

A47 North Tuddenham to Easton Dualling

Scheme Number: TR010038

Volume 6

6.3 Environmental Statement Appendices

Appendix 10.3 - Mineral impact assessment

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed
Forms and Procedure) Regulations 2009

March 2021

Infrastructure Planning

Planning Act 2008

**The Infrastructure Planning
(Applications: Prescribed Forms and
Procedure) Regulations 2009**

The A47 North Tuddenham to Easton
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ENVIRONMENTAL STATEMENT APPENDICES
Appendix 10.3 - Mineral impact assessment

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Appendix 10.3 – Minerals impact assessment

10.1. Introduction

Minerals safeguarding policy

Legislative context

10.1.1. A summary of the legislative context of the Proposed Scheme and the requirement for an Environmental Impact Assessment (EIA) is provided in Section 1.4.1 to 1.4.8 of Chapter 1 (Introduction) of this Environmental Statement (ES) (**TR010038/APP/6.1**).

National planning policy context

10.1.2. A general summary of the national planning policy context is provided in Section 1.4.9 to 1.4.14 of Chapter 1 (Introduction) of this ES (**TR010038/APP/6.1**).

10.1.3. The *National Policy Statements for National Networks (NPS NN)* set out the need for, and Government's policies to deliver, development of nationally significant infrastructure projects on the national road and rail networks in England. This includes requirements to consider sustainability within the development.

10.1.4. Consideration of mineral resources is included in paragraph 5.169 which states 'Applicants should safeguard any mineral resources on the proposed site as far as possible' and Paragraph 5.182 which states 'Where a proposed development has an impact on a mineral safeguarding area, the Secretary of State should ensure that the applicant has put forward appropriate mitigation measures to safeguard mineral resources'.

10.1.5. The National Planning Policy Framework (NPPF) was revised in February 2019. Section 17 of the NPPF outlines the planning policy mechanisms required to facilitate the sustainable use of minerals. The NPPF states that planning policies should '*safeguard mineral resources by defining mineral safeguarding areas, and adopt appropriate policies so that known locations of specific minerals resources of local and national importance are not sterilised by non-mineral development where this should be avoided*' and '*set out policies to encourage the prior extraction of minerals, where practical and environmentally feasible, if it is necessary for non-mineral development take place*'.

Local Planning Policy

10.1.6. The Norfolk Minerals and Waste Development Framework was adopted on 1 January 2010 and will run for a 17 year period until 31 December 2026 (in line with Planning Policy Statement 12: Local Spatial Planning (PPS12)).

10.1.7. The Minerals and Waste Development Framework comprises three mineral and waste planning policy documents and a policies map:

- Core Strategy and Minerals and Waste Development Management Policies Development Plan Document 2010-2026 (adopted September 2011)
- Minerals Site Specific Allocations Development Plan Document (adopted October 2013, amendments adopted December 2017)
- Waste Site Specific Allocations Development Plan Document (adopted October 2013)

10.1.8. The purpose of the Minerals and Waste Development Framework is to provide a series of policies used to plan for mineral extraction and associated development and waste management facilities in the most sustainable way in line with the Government's sustainable development strategy in Planning Policy Statement 1: Delivering Sustainable Development (PPS1).

10.1.9. The Core Strategy document sets out the spatial vision for future mineral extraction and associated development through a series of strategic objectives and policies.

10.1.10. Norfolk County Council is preparing a Norfolk Minerals and Waste Local Plan Review to consolidate the three adopted plans which form the current Minerals and Waste Framework. This review will extend the plan period to the end of 2036. It is anticipated that the adoption of the Norfolk Minerals and Waste Local Plan Review will occur by March 2022.

10.1.11. The legislative and policy framework is summarised in Section 10.3 of the ES chapter (**TR010038/APP/6.1**) and provided in Appendix 10.1 (**TR010038/APP/6.3**).

10.2. Need for the Proposed Scheme and further minerals assessment

10.2.1. The requirement for the Proposed Scheme is discussed in Chapter 2 (The Proposed Scheme) of the ES (**TR010038/APP/6.1**).

10.2.2. Highways England submitted the EIA Scoping Report (**TR010038/APP/6.5**) for the Proposed Scheme to the secretary of state in September 2019. The subsequent Scoping Opinion (**TR010038/APP/6.6**) was adopted by the Secretary of State in November 2019. Norfolk County Council were consulted as part of the EIA scoping exercise for the Proposed Scheme. Norfolk County Council identified the DCO boundary as being partly underlain by a mineral resource (sand and gravel) which is safeguarded as part of the Mineral and Waste Core Strategy and as such, the council have a duty to ensure that the mineral resources are not

needlessly sterilised. To determine whether the excavated minerals can be re-used on the Proposed Scheme, further minerals impact assessment is required.

- 10.2.3. Within the Scoping Opinion, the Inspectorate notes the consultation response from Norfolk County Council and stated that the extent to which the Proposed Development would impact mineral reserves should be assessed in the ES(**TR010038/APP/6.1**) and that the Applicant should seek to agree the approach to the assessment.

10.3. Mineral resources

- 10.3.1. The BGS 1:50,000 scale geological map indicates that sections of the Proposed Scheme are underlain by superficial deposits of sands and gravels attributed to the Sheringham Cliffs Formation (SCF), Alluvium (ALV), River Terrace Deposits (RTD), Happisburgh Glacigenic Formation (HPGL) and Lowestoft Formation (LOFT) sands and gravels (Figure 10.1) (**TR010038/APP/6.2**) which have been designated as a Mineral Safeguarding Area (MSA) as part of the adopted Norfolk Minerals and Waste Development Framework (Figure 10.2) (**TR010038/APP/6.2**).
- 10.3.2. The inclusion of land in a MSA does not necessarily mean that planning permission would be granted for mineral extraction and there may be sound planning reasons why proposals would be rejected. Designation of these areas is intended to ensure that mineral interests are taken into account at the appropriate time.
- 10.3.3. For example, circumstances may arise where it may be appropriate to undertake mineral extraction in advance of development. MPS1 (paragraph 13) states that planning authorities should encourage the prior extraction of minerals, where practicable, if it is necessary for non-mineral development to take place in MSAs.
- 10.3.4. The most recent ground investigation for the Proposed Scheme was undertaken by Soiltechnics Ltd between 2 March 2020 and 31 May 2020.
- 10.3.5. Due to programme constraints, the 2020 ground investigation (GI) was designed and scoped by Sweco to investigate the highways alignment design that was current in October 2019, prior to Design Fix B. Subsequently, the highways alignment design has been further developed meaning that certain investigation points are no longer located in optimal positions. Where possible, investigation points were actively relocated during the site works to better suit the developing design. Where it has not been possible to adequately investigate the developed design arrangement, additional targeted investigation works are proposed to be completed during the detailed design stage.

