunnel project material would effect landtake at (footprint of) receptor sites in the long term.	0	The acceptance of Thames Tideway Tunnel project material would not contribute to the requirement for additional land extending the receptor site's boundary.	Thames Tideway Tunnel project material and would not contribute to a need for the receptor site to expand as all material would be used within the receptor site's boundary.

5 Evaluation objective 2: To reduce climate change impacts

5.1.1 Thames Tideway Tunnel project material would be pumped using the addition of water from barges moored at the receptor site jetty, to the pools within the receptor site via enclosed pipes. Material would not require any additional handling when placed within the receptor site. The operator has a management plan in place to monitor its carbon emissions and seeks to actively reduce these.

5.1.2 Based on data from the EA's lifecycle analysis tool WRATE, the overall GhG emissions for deposition of excavated material to land is 3.17kg CO_2 eq per tonne of excavated material. The excavation material is assumed to be inert soil and the EA's WRATE emissions associated with material reception and spreading have been assumed.

5.1.3 The figures for GhG emissions from transport have been estimated based on:

a. the average CO_2 emissions for the different types of transport; and

b. the distance travelled from the Thames Tideway Tunnel sites to the receptor site.

5.1.4 The GhG emissions calculated are for comparative purposes only and do not provide an exact representation of the transport emissions associated with the Thames Tideway Tunnel excavated material. Full GhG methodology and assumptions can be found in Appendix B.10.

5.1.5 It has been estimated that using Cliffe Pools would produce 1.10kg CO_2 eq per tonne of excavated material accepted.

5.1.6 The receptor site is within the flood plain; however the working plan states that the surrounding coastline has had significant reinforcement for flood protection. The operator has commented that due to the size of the receptor site, the surrounding land use and the flood protection, the receipt of Thames Tideway Tunnel project material for the restoration of the receptor site would have no impact on local flood risk

5.1.7 Table 5.1 provides the grade given for evaluation objective 2 and the justification for the grade.

Table 5.1 Evaluation objective 2 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
2. To reduce climate change impacts	a) Greenhouse gases emitted through treatment, handling and use of Thames Tideway Tunnel project material at receptor sites (excludes transport).	**0**	Thames Tideway Tunnel project material would not require treatment and minimal handling required e.g. passive drying used and material moved by conveyor where possible.	Material would be pumped from barges to where it is required at the receptor site with no additional handling. The operator has a management plan in place to monitor its carbon emissions and seeks to actively reduce these.
	b) Extent to which flood risk is altered by Thames Tideway Tunnel project material at the receptor site (or in the local catchment).	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tunnel project material would contribute, would not change flood risk (from any source or a combination of sources) to the site and surroundings.	The receipt of Thames Tideway Tunnel project material would have no impact on the flood risk to the area surrounding the receptor site, due to the nature of surrounding land use and local flood protection development.
	c) Greenhouse gases emitted through transport of Thames Tideway Tunnel project material to the receptor sites.	**++**	Through the transport of Thames Tunnel project material between 1 and less than or equal to 2 kg CO2 eq per tonne of excavated material accepted by the receptor site would be produced	Through the transport of Thames Tideway Tunnel material it is estimated that 1.10kg CO_2 eq per tonne of excavated material accepted by the receptor site would be produced.

6 Evaluation objective 3: To protect local amenity

6.1.1 The receptor site is not located within an Air Quality Management Area (AQMA).

6.1.2 The placement of a large quantity of Thames Tideway Tunnel project material would be below the waterline of the pools within the receptor site and the operations would not create dust or odour.

6.1.3 When required to raise landforms, Thames Tideway Tunnel project material would be 'fanned' above the waterline of the pools. This would be as a pumped slurry and so there is unlikely to be any affect on air quality as a result of this process.

6.1.4 The Amenity Risk Assessment which is appended to the receptor site's working plan states that there is a low level risk of noise impacting sensitive receptors and that noise monitoring or management is not required for the receptor site. When varying the environmental permit in order to receive Thames Tunnel project material, noise monitoring measures may be required to be introduced.

6.1.5 Whilst there is a property 30m from the eastern boundary of the receptor site, operations would not be located in close proximity to this boundary. The placement of Thames Tideway Tunnel project material at the receptor site is therefore remote and not with close proximity of local sensitive receptors such as domestic dwellings.

