M20 lorry area

Stanford West
Interim environmental assessment report

August 2016

M20 Lorry Area - Stanford West
Environmental Assessment Report
Volume 1

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1. Introduction

1.1 M20 Lorry Area, Stanford West

1.1.1 Highways England propose to construct a Lorry Area off the M20 (the Project) to relieve congestion caused by Operation Stack. Further details of the Project are given in Chapter 2.

1.1.2 Over recent decades, the number of lorries crossing the English Channel has increased seven fold. Nearly ninety percent of all UK roll-on, roll-off international freight goes through the Strait of Dover and that puts 11,000 lorries per day on Kent's roads. There are projections that by 2025 the number of lorries travelling through Kent each day could double.

1.1.3 Usually the road network copes well. But unexpected events cause problems, as there is little slack in the system. Extra parking has recently been provided at the Port of Dover and Eurotunnel, but we expect that severe weather, security threats or industrial action will still mean that queues of lorries have to be held on the M20 using a procedure known as Operation Stack. This happened 32 times in 2015.

1.1.4 Operation Stack can cause significant problems as it shuts the M20. Kent residents struggle to get to work or school, to medical appointments or to carry out everyday tasks. People from further afield get held up or delayed and businesses are affected.

1.1.5 The Project will alleviate the problems caused by Operation Stack by providing a dedicated lorry holding area at Stanford, near Folkestone. In almost all cases, this will keep Kent residents moving and get rid of traffic congestion caused by cross-Channel disruption so businesses keep investing in the area and jobs can be created, leading to greater prosperity both in Kent and nationally.

1.1.6 This Environmental Assessment Report (EAR) documents the non-statutory Environmental Assessment which has been carried out for the Project.

1.1.7 The location of the Project is shown in Figure 1.1.

1.1.8 Supporting and background information for the Project can be found in the following information sources:

- See appendix 1.1 for text of 'Transport Secretary announces proposed site for Operation Stack Lorry Area', Department for Transport, 6 July 2016
- Managing Freight Vehicles through Kent – Public Consultation Report, Highways England, March 2016
- Public Consultation documents - August 2016

1.1.9 Further information regarding the statutory process relating to this environmental assessment can be found in Appendix 1.1.

1.2 The Role of Highways England

1.2.1 Highways England is the wholly government-owned company responsible for modernising, maintaining and operating England's motorways and major A roads. Our network covers approximately 4,300 miles. In Kent, it includes the A2, M2 and M26 as well as the M20 and A20 that provide the main access routes to the Port of Dover and Eurotunnel.

1.2.2 Highways England is responsible for delivering the Lorry Area at Stanford West.

1.3 Purpose of this Environmental Assessment Report and its Status

1.3.1 The purpose of this Environmental Assessment Report (EAR) is to provide information to consultees and any other interested parties about the effects of the Project on the environment, and inform the ongoing design process.

1.3.2 The EAR is based on an illustrative design in accordance with the precautionary principle and is therefore an interim assessment. It should be read in conjunction with the consultation documentation published in August 2016. We will publish an updated and final EAR before construction of the area starts.

1.4 Content of this Environmental Assessment Report

1.4.1 This EAR is structured as follows:

- Volume 1 – Main Text
- Volume 2 – Drawings
- Volume 3 – Appendices

1.4.2 The main text of the EAR has been written to be easily understood and with minimal use of technical terms. Where the use of technical terms is unavoidable, every effort has been made to provide an explanation. A glossary of abbreviations is also included (chapter 16).

1.4.3 Following this introduction, chapters 2 (The Project) and 3 (Design Development) and 4 (Approach to Environmental Assessment) provide background information to the Project and explain the design and the environmental assessment processes.

1.4.4 Chapters 5 to 14 describe the assessment of impacts for Air Quality, Cultural Heritage, Landscape, Nature Conservation, Geology and Soils, Materials, Noise and Vibration, People and Communities, Road Drainage and the Water Environment and Agriculture.

