A12 Chelmsford to A120 widening scheme

TR010060

9.12 Borrow Pits Supplementary Technical Note

Rule 8(1)(k)

Planning Act 2008

Infrastructure Planning (Examination Procedure) Regulations 2010

Volume 9

January 2023

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning
(Examination Procedure) Rules 2010

A12 Chelmsford to A120 widening scheme

Development Consent Order 202[ ]

Borrow Pits Supplementary Technical Note

Regulation Number	Rule 8(1)(k)
Planning Inspectorate Scheme Reference	TR010060
Application Document Reference	TR010060/EXAM/9.12
Author	A12 Project Team and National Highways

Version	**Date**	**Status of Version**
Rev 1	30 January 2023	Final for Deadline 1

CONTENTS

APPENDICES

LIST OF PLATES

LIST OF TABLES

1 Executive Summary

1.1.1 This technical note includes summary results of the volume modelling work undertaken to identify that there is an overall deficit of general earthworks fill material for the proposed scheme, as well as where that deficit exists.

1.1.2 It provides an explanation of the assessment undertaken of potential sources of general earthworks fill material for the proposed scheme, as well as how locations for borrow pits for the proposed scheme were selected using the criterion described in the A12 Chelmsford to A120 Widening Scheme Borrow Pits Report [APP-278].

1.1.3 A considerable amount of volume modelling and mass haul assessment has been carried out by earthworks specialists, in accordance with industry standard methodologies to determine the earthworks general fill deficit and the locations where this exists along the proposed scheme.

1.1.4 Design considerations and assumptions relevant to the level of design maturity of the proposed scheme have been applied to ensure the calculations are as accurate as possible to ensure a robust assessment on a reasonable worst-case basis.

1.1.5 The calculations have confirmed the general earthworks material and granular engineering fill deficit for the proposed scheme is 600,000 cubic metres and 445,000 cubic metres respectively (note these figures are rounded).

1.1.6 To meet this deficit, various sources of supply were considered, and it has been concluded that using borrow pits within the proposed scheme Order Limits is the only feasible solution to ensure that construction risks are appropriately managed to enable delivery of the proposed scheme in accordance with programme and budget constraints.

1.1.7 The assessment of import options has concluded that sourcing the required volume of material from the market, or other local sources is not viable for the following reasons:

- The availability of volumes of material required cannot be guaranteed at this stage.
- The rate of import required to meet the proposed scheme programme cannot be met due to the restrictions of road hauling material in from outside of the Order Limits
- The cost of importing material from external sources is significantly more expensive that winning and processing material from borrow pits within the proposed scheme Order Limits.

1.1.8 As a result, four borrow pits have been selected from a total of 19 locations that have been assessed against key criterion for their use, across the length of the proposed scheme. These four borrow pits are:

- Borrow Pit E (Work No. 17)

- Borrow Pit F (Work No. 26)
- Borrow Pit I (Work No. 48)
- Borrow Pit J (Work No. 59)

1.1.9 These borrow pits have been selected because they have the required quantities of the target materials, as close to the areas of deficit as practicable, and environmental impacts identified from the borrow pit activities can be mitigated to acceptable levels.

2 Introduction

2.1 Overview

2.1.1 The purpose of this technical note is to provide further information in relation to the decision to use borrow pits within the proposed scheme and how the locations of the borrow pits were determined. This technical note builds on the information provided in the A12 Chelmsford to A120 Widening Scheme Borrow Pits Report [APP-278].

2.1.2 This technical note includes:

2.1.3 Summary results of the volume modelling work which identifies that there is an overall deficit of general earthworks fill material for the proposed scheme, as well as where that deficit exists.

2.1.4 An explanation of the assessment undertaken of potential sources of general earthworks fill material for the proposed scheme.

2.1.5 An explanation of the assessment undertaken of the potential borrow pit locations for the proposed scheme which used the criterion described in the A12 Chelmsford to A120 Widening Scheme Borrow Pits Report [APP-278].

3 Calculation of earthworks material requirements

3.1 Volume modelling

3.1.1 Table 2.1 Material Quantities in the Borrow Pits Report [APP-278] provides the rounded summary figures that have been used in the Environmental Statement.

3.1.2 These figures were calculated from a combination of three-dimensional preliminary design models which included details of the proposed mainline highway alignment, side roads, attenuation ponds and their associated earthworks outline.

3.1.3 To calculate the earthworks materials required from the three-dimensional preliminary design models, they were further developed by a specialist earthworks sub-contractor to include design and construction assumptions (appropriate to the maturity of the design) such as:

- depth of topsoil to be stripped
- the proposed pavement depth and construction offsets which dictate the excavated road box size
- over-dig for pond liners
- over-dig for existing ditches/watercourses to be cleared and backfilled

The above list is not exhaustive.

3.1.4 Further separate allowances were made based on previous experience on other aspects which could not yet be modelled, such as:

- Excavation works and fill requirements for new structures
- Excavation works and fill requirements for new access tracks
- Excavation and replacement of ‘soft spots’
- Infilling of existing abandoned ditch networks and watercourses
- Starter layers required in areas of low strength subgrade to embankments

3.1.5 The developed models described above were assessed against an existing ground level model using specialist software to calculate the outline earthworks volumes. This was combined with the further un-modelled calculations also described above to form the basis for general fill material requirements and associated scheme deficit.

3.1.6 The existing ground level model is built from a combination of flown and driven Light Detection and Ranging (LiDAR) survey which has been adjusted to ground control, surveyed using Terrestrial Survey instruments (GNSS and Total Stations).

Considerations for the volume calculations:

3.1.7 At the current level of design maturity, the above methodology is industry standard practice and requires the input of earthworks specialists to apply experience-based assumptions to the calculations to temper any limitations from the modelling work. This ensures numerous design considerations are included in the volume modelling to increase its accuracy for budget setting and programme modelling.

3.1.8 The design considerations in the volume modelling are:

- The accuracy of the resultant mapping of the LiDAR survey. The accuracies for “soft” features are slightly lower than “hard” features, mainly due to the potential for vegetation obstructing ground levels in some areas. Mitigation for this has been carried out in the form of other traditional surveying methods (handheld Global Positioning System and Total Stations) to calibrate the survey model.

- Excavation and fill requirements for proposed work to structures are based on assumed construction requirements because structural design details are not yet available. These include estimations of ground replacement under structures, suitability of material won around existing structures, size of new structural elements and size of temporary excavations required to construct them.

- Proposed access tracks have been assumed to follow the existing ground level in the absence of a three-dimensional design. Ultimately the design of these access tracks will be refined to suit safe vehicle movement and will involve elements of cut and fill which have not yet been foreseen.

- Proposed ditch profiles (and some existing, unmodelled ditches) have been assigned consistent cross-sections along their lengths for preliminary calculations in the absence of three-dimensional information.

- A general assumption that 25% of all excavated material is considered as unsuitable for re-use on the proposed scheme as general earthworks fill. This figure includes an element of unsuitable material within the existing soil structure, considered to be 15% from the ground investigation results. It also includes an assessment on material made unsuitable through inclement weather during construction of 10% based on previous experience.

- Small areas of soft ground at sub-formation level have been assumed to exist and will require excavating and replacing with suitable engineered fill to provide a suitable foundation. The overall area requiring treatment is assumed to be 4% of the sub-formation area, based on historical data from previous schemes.

- Proposed new embankment areas have been assessed for the risk of excessive differential settlement from compressible and low-strength ground. General areas requiring a starter layer have been calculated

under the preliminary design embankment footprint, with an assumed construction thickness.

- The properties of site materials have been assessed to provide estimations of the strength of foundations to new road pavement. This has been used to define a practicable range of pavement construction depths along the proposed scheme where varying pavement formation strengths are expected.
- Existing topsoil depths are assumed to be constant across the model, and in the absence of a detailed landscape and planting design (which may require differing depths of topsoil), re-soil depths are assumed to be constant for new verges and new batter slopes across the model.
- On advice from the drainage designer, all attenuation ponds have been assessed as requiring a liner to safeguard groundwater. As a result, a constant depth clay liner has been applied to all pond models and an assumption has been made that the clay material won from the borrow pits is suitable for use as a lining.

3.1.9 It should be noted that whilst the above considerations are usual for a scheme at this stage of development, they can change through the necessary phases of further design refinement within the limits of deviation, which may affect the volume modelling. For example, refinement of construction details and overall sizes of highway elements such as the pavement, starter layers, ditches and structures will affect the volumes of suitable and unsuitable cut material won from the proposed scheme and the amount of fill material required to construct them.

3.1.10 The above considerations have been taken into account by specialists with the experience and expertise to balance these considerations against the requirements for the project and therefore ensure a robust assessment on a reasonable worst-case basis.

3.1.11 In addition, the figures reported for use in the environmental statement have been rounded to the nearest 100,000m^3. This is within 5% of the calculated values and is therefore considered to be a reasonable margin for a scheme at this stage of development.

3.2 Calculation output

3.2.1 The results of the volume calculations from the three-dimensional modelling activity and subsequent further volume calculations which could not be modelled are presented in Table 3.1.

3.2.2 The modelling output can be viewed in Appendix A and has been summarised in Table 3.1 below. Table 3.1 shows the amount of suitable and unsuitable cut material (which equates to the total cut material) that can be gained from each element of construction works listed, as well the amount of fill material which is required for that element during construction of the proposed scheme. Table 3.2 then totals these amounts across the proposed scheme, to give an overall quantum of suitable cut material gained and an overall quantum of fill material required, from which the deficit of suitable material can be established.

Table 3.1 Model/calculation cut and fill output volumes

Measured / Calculated Element	Total volume calculated (m^3)
Proposed Alignment	
Total Cut	1,020,007
Unsuitable cut	255,002
Suitable cut	765,005
Fill	1,849,421
Proposed Ponds	
Total Cut (allowing for placement of topsoil and clay liner)	488,227
Unsuitable cut	122,057
Suitable cut	366,170
Fill	869
Place clay liner to ponds[1]	282,362
Proposed Access Tracks	
Total Cut (below topsoil strip)	35,139
Unsuitable cut	8,785
Suitable cut	26,354
Fill	878
Proposed New Ditches	
Total cut	70,845
Unsuitable cut	17,711
Suitable cut	53,134
New Ditch fill	1,677
Existing Abandoned Ditches	
Clean out – unsuitable cut	3,420
Re-fill with suitable fill	8,735

Measured / Calculated Element	Total volume calculated (m^3)
Drainage Arisings	
Total cut	154,310
Unsuitable cut	115,733
Suitable cut	38,578
Compressible and Low Strength Ground	
Excavate soft spots in sub-formation – unsuitable cut	14,469
Re-fill soft spots with suitable fill	14,469
Starter layer required in embankments – suitable fill[2]	127,094
Proposed pavement foundation (Road Box)	
Granular engineering fill (Class 6) – adjusted for varying pavement foundation strength[3]	291,900
Proposed Gantries	
Total cut	160
Unsuitable cut	80
Suitable cut	80
Granular engineering fill (Class 6)[2, 3]	0
Proposed Bridges	
Total cut	6,887
Unsuitable cut	1,722
Suitable cut	5,165
Granular engineering fill (Class 6)[2, 3]	46,031
Proposed Retaining Walls	
Total cut	88,632
Unsuitable cut	23,488
Suitable cut	65,144
Granular engineering fill (Class 6)[2, 3]	80,578
Proposed Bridge widening	
Total cut	13,628
Unsuitable cut	6,814
Suitable cut	6,814
Granular engineering fill (Class 6)[2, 3]	6,862

Measured / Calculated Element	Total volume calculated (m^3)
Notes: 1. Clay liner to ponds is assumed to be won from borrow pits because this clay is likely to be of appropriate quality. 2. This figure needs to be subtracted from the overall fill volume required because it would have been included within the proposed scheme alignment fill volume. 3. Granular engineering fill (Class 6) is a higher quality of earthworks material (when compared to Class 1/2 general fill) required to construct specific elements of the proposed scheme, e.g. backfill to structures. This is a separate requirement over and above the general fill material requirement.	

3.2.3 The above summary can be totalled as follows to show the overall scheme deficit of general earthworks fill material:

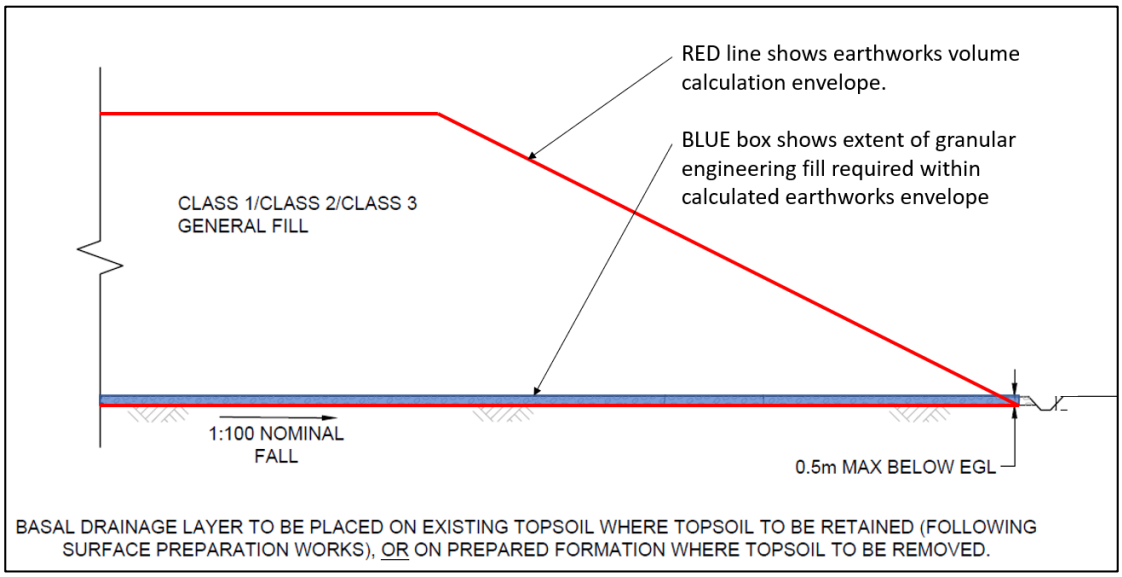
Table 3.2 Cut and fill volume totals

Totals	Volume (m^3)
Unsuitable Cut	569,281
Suitable Cut gained	1,326,444
Fill required	1,897,846
Shortfall	571,402
Granular engineering fill (Class 6) required	425,371

3.2.4 As described in the notes to Table 3.1 a proportion of the granular engineering fill (Class 6) material requirement, as well as the starter layer volume has been subtracted away from the total fill requirement to arrive at the above figures. This is because the modelling element is not sufficiently advanced at this stage to be able to cater for this deduction.

3.2.5 An example of the above would be where an embankment starter layer is required within the volume of the proposed fill volume for the new embankment as shown in the below example Plate 3.1.

Plate 3.1 Proposed new embankment cross section sketch with starter layer



Re-use of unsuitable cut material

3.2.6 Although Table 3.2 identifies volumes of cut material which would be unsuitable to use as fill material for construction of the engineering works identified above, some of this material may be suitable for re-use in other construction works required for the proposed scheme, for example, for landscaping works, ecological mitigation or restoration of borrow pits.

3.2.7 Unsuitable cut materials are defined under three separate categories in the Specification for Highway Works. These are;

- U1A – material which does not comply with the permitted constituents and material properties as set out in the specification or contract (i.e. materials which are clean/natural but do not meet the required engineering properties).
- U1B – contaminated materials, including controlled wastes whose level of contamination is above that given either in specification or contract, but excluding all hazardous wastes.
- U2 – hazardous waste.

3.2.8 Unsuitable materials considered appropriate for re-use in the proposed scheme would be U1A and U1B, provided the U1B is treated/remediated to render it inert and suitable to use (this includes assessing the risk to groundwaters where the material would be placed). Most unsuitable materials will be class U1A. The materials specification for re-use would be agreed with the Environment Agency, secured via the second iteration Environmental Management Plan.

3.2.9 U2 unsuitable material would be removed from site and disposed of in accordance with the Materials Management Plan [APP-194].

Material suitability and options for treatment or design that may enable such materials to be rendered suitable for re-use on the proposed scheme has been considered carefully during the preliminary design phase.

Ground investigation survey results have shown high total sulphur and total potential sulphate content in the target general fill materials, meaning it is unlikely to be suitable for modification or stabilisation with lime/cement.

3.2.10 As noted in the Borrow Pits Report [APP-278] Table 2.1, where cut material unsuitable for use as general earthworks or engineering fill can be used for landscaping works, ecological mitigation areas or borrow pit restoration (where suitable), this would be used as close to its source of origin as reasonably practical. This will reduce the cost, traffic and environmental impacts of hauling the unsuitable material along the proposed scheme.

3.3 Basic Mass Haul

3.3.1 Alongside the volume calculations, a basic mass haul diagram has been produced to map the movements of the calculated quantities of material and highlight the key areas of deficit/shortfall. This provides the basis for locating the borrow pits strategically in order to minimise material haul distances.

3.3.2 The basic mass haul diagram can be seen in Appendix B.

3.3.3 It should be noted that the mass haul diagram included shows the volumes calculated from the three-dimensional modelling works and does not show the amendments to the volumes from the separately calculated elements such as soft spot and starter layer volumes and structures arisings volumes. This is because the geographical or model information for these elements was not available at the time of three-dimensional calculation.

3.3.4 However, given the changes were in the region of 5% difference, this does not alter the basis for the assessment of the borrow pit locations. This can be seen from the three-dimensional modelling volumes and the further adjusted final volumes (given in Table 3.2). The suitable cut volume has increased, and the total fill requirement has decreased meaning an increase in zone surplus and reduction in zone shortfalls is possible. This could lead to a decrease in the borrow pit volumes required, however as the percentage change will be in the order of 5%, this is considered insignificant.

3.3.5 The mass haul diagram is set along a proposed scheme chainage line, shown by the grey section through the middle. The suitable scheme cut volumes are shown by the red boxes, in their relevant zones below the chainage line. The required fill volumes are shown by the green boxes, in their relevant zones above the chainage line.

The sizes of the boxes are an indicative guide for the volume shown inside to give a graphical representation of the volume demand per area.

Surplus excavated material in a zone is indicated by a brown box in that zone.

Shortfalls of required fill material are shown by a yellow box in that zone.

The blue arrows denote the intended direction of movement of surplus excavated material to areas of shortfall.

Where shortfalls cannot be met by the proposed scheme cut areas, borrow pits are shown in grey boxes to meet the overall shortfall.

3.3.6 It should be noted that the image of the A12 proposed scheme included in the mass haul diagram is taken from the proposed route announcement, so is shown for illustrative purposes only.

3.3.7 The earthworks zones (bulk zones) shown in the volume modelling output are generally defined by 4-5km long areas, centred around the existing and proposed junction areas because they are usually ‘hotspots’ for earthworks.

3.3.8 This has split the proposed scheme into nine separate areas along its length to provide a geographical representation of where the surplus and shortfalls of material are spread across it.

3.3.9 The schematic is drawn at an appropriate level of detail for the current stage of the design and is considered to be sufficiently robust to inform the selection of proposed scheme borrow pits.

Summary

3.3.10 In summary, the volumes provided in the Borrow Pits Report [APP-278] are a product of a significant amount of calculation from the three-dimensional modelling work, along with a series of separate calculations that are combined and represented across separate geographical areas along the route of the proposed scheme.

3.3.11 The calculations have been undertaken by experts with significant experience in volume modelling with consideration given to appropriate assumptions to ensure the calculations are as accurate as possible at this stage of design refinement.

3.3.12 The volume tolerance of the modelling work is within that appropriate to the stage of design. There can be confidence in the calculations and the identification of the broad areas of deficit requiring borrow pits for the reasons given above.

3.3.13 The result in this case is general earthworks material shortfalls at the following locations:

- The proposed junction 21 fill embankment
- The proposed junction 22 fill embankment and mainline fill embankment in the same area.

4 Assessment of sources for earthworks material

4.1 Volumes and import rates required

4.1.1 As detailed in the previous section, the design of the proposed scheme, with its cuttings and embankments and their associated side slopes, has an overall shortage of earthworks material necessary for construction. This deficit of overall general earthworks material is in the order of 600,000m^3.

4.1.2 A further 300,000m^3 of Class 6 granular engineering fill material is required for engineering purposes, mainly to be used in the construction of the 26 new or extended structures throughout the scheme as well as the pavement foundation and retaining walls.

4.1.3 The current proposals are that as a preference, embankments requiring general earthworks fill material will be constructed of Class 2 cohesive material because of its availability in this area and its suitability for use.

4.1.4 To satisfy the programme requirement, it is envisaged that the general earthworks deficit fill material will need to be sourced, transported and placed at a rate of approximately 2,000m^3/day. This rate has been derived from the volume of material that needs to be placed in the peak earthworks season to meet the overall proposed scheme completion date. It has been based on earthworks team output rates achieved on previous similar projects so is considered robust. The final rate will be determined as part of the detailed design.

4.2 Potential sources of material

4.2.1 Given the above volumes and rate of need, the options for sourcing both general fill and granular engineering fill are as follows:

- The construction aggregates market eg quarries
- Other construction projects of a similar size and scale that can provide construction, demolition and excavation waste eg other Nationally Significant Infrastructure Projects
- Other smaller construction projects that can provide construction, demolition and excavation waste eg local road schemes and residential schemes
- Borrow pits located within the scheme Order Limits

4.2.2 These sources of material are considered further below.

4.3 Sourcing material from the market

4.3.1 One option is to source fill material from quarries in the construction aggregates market.

4.3.2 These sources are set up for supplying fill material and there are several suppliers within a reasonable distance of the proposed scheme.

4.3.3 Materials available from these sources are predominantly granular products, which are generally better suited to higher value applications such as concrete making aggregates or for use in asphalt producing plants. These products will exceed the requirement for general earthworks fill operations, meaning the cost of the product is likely to be the leading factor in determining its use on the proposed scheme.

Supplier business models will obviously look to generate optimum profit from products sold. So, the rate paid for these granular materials is likely to be very high in comparison to as-raised or unprocessed cohesive or granular materials.

4.3.4 The possibility of acquiring unprocessed cohesive or granular materials from quarry operators does exist. However, this is dependent on the availability of the material within the quarry, planning restrictions imposed on the operation and restoration of the quarry and other competing opportunities on the open market.

For example, if the overburden material of a quarry meets the general earthworks fill material specification required, it could be transported and used for the proposed scheme, provided the planning restrictions on the quarry operation and restoration do not prohibit this.

Maximum likely import radius for the proposed scheme

4.3.5 To determine the envelope of study for import of earthworks materials from external sources, a maximum travel radius was estimated based upon a suitable turnaround time for a road delivery wagon making approximately four site deliveries per day. The maximum journey time for one delivery was set at one hour.

4.3.6 Plate 4.1 is a map which shows up to a one-hour haul radius from the approximate centre of the proposed scheme, which is also the area of largest deficit of general earthworks fill material, Junction 22. This perimeter shows where surplus material could be sourced from.

4.3.7 The average travel speed of the haulage vehicles has been set at, 50mph on motorways, 40mph on A-Roads and 30mph on B-Roads. This perimeter does not consider any congestion on the road network, therefore providing an optimistic view of the maximum radius.

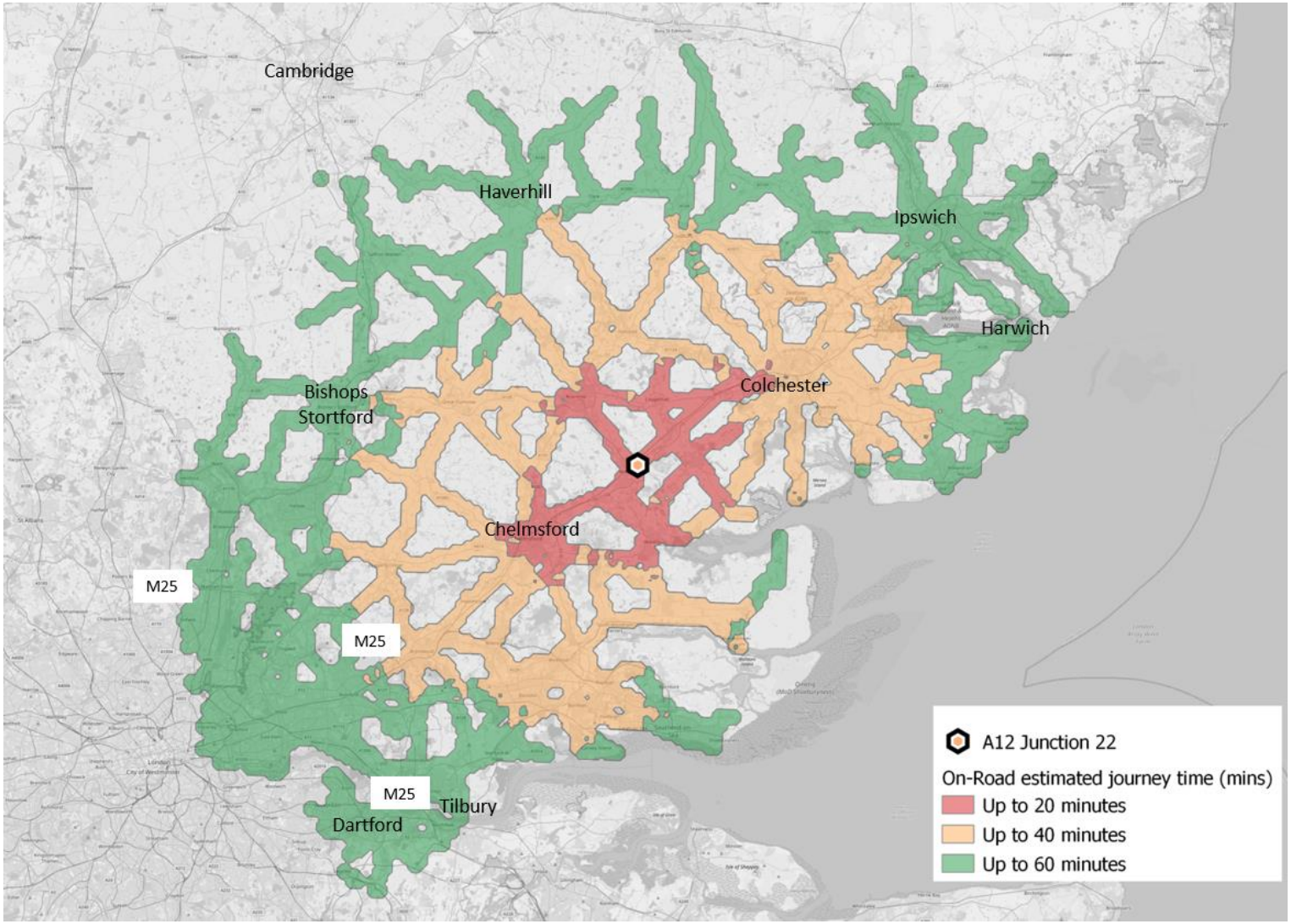
4.3.8 To temper this, sources within the M25 as well as those on the south side of the River Thames have been discounted for availability because the likelihood of achieving the one hour journey time from these areas is considered to be low.

4.3.9 Other local roads shown as grey within the perimeter of the green 60 minute band were not considered as accessible in producing the below mapping, however it is understood that a number of the areas are likely to be achievable

within the yellow and red zones, so were assumed to be acceptable source locations.

4.3.10 A summary of local construction aggregate suppliers with material availability is provided in Table 4.1.

Plate 4.1 Maximum import radius map



Supplier import options data

Table 4.1 Supplier material import data

(Quantity data given in the table is in tonnes. A general assumption can be made that the conversion factor from m^3 to tonnes is 2.0.)