6.1.6 The Amenity Risk Assessment finds that for the worst case scenario modelled, (i.e. the maximum values to ensure compliance with regulations relating to of groundwater or soil contamination, noise levels, mud on roads etc), there would be no or negligible impact on amenity. This is as a result of mitigation measures undertaken at the receptor site to reduce the impact of activities, the nature of onsite activities having low impact on amenity and the distance of sensitive receptors to onsite activities.

6.1.7 Table 6.1 provides the grade given for evaluation objective 3 and the justification for the grade.

Table 6.1 Evaluation objective 3 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
3. To protect local amenity	a) Extent of potential effects on local amenity from treatment, handling and use of Thames Tideway Tunnel project material at receptor	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would not have an effect on the local amenity or any	The use of Thames Tideway Tunnel project material at the receptor site is likely to have a negligible or no effect on sensitive receptors due to the distance from these to onsite operations, as well as the nature of placement

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	sites.		effect would be negligible.	of this material.

7 Evaluation objective 4: To conserve landscape and townscapes at receiving locations

7.1.1 The receptor site is not located within an Area of Outstanding Natural Beauty (ANOB).

7.1.2 The receptor site is located within the South Thames Estuary and Marshes Site of Special Scientific Interest and Thames Estuary and Marshes SPA and Ramsar site.

7.1.3 The surrounding landuse to the receptor site is marshes and agricultural land. The closest residential property is 30m to the east of the receptor site boundary, with Cliffe located 500m to the east of the receptor site boundary.

7.1.4 In the short term the receipt of Thames Tideway Tunnel project material is not expected to change the nature of the operations at the receptor site. It is likely however that the receipt of the material would increase the annual number of barges mooring and unloading material at the jetty.

7.1.5 The placement of a large quantity of Thames Tideway Tunnel project material is not likely to be visible as it would be below the waterline of the pools.

7.1.6 The RSPB commented that some release of material from the pipes occurs above the waterline, resulting in a 'fanning' of material as it is sprayed across the pools to create land above the waterline.

7.1.7 The RSPB indicated that they would make the delivery of Thames Tideway Tunnel project material a feature of the nature reserve and would show visitors of the restoration project and the activities taking place on site. Where this placement is visible, such as the fanning described above, this would be managed to ensure a beneficial contribution to the existing landscape.

7.1.8 In the long term, the restoration plans would create new islands and other landforms within the receptor site boundary. The new landforms would be in keeping with the nature of the surrounding landscape and the RSPB consider this to have a minor visual enhancement as this would create new habitats within the receptor site.

7.1.9 Table 7.1 provides the grade given for evaluation objective 4 and the justification for the grade.

Table 7.1 Evaluation objective 4 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
4. To conserve landscapes and townscapes at receiving locations	a) Extent of short term visual & landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tunnel project material would contribute, would not have a short term effect on the local visual amenity at the receptor site or any effect would be negligible	The use of Thames Tideway Tunnel project material at the receptor site would have no impact on the landscape as its placement would be largely below the waterline of existing pools.
	b) Extent of permanent visual & landscape impacts from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**+**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a permanent minor beneficial visual effect on the landscape, based on a 'do nothing' view of the site.	The final use of the Thames Tideway Tunnel project material would have a permanent minor beneficial visual effect on the area as the receptor site would include the creation of new habitats in keeping with the surrounding area.

8 Evaluation objective 5: To protect quality of and access to open space

8.1.1 There are a number of Public Rights of Way (PRoW) running across and within the receptor site.

8.1.2 In the short term there maybe some PRoWs which would require temporary closure or rerouting as new landforms are created.

8.1.3 In the long term when the nature reserve is completed there would be new PRoWs created within the receptor site.

8.1.4 When restored the nature reserve would allow greater public access across the receptor site as new landforms, pathways and two screened hides for bird watchers would be created. In addition, compared to the current PRoWs (10.6km) at the receptor site, the restored site would increase pathways by 6.15km.

8.1.5 Restoration plans also include the development of outdoor education areas including a 'Discovery Zone' with pond-dipping platforms, seating and 'interpretation' plus a riverside study area and supported by an education/community programme.