1.4.5 Chapter 15 (Consideration of Cumulative Effects) considers the inter-relationships between the impacts of the Project identified for different topics, and also between the impacts of the Project and impacts of other planned developments.

1.5 Other Relevant Documents

1.5.1 Although this EAR is a standalone report, there are other documents that have been produced to support the environmental assessment process. All documents that have been referenced are detailed within relevant chapters.

1.6 What Happens Next and How we will Develop the Design

1.6.1 The EAR will be used to inform consultees during the planned non-statutory consultation and inform the ongoing design process.

1.6.2 If a decision is made to go ahead with the proposals, Highways England will progress the Project to prepare for construction alongside the appointed contractor.

1.6.3 The assessment set out in this EAR is based on an illustrative design, which is described in Chapter 2: The Project. Future mitigation opportunities have been identified (see section 4.10.7 in Chapter 4), but these do not form part of the Illustrative design and so are not reflected in the assessment. The assessment therefore represents a potentially worst case scenario. We plan to incorporate mitigation to reduce these impacts.

1.6.4 Highways England is committed to undertaking a programme of collaborative engagement to work closely with residents and local stakeholders to ensure the design of the new Lorry Area minimises its social and environmental impact, while meeting the wider need to address this issue for Kent and the UK. We have set out how we will do this in Chapter 3.

2. The Project

2.1 Project Background and Need

2.1.1 In 2014, the Port of Dover and Eurotunnel handled record numbers of freight vehicles and both predict a doubling of freight vehicles over the next decade. Kent residents and businesses have experienced disruption caused by problems with ferry and/or Eurotunnel services which have resulted in queues of lorries on the surrounding road network.

2.1.2 Highways England has been working alongside Kent Police, Kent County Council and ferry operators to try and deal with the resulting disruption. One method, called Operation Stack, involves closing sections of the M20 and parking lorries on these sections when there are emergency closures of Eurotunnel or the Port of Dover.

2.1.3 Operation Stack was implemented 48 times between 1997 and January 2015 with an average of five to six days per year and rarely for longer than a single day at a time. In response to disruption at Eurotunnel or the Port of Dover during 2015 due to either poor weather, operational issues, industrial action or security concerns, Operation Stack was used more intensely than in previous years and caused major traffic problems.

2.1.4 In 2015, Operation Stack was used for 32 days. This included three implementations each lasting five days. On two occasions, both carriageways were closed between junction 8 and 11 on the M20 to accommodate over 5,000 lorries.

2.1.5 As a result, local roads became impassable and many lorries were forced to park in laybys with consequent litter and human waste issues. Travel times were increased and the delivery of goods to the local area affected, causing increased disruption to businesses across Kent and UK-wide.

2.1.6 A Lorry Area located off the M20 has been identified as a solution to alleviate the disruption caused in future foreseeable events. Operation Stack was intended to provide a temporary solution only.

2.1.7 Information relating to the project parameters and objectives can be found in Appendix 2.1.

2.2 Project Site Setting

2.2.1 The Project Site is located within a rural setting between the villages of Stanford and Sellindge and comprises two areas; one to the immediate north and one to the immediate south of the M20 (Figure 1.2). The Channel Tunnel Rail Link (CTRL) and man-made drainage ditch form the southern Site Boundary.

2.2.2 There are approximately 960 residential properties within 2km of the site boundary.

2.2.3 Westenhanger Castle is a scheduled monument and located 35m to the south of the Project. There are also Grade I, Grade II* and Grade II buildings located within 1km of the Site Boundary and a registered park and garden (Sandling Park) located c. 250m to the south-east.

2.2.4 The topography is undulating with the ground rising northwards from the Project Site up into the Kent Downs. The Kent Downs Area of Outstanding Natural Beauty (AONB) lies outside of the Site Boundary but is located within 250m at its closest point. Gibbon's Brook Site of Special Scientific Interest (SSSI) lies to the immediate northwest of the Site Boundary and there are a number of Public Rights of Way (PRoW) of local importance which intersect the Project Site, including a bridleway (HE271).