Supplier	Source location	Date available	Material quantity available (tonnes)	Potential import rate (tonnes per day)	Material available	Notes
Supplier 1	Quarry 5km from the scheme	2023	12.8 million	Not Specified	General fill material (Class 1/2) Granular Engineering Fill (various Class 6)	Quarry is a live site with good proximity to the southern half of the proposed scheme. Quarried material is sand and gravel. The available quantity is being drawn down on every week, with a stated annual capacity of 1 million tonnes per year. Supplier has stated that the proposed scheme's daily volume requirement should be achievable from this quarry but has not provided any evidence to support this. Material Classes available are assumed to meet the relevant specification requirements and are still under-going testing to confirm. Supplier has also suggested that proposed scheme surplus material can be 'backhauled' to the quarry location to reduce lorry movements. Supplier states that further work would be needed to ensure this suggestion is viable eg what materials will be exported from the proposed scheme and what can be accepted

Supplier	Source location	Date available	Material quantity available (tonnes)	Potential import rate (tonnes per day)	Material available	Notes
						at the quarry. It is noted that this is not currently being undertaken at the quarry.
	Quarry 5km from the scheme	2023	2.1 million	Not Specified	General fill material (Class 1/2) Granular Engineering Fill (various Class 6)	Quarry is a live site with good proximity to the northern half of the proposed scheme. Quarried material is sand and gravel. The available quantity is being drawn down on every week, with a stated annual capacity of 0.5 million tonnes per year. Supplier has stated that the proposed scheme's daily volume requirement should be achievable from this quarry but has not provided any evidence to support this. Material Classes available are assumed to meet the relevant specification requirements and are still under-going testing to confirm. Supplier has also suggested that proposed scheme material can be 'backhauled' to the quarry location to reduce lorry movements. Supplier states that further work would be needed to ensure this suggestion is viable e.g. what materials will be exported from the proposed scheme and what can be accepted at the quarry. It is noted that this is not currently being undertaken at the quarry.

Supplier	Source location	Date available	Material quantity available (tonnes)	Potential import rate (tonnes per day)	Material available	Notes
	Port - 43km from the scheme (material supplied from Norway)	2023	300 million	Not Specified	General fill material (Class 1/2) And Granular Engineering Fill (various Class 6)	Quarry is a live site with the available quantity being drawn down on every day, with a stated annual capacity of 1.5 million tonnes per year. Quarried material is rock. Supplier has stated that the proposed scheme's daily volume requirement should be achievable from this quarry but has not provided any evidence to support this. Material Classes available are assumed to meet the relevant specification requirements and are still under-going testing to confirm.
Supplier 2	Quarry 48km from the scheme	2023	1.2 million	500	General fill material (Class 1/2) as-dug (unprocessed) material	Quarry is a live site with the available quantity currently being drawn down on at an unstated rate. Material Classes available are unprocessed 'as-dug' and are assumed to meet the relevant specification requirements and have not been confirmed by any testing. It is worth noting that this quarry is located at the extremities of the maximum import radius. This means import rates are significantly impacted by available lorry numbers and congestion on a day-to-day basis.
	Quarry 14km from	2023	28,000 grit	1000	General fill material	Quarry is a live site with the available quantity currently being drawn down on at an unstated rate.

Supplier	Source location	Date available	Material quantity available (tonnes)	Potential import rate (tonnes per day)	Material available	Notes
	the scheme		27,000 sand		Class 1/2 (grit and sand)	Material Classes available are unprocessed and are assumed to meet the relevant specification requirements and have not been confirmed by any testing.
	Recycling 14km from the scheme	2023	20,000	1000	General fill material (Class 1) And Granular Engineering Fill (Class 6)	Source is a material recycling facility that has scope for the capacities stated. This source is completely dependent on the raw feed being brought into the facility at the time. Material Class should be relatively well guaranteed as a product.
	Railhead – 12km from the scheme	2023	Can stock 10,000	1000	Granular Engineering Fill (various Class 6)	Stock levels at the railhead can significantly vary week by week and are dependent on available rail space bookings. Suggested sources are likely to come from the midlands. Material supplied would meet the specification for a Type 1 subbase (high value, processed aggregate that meets stringent road pavement specifications).
	Railhead - 45km from the scheme	2023	Can stock 20,000 to 30,000	500	Granular Engineering Fill (various Class 6)	Stock levels at the railhead can significantly vary week by week and are dependent on available rail space bookings. Material supplied would meet the specification for a Type 1 subbase.

Supplier	Source location	Date available	Material quantity available (tonnes)	Potential import rate (tonnes per day)	Material available	Notes
	Port - 43km from the scheme (material supplied from Norway)	2023	Can stock 100,000	Not Specified	Granular Engineering Fill (Class 6)	Quarry is a live site. No details provided for available volume, however this is assumed to be a significant figure. Quarried material is rock. Supplier has not provided an import rate to the proposed scheme but has stated that the material can be brought to port in 90,000 tonne vessels. Material Classes available are assumed to meet the relevant specification requirements and have not been confirmed by any testing.
Supplier 3	Not available	2023	Not available	Not available	General fill material (Class 1/2)	Material not available currently. The supplier noted that their sources of this material for the period 2024-2026 cannot be guaranteed at this stage.
	Port - 45km from the scheme	2023	Not Specified	Maximum 2,000	Granular Engineering Fill (various Class 6)	Supplier has not provided details on the source of the material and has suggested a maximum import rate based on the distance to the northern half of the proposed scheme. Material Classes available are assumed to meet the relevant specification requirements and have not been confirmed by any testing.
	Port - 43km from	2023	Not Specified	Maximum 2,000	Granular Engineering Fill (various Class 6)	Supplier has not provided details on the source of the material and has suggested a maximum import rate

Supplier	Source location	Date available	Material quantity available (tonnes)	Potential import rate (tonnes per day)	Material available	Notes
	the scheme					based on the distance to the southern half of the proposed scheme. Material Classes available are assumed to meet the relevant specification requirements and have not been confirmed by any testing.
Supplier 4	Quarry 15km from the scheme	2023	Class 1 Not Specified See notes. Class 2 600,000	2,400	General fill material (Class 1/2)	Quarry is a live site with the available quantity currently being drawn down on at an unstated rate. Material Classes available are unprocessed and are assumed to meet the relevant specification requirements. Quantity of Class 1 material available between both quarries is 300,000tonnes.
	Quarry 24km from the scheme	2023	Class 1 Not Specified See notes. Class 2 400,000	2,400	General fill material (Class 1/2)	Quarry is a live site with the available quantity currently being drawn down on at an unstated rate. Material Classes available are unprocessed and are assumed to meet the relevant specification requirements. Quantity of Class 1 material available between both quarries is 300,000tonnes.
	Quarry 24km from the scheme	2023	Class 2 600,000	2,400	General fill material (Class 2)	Quarry is a live site with the available quantity currently being drawn down on at an unstated rate. Material Classes available are unprocessed and are assumed to meet the relevant specification requirements.

Summary

4.3.11 Of the four suppliers that returned information, material source locations available generally lie within the 20 to 40 minute travel time band with the exception of the quarry 48km from the scheme, the railhead 45km from the scheme and the ports that are 43-45km from the scheme which lie within the 60 minute travel time band.

4.3.12 The quarries at 5km from the scheme are the obvious preferred source locations providing the shortest haulage distance. This would have the lowest cost and environmental impact of the available sources.

4.3.13 In terms of using quarries as a source of general fill material, the material quality is likely to be reliable (if not, over-specified) based on the information provided. All the quarries mentioned in Table 4.1 are used to supplying the key component parts for each of the suppliers own further operations including concrete production, asphalt production and aggregate supply to the construction industry.

At this stage it is not possible to determine whether these higher value products are likely to take priority of supply over the proposed scheme's needs for general earthworks fill material, although it is probably likely considering the beneficial use in higher value products for the suppliers.

4.3.14 The main challenge with using these types of quarries for general fill material purposes is therefore generally a commercial one, whereby the quarry operator / material supplier will typically look to maximise their profit where possible. A strategic decision would have to be made by the supplier on whether supplying a potentially unprocessed product in a large quantity, at a lower cost, will fit in with their business plan and needs at the time. This could be seen as an inappropriate use of quality primary aggregates.

4.3.15 Consideration also needs to be given to the fact that these quarries are currently live and producing material for the market. Therefore, the volume stocks are being depleted week by week. The information given in Table 4.1 is a snapshot in time and is not likely to remain the same for the start of the first earthworks season for the proposed scheme in 2024. Most suppliers consider that the 'backhauling' of material from the proposed scheme to quarries or recycling facilities is a feasible operation, but at this stage there is no guarantee that it is achievable.

Considering that unsuitable material produced by the proposed scheme is likely to be general earthworks fill that is too wet for re-use, detailed assessments will need to be made on whether it can be recycled at the facilities described above or if it can be used to restore the quarries, depending on planning restrictions and waste management regulations.

The material exported will also need to be classed as a construction waste and will need to be managed as such within existing regulations and procedures.

4.3.16 The nature of the unsuitable material, being generally wet, will also provide challenges in the haulage operation because they can spoil a lorry's loading

area meaning a clean out of the lorry is required after each load. This adds to the vehicle turnaround time of delivery, as well as haulage costs.

This would limit the type of backhauled materials to those that are relatively clean or dry that will not contaminate the imported material quality.

4.3.17 All suppliers have made it clear that the availability of recycled material is wholly dependent on the demolition market at the time, which is why maximum stock volumes have been stated. Therefore, at this stage the supply of recycled material cannot be relied upon as a source of fill for the proposed scheme.

4.3.18 Three of the suppliers asked provided quantifiable import rates, with two providing rates to supply Class 1/2 general fill material. From these an approximate daily import rate from suppliers for the proposed scheme can be calculated.

Assuming Supplier 1, 2 and 4, being similar in business type and size, can supply material at similar rates an average would be 1,500 tonnes per day. This is unlikely to be achieved daily for the long term requirement of an earthworks season. It is likely that factors such as other business needs, congestion on roads and material quality issues would reduce the quoted import rates.

Considering the other business needs of the suppliers and the haulage fleet available (both in-house and hired in) it is reasonable to assume that they would not be able to supply the proposed scheme from all the quarries stated on a day-by-day basis and that an average supply rate of 1,000 tonnes per day for a single supplier (or 500m^3 per day) is more achievable.

4.3.19 Whilst a combination of three suppliers totals a rate of 1,500m^3 per day, this would mean over 180 lorries would be required to enter the proposed scheme per day. This is unrealistic for a site of this size and is unachievable.

4.3.20 The recycled material source stated in Table 4.1 could add a further 1,000 tonnes (or 500m^3) per day if the feedstock from the demolition or wider construction wastes market is available. However, this is still dependant on the haulage fleet being available and the volume of lorries that can physically enter site on a day-to-day basis.

4.3.21 The combination of these sources would still be lower than the import rate required and stockpiling of material in advance of its time of need would be required to ensure the proposed scheme programme can be met.

4.3.22 The average budget cost (at today's prices) to import and place a primary source Class 1/2 general fill material from a quarry is £71 per cubic metre. This rate includes the placement and compaction of the material at the required location and specification, and any double handling of materials that is required.

Imported material will aim to be deposited at the required location where possible, but this is not always feasible owing to the off-road location of the fill area. Therefore, an adjustment is required that allows for an element of double handling the material. Typically, the amount of re-handled material would be approximately 50% of the imported volume, which has been included in the figure above.

4.4 Source material from other local construction projects

4.4.1 After the construction aggregates market, sources of fill material from other local construction projects have been considered to meet the demand required.

4.4.2 For the purposes of this exercise local construction projects have been considered as:

- Nationally Significant Infrastructure Projects (NSIPs)
- Construction projects such as (but not limited to) residential developments with 100 plus units

4.4.3 These sources have earthworks operations on varying scales and have potential to supply suitable general fill material from construction, demolition and excavation wastes.

4.4.4 For this material transfer operation to be efficient, material of the correct quality needs to be available at the right time for both parties. Therefore, the target construction projects to win material from need to be in a construction phase coinciding with the 2024/5 earthworks seasons of the proposed scheme.

Material stockpiling in advance of the construction requirement is also possible but is undesirable due to the additional costs involved with double handling the material and challenges with securing the land available to stockpile.

4.4.5 Individual scheme planning restrictions would need to be assessed when planning material transfers to ensure they could still be met.

4.4.6 The same maximum import distance model used for supplying material from the construction aggregates market was used for this exercise.

4.4.7 To develop the list of construction projects, the National Infrastructure Planning website and local planning authorities have been searched for live and expected planning applications.

4.4.8 The maximum import distance model has defined the search area to the following local planning administrative areas:

Chelmsford	Basildon	Harlow
Braintree	Babergh	Broxbourne
Colchester	Ipswich	East Herefordshire
Essex	Mid-Suffolk	Castle Point
Brentwood	Uttlesford	Southend on Sea
Thurrock	Epping Forest	Rochford
Maldon	Bury St Edmunds	
Tendring	East Suffolk	

4.4.9 The search of local planned developments has been limited to applications submitted between January 2022 to January 2023 to provide a recent view of developments that can be considered for material supply options.

Local construction projects import options data

Table 4.2 Local construction projects planning data

Local Planning Authority	Application Reference	Approximate Site Location	Site Area (ha)	Short Description	Key Date
National Infrastructure Planning	TR010029	M25 Junction 28 Essex	81	Building a new two-lane loop road, for traffic travelling from the M25 anti-clockwise onto the A12 eastbound (towards Brentwood). This will include the construction of new bridges to take the loop road over or under the other road links, and the Weald Brook; new signage and changes to the landscape Changing the position of A12 eastbound exit slip road and M25 anti-clockwise entry slip road to allow for the new loop road Widening the M25 anti-clockwise carriageway to provide more space for traffic leaving for the A12 eastbound	Start main works Oct 2022 Key earthworks activity dates: Gas Main Diversion Aug 22 – Aug 23 Pond Creation Winter 22 Earthworks and Piling for bridge works Spring 23 All works complete Winter 2025
National Infrastructure Planning	EN010118	Longfield Solar Farm	Approximately 459	Longfield Solar Farm is a proposed new solar energy farm, co-located with battery storage. The proposals include grid infrastructure to connect Longfield Solar Farm to the National Grid and any necessary and appropriate environmental mitigation. Consent for infrastructure needed for building and	DCO Application Submitted Feb 2022

Local Planning Authority	Application Reference	Approximate Site Location	Site Area (ha)	Short Description	Key Date
				maintaining Longfield Solar Farm such as construction compounds and site offices is also included.	
National Infrastructure Planning	Not yet known	Bradwell B Nuclear Power Station	Approximately 400 temporary land, 100 permanent land	Bradwell B is a proposed new nuclear power station, which would be built at Bradwell-on-Sea in Essex.	No DCO Submitted Stage 1 consultation ended July 2020 stage 2 consultation has not started with no proposed dates on the website.
National Infrastructure Planning	TR010032	Lower Thames Crossing	2400	Major highways and tunnelling scheme stretching between Essex and Kent. Including approximately 14 miles of new road, 2.6 miles of tunnel under the river Thames, and around 50 new bridges and viaducts.	DCO application accepted in Nov 2022. Planned construction 2025 to 2028 Main earthworks seasons planned for 2026 and 2027.

Local Planning Authority	Application Reference	Approximate Site Location	Site Area (ha)	Short Description	Key Date
National Infrastructure Planning	Not yet known	Rivenhall IWMF and Energy Centre	Unknown	Rivenhall Intergrated Waste Management Facility	Application expected Q4 2023
National Infrastructure Planning	Not yet known	Bramford to Twinstead Reinforcement	18km of overhead line and 11km of underground line	An electricity network reinforcement between Bramford Substation in Suffolk and Twinstead Tee in Essex. The proposals include constructing up to 18 km of overhead line and around 11 km of underground cable (through the Dedham Vale AONB and in the Stour Valley).	Application expected early 2023
National Infrastructure Planning	TR040002	Ipswich rail chord	1.2km	The Ipswich Chord is a 1.2km double track railway providing essential connection between the East Suffolk Line and the Great Eastern Line. The Chord forms part of the strategic freight network between Ipswich and Peterborough.	Completed

Local Planning Authority	Application Reference	Approximate Site Location	Site Area (ha)	Short Description	Key Date
National Infrastructure Planning	Not yet known	Oikos Marine & South Side Development	Alteration of the existing harbour facility	The project will consist of the installation of substantial new marine loading and unloading equipment and related infrastructure enhancement on the jetties that serve the facility. It will also include the redevelopment of the south side of the facility to provide new storage tanks and associated operational services.	Application Expected Q1 2023
National Infrastructure Planning	TR030003	Tilbury 2	Approximately 61.5	The expansion of the Port of Tilbury, including a Roll-On/Roll-Off (RoRo) facility, highways works, the relocation of the existing railhead (to accommodate freight trains of 75m), and a fixed structural steel bridge to the linkspan.	Secretary of state decision: DCO granted Feb 2019 Project is now complete
National Infrastructure Planning	EN010092	Thurrock Flexible Generation Plant	Unknown	The project includes a gas fired electricity generating station and a battery storage facility, located to the north of Tilbury substation.	Secretary of state decision: DCO granted Feb 2022

Local Planning Authority	Application Reference	Approximate Site Location	Site Area (ha)	Short Description	Key Date
National Infrastructure Planning	Unknown	Tilbury Energy Centre	Unknown	Unknown	Unknown
Chelmsford City Council	22/00473/REM	Boreham Chelmsford Essex	Unknown	Beaulieu Park Station and associated development	Approved June 2022
Chelmsford City Council	22/01723/FUL	Springfield Chelmsford Essex	2.9	Construction of a two-way bus link and pedestrian and cycle paths to connect the Beaulieu Park Railway Station to White Hart Lane with utility, landscape and infrastructure works, together with associated and ancillary development.	Submitted September 2022

Local Planning Authority	Application Reference	Approximate Site Location	Site Area (ha)	Short Description	Key Date
Brentwood Borough Council	22/00402/FUL	M25 Junction 29 Great Warley Essex	45.5	Hybrid application seeking outline planning permission for M25 to B186 link Road (Phase 2) and detailed planning permission for demolition of existing buildings and structures; ground works to enable creation of development plots; highways works including construction of new A127 overbridge, access from B186, site roads and construction of M25 J29 to B186 link road (Phase 1); erection of buildings for storage & distribution and/or general industrial use, with ancillary office space; landscaping; infrastructure and enabling works including diversion of public rights of way.	Submitted March 2022 Decision expected June 2023
Braintree District Council	20/02060/OUT	Rivenhall Essex	17.1	Outline planning application for up to 230 dwellings including affordable homes; public open space including sports pitches and facilities, neighbourhood equipped area for play, parkland and alternative natural greenspace; vehicular access to local roads; a bus, cycle and pedestrian connection to a local road; sustainable drainage systems; landscaping; and, all associated infrastructure and development.	Appeal won January 2023

Local Planning Authority	Application Reference	Approximate Site Location	Site Area (ha)	Short Description	Key Date
Colchester Borough Council	212507	Stanway Colchester	28	Outline planning application for the erection of up to 600 dwellings, land for a co-located primary school and early years nursery, public open space and associate infrastructure. Vehicular access to local roads.	Decision expected early 2023
Tendring District Council	22/00537/OUT	Clacton On Sea Essex CO16 9QH	45.7	Hybrid planning application consisting of: Full planning permission for the erection of age-restricted dwellings, care home, allotments, community building, public open space and associated works. Outline planning permission for erection of up to 710 no. dwellings, primary school, early years and childcare facility, local centre, open space and associated works.	Submitted March 2022
Tendring District Council	22/02076/FUL	Elmstead Essex	10.4	Hybrid planning application consisting of the following: Full planning permission for 126 No residential dwellings including new access. Construction of multi use building (337sqm), reception office (200sqm), workshop (222sqm), 46 space car park, ancillary landscaping and buildings. Outline planning permission for mixed use commercial Space 1.12ha up to 2500sqm.	Submitted January 2023

Local Planning Authority	Application Reference	Approximate Site Location	Site Area (ha)	Short Description	Key Date
Basildon Council	22/01353/OUT	Billericay Essex	10	Outline planning application for demolition of two dwelling houses and erection of up to 150 dwellings and a 50-bed care home, together with car parking, landscaping, surface water drainage basins and associated works.	Submitted March 2022
Basildon Council	22/00388/OUT	Wickford Essex	26.8	Outline planning application for a proposed redevelopment comprising demolition of existing industrial and commercial properties, retention of listed buildings and the erection of up to 370 dwellings, together with the provision of green infrastructure, including public open space and landscaping, flood attenuation and drainage measures, car parking and new access arrangements.	Submitted March 2022
Basildon Council	22/01179/FULL	Basildon Essex	2.38	Residential development comprising of apartments and dwelling houses (105 no. dwellings overall), vehicular access from local roads, cycle and pedestrian accesses, associated parking, landscaping including open space, boundary treatments, drainage, earthworks, 1 no. substation and associated ancillary works.	Submitted September 2022

Local Planning Authority	Application Reference	Approximate Site Location	Site Area (ha)	Short Description	Key Date
Uttlesford District Council	UTT/22/2997/OP	Great Chesterford Essex	30.17	Outline planning application for residential development of up to 350 dwellings, including a Heritage Park including historical interpretation boards and heritage trail and other public open space, up to 50sqm of shop and café floorspace, sustainable urban drainage system and associated infrastructure	Submitted November 2022
Uttlesford District Council	UTT/22/0434/OP	Stansted	61.86	Outline application for demolition of existing structures and redevelopment of 61.86Ha to provide 195,100sqm commercial / employment development and supporting food retail/ food/beverage/nursery uses and associated access/highway works, substation, strategic landscaping and cycle route.	Submitted February 2022

Local Planning Authority	Application Reference	Approximate Site Location	Site Area (ha)	Short Description	Key Date
East Hertfordshire Council	3/22/1613/OUT	Bishops Stortford Hertfordshire	2.62	Full permission for 178 residential dwellings and 3,006sqm of commercial floorspace, together with associated car parking, plant, sub station, landscaping, public realm and infrastructure works. Outline permission for up to 245 residential dwellings, up to 270sqm of commercial floorspace and up to 565 multi-storey car parking spaces, plant, landscaping, new public realm and infrastructure works.	Submitted August 2022
Castle Point District Council	22/0484/FUL	Hadleigh Essex	18.93	Construct 173No. dwellings including public open space, landscaping, access, drainage, parking, servicing, utilities and all associated infrastructure and ancillary buildings.	Submitted August 2022

Summary

4.4.10 11 NSIPs were identified within the maximum import area. One has been identified as having a potential construction programme overlap with the proposed scheme.

4.4.11 The M25 junction 28 improvement scheme has potential earthworks overlap with the proposed scheme in 2024, and works plans initially indicated that the M25 junction 28 scheme would have a surplus of excavated material that would be placed in environmental bunds within the scheme boundary. Specific quantities are not available within published documentation, however the M25 junction 28 scheme contractor has confirmed that following further detailed design there is expected to be a slight volume deficit, and so would not be able to provide any surplus to the proposed scheme.

4.4.12 On investigation of the Longfield Solar Farm development there is very limited earthworks involved in the scheme because most of the work is planned to be carried out at or around existing ground level. Therefore, a surplus of good quality suitable material cannot be relied upon for the proposed scheme.

4.4.13 The Bradwell B Nuclear Power Station upgrade project is currently on standby and is not likely to move into the construction phase before 2030. Therefore, it cannot be relied upon for a source of general earthworks material for the proposed scheme.

4.4.14 The Lower Thames Crossing (LTC) is one of the most likely sources of suitable fill material due to the large surplus of materials expected on tunnelling schemes. The northern roads section of the scheme sits within the maximum import radius for the proposed scheme.

The LTC project has confirmed that the main earthworks seasons for both schemes do not align. The major LTC earthwork seasons are 2026 and 2027, which is one year too late for the A12 Widening Scheme. In addition, the LTC project is not consented. Therefore, this source cannot be relied upon as an import option for the proposed scheme.

4.4.15 Of the 14 planning applications returned from local planning authorities within the maximum import area and period searched, 10 have a major element of residential development, 4 have commercial or industrial developments with associated infrastructure, 3 can be considered as infrastructure projects (e.g highways schemes) and 3 also have an element of demolition.

4.4.16 Residential schemes can generally be ruled out as a reliable source of quality material because they generally have relatively shallow excavations, mainly producing topsoil and subsoil as a waste product which is unsuitable for re-use in engineering or general embankment fill.

Residential projects usually have low levels of waste export because of the limited nature of earthworks on these sites and any surplus produced is generally re-used on-site for landscaped areas to reduce export to landfill.

4.4.17 Commercial or industrial developments can potentially produce higher quantities of surplus material due to the volume of earthworks required for creating large flat spaces suitable for development needs.

The excavation depth will vary based on the topography of the area and space requirements of the development, but as a rule earthworks will be minimised where practical to reduce construction costs. The same principle will apply for surplus materials in that as much as possible will be re-used on site to reduce the quantity of export to landfill.

4.4.18 Infrastructure developments have the potential to create higher quantities of surplus material depending on the detail of the development. Schemes with new road works or large buildings designed at or around existing ground levels will produce cut material that is potentially suitable for re-use in general earthworks embankments. However, this is subject to each development's own needs to create fill embankments for roads or as landscaping for environmental needs.

4.4.19 Developments which require an aspect of demolition are generally a source of suitable granular engineering fill, provided the soils on site are not contaminated (or are appropriately treated) and the demolition materials meet the requirements of the Specification for Highway Works ie they do not contain any organics and have limited amounts of bituminous materials.

4.4.20 The cost of importing general earthworks fill material from other local developments will be dependent on haulage distance but can be averaged at £57 per cubic metre). This is assuming that the material is essentially a waste product from the source development project that would be exported to landfill, which can be provided to the proposed scheme for free, meaning the costs associated are for loading, hauling, and tipping the material only.

The cost would include setting up a loading facility at the source project location, hauling it by road to the proposed scheme and depositing and compacting it in place as if it were a road hauled import. The same assumptions have been made for a quantity of double-handling of material to stockpile enough material to ensure the proposed scheme import rate can be met.

4.4.21 Given the current quantity available as demonstrated above, it is not possible to meet the proposed scheme's earthworks material deficit using import from other construction schemes.

4.5 Borrow pits within the proposed scheme

4.5.1 The immediate benefits of using borrow pits within the proposed scheme is that the source location, date the material will be available, and the volume of material that is available are all guaranteed, reducing the risk and dependency on other external factors that may delay the construction programme.

4.5.2 Having control over the borrow pits also means that import rates can be managed to align with the project programme requirements.

4.5.3 As described in the Borrow Pits Report [APP-278] other benefits of using local borrow pits are as follows:

- A source of suitable construction material close to the areas of deficit, making haul distance more efficient.
- Reduced costs for sourcing, transporting and placing the material when compared to importing from outside of the proposed scheme Order Limits.
- Reducing heavy goods vehicle (HGV) movements associated with the import of acceptable fill material from areas remote from the proposed scheme to meet the shortfall.
- Less construction haul traffic required on the public road network, reducing fuel use, associated vehicle emissions and potential road traffic incidents.
- Providing a local area for material considered unsuitable for engineering purposes to be deposited, reducing the requirement for potential disposal to landfill.

4.5.4 Based on the borrow pit locations proposed in the Borrow Pits Report [APP-278] the general cost for importing earthworks material from borrow pits to the fill location, including placing and compaction is £29 per cubic metre.

This rate includes work associated with preparing and managing the borrow pit areas through construction, such as archaeology, dewatering and other temporary works, topsoil strip and storage, then re-soiling on completion.

4.5.5 Import, placing and compaction of granular Class 6 from borrow pits will cost £88 per cubic metre). This is because processing of the excavated material is required to achieve the right quality of engineered fill.

4.5.6 Borrow pits will also reduce the carbon impacts associated with embankment construction due to the import method of using relatively short internal off-road articulated dump truck haul. This method will allow more material to be transported per load, whilst also traveling a shorter distance, when compared to import from outside of the proposed scheme Order Limits.

4.6 Summary of import options

General fill material

4.6.1 From the range of sources investigated, borrow pits provide the cheapest solution, with the lowest overall haulage distance and carbon footprint. The environmental impacts from borrow pit activities would be mitigated through the restoration of the borrow pit areas in line with section 4 of the Borrow Pits Report [APP-278].

4.6.2 Importing fill material from quarries within the construction aggregates market is the next most reliable source of fill material for the proposed scheme because the material stocks appear to be secured for the years ahead which coincide with the need of the proposed scheme.

4.6.3 The primary factors that affect the feasibility of using these as sole sources of fill material for the proposed scheme are the uncertain availability of the target material, coupled with the cost and the rate at which it can be supplied to the disposition location. This carries a significant risk to the proposed scheme programme with substantial cost risk from delays that would be incurred.

In addition, the carbon generation associated with the increased number of lorries required, longer haulage distances and double handling of the material to place it would be significant.