- 10.3.6. The COVID-19 pandemic impacted the scope of works and the fieldwork program considerably, beginning with the government-imposed 'lock down' from 23 March 2020.
- 10.3.7. What was programmed to be eight to ten week programme became a 24 week overall site works duration. With an aim to meet the SGAR deliverables it was requested by Sweco that Soiltechnics Ltd separate their factual report into two versions and thus adopt a phased approach to the delivery of the factual data.
- 10.3.8. This mineral impact assessment therefore considers that data included within the Soiltechnics Ltd. Factual Report 01; considered to be the 'main' issue. The remainder of the works are to be supplied as a subsequent 'supplementary' revision. The 'main' factual report comprises all exploratory holes and laboratory testing undertaken prior to the 31 May 2020 which was the agreed cut off time.
- 10.3.9. The following sections describe the principal geological relationships relevant to the Proposed Scheme.
- 10.3.10. The SCF, encountered as glaciogenic sequences of sands and gravels, was typically described as brown/grey slightly clayey slightly silty gravelly sand, mostly of flint with some other minor lithologies.
- 10.3.11. SCF has been proven to be present at the western extents of the Proposed Scheme and as a 'wedge' at the east of the Proposed Scheme near Church Lane, East Tuddenham in line with the available published mapping. It is present to a maximum depth of 13m. East of Church Lane, the SCF comprises predominantly sand with thin bands of clay and silt. SCF deposits were encountered at depths between 0.3m below ground level (bgl) and 2.75m bgl, with a maximum thickness of 12m.
- 10.3.12. ALV was recorded as both cohesive and granular soils, with varying organic content including peat. ALV was encountered at depths between existing ground level and 2m bgl, with a maximum thickness of 19.5m. The deposits were present at the River Tud and its tributaries, including the area between Mill Lane and Mooney Reclamation Yard. The ALV comprises both cohesive (clay/silt) and granular soils (silty gravelly sand/sandy gravel), with cohesive organic soils, including peat, limited to near surface locations (less than 3.0m). Within the alluvial soils, organic soils and peat were recorded locally and to a maximum thickness of 1.40m (average 0.70m).
- 10.3.13. RTD were recorded as sand and gravel to depth of between 5.7 and 9.6 mbgl. The RTD typically comprised grey or orange brown very sandy gravel or gravelly fine to coarse sand. Gravel consisted of fine to coarse flint. RTD was proven to a maximum depth of 9.6 mbgl with an average proven thickness of 2.1 m.

- 10.3.14. HPGL was rarely encountered as a yellowish-brown loose to medium dense sand and gravel recorded at depths between 0.4m bgl and 8.1m bgl, with an average thickness of 7.6m. HPGL is recorded at a discrete location to the east of Taverham Road and St Andrew's Church, and is noted to comprise very clayey, very gravelly sand to a depth of 2.3m.
- 10.3.15. Granular LOFT was recorded as loose to medium dense sand with pockets and lenses of cohesive material and soft to stiff clay, occasional silt, with pockets, lenses and lamination of sand. LOFT was recorded at depths between 0.05m bgl and 10.5m bgl, with an average thickness of 25.1m. LOFT is widespread across the route to a depth of up to 23.5m bgl, occurring directly below either topsoil, made ground, ALV and SCF deposits above HPGL, where present, and the underlying Chalk.
- 10.3.16. LOFT is described as a "chalky till" and displays a full range of grain sizes comprising clay, silt, sand and gravel that is typically clayey near the surface becoming gravelly and increasingly chalky at depth, significantly such that initially it may appear to be weathered Chalk. The formation becomes increasingly more interstratified with sands within exploratory holes located to the east of the River Tud.
- 10.3.17. Upper Lowestoft sands and gravels are typically poorer sorted and chalkier than the younger SCF sands and gravels above.

10.4. Practicability and environmental acceptability for the extraction of mineral reserves and infrastructure

- 10.4.1. Paragraph 143 of the NPPF requires Local Plans to: "Set out policies to encourage the prior extraction of minerals, where practicable and environmentally feasible, if it is necessary for non-mineral development to take place".
- 10.4.2. Constraints to prior extraction of mineral resources include:
- existing landscape features
 - designated habitats and species
 - sites of archaeological significance
 - historic buildings and their settings
 - existing sensitives developments (including residential properties)
- 10.4.3. To determine whether the above constraints would inhibit the practical prior extraction of SCF, a desktop was undertaken using GIS mapping produced the Proposed Scheme.