2.2.5 East Stour River is located to the southeast and southwest of the Site Boundary, flowing south beneath the M20 and continuing in a south-westerly direction.

2.2.6 The Project Site predominantly comprises agricultural fields. The area to the north of the M20 comprises two arable fields, divided by a fishing lake orientated northeast to southwest and Hayton's Stream, which is surrounded by trees and shrubs that extends to the south to form a linear belt of trees and scrub.

2.2.7 Hayton's Stream flows south, is culverted beneath the M20 and then discharges to East Stour River to the immediate southwest of the Project Site.

2.2.8 The area to the south of the M20 comprises arable farmland with hedgerows and some broadleaved woodland towards the Site Boundary. The area includes excavated material associated with construction of the CTRL. A drainage pond linked to the M20 drainage system is also located in the west of this area.

2.3 Design Overview

2.3.1 The Project is at the illustrative design stage, which is where the key parameters of the design are set out. The layout and arrangement at this stage of design is indicative, and will be refined at the further stages of preliminary and detailed design. Before construction starts we will hold exhibitions to inform local people of the revised proposals.

2.3.2 The Project will comprise two areas of concrete hardstanding located to the north and south of the M20, connected by a new bridge across the M20. Lorry Area equates to approximately 63 hectares of hard surfacing as part of a total site area of approximately 108 hectares. The indicative layout for the illustrative design is given in Figure 1.2.

Lorry Area Access

2.3.3 The main entry and exit to the Lorry Area will be direct from the M20 eastbound carriageway via a new simple merge (exit) / diverge (entry) with the M20. The entry and exit off the M20 will only be used during Operation Stack.

2.3.4 A secondary access and exit through the existing Stop24 Service Area is proposed for lorries using the full-time parking in the southern part of the Site. This secondary access will also enable lorries to approach from the westbound M20 via junction 11 during Operation Stack and access the Lorry Area. During Operation Stack, lorries will not be permitted to exit the Lorry Area through the Stop24 Service Area. Discussions with Stop24 regarding the proposals are ongoing.

2.3.5 Control booths will be located in both the north and south parts of the Lorry Area. The anticipated number of booths and arrangement is not confirmed.

2.3.6 Further detail can be found in appendix 2.1.

Lorry Area Layout

2.3.7 The surface of the Lorry Area will be concrete.

2.3.8 The internal circulatory roads will be a minimum of two lanes within the Lorry Area to accommodate vehicle breakdown and a one-way traffic system will be in operation (where possible), controlled by traffic lights.

2.3.9 Lorries will be parked in marked parking lanes, taking up to five lorries each, parked nose-to-tail.

2.3.10 A facilities building (shop, office, plant room, toilets and wash facilities) will be provided within the full-time parking area in the south. Standpipes and portable toilets[1] will be provided for the north area.

2.3.11 The facilities building will be designed to be as low in height as possible to help reduce visual impacts on the surrounding environment, with its south facing elevation glazed with low reflective glazing. Panels within the elevation will be faced in an appropriate finish.

2.3.12 A series of segregated walkways will also be provided through the north area of the Site with all crossing points gated for drivers crossing the Lorry Area on foot during Operation Stack. These walkways will be open to public as permissive footways when Operation Stack is not in operation.

2.3.13 Approximately one half of the existing fishing lake within the northern part of the Project Site will be removed and a new compensatory lake provided to the northeast of the retained portion of the fishing lake. It is anticipated that a culvert

[1] Portable toilets will be permanently in place, but will not be permanent structures.

will connect them. A new culvert will also be constructed for Hayton's Stream between the retained portion of the fishing lake to the existing culvert under the M20.