4.6.4 The most cost-effective general fill material type to import would be as-dug Class 2 cohesive general fill material (e.g. clay overburden to quarries). This requires the least amount of processing and does not attract the Aggregate Levy tax (£2 per tonne) that excavated gravels do. This is equally true for using borrow pits within the Order Limits of the proposed scheme.

Although this is a small value alone, when it is applied to the proposed scheme deficit of 600,000 cubic metres the difference in cost between a cohesive material and a granular material would be approximately £2.4million.

4.6.5 Most suppliers are expecting to supply a Class 1 granular general fill material due to the availability at their quarry locations, which will set the material cost rate at the higher end of the range.

4.6.6 A comparison of the material import costs from each source for the general fill material deficit volume of 600,000m^3 are shown in Table 4.3. This demonstrates that winning material from borrow pits within the proposed scheme Order Limits is the most cost-effective solution.

Table 4.3 General fill material import rates

Material Source	Rate (£ per cubic metre)
Borrow pits within Order Limits	29
Construction aggregate market quarries	71
Waste/surplus material from local construction developments	57

4.6.7 These rates represent a cost difference of £25.2million between importing material borrow pits on the scheme versus importing them from the construction aggregates market.

4.6.8 Similarly, importing waste/surplus material from local construction developments is £16.6million more costly than using borrow pits on the proposed scheme.

4.6.9 The construction aggregate market has also offered up sources from further afield via the use of local railheads and via overseas routes through the ports.

The source of these materials means the price is vastly higher than the local sources, making it an unsuitable general fill material. The distance the material travels is also considerably higher and generally requires more machine and lorry movements from several re-handling points meaning the carbon generation associated with the activity is significantly higher.

4.6.10 The rail heads proposed can stock between 10-30,000 tonnes of material at a time, meaning large numbers of rail movements would be required to facilitate the proposed scheme's need.

The suppliers have limited control over rail movements to these terminals and have noted that the material supply for High Speed 2 is likely to negatively affect the supply to this region.

4.6.11 The suppliers have also stated that the material quality will generally vastly exceed that required for a general fill material, meaning that this would be better suited for a source of granular engineering fill material.

4.6.12 The rate of supply of material from quarries would mean at least three separate suppliers with their own quarries and fleet of lorries would be required to meet the daily rate required by the proposed scheme. Based on the information provided these lorries would be originating from similar areas local to the proposed scheme, putting a significant number of HGV movements on the roads. If the target of 2,000m^3 per day were to be achieved, this means approximately 500 lorry movements per day in the affected areas.

4.6.13 When assessing the source of material from local development projects the larger NSIPs provide the most likely source of material owing to the volume of earthworks generally associated with these works.

4.6.14 From the NSIPs considered within the maximum import radius there are no potential sources of fill material for the proposed scheme.

4.6.15 From the assessment of potential local development sources available, that are not NSIPs, the small number of potential developments to gain material from, and the nature of those developments renders them an unreliable source of supply for the proposed scheme. The materials available from these sources will also vary considerably in type, quality, and time available.

4.6.16 In addition to the disadvantages of the external import options, a change in construction strategy would be required compared to that currently proposed for the proposed scheme. If imported material from the market were the only source it would result in the following changes:

- Changes in land requirements associated with a strategy of stockpiling material to ensure that sufficient material is available prior to the start of each earthworks season to ensure a constant supply of material during each earthworks season.
- A requirement for early procurement of land to start enable stockpiling operations to commence ahead of the first earthworks season.
- Additional traffic movements on the A12 and surrounding local network as a result of the need to haul the earthworks material from its point of origin to its point of use.
- Potential additional carbon impacts and other environmental impacts from haulage and double handling of the material.
- Potential impacts upon the construction programme and costs (eg from the need for doubling handling material).

Granular engineering fill material

4.6.17 The most cost-effective Class 6 granular engineering fill material to import would be recycled product from the demolition market. The sources for this material include borrow pits, the construction aggregates market and local construction development sites.

4.6.18 A comparison of the material import costs from each source of the granular engineering fill material, at the target volume to win from Borrow Pit J of 300,000m^3 are shown in Table 4.4.

Table 4.4 Engineering fill material import rates

Material Source	Rate (£ per cubic metre)
Borrow pit J within Order Limits[1]	88
Construction aggregate market and local construction development recycling facilities	114
1. Rate includes processing material won to the required Class 6 quality.	

4.6.19 Local construction development sites are incentivised to re-use as much of the recycled material within their own project to reduce construction costs and environmental impact. Or alternatively they will sell the material to the construction aggregates market, meaning winning material directly from these sources will be highly competitive in terms of the cost of the material.

4.6.20 All suppliers studied have stated that recycled material availability is entirely dependant on the demolition market at the time of need. Based on the small number of demolition projects available within the maximum import radius considered for the proposed scheme, this is not a source that can be relied upon to guarantee the quantity of material required.

4.6.21 It is recognised that there are likely to be more sources of recycled aggregates originating from within the M25 and Greater London area, however, as previously stated these sources will have slower turn around times for deliveries and would cost more to deliver.

4.6.22 The supply of primary aggregates from the construction aggregate market to the proposed scheme covers more potential sources with the use of local quarries and the rail head and seaport options. However, it is clear that the cost from these sources is higher than sourcing from local scheme borrow pits.

4.6.23 It should be noted that the available quarry volumes stated are reflective of the current position and cannot be guaranteed for the 2024/5 earthworks seasons.

4.6.24 By providing a borrow pit local to the proposed scheme the volume and rate of import of granular fill material is brought within scheme control, securing the supply for the volume required.

The import of granular fill from a scheme borrow pit will require road haulage because it is not feasible to construct an off-road haul route along the full length of the scheme. However, for the proposed scheme, the road haul can be restricted to the strategic road network utilising temporary construction access roads to limit disruption on local roads around the proposed scheme. That disruption will not reach the local road network around the quarry sites (or other external sources).

4.6.25 In summary, for both general fill and granular engineering fill material the advantage of having borrow pits on the proposed scheme significantly outweigh the alternative options because:

- The cost associated with excavating, processing, hauling, placing and compacting is significantly lower.
- The required volume of material and its availability is guaranteed.
- The haulage distance is significantly shorter and more efficient.

4.6.26 These benefits would enable the construction of the proposed scheme to be delivered to the required programme and budget.

5 Assessment of borrow pit locations

5.1 Outline assessment

5.1.1 This section should be read in conjunction with Section 5 of the Borrow Pits Report [APP-278].

5.1.2 As discussed, 18 borrow pit locations, plus an additional location put forward during consultation with a landowner, were assessed against the key criterion identified for borrow pit selection. These criteria are detailed in the Borrow Pits Report [APP-278] in Table 5.4.

5.1.3 The selection of borrow pit locations was carried out through continuous assessment with two key phases.

5.1.4 The desk-based study initially identified areas close to the proposed scheme that could provide the quality of material required in the volumes that were envisaged at that stage in the design development.

5.1.5 To refine the desk-based assessment, surveys were undertaken to gather real data from the locations identified.

5.1.6 Carrying out intrusive survey work, such as ground investigation to verify one of the primary criterion of the quality and quantity of material available, has a disruptive impact on the landowners identified and their associated activities, which is predominantly farming. There is also an element of cost associated with this, which needs to be balanced with the development phase of the proposed scheme. Significant numbers of ground investigation locations will provide very detailed information to build a detailed design from, however the cost of the activity and disruption to the landowner needs to be weighed against the level of information required to prepare a design which is suitable to inform assessment for consenting purposes.

5.1.7 A Red / Amber / Green (RAG) analysis of the initial borrow pit areas was developed which identified 12 locations to take forward to site investigations.

5.1.8 Following the site investigation and survey works the Red / Amber / Green analysis was revisited to refine and determine the optimal borrow pit locations for the proposed scheme need.

It is noted in the Borrow Pits Report [APP-278] that during this period of surveys the preliminary design developed considerably to reduce the proposed scheme earthworks deficit, reducing the import needed from borrow pits.

5.2 Borrow pit option Red/Amber/Green assessment

5.2.1 The results of the decision-making process of selecting borrow pit locations for the proposed scheme are presented in Appendix C.

5.2.2 This matrix comprises the initial desk-based study carried out combined with the post-survey output for each of the 19 locations assessed as being viable for the scheme need.

5.2.3 Not that the borrow pit names include the historical borrow pit reference in brackets i.e. Borrow Pit A (04), Borrow pit A was initially numbered Borrow Pit 04.

5.2.4 The assessment scoring for each criterion is set out in Table 5.1. The colours of the text denoted correspond with the relevant RAG score.

5.2.5 The scoring of the desk-based study differs slightly to that used post-survey. This is due to the development of the decision-making process since it was started in 2017 and the appointment of a contractor to support the process.

Table 5.1 Scoring for RAG assessment

Discipline	Criteria	Desk-based study RAG scoring	Post survey RAG scoring
Technical	Does the borrow pit provide suitable engineering/non-engineering fill for A12 construction?	Information based on limited geological maps and historical borehole information available adjacent to the site. Subject to Series 600 Earthworks (Specification for Highways Works), acceptable engineered fill obtained borrow pits may comprise London Clay Formation, Lowestoft Formation and granular sands and gravels (River Terrace Deposits, Kesgrave Sands and Glaciofluvial sands and gravel). Borrow pits with large portions and volumes of engineered fill material is considered to be favourable and beneficial to the project as they can be used for capping/select and embankment fill. Acceptable non-engineered fill, which may comprise of Brickearth and Head Deposits are materials which do not conform as an engineered fill due to material composition. This material may be used as landscaping or for improving accessibility (flatten slope angles). Borrow pits with large portions and volumes of acceptable non-engineered fill is considered to have no significant impact on the project.	Not included in post survey exercise because the information is clarified further in 'Likely quantity of usable material' section below.

Discipline	Criteria	Desk-based study RAG scoring	Post survey RAG scoring
		Unacceptable fill material, which may comprise high organic matter(peat/marsh/bogs), perishable material, extremely sensitive clays (LL>90% or PI>65%) and uncontrolled waste should not be used in the permanent works and should be disposed offsite. Unacceptable fill material may comprise of Topsoil, Alluvium, Interglacial Lacustrine Deposits, Made Ground and Hazardous Waste. Borrow pits with large portions and volumes of this material is considered to be unfavourable and may have adverse effects.	
	Ease of extraction	The ease of extraction is dependent on the density/consistency of the materials. Granular sands/gravels and cohesive soils shallower than 5m are expected to be easily extracted using conventional excavation methods such as dragline, excavators and dozers. Borrow pits which do not encounter groundwater are considered favourable due to less work required to manage inflows and increase stability of side slope of excavation. Granular sands and gravel with relatively high groundwater is expected to be highly permeable and may	Low Impact - Limited / shallow groundwater and negligeable impact on adjacent receptors. Moderate - Shallow groundwater. Pumping may be required. Mitigation measures may be required to protect adjacent receptors. High - Shallow groundwater. Mitigation measures will be required to protect adjacent receptors.

Discipline	Criteria	Desk-based study RAG scoring	Post survey RAG scoring
		require additional measures to manage groundwater inflows. Material from locations with high groundwater levels are not expected to be directly useable, unless allowed to dry. Material with unfavourable groundwater conditions may have unstable slopes during excavation and may require additional controls to manage groundwater and prevent collapse of the side slopes to occur.	
	Likely quantity of usable material	This section provides an overall breakdown of various geological units likely to be encountered within the borrow pit with associate rough estimates of percentages based on geological maps and historical borehole information. Material unit shall comply with the Series 600 Earthworks (Specification for Highway Works) and generally comprise of acceptable engineered fill with favourable engineering properties, which may allow the design to be more optimised. Acceptable non-engineered fill, which may comprise of Brickearth and Head Deposits (HD) are materials which do not conform as an engineered fill due to material composition and	Low - <50% Class 1 / 2 Medium - 50 to 65% Class 1 / 2 High - >65% Class 1 / 2

Discipline	Criteria	Desk-based study RAG scoring	Post survey RAG scoring
		engineering properties. This material may be used as landscaping or for improving accessibility (flatten slope angles) and is considered to have no impact on the project. Unacceptable material is considered to be unusable and unacceptable as engineered fill, which include Topsoil, Alluvium, Interglacial Lacustrine Deposits, Made Ground and Hazardous Waste. Large quantities of these materials will be considered unfavourable to the project.	
	Existing utilities – diversions/protection	Greenfield sites are likely to be simple and require minimal amount of additional work to divert and protect existing overhead and underground utilities. Brownfield sites are likely to be complex and require significant amount of additional work to divert and protect existing overhead and underground utilities.	Low Impact – Free from existing utilities within the area proposed to be excavated. Existing utility assets can exist around the boundary of the site, which may affect haulage of material or potentially sterilize excavated area. Moderate - Existing utilities lie within the area proposed to be excavated. Existing utility assets cause sterilisation of borrow pit areas, but do not impede extracting and managing the volume of required material from the borrow pit. High – Numerous or large footprint existing utilities lie within the area proposed to be excavated. Existing utility assets cause sterilisation of borrow pit areas that impede extracting and managing the volume of required

Discipline	Criteria	Desk-based study RAG scoring	Post survey RAG scoring
			material from the borrow pit rendering the land plot too complex to work.
	Contaminated land	Sites which are not in close proximity to commercial and industrial activities or relatively undisturbed ground are likely to require less effort in handling, treating and disposing contaminated waste. Site which contains minor sources of contamination and receptors that are easily managed are considered to have insignificant effects on the project. Sites which are heavily contaminated by commercial and industrial activities are likely to require significant effort in handling, treating, and disposing the material.	Low Impact - Low / moderate levels of contamination. Pre-treatment prior to discharge of groundwater unlikely. Moderate - Moderate levels of contamination. Pre-treatment prior to discharge of groundwater may be required. High - High levels of contamination. Pre-treatment required prior to discharge of groundwater, or disposal off-site.
	Summary	RAG system applied based on average impact.	RAG system applied based on highest from previous headings in this criterion.
Construction	Location relative to area of fill	Borrow pit adjacent to or less than 2km to fill area Between 2km and 6km to fill area from borrow pit Greater than 6km to fill area from borrow pit (Note that the distances stated are based on a driven distance, not a direct distance)	Borrow pit adjacent to or less than 1km to fill area Between 1km and 2km to fill area from borrow pit Greater than 2km to fill area from borrow pit (Note distances stated are direct distances looking to consider the best off-road haul route possible)

Discipline	Criteria	Desk-based study RAG scoring	Post survey RAG scoring
	Accessibility (haul road)	Route from borrow pit to fill area can be achieve by direct off-road haul. Route from borrow pit to fill area can be achieved by local or strategic road network. Off-road haul is extensive/costly or not feasible. Borrow pit is inaccessible.	Direct off-road route can be implemented with minor utility or ditch/water course crossings. Direct access to the strategic road network, no constraints such as weak bridges. Direct off-road route with major utility crossings or road/rail crossings. Access onto strategic road network via local road network, may require some local alterations for safe access/egress. No off-road access. Access to strategic road network is only by local road network with significant constraints such as major utility diversions (such as HP gas main) or a weak bridge. Access route may also run through a local village or town.
	Borrow pit construction, dewatering/material drying/area for drying requirements, site setup	Groundwater management is not expected. Groundwater management expected. Artesian groundwater conditions are expected that are unmanageable.	Groundwater management is not expected. Land plot size suitable for material management (i.e. soil storage areas and material processing) Groundwater management expected and is not complex i.e requires low levels of treatment and can be discharged or recycled to ground easily. Land plot size can cater for material management with a phased approach to excavation (i.e. soil storage areas and material processing)

Discipline	Criteria	Desk-based study RAG scoring	Post survey RAG scoring
			Intensive groundwater management expected with complex treatment arrangements and very limited or no ability to discharge or recycle to ground. Land plot size does not cater for material management (ie soil storage area and material processing) which will have to be undertaken elsewhere.
	Summary	RAG system applied based on average of scores from previous headings in this criterion.	RAG system applied based on worst case from previous headings in this criterion.
Environment	Air quality	Red – Receptors located within 50m of the borrow pit. Mitigation may not be effective or would be difficult to implement. Residual adverse effects may remain. Amber – Receptors located within 50m of the borrow pit. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels. Green – Receptors located within 200m, but not within 50m, of the borrow pit. Standard good construction practices are likely to reduce adverse impacts to acceptable levels.	Red – Receptors located within 50m of the borrow pit. Mitigation may not be effective or would be difficult to implement. Residual adverse effects may remain. Amber – Receptors located within 50m of the borrow pit. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels. Green – Receptors located within 200m, but not within 50m, of the borrow pit. Standard good construction practices are likely to reduce adverse impacts to acceptable levels.
	Cultural heritage	Red – High value or complex archaeological deposits likely to be impacted. Significant adverse effect on the setting of cultural heritage assets.	Red – High value or complex archaeological deposits likely to be impacted. Significant adverse effect on

Discipline	Criteria	Desk-based study RAG scoring	Post survey RAG scoring
		Large scale mitigation may be required. Amber – Potential to remove archaeological deposits or affect the setting of cultural heritage assets. Additional mitigation measures would be required to reduce the effect. Green – No or negligible value cultural heritage assets identified from records or surveys within or adjacent to the borrow pit footprint.	the setting of cultural heritage assets. Large scale mitigation may be required. Amber – Potential to remove archaeological deposits or affect the setting of cultural heritage assets. Additional mitigation measures would be required to reduce the effect. Green – No or negligible value cultural heritage assets identified from records or surveys within or adjacent to the borrow pit footprint.
	Landscape and visual	Red – Likely significant adverse effect. Unlikely to be able to mitigate. Amber – Potential for significant adverse effect. Mitigation may reduce residual effect. Green – Negligible or minor impacts on landscape character or views. Effect unlikely to be significant with mitigation.	Red – Likely significant adverse effect. Unlikely to be able to mitigate. Amber – Potential for significant adverse effect. Mitigation may reduce residual effect. Green – Negligible or minor impacts on landscape character or views. Effect unlikely to be significant with mitigation.
	Biodiversity	Red – Likely significant adverse impacts. Mitigation may not be possible. Or effects are uncertain. Amber – Potential significant adverse impacts. Additional mitigation measures may be required to reduce the effect.	Red – Likely significant adverse impacts. Mitigation may not be possible. Or effects are uncertain. Amber – Potential significant adverse impacts. Additional mitigation measures may be required to reduce the effect. Green – No or negligible value ecological constraints identified that could be impacted by the borrow pit.

Discipline	Criteria	Desk-based study RAG scoring	Post survey RAG scoring
		Green – No or negligible value ecological constraints identified that could be impacted by the borrow pit.	
	Noise and vibration	Red – Receptors located within 50m of the borrow pit. Mitigation may not be effective or would be difficult to implement. Residual adverse effects may remain. Amber – Receptors located within 50m of the borrow pit. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels. Green – Receptors located within 300m, but not within 50m, of the borrow pit. Standard good construction practices are likely to reduce adverse impacts to acceptable levels.	Red – Receptors located within 50m of the borrow pit. Mitigation may not be effective or would be difficult to implement. Residual adverse effects may remain. Amber – Receptors located within 50m of the borrow pit. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels. Green – Receptors located within 300m, but not within 50m, of the borrow pit. Standard good construction practices are likely to reduce adverse impacts to acceptable levels.
	Population and health	Red – Option would introduce significance hindrance to non-motorised user access, such as a requirement for a substantial (>500m) diversion or prevention of NMU journeys. Amber – Option would introduce inconvenience to non-motorised user access such as minor (<500m) diversions or requirements to take nearby alternative routes, but	Red – Option would introduce significance hindrance to non-motorised user access, such as a requirement for a substantial (>500m) diversion or prevention of NMU journeys. Amber – Option would introduce inconvenience to non-motorised user access such as minor (<500m) diversions or requirements to take nearby alternative routes, but connectivity for non-motorised user journeys would be overall maintained.

Discipline	Criteria	Desk-based study RAG scoring	Post survey RAG scoring
		connectivity for non-motorised user journeys would be overall maintained. Green – Option would have negligible impacts on non-motorised user access although amenity of the route may be reduced.	Green – Option would have negligible impacts on non-motorised user access although amenity of the route may be reduced.
	Road drainage and the water environment	Red – Likely significant adverse effect. Unlikely to be able to mitigate. Amber – Potential for significant adverse effects. Additional mitigation measures would be required to reduce the effect. Green – No water environment impacts have been identified; or, potential for impacts that could be managed through standard mitigation measures, with opportunities for long-term betterment.	Red – Likely significant adverse effect. Unlikely to be able to mitigate. Amber – Potential for significant adverse effects. Additional mitigation measures would be required to reduce the effect. Green – No water environment impacts have been identified; or, potential for impacts that could be managed through standard mitigation measures, with opportunities for long-term betterment.
	Summary	Conclusions on the likely significant effects from the borrow pits based on the following criteria: Red – Likely significant adverse effect. Complex mitigation likely to be required. Residual significant effects could remain. Amber – Potential for a significant adverse effect. Additional mitigation likely to be required.	Conclusions on the likely significant effects from the borrow pits based on the following criteria: Red – Likely significant adverse effect. Complex mitigation likely to be required. Residual significant effects could remain. Amber – Potential for a significant adverse effect. Additional mitigation likely to be required.

Discipline	Criteria	Desk-based study RAG scoring	Post survey RAG scoring
		Green – No or negligible effect. Standard mitigation likely enough to manage potential impacts.	Green – No or negligible effect. Standard mitigation likely enough to manage potential impacts.
Planning	Planning policy (including local plans, minerals plan and National Networks National Policy Statement (Department for Transport, 2014))	Green – No planning allocation identified OR identified with no impact on future development Amber – Planning allocation identified with potential impact on future development e.g. area safe guarded for mineral value Red - Planning allocation identified with impact on future development	Green – No planning allocation identified OR identified with no impact on future development Amber – Planning allocation identified with potential impact on future development e.g. area safe guarded for mineral value Red - Planning allocation identified with impact on future development
	Planning applications and consented schemes	Green – No planning application identified OR identified with no impact on future development Amber – Planning application identified with potential impact on future development Red - Planning application identified with impact on future development	Green – No planning application identified OR identified with no impact on future development Amber – Planning application identified with potential impact on future development Red - Planning application identified with impact on future development
	Summary	RAG system applied with weighting towards score for planning applications because the local plans, minerals plan and National Networks National Policy Statement are not likely to change for the next scoring exercise.	RAG system applied with weighting towards score for planning applications because the local plans, minerals plan and National Networks National Policy Statement have not changed since the initial scoring exercise.
Existing land use	The land use	Low impact – Fallow unused land or low grade arable agricultural land.	Low impact – Fallow unused land or low grade arable agricultural land.

Discipline	Criteria	Desk-based study RAG scoring	Post survey RAG scoring
		Moderate – moderate to high grade arable and/or pastural agricultural land. High – Public open space or development land.	Moderate – moderate to high grade arable and/or pastural agricultural land. High – Public open space or development land.
	Identify who owns the land (is it a public body or private landowner?)	Low impact – Private landowner(s). Moderate – Public landowner. High – Special category land.	Low impact – Private landowner(s). Moderate – Public landowner. High – Special category land.
	The percentage of the landholding affected (i.e. how much land is retained?)	Low impact – less than 20% affected. Moderate – between 20 and 50% affected. High – over 50% affected.	Low impact – less than 20% affected. Moderate – between 20 and 50% affected. High – over 50% affected.
	Summary	RAG system applied based on worst case from all headings under this criterion.	RAG system applied based on worst case from previous headings under this criterion.

5.3 Discussion of borrow pit location selection for the preliminary design.

5.3.1 The volume and quality of material, as well as the distance between the borrow pit locations and the fill (deficit) areas, were used to establish comparable borrow pit locations, which were capable of serving the same target fill (deficit) areas. The comparison and assessment of borrow pit locations was then undertaken by assessing relevant borrow pit locations for their corresponding target fill (deficit) areas. These are shown in 5.2.

5.3.2 Each borrow pit was then assessed against all of the criterion identified above. The criterion used to assess the borrow pit areas (as identified above) are not equally weighted and require professional judgement to be applied in order to determine the most appropriate location. Where impacts or issues were identified, consideration was also given as to whether these could be appropriately mitigated or overcome, and this was factored into the evaluation and overall decision making.

Table 5.2 Borrow pits and their target fill areas

Borrow Pit	Target fill area at desk-based study	Target fill area at post-survey
Borrow Pit 01	Junction 21	Junction 21
Borrow Pit 02	Junction 21	Junction 21
Borrow Pit 03	Junction 21	Junction 21
Borrow Pit A (04)	Junction 21	Junction 21
Borrow Pit B (05)	Junction 21	Junction 21
Borrow Pit C (06)	Junction 21	Junction 21
Borrow Pit D (07)	Junction 21	Junction 21
Borrow Pit E (08)	Junction 21	Junction 21
Borrow Pit 09	Junction 21	Junction 21
Borrow Pit F (10)	Junction 21	Junction 21
Borrow Pit G (11)	Junction 21	Junction 21
Borrow Pit H (12)	Junction 22	Junction 22
Borrow Pit 13	Junction 22	Junction 22
Borrow Pit 14	Junction 22	Junction 22
Borrow Pit 15	Junction 22	Junction 22
Borrow Pit I (16)	Junction 22	Junction 22

Borrow Pit	Target fill area at desk-based study	Target fill area at post-survey
Borrow Pit J (17)	Junction 22	Aggregate Source for the proposed scheme
Borrow Pit K (18)	Junction 24	Aggregate Source for the proposed scheme
Borrow Pit L	Junction 21	Junction 21

Initial borrow pit sites

5.3.3 It is noted in paragraph 5.12 of the Borrow Pits Report [APP-278] that the earthworks material deficit reduced with further design iterations. At the desktop stage, the deficit had reduced from an initial 2.7 million cubic metres down to 1.2 million cubic metres, also changing the deficit areas along the proposed scheme route.

5.3.4 The RAG assessment for the desktop stage was undertaken in relation to the design with a deficit of 1.2 million cubic metres. This is different to the deficit areas for the proposed scheme taken forward to DCO application given the progression of the design by that stage.

The notable difference is the location of the proposed junction 24. As the proposed scheme design developed, junction 24 was relocated and re-designed from a fill embankment to a cutting, which resulted in a surplus of material rather than a deficit. This meant that a borrow pit was no longer required at this location. . However, this does not change the assessment of the other borrow pit locations, including those discounted at the desktop stage, which were still required because the cut and fill balance for those locations had not changed.

5.3.5 The summary of reasons for discounting the initial 7 borrow pits is given in Table 5.1 of the Borrow Pits Report [APP-278].

5.3.6 Further detail is provided below in Table 5.3.

Table 5.3 Initial borrow pit sites discounted.

Borrow Pit	Reason for discounting
Borrow Pit 01	Although the available material looks favourable, the distance of the borrow pit from the intended fill location at junction 21, combined with the potential haul road along narrow roads and through villages is unsuitable. Borrow Pits 04 to 11 are better located in comparison to this borrow pit.
Borrow Pit 02	The assessment of available material concluded that the yield of suitable fill material is poor, when considered against some of the closer borrow pits (Borrow Pits 04 to 11). The distance of the potential borrow pit from the intended fill location at junction 21, combined with the potential haul road along narrow roads and through villages is unsuitable. Borrow Pits 04 to 11 are better located in comparison to this borrow pit. Borrow Pit 02 also sits within a Mineral Consultation Area (Northeast Chelmsford), which would limit its ability to be used as a point of disposal for unsuitable material which could sterilise future extraction.
Borrow Pit 03	The distance of the potential borrow pit from the intended fill location at junction 21, combined with the potential haul road along narrow roads and through villages is unsuitable. Borrow Pits 04 to 11 are better located in comparison to this borrow pit.
Borrow Pit 09	The assessment of available material and haul road distance to the intended fill location at junction 21 are all favourable for this borrow pit. However, its use was precluded by a development allocation (HATF321) in the Braintree Local Plan – Options Assessment (Essex County Council, 2016) for a mixed-use development.
Borrow Pit 13	The location of the borrow pit is unfavourable due to being on the opposite side of a main watercourse from the intended fill area of junction 22, as well as being in a flood zone. Groundwater levels are likely to be a significant issue based on the geotechnical assessment. Borrow Pit 16 is better located with better access in comparison to this borrow pit. The location is also unfavourable from a landscape and visual perspective, being within or adjacent to a former special landscape area, affecting the setting of, and views from, cultural heritage assets. Borrow Pits 12 and 16 have a lower overall potential environmental impact in comparison to this borrow pit.
Borrow Pit 14	The location of the borrow pit is unfavourable due to being on the opposite side of a main watercourse from the intended fill area of junction 22, as well as being in a flood zone. Borrow Pit 16 is better located with better access in comparison to this borrow pit.