10.4.4. The main points arising from the assessment of environmental constraints are as follows:

Within the DCO Boundary

- No significant environmental constraints would preclude the prior extraction of the granular SCF, ALV, HPGL and LOFT within the Proposed Scheme's DCO boundary.
- The safeguarded granular SCF, HPGL and ALV intersect the Proposed Scheme in the footprints of the existing A47 road infrastructure. This precludes prior extraction as the carriageways will be retained and amalgamated into the Proposed Scheme in areas where existing carriageway will not be replaced by new dual carriageway.
- Safeguarded granular deposits are mapped in five general locations of proposed infrastructure (Figure 10.3) (**TR010038/APP/6.2**).
- Safeguarded SCF deposits are mapped in the vicinity of the of the proposed new dual carriageway and replacement access road to Poppy's Wood at location 1. Prior excavation of mapped deposits adjacent to the north of the Proposed Scheme is restricted by the presence of Poppy's Wood. The Proposed Scheme will not restrict future excavation of the larger northern portion of the mapped deposits or the smaller portion mapped to the south of the existing A47 mainline. It is anticipated that the proposed infrastructure will follow the topography of the existing A47 mainline.
- Safeguarded ALV deposits are mapped in the vicinity of Oak Farm adjacent to the current A47 carriageway (location 2 above). The existing section of A47 that crosses the mapped ALV deposits will be replaced by the proposed dual carriageway. Alluvium was not recorded in the exploratory locations within the mapped ALV deposits. Additionally, if present outside the exploratory locations, the deposits are spatially constrained to a narrow margin along the drain and as such do not represent a significant economical supply of sands and gravel.
- Safeguarded LOFT (sand and gravels) deposits are mapped in the vicinity of Mattishall Lane and parallel with the River Tud (location 3 above). Proposed infrastructure that crosses the LOFT deposits includes the link road from the existing A47 carriageway to Mattishall Lane, a section of the new dual carriageway to the south of Hockering and a local access road. The mapped deposits appear spatially limited. Prior extraction of the mapped deposits is constrained by the presence of the existing Mattishall Lane, an area of woodland and the River Tud. The presence of safeguarded LOFT, RTD and ALV in the topographic low point of this section of the proposed dual carriageway. The deposits are illustrated to be both spatially and vertically constrained. Import of material is required at this location. Prior extraction of the safeguarded deposits is not considered viable due to the location of the River Tud and residential properties along Mattishall Lane.
- Safeguarded ALV deposits are mapped in the vicinity of location 4 in the above map. A short section of the proposed new dual carriageway crosses these deposits. The ALV deposits are both spatially and vertically

constrained. It would likely not be considered economically viable to prior extract these materials. Additionally, a large quantity of materials import is required to construct this section of the proposed dual carriageway, so prior excavation of the safeguarded minerals would require greater materials import. The Proposed Scheme does not restrict extraction of the wider ALV deposits, however the presence of the River Tud, existing residential and commercial properties and restricted existing road infrastructure would likely preclude economical extraction.

- Safeguarded SCF and ALV deposits are mapped to the east of Sandy Lane/Church Lane (location 5 above). Proposed new infrastructure in this area includes a section of the new dual carriageway, slip road and local access road. This section of the proposed mainline does potentially intersect mapped SCF which extends eastwards beyond the BGS mapped area. ALV was not encountered in exploratory locations referenced in the current GIR, and the absence of deposits in locations adjacent to the mapped ALV suggest these deposits are spatially constrained. There is an overall requirement to import materials at this location and therefore there will be no excavation of the SCF or ALV (where present) deposits. Prior and future excavation of these deposits will be constrained by the presence of the existing (and proposed) road infrastructure, residential properties and the River Tud.
- Safeguarded ALV deposits are mapped in proximity to the River Tud (location 6 above). A section of the proposed new dual carriageway intersects these deposits at this location. Deposits are constrained to a narrow corridor along the River Tud. A net import of material is required at this location to raise the construction level. Prior extraction of the ALV would not be considered suitable due to the presence of the River Tud.
- Safeguarded ALV deposits and HPGL are mapped in the proximity of the proposed access road to St Andrew's church (location 7). HPGL deposits were encountered at this location during the GI and that the proposed access road will be constructed at the existing ground level. Prior and future excavation of the ALV and HPGL deposits is constrained by the presence of the River Tud, existing residential infrastructure and St Andrew's Church. Geological Long Section (Mainline) HE551489-GTY-HGT-000-DR-CE-30010 (Sheet 10 of 12) indicates that there are HPGL deposits under the proposed dual carriageway at this location. Due to the presence of overlying unsafeguarded cohesive LOFT deposits at largely greater than 1:1 ratio, it is not considered economically viable to prior excavate these deposits.
- Safeguarded SCF deposits are mapped to the east of the proposed Norwich Road Junction (location 8). The SCF deposits are limited in both vertical and spatial extent beneath the proposed dual carriageway and side roads at this location. Due to the limited extent of the mapped deposits, it is not considered to represent a significant economic source of sands and gravels.
- Safeguarded SCF deposits are mapped at the eastern extent of the Scheme (location 9). Prior and future excavation of the mapped SCF is constrained by the presence of the urban development of Easton, St Peter's Church and existing road infrastructure.

Outside the DCO boundary

- Safeguarded deposits of SCF are located to the west of the Proposed Scheme. The Proposed Scheme would pose no restriction to future extraction of this resource, however, due to the presence of farming buildings, existing road infrastructure (Trap's Lane) and commercial property (The Lodge) it is not considered likely that this safeguarded deposit would be excavated.
- Safeguarded deposits of ALV, River Terrace Deposits and LOFT (sand and gravel) are located along the River Tud corridor. The Proposed Scheme will not inherently restrict future extraction of these deposits, however, extraction may not be considered suitable due to the presence of the River Tud, farming infrastructure, existing road infrastructure and residential properties.
- Safeguarded deposits of SCF and (to a significantly lesser extent, ALV) are located to the northeast of Honingham. The Proposed Scheme will not restrict future extraction of these safeguarded deposits.
- Safeguarded deposits of SCF are located to the east of the Proposed Scheme. These significant deposits are unlikely to be excavated on a large scale due to the urban development of Easton. Extraction of these deposits is likely to be restricted to small-scale excavation during new development.

10.5. Mineral infrastructure sites

- 10.5.1. The mineral impact assessment also considers the constraints the Proposed Scheme may place on existing and proposed mineral extraction and mineral infrastructure sites.
- 10.5.2. The Norfolk County Council Adopted Revised Policies Map identifies:
- existing mineral extraction sites and mineral infrastructure
 - existing mineral sites and mineral infrastructure consultation area
 - mineral extraction site specific allocation or consultation area for mineral site specific allocations and their indicative access routes
- 10.5.3. The Revised Policies map identifies an existing mineral extraction site adjacent to the north of the A47 in Easton (outside of the Proposed Scheme's construction boundary). This mineral extraction site extends eastwards to the CEMEX Costessey Quarry and Longdell Recycling centre located in Longwater, to the east of Easton. Direct access to and from this mineral extraction site will not be impeded by the Proposed Scheme. Access may be temporarily restricted during the construction of the Proposed Scheme, however it is concluded that the Proposed Scheme will not unduly restrict existing and proposed mineral operations within the county long-term.