8.1.6 The proposed development is therefore considered to be a major enhancement to the current receptor site.

8.1.7 Table 8.1 provides the grade given for evaluation objective 5 and the justification for the grade.

Table 8.1 Evaluation objective 5 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
5. To protect quality of and access to open space	a) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the short term?	-	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would permanently re route PRoW	Some existing PRoWs on the receptor site may be temporarily re routed at the receptor site in the short term.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Would Thames Tideway Tunnel project material enhance quality of and access to open space in the long term?	+++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would constitute a major enhancement to the PRoW and substantially increase accessibility to public open space.	When restored there would be new PRoWs created at the receptor site increasing pathways by 6.15km. This would substantially increase public accessibility across the receptor site when compared to current provision. In addition outdoor education areas would be developed explaining the local habitats and historical features of the area further enhancing the public amenity.

9 Evaluation objective 6: To protect water quality

9.1.1 There are a number of pools located within the receptor site boundary and on the land surrounding the receptor site. The River Thames is located on the western boundary of the receptor site.

9.1.2 The operations at the receptor sites extract water from the River Thames in order to discharge barge loads. Water from the pools drain back into the Thames after material is deposited. Management systems are in place to control the water flows at the receptor site and the receipt of Thames Tideway Tunnel project material is unlikely to change these operations.

9.1.3 The receptor site's working plan includes details on the monitoring of groundwater and surface water conditions. It notes that the deposition of river dredgings at the receptor site poses no risk of contamination to local groundwater. When applying for a variation to the receptor sites environmental permit in order to receive material similar in nature to the Thames Tunnel project material, a new working plan would be required to be produced. This would detail measures the operator would introduce to protect local groundwater.

9.1.4 The receptor site is not in a groundwater Source Protection Zone (SPZ), which highlights groundwater sources such as wells, boreholes and springs used for public drinking water supply.

9.1.5 The Thames Tideway Tunnel project material would have no or negligible effect on groundwater given the management practices that would be implemented on the receptor site.

9.1.6 Table 9.1 provides the grade given for evaluation objective 6 and the justification for the grade.

Table 9.1 Evaluation objective 6 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
6. To protect water quality	a) Extent of potential effects on fluvial water quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on the local watercourses.	The receptor site's working plan states that the methods used to receive material and its nature, would have no impact on groundwater quality. This would be required to be updated when applying for a variation to the environmental permit.

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	b) Extent of potential effects on groundwater quality from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on groundwater.	The receptor site is not located within a groundwater SPZ and therefore effects on groundwater are not anticipated.

10 Evaluation objective 7: To protect biodiversity

10.1.1 The receptor site is located within the South Thames Estuary and Marshes Site of Special Scientific Interest and Thames Estuary and Marshes SPA and Ramsar site. The Ramsar designation indicates a wetland of international importance as outlined in the Convention on Wetlands of International Importance, known as the Ramsar Convention. The SPA designation is intended to protect all wild birds, their eggs, nests and habitats within the European Community as set out under the EC Directive on the Conservation of Wild Birds (the Birds Directive, 79/409/EEC and updated 2009 (2009/147/EC)).

10.1.2 The receptor site is currently a nature reserve with a number of wildlife habitats. The delivery of Thames Tideway Tunnel project material to the receptor site would have a negligible impact on habitats as the majority of the material would be deposited via enclosed pipes and not moved by mobile plant.

10.1.3 The receptor site's working plan states that a 'sensitive deposition of dredgings according to the dredgings plan' agreed with by the RSPB and English Nature, would ensure that the deposit of material would have no adverse or limited impact on the lagoon system within the receptor site as a whole. It does acknowledge that there will be some impact on lagoon habitats as material is delivered so that depth of lagoons fall and or material is raised above the water level.

10.1.4 Any adverse impact on the habitat within areas of the receptor site would be managed so that healthy ecosystems and invertebrate communities can re-colonise lagoons quickly resulting in a quick recovery of lagoon habitats after material is deposited.

10.1.5 The on-going development of the nature reserve through the construction of islands and causeways would result in the creation of new invertebrate and saline lagoon habitats. This, according to the RSPB, would significantly enhance the biodiversity of the receptor site.

10.1.6 Table 10.1 provides the grade given for evaluation objective 7 and the justification for the grade.

Table 10.1 Evaluation objective 7 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
7. To protect biodiversity	a) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in	**0**	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have no or negligible effect on a	Operations are managed at the receptor site so to have no effect on the habitats currently existing in the receptor site. Material would be delivered by pipe and not require movement around the receptor

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	the short term.		designated site	site by mobile plant.
	b) Extent of potential effects on designated sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites in the long term.	+++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a major beneficial effect on a designated site and/or creation/improvement of habitats designated site and/or creation/ improvement of habitats	The treatment, handling or use of the Thames Tideway Tunnel project material at the receptor site would have a major beneficial effect on a designated site of international importance through the creation of new landforms and saline lagoons resulting in a significant enhancement of biodiversity.