	The location is also unfavourable from a landscape and visual perspective, being within or adjacent to a former special landscape area, affecting the setting of, and views from, cultural heritage assets. Borrow Pits 12 and 16 have a lower overall potential environmental impact in comparison to this borrow pit.
Borrow Pit 15	The location of the borrow pit is unfavourable due to being on the opposite side of a main watercourse from the intended fill area of junction 22, as well as being in a flood zone. Borrow Pit 16 is better located with better access in comparison to this borrow pit. Groundwater levels are likely to be an issue based on the geotechnical assessment. The location is also unfavourable from a landscape and visual perspective, being within or adjacent to a former special landscape area, affecting the setting of, and views from, cultural heritage assets. Borrow Pits 12 and 16 have a lower overall potential environmental impact in comparison to this borrow pit.

5.3.7 Following this assessment, the site surveys were commissioned on the preliminary locations taken forward (i.e not discounted above).

5.3.8 These locations were Borrow Pits 04, 05, 06, 07, 08, 10, 11, 12, 16, 17 and 18, plus the additional location proposed by the landowner (Borrow Pit L).

Surveyed borrow pit sites (preliminary borrow pit options)

5.3.9 At this stage, design development had reduced the overall proposed scheme earthworks deficit to 600,000 cubic metres (from the 1.2 million cubic metres in the previous stage). This is reflected in the design of the proposed development taken forward in the DCO application.

5.3.10 As discussed in section 3 of this report the key areas of deficit are:

- Junction 21 fill embankments
- Junction 22 fill embankments

5.3.11 Section 3 also states that the granular engineering fill requirement for the proposed scheme is in the order of 425,000 – 450,000 cubic metres.

Table 4.4 highlights the cost, programme and construction risk benefits of winning this material from borrow pits within the proposed scheme Order Limits. Combining this with the benefits of shorter haul distances in regard to carbon generation, borrow pits with large deposits of granular material have been assessed to supply this material along the full length of the proposed scheme.

5.3.12 The summary of reasons for discounting the 8 preliminary borrow pits are given in Table 5.5 of the Borrow Pits Report [APP-278].

5.3.13 Further detail is provided here in Table 5.4.

Table 5.4 Preliminary borrow pits assessment

Borrow Pit	Assessment against fill deficit areas
Borrow Pit A	The distance of the borrow pit from the required fill area at junction 21 is unsuitable when compared to borrow pits B, C, D, E, F, G and L. Ground investigations suggest that the yield of suitable material is not as high as borrow pits B, C, D, E, F, G and L and that the indicated depth of groundwater may make extraction challenging. Material haulage lorries would be required to use the narrow Mowden Hall Lane to access the proposed scheme which goes against the preference for off-road haulage. Main Road separates the borrow pit from the A12, meaning construction traffic would need to travel via Hatfield Peverel or Boreham.
Borrow Pit B	The distance of the borrow pit from the required fill area at junction 21 is unsuitable when compared to borrow pits C, D, E, F, G and L. The Great Eastern Mainline (GEML) separates this borrow pit from the A12, meaning construction traffic would need to travel on public highway via Hatfield Peverel, or a temporary bridge over the railway line. Both instances score unfavourably against accessibility of the borrow pit due to the traffic and environmental impacts of road haul through the village of Hatfield Peverel and the cost of a temporary bridge over a railway line, when considered against the amount of fill material looking to be won from this location. The ground investigation information suggests that the yield of suitable material is sufficient, however this is outweighed by the haul route implications discussed here. Borrow pits D, E, F and G have better off-road haulage options.
Borrow Pit C	The distance of the borrow pit from the required fill area at junction 21 is unsuitable when compared to borrow pits D, E, F and L. The GEML separates this borrow pit from the A12, meaning construction traffic would need to travel on public highway via Hatfield Peverel, or a temporary bridge over the railway line. Both instances score unfavourably against accessibility of the borrow pit due to the traffic and environmental impacts of road haul through the village of Hatfield Peverel and the cost of a temporary bridge over a railway line, when considered against the amount of fill material looking to be won from this location. The ground investigation information suggests that the yield of suitable material is sufficient, however this is outweighed by the haul route implications discussed here. Borrow pits D, E and F have better off-road haulage options.
Borrow Pit D	The distance of the borrow pit from the required fill area at junction 21 and the access to it is suitable and scores favourably against this criterion. However, Borrow Pit E is closer to the area of required fill making it a more preferred location over this borrow pit.

Borrow Pit	Assessment against fill deficit areas
	Ground investigations have confirmed material suitability is potentially better than the adjacent Borrow Pit E, however the difference is slight and does not outweigh the haulage distance benefits brought by Borrow Pit E. Considering the environmental criterion, this borrow pit has a slightly worse effect in the aspects of air quality and noise and vibration due to its proximity to local residents when compared to Borrow Pit E.
Borrow Pit E	This borrow pit is best suited to provide the junction 21 fill area owing to its location, quality, and quantity of material available when compared to the other options considered. By using the borrow pit to supply earthworks general fill material to the embankments north side of the A12, traffic implications on the local road network along with the cost and carbon generation from haulage activities can be minimised.
Borrow Pit F	This borrow pit is suited to provide the junction 21 fill area owing to its location, quality, and quantity of material available when compared to Borrow Pits D and G. Borrow Pits D and E are a closer option with better material quality. However, they would require a considerable amount of local road haulage and double handling of material to provide supply to the embankments on the south side of the A12. By using Borrow Pit F to supply earthworks general fill material to the embankments on the south side of the A12, traffic implications on the local road network along with the cost and carbon generation from haulage activities can be minimised.
Borrow Pit G	The distance of the borrow pit from the required fill area at junction 21 is unsuitable when compared to borrow pits D, E, F and L. Ground investigations suggest that groundwater control during excavation is likely to be intensive and will result in drawdown impacts extending offsite which will need to be mitigated due to nearby areas of wet woodland. Borrow Pits D, E, F and L perform better in comparison.
Borrow Pit H	The distance of the borrow pit from the required fill area at junction 22 is unsuitable when compared to Borrow Pit I. The off-road haulage route for this borrow pit would require multiple local road crossings and a temporary bridge structure to facilitate access. This route is longer and more complex than that of Borrow Pit I. Ground investigations have confirmed material suitability is very good. However, when the working area for the local high pressure gas main diversion is taken into consideration the volume of available material reduces considerably, along with the space requirements to extract it with the groundwater levels expected.
Borrow Pit I	This borrow pit is best suited to provide the junction 22 fill area owing to its location, quality, and quantity of material available when compared to Borrow Pit H.

Borrow Pit	Assessment against fill deficit areas
	The borrow pit is located on the opposite side of the existing A12 carriageway to its intended fill location, which is not desirable. This can be alleviated by installing a temporary bridge over the existing carriageway to provide a direct off-road haul route. The cost of a temporary bridge for this borrow pit is acceptable, in comparison to the scenario for Borrow Pits B, C and L because of the volume of fill required for the junction 22 fill embankments (being double that of junction 21). The benefits of minimising traffic implications on the local road network for this larger volume of fill material, along with the cost and carbon generation from haulage activities also contribute to the feasibility of the temporary bridge in this location.
Borrow Pit L	The distance of the borrow pit from the required fill area at junction 21 and the haul routes available are unsuitable when compared borrow pits D and E. The GEML separates this borrow pit from the A12, meaning construction traffic would need to travel on public highway via Hatfield Peverel, or a temporary bridge over the railway line. Both instances score unfavourably against accessibility of the borrow pit due to the traffic and environmental impacts of road haul through the village of Hatfield Peverel and the cost of a temporary bridge over a railway line, when considered against the amount of fill material looking to be won from this location. The ground investigation information suggests that the yield of suitable material is potentially slightly better than Borrow Pits D and E, however this is outweighed by the haul route implications discussed here. Borrow pits D, E and F have better off-road haulage options.

	Assessment for provision of granular engineering material for the proposed scheme
Borrow Pit H	This borrow pit was also considered for providing granular engineering fill material for the proposed scheme because of its yield of granular material assessed from ground investigation information. The access options are considered as suitable with the proximity of the borrow pit to the strategic road network for moving material across the proposed scheme. However, the volume of available material has been reduced considerably by the working area of the local high pressure gas main diversion, along with the space requirements to extract it with the groundwater levels expected. In comparison, Borrow Pit J is closer to the centroid of the proposed scheme and has vastly more material available.
Borrow Pit J	This borrow pit is best suited to provide the proposed scheme with granular engineering fill material owing to its location, quality, and quantity of material available when compared to Borrow Pits H and K.

	Assessment for provision of granular engineering material for the proposed scheme
	When considering the material quantity, Borrow Pits H and K have better potential quantity of granular material within their footprint when compared to Borrow Pit J. However, the size of Borrow Pit J can provide a larger quantity of the material required in a single location. This is preferred because of the costs involved in setting up multiple material processing plants to gain the required quality of material. Borrow Pit J can facilitate this in a single area involving only one set up. Especially with its relatively central location along the scheme compared to Borrow Pits H and K. The environmental impacts assessed for Borrow Pits K, J and H do not differentiate the locations from each other and therefore do not guide the decision making for selecting this borrow pit.
Borrow Pit K	This borrow pit was also considered for providing granular engineering fill material for the proposed scheme because of its yield of granular material assessed from ground investigation information. The access options are reasonable considering the proximity of the borrow pit to the strategic road network for moving material across the proposed scheme. However, Borrow Pits H and J have better options. The geotechnical information has not been updated since the desktop study (as described in the Borrow Pits Report [APP-278]). Therefore, the assessment of this borrow pit carries a higher level of risk, at this stage which is why a lower rating was considered appropriate. In comparison, there is more certainty of information for Borrow Pits H and J. However, the desk-based study information shows potential for a good quality of material. Considering the size of the borrow pit, the volume of fill that could be extracted is low compared to Borrow Pit J. This borrow pit would therefore require another borrow to supplement the quantity of material required. As previously stated, the costs involved in setting up multiple material processing plants to gain the required quality of material is undesirable. A single set up is preferred, which Borrow Pit J can provide. Borrow Pit K is owned by the Crown Estate and Section 135 of the Planning Act 2008 provides specific protections and constraints in relation to making DCOs which affect Crown land. Interests in land held by the Crown cannot be acquired compulsorily. As it cannot be guaranteed that this land can be acquired, this adds significant risk and consequently Borrow Pit K is not a preferred site.

5.3.14 The final outcome of the assessment was that the following four borrow pits were identified for the proposed scheme:

- Borrow Pit E (located for the construction of proposed junction 21 – north side)
- Borrow Pit F (located for the construction of proposed junction 21 – south side)

- Borrow Pit I (located for the construction of proposed junction 22)
- Borrow Pit J (located near the centre of the scheme to provide granular engineering fill to the proposed scheme)

6 Conclusion

6.1 Calculation of earthworks material requirements

6.1.1 An earthworks material volume deficit exists for the design of the proposed scheme. This deficit is 600,000 cubic metres of general earthworks fill which is required to construct the earthworks embankments around the proposed junction 21 and 22.

6.1.2 A significant amount of work has been completed using industry best practice methodology to define the volume deficit and fill required. This includes the use of three-dimensional modelling, standalone volume calculations and the production of a mass haul schematic to calculate, as accurately as possible, the volumes of cut and fill, and the extra material required to construct the proposed design.

6.1.3 Given the maturity of the design, the calculated volumes are subject to tolerances associated with variability of design, properties of won material and weather. However, practical consideration has been given to the elements that can alter the volume calculations to define the most likely outcome based on the combined expert knowledge and experience of the design team, principal contractor and their earthworks specialist.

6.2 Assessment of sources for earthworks material

6.2.1 A wide range of material source options have been considered to obtain the deficit material identified in Section 3 of this technical note.

6.2.2 These include the supply of material from local quarries or using surplus materials from other construction projects ongoing at the time of construction of the proposed scheme as well as importing material via the rail heads local to the scheme.

6.2.3 However, as the availability of sufficient quantities of economically viable materials of suitable specification cannot be guaranteed from alternative sources, these options are not considered feasible for the proposed scheme.

6.2.4 The quarries and rail heads local to the scheme are operated by national aggregate suppliers providing material for their business purposes for East Anglia and East London. Due to the nature of the businesses operating the quarries and rail heads, the materials imported are generally primary aggregates, that are of higher cost and specification than are required for the construction of highway embankments. This type of material would not be economically or environmentally viable as general fill for construction of the earthworks for the proposed scheme because of the cost and environmental impact arising from their use.

6.2.5 In addition, the quantities and rate of import required by the proposed scheme cannot be met by any single, or a combination of, the aggregate suppliers due to limitations on road haulage (such as distance and number of delivery vehicles available).

6.2.6 Additionally, this would not justify additional train movements to import the lower specification materials required for highway embankment construction.

6.2.7 The use of recycled material from the construction aggregates market also cannot be guaranteed, because this is exclusively dependant on the demolition market and export of unsuitable materials from other local schemes.

6.2.8 Local sources of suitable materials are similarly unreliable. With NSIPs offering the best opportunity to gain material, none of the options that lie within a suitable area for importing material either meet the programme requirement or volume requirement for the proposed scheme.

6.2.9 Sources from smaller local construction schemes, at this stage, are unknown. However, from the options searched in the local area, the quantities and quality of material required during the construction of the proposed scheme would not be available.

6.2.10 In any event, the rate of import required to suit the embankment fill operations of the proposed scheme would be unlikely to be available from local sources, resulting in sources being required from further afield with associated longer road hauls, many of which may need to be transported via local road networks as well as the strategic road network. Therefore, because of the cost and environmental impacts, and associated programme risks, this source of material is not considered to be economically or environmentally viable as general fill for the proposed scheme.

6.2.11 Based on the necessity of securing the delivery of the proposed scheme programme in regard to material import rates, costs associated with material extraction / haulage and placement for both suitable and unsuitable materials, the mitigation of impacts on the environment and local and strategic road networks, winning fill material from borrow pits within the proposed scheme Order Limits is the most suitable option available.

6.3 Assessment of borrow pit locations

6.3.1 The final borrow pit locations have been determined through a rigorous process of assessment, which reduced 19 total potential locations down to four. This was achieved with a combination of desk-based, high-level assessment, to determine the scope for carrying out detailed surveys to identify potential borrow pit locations.

6.3.2 The four proposed scheme borrow pits are targeted at providing a combination of:

- earthworks material and engineering fill close to the main earthworks deficit areas
- other granular construction materials for the proposed scheme's needs
- reception areas for material deemed unsuitable for engineering purposes
- a reduction in HGV traffic associated with earthworks material supply on public roads (import from external sources)

6.3.3 The final outcome of the assessment is that the following four borrow pits have been identified for the proposed scheme:

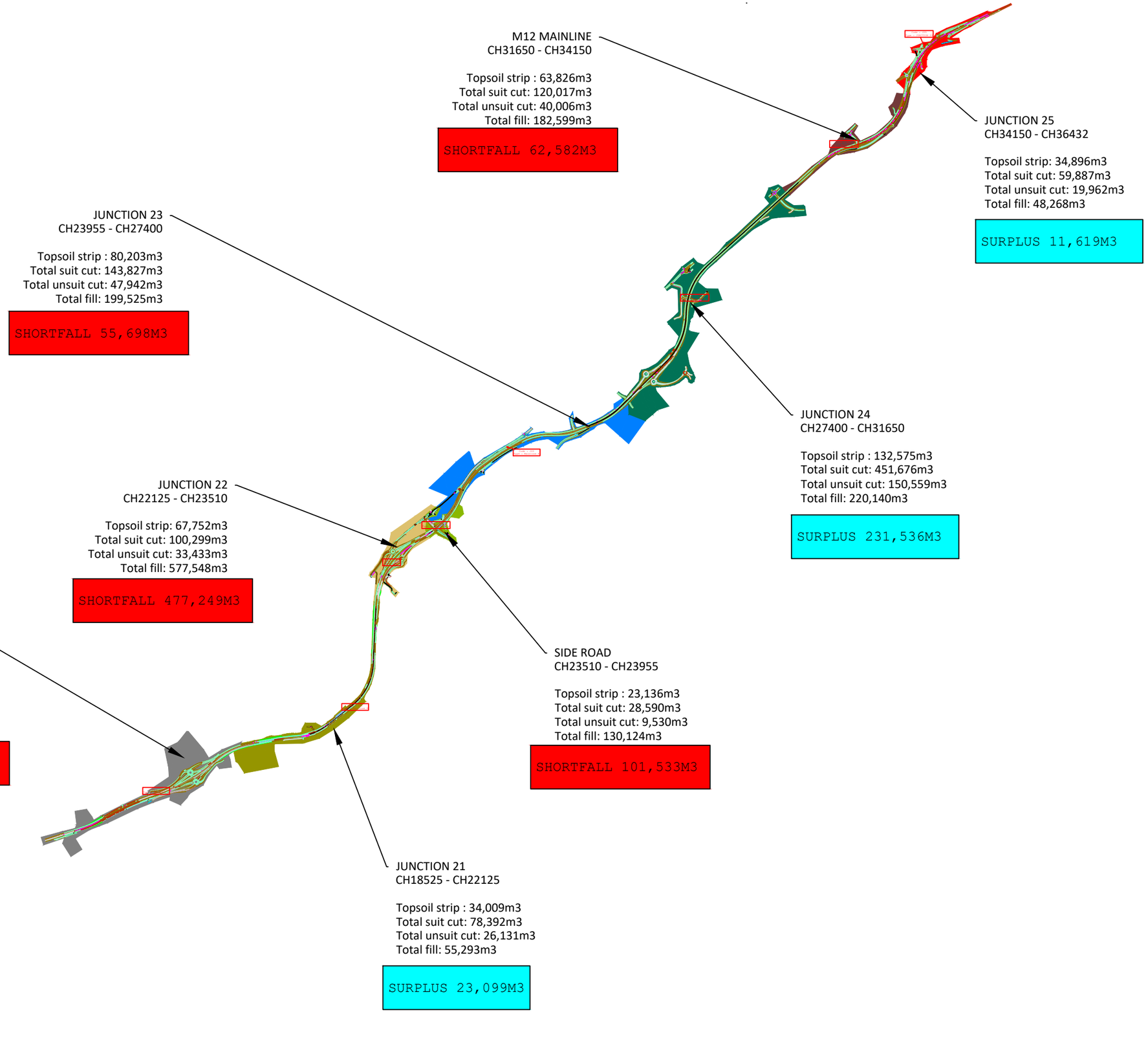
- Borrow Pit E (located for the construction of proposed junction 21 – north side)
- Borrow Pit F (located for the construction of proposed junction 21 – south side)
- Borrow Pit I (located for the construction of proposed junction 22)
- Borrow Pit J (located near the centre of the scheme to provide granular engineering fill to the proposed scheme)

6.3.4 These were chosen primarily because they contain the material required for the construction of the proposed scheme and given their proximate location to the required earthworks fill areas considering the existing geology and other constraints.

6.3.5 The environmental impacts, and mitigation required, of using the borrow pits are similar across all the proposed options for general earthworks fill material and are not considered to be a determining factor in identifying the preferred borrow pit locations.

6.3.6 For the granular engineering material supply borrow pit, the environmental effects identified show that Borrow Pit K has a preferable overall scoring. The environmental effects noted in Borrow Pit J have been considered in more detail in Table 5.4 and are not considered to be significant to affect the choice of borrow pit to use.

Appendix A – Volume modelling output



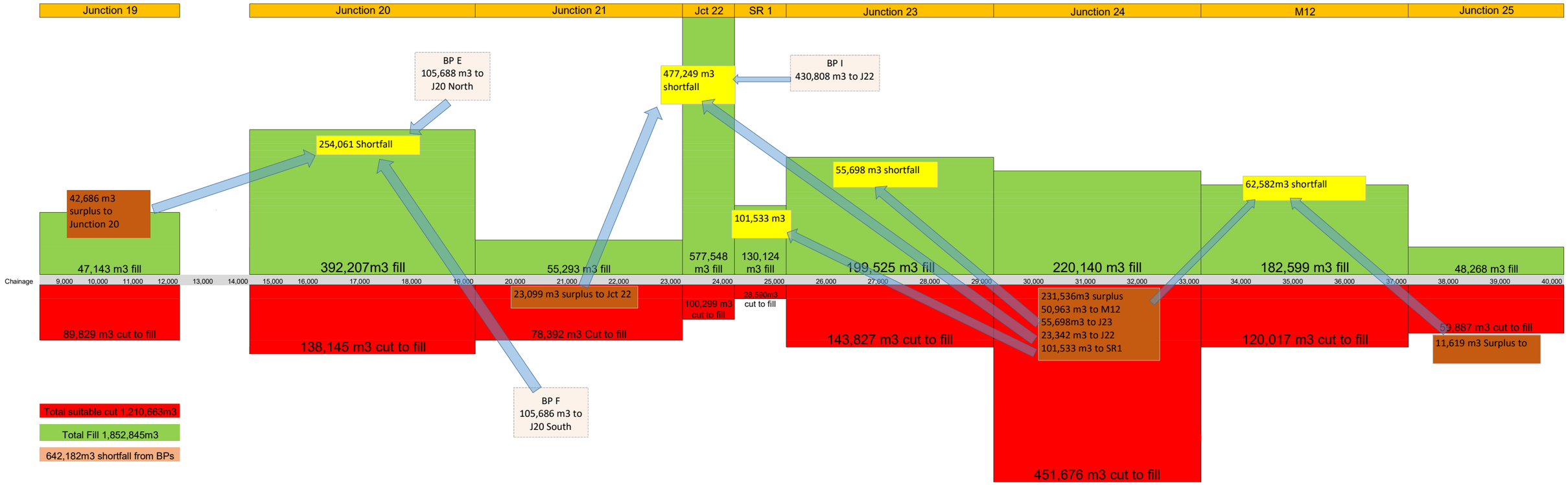
REV	DATE	STATUS	DESCRIPTION OF REVISION
0		PRELIMINARY	FOR COMMENT

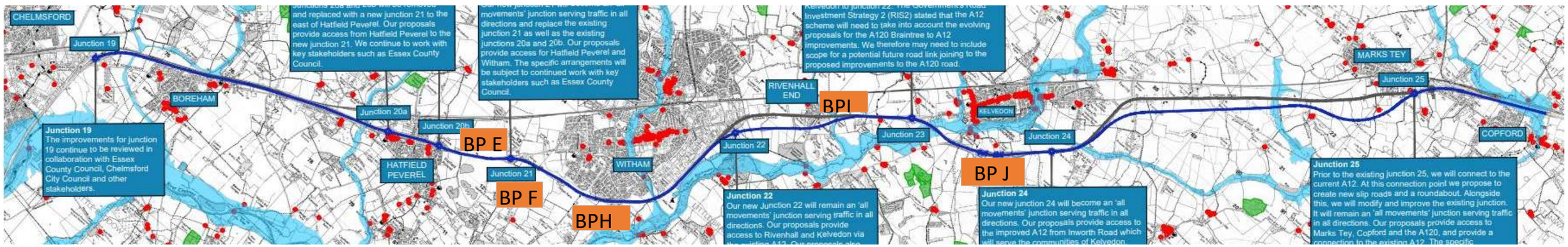
WALTERS
CIVIL ENGINEERING · PLANT · DEVELOPMENT

Client: COSTAIN
Project: A12 CHELMSFORD TO A120
Title: BULK ZONE VOLUME SPLIT

Drawing Number: 1 OF 1
Scale: –
Original Size: A3
Drawn By: T LAWRENCE
Checked:
CAD File: X X X

Appendix B – Basic mass haul diagram


Junction 19
Junction 20
Junction 21
Jct 22
SR 1
Junction 23
Junction 24
M12
Junction 25
BP E
105,688 m3 to J20 North
BP I
430,808 m3 to J22
477,249 m3 shortfall
254,061 Shortfall
42,686 m3 surplus to Junction 20
55,698 m3 shortfall
62,582m3 shortfall
101,533 m3
47,143 m3 fill
392,207m3 fill
55,293 m3 fill
577,548 m3 fill
130,124 m3 fill
199,525 m3 fill
220,140 m3 fill
182,599 m3 fill
48,268 m3 fill
Chainage
9,000 10,000 11,000 12,000 13,000 14,000 15,000 16,000 17,000 18,000 19,000 20,000 21,000 22,000 23,000 24,000 25,000 26,000 27,000 28,000 29,000 30,000 31,000 32,000 33,000 34,000 35,000 36,000 37,000 38,000 39,000 40,000
23,099 m3 surplus to Jct 22
100,299 m3 cut to fill
28,590m3 cut to fill
231,536m3 surplus
50,963 m3 to M12
55,698m3 to J23
23,342 m3 to J22
101,533 m3 to SR1
89,829 m3 cut to fill
138,145 m3 cut to fill
78,392 m3 Cut to fill
143,827 m3 cut to fill
120,017 m3 cut to fill
59,887 m3 cut to fill
11,619 m3 Surplus to
BP F
105,686 m3 to J20 South
451,676 m3 cut to fill
Total suitable cut 1,210,663m3
Total Fill 1,852,845m3
642,182m3 shortfall from BPs


CHELMSFORD
Junction 19
BOREHAM
Junction 20a
Junction 20b
HATFIELD PEVEREL
Junction 21
WITHAM
Junction 22
RIVENHALL END
Junction 23
KELVEDON
Junction 24
MARKS TEY
Junction 25
COPFORD
BP E
BP F
BPH
BPI
BP J
Junction 19
The improvements for junction 19 continue to be reviewed in collaboration with Essex County Council, Chelmsford City Council and other stakeholders.
and replaced with a new junction 21 to the east of Hatfield Peverel. Our proposals provide access from Hatfield Peverel to the new junction 21. We continue to work with key stakeholders such as Essex County Council.
movements' junction serving traffic in all directions and replace the existing junction 21 as well as the existing junctions 20a and 20b. Our proposals provide access for Hatfield Peverel and Witham. The specific arrangements will be subject to continued work with key stakeholders such as Essex County Council.
Investment Strategy 2 (RIS2) stated that the A12 scheme will need to take into account the evolving proposals for the A120 Braintree to A12 improvements. We therefore may need to include scope for a potential future road link joining to the proposed improvements to the A120 road.
Junction 22
Our new junction 22 will remain an 'all movements' junction serving traffic in all directions. Our proposals provide access to Rivenhall and Kelvedon via
Junction 24
Our new junction 24 will become an 'all movements' junction serving traffic in all directions. Our proposals provide access to the improved A12 from Inworth Road which will serve the communities of Kelvedon
Junction 25
Prior to the existing junction 25, we will connect to the current A12. At this connection point we propose to create new slip roads and a roundabout. Alongside this, we will modify and improve the existing junction. It will remain an 'all movements' junction serving traffic in all directions. Our proposals provide access to Marks Tey, Copford and the A120, and provide a
connection to the existing A12. The specific

Appendix C – Borrow pit options RAG matrix

Borrow pits 01 to 05

	Criterion	Borrow Pit 01	Borrow Pit 02	Borrow Pit 03	Borrow Pit A (04)	Borrow Pit B (05)
Technical / Geotechnical	Groundwater	**DESKTOP STUDY** Majority of borrow pit area consists of Sand and Gravel. Groundwater level is likely to be encountered towards the base of excavation (approximately 4.0m below ground level).	**DESKTOP STUDY** Groundwater level is likely to be encountered towards the base of excavation (approximately 4.0m below ground level). Groundwater level assumed conservatively at 2.5m below ground level.	**DESKTOP STUDY** Majority consists of Sand and Gravel. Groundwater level is likely to be encountered towards the base of excavation (approximately 3.4m below ground level). Groundwater level assumed conservatively at 2.5m below ground level.	**DESKTOP STUDY** Groundwater level is relatively high based on the limited information (approximately 2.68m below ground level).	**DESKTOP STUDY** Majority of borrow pit area consists of cohesive engineering fill. Groundwater is not expected to be encountered in the excavation based on limited ground information (estimated 5.8m below ground level).
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Groundwater levels have been encountered within 2m of ground surface in some areas but depth and presence likely to be variable in generally low permeability deposits. It is likely that groundwater ingress can be controlled by pumping from sumps as excavation progresses.	**POST SURVEY** Limited groundwater is expected to be encountered in the excavation based on limited ground information and low permeability strata. It is likely groundwater ingress can be controlled by pumping from sumps as excavation continues.
	Likely quantity of usable material	**DESKTOP STUDY** River Terrace Deposits (80%) and Glaciofluvial Deposits (13%), comprises sands and gravels with very favourable engineering properties. London Clay Formation (7%) comprises cohesive soils with generally favourable engineering properties but may require further assessments.	**DESKTOP STUDY** Brickearth (70%) comprises cohesive material with unfavourable engineering properties (for non-engineering use only) Lowestoft Formation (30%) comprises glacial till with favourable engineering properties.	**DESKTOP STUDY** Glaciofluvial Deposits (85%) comprises sands and gravels with very favourable engineering properties. Brickearth (15%) comprises cohesive material with unfavourable engineering properties (for non-engineering use only)	**DESKTOP STUDY** London Clay Formation (66%) comprises cohesive soils with generally favourable engineering properties but may require further assessments. Head Deposits (33%) comprises mixed material with unfavourable engineering properties (for non-engineering use only)	**DESKTOP STUDY** London Clay Formation (52%) comprises cohesive soils with generally favourable engineering properties but may require further assessments. Lowestoft Formation (40%) comprises glacial till with favourable engineering properties. Glaciofluvial Deposits (8%) comprises sands and gravels with very favourable engineering properties.
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Assuming Borrow Pit = 4m depth Topsoil = 8% Potential Class 4 Landscape Fill: Made Ground = 3% Alluvium = 11% Peat = 4% Head Deposits = 25% Potential Class 1 and 2 Engineering Fill: Glaciofluvial Deposits = 27% includes (Cohesive) = 10% (Granular) = 17% London Clay Formation = 22% NOTE. Some material may be found to be unacceptable (Class U1A/U1B) - an allowance for unacceptable material has not been applied to the above assessment. However, a provisional allowance of 20 to 30% could be considered.	**POST SURVEY** Assuming Borrow Pit = 4m depth Topsoil = 7% Potential Class 4 Landscape Fill: Made Ground = 3% Alluvium = 8% Glaciolacustrine Deposits = 3% Interglacial Silt and Clay =7% Potential Class 1 and 2 Engineering Fill: Lowestoft Formation =27% Glaciofluvial Deposits = 10% includes (Cohesive) = 1% (Granular) = 9% London Clay Formation (Cohesive) = 34% NOTE. Some material may be found to be unacceptable (Class U1A/U1B) - an allowance for unacceptable material has not been applied to the above assessment. However, a provisional allowance of 15 to 20% could be considered.