10.6. Policy CS16 Test: Safeguarding mineral and waste sites and mineral resources

- 10.6.1. This section examines the degree to which the Proposed Scheme satisfies the test set out in Policy CS16 of the Norfolk Minerals and Waste Development Framework Core Strategy and Minerals and Waste Development Management Policies Development Plan Document (2010-2026) (published 2011).
- 10.6.2. Policy CS16 states that Norfolk County Council will safeguard existing, permitted and allocated mineral extraction and associated development, which is currently active, has planning permission and is an allocated site.
- 10.6.3. Norfolk County Council will oppose development proposals which would prevent or prejudice the use of safeguarded sites unless suitable alternative provision is made. The Policy cites paragraph 13 of Minerals Policy Statement 1: planning and minerals which *'cautions against proven mineral resources being 'needlessly' sterilised by non-mineral development'*.
- 10.6.4. Although no further definition of 'needlessly sterilised' is provided within the Council's Norfolk Minerals and Waste Development Framework, it can be assumed that this would include excavation and disposal of the safeguarded mineral resource, reduced access to safeguarded resources through development, proximal sterilisation and encroachment of existing development onto safeguarded resources.

Re-use suitability assessment

- 10.6.5. Anticipated material volumes provided below are approximate and have been based solely on the 2020 Soiltechnics GI data where available. Cut and fill volumes generated from the 3D highways model have been interrogated with geological data for each alignment string to determine the relative percentage of excavated material derived from each formation. Preliminary earthworks volumes provided here only refer to the main works and do not include excavations for drainage, attenuation ponds, WCH routes or structures.
- 10.6.6. The sequence of deposits encountered within the Proposed Scheme vary, dependent on the chainage, owing to the geo-spatial distribution and variable thicknesses of the various superficial deposits. Ground conditions have proven to vary over a short distance laterally, particularly where the proposed Scheme alignment is intersected by natural drainage channels reflecting the variable and interbedded nature of the glacial lithological units, in particular the Lowestoft Formation. Given the variability of the superficial deposits encountered on the scheme, there is potential for the assumed fill classes discussed below to differ upon bulk excavation and further material testing.

- 10.6.7. Preliminary reuse of site-won superficial deposits in the works has been assessed in accordance with the Manual of Contract Documents for Highways Works Volume 1- Specification for Highway Works Series 600 (SHW Series 600). General earthworks materials are initially classified by virtue of grading, in accordance with the SHW Series 600, into Class 1 or Class 2 material. Class 1 material has less than 15% fines (defined as material finer than or passing a 63µm mesh) and Class 2 has more than 15% material passing the 63µm sieve. The respective Particle Size Distribution (PSD) plots for the relevant superficial deposits are attached.
- 10.6.8. It should be noted that a full assessment of re-use for the superficial deposits above has not been carried out at this time (to be assessed at PCF Stage 5), particularly for those materials that will likely classify as Class 2A/2B. Here, the reusability of material will depend on a number of other material characteristics beyond grading, such as shear strength, moisture content and condition upon excavation. However, it is envisaged that acceptability limits for Series 600 fill classes will be set as wide as possible to maximise re-use on this scheme, and as much material as practicable will be reused as general embankment fill. Any material falling outside acceptability limits could potentially be treated for use as Class 1/ Class 2 or alternatively used for landscaping fill (Class 4).

Alluvium

- 10.6.9. Alluvium where encountered across the Proposed Scheme typically comprises mixed cohesive and granular deposits, ranging from soft to firm (occasionally stiff) sandy slightly gravelly CLAY, to, loose to medium dense slightly clayey fine to coarse SAND.
- 10.6.10. PSD analysis undertaken on 29No samples of both cohesive and granular alluvium suggests the majority of the alluvium sampled (approx. 60%) has a fines content >15% so would only meet the requirements for Class 2A/2B fill in accordance with Table 6/2 of SHW Series 600. The remaining ~40% would likely meet the requirements for Class 1A/1B fill. Based on an assumed total excavation in alluvium of 4,450m³ across the scheme, the volumes of Class 1 and Class 2 fill likely to be available for reuse are in the region of 2,760m³ and 1,690m³ respectively (pending other acceptability criteria are met).