11 Evaluation objective 8: To protect cultural heritage

11.1.1 A Scheduled Ancient Monument (SAM), Cliffe Fort is located within the receptor site boundary. On the opposite side of the River Thames is the SAM of Coalhouse Fort battery and artillery defences which is approximately 1.5km to the west of the receptor site boundary.

11.1.2 It is not anticipated that in the short term the operations at the receptor site would impact these SAM sites, including that within the receptor site. This is because the delivery of material for restoration would not affect the access to the SAM sites.

11.1.3 In the long term, the RSPB is currently planning to develop the cultural heritage links of the nature reserve, with information and educational walks relating to its industrial and military past, as well as its links to Charles Dickens' novel Great Expectations. This would result in an enhancement of the cultural heritage of the receptor site and the surrounding area as well as improving accessibility of Cliffe Fort by improving pathways.

11.1.4 The receipt of Thames Tideway Tunnel project material would directly contribute to this by being used to restore the nature reserve and create new PRoWs which would incorporate the areas of cultural heritage along the newly created routes.

11.1.5 Table 11.1 provides the grade given for evaluation objective 8 and the justification for the grade.

Table 11.1 Evaluation objective 8 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
8. To protect cultural heritage	a) Extent of potential effects on designated or nominated archaeological sites from treatment, handling and use of Thames Tideway Tunnel project material at receptor sites.	++	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would have a moderate beneficial effect on a designated site	The receipt of Thames Tideway Tunnel project material would result in a moderate beneficial effect on the receptor site, as they would produce new PRoWs which the RSPB would incorporate local cultural heritage along the routes.

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12 Evaluation objective 9: To provide employment opportunities

12.1.1 In the short term it is estimated that between one and five additional staff would be required at the receptor site in order to manage the receipt of Thames Tideway Tunnel project material. These staff would be required to manage operations if conducted over a 24 hour period.

12.1.2 When restored, the RSPB estimate that between five and ten staff would be required to manage the habitat and the visitor infrastructure which would be developed. The receipt of Thames Tideway Tunnel project material would directly contribute to this habitat and infrastructure being developed.

12.1.3 Table 12.1 provides the grade given for evaluation objective 9 and the justification for the grade.

Table 12.1 Evaluation objective 9 grades and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
9. To provide employment opportunities	a) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the short term.	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would lead to minor job gains over the short term of less than ten jobs	The use of Thames Tideway Tunnel project material on the receptor site would contribute to between one and five full time equivalent jobs directly attributable to the receipt of Thames Tideway Tunnel project material.
	b) Extent to which the acceptance of Thames Tideway Tunnel project material would affect the number jobs available at the receptor sites in the long term.	+	Operations at the receptor site, to which the treatment, handling and use of Thames Tideway Tunnel project material would contribute, would lead to minor job gains over the long term of less than ten jobs	The use of Thames Tideway Tunnel project material on the receptor site would contribute to between five and ten full time equivalent jobs over the long term to manage the nature reserve and visitor infrastructure.

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13 Evaluation objective 10: To minimise the cost of waste management

13.1.1 At the time of this assessment, the costs of using the receptor site as a recipient of Thames Tideway Tunnel project material are not known and costs would need to be developed by the RSPB and Boskalis Westminster Ltd.

13.1.2 In order to compare the likely cost associated with transport and acceptance of the Thames Tideway Tunnel project material at each receptor site a cost model is used.

13.1.3 The cost of transporting the excavated material has been calculated from the distance travelled and a cost per tonne/ km for each of the transport mode (road, marine transport and rail). The road and marine transport costs have been calculated from the quotes gathered from operators based on today's prices. A material placement cost of £4 per tonne is assumed based on current prices. Full details of the assumptions made can be found at Appendix B.10.

13.1.4 It has been estimated that the cost of transporting to and managing excavated material at Cliffe Pools would be £11.09 per tonne of excavated material accepted. These costs are predominantly associated with transfer of the material from the Thames Tideway Tunnel sites to the receptor sites. This cost is an estimated cost for comparison purposes within the *EMOA* and may differ from the actual cost which would be incurred if Thames Tideway Tunnel project material were taken to this receptor site.