	Criterion	Borrow Pit 01	Borrow Pit 02	Borrow Pit 03	Borrow Pit A (04)	Borrow Pit B (05)
	Existing utilities	**DESKTOP STUDY** There is a National Grid LHP Gas Main very close to the borrow pit area.	**DESKTOP STUDY** There is a National Grid LHP Gas Main crossing part of the borrow pit area.	**DESKTOP STUDY** Free from existing utilities	**DESKTOP STUDY** Free from existing utilities	**DESKTOP STUDY** Potential service (Rail cable)
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Still assumed free from existing utilities	**POST SURVEY** 11kV overhead cables located in the southern half of the land plot and a buried water main runs north to south through the middle of the borrow pit area. These will either require an exclusion zone which sterilises borrow pit area or will need to be diverted.
	Contaminated Land	**DESKTOP STUDY** Minor receptors identified, which may be impacted by dewatering activities	**DESKTOP STUDY** Minor receptors identified, which may be impacted by dewatering activities	**DESKTOP STUDY** Minor receptors identified, which may be impacted by dewatering activities	**DESKTOP STUDY** Minor receptors identified, which may be impacted by dewatering activities	**DESKTOP STUDY** Potential contamination from nearby disturbed ground
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** No soil contamination identified. Some (2 out of 6) of samples tested exceeded the soil leachate criteria. Groundwater quality is moderate (exceedance for 1 analyte only). Pre-treatment of pumped groundwater prior to discharge unlikely to be required - subject to discharge consent requirements.	**POST SURVEY** No soil contamination identified. Half of samples tested exceeded the soil leachate criteria. Groundwater quality is poor (exceedances for 11 analytes). Pre-treatment of pumped groundwater prior to discharge may be required - subject to discharge consent requirements.
	Summary	**DESKTOP STUDY** Predominantly Series 600 Earthworks (Specification for Highways Works) Class 1 acceptable engineered fill anticipated, consisting granular River Terrace Deposits with some Glaciofluvial Deposits, and Class 2 cohesive London Clay Formation at depth. Shallow groundwater likely to be encountered towards the base of the pit requiring some groundwater control. National Grid Local High Pressure Gas Main very close to the borrow pit area. Contaminated land - Minor receptors identified which may be impacted by dewatering activities.	**DESKTOP STUDY** Predominately non engineered fill anticipated, consisting of Brickearth Deposits. Limited Series 600 Earthworks (Specification for Highways Works) Class 2 acceptable engineered fill anticipated, consisting of cohesive Lowestoft Formation. Shallow groundwater likely to be encountered towards the base of the pit requiring some groundwater control. National Grid Local High Pressure Gas Main crosses the borrow pit area. Contaminated land - Minor receptors identified which may be impacted by dewatering activities.	**DESKTOP STUDY** Predominantly Series 600 Earthworks (Specification for Highways Works) Class 1 acceptable engineered fill anticipated, consisting of granular Glaciofluvial Deposits. Some non-engineered fill anticipated, consisting of Brickearth Deposits. Shallow groundwater likely to be encountered towards the base of the excavation requiring some groundwater control. No utilities.	**POST SURVEY** It is likely that groundwater ingress can be controlled by pumping from sumps as excavation progresses. Pre-treatment of pumped groundwater prior to discharge unlikely to be required - subject to discharge consent requirements. Approximately 49% Class 1/2 material anticipated. A provisional allowance of 20 to 30% for potentially unacceptable material could be considered. The remaining material is anticipated to consist of Class 4 material.	**POST SURVEY** It is likely that groundwater ingress can be controlled by pumping from sumps as excavation progresses. Pre-treatment of pumped groundwater prior to discharge may be required - subject to discharge consent requirements. Approximately 71% Class 1/2 material anticipated. A provisional allowance of 15 to 20% for potentially unacceptable material could be considered. The remaining material is anticipated to consist of Class 4 material.

	Criterion	Borrow Pit 01	Borrow Pit 02	Borrow Pit 03	Borrow Pit A (04)	Borrow Pit B (05)
Construction	Location relative to area of fill	**DESKTOP STUDY** Approximately 1.1km from existing A12 at nearest point. Approximately 6km from Junction 21 where fill is required.	**DESKTOP STUDY** Approximately 200m from existing A12 at nearest point. Approximately 5km from junction 21 where fill is required.	**DESKTOP STUDY** Approximately 500m from existing A12 at nearest point. Approximately 3.5km from junction 21 where fill is required.	**DESKTOP STUDY** Approximately 300m from existing A12 at nearest point. Approximately 3.5km from junction 21 where fill is required.	**DESKTOP STUDY** Approximately 1km from existing A12 but located north of the railway line (GEML). Approximately 2km from junction 21 where fill is required.
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Approximately 300m from existing A12 at nearest point. Approximately 2.5km from junction 21 where fill is required.	**POST SURVEY** Located north of the Great Eastern railway Mainline approximately 350m from existing A12. Approximately 1.6km from junction 21 where fill is required.
	Accessibility (haul route)	**DESKTOP STUDY** Existing Church Road is a local narrow road, which goes through the town of Boreham. It is unsuitable for construction HGV's. Alternative haul roads to areas of the A12 where fill is required would be unfeasible because it would cross many landowners' properties.	**DESKTOP STUDY** A relatively short haul road (100m) across a field, would be needed to connect the borrow pit to the B1137 local road. However, B1137 is not likely to be suitable for construction HGV's. This would also mean construction traffic would need to travel through either Boreham or Hatfield Peverel.	**DESKTOP STUDY** Access to local road network via single-track Mowden Hall Lane, then it is 400m to the B1137 near Crix Bridge. The single-track road ideally would need widening. The B1137 is not likely to be suitable for construction HGV's and would also mean construction traffic would need to travel through either Boreham or Hatfield Peverel.	**DESKTOP STUDY** Access to local road network via single-track road, then it is 250m to B1137 near Crix Bridge. The single-track road would ideally need widening. The B1137 is not likely to be suitable for construction HGV's and would also mean construction traffic would need to travel through either Boreham or Hatfield Peverel.	**DESKTOP STUDY** Local road access would be made via Station Road, Hatfield Peverel. The existing bridge over the railway would be unsuitable for construction HGV's, as would the route along Station Road and over Station Road Bridge. This bridge is to be demolished and replaced as part of the proposed scheme, so there will be potential programme issues to overcome. A bespoke railway overbridge would be necessary.
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** No suitable off-road route available. Access to the strategic road network is made via a local single-track road and the B1137 near Crix Bridge. The single-track road ideally would need widening.	**POST SURVEY** Off road access would require local road network crossing point and a railway crossing point. The shortest potential distance for this is 1.6km. Otherwise, access would be made via local road network over Station Road bridge through Hatfield Peverel. The road bridge is to be demolished and replaced as part of scheme, so accessibility and programme issues would need to be suitably addressed in the construction programme.
	Borrow pit management e.g. dewatering / material drying and processing	**DESKTOP STUDY** Borrow Pit 01 is surrounded by existing ponds so there is a strong likelihood that groundwater levels are shallow. This increases the complexity of excavation operations leading to smaller phased work areas with potential programme impacts and a dependency on discharging to local water courses.	**DESKTOP STUDY** Following geotechnical assumption that groundwater level is 2.5m below ground level, dewatering will be required during construction with phased work areas and a requirement for discharging to local water courses.	**DESKTOP STUDY** Following geotechnical assumption that groundwater level is 2.5m below ground level, dewatering will be required during construction with phased work areas and a requirement for discharging to local water courses.	**DESKTOP STUDY** Following geotechnical assumption that groundwater level is 2.5m below ground level, dewatering will be required during construction with phased work areas and a requirement for discharging to local water courses.	**DESKTOP STUDY** Following geotechnical assumption that groundwater level is 2.5m below ground level, dewatering will be required during construction with phased work areas and a requirement for discharging to local water courses.
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Land plot size can suitably cater for material management with a phased approach to excavation.	**POST SURVEY** Land plot size can suitably cater for material management with a phased approach to excavation.
	Summary	**DESKTOP STUDY** Average performing borrow pit.	**DESKTOP STUDY** Average performing borrow pit.	**DESKTOP STUDY** Average performing borrow pit.	**POST SURVEY** Borrow pit is too far from intended fill location with poor access.	**POST SURVEY** Borrow pit is a reasonable distance from the intended fill location however access options are poor.

	Criterion	Borrow Pit 01	Borrow Pit 02	Borrow Pit 03	Borrow Pit A (04)	Borrow Pit B (05)
Environment	Air Quality	**DESKTOP STUDY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse air quality impacts to acceptable levels.	**DESKTOP STUDY** Located within 200m of at least one residential property. In addition, located within 200m of a playing field. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse air quality impacts to acceptable levels.	**DESKTOP STUDY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse air quality impacts to acceptable levels.
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse air quality impacts to acceptable levels.	**POST SURVEY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse air quality impacts to acceptable levels.
	Cultural Heritage	**DESKTOP STUDY** Potential to remove archaeological deposits located within footprint & affect the setting of a Conservation Area. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels (e.g. geophysical survey and/or trial trenching followed by preservation in situ, excavation or recording through watching brief).	**DESKTOP STUDY** Potential to remove archaeological deposits located within footprint. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels (e.g. geophysical survey and/or trial trenching followed by preservation in situ, excavation or recording through watching brief).	**DESKTOP STUDY** Potential to remove archaeological deposits located within footprint. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels (e.g. geophysical survey and/or trial trenching followed by preservation in situ, excavation or recording through watching brief).	**DESKTOP STUDY** Potential to remove archaeological deposits located within footprint. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels (e.g. geophysical survey and/or trial trenching followed by preservation in situ, excavation or recording through watching brief).	**DESKTOP STUDY** Potential to remove archaeological deposits located within footprint. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels (e.g. geophysical survey and/or trial trenching followed by preservation in situ, excavation or recording through watching brief).
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** No survey undertaken.	**POST SURVEY** No survey undertaken.
	Landscape and Visual	**DESKTOP STUDY** Potential to affect the setting of, and views from, cultural heritage assets. Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.	**DESKTOP STUDY** Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.	**DESKTOP STUDY** Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.	**DESKTOP STUDY** Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.	**DESKTOP STUDY** Likely to be visible from one or more sensitive visual receptors, including residential properties.
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Open arable land. Site visually well contained by woodland blocks to the south, along the River Ter Valley to the east and north around Crix Farm. Few visual receptors, although there would be views across the borrow pit from part of a PRoW along the southern boundary.	**POST SURVEY** Largely open arable land with few visual receptors. Site visually well contained by woodland to the west along the River Ter Valley, vegetation along the railway to the south and Titbeech Wood (ancient woodland) to the north.
	Biodiversity	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species. These impacts are expected to be relatively localised. However, mitigation beyond standard good construction practice is likely to be required to reduce the impacts to acceptable levels. Without mitigation	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species. These impacts are expected to be relatively localised. However, mitigation beyond standard good construction practice is likely to be required to reduce the impacts to acceptable levels. Without mitigation	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species. These impacts are expected to be relatively localised. However, mitigation beyond standard good construction practice is likely to be required to reduce the impacts to acceptable levels. Without mitigation	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species. These impacts are expected to be relatively localised. However, mitigation beyond standard good construction practice is likely to be required to reduce the impacts to acceptable levels. Without mitigation	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species. These impacts are expected to be relatively localised. However, mitigation beyond standard good construction practice is likely to be required to reduce the impacts to acceptable levels. Without mitigation

	Criterion	Borrow Pit 01	Borrow Pit 02	Borrow Pit 03	Borrow Pit A (04)	Borrow Pit B (05)
		these impacts would be long term.	these impacts would be long term.	these impacts would be long term.	these impacts would be long term.	these impacts would be long term.
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Borrow pit surrounded by three main badger setts and their annexes in the woodland blocks.	**POST SURVEY** Survey results show no constraints.
	Noise and Vibration	**DESKTOP STUDY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse impacts to acceptable levels.	**DESKTOP STUDY** Located within 300m of at least one residential property. In addition, located within 300m of a playing field. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse impacts to acceptable levels.	**DESKTOP STUDY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse impacts to acceptable levels.
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse impacts to acceptable levels.	**POST SURVEY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse impacts to acceptable levels.
	People and Health	**DESKTOP STUDY** No non-motorised user routes directly affected, Church Road expected to be used as haul route where some non-motorised user routes intersect and into residential area (Boreham), some mitigation required/may not be practical as haul route. Haul route to be confirmed.	**DESKTOP STUDY** Public Rights of Way 213_38/39/40 are parallel to the western and southern extents of the borrow pit. Depending on access (via Church Road), the routes would become affected. If access were from the north of the borrow pit at Damases Lane then no routes would be affected. PROW 213_41 does reside within the proposed borrow pit boundary and would need to be diverted. Mitigation from non-motorised user and borrow pit required.	**DESKTOP STUDY** No NMU routes directly affected. PROW 90_13 is parallel to the northern extents of the borrow pit. Mitigation from non-motorised user and borrow pit required. Regional Cycle Route 50 runs through Mowden Hall Lane which would increase risk to users if used as a haul route. Crabbs Hill proceeds into Hatfield Peverel and some mitigation required/may not be practical as haul route. Haul route to be confirmed.	**DESKTOP STUDY** Details as for Borrow Pit 03. The difference being PROW 90_13 now resides south of the location. Mitigation from non-motorised user and borrow pit required.	**DESKTOP STUDY** No non-motorised user routes affected. Issues may be experienced using Station Road as a haul route with regards non-motorised user commuting flows from Hatfield Peverel station.
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** No non-motorised user routes directly affected, PROW 90_13 is south of the borrow pit. Regional Cycle Route 50 runs through Mowden Hall Lane which would increase risk if used as a haul route, Crabbs Hill proceeds into Hatfield Peverel and some mitigation required/may not be practical as haul route. Haul route to be confirmed.	**POST SURVEY** No non-motorised user routes affected. Issues may be experienced using Station Road as a haul route with regards non-motorised user commuting flows from Hatfield Peverel station.
	Road Drainage and the Water Environment	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice

	Criterion	Borrow Pit 01	Borrow Pit 02	Borrow Pit 03	Borrow Pit A (04)	Borrow Pit B (05)
		may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary. This borrow pit is located within Flood Zone 2 and/or Flood Zone 3. This may present opportunities for flood mitigation as part of the restoration plan.	may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary.	may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary.	may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary. This borrow pit is located within Flood Zone 2 and/or Flood Zone 3. This may present opportunities for flood mitigation as part of the restoration plan.	may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary.
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary. This borrow pit is located within Flood Zone 2 and/or Flood Zone 3. This may present opportunities for flood mitigation as part of the restoration plan.	**POST SURVEY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary.
	Summary	**DESKTOP STUDY** Not located within 50m of any existing residential or commercial properties. Standard good construction practices are likely to reduce adverse air quality and noise and vibration impacts to acceptable levels. Potential significant adverse impacts to: - the removal of archaeological deposits located within the footprint - the setting of, and views from, cultural heritage assets, including Conservation Area, PRoWs and sensitive visual receptors - one or more localised ecological species - the removal of best and most versatile agricultural land - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels. This borrow pit is located within Flood Zone 2 and/or Flood Zone 3 and this may present opportunities for flood mitigation as part of the restoration plan.	**DESKTOP STUDY** Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality and noise and vibration impacts on these properties to acceptable levels. Potential significant adverse impacts to: - the removal of archaeological deposits located within the footprint - views from PRoWs and sensitive visual receptors - one or more localised ecological species - the removal of best and most versatile agricultural land - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels.	**DESKTOP STUDY** Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality and noise and vibration impacts on these properties to acceptable levels. Potential significant adverse impacts to: - the removal of archaeological deposits located within the footprint - views from PRoWs and sensitive visual receptors - one or more localised ecological species - the removal of best and most versatile agricultural land - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels.	**POST SURVEY** The borrow pit is not located within 50m of any existing residential or commercial properties. Standard good construction practices are likely to reduce adverse air quality and noise and vibration impacts to acceptable levels. Potential significant adverse impacts to: - the removal of archaeological deposits located within the footprint - views from PRoW and sensitive visual receptors - the removal of best and most versatile agricultural land - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels. This borrow pit is located within Flood Zone 2 and/or Flood Zone 3 and this may present opportunities for flood mitigation as part of the restoration plan.	**POST SURVEY** The borrow pit is not located within 50m of any existing residential or commercial properties. Standard good construction practices are likely to reduce adverse air quality and noise and vibration impacts to acceptable levels. Potential significant adverse impacts to: - the removal of archaeological deposits located within the footprint - the removal of best and most versatile agricultural land - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels.

	Criterion	Borrow Pit 01	Borrow Pit 02	Borrow Pit 03	Borrow Pit A (04)	Borrow Pit B (05)
Planning	**Planning policy** (including local plans, minerals plan and National Networks National Policy Statement (Department for Transport, 2014))	**DESKTOP STUDY** The entirety of Borrow Pit 01 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**DESKTOP STUDY** - North-east section of Borrow Pit 02 sits within Mineral Consultation Area (Northeast Chelmsford). Policy S8 of the Essex Minerals Local Plan (2014) states *"Proposals which would unnecessarily sterilise mineral resources or conflict with the effective workings of permitted minerals development, Preferred or Reserve Mineral Site allocation shall be **opposed**."*. The Northeast Chelmsford mineral safeguarded area extends for 250m from its designation which covers the area of Borrow Pit 02. - The entirety of Borrow Pit 02 is located within Essex Mineral Safeguarded Area– Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**DESKTOP STUDY** The entirety of Borrow Pit 03 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**DESKTOP STUDY** The entirety of Borrow Pit 04 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**DESKTOP STUDY** The entirety of Borrow Pit 05 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** The entirety of Borrow Pit 04 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**POST SURVEY** The entirety of Borrow Pit 05 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).
	Planning applications and consented schemes	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 01 within the five-year monitoring period.	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 02 within the five-year monitoring period.	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 03 within the five-year monitoring period.	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 04 within the five-year monitoring period.	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 05 within the five-year monitoring period.
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** No planning applications were identified within the boundary of Borrow Pit 04 within the five-year monitoring period.	**POST SURVEY** No planning applications were identified within the boundary of Borrow Pit 05 within the five-year monitoring period.
	Summary	**DESKTOP STUDY** - No planning applications identified. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].	**DESKTOP STUDY** - Located within Mineral Consultation Area (Northeast Chelmsford). Policy S8 of the Essex Minerals Local Plan (2014) states *"Proposals which would unnecessarily sterilise mineral resources or conflict with the effective workings of permitted minerals development, Preferred or Reserve Mineral Site allocation shall be opposed."*	**DESKTOP STUDY** - No planning applications identified. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].	**POST SURVEY** - No planning applications identified. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].	**POST SURVEY** - No planning applications identified. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].

	Criterion	Borrow Pit 01	Borrow Pit 02	Borrow Pit 03	Borrow Pit A (04)	Borrow Pit B (05)
Existing Land Use	**The land use**	**DESKTOP STUDY** Arable agricultural land	**DESKTOP STUDY** Arable agricultural land	**DESKTOP STUDY** Arable agricultural land	**DESKTOP STUDY** Arable agricultural land	**DESKTOP STUDY** Arable agricultural land
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Arable agricultural land	**POST SURVEY** Arable agricultural land
	Identify who owns the land (is it a public body or private landowner?)	**DESKTOP STUDY** Private landowner	**DESKTOP STUDY** Two private landowners	**DESKTOP STUDY** Private landowner	**DESKTOP STUDY** Private landowner	**DESKTOP STUDY** Private landowner
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Private landowner	**POST SURVEY** Private landowner
	The percentage of the landholding affected (i.e. how much land is retained?)	**DESKTOP STUDY** 20%	**DESKTOP STUDY** 30% and 18%	**DESKTOP STUDY** 15%	**DESKTOP STUDY** 7%	**DESKTOP STUDY** Land plot forms part of a considerable acreage across Essex and Suffolk
		Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	**POST SURVEY** 7%	**POST SURVEY** Land plot forms part of a considerable acreage across Essex and Suffolk
	Summary	**DESKTOP STUDY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation.	**DESKTOP STUDY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation.	**DESKTOP STUDY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation.	**POST SURVEY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation. The level of impact to the landowner is deemed to be low.	**POST SURVEY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation. The level of impact to the landowner is deemed to be low.

Borrow pits 06 to 10

	Criterion	Borrow Pit C (06)	Borrow Pit D (07)	Borrow Pit E (08)	Borrow Pit 09	Borrow Pit F (10)
Technical / Geotechnical	Groundwater	**DESKTOP STUDY** Majority of borrow pit area consists of cohesive engineering fill. Groundwater is not expected to be encountered in the excavation based on limited ground information (estimated 5.8m below ground level).	**DESKTOP STUDY** Majority of borrow pit area consists of cohesive engineering fill. Groundwater information is not available.	**DESKTOP STUDY** Majority of borrow pit area consists of acceptable cohesive engineering fill. Groundwater information is not available.	**DESKTOP STUDY** Majority of borrow pit area consists of acceptable cohesive engineering fill. Groundwater information is not available.	**DESKTOP STUDY** There is limited groundwater information. Available British Geological Society borehole data indicate that, close to the site, levels vary between 2 and 5m below ground level.
		POST SURVEY Majority of borrow pit area consists of cohesive engineering fill. Shallow groundwater present across majority of site between 2m and 5m below ground level with potential for higher permeability gravels at depth. It is likely that groundwater ingress can be controlled by pumping from a sump as excavation continues although a groundwater control system may be required as a contingency and if deployed may result in drawdown impacts extending off-site which may need to be mitigated.	**POST SURVEY** Groundwater levels are shown to be variable across the site with rest water levels measured in monitoring boreholes as being within 2 and 9.9m of the ground surface. It is likely that groundwater ingress can be controlled by pumping from sumps as excavation continues.	**POST SURVEY** Significant groundwater is not expected to be encountered in Borrow Pit E, therefore only limited dewatering is likely to be required which could be controlled by pumping from sumps as excavation progresses.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Groundwater is expected to be encountered during borrow pit excavation however, the permeability and flows are anticipated to be low. Therefore, only limited drawdown is expected outside of Borrow Pit F and it is likely that groundwater ingress will be controlled by pumping from sumps as excavation progresses.
	Likely quantity of usable material	**DESKTOP STUDY** Lowestoft Formation (100%) comprises glacial till with favourable engineering properties.	**DESKTOP STUDY** Lowestoft Formation (75%) comprises glacial till with favourable engineering properties. Head Deposits (25%) comprises mixed material with unfavourable engineering properties (for non-engineering use only)	**DESKTOP STUDY** Lowestoft Formation (100%) comprises glacial till with favourable engineering properties.	**DESKTOP STUDY** London Formation (85%) comprises glacial till with favourable engineering properties. Glaciofluvial Deposits (15%) comprises sands and gravels with very favourable engineering properties.	**DESKTOP STUDY** Lowestoft Formation (34%) comprises glacial till with favourable engineering properties. Brickearth (33%) comprises cohesive material with unfavourable engineering properties (for non-engineering use only) London Clay Formation (32%) comprises cohesive soils with generally favourable engineering properties but may require further assessments. Glaciofluvial Deposits (1%) comprises sands and gravels with very favourable engineering properties.
		POST SURVEY Assuming Borrow Pit = 4m depth Topsoil = 8% Potential Class 4 Landscape Fill: Made Ground = 1% Head Deposits = 3% Glaciolacustrine Deposits = 7% Potential Class 1 and 2 Engineering Fill: Lowestoft Formation = 66% Glaciofluvial Deposits = 10% includes (Cohesive) = 2% (Granular) = 8% London Clay Formation = 5% NOTE. Some material may be found to be unacceptable (Class U1A/U1B) - an allowance for unacceptable material	**POST SURVEY** Assuming Borrow Pit = 4m depth Topsoil = 8% Potential Class 4 Landscape Fill: Made Ground = 1% Head Deposits = 7% Potential Class 1 and 2 Engineering Fill: Lowestoft Formation = 84% Glaciofluvial Deposits = <1% NOTE. Some material may be found to be unacceptable (Class U1A/U1B) - an allowance for unacceptable material has not been applied to the above assessment. However, a provisional allowance of 10% could be considered.	**POST SURVEY** Assuming Borrow Pit = 2.5m depth Topsoil = 10% Potential Class 4 Landscape Fill: Made Ground = 4% Head Deposits = 21% Potential Class 1 and 2 Engineering Fill: Lowestoft Formation = 65% NOTE. Some material may be found to be unacceptable (Class U1A/U1B) - an allowance for unacceptable material has not been applied to the above assessment. However, a provisional allowance of 10 to 20% could be considered. Assuming Borrow Pit = 4.5m depth Topsoil = 7%	Borrow pit discounted at desktop study phase.	**POST SURVEY** Assuming Borrow Pit = 2.5m depth Topsoil = 11% Potential Class 4 Landscape Fill: Made Ground = 9% Head Deposits = 7% Brickearth = 3% Potential Class 1 and 2 Engineering Fill: Lowestoft Formation = 45% Glaciofluvial Deposits = 11% includes (Cohesive) = 0% (Granular) = 11% London Clay Formation = 13% NOTE. Some material may be found to be unacceptable (Class U1A/U1B) - an allowance for unacceptable material has not been applied to the