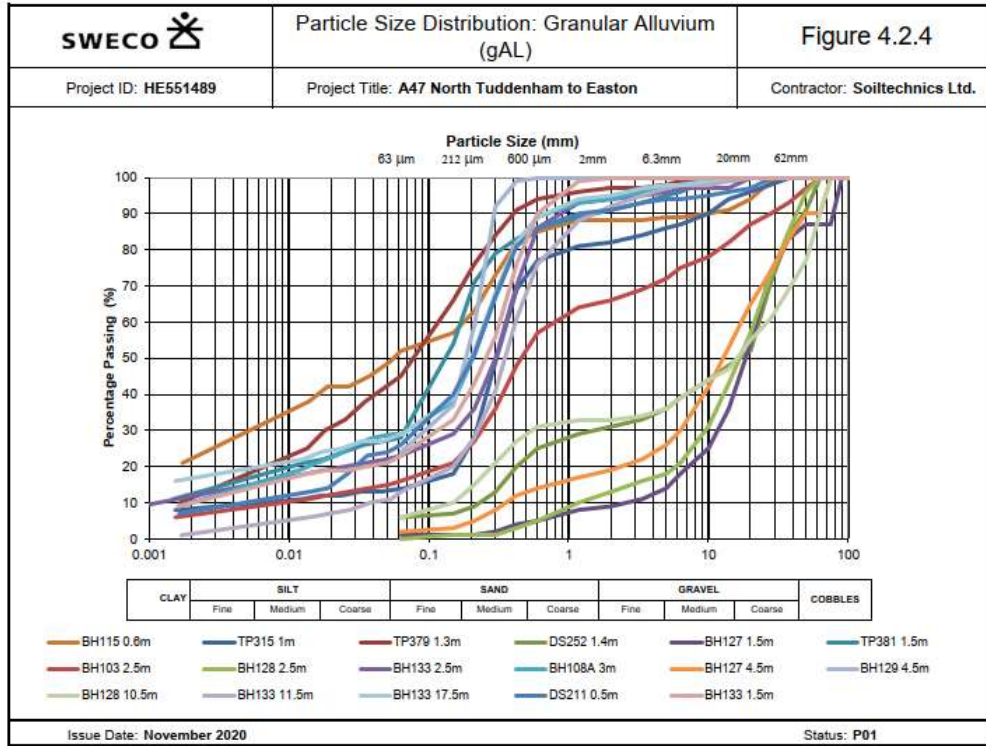


Figure 1 PSD distribution of granular alluvium

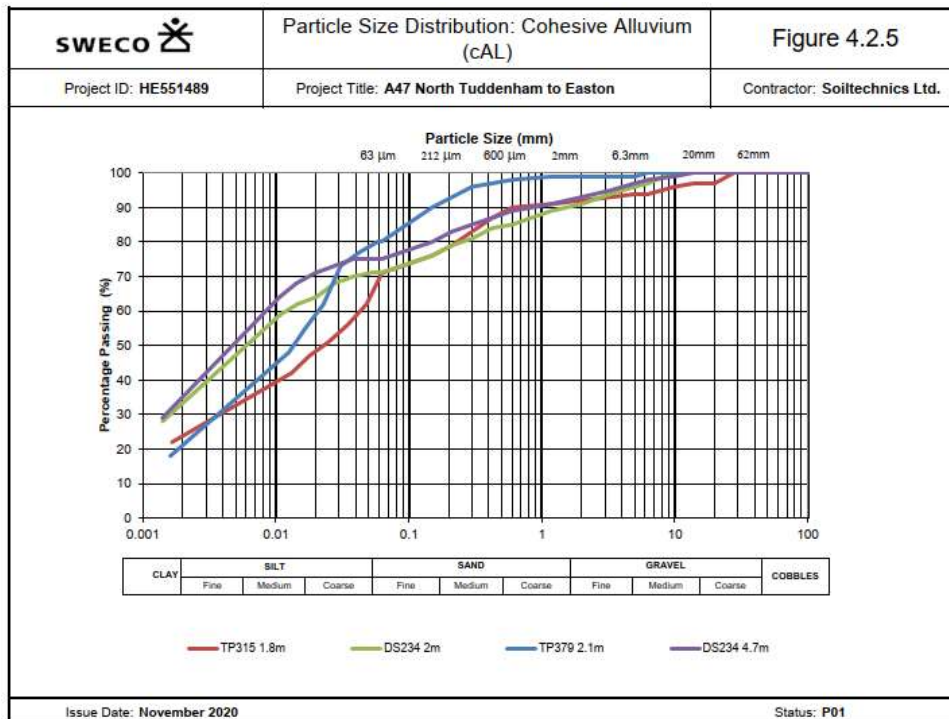


Figure 2 PSD distribution of cohesive alluvium

Sheringham Cliffs Formation

- 10.6.11. Soils of the Sheringham Cliffs Formation (SMCL) have been proven at the western extents of the Proposed Scheme and as a 'wedge' at the east of the Scheme near Church Lane. The SMCL deposits encountered during the 2020 GI were predominantly granular, however localised cohesive deposits were also noted.
- 10.6.12. The PSD plot for SMCL illustrates a predominantly poorly graded distribution typical of a granular soil with the primary constituents being sand and gravel. The grading envelope suggests that ~60% of the SMCL would qualify as Class 1A/1B material. The remaining 40% of the Sheringham Cliffs Formation has a much wider grading with a fines content >15% and would likely classify as a Class 2A/2B material.
- 10.6.13. Based on our preliminary earthworks calcs approximately 29,500m³ of bulk excavated material will be derived from the SMCL. Given that the PSD analysis suggest a 60:40 split of granular and cohesive, this equates to potential approx. volumes of 17,700m³ of Class 1A/B and 11,800m³ of Class 2A/B fill.