13.1.5 Table 13.1 provides the grade given for evaluation objective 10 and the justification for the grade.

Table 13.1 Evaluation objective 10 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
10. To minimise the costs associated with the management of excavated material	a) Costs of transporting, handling, treating, reusing, managing and disposal.	++	The transportation, treatment, handling and use of Thames Tideway Tunnel project material would cost between £10 and less than or equal to £13 per tonne	The cost of transportation, treatment, handling and use of Thames Tideway Tunnel project material has been estimated (using the *EMOA* cost model) to be £11.09 per tonne.

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14 Evaluation objective 11: To ensure operational suitability of the receptor site

14.1 Evaluation indicator 11a) Timescales

14.1.1 The planning consent places no time limit restrictions for operations at the receptor site.

14.1.2 There is a legal agreement between RSPB and Boskalis Westminster Ltd. signed in 2002 that allows for deposition of river dredgings and lasts for 40 years from the time of the agreement being signed.

14.1.3 The operator has commented that changes in dredging methods have resulted in a reduced demand for land on which to deposit dredging materials. Therefore if only dredging materials were used to complete the restoration of the receptor site, it could take longer than the 40 years agreed between the RSPB and receptor site operator. The RSPB therefore has preference for other material to be used to complete restoration of the receptor site.

14.1.4 The operator has commented that based on the annual dredgings arisings of the preceding five years, the small amount of dredging materials requiring deposit could be accommodated at Cliffe Pools even with the receipt of Thames Tideway Tunnel project material.

14.1.5 Based on Thames Tideway Tunnel excavation timescales of 2016 to 2021, Cliffe Pools would be available for use for the Thames Tideway Tunnel project material for all years of the project timetable.

14.1.6 Table 14.1 provides the grade given for evaluation objective 11a and the justification for the grade.

Table 14.1 Evaluation objective 11a grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	a) Likelihood of implementation within the required timescale.	+++	The receptor site would be available for use for Thames Tideway Tunnel project material for more than 100% of the required timescale	The planning consent places no time limit restrictions for operations at the receptor site. However there is an agreement in place with RSPB and Boskalis Westminster Ltd. to allow for the deposition of river dredgings for 40 years from 2002.

14.2 Evaluation indicator 11b) Material characteristics

14.2.1 The receptor site has planning consent for the deposit of river dredgings and materials excavated from coffer dams and river banks; “in the course of conducting civil engineering contracts connected with river works”. The receptor site would require a variation of its environmental permit to receive Thames Tideway Tunnel project material.

14.2.2 The operator commented that it would seek to secure a variation to its environmental permit for it to receive Thanet sands and Lambeth Bed gravels as well as London clay.

14.2.3 The operator commented that if the receptor site were to receive the chalk material produced by the Thames Tideway Tunnel project material, then this would require handling in a different manner than the sands, gravels and clay. If it were to receive chalk, it would require the draining of a pool before the placement of chalk and then this material to be capped prior to infilling of water.

14.2.4 The operator confirmed that there may be other technical considerations needed prior to confirmation that chalk material could definitely be accepted.

14.2.5 For this assessment it has been assumed that the receptor site has a preference not to receive chalk from the Thames Tideway Tunnel project as there remain some unknowns with regards to how this material would be handled or if consent for its receipt would be granted.

14.2.6 Table 14.2 provides the grade given for evaluation objective 11b and the justification for the grade.

Table 14.2 Evaluation objective 11b grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	b) Acceptability of material with Thames Tideway Tunnel project material characteristics by the receptor sites.	0	The receptor site could accept for use three Thames Tideway Tunnel project material types based on their characteristics including at least two of the following: London Clay, Lambeth Group and chalk	The receptor site would seek to receive London clay, Thanet sands and Lambeth Group gravels.

14.3 Evaluation indicator 11c) Capacity

14.3.1 The receptor site is split in to two areas; north and south.

14.3.2 The north area of the receptor site currently has capacity for 900,000m^3 of material in order to complete restoration proposals and is consented for

these activities using dredgings materials. A permit variation would be required for the receptor site to receive Thames Tideway Tunnel project material.