	Criterion	Borrow Pit C (06)	Borrow Pit D (07)	Borrow Pit E (08)	Borrow Pit 09	Borrow Pit F (10)
		has not been applied to the above assessment. However, a provisional allowance of 10% could be considered.		Potential Class 4 Landscape Fill: Made Ground = 2% Head Deposits = 11% Potential Class 1 and 2 Engineering Fill: Lowestoft Formation = 79% Glaciofluvial Deposits = 1% includes (Cohesive) = 0% (Granular) = 1% NOTE. Some material may be found to be unacceptable (Class U1A/U1B) - an allowance for unacceptable material has not been applied to the above assessment. However, a provisional allowance of 10 to 15% could be considered.		above assessment. However, a provisional allowance of 20% could be considered. Assuming Borrow Pit = 4.0m depth Topsoil = 7% Potential Class 4 Landscape Fill: Made Ground = 7% Head Deposits = 5% Brickearth = 2% Potential Class 1 and 2 Engineering Fill: Lowestoft Formation = 40% Glaciofluvial Deposits = 8% includes (Cohesive) = 0% (Granular) = 8% London Clay Formation = 32% NOTE. Some material may be found to be unacceptable (Class U1A/U1B) - an allowance for unacceptable material has not been applied to the above assessment. However, a provisional allowance of 10 to 15% could be considered.
	Existing utilities	**DESKTOP STUDY** Overhead Telecommunications & Electrical Cables across the Site. Potential rail cable	**DESKTOP STUDY** National grid gas pipe close to the southeast side.	**DESKTOP STUDY** National grid gas (medium pressure) pipe on the northeast side.	**DESKTOP STUDY** Free from existing utilities.	**DESKTOP STUDY** High pressure gas pipe runs diagonally through the borrow pit.
		POST SURVEY 11kV overhead cables cross the southern corner of the borrow pit area and then run north to south, just off centre of the borrow pit area. These will either require an exclusion zone which sterilises borrow pit area or will need to be diverted. A buried water main and overhead telecommunications cables run along the western boundary of the site which would require an exclusion zone.	**POST SURVEY** 11kv buried cables run along the northern border of the borrow pit area. 11kV overhead cables also cross the southern corner of the borrow pit area. These will either require an exclusion zone which sterilises borrow pit area or will need to be diverted. The landowner also has a private water main (for irrigation purposes) that crosses directly through the centre of the borrow pit area from west to east. This will either require an exclusion zone which sterilises borrow pit area or will need to be diverted.	**POST SURVEY** 11kv buried cables run along the northern border of the borrow pit area. The landowner also has a private water main (for irrigation purposes) that crosses directly through the centre of the borrow pit area from west to east. These will either require an exclusion zone which sterilises borrow pit area or will need to be diverted. A buried medium pressure gas pipe exists at the eastern corner of the borrow pit which would require an exclusion zone.	Borrow pit discounted at desktop study phase.	**POST SURVEY** 11kv buried cables run along the west and northern borders of the borrow pit area. A buried local high pressure gas pipe and buried pressurised foul sewer run across the centre of the borrow pit area, from southwest to northeast. These will either require an exclusion zone which sterilises borrow pit area or will need to be diverted.
	Contaminated Land	**DESKTOP STUDY** Potential contamination from nearby disturbed ground.	**DESKTOP STUDY** No significant impact expected.	**DESKTOP STUDY** Minor receptors identified, which may be impacted by dewatering activities.	**DESKTOP STUDY** Minor receptors identified, which may be impacted by dewatering activities. Minor risk of contaminants from backfill material for historical sands and gravel pits (source of backfill material unknown).	**DESKTOP STUDY** Potential contamination from nearby fuel station and potential impacts by dewatering activities.
		POST SURVEY No soil contamination identified. No soil leachate exceedances. Groundwater quality is moderate (exceedances for 4 analytes). Pre-treatment of pumped groundwater prior to discharge unlikely to be required - subject to	**POST SURVEY** No soil contamination identified. Some (1 sample out of 3) of the samples exceeded the soil leachate criteria. No groundwater chemical data was available to review as the borehole wells were dry during monitoring. Pre-treatment of pumped groundwater prior to	**POST SURVEY** No soil contamination identified. Some (1 out of 2) of samples tested exceeded the soil leachate criteria. Groundwater quality moderate (exceedance for 3 analytes only). Pre-treatment of pumped groundwater prior to discharge unlikely to be	Borrow pit discounted at desktop study phase.	**POST SURVEY** No soil contamination identified. Uncommon (1 out of 6) for samples with exceedances of soil leachate criteria. Groundwater quality is poor (Exceedances for 11 analytes). Pre-treatment of pumped groundwater prior to discharge may be required

	Criterion	Borrow Pit C (06)	Borrow Pit D (07)	Borrow Pit E (08)	Borrow Pit 09	Borrow Pit F (10)
		discharge consent requirements.	discharge unlikely to be required - subject to discharge consent requirements and monitoring / testing.	required - subject to discharge consent requirements.		- subject to discharge consent requirements. A Detailed Quantitative Risk Assessment may be required to assess the risk from the potential contamination sources surrounding the site (fuel filling station 100m north). Further additional monitoring / testing may be required.
	Summary	**POST SURVEY** It is likely that groundwater ingress can be controlled by pumping from a sump as excavation continues although a groundwater control system may be required as a contingency and if deployed may result in drawdown impacts extending off-site which may need to be mitigated. Pre-treatment of pumped groundwater prior to discharge unlikely to be required - subject to discharge consent requirements. Approximately 81% Class 1/2 material anticipated. A provisional allowance of 10% for potentially unacceptable material could be considered. The remaining material is anticipated to consist of Class 4 material.	**POST SURVEY** It is likely that groundwater ingress can be controlled by pumping from sumps as excavation progresses. Pre-treatment of pumped groundwater prior to discharge unlikely to be required - subject to discharge consent requirements and monitoring / testing. Approximately 84% Class 1/2 material anticipated. A provisional allowance of 10% for potentially unacceptable material could be considered. The remaining material is anticipated to consist of Class 4 material.	**POST SURVEY** It is likely that groundwater ingress can be controlled by pumping from sumps as excavation progresses. Pre-treatment of pumped groundwater prior to discharge unlikely to be required - subject to discharge consent requirements. Approximately 65% (2.5m deep borrow pit) or 80% (4.5m deep borrow pit) Class 1/2 material anticipated. A provisional allowance of 10 to 20% and 10 to 15% respectively for potentially unacceptable material could be considered. The remaining material is anticipated to consist of Class 4 material.	**DESKTOP STUDY** Predominantly Series 600 Earthworks (Specification for Highways Works) Class 2 acceptable engineered fill anticipated, consisting of cohesive Lowestoft Formation, with some Class 1 granular Glaciofluvial Deposits. No groundwater data, however shallow groundwater may be encountered requiring groundwater control. No utilities. Contaminated land potential shows minor receptors identified, which may be impacted by dewatering activities. Minor risk of contaminants from backfill material for historical sand and gravel pits (source of backfill material unknown).	**POST SURVEY** It is likely that groundwater ingress can be controlled by pumping from sumps as excavation progresses. Pre-treatment of pumped groundwater prior to discharge may be required - subject to discharge consent requirements. A Detailed Quantitative Risk Assessment may be required to assess the risk from the potential contamination sources surrounding site (fuel filling station 100m north). Further additional monitoring / testing may be required. Approximately 69% (2.5m deep borrow pit) or 80% (4.0m deep borrow pit) Class 1/2 material anticipated. A provisional allowance of 20% and 10 to 15% respectively for potentially unacceptable material could be considered. The remaining material is anticipated to consist of Class 4 material.

	Criterion	Borrow Pit C (06)	Borrow Pit D (07)	Borrow Pit E (08)	Borrow Pit 09	Borrow Pit F (10)
Construction	Location relative to area of fill	**DESKTOP STUDY** Approximately 1km from existing A12 but located north of the Great Eastern Mainline railway line. Approximately 2km from junction 21 where fill is required.	**DESKTOP STUDY** Close to junction 21 location where import fill is required.	**DESKTOP STUDY** At junction 21 location where import fill is required.	**DESKTOP STUDY** At junction 21 location where import fill is required.	**DESKTOP STUDY** At junction 21 location where import fill is required.
		POST SURVEY North of the Great Eastern Mainline railway line. Approximately 350m from existing A12. Approximately 1.3km from junction 21 where fill is required.	**POST SURVEY** Approximately 150m from existing A12. Approximately 600m from junction 21 where fill is required.	**POST SURVEY** Approximately 200m from existing A12. Directly adjacent to Junction 21 location where fill is required, at approximately 300m.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Approximately 50m from existing A12. Approximately 1km from junction 21 where fill is required.
	Accessibility (haul route)	**DESKTOP STUDY** Local road access would be made via Station Road, Hatfield Peverel. The existing bridge over the railway would be unsuitable for construction HGV's, as would the route along Station Road and over Station Road Bridge. This bridge is to be demolished and replaced as part of the proposed scheme, so there will be potential programme issues to overcome. A bespoke railway overbridge would be necessary.	**DESKTOP STUDY** Short haul route off-road across field, to junction 21 where fill is required. Off-road construction vehicles can be used to expedite programme and negate use of existing A12 and/or local road network.	**DESKTOP STUDY** Short haul route off-road across field, to junction 21 where fill is required. Off-road construction vehicles can be used to expedite programme and negate use of existing A12 and/or local road network.	**DESKTOP STUDY** Good access to existing A12. Could also be used as a potential stockpile area or site compound area.	**DESKTOP STUDY** Good access to existing A12. Could also be used as a potential stockpile area or site compound area.
		POST SURVEY Off road access would require railway crossing point, shortest distance 1km. Otherwise, access is via the local road network over Station Road bridge through Hatfield Peverel. The road bridge is to be demolished and replaced as part of scheme, so there will be potential programme issues to overcome.	**POST SURVEY** Off road access route available. The shortest potential distance for this would be less than 500m. There are no major road/rail/utility crossings envisaged. Access for unsuitable road hauled material would require a temporary access road to the borrow pit.	**POST SURVEY** Off road access route available. The shortest potential distance for this would be less than 500m. There are no major road/rail/utility crossings envisaged. Access for unsuitable road hauled material would require a temporary access road to the borrow pit.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Off road access route available. The potential distance for this would be between 0.5-1km. Crossings of buried local high pressure gas main and overhead 11kV cables would be required. Access for unsuitable road hauled material would require a temporary access road to the borrow pit.
	Borrow pit management e.g. dewatering / material drying and processing	**DESKTOP STUDY** Following geotechnical assumption that groundwater level is 2.5m below ground level, dewatering will be required during construction with phased work areas and a requirement for discharging to local water courses.	**DESKTOP STUDY** Following geotechnical assumption that groundwater level is 2.5m below ground level, dewatering will be required during construction with phased work areas and a requirement for discharging to local water courses.	**DESKTOP STUDY** Following geotechnical assumption that groundwater level is 2.5m below ground level, dewatering will be required during construction with phased work areas and a requirement for discharging to local water courses.	**DESKTOP STUDY** Presence of existing lakes (Waterbaby Lake, Love Lake etc) suggest dealing with groundwater would be an issue.	**DESKTOP STUDY** A historical record of groundwater information suggests it is 2.7m below ground level. Following geotechnical assumption that groundwater level is 2.5m below ground level, dewatering will be required during construction with phased work areas and a requirement for discharging to local water courses.
		POST SURVEY Groundwater management is expected and is not deemed to be complex. Land plot size is suitable for material management.	**POST SURVEY** Groundwater management is not expected. Land plot size is suitable for material management.	**POST SURVEY** Groundwater management is not expected. Land plot size is suitable for material management.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Groundwater management is expected and is not deemed to be complex. Land plot size is suitable for material management (i.e. including soil storage areas and material processing areas)
	Summary	**POST SURVEY** Borrow pit is a reasonable distance from the intended fill location and access options are poor.	**POST SURVEY** Borrow pit is close to intended fill area with good access. Management of borrow pit is expected to be straight forward.	**POST SURVEY** Borrow pit is close to intended fill area with good access. Management of borrow pit is expected to be straight forward.	**DESKTOP STUDY** Best performing borrow pit.	**POST SURVEY** Borrow pit location is good regarding intended fill area. Access to and from borrow pit presents challenges and management of borrow pit activities will require slightly more rigorous planning.

	Criterion	Borrow Pit C (06)	Borrow Pit D (07)	Borrow Pit E (08)	Borrow Pit 09	Borrow Pit F (10)
Environment	Air Quality	**DESKTOP STUDY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse air quality impacts to acceptable levels.	**DESKTOP STUDY** Located within 200m of at least one residential property. In addition, located within 200m of a bowling club. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 200m of at least one residential property. In addition, located within 200m of a nursery school. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.
		POST SURVEY Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	**POST SURVEY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	**POST SURVEY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse air quality impacts to acceptable levels.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Located within 200m of at least one residential property. In addition, located within 200m of a nursery school. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.
	Cultural Heritage	**DESKTOP STUDY** No potential cultural heritage impacts identified from existing records.	**DESKTOP STUDY** No potential cultural heritage impacts identified from existing records.	**DESKTOP STUDY** Potential to remove archaeological deposits located within footprint. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels (e.g. geophysical survey and/or trial trenching followed by preservation in situ, excavation or recording through watching brief).	**DESKTOP STUDY** Potential to remove archaeological deposits located within footprint. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels (e.g. geophysical survey and/or trial trenching followed by preservation in situ, excavation or recording through watching brief).	**DESKTOP STUDY** No potential cultural heritage impacts identified from existing records.
		POST SURVEY No survey undertaken; previous scoring carried through in the absence of other information.	**POST SURVEY** No potential cultural heritage impacts identified from existing records.	**POST SURVEY** No Historic Environment Record constraints and nothing of significance identified in geophysical survey other than land drains and former field boundaries.	Borrow pit discounted at desktop study phase.	**POST SURVEY** No Historic Environment Record constraints but the geophysical survey identified a number of linear and discrete anomalies which have been interpreted as possible archaeological ditches and pits in the north of the area. Dependent on results of trial trenching some archaeological excavation may be required in the north of the area.
	Landscape and Visual	**DESKTOP STUDY** Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.	**DESKTOP STUDY** Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.	**DESKTOP STUDY** Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.	**DESKTOP STUDY** Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.	**DESKTOP STUDY** Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.
		POST SURVEY Largely open arable land with potential to retain some tree belts including potential veteran trees. Surrounding woodland including Titbeech Wood (ancient woodland) to the west and vegetation along the railway to the south restrict views. Few visual receptors, although close	**POST SURVEY** Open arable land with potential to retain potential veteran trees along eastern site boundary. Close views from The Vineyards, PRoW to the west and views from the eastern residential edge of Hatfield Peverel. Site contained to the north by well vegetated railway line.	**POST SURVEY** Largely open arable land with potential to retain existing vegetation including potential veteran trees. Site contained by well vegetated railway line to the north. Few visual receptors, although views across borrow pit site close at hand for residents at	Borrow pit discounted at desktop study phase.	**POST SURVEY** Open arable land with potential to retain potential veteran trees around site boundary. Few visual receptors and trees and vegetation around periphery of arable land provides screening for residents and users of PRoW to the west.

	Criterion	Borrow Pit C (06)	Borrow Pit D (07)	Borrow Pit E (08)	Borrow Pit 09	Borrow Pit F (10)
		views from residents at Woodside to the west and users of PRoW to the north and east.		Wood End Farm to the east.		
	Biodiversity	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species. These impacts are expected to be relatively localised. However, mitigation beyond standard good construction practice is likely to be required to reduce the impacts to acceptable levels. Without mitigation these impacts would be long term.	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species. These impacts are expected to be relatively localised. However, mitigation beyond standard good construction practice is likely to be required to reduce the impacts to acceptable levels. Without mitigation these impacts would be long term.	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species that may extend well beyond the site boundary. The extent of mitigation for these impacts is unknown (may need to be tested and quantified) but is expected to be possible with acceptance by consultees.	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species that may extend well beyond the site boundary. The extent of mitigation for these impacts is unknown (may need to be tested and quantified) but is expected to be possible with acceptance by consultees.	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species that may extend well beyond the site boundary. The extent of mitigation for these impacts is unknown (may need to be tested and quantified) but is expected to be possible with acceptance by consultees.
		POST SURVEY Adjacent to a woodland with subsidiary badger sett.	**POST SURVEY** Survey result shows no constraints.	**POST SURVEY** Survey result shows no constraints.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Outlier badger sett found.
	Noise and Vibration	**DESKTOP STUDY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse impacts to acceptable levels.	**DESKTOP STUDY** Located within 300m of at least one residential property. In addition, located within 300m of a bowling club. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 300m of at least one residential property. In addition, located within 300m of a nursery school. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.
		POST SURVEY Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	**POST SURVEY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	**POST SURVEY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse impacts to acceptable levels.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Located within 300m of at least one residential property. In addition, located within 300m of a nursery school. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.
	People and Health	**DESKTOP STUDY** PROW 90_1 is parallel to the northern extents, whilst PROW 90_2 is parallel to the eastern extents. Mitigation from non-motorised user and borrow pit required. As for Borrow Pit B (05) and Borrow Pit C (06) the haul route may have issues.	**DESKTOP STUDY** The northeast extents slightly encroach onto PROW 90_2 but can be mitigated without severe disruption. Mitigation from non-motorised users and borrow pit required. An assumption has been made that the borrow pit will have direct access to the A12.	**DESKTOP STUDY** There are no non-motorised user routes affected. An assumption has been made that the borrow pit will have direct access to the A12.	**DESKTOP STUDY** PROW 90_40 is parallel to the western extents of the borrow pit whilst PROW 90_29, briefly is parallel to the east. Mitigation from non-motorised users and borrow pit required. An assumption has been made that the borrow pit will have direct access to the A12.	**DESKTOP STUDY** PROW 90_29 is parallel to the western extents of the borrow pit. Mitigation from non-motorised users and borrow pit required. An assumption has been made that the borrow pit will have direct access to the A12.
		POST SURVEY PROW 90_1 is parallel to the northern extents, whilst PROW 90_2 is parallel to the eastern extents. Mitigation from non-motorised user and borrow pit required. The haul route may have issues.	**POST SURVEY** The northeast extents slightly encroach onto PROW 90_2 but can be mitigated without severe disruption. Mitigation from non-motorised users and borrow pit required. An assumption has been made that the borrow pit will have direct access to the A12.	**POST SURVEY** There are no non-motorised user routes affected. An assumption has been made that the borrow pit will have direct access to the A12.	Borrow pit discounted at desktop study phase.	**POST SURVEY** PROW 90_29 is parallel to the western extents of the borrow pit. Mitigation from non-motorised users and borrow pit required. An assumption has been made that the borrow pit will have direct access to the A12.

	Criterion	Borrow Pit C (06)	Borrow Pit D (07)	Borrow Pit E (08)	Borrow Pit 09	Borrow Pit F (10)
	Road Drainage and the Water Environment	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary.	**DESKTOP STUDY** No water environment impacts have been identified.	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary.	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary.	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary.
		POST SURVEY Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary.	**POST SURVEY** No water environment impacts have been identified.	**POST SURVEY** No water environment impacts have been identified.	Borrow pit discounted at desktop study phase.	**POST SURVEY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary.
	Summary	**POST SURVEY** There is no potential for cultural heritage impacts from existing records. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality and noise and vibration impacts on these properties to acceptable levels. Potential significant adverse impacts to: - views from PRoW and sensitive visual receptors - the removal of best and most versatile agricultural land - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels.	**POST SURVEY** No water environmental impacts have been identified. There is no potential for cultural heritage impacts from existing records and impacts to population and health is considered low. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality and noise and vibration impacts on these properties to acceptable levels. Potential significant adverse impacts to: - views from The Vineyards, PRoW and sensitive visual receptors - the removal of best and most versatile agricultural land Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels.	**POST SURVEY** No Historic Environment Record constraints and nothing of significance identified in geophysical survey other than land drains and former field boundaries. Impacts to population and health is considered low and no water environment nor biodiversity impacts have been identified. The borrow pit is also not located within 50m of any existing residential or commercial properties. Standard good construction practices are likely to reduce adverse air quality and noise and vibration impacts to acceptable levels. Potential significant adverse impacts to: - potential veteran trees - removal of best and most versatile agricultural land Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels.	**DESKTOP STUDY** Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality and noise and vibration impacts on these properties to acceptable levels. Impacts to population and health is considered low. Potential significant adverse impacts to: - the removal of archaeological deposits located within the footprint - views from PRoWs and sensitive visual receptors - one or more localised ecological species that may extend well beyond the site boundary - the removal of best and most versatile agricultural land - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels.	**POST SURVEY** Impacts to population and health is considered low. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality and noise and vibration impacts on these properties to acceptable levels. Potential significant adverse impacts to: - views from PRoW and sensitive visual receptors - badger, an outlier sett found within the boundary - the removal of best and most versatile agricultural land - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels.

		Borrow Pit C (06)	Borrow Pit D (07)	Borrow Pit E (08)	Borrow Pit 09	Borrow Pit F (10)
Planning	**Planning policy** (including local plans, minerals plan and National Networks National Policy Statement (Department for Transport, 2014))	**DESKTOP STUDY** The entirety of Borrow Pit 06 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**DESKTOP STUDY** The entirety of Borrow Pit 07 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**DESKTOP STUDY** The entirety of Borrow Pit 08 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**DESKTOP STUDY** - Braintree District Council Draft Local Plan (2013-2033), identifies the *'Land Between Hatfield Peverel & Witham South of A12'* as allocation HATF321. Borrow Pit 9 sits within HATF321 which is allocated for mix-used development. - The entirety of Borrow Pit 09 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**DESKTOP STUDY** The entirety of Borrow Pit 10 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).
		POST SURVEY The entirety of Borrow Pit 06 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**POST SURVEY** The entirety of Borrow Pit 07 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**POST SURVEY** The entirety of Borrow Pit 08 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	Borrow pit discounted at desktop study phase.	**POST SURVEY** The entirety of Borrow Pit 10 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).
	Planning applications and consented schemes	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 06 within the five-year monitoring period.	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 07 within the five-year monitoring period.	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 08 within the five-year monitoring period.	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 09 within the five-year monitoring period.	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 10 within the five-year monitoring period.
		POST SURVEY No planning applications were identified within the boundary of Borrow Pit 06 within the five-year monitoring period.	**POST SURVEY** No planning applications were identified within the boundary of Borrow Pit 07 within the five-year monitoring period.	**POST SURVEY** No planning applications were identified within the boundary of Borrow Pit 08 within the five-year monitoring period.	Borrow pit discounted at desktop study phase.	**POST SURVEY** No planning applications were identified within the boundary of Borrow Pit 10 within the five-year monitoring period.
	Summary	**POST SURVEY** - No planning applications identified. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].	**POST SURVEY** - No planning applications identified. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].	**POST SURVEY** - Selected final Borrow Pit E location boundary sites outside the boundary of 22/03461/FUL and therefore no impact is assessed. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].	**DESKTOP STUDY** - Braintree District Council Draft Local Plan (2013-2033), identifies the *'Land Between Hatfield Peverel & Witham South of A12'* as allocation HATF321. Borrow Pit 9 sits within HATF321 which is allocated for mix-used development. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].	**POST SURVEY** - No planning applications identified. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].

	Criterion	Borrow Pit C (06)	Borrow Pit D (07)	Borrow Pit E (08)	Borrow Pit 09	Borrow Pit F (10)
Existing Land Use	**The land use**	**DESKTOP STUDY** Arable agricultural land	**DESKTOP STUDY** Arable agricultural land	**DESKTOP STUDY** Arable agricultural land	**DESKTOP STUDY** Arable agricultural land and large reservoirs	**DESKTOP STUDY** Arable agricultural land
		POST SURVEY Arable agricultural land	**POST SURVEY** Arable agricultural land	**POST SURVEY** Arable agricultural land	Borrow pit discounted at desktop study phase.	**POST SURVEY** Arable agricultural land
	Identify who owns the land (is it a public body or private landowner?)	**DESKTOP STUDY** Private landowner	**DESKTOP STUDY** Private landowner	**DESKTOP STUDY** Private landowner	**DESKTOP STUDY** Three private landowners	**DESKTOP STUDY** Unregistered land
		POST SURVEY Private landowner	**POST SURVEY** Private landowner	**POST SURVEY** Private landowner	Borrow pit discounted at desktop study phase.	**POST SURVEY** Private landowner
	The percentage of the landholding affected (i.e. how much land is retained?)	**DESKTOP STUDY** Land plot forms part of a considerable acreage across Essex and Suffolk	**DESKTOP STUDY** Land plot forms part of a considerable acreage across Essex and Suffolk	**DESKTOP STUDY** Land plot forms part of a considerable acreage across Essex and Suffolk	**DESKTOP STUDY** 29%, 23% and 7% for each of the landowners.	**DESKTOP STUDY** Unknown
		POST SURVEY Land plot forms part of a considerable acreage across Essex and Suffolk	**POST SURVEY** Land plot forms part of a considerable acreage across Essex and Suffolk	**POST SURVEY** Land plot forms part of a considerable acreage across Essex and Suffolk	Borrow pit discounted at desktop study phase.	**POST SURVEY** Unknown
	Summary	**POST SURVEY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation. The level of impact to the landowner is deemed to be low.	**POST SURVEY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation. The level of impact to the landowner is deemed to be low.	**POST SURVEY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation. The level of impact to the landowner is deemed to be low.	**POST SURVEY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation. The level of impact to the landowners is deemed to be low to moderate.	**POST SURVEY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation. The level of impact to the landowner is deemed to be low.

Borrow pits 11 to 15

	Criterion	Borrow Pit G (11)	Borrow Pit H (12)	Borrow Pit 13	Borrow Pit 14	Borrow Pit 15
Technical / Geotechnical	Groundwater	**DESKTOP STUDY** Groundwater may be encountered within the excavation, approximately 2.7m below existing ground level based on limited information from available British Geological Society boreholes.	**DESKTOP STUDY** Majority of borrow pit consists of acceptable granular engineering fill. Groundwater may be encountered approximately 2.7m below existing ground level based on limited information from available British Geological Society boreholes.	**DESKTOP STUDY** Groundwater is likely to be encountered within the excavation based on limited available information from British Geological Society boreholes (approximately 2.4m below ground level).	**DESKTOP STUDY** Groundwater not expected to be encountered within the excavation based on limited available information (approximately 9.6m below ground level).	**DESKTOP STUDY** Groundwater may be encountered within the excavation below 3.1m bgl based on limited available information.
		POST SURVEY Shallow groundwater likely across the borrow pit area with areas of permeable River Terrace Deposits present at shallow depths. It is possible that groundwater ingress could be controlled by pumping from sumps as excavation continues, although a groundwater control system will likely be required as a contingency. Any dewatering will result in some drawdown impacts extending off-site which will need to be mitigated due to nearby areas of Wet Woodland.	**POST SURVEY** Groundwater may be encountered approximately 2m below existing ground level. It is likely that groundwater ingress can be controlled by pumping from a sump as excavation continues, although a groundwater control system may be required as a contingency and if deployed may result in drawdown impacts extending off-site which may need to be mitigated.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	Likely quantity of usable material	**DESKTOP STUDY** London Clay Formation (50%) comprises cohesive soils with generally favourable engineering properties but may require further assessments. Head Deposits (25%) comprises mixed material with unfavourable engineering properties (for non-engineering use only) Glaciofluvial Deposits (15%) comprises sands and gravels with very favourable engineering properties. Lowestoft Formation (10%) comprises glacial till with favourable engineering properties.	**DESKTOP STUDY** River Terrace Deposits (100%) comprises sands and gravels with very favourable engineering properties.	**DESKTOP STUDY** River Terrace Deposits (33%) comprises sands and gravels with very favourable engineering properties. Lowestoft Formation (32%) comprises glacial till with favourable engineering properties London Clay Formation (20%) comprises cohesive soils with generally favourable engineering properties but may require further assessments. Glaciofluvial Deposits (15%) comprises sands and gravels with very favourable engineering properties.	**DESKTOP STUDY** Lowestoft Formation (53%) comprises glacial till with favourable engineering properties. Glaciofluvial Deposits (18%) comprises sands and gravels with very favourable engineering properties. River Terrace Deposits (17%) comprises sands and gravels with very favourable engineering properties. London Clay Formation (12%) comprises cohesive soils with generally favourable engineering properties but may require further assessments.	**DESKTOP STUDY** River Terrace Deposits (45%) comprises sands and gravels with very favourable engineering properties. Lowestoft Formation (20%) comprises glacial till with favourable engineering properties. Head Deposits (18%) comprises mixed material with unfavourable engineering properties (for non-engineering use only) London Clay Formation (17%) comprises cohesive soils with generally favourable engineering properties but may require further assessments.
		POST SURVEY Assuming Borrow Pit = 4m depth Topsoil = 6% Potential Class 4 Landscape Fill: Made Ground = 8% Head Deposits = 12% Brickearth = 1% Interglacial Silt and Clay = 1% Potential Class 1 and 2 Engineering Fill: River Terrace Deposits = 10% includes (Cohesive) = 0% (Granular) = 10% Lowestoft Formation = 5% Glaciofluvial Deposits = 13% includes (Cohesive) = 0% (Granular) = 13% London Clay Formation = 44%	**POST SURVEY** Assuming Borrow Pit = 4m depth Topsoil = 9% Potential Class 4 Landscape Fill: Made Ground = 1% Potential Class 1 and 2 Engineering Fill: River Terrace Deposits = 62% includes (Cohesive) = 23% (Granular) = 39% London Clay Formation = 28% NOTE. Some material may be found to be unacceptable (Class U1A/U1B) - an allowance for unacceptable material has not been applied to the above assessment. However, a provisional allowance of 5% could be considered.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.