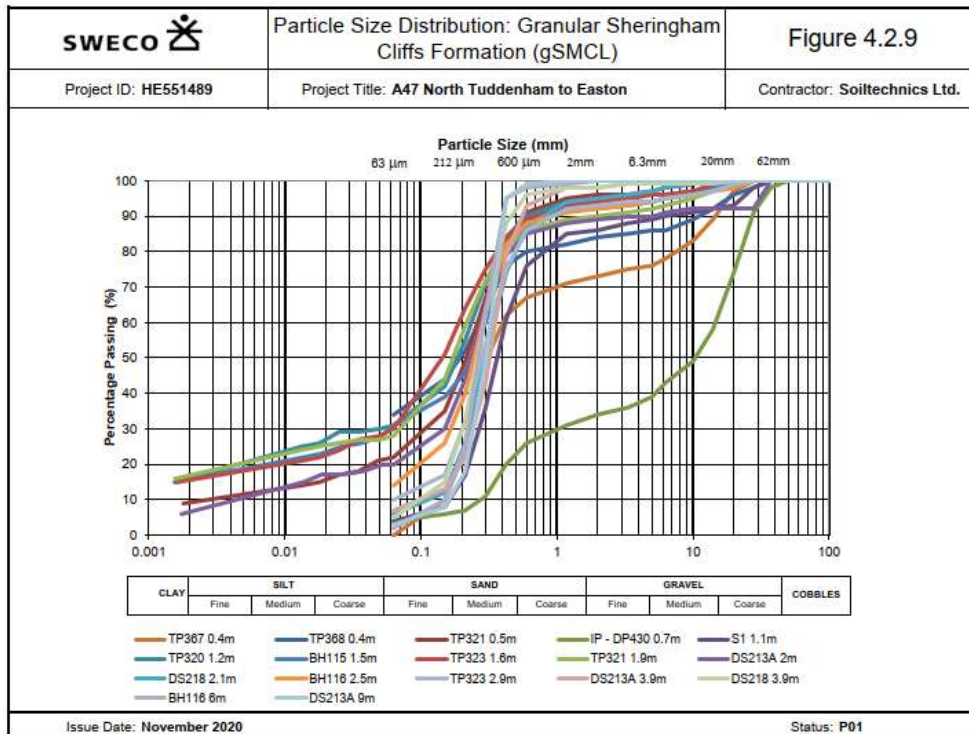


Figure 3 PSD of the Sheringham Cliffs Formation

Happisburgh Glaciogenic Formation

- 10.6.14. The Happisburgh Glaciogenic Formation (HPGL) was encountered in a small number of discrete locations during the 2020 GI, mainly within the location of St Andrews Church and east of Taverham Road. It is interpreted that the HPGL

extends further southwards than is depicted on the BGS GeoIndex, having been identified at shallow depth beneath the Norwich Road Junction EB Diverge at depths of between 0.40 and 6.20m. The depth of the HPGL increases southwards beneath the Mainline and Norwich Road junction WB on slip road where it is present from a depth of 8.10m.

10.6.15. Following a review of the geological long-sections it is considered unlikely that areas of major cut will intersect this formation, hence there is anticipated to be limited generation of site-won fill from this stratum. Based on the PSD grading curves for HPGL (7No. results), fines content is above 15% for all samples tested so it is considered likely that material will be suitable for reuse as Class 2 general fill, where encountered.