Public Rights of Way

2.3.14 All Public Rights of Way (PRoW) will be demarked on the newly paved areas. These will remain open as per the current situation except when Operation Stack is implemented and the Lorry Area is in use, when the PRoWs will be under temporary closure. Gates at the Site Boundary will prevent their use.

Drainage Design

2.3.15 Drainage for the new slip road will match the existing kerb and gully design and connect to the current M20 drainage. The existing attenuation pond for the M20 will also be removed and replaced to the west of its existing location within the area to the south of the M20.

2.3.16 For the Lorry Area, linear drainage channels will be installed, with carrier pipes and catch pits. The proposed drainage design will capture all surface water run-off from the impermeable area of the Site within a below ground drainage system and convey it to new attenuation ponds in the Site to the north of the M20 and below-ground attenuation features. Surface water runoff will then pass through a full retention petrol interceptor and vegetated sustainable drainage system (SuDS) feature prior to discharge to Hayton's Stream and subsequently to the East Stour River. New length of channel which outfalls into the East Stour will be created in the south area to replace a section of channel that is required to be removed to facilitate the creation of the control booths.

Structures Design

2.3.17 The new bridge across the M20 will be designed with a 5.4m headroom over the M20 and will also require a retaining wall and an access ramp within the Lorry Area. Dimensions for the wall and ramp are still to be confirmed although the ramp will be approximately 250m in length and with a height of approximately 5m.

2.3.18 The alignment for the secondary access and exit from the Stop24 Service Area is still to be confirmed but currently requires two retaining walls, which will all receive an appropriate aesthetic finish depending on their location.

2.3.19 To provide the secondary access and exit from the Stop24 Service Area, the existing culvert over the East Sour River will be extended or the culvert spanned by a bridge. The current design assumes that the culvert will be extended by approximately 15m and has been used in this EAR as a worst case scenario.

2.3.20 A new culvert will also be constructed for Hayton's Stream from the retained part of the fishing lake to the existing culvert under the M20.

2.3.21 Another new culvert will be created where the channel is diverted under the control boots in the southern part of the Lorry Area.

Earthworks Design

2.3.22 The design levels across the Project Site have been optimised to minimise the need for earthworks. The illustrative design currently has a design surplus of excavated material, based on the assumption that no bunds are located around the perimeter of the Site. The provision of bunds as part of the package of mitigation measures will be explored during the preliminary and detailed design stages.

Utilities

2.3.23 The Project Site will be connected to mains water and electricity.

2.3.24 The facilities building will be connected to mains water, gas and electricity and to either the mains sewer (which will require a pumping station) or serviced by a cess pit with anaerobic in-situ treatment.

2.3.25 National Grid and UK Power Networks underground cables run adjacent to the north side of the M20 through the Project Site. The illustrative design is based on the assumption that these will be diverted into a dedicated service corridor.

2.3.26 On completion, there will be a minimum 6m wide clear corridor for the underground cables. This corridor will be finished with either sacrificial pavement where the road passes over the cables or a box culvert that can be opened to expose the cables. The design is still be agreed with National Grid.

Lighting Design

2.3.27 Approximately 400 12m tall lighting columns will be installed within the Lorry Area. They will be fitted with flat glass LED lanterns to minimise unnecessary light spillage.

2.3.28 Permanent night time lighting will be required for the full-time parking area, with the northern area lighting turned off unless Operation Stack is implemented. During Operation Stack lighting will be required, but will be turned off within non-operational areas. Lighting will also be dimmed within zones of the Lorry Area when there are no lorry movements in that zone.

2.4 Environmental Design

2.4.1 The Site Boundary is drawn to enable a landscaped zone around the perimeter of the Lorry Area to be created that integrates the edge of the site with its surroundings and maximises the potential for providing landscaping and other mitigation features.