	Criterion	Borrow Pit G (11)	Borrow Pit H (12)	Borrow Pit 13	Borrow Pit 14	Borrow Pit 15
		NOTE. Some material may be found to be unacceptable (Class U1A/U1B) - an allowance for unacceptable material has not been applied to the above assessment. However, a provisional allowance of 20 to 25% could be considered.				
	Existing utilities	**DESKTOP STUDY** Free from existing utilities.	**DESKTOP STUDY** Buried water pipe runs through northern area of borrow pit. Overhead electrical (high voltage) cables and buried high pressure gas pipe near the north of site.	**DESKTOP STUDY** Free from existing utilities.	**DESKTOP STUDY** Free from existing utilities.	**DESKTOP STUDY** Free from existing utilities.
		POST SURVEY Predominantly still perceived to be free from existing utilities except for buried 11kV and 33kV cables that run along the eastern boundary. These will require an exclusion zone which sterilises borrow pit area.	**POST SURVEY** A fragile buried water pipe runs along the southern and western boundary within the field plot. A separate buried water pipe runs north to south at the eastern edge of the borrow pit area. Overhead 11kV cables also run west to east along the northern edge of the borrow pit area. These will either require an exclusion zone which sterilises borrow pit area or will need to be diverted.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	Contaminated Land	**DESKTOP STUDY** Minor receptors identified, which may be impacted by dewatering activities. Minor risk of contaminants from backfill material for historical sands and gravel pits (source of backfill material unknown)	**DESKTOP STUDY** Potential receptors identified, which would be impacted by dewatering activities.	**DESKTOP STUDY** Potential contamination from nearby sewage works and landfill.	**DESKTOP STUDY** Potential receptors identified, which would be impacted by dewatering activities.	**DESKTOP STUDY** Potential receptors identified, which would be impacted by dewatering activities.
		POST SURVEY No soil contamination identified. Uncommon (1 out of 6) for samples with exceedances of soil leachate criteria. Groundwater quality is poor (18 analytes exceeding criteria). Pre-treatment of pumped groundwater prior to discharge may be required - subject to discharge consent requirements. A Detailed Quantitative Risk Assessment may be required to assess the risk from the potential contamination sources surrounding site (including a landfill 50m from site). Further additional monitoring / testing may be required.	**POST SURVEY** No soil contamination identified. Some of the samples (2 out of 6) tested exceeded the soil leachate criteria. Groundwater quality is good (no exceedances). Pre-treatment of pumped groundwater prior to discharge unlikely to be required - subject to discharge consent requirements.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	Summary	**POST SURVEY** It is possible that groundwater ingress could be controlled by pumping from sumps as excavation continues although a groundwater control system will likely be required as a contingency. Any dewatering will result in	**POST SURVEY** It is likely that groundwater ingress can be controlled by pumping from a sump as excavation continues although a groundwater control system may be required as a contingency and if deployed may result in drawdown impacts	**DESKTOP STUDY** Predominantly Series 600 Earthworks (Specification for Highways Works) Class 1 acceptable engineered fill anticipated, consisting granular River Terrace Deposits with some Glaciofluvial Deposits, and	**DESKTOP STUDY** Predominantly Series 600 Earthworks (Specification for Highways Works) Class 2 acceptable engineered fill anticipated, consisting of cohesive Lowestoft Formation, some London Clay Formation and Class 1	**DESKTOP STUDY** Predominantly Series 600 Earthworks (Specification for Highways Works) Class 2 acceptable engineered fill anticipated, consisting of cohesive Lowestoft Formation and London Clay Formation and Class 1 granular River Terrace

	Criterion	Borrow Pit G (11)	Borrow Pit H (12)	Borrow Pit 13	Borrow Pit 14	Borrow Pit 15
		some drawdown impacts extending off-site which will need to be mitigated due to nearby areas of Wet Woodland. Pre-treatment of pumped groundwater prior to discharge may be required - subject to discharge consent requirements. A Detailed Quantitative Risk Assessment may be required to assess the risk from the potential contamination sources surrounding site (including a landfill 50m from site). Further additional monitoring / testing may be required. Approximately 72% Class 1/2 material anticipated. A provisional allowance of 20 to 25% for potentially unacceptable material could be considered. The remaining material is anticipated to consist of Class 4 material.	extending off-site which may need to be mitigated. Pre-treatment of pumped groundwater prior to discharge unlikely to be required - subject to discharge consent requirements. Approximately 90% Class 1/2 material anticipated. A provisional allowance of 5% for potentially unacceptable material could be considered. The remaining material is anticipated to consist of Class 4 material.	Class 2 cohesive London Clay Formation. Shallow groundwater may be encountered requiring groundwater control. No utilities. Contaminated land - Potential for contamination from nearby sewage works and landfill to be mobilised by dewatering activities.	granular River Terrace and Glaciofluvial Deposits. Significant shallow groundwater not anticipated. No utilities. Contaminated land - Potential receptors identified which would be impacted by dewatering activities.	Deposits. Some non-engineered fill anticipated, consisting of Head Deposits. Shallow groundwater may be encountered towards the base of the pit. No utilities. Contaminated land - Potential receptors identified which would be impacted by dewatering activities.

	Criterion	Borrow Pit G (11)	Borrow Pit H (12)	Borrow Pit 13	Borrow Pit 14	Borrow Pit 15
Construction	Location relative to area of fill	**DESKTOP STUDY** Approximately 350m from existing A12 at nearest point. Close to junction 21 location where fill is required.	**DESKTOP STUDY** Adjacent to existing A12 highway boundary. Approximately 1.5km from existing junction 22 where fill is required.	**DESKTOP STUDY** Close to existing junction 22 to 23 Rivenhall End Bypass.	**DESKTOP STUDY** Close to existing junction 22 to 23 Rivenhall End Bypass.	**DESKTOP STUDY** Close to existing junction 22 to 23 Rivenhall End Bypass.
		POST SURVEY Approximately 350m from existing A12 at nearest point. Approximately 1.5km to junction 21 location where fill is required.	**POST SURVEY** Adjacent to A12 highway boundary, meaning granular material can be distributed scheme wide via the strategic road network. Approximately 5km from junction 21 and junction 22 where the majority of proposed scheme fill is required. It is also over 5km from the approximate scheme centre (when junction 19 is ignored, which will be better supplied via import material), meaning supply of granular material would be better suited to the southern half of the scheme.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	Accessibility (haul route)	**DESKTOP STUDY** New haul road could be constructed across the adjacent field to the proposed A12. Or direct access to the local road network can be made via the B1018 Maldon Road. However, the weak bridge (13t) on Blue Mills Hill, would require review & strengthening works for use by construction traffic.	**DESKTOP STUDY** Good access to the proposed A12 boundary. Also has good access to Blue Mills Hill. However, the existing (13t) weak bridge would need review / strengthening works for use by construction traffic.	**DESKTOP STUDY** Borrow pit is located on the other (south) side of Blackwater River, so a temporary bridge and approaches would be required in the flood plain.	**DESKTOP STUDY** Borrow pit is located on the other (south) side of Blackwater River, so a temporary bridge and approaches would be required in the flood plain.	**DESKTOP STUDY** Borrow pit is located on the other (south) side of Blackwater River, so a temporary bridge and approaches would be required in the flood plain.
		POST SURVEY Off road access between 1-1.5km in length. Crossings of local high-pressure gas main and overhead 11kV cables required would be required to facilitate this. Access for unsuitable road hauled material would require a temporary access road of significant length to be able to access the borrow pit or would be required to use the local road network through local towns.	**POST SURVEY** Off road access is greater than 2km to proposed scheme general fill areas. Numerous crossings of a local high pressure gas main would be required. Main River watercourse and local road network crossings would also be required. Access to the strategic road network for road hauled material would be direct from a very short temporary access road.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	Borrow pit management e.g. dewatering / material drying and processing	**DESKTOP STUDY** It is considered that temporary dewatering may be required.	**DESKTOP STUDY** It is considered that temporary dewatering may be required.	**DESKTOP STUDY** Borrow pit location is close to the River Blackwater, therefore complex dewatering issues are very likely.	**DESKTOP STUDY** Borrow pit location is close to the River Blackwater, therefore complex dewatering issues are very likely.	**DESKTOP STUDY** Borrow pit location is close to the River Blackwater, therefore complex dewatering issues are very likely.
		POST SURVEY Land plot size is suitable for material management.	**POST SURVEY** Land plot size is limited by the proposed local high-pressure gas main corridor. This limits access to the material to be won and space available for material management and processing. The borrow pit size would be too small to warrant the volume of material available combined with the added complexity of winning it from such a small area.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	Summary	**POST SURVEY** Borrow pit location regarding fill area is not	**POST SURVEY**	**DESKTOP STUDY** Average performing borrow pit.	**DESKTOP STUDY** Average performing borrow pit.	**DESKTOP STUDY** Average performing borrow pit.

	Criterion	Borrow Pit G (11)	Borrow Pit H (12)	Borrow Pit 13	Borrow Pit 14	Borrow Pit 15
		ideal and will require changes to the Order Limits to shorten the best haul route. Access to and from borrow pit presents challenges.	Borrow pit location regarding major fill areas is too far. Access to the strategic road network is good and could provide granular material to the southern half of the scheme. The borrow pit area available is significantly impacted by the land take for the proposed local high-pressure gas main diversion route.			

	Criterion	Borrow Pit G (11)	Borrow Pit H (12)	Borrow Pit 13	Borrow Pit 14	Borrow Pit 15
Environment	Air Quality	**DESKTOP STUDY** Located within 200m of at least one residential property. In addition, located within 200m of a fishing lake. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 200m of at least one residential property and a golf club. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties, including a golf club. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.
		POST SURVEY Located within 200m of at least one residential property. In addition, located within 200m of a fishing lake. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	**POST SURVEY** Located within 200m of at least one residential property and a golf club. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties, including a golf club. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	Cultural Heritage	**DESKTOP STUDY** Potential to remove archaeological deposits located within footprint & affect the setting of a Grade II Listed Building. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels (e.g. geophysical survey and/or trial trenching followed by preservation in situ, excavation or recording through watching brief).	**DESKTOP STUDY** No potential cultural heritage impacts identified from existing records.	**DESKTOP STUDY** Potential to remove archaeological deposits located within footprint & affect the setting of one Grade I Listed Building & four Grade II Listed Buildings. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels (e.g. geophysical survey and/or trial trenching followed by preservation in situ, excavation or recording through watching brief).	**DESKTOP STUDY** Potential to remove archaeological deposits located within footprint. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels (e.g. geophysical survey and/or trial trenching followed by preservation in situ, excavation or recording through watching brief).	**DESKTOP STUDY** Potential to remove archaeological deposits located within footprint & affect the setting of a Grade II Listed Building and a Grade II* Listed Registered Park and Garden. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels (e.g. geophysical survey and/or trial trenching followed by preservation in situ, excavation or recording through watching brief).
		POST SURVEY No survey undertaken.	**POST SURVEY** No Historic Environment Record constraints but the geophysical survey interpreted three linear anomalies as possible archaeological ditches due to their common alignment and located in the western half of the area. Dependent on results of trial trenching, potential limited archaeological mitigation may be required on ditches in the western half.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	Landscape and Visual	**DESKTOP STUDY** Borrow pit is located within or adjacent to a former special landscape area. Potential to affect the setting of, and views from, cultural heritage assets. Likely to be visible from one or more sensitive visual receptors, including residential properties.	**DESKTOP STUDY** Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.	**DESKTOP STUDY** Borrow pit is located within or adjacent to a former special landscape area. Potential to affect the setting of, and views from, cultural heritage assets. Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.	**DESKTOP STUDY** Borrow pit is located within or adjacent to a former special landscape area. Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.	**DESKTOP STUDY** Borrow pit is located within or adjacent to a former special landscape area. Potential to affect the setting of, and views from, cultural heritage assets. Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.
		POST SURVEY Largely open arable land with hedgerow boundaries and hedgerow trees, including some potential	**POST SURVEY** Open arable land, contained by vegetation to the north, east and west. The well vegetated	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.

	Criterion	Borrow Pit G (11)	Borrow Pit H (12)	Borrow Pit 13	Borrow Pit 14	Borrow Pit 15
		veteran and potential ancient with potential to retain. Surrounding woodland blocks to the south, west and north help visually contain the site. Few visual receptors including residential properties to the east and south-west.	Blackwater Rail Trail Country Park would restrict views from housing east of Maldon Road and from within the country park. Few visual receptors, although there would be views from the PRoW along the eastern boundary.			
	Biodiversity	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species. These impacts are expected to be relatively localised. However, mitigation beyond standard good construction practice is likely to be required to reduce the impacts to acceptable levels. Without mitigation these impacts would be long term.	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species. These impacts are expected to be relatively localised. However, mitigation beyond standard good construction practice is likely to be required to reduce the impacts to acceptable levels. Without mitigation these impacts would be long term.	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species that may extend well beyond the site boundary. The extent of mitigation for these impacts is unknown (may need to be tested and quantified) but is expected to be possible with acceptance by consultees.	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species that may extend well beyond the site boundary. The extent of mitigation for these impacts is unknown (may need to be tested and quantified) but is expected to be possible with acceptance by consultees.	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species that may extend well beyond the site boundary. The extent of mitigation for these impacts is unknown (may need to be tested and quantified) but is expected to be possible with acceptance by consultees.
		POST SURVEY Potential for significant adverse impacts on one or more species. These impacts are expected to be relatively localised. However, mitigation beyond standard good construction practice is likely to be required to reduce the impacts to acceptable levels. Without mitigation these impacts would be long term.	**POST SURVEY** Potential for haul route through Whetmead Local Nature Reserve.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	Noise and Vibration	**DESKTOP STUDY** Located within 300m of at least one residential property. In addition, located within 300m of a fishing lake. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 300m of at least one residential property. In addition, located within 300m of a golf club. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.
		POST SURVEY Located within 300m of at least one residential property. In addition, located within 300m of a fishing lake. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	**POST SURVEY** Located within 300m of at least one residential property. In addition, located within 300m of a golf club. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	People and Health	**DESKTOP STUDY** There are no non-motorised user routes affected, and if the haul route is to be via Maldon Road/Howbridge Hall Lane then no perceived issues are noted.	**DESKTOP STUDY** National cycle route 16 is parallel to the western extents (via the Blackwater Rail Trail) which must be maintained as a safe non-motorised user route whilst PROW 121_102 is parallel to the eastern extents. Score is based on potential affect to national cycle route 16. Mitigation from non-motorised user and borrow pit required.	**DESKTOP STUDY** National cycle route 16 is parallel to the eastern extents of the borrow pit, running via Little Braxted Lane which would present risks if utilised as the haul route. PROW 251_5 is parallel to the south. A number of other footpaths interact with Little Braxted Lane which could be affected if this were to be the haul route. Were a	**DESKTOP STUDY** The borrow pit directly severs PROW 251_1&2 which would result in substantial diversions. If the haul route were to be via Lea Lane/Braxted Park Road, there would be no perceived issues but mitigation may be required.	**DESKTOP STUDY** PROW 251_1 is parallel to the north of the site. Mitigation from non-motorised user and borrow pit required. Haul Route again assumed to be via Braxted Park Road with no perceived issues at this stage.

	Criterion	Borrow Pit G (11)	Borrow Pit H (12)	Borrow Pit 13	Borrow Pit 14	Borrow Pit 15
				direct access to the existing A12 be sought instead then the scoring could be altered. The scoring is based on worst case scenario.		
		POST SURVEY There are no non-motorised user routes affected, and if the haul route is to be via Maldon Road/Howbridge Hall Lane then no perceived issues are noted.	**POST SURVEY** National cycle route 16 is parallel to the western extents (via the Blackwater Rail Trail) which must be maintained as a safe non-motorised user route whilst PROW 121_102 is parallel to the eastern extents. Score is based on potential affect to national cycle route 16. Mitigation from non-motorised user and borrow pit required.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	Road Drainage and the Water Environment	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary. This borrow pit is located immediately east of an authorised landfill site. Landfill site could contain hazardous waste but it is assumed that standard good practice measures would be implemented to prevent pathways between the contaminants and any sensitive water features. Therefore, significant impacts are not anticipated.	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary.	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary. This borrow pit is located within Flood Zone 2 and/or Flood Zone 3. This may present opportunities for flood mitigation as part of the restoration plan. The borrow pit is also within 100m of a historic landfill site. Landfill site could contain hazardous waste but it is assumed that standard good practice measures would be implemented to prevent pathways between the contaminants and any sensitive water features. Therefore, significant impacts are not anticipated.	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary. This borrow pit is located within Flood Zone 2 and/or Flood Zone 3. This may present opportunities for flood mitigation as part of the restoration plan.	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary. This borrow pit is located within Flood Zone 2 and/or Flood Zone 3. This may present opportunities for flood mitigation as part of the restoration plan.
		POST SURVEY Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary. This borrow pit is located immediately east of an authorised landfill site. Landfill site could contain hazardous waste but it is assumed that standard good practice measures would be implemented to prevent pathways between the contaminants and any sensitive water features. Therefore, significant impacts are not anticipated.	**POST SURVEY** No water environment impacts have been identified.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	Summary	**POST SURVEY** Located within or adjacent to a former special landscape area and within 50m of one or more residential properties.	**POST SURVEY** There is no potential for cultural heritage impacts from existing records.	**DESKTOP STUDY** Located within or adjacent to a former special landscape area and within 50m of one or more residential properties.	**DESKTOP STUDY** Located within or adjacent to a former special landscape area and within 50m of one or more residential properties.	**DESKTOP STUDY** Located within or adjacent to a former special landscape area and within 50m of one or more residential properties.

	Criterion	Borrow Pit G (11)	Borrow Pit H (12)	Borrow Pit 13	Borrow Pit 14	Borrow Pit 15
		Additional mitigation measures may be required to reduce the adverse air quality and noise and vibration impacts on these properties to acceptable levels. The borrow pit is also located immediately east of an authorised landfill site. Landfill site could contain hazardous waste but it is assumed that standard good practice measures would be implemented to prevent pathways between the contaminants and any sensitive water features. Impacts to population and health is considered low. Potential significant adverse impacts to: - the removal of archaeological deposits located within the footprint - the setting of, and views from, cultural heritage assets, including Grade II Listed Building, PRoWs and sensitive visual receptors - one or more localised ecological species - the removal of best and most versatile agricultural land - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels.	Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality and noise and vibration impacts on these properties to acceptable levels. Potential significant adverse impacts to: - views from PRoWs and sensitive visual receptors - Whetmead Local Nature Reserve - the removal of best and most versatile agricultural land - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels.	Additional mitigation measures may be required to reduce the adverse air quality and noise and vibration impacts on these properties to acceptable levels. The borrow pit is also within 100m of a historic landfill site. Landfill site could contain hazardous waste but it is assumed that standard good practice measures would be implemented to prevent pathways between the contaminants and any sensitive water features. Potential significant adverse impacts to: - the removal of archaeological deposits located within the footprint - the setting of, and views from, cultural heritage assets, including Grades I and II Listed Buildings, PRoWs and sensitive visual receptors - one or more localised ecological species that may extend well beyond the site boundary. - the removal of best and most versatile agricultural land - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels. This borrow pit is located within Flood Zone 2 and/or Flood Zone 3 and this may present opportunities for flood mitigation as part of the restoration plan.	Additional mitigation measures may be required to reduce the adverse air quality and noise and vibration impacts on these properties to acceptable levels. Potential significant adverse impacts to: - the removal of archaeological deposits located within the footprint - views from PRoWs and sensitive visual receptors - one or more localised ecological species that may extend well beyond the site boundary. - the removal of best and most versatile agricultural land - PRoW with substantial diversions required - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels. This borrow pit is located within Flood Zone 2 and/or Flood Zone 3 and this may present opportunities for flood mitigation as part of the restoration plan.	Additional mitigation measures may be required to reduce the adverse air quality and noise and vibration impacts on these properties to acceptable levels. Impacts to population and health is considered low. Potential significant adverse impacts to: - the removal of archaeological deposits located within the footprint - the setting of, and views from, cultural heritage assets, including Grade II Listed Building and Grade II* Registered Park and Garden, PRoWs and sensitive visual receptors - one or more localised ecological species that may extend well beyond the site boundary. - the removal of best and most versatile agricultural land - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels. This borrow pit is located within Flood Zone 2 and/or Flood Zone 3 and this may present opportunities for flood mitigation as part of the restoration plan.

	Criterion	Borrow Pit G (11)	Borrow Pit H (12)	Borrow Pit 13	Borrow Pit 14	Borrow Pit 15
Planning	**Planning policy** (including local plans, minerals plan and National Networks National Policy Statement (Department for Transport, 2014))	**DESKTOP STUDY** The entirety of Borrow Pit 11 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**DESKTOP STUDY** The entirety of Borrow Pit 12 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**DESKTOP STUDY** The entirety of Borrow Pit 13 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**DESKTOP STUDY** The entirety of Borrow Pit 14 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**DESKTOP STUDY** The entirety of Borrow Pit 15 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).
		POST SURVEY The entirety of Borrow Pit 1 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**POST SURVEY** The entirety of Borrow Pit 12 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	Planning applications and consented schemes	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 11 within the five-year monitoring period.	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 12 within the five-year monitoring period.	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 13 within the five-year monitoring period.	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 14 within the five-year monitoring period.	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 15 within the five-year monitoring period.
		POST SURVEY No planning applications were identified within the boundary of Borrow Pit 11 within the five-year monitoring period.	**POST SURVEY** No planning applications were identified within the boundary of Borrow Pit 12 within the five-year monitoring period.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	Summary	**POST SURVEY** - No planning applications identified. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].	**POST SURVEY** - No planning applications identified. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].	**DESKTOP STUDY** - No planning applications identified. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].	**DESKTOP STUDY** - No planning applications identified. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].	**DESKTOP STUDY** - No planning applications identified. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144]..

	Criterion	Borrow Pit G (11)	Borrow Pit H (12)	Borrow Pit 13	Borrow Pit 14	Borrow Pit 15
Existing Land Use	**The land use**	**DESKTOP STUDY** Arable agricultural land	**DESKTOP STUDY** Arable agricultural land	**DESKTOP STUDY** Mixed arable and pasture agricultural land	**DESKTOP STUDY** Arable agricultural land	**DESKTOP STUDY** Mixed arable and pasture agricultural land
		POST SURVEY Arable agricultural land	**POST SURVEY** Arable agricultural land	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	Identify who owns the land (is it a public body or private landowner?)	**DESKTOP STUDY** Unregistered Land and private landowner	**DESKTOP STUDY** Private landowner	**DESKTOP STUDY** Private landowner	**DESKTOP STUDY** Private landowner	**DESKTOP STUDY** Private landowner
		POST SURVEY Unregistered Land and private landowner	**POST SURVEY** Private landowner	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	The percentage of the landholding affected (i.e. how much land is retained?)	**DESKTOP STUDY** 6.5% for private landowner	**DESKTOP STUDY** 14%	**DESKTOP STUDY** 17%	**DESKTOP STUDY** 17%	**DESKTOP STUDY** 15%
		POST SURVEY 6.5% for private landowner	**POST SURVEY** 14%	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.	Borrow pit discounted at desktop study phase.
	Summary	**POST SURVEY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation. The level of impact to the landowner is deemed to be low.	**POST SURVEY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation. The level of impact to the landowner is deemed to be low.	**POST SURVEY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation. The level of impact to the landowner is deemed to be low.	**POST SURVEY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation. The level of impact to the landowner is deemed to be low.	**POST SURVEY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation. The level of impact to the landowner is deemed to be low.

Borrow pits 16 to 19

	Criterion	Borrow Pit I (16)	Borrow Pit J (17)	Borrow Pit K (18)	Borrow Pit L	
Technical / Geotechnical	Groundwater	**DESKTOP STUDY** Majority of borrow pit consists of acceptable cohesive engineering fill. Groundwater is not expected to be encountered within the excavation based on limited available information from British Geological Society boreholes (estimated to be approximately 6.1m below ground level)	**DESKTOP STUDY** Majority of borrow pit consists of acceptable cohesive engineering fill. Historical groundwater levels from nearby British Geological Society boreholes at the site indicate that the water level may be quite deep (not encountered/recorded).	**DESKTOP STUDY** Based on nearby historical British Geological Society borehole logs, groundwater may potentially be quite high, approximately 0.8m below existing ground level.	**DESKTOP STUDY** Majority of borrow pit consists of acceptable cohesive engineering fill. Groundwater is not expected to be encountered within the excavation based on limited available information from British Geological Society boreholes (estimated to be approximately 5.8m below ground level)	
		POST SURVEY Due to the depth of the proposed excavation, high groundwater levels and the presence of permeable materials at depth, a groundwater control system will likely be required, and drawdown impacts may extend off-site which may need to be mitigated.	**POST SURVEY** Due to the depth of the proposed excavation, high groundwater levels and the presence of permeable materials, a groundwater control system will likely be required, and drawdown impacts may extend off-site which may need to be mitigated.	**POST SURVEY** No ground investigation undertaken at this location. Previous assumption still applies. Based on nearby historical British Geological Society borehole logs, groundwater may potentially be quite high, approximately 0.8m below existing ground level.	**POST SURVEY** Groundwater is not expected to be encountered within the excavation based on groundwater levels recorded in site investigation.	
	Likely quantity of usable material	**DESKTOP STUDY** Lowestoft Formation (75%) comprises glacial till with favourable engineering properties. Head Deposits (24%) comprises mixed material with unfavourable engineering properties (for non-engineering use only) River Terrace Deposits (1%) comprises sands and gravels with very favourable engineering properties.	**DESKTOP STUDY** Lowestoft Formation (83%) comprises glacial till with favourable engineering properties. River Terrace Deposits (15%) comprises sands and gravels with very favourable engineering properties. Glaciofluvial Deposits (2%) comprises sands and gravels with very favourable engineering properties.	**DESKTOP STUDY** River Terrace Deposits (40%) comprises sands and gravels with very favourable engineering properties. Head Deposits (33%) comprises mixed material with unfavourable engineering properties (for non-engineering use only) Lowestoft Formation (27%) comprises glacial till with favourable engineering properties.	**DESKTOP STUDY** Lowestoft Formation (100%) comprises glacial till with favourable engineering properties.	
		POST SURVEY Assuming Borrow Pit = 12m depth Topsoil = 3% Potential Class 4 Landscape Fill: Made Ground = 1% Head Deposits = 1% Glaciolacustrine Deposits = 18% Potential Class 1 and 2 Engineering Fill: River Terrace Deposits = 8% includes (Cohesive) = 2% (Granular) = 6% Lowestoft Formation = 41% Glaciofluvial Deposits = 21% includes (Cohesive) = 0% (Granular) = 21% London Clay Formation = 8% NOTE. Some material may be found to be unacceptable (Class U1A/U1B) - an allowance for unacceptable material has not been applied to the above assessment. However, a provisional allowance of 10% could be considered.	**POST SURVEY** Assuming Borrow Pit = 7m depth Topsoil = 2% Potential Class 4 Landscape Fill: Made Ground = 5% Head Deposits = 6% Interglacial Silt and Clay = 7% Potential Class 1 and 2 Engineering Fill: River Terrace Deposits = 3% includes (Cohesive) = 0% (Granular) = 3% Lowestoft Formation = 42% Glaciofluvial Deposits = 25% includes (Cohesive) = 5% (Granular) = 20% London Clay Formation = 12% NOTE. Some material may be found to be unacceptable (Class U1A/U1B) - an allowance for unacceptable material has not been applied to the above assessment. However, a provisional allowance of 10 to 20% could be considered.	**POST SURVEY** No ground investigation undertaken at this location. Previous assumption still applies. River Terrace Deposits (40%) comprises sands and gravels with very favourable engineering properties. Head Deposits (33%) comprises mixed material with unfavourable engineering properties (for non-engineering use only) Lowestoft Formation (27%) comprises glacial till with favourable engineering properties.	**POST SURVEY** Assuming Borrow Pit = 4m depth Topsoil = 6% Potential Class 4 Landscape Fill: Made Ground = 3% Glaciolacustrine Deposits = 4% Potential Class 1 and 2 Engineering Fill: Lowestoft Formation = 87% Glaciofluvial Deposits = <1% NOTE. Some material may be found to be unacceptable (Class U1A/U1B) - an allowance for unacceptable material has not been applied to the above assessment. However, a provisional allowance of 5 to 10% could be considered.	