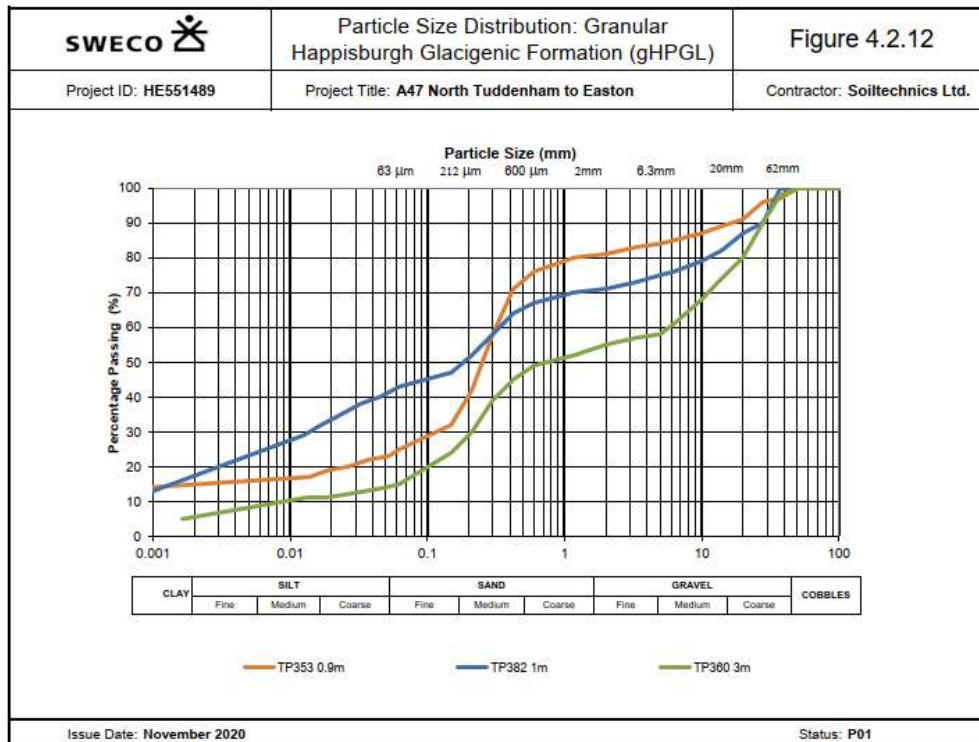


Figure 4 PSD of the granular Happisburgh Glacigenic Formation

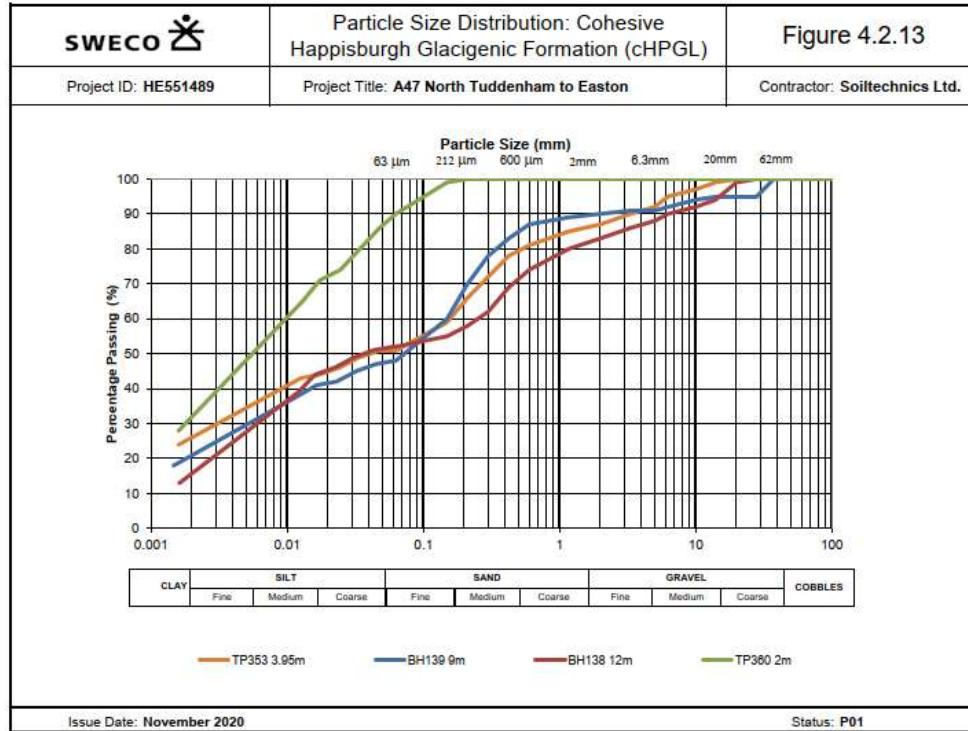


Figure 5 PSD of the cohesive Happisburgh Glacigenic Formation

Lowestoft Formation

10.6.16. The predominant source of excavated material on this Proposed Scheme will be generated from cuttings through the granular and cohesive Lowestoft formation (gLOFT and cLOFT). The Lowestoft Formation is typically encountered as a cohesive Diamicton, but the GI data does suggest localised areas where these deposits are predominantly granular in nature. Based on preliminary earthworks quantities, an estimated 580,000m³ of bulk earthworks could be derived from the Lowestoft Formation.

10.6.17. PSD analysis of 170No. samples of both cLOFT and gLOFT suggests the site-won fill will predominantly be suitable for reuse as Class 2 fill by virtue of grading, with 85% of samples recording a fines content greater than allowable for Class 1 granular fill. Whilst it is recognised that 170No. tests is still a limited number considering the significant volume of bulk excavation anticipated in this formation, a crude assumption of 80% Class 2 and 20% Class 1 is considered appropriate at this stage. Based on this 80:20 split this would provide approx. volumes of 465,000m³ and 116,000m³ of Class 2A/B and Class 1A/B respectively. This is subject to the material meeting contract acceptability criteria and being capable of being placed, trafficked and maintaining the required surface profile