14.3.3 The south area of the receptor site has a requirement of 1million m^3 of material in order to complete restoration proposals. This part of the receptor site however is not permitted. However the RSPB have commented that in the future they would seek to secure this consent as this area is required to complete the restoration of the receptor site.

14.3.4 Table 14.3 details the estimated capacity for the receptor site in relation to the material that would be produced by the Thames Tideway Tunnel.

14.3.5 The receptor site has a total capacity to accept 1.9million m^3 (2.34million tonnes). The receptor site's working plan states that the maximum volume of material to be deposited at the receptor site within a 24 hour period is 10,000m^3. The working plan acknowledges that this rate may be increased depending on the dredging campaign requirements. There are no restrictions on operational hours or days per annum permitted for operations to occur at the site.

14.3.6 Table 14.3 also sets out the potential tonnage of Thames Tideway Tunnel project material accepted at the receptor site each year based on the assumptions used in the *EMOA* cost and GhG model. The receptor site would be able to accept 45% of the Thames Tideway Tunnel project excavated materials, based on the total amount of material that it can accept and tonnages which are likely to be produced by the Thames Tideway Tunnel during the years that it is available.

Table 14.3 Capacity for inert material at Cliffe Pools (tonnes[l])

	Year						Total
	2016	2017	2018	2019	2020	2021	
Total Thames Tideway Tunnel production (tonnes)	63,000	549,000	1,938,000	1,852,000	147,000	155,000	4,704,000
Maximum tonnage required to complete restoration	2,340,000	2,340,000	2,340,000	2,340,000	2,340,000	2,340,000	-
Potential Thames Tideway Tunnel project material accepted (tonnes)	63,000	486,000	1,495,000	296,000	-	-	Up to a capacity of 2,340,000
Potential Thames Tideway Tunnel project material accepted (%)	100%	89%	77%	16%	0%	0%	50%

14.3.7 Table 14.4 provides the grade given for evaluation objective 11c and the justification for the grade.

Table 14.4 Evaluation objective 11c grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	c) Capacity of the receptor site to accept the required volume of Thames Tideway Tunnel project material	**0**	The receptor site has capacity to accept greater than or equal to 45% but less than 60% of Thames	The receptor would have the potential to accept 50% of the excavated material that would be produced by the

[l] Figures quoted to the nearest 1,000 tonnes

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
	(based on likely tonnage accepted).		Tunnel project material.	Thames Tideway Tunnel.

14.4 Evaluation indicator 11d) Receptor site throughput

14.4.1 On average the receptor site would be able to receive 10,000t per day subject to the size of the barges, the number of barges and the density of material.

14.4.2 For this assessment it has been assumed that the receptor site would receive 1,000t barges.

14.4.3 The amount of material produced by the Thames Tideway Tunnel would vary on a daily and monthly basis. The assessment of throughput has been based on both the mean and peak production rates over the Thames Tideway Tunnel construction period. The mean rate is taken as the mean monthly production rate taken over each year in the period 2016 to 2021. The peak rate is based on the month producing the maximum tonnage of excavated material in each year.

14.4.4 Table 14.5 details the proportion of the Thames Tideway Tunnel project material which could be accepted by Cliffe Pools over time. This calculation is based on the use of 1,000t barges operating 24hours a day. In all years of the excavation process, Cliffe Pools has throughput to accept the average daily tonnage of the Thames Tideway Tunnel project material produced.

14.4.5 The receptor site also has the ability to receive the peak daily tonnages for Year 1, 2, 5 and 6, 93% of the peak daily tonnages in Year 3 and 97% of the peak daily tonnages in Year 4.

Table 14.5 Throughput of material at Cliffe Pools (tonnes[II])

	Year					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Maximum allowable number of barge deliveries at receptor site per day (A)	10	10	10	10	10	10
Capacity per barge (tonnes)	1,000	1,000	1,000	1,000	1,000	1,000
Thames Tideway Tunnel average daily tonnage*	250	2,050	7,200	6,850	550	550

[II] Figures quoted to the nearest 1,000 tonnes

	Year					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Required number of barges to transport average daily tonnage (B)	0.3	2.1	7.2	6.9	0.6	0.6
Allowable vs average required number of barges at receptor site (A ÷ B)	4000%	488%	139%	146%	1818%	1818%
Thames Tideway Tunnel peak daily tonnage**	350	3,050	10,750	10,300	800	850
Required number of barges to transport peak rate (C)	0.4	3.1	10.8	10.3	0.8	0.9
Allowable vs Peak Number of barges at receptor site (A ÷ C)	2,857%	328%	93%	97%	1,250%	1,177%