	Criterion	Borrow Pit I (16)	Borrow Pit J (17)	Borrow Pit K (18)	Borrow Pit L	
		Assuming Borrow Pit = 17m depth Topsoil = 2% Potential Class 4 Landscape Fill: Made Ground = 1% Head Deposits = 1% Glaciolacustrine Deposits = 13% Potential Class 1 and 2 Engineering Fill: River Terrace Deposits = 5% includes (Cohesive) =1% (Granular) = 4% Lowestoft Formation = 29% Glaciofluvial Deposits = 15% includes (Cohesive) = 0% (Granular) = 15% London Clay Formation = 34% NOTE. Some material may be found to be unacceptable (Class U1A/U1B) - an allowance for unacceptable material has not been applied to the above assessment. However, a provisional allowance of 10% to 15% could be considered.				
	Existing utilities	**DESKTOP STUDY** Potential service (Rail cable) and high voltage overhead electrical cables south west of the proposed borrow pit site.	**DESKTOP STUDY** Potential high voltage overhead electrical cables and water utilities north and north-west of the proposed borrow pit site.	**DESKTOP STUDY** Free from existing utilities.	**DESKTOP STUDY** Free from existing utilities.	
		POST SURVEY Overhead 11kV cables run along the north-western and northern edge of the borrow pit area as well as cutting north to south through the southern third the borrow pit area. A buried water pipe runs along the southern boundary towards the existing A12 northbound verge. These will either require an exclusion zone which sterilises borrow pit area or will need to be diverted.	**POST SURVEY** Overhead 11kV cables run along the south-western edge of the borrow pit area. A buried water pipe runs along the north-eastern edge of the borrow pit area. These will require an exclusion zone which sterilises borrow pit area.	**POST SURVEY** Free from existing utilities.	**POST SURVEY** Predominantly still perceived to be free from existing utilities, however it is noted that the landowner owns a private buried water main in the surrounding fields which may be present here as well.	
	Contaminated Land	**DESKTOP STUDY** Potential source from nearby fuel station, which would be impacted by dewatering activities.	**DESKTOP STUDY** Potential receptors identified, which would be impacted by dewatering activities.	**DESKTOP STUDY** Potential receptors identified, which would be impacted by dewatering activities.	**DESKTOP STUDY** Potential contamination from nearby disturbed ground.	
		POST SURVEY No soil contamination identified. Uncommon (1 out of 4) for samples to exceed soil leachate criteria. Groundwater quality is poor (exceedances for 6 analytes). Pre-treatment of pumped groundwater prior to discharge may be required - subject to discharge consent requirements. A Detailed Quantitative Risk Assessment may be required to assess the risk from the potential contamination sources surrounding site (fuel filling	**POST SURVEY** Suspected Asbestos Containing Materials (ACM) in the form of asbestos cement sheet and other waste materials were encountered within 1.0m below existing ground level in an infilled area located in the southern area of the borrow pit. Uncommon (3 out of 13) for samples to exceed soil leachate criteria. Groundwater quality is moderate (exceedance for 1 analyte only). Proposals are to not disturb the infilled area containing ACM. Pre-treatment of	**POST SURVEY** No ground investigation undertaken at this location. Previous assumption still applies. Potential receptors identified, which would be impacted by dewatering activities.	**POST SURVEY** No soil contamination identified. Uncommon (1 out of 6) for samples to exceed soil leachate criteria. Groundwater quality is moderate (4 different analytes exceeding). Pre-treatment of pumped groundwater prior to discharge unlikely to be required - subject to discharge consent requirements.	

	Criterion	Borrow Pit I (16)	Borrow Pit J (17)	Borrow Pit K (18)	Borrow Pit L	
		station 120m south). Further additional monitoring / testing may be required.	pumped groundwater prior to discharge unlikely to be required - subject to discharge consent requirements.			
	Summary	**POST SURVEY** Due to the depth of excavation, high groundwater levels and the presence of permeable materials at depth, a groundwater control system will likely be required, and drawdown impacts may extend off-site which may need to be mitigated. Pre-treatment of pumped groundwater prior to discharge may be required - subject to discharge consent requirements. A Detailed Quantitative Risk Assessment may be required to assess the risk from the potential contamination sources surrounding site (fuel filling station 120m south). Further additional monitoring / testing may be required. Approximately 78% (12.0m deep pit) or 83% (17.0m deep pit) Class 1/2 material anticipated. A provisional allowance of 10% and 10 to 15% respectively for potentially unacceptable material could be considered. The remaining material is anticipated to consist of Class 4 material.	**POST SURVEY** Due to the depth of excavation, high groundwater levels and the presence of permeable materials, a groundwater control system will likely be required, and drawdown impacts may extend off-site which may need to be mitigated. Proposals are to not disturb the infilled area containing ACM. Pre-treatment of pumped groundwater prior to discharge unlikely to be required - subject to discharge consent requirements. Approximately 82% Class 1/2 material anticipated. A provisional allowance of 10 to 20% for potentially unacceptable material could be considered. The remaining material is anticipated to consist of Class 4 material.	**POST SURVEY** Based on a nearby historical British Geological Society borehole log, groundwater may potentially be quite high, approximately 0.8m below existing ground level. No GI undertaken to determine land / groundwater contamination or construction material availability.	**POST SURVEY** Groundwater is not expected to be encountered within the excavation based on groundwater levels recorded in site investigation. Pre-treatment of pumped groundwater prior to discharge unlikely to be required - subject to discharge consent requirements. Approximately 87% Class 1/2 material anticipated. A provisional allowance of 5 to 10% for potentially unacceptable material could be considered. The remaining material is anticipated to consist of Class 4 material.	

	Criterion	Borrow Pit I (16)	Borrow Pit J (17)	Borrow Pit K (18)	Borrow Pit L	
Construction	Location relative to area of fill	**DESKTOP STUDY** Proposed location is approximately central to Rivenhall End Bypass.	**DESKTOP STUDY** Proposed location is good for serving Rivenhall End Bypass and Marks Tey Bypass. Approximately 1.2km from junction 23 and 1km from junction 24.	**DESKTOP STUDY** Adjacent to junction 24 which requires fill. [NB – assessment carried out before junction 24 was relocated to current proposed location]	**DESKTOP STUDY** Proposed location is approximately 700m north of the A12 at Junction 21 where much of the imported fill is required for the junction 19 to 21 scheme. Borrow Pit L is north of the Great Eastern Mainline railway.	
		POST SURVEY Approximately 80m from existing A12 at nearest point. Approximately 1.6km to junction 22 location where fill is required.	**POST SURVEY** Approximately 50m from existing A12 at nearest point. Change in material supply requirement from general fill to construction aggregates for full scheme means this borrow pit should ideally have good access to the strategic road network and be centrally placed on the scheme. Borrow pit is located within 2km of scheme centre, when J19 is ignored, which will be better supplied by material import.	**POST SURVEY** The general fill requirement in the local area has been designed out. Next nearest fill area is approximately 6km away. If the granular material quantities could be further confirmed the borrow pit may be useful for construction aggregates. Its location is approximately 3km from the centre of the scheme.	**POST SURVEY** North of the Great Eastern Mainline railway. Approximately 500m from existing A12. Approximately 900m from junction 21 where fill is required.	
	Accessibility (haul route)	**DESKTOP STUDY** Borrow pit location is north of the existing A12 but with good access to proposed A12, adjacent to highway boundary.	**DESKTOP STUDY** Good access to existing A12, with several options including a layby on the southbound carriageway. Potential connections via off-road haul route to run off-road dump trucks to bypasses. Road crossing of the B1023 would be required.	**DESKTOP STUDY** Borrow pit has good access due to its location adjacent to junction 24 where fill needed. [NB – assessment carried out before junction 24 was relocated to current proposed location]	**DESKTOP STUDY** Located north of the Great Eastern Mainline railway. Job's Bridge is an existing structure over the railway but initial investigations show that it has a 3t weight limit currently. Extensive works would be required to strengthen this structure to take estimated 60t loaded trucks. Alternative access using temporary Bailey Bridges are a more likely option. However, the time required to book railway possession for installation (potentially 80 weeks) could constrain the construction programme. Alternative route is across land to Terling Road and through Hatfield Peverel which is undesirable.	
		POST SURVEY Off road access would require watercourse, strategic road network and local road network crossing points. The shortest haul distance is between 1.5-2km. Access can be made to the strategic road network via a temporary access road approximately 1km in length to the existing junction 23.	**POST SURVEY** Off-road haul routes with local road network and watercourse crossings are possible to approximately 50% of the scheme length. Access to the strategic road network (for the remaining 50% of scheme) can be made via very short temporary access road.	**POST SURVEY** Off road route to the next nearest general fill area is not possible. An off-road haul route for construction aggregates would be possible to the east of the borrow pit location. Access for unsuitable material from the strategic road network can be made via the existing junction 24 and an approximate 500m long temporary access road.	**POST SURVEY** Off road access would require a temporary railway crossing. Job's Bridge is an existing structure over the railway but initial investigations show that it has a 3t weight limit making it unsuitable for off-road dumpers. The shortest off road haul distance is between 0.5-1km. Otherwise, access is via temporary access roads across neighbouring fields and the local road network over Station Road bridge through Hatfield Peverel. (Road bridge to be demolished and replaced as part of scheme, so there will be potential programme issues to overcome)	
	Borrow pit management e.g. dewatering / material drying and processing	**DESKTOP STUDY** Historical groundwater record shows approximately 6.1m below ground level, but as a worst case assumption, say ground water level is 2.5m below ground level. Dewatering will be required during construction with	**DESKTOP STUDY** No historical groundwater data is available. Following geotechnical assumption that groundwater level is 2.5m below ground level, dewatering will be required during construction with phased work areas and a	**DESKTOP STUDY** A potentially high-water table is expected near the Domsey Brook. Dewatering is anticipated during construction with phased work areas and a requirement for discharging to local water courses.	**DESKTOP STUDY** Following geotechnical assumption that groundwater level is 2.5m below ground level, dewatering may be required during construction however this borrow pit is located on higher ground than Borrow Pits B and C.	

	Criterion	Borrow Pit I (16)	Borrow Pit J (17)	Borrow Pit K (18)	Borrow Pit L	
		phased work areas and a requirement for discharging to local water courses.	requirement for discharging to local water courses.			
		POST SURVEY Groundwater management is expected and is not complex. Land plot size can cater for material management with a phased approach to excavation.	**POST SURVEY** Groundwater management is expected and is not complex. Land plot size can cater for material management with a phased approach to excavation.	**POST SURVEY** The potentially high ground water table expected near the Domsey Brook suggests groundwater management will be expected. The land plot size limits space available for material management and increase the complexity of operations.	**POST SURVEY** Land plot size suitable for material management.	
	Summary	**POST SURVEY** Borrow pit location is not ideal regarding intended fill area. Access to and from borrow pit presents challenges, however there is sufficient space for the management of borrow pit activities. The use of a temporary bridge for off road haul is not necessarily considered cost effective but will provide programme benefits as well as reducing construction traffic to the strategic road network.	**POST SURVEY** Borrow pit location and access to the strategic road network is considered to be good in regard to intended fill areas. There is sufficient space for the management of borrow pit activities.	**POST SURVEY** Borrow pit is too far from general fill locations, but has potential for off-road access for construction aggregates to the junction 24 to 25 bypass section. Access to the strategic road network is possible, but only in the northbound direction at the existing junction 24, which would have a significant length of 'turn-around' time/distance for road lorries. The absence of geotechnical surveys places a large amount of risk/uncertainty on this borrow pit location.	**POST SURVEY** The distance of the borrow pit to the intended general fill area is reasonable, provided an off-road haul route is used with the use of a temporary bridge over the railway.	

	Criterion	Borrow Pit I (16)	Borrow Pit J (17)	Borrow Pit K (18)	Borrow Pit L	
Environment	Air Quality	**DESKTOP STUDY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	**DESKTOP STUDY** Not located within 50m or 200m of any existing residential properties. Standard good construction practices are likely to reduce adverse air quality impacts to acceptable levels.	**DESKTOP STUDY** Not located within 200m or 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse air quality impacts to acceptable levels.	.
		POST SURVEY Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	**POST SURVEY** Located within 200m of at least one residential property. Therefore, there is the potential for temporary adverse air quality impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality impacts on these properties to acceptable levels.	**POST SURVEY** Not located within 50m or 200m of any existing residential properties. Standard good construction practices are likely to reduce adverse air quality impacts to acceptable levels.	**POST SURVEY** Not located within 200m or 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse air quality impacts to acceptable levels.	
	Cultural Heritage	**DESKTOP STUDY** Potential to remove archaeological deposits located within footprint. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels (e.g. geophysical survey and/or trial trenching followed by preservation in situ, excavation or recording through watching brief).	**DESKTOP STUDY** Encloses the site of a nationally important find uncovered in 1988. Potential to remove archaeological deposits located within footprint. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels (e.g. geophysical survey and/or trial trenching followed by preservation in situ, excavation or recording through watching brief).	**DESKTOP STUDY** No potential cultural heritage impacts identified from existing records.	**DESKTOP STUDY** No potential cultural heritage impacts identified from existing records.	
		POST SURVEY Cropmarks on HER in north-east quarter of area. Geophysical survey identified a group of discrete anomalies and pit-like anomalies in south east corner and interpreted as possible archaeology. Archaeological excavation in north-east quarter likely required, but extent of mitigation area will be defined on basis of trial trenching results.	**POST SURVEY** Three discreet areas of archaeological remains which are potentially complex (although one is immediately to the south of scheme alignment) identified through geophysical survey also cropmark areas and various assets also recorded on the HER. Trial trenching has confirmed that the extent of mitigation covers approximately 22% of the borrow pit area. Mitigation will include archaeological investigation.	**POST SURVEY** No potential cultural heritage impacts identified from existing records.	**POST SURVEY** No survey undertaken.	
	Landscape and Visual	**DESKTOP STUDY** Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.	**DESKTOP STUDY** Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.	**DESKTOP STUDY** Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.	**DESKTOP STUDY** Likely to be visible from PRoWs and one or more sensitive visual receptors, including residential properties.	
		POST SURVEY Largely open arable land with potential to retain hedgerow field boundaries. Woodland south of the site restricts views from Rivenhall End. Site is contained by railway to north and A12 to the south. Few visual	**POST SURVEY** Largely open arable land with potential to retain some existing vegetation including potential veteran and potential ancient trees. Few visual receptors as trees and vegetation provide screening for surrounding properties	**POST SURVEY** Open arable land with likely views across borrow pit from PRoW to the north. Site well contained by A12 to the west, vegetation along Domsey Brook to the south and vegetation along boundary to Prested Hall	**POST SURVEY** Largely open arable land with potential to retain hedgerow boundaries. Site contained by well vegetated railway to the south and Jobs Wood to the east. Few visual receptors, although views across borrow pit likely	

	Criterion	Borrow Pit I (16)	Borrow Pit J (17)	Borrow Pit K (18)	Borrow Pit L	
		receptors, although there would be close views across borrow pit from users of PRoW which cross the site.	including Inworth Hall (grade II listed), although there would be close views across borrow pit from users of PRoW which cross the site and run along the eastern boundary.	grounds to the east. Potential to affect the setting of Prested Hall, although western boundary to Prested Hall grounds forms a strong visual buffer between Prested Hall and borrow pit site.	from PRoW along western boundary and there would be potential views from Termitts Farm to the north.	
	Biodiversity	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species that may extend well beyond the site boundary. The extent of mitigation for these impacts is unknown (may need to be tested and quantified) but is expected to be possible with acceptance by consultees.	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species that may extend well beyond the site boundary. The extent of mitigation for these impacts is unknown (may need to be tested and quantified) but is expected to be possible with acceptance by consultees.	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species that may extend well beyond the site boundary. The extent of mitigation for these impacts is unknown (may need to be tested and quantified) but is expected to be possible with acceptance by consultees.	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species. These impacts are expected to be relatively localised. However, mitigation beyond standard good construction practice is likely to be required to reduce the impacts to acceptable levels. Without mitigation these impacts would be long term.	
		POST SURVEY Main badger sett found. The sett would be destroyed as part of scheme works and will need to be closed under licence. An artificial sett must be constructed within 500m of the original sett in connected habitat.	**POST SURVEY** Outlier badger sett found and there are a number of mature trees within the borrow pit footprint.	**POST SURVEY** Adjacent to an outlier badger sett found.	**POST SURVEY** Adjacent to an outlier badger sett found.	
	Noise and Vibration	**DESKTOP STUDY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 300m of at least one residential property. In addition, located within 300m of a church. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	**DESKTOP STUDY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse impacts to acceptable levels.	**DESKTOP STUDY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse impacts to acceptable levels.	
		POST SURVEY Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	**POST SURVEY** Located within 300m of at least one residential property. In addition, located within 300m of a church. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts on these properties to acceptable levels.	**POST SURVEY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse impacts to acceptable levels.	**POST SURVEY** Located within 300m of at least one residential property. Therefore, there is the potential for temporary adverse noise and vibration impacts on sensitive receptors. Not located within 50m of any existing residential properties. Standard good construction practices are likely to reduce adverse impacts to acceptable levels.	
	People and Health	**DESKTOP STUDY** This borrow pit severs PROW 105_45 & 46, whilst divertable via Henry Dixon Road this would be a significant diversion. The extents of the borrow pit do not appear to sever a connection to PROW 105_43 via what looks like a rail crossing provision facility. Maintaining this access will be more of a priority. Mitigation from non-motorised users and borrow pit required. It is assumed the haul route will have direct access to the A12 which would	**DESKTOP STUDY** This location completely severs PROW 92_25 and 92_20, with 92_41 being parallel to the northern extents. This is a location where non-motorised users are afforded a crossing opportunity of the A12 via Ewell Hall Chase. Diversions would be substantial.	**DESKTOP STUDY** PROW 78_18 is to the north of the pit extents and this route also crosses the A12 via an overbridge which would need to remain accessible. Mitigation from non-motorised users and borrow pit required. It is assumed that the haul route would have direct access to the A12.	**DESKTOP STUDY** PROW 90_2 is parallel to the western extents of the pit. Mitigation from non-motorised users and borrow pit required. As for Borrow Pit B (05) and Borrow Pit C (06) the haul route may have issues.	

	Criterion	Borrow Pit I (16)	Borrow Pit J (17)	Borrow Pit K (18)	Borrow Pit L	
		affect the existing A12 footway/cycleway and could cause further issues.				
		POST SURVEY This borrow pit severs PROW 105_45 & 46, whilst divertable via Henry Dixon Road this would be a significant diversion. The extents of the borrow pit do not appear to sever a connection to PROW 105_43 via what looks like a rail crossing provision facility. Maintaining this access will be more of a priority. Mitigation from non-motorised users and borrow pit required. It is assumed the haul route will have direct access to the A12 which would affect the existing A12 footway/cycleway and could cause further issues.	**POST SURVEY** This location completely severs PROW 92_25. This is a location where non-motorised users are afforded a crossing opportunity of the A12 via Ewell Hall Chase. Diversions would be substantial. Mitigation will include keeping the PROW open during construction.	**POST SURVEY** PROW 78_18 is to the north of the pit extents and this route also crosses the A12 via an overbridge which would need to remain accessible. Mitigation from non-motorised users and borrow pit required. It is assumed that the haul route would have direct access to the A12.	**POST SURVEY** PROW 90_2 is parallel to the western extents of the pit. Mitigation from non-motorised users and borrow pit required. The haul route may have issues.	
	Road Drainage and the Water Environment	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary.	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary.	**DESKTOP STUDY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary. This borrow pit is located within Flood Zone 2 and/or Flood Zone 3. This may present opportunities for flood mitigation as part of the restoration plan.	**DESKTOP STUDY** Potential for significant adverse impacts on one or more species. These impacts are expected to be relatively localised. However, mitigation beyond standard good construction practice is likely to be required to reduce the impacts to acceptable levels. Without mitigation these impacts would be long term.	
		POST SURVEY Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Minorly within surface water flood plain. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary.	**POST SURVEY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Some surface water flowpaths across the area. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary.	**POST SURVEY** Potential for adverse impacts on water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice may be required to reduce the impacts to acceptable levels. With this mitigation in place, the impacts are not expected to have significant or irreversible impacts beyond the site boundary. This borrow pit is located within Flood Zone 2 and/or Flood Zone 3. This may present opportunities for flood mitigation as part of the restoration plan.	**POST SURVEY** Potential for significant adverse impacts on one or more species. These impacts are expected to be relatively localised. However, mitigation beyond standard good construction practice is likely to be required to reduce the impacts to acceptable levels. Without mitigation these impacts would be long term.	
	Summary	**POST SURVEY** Located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse air quality and noise and vibration impacts on these properties to acceptable levels. Potential significant adverse impacts to:	**POST SURVEY** Encloses the site of a nationally important find uncovered in 1988 and located within 50m of one or more residential properties. Additional mitigation measures may be required to reduce the adverse impacts to acceptable levels. Potential significant adverse impacts to:	**POST SURVEY** There is no potential for cultural heritage impacts from existing records and impacts to population and health is considered low. The borrow pit is not located within 50m of any existing residential or commercial properties. Standard good construction practices are likely to reduce adverse air quality and noise and	**DESKTOP STUDY** There is no potential for cultural heritage impacts from existing records. The borrow pit is not located within 50m of any existing residential or commercial properties. Standard good construction practices are likely to reduce adverse air quality and noise and vibration impacts to acceptable levels.	

	Criterion	Borrow Pit I (16)	Borrow Pit J (17)	Borrow Pit K (18)	Borrow Pit L	
		- the removal of archaeological deposits located within the footprint - views from PRoW and sensitive visual receptors - badger, an outlier sett found within the boundary - the removal of best and most versatile agricultural land - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels.	- the removal of archaeological deposits located within the footprint - views from PRoWs and sensitive visual receptors - badger, an outlier sett found within the boundary - the removal of best and most versatile agricultural land - PRoW with substantial diversions required - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels.	vibration impacts to acceptable levels. Potential significant adverse impacts to: - views from Prested Hall, PRoW and sensitive visual receptors - badger, an outlier sett found adjacent to the borrow pit boundary - the removal of best and most versatile agricultural land - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels. This borrow pit is located within Flood Zone 2 and/or Flood Zone 3 and this may present opportunities for flood mitigation as part of the restoration plan.	Potential significant adverse impacts to: - views from PRoW and sensitive visual receptors - badger, an outlier sett found adjacent to the borrow pit boundary - the removal of best and most versatile agricultural land - water quality, fluvial geomorphology and/or pluvial flood risk. Mitigation beyond standard good construction practice would be required to reduce the impacts to acceptable levels.	

	Criterion	Borrow Pit (Previous location name)				
		Borrow Pit I (16)	**Borrow Pit J (17)**	**Borrow Pit K (18)**	**Borrow Pit L**	
Planning	**Planning policy** (including local plans, minerals plan and National Networks National Policy Statement (Department for Transport, 2014))	**DESKTOP STUDY** The entirety of Borrow Pit 16 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**DESKTOP STUDY** The entirety of Borrow Pit 17 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**DESKTOP STUDY** The entirety of Borrow Pit 18 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**DESKTOP STUDY** The entirety of Borrow Pit L is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	
		POST SURVEY The entirety of Borrow Pit 16 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**POST SURVEY** The entirety of Borrow Pit 17 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**POST SURVEY** The entirety of Borrow Pit 18 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	**POST SURVEY** The entirety of Borrow Pit 18 is located within Essex Mineral Safeguarded Area – Sand and Gravel as designated in the Essex Minerals Local Plan (2014).	
	Planning applications and consented schemes	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 16 within the five-year monitoring period.	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 17 within the five-year monitoring period.	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit 18 within the five-year monitoring period.	**DESKTOP STUDY** No planning applications were identified within the boundary of Borrow Pit L within the five-year monitoring period.	
		POST SURVEY No planning applications were identified within the boundary of Borrow Pit 16 within the five-year monitoring period.	**POST SURVEY** No planning applications were identified within the boundary of Borrow Pit 17 within the five-year monitoring period.	**POST SURVEY** No planning applications were identified within the boundary of Borrow Pit 18 within the five-year monitoring period.	**POST SURVEY** No planning applications were identified within the boundary of Borrow Pit L within the five-year monitoring period.	
	Summary	**POST SURVEY** - No planning applications identified. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].	**POST SURVEY** - No planning applications identified. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].	**POST STUDY** - Potential issues could be encountered with land acquisition and area. The area has the potential to become open space to serve Braintree District Council development allocation FEER233 to the north of the A12. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].	**DESKTOP SURVEY** - No planning applications identified. - Policy S8 of the Essex Minerals Local Plan (2014) requires that a non-mineral proposal located within an MSA which exceeds 5ha must be supported by a Minerals Resource Assessment to establish the existence, or otherwise, of a resource capable of having economic importance. This will ascertain whether there is an opportunity for the prior extraction of that material to avoid the sterilisation of the resource, as required by the National Planning Policy Framework (paragraph 210). This requirement has been met through the submission of a Mineral Resource Assessment as an appendix to the Environmental Statement [APP-144].	

	Criterion	Borrow Pit (Previous location name)				
		Borrow Pit I (16)	**Borrow Pit J (17)**	**Borrow Pit K (18)**	**Borrow Pit L**	
Existing Land Use	**The land use**	**DESKTOP STUDY** Arable agricultural land	**DESKTOP STUDY** Arable agricultural land	**DESKTOP STUDY** Arable agricultural land	**DESKTOP STUDY** Arable agricultural land	
		POST SURVEY Arable agricultural land	**POST SURVEY** Arable agricultural land	**POST SURVEY** Arable agricultural land	**POST SURVEY** Arable agricultural land	
	Identify who owns the land (is it a public body or private landowner?)	**DESKTOP STUDY** Private landowner	**DESKTOP STUDY** Private landowner and unregistered Land	**DESKTOP STUDY** Special category land	**DESKTOP STUDY** Private landowner	
		POST SURVEY Private landowner	**POST SURVEY** Private landowner and unregistered Land	**POST SURVEY** Special category land	**POST SURVEY** Private landowner	
	The percentage of the landholding affected (i.e. how much land is retained?)	**DESKTOP STUDY** 7%	**DESKTOP STUDY** 25%	**DESKTOP STUDY** 15%	**DESKTOP STUDY** Land plot forms part of a considerable acreage across Essex and Suffolk	
		POST SURVEY 7%	**POST SURVEY** 25%	**POST SURVEY** 15%	**POST SURVEY** Land plot forms part of a considerable acreage across Essex and Suffolk	
	Summary	**POST SURVEY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation. The level of impact to the landowner is deemed to be low.	**POST SURVEY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation. The level of impact to the landowner is deemed to be moderate.	**POST SURVEY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the land is still to be determined. The land ownership status means that compulsory acquisition powers could not be exercised in the event agreement cannot be reached by voluntary negotiation. The level of impact to the landowner is deemed to be low.	**POST SURVEY** Extant land use is suitable regarding the construction of borrow pits. The value and quality of the agricultural land is still to be determined. The land ownership satisfies the need to exercise compulsory acquisition powers in the event agreement cannot be reached by voluntary negotiation. The level of impact to the landowner is deemed to be low.	