2.4.2 The following elements will be incorporated into the illustrative design (see Figure 1.2), and form part of the Project that has been assessed in this EAR:

- A minimum 20m wide buffer along the Site Boundary for proposed woodland, shrub or scrub planting as well as species rich grassland. This would include an approximate 4m wide grassland buffer to allow a scalloped edge for tree planting and canopy growth
- Planting in straight or regular rows will be avoided
- Existing trees along bridleway (HE271) will be retained for wildlife continuity with additional woodland or shrub planting, including individual trees
- A mammal underpass will be installed under the new access road
- An existing badger sett within buffer zone will be closed and an artificial sett will be established with the Site Boundary (location to be confirmed)
- Selective species will be planted along the northwest Site Boundary to reflect species within Gibbin's Brook SSSI
- Existing trees will be retained around the remaining portion of the fishing lake
- Individual trees (wetland tree species) and species rich grassland will be planted around the new compensation fishing lake
- Hibernacula will be established near the compensation fishing lake for hibernating species
- A number of fishing swims around the replacement fishing lake will be created to match those lost around the existing lake, including easy access platforms
- Green corridors installed across the Lorry Area
- Existing vegetation will be retained where possible around the section of culvert widening for the access from Stop24 Service Area
- An otter / mammal ledge will be installed at culvert widening for the access from Stop24 Service Area
- Existing mature trees and additional woodland / shrub planting along the southeast Site Boundary will be retained for wildlife continuity and screening
- Where site levels allow, existing hedgerows will be retained and additional planting of linear belt of trees and shrubs planted along southern Site Boundary for wildlife continuity, screening and potential dormice habitat
- A shallow wildlife pond will be created with wetland habitat, with woodland and open glade area in the west of the Project Site, north of the M20
- Species rich grassland and scrub will be planted around the new attenuation ponds, in the west of the Project Site, north of the M20 and extending the grassland planting as far as possible
- Wetland habitat creation and reed bed planting will be integrated into the replacement attenuation pond, south of the M20
- Up to 30 log piles (approx. 500mm high), 40 bat boxes and 20 bird boxes will be installed

- Drainage features will be designed to be safe for reptiles and amphibians where possible

2.5 Construction Strategy

2.5.1 Working hours will be in line with standard good practice for major construction works, with all main construction works undertaken during weekday daylight hours.

2.5.2 From October to March this would be generally limited to 08:00 to 18:00 weekdays and 08:00 to 14:00 on Saturdays. From April to September this would be 07:00 to 19:00 weekdays and 07:00 to 16:00 on Saturday and Sunday. Construction works outside these hours (such as safety critical works on the M20 that cannot be undertaken during the day) would subject to liaison with the local Environmental Health Officer.

2.5.3 Construction activities for the Project will operate from a compound area within the Project Site boundary, which shall include a small office for management of the works. The main location for office-based staff will be off-site within an existing office complex, rented for the duration of the construction works.

2.5.4 Construction plant will be regularly serviced and maintained on-site by a team of visiting fitters. An onsite fuelling facility will also be provided, including appropriate pollution prevention measures.

2.5.5 During construction the Project Site boundary will be fenced to: define the extent of the Project Site; prevent construction plant operatives and site workers from straying onto private land; and restrict access by the general public. The main access for the Project Site will have 24 hour security and mobile patrols will be deployed.

2.5.6 The general intentions would be to minimise movements of materials by reducing imported fill to a minimum, and by obtaining aggregates and other fill from sources as close to the site as possible. Where this is not possible aggregates will be imported via train to local railheads in Ashford for their final journey to site by lorry using the M20 between junctions 10 and 11. Delivery times would be restricted to avoid peak hours and minimise disruption to the travelling public.

2.5.7 All delivery company drivers would be instructed on the health, safety and environmental conditions prior to entering site. On entry to the site they would be controlled by a trained operative to ensure safe movement of vehicles.

2.5.8 Wherever possible, staff resources would be employed from the local and surrounding areas. The workforce may be accommodated in facilities within the local area. Day to day commuting to the Project would therefore be maintained at a practicable minimum and would also be limited by the operation of a green travel plan for the Project and its associated dedicated group transport facilities.