***** *The Thames Tideway Tunnel average daily tonnage for each year is calculated as the mean of the daily rate each month assuming 22.5 days in each month.*

****** *The peak daily tonnage is based on the average daily tonnage (assuming a 22.5 day month) for the peak month of production in each year.*

14.4.6 Table 14.7 provides the grade given for evaluation objective 11d and the justification for the grade.

Table 14.6 Evaluation objective 11d grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	d) Ability of the receptor sites to accept Thames Tideway Tunnel project material at the anticipated rate (speed of material generation vs acceptance rate)	**+++**	The receptor site could take greater than or equal to 10,000 tonnes per day of Thames Tunnel project material	The receptor site has the ability to receive 10,000t per day, based on using barges with a capacity of 1,000t and operating 24hours a day.

14.5 Evaluation indicator 11e) Planning consent and permitting

14.5.1 Cliffe Pools has the necessary planning consent in place to accept material for habitat creation. The planning consent limits this material to material resulting from river works. An amendment to the planning consent for the receptor site to receive Thames Tideway Tunnel project material may be required to be obtained prior to its receipt.

14.5.2 The north part of the receptor site operates under an environmental permit. The south part of the receptor site does not currently have an environmental permit. The environmental permit of the north part of the site permits the receipt of dredgings material and would therefore require a variation in order for it to receive Thames Tideway Tunnel project material, or any material of a similar nature. The south part of the receptor site would require an environmental permit for it to receive any material.

14.5.3 Further information on the receptor site's planning consent and environmental permit status can be found in Section 2.3 and 2.4.

14.5.4 Table 14.7 provides the grade given for evaluation objective 11e and the justification for the grade.

Table 14.7 Evaluation objective 11e grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	e) Site operations have appropriate planning/permitting consent.	---	The receptor site has no current planning consent or a relevant EA permit.	Both parts of the receptor site (north and south) would require an environmental permit in order for it to receive Thames Tideway Tunnel project material. Additionally it is likely that an amendment would be required to the receptor site's planning consent for it to receive this material.

14.6 Evaluation indicator 11f) Transport modes

14.6.1 The receptor site would seek to receive all Thames Tideway Tunnel project material by barge via the onsite jetty.

14.6.2 There are no restrictions in the planning consent for the receptor site to receive delivery of material by HGV. For this assessment it is considered that the receptor site would only receive delivery of Thames Tideway Tunnel project material by barge.

14.6.3 Table 14.8 provides the grade given for evaluation objective 11f and the justification for the grade.

Table 14.8 Evaluation objective 11f grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
11. To ensure operational suitability of the receptor site.	f) Can accept excavated material from multiple transport modes.	--	The receptor site is only accessible by one transport mode.	The receptor site can only accept material by barge.

15 Evaluation objective 12: To conform to the waste hierarchy

15.1.1 The Thames Tideway Tunnel *Excavated materials and waste (EM&W) strategy* contain an objective to 'to minimise waste arisings, maximise re-use, recovery, recycling and beneficial use and minimise the impact of waste on the environment and communities'.

15.1.2 The Thames Tideway Tunnel project excavated material would be used as an integral part of the habitat creation scheme. The restoration of Cliffe Pools involves the ecological improvement of the area which would enhance ecosystem performance and enhance biodiversity. This is considered to be beneficial use in line with the *EMOA* beneficial use test. Table 15.1 details the application of the *EMOA* beneficial use test applied to Cliffe Pools.

Table 15.1 Habitat creation performance against *EMOA* beneficial use test

***EMOA* test**	**Does the receptor site comply with the test?**	**Comment**
The activity will lead to a beneficial reuse and bring land back into use or provide ecological benefit	Yes	Material used at Cliffe Pools would be used to increase the habitats available at the current nature reserve contained within its boundary. It is anticipated that there would be a significant beneficial enhancement of local biodiversity as a result of this.
In the case of quarries or landfill sites that the activity has a planning requirement to be restored	Yes	Cliffe Pools has planning consent for restoration of the land created from previous clay extraction activities.
Landfill Tax would not be charged on the material	TBC	The RSPB and the receptor site operator are planning to apply to the EA for a recovery permit at the receptor site; therefore landfill tax would not apply if this were to be obtained.
That the material is suitable for its intended use and would not harm human health or the environment	Yes	Cliffe Pools would be able to accept sands, gravels and clays produced by Thames Tideway Tunnel project material. The technical requirements for managing chalk at the receptor site