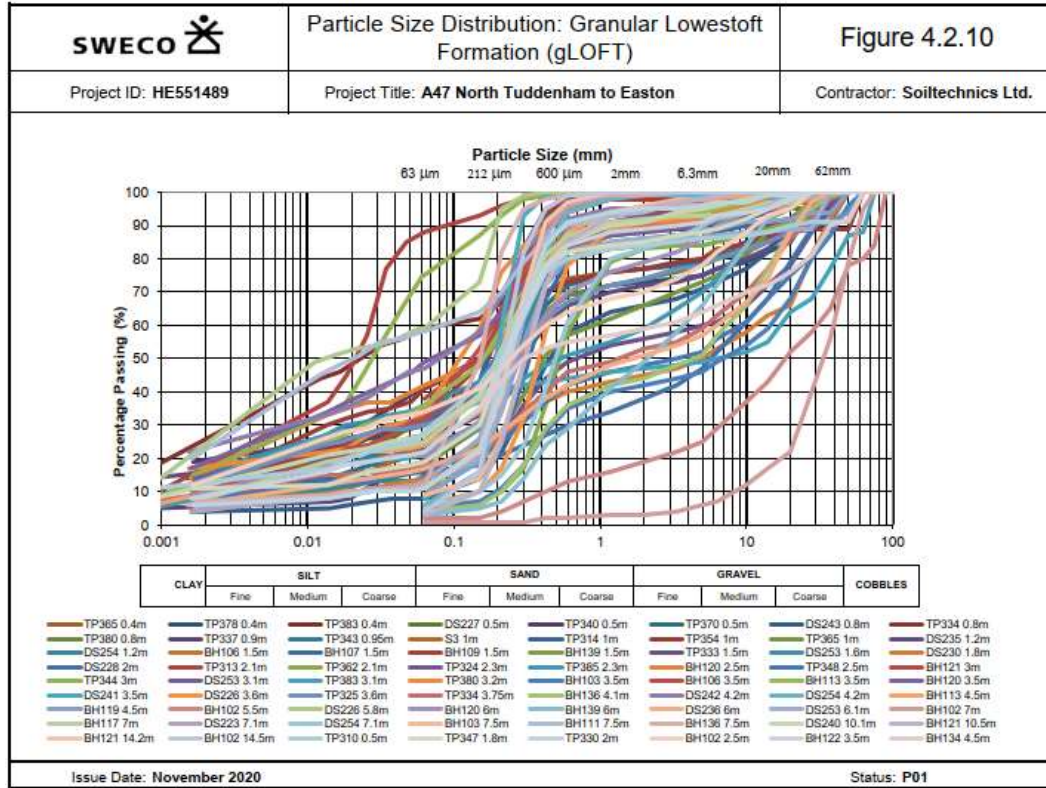


Figure 6 PSD of the granular Lowestoft Formation

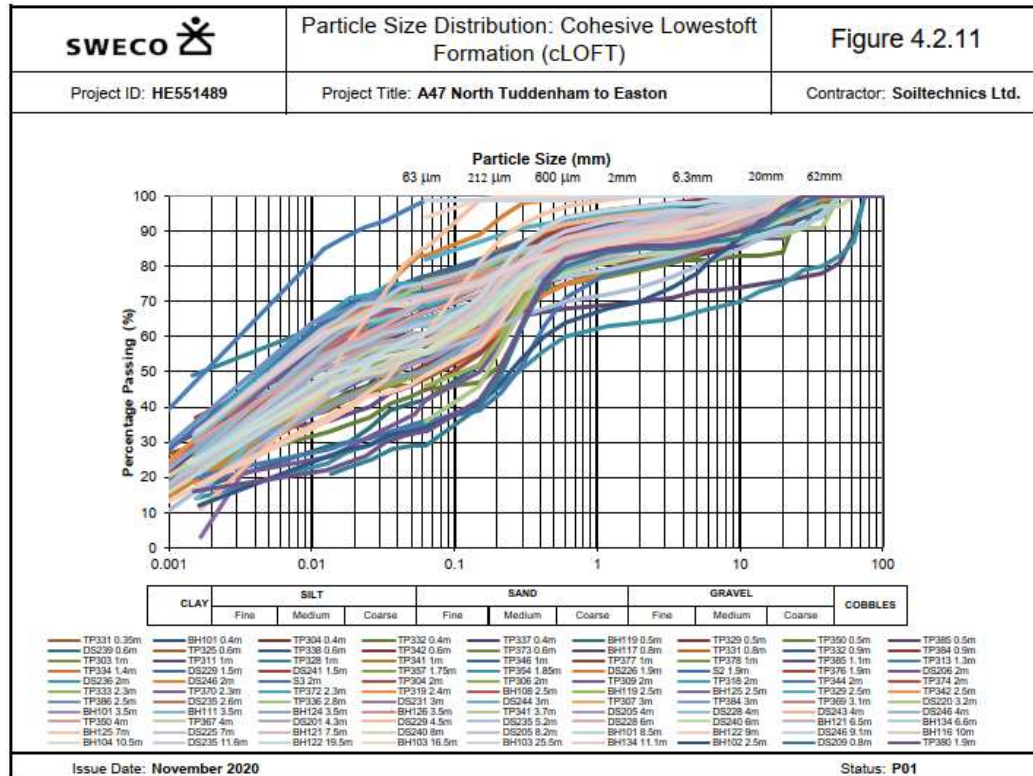


Figure 7 PSD of the cohesive Lowestoft Formation

Design, mitigation and enhancement measures

- 10.6.18. The Proposed Scheme has been designed to avoid and minimise the impacts on material resources through the process of the assessment of alternatives and 'embedded' mitigation as defined in DMRB LA 104 (Environmental Assessment and Monitoring). Design measures integrated into the Proposed Scheme for the purpose of minimising the environmental effects is reported in Chapter 2 (The Proposed Scheme) of the ES (**TR010038/APP/6.1**).
- 10.6.19. Section 10.9 of ES Chapter 10 (Material assets and waste) reports on 'essential mitigation required in addition to embedded mitigation to reduce and offset likely significant adverse environmental effects (**TR010038/APP/6.1**).
- 10.6.20. The following essential mitigation has been outlined to ensure that excavation material attributed to the HPGL is not 'needlessly sterilised':
- In accordance with the EU Waste Framework Directive 2008/98/EC 'waste hierarchy', the Proposed Scheme aims to prioritise waste prevention, followed by preparing for re-use, recycling and recovery and lastly disposal to landfill.
 - Design for re-use and recovery by identifying, securing and using materials that already exist on the Proposed Scheme.
 - Design for materials optimisation by simplifying the layout and form to minimise material use and balancing cut and fill.
- 10.6.21. In accordance with DMRB LA 120 (Environmental Management Plan (EMP)) an EMP (**TR010038/APP/7.4**) has been prepared parallel to the development of the Proposed Scheme design and construction methodologies. Measures and procedures within the outline EMP include design, construction and operational mitigation, which have been developed in-line with the requirements arising from this ES.
- 10.6.22. The principal contractor will update the EMP prior to commencement of works based on the current EMP. As part of this, the principal contractor will be required to generate a Materials Management Plan (MMP).
- 10.6.23. The MMP will be developed in accordance with the CL:AIRE Definition of Waste Code of Practice (DoW CoP), Version 2, 2011. This approach offers the most effective method of ensuring materials can be re-used on or off the Proposed Scheme. The MMP will detail the procedures and measures to be implemented to classify, track, store, re-use and dispose of all excavated materials encountered during the construction phase.
- 10.6.24. In addition to the mitigation outlined in the ES chapter, Section 10.9 outlines potential enhancement measures to be incorporated into the Proposed Scheme

including re-use of suitable surplus material outside of the Proposed Scheme's DCO boundary (**TR010038/APP/6.1**). Examples include the use of suitable surplus materials in engineered noise and landscaping bunding and on local projects such as fenland restoration that are concurrent to the construction phase of the Proposed Scheme.

10.7. Conclusions

- 10.7.1. Under its Roads Investment Strategy, the Applicant, Highways England, has identified that there is a requirement to improve transport infrastructure at the A47 North Tuddenham to Easton. The proposed upgrade is part of the wider programme of A47 corridor improvement programme required to improve connectivity and stimulate growing economic activity in Norwich and South Norfolk.
- 10.7.2. The North Tuddenham to Easton section of the A47 connects key economic growth areas of Norwich. The current road is unable to cope with the high traffic volume and there are limited opportunities to overtake slower moving vehicles on this single carriageway.
- 10.7.3. The proposals will create a new dual carriageway and associated new junctions and access roads that will relieve congestion, provide extra road space, improve safety and help provide a free-flowing network.
- 10.7.4. Due consideration of the environmental impacts of the Proposed Scheme in the context of applicable national and local planning policy confirms that there is a clear need for the Scheme to proceed.
- 10.7.5. The Norfolk Minerals and Waste Development Framework identifies the presence of Minerals Safeguarding Areas which intersect the Proposed Scheme in the footprint of the existing A47 road infrastructure. In these instances, mineral resources are sterilised by the existing development, whilst prior extraction is prohibited as the carriageway will be in use during the offline construction works and will be retained or amalgamated into the Proposed Scheme.
- 10.7.6. There are limited opportunities to prior excavate the safeguarded deposits due to the requirement to maintain existing topography, import materials as part of the required ground improvements and due to external constraints such as the River Tud, residential properties and existing road infrastructure. The intention is to use excavated materials within the Proposed Scheme in accordance with the wider measures developed to avoid and minimise the impacts on material resources through the process of the assessment of alternatives and 'embedded' mitigation. As such, any safe guarded minerals that are encountered should be retained on the Scheme, if possible.

- 10.7.7. Where deposits of safeguarded minerals are present outside of the area of the DCO the Proposed Scheme is not considered likely to further constrain future extraction of deposits.
- 10.7.8. Any opportunity to reuse safeguarded material in the works will be exploited and as much material as possible will be reused. This approach is in accordance with the EA Waste Framework Directive 2008/98/EC “Waste Hierarchy” and is considered to present an appropriate means of ensuring proven mineral resources are not ‘needlessly’ sterilised by non-mineral development.

10.8. References

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