Temporary drainage works

2.5.9 Water management would be an important part of the earthworks operation. During wet periods storage of surface runoff would be undertaken to assist in dust suppression during dry periods. Prior to the commencement of any major soil stripping activities, initial water management systems would be installed to contain run off water.

2.5.10 Temporary site drainage would be designed where practicable to retain surface runoff within the site boundary. Where possible the permanent drainage arrangements would be utilised in the temporary management system. Prior to starting the main earthworks, the permanent design cut off drainage would be constructed at the limits of the site to stop excess water entering the site from the surrounding land. These ditches would be used to transport the surface water to the storage lagoons and stop the water from entering the earthworks areas.

2.5.11 The water stored within the lagoons would be used for dust suppression. If required, pumps would be provided at each storage lagoon for use in re-filling water bowsers. Where necessary, the proposed balancing ponds would be temporarily modified to provide additional settlement, so that in the event of a storm, water can be allowed to settle before discharge within consented parameters into receiving watercourses.

2.5.12 The following considerations would be taken during construction to ensure that an effective surface water drainage system would be operational throughout construction and risks of pollution would be appropriately controlled:

- New drainage outfalls, storage and pollution control systems would be built first
- During the construction phase the drainage systems would be inspected regularly and maintained as necessary to ensure the carriageway operates to the appropriate standard. Inspection and maintenance would be required more often in areas with a high level of construction activity
- Access to pollution control and spillage facilities would be maintained and a spillage prevention plan would be reinforced through toolbox talks.
- All temporary measures would be agreed with the Environment Agency
- The emergency action planning would include measures to be taken to prevent pollution caused by severe weather

Earthworks strategy (soil handling and management)

2.5.13 Any aggregates and fill materials would be excavated from established local quarries within the Medway Valley, or brought to the area through a railhead within 16 Km of the Project. Commercial considerations and the economic climate prevailing at the time construction commences may lead to it being more cost effective for deliveries to come from further afield. There are several facilities available in the Dartford, Gravesend and Isle of Grain areas which are able to supply materials, but each would require longer haulage distances.

Materials storage

2.5.14 Storage areas would be provided for the following:

- Topsoil would be stored located in areas adjacent to the works for reuse. The topsoil storage bunds would be located in the landscape areas which are on the boundary of the site and would take the respective volume for the total stripped area
- Works areas would include holding ponds to provide non-potable water for dust control
- Formwork would be stored adjacent to the bridge sites and in the central compound. There would be a joiners shop on site at the main compound to make up panels
- Reinforcement would be stored on laydown areas at bridge sites, which would consist of a thickness of suitable hardstanding material. The areas would be fenced and have security to prevent theft
- Small items of plant would be stored in the central plant compound; large items would be parked around the site. Fuel would be stored at the main compound

Types and numbers of proposed machinery

2.5.15 During the months of March through to October the earthworks will be running at full capacity, the majority of the material will be moved using a range of excavators from 65t capacity down to 20t. Movement of the material will utilise 25t articulated dump trucks.

2.5.16 Several onsite concrete batching facilities would be installed on the north side of the M20. This would help to reduce the number of lorries on the M20 and local network.

Construction worker numbers

2.5.17 It is anticipated that at its peak (during the months of March through to October) proximately 200 workers would be on Site.

3. Design Development and Ongoing Evaluation

3.1 Introduction

3.1.1 When the Transport Secretary announced the proposed site for the Operation Stack Lorry Area, Highways England chief executive Jim O'Sullivan made a commitment to *'work closely with residents and local stakeholders to ensure the design of the new Lorry Area minimises its social and environmental impact, while meeting the wider need to address this issue for Kent and the UK.'.*

3.1.2 To deliver this commitment the following steps will be taken over the life of the Project:

- Design development
- Engagement with stakeholders and the community
- Enquiries and complaints procedure (see Appendix 3.1)
- Ongoing evaluation, monitoring and further mitigation as practicable

3.1.3 This will be carried out in alignment with the Licence which Highways England operate under, and in particular their duties with regard to cooperation, the environment, and sustainable development & design

3.2 Design development

3.2.1 The design team are currently working with the appointed contractor (Balfour Beatty) to develop the preliminary and then detailed design as we move towards construction.