EMOA test	Does the receptor site comply with the test?	Comment
		may restrict this material being received at the receptor site.
That the minimum amount of waste is being used	Yes	The material is being used for landraising in line with those agreed contours through the restoration plan.
That alternative material (whether waste or non-waste) would be required if Thames Tideway Tunnel project material was not used	Yes	Material would be sourced from elsewhere for the project if Thames Tideway Tunnel project material was not available.

15.1.3 All the material accepted at the receptor site would be considered as recovery. Thus this receptor site would achieve 100% recovery for all clean materials accepted. It should be noted that this receptor site can only accept 50% of the total Thames Tideway Tunnel project material.

15.1.4 Table 15.2 provides the grade given for evaluation objective 12 and the justification for the grade.

Table 15.2 Evaluation objective 12 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
12. To conform to waste hierarchy	a) Extent to which the option meets the *EM&W strategy* targets.	+++	Performance of receptor site substantially exceeds target.	All the material accepted at the receptor site would be considered as beneficial use. Thus this receptor site would achieve 100% beneficial use for all clean materials accepted. It should be noted that this receptor site can only accept 50% of the total Thames Tideway Tunnel project material.

16 Evaluation objective 13: To conform to the proximity principle

16.1.1 Material would need to be delivered to the receptor site by barge. The receptor site is located 47km from Carnwath Road Riverside drive site and 43km from Kirtling Street drive site. The average distance from the drive sites to the receptor site is 45km.

16.1.2 For this evaluation objective the receptor site was assessed using a straight line distance from the main drive sites. Using a straight line distance provides a consistent measure for assessment purposes. As the receptor site would be able to receive excavated materials from more than one drive site, the mean distance has been calculated. The receptor site was then graded according to this mean figure.

16.1.3 The receptor site is approximately 45km in a straight line from the main drive sites.

16.1.4 Table 16.1 provides the grade given for evaluation objective 13 and the justification for the grade.

Table 16.1 Evaluation objective 13 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
13. To conform to Proximity Principle	a) Average distance from main tunnel drive sites.	**0**	The receptor site is between 60km and 40km from source of the Thames Tideway Tunnel project material	The receptor site is approximately 45km (straight line distance) from the main drive sites.

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17 Evaluation objective 14: To conform to sustainable transport policy

17.1.1 The receptor site would only be accessed by barge.

17.1.2 *The London Plan 2011*[2] Policy 5.18 Construction, excavation and demolition states that "waste should be removed from construction sites and materials brought to the receptor site, by water or rail transport wherever that is practicable." The receptor site meets this criterion.

17.1.3 Table 17.1 provides the grade given for evaluation objective 14 and the justification for the grade.

Table 17.1 Evaluation objective 14 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
14. To conform to sustainable transport policy	a) Conforms to policy objective to move transport of materials from road to rail or marine transport.	+++	The receptor site can be directly accessed from waterway or rail and requires no double handling	The receptor site can be directly accessed from marine transport.

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18 Evaluation objective 15: To conform to health and safety good practice

18.1.1 The receptor site operates under the Boskalis Westminster Ltd. corporate health and safety management system to report and record accidents or safety related incidents.

18.1.2 The management system applicable to this receptor site is ISO14001, ISO9001 and ISO18001 accredited.

18.1.3 Boskalis Westminster Ltd is also accredited with the Contractors Health and Safety Assessment Scheme (CHAS) having demonstrated compliance with and sound management of current basic health and safety legislation.

18.1.4 There has been no reported RIDDOR incident in the last five years at the receptor site.

18.1.5 Table 18.1 provides the grade given for evaluation objective 15 and the justification for the grade.

Table 18.1 Evaluation objective 15 grade and justification

Evaluation objective	Evaluation indicator	Grade	Evaluation criteria	Justification
15. To conform to Health and Safety Good Practice.	a) Health and safety performance conforms to good practice.	+	The receptor sites H&S system is accredited and there have been five or less RIDDOR incidents in three year recorded at the receptor site	The receptor site is ISO14001, ISO9001 and ISO18001 accredited. There have been no RIDDOR incidents reported in the past five years.

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References

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