3.2.2 The design process is iterative in nature, further developing the mitigation measures set out in the illustrative design while meeting the operational requirements of the Lorry Area.

3.2.3 Where opportunities for further mitigation have been identified, within each of the topic chapters of this EAR, these will also be explored and incorporated into the design where appropriate.

3.2.4 Throughout the design process, the proposed design will be discussed with the appropriate consultees including affected residents, key stakeholders, the general public and statutory consultees.

3.3 Engaging with the community

3.3.1 We will prepare a community engagement strategy for the detailed design, construction and ongoing operation of the Project that will provide the approach to stakeholder engagement. The strategy will include procedures to:

- Maintain effective community engagement throughout the detailed design and construction period to build on existing relationships with the communities around the Project
- Engage on those detailed design issues relevant to the community, landowners and relevant businesses
- Inform affected communities in advance of the relevant construction works commencing about how the effects of construction activities will be managed and, as appropriate, mitigated
- Inform affected communities in advance of the relevant construction works commencing about the timetable of the construction works
- Provide information on the enquiry and complaints procedures and how this is operated

3.3.2 During detailed design and construction, a programme of high quality, effective and sustained communications will include an online presence. This will be updated regularly to reflect the progress of the project.

- Provision of information on progress of construction works – the relevant local authority, district councils, parish councils, councillors, constituency and regional members of Parliament and other relevant persons will be kept informed of the progress and effects of construction works
- Notification to local residents, businesses and parish councils – the contractor will notify occupiers of nearby or affected properties, businesses and adjacent or affected parish councils a minimum of two weeks in advance of the nature and anticipated duration of planned construction works that may affect them, including both principal and ancillary works
- As a minimum, the contractor will take steps including direct correspondence and/or mail drops, as well as providing information in local community centres. The notification will also provide details of the enquiries and complaints procedure developed in accordance with the requirements below. Information included in the notifications will include, as appropriate:
    - The location of the planned works
    - The activities to be carried out
    - The duration of the planned works and the periods within which works will be undertaken (i.e. whether during normal working hours, during the evening or overnight)
    - The anticipated effects of the planned works
    - The measures to be implemented to mitigate the impact of the planned works
    - Enquiries and complaints procedure

Local authorities

3.3.3 As touched upon above, Highways England will continue to engage with the relevant local authorities throughout the detailed design and construction phases of the Project. Highways England is aware that certain elements of the Project are of particular interest to the local authorities and engagement will reflect this.

3.4 Ongoing environmental evaluation and monitoring

3.4.1 We are committed to environmental evaluation and monitoring the Project annually for the first 15 years after opening. This would include considering the effectiveness of mitigation that is in place, and the need to provide any further mitigation with the focus on the effects on the surrounding community. This would also cover the monitoring requirements set out in any licences required to undertake the Project, such as a European Protected Species licence.

3.4.2 The outcomes of the annual evaluation and monitoring will be available to the community and stakeholders.

4. Approach to Environmental Assessment

4.1 Introduction

4.1.1 Environmental Assessment is a process which identifies the effects that development proposals would have on the environment. When impacts are identified, steps can be taken as part of the process to prevent, reduce or offset any adverse effects.

4.1.2 This section explains how the Environmental Assessment has been carried out and reported for the Project.

4.1.3 Impacts are considered to be the changes resulting from an action (the Project) and effects are considered to be the consequences of those impacts on the environment.

4.2 Environmental Assessment Guidance

4.2.1 Guidance published by the Government for the preparation of Environmental Assessments of Strategic Road Network Projects is contained in the Design Manual for Roads and Bridges (DMRB), Volume 11 Environmental Assessment.

4.2.2 Where DMRB guidance has not been followed, the reasons for this and the alternative methodology used is explained in the relevant topic chapters. Examples include the chapter 5: air quality assessment and chapter 11: noise and vibration assessment.

4.2.3 DMRB Volume 11 sets out both the general process (sections 1 and 2); and the methods for assessing individual environmental topics (section 3), as follows:

- Section 3, Part 1 – Air Quality (HA207/07)
- Section 3, Part 2 – Cultural Heritage (HA208/07)
- Section 3, Part 3 – Disruption Due to Construction
- Section 3, Part 4 – Ecology and Nature Conservation
- Section 3, Part 5 – Landscape Effects
- Section 3, Part 6 – Land Use
- Section 3, Part 7 – Noise and Vibration (HD213/11)
- Section 3, Part 8 – Pedestrians, Cyclists, Equestrians and Community Effects
- Section 3, Part 9 – Vehicle Travellers
- Section 3, Part 10 – Road Drainage and the Water Environment (HD45/09)
- Section 3, Part 11 – Geology and Soils
- Section 3, Part 12 – Impact of Road Schemes on Policies and Plans

4.2.4 In addition, relevant Highways England Interim Advice Notes (IANs) provide agreed best practice guidance and reflect legal requirements. The following IANs are also relevant for this Environmental Assessment Report (EAR):

- IAN 116/08: Nature conservation advice in relation to bats
- IAN 130/10: Ecology and Nature Conservation: Criteria for Impact Assessment
- IAN 133/10: Environmental Assessment and the Planning Act 2008
- IAN 135/10: Landscape and visual effects assessment
- IAN 153/11: Guidance on the Environmental Impact Assessment of Materials
- IAN 170/12 v3: Updated air quality advice on the assessment of future NOx and NO2 projections for users of DMRB Volume 11, Section 3, Part 1
- IAN 174/13 Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1
- IAN 175/13 Updated advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans for users of DMRB Volume 11, Section 3, Part 1
- IAN 125/15: Supplementary guidance for users of DMRB Volume 11 'Environmental Assessment'
- IAN 185/15: Updated traffic, air quality and noise advice on the assessment of link speeds and generation of traffic data into speed-bands for users of DMRB Volume 11, Section 3, Part 1

4.2.5 Further details of the guidance and methodologies used are described in the relevant topic Chapters (5 to14) of this EAR.

4.3 Overall Approach

4.3.1 The Project programme has required that an illustrative design has been used for assessment and therefore the general principals of the 'Rochdale Envelope' have been followed.

4.3.2 Guidance[2] on the Rochdale Envelope approach has been prepared by the Planning Inspectorate. The guidance sets out an approach to environmental assessment for developments where details of the Project have not been resolved. The guidance notes the importance of ensuring that the likely worst case scenarios of the Project have been properly considered and are clearly set out, and as such that the likely significant impacts have been adequately assessed. As the design is developed and mitigation measures incorporated, the assessment will continue to ensure that adverse effects are reduced as much as possible compared the worst case scenario set out in this EAR.

[2] The Planning Inspectorate (2012) Rochdale Envelope Version 2

4.3.3 This EAR aims to identify all significant beneficial or adverse environmental effects of the Project, including direct, indirect and cumulative impacts in accordance with the DMRB and Highways England IAN guidance.

4.3.4 The EAR provides information and advice to enable the avoidance or reduction of adverse environmental effects through design or the implementation of mitigation measures, where required.

4.3.5 The environmental effects of the Project have been assessed taking into consideration any mitigation measures already included within the Project design.

4.3.6 The EAR will allow decision making about the Project to be based on consideration of the residual environmental effects.

4.4 Scope of the Environmental Assessment

Scoping process

4.4.1 DMRB Volume 11 explains that a Scoping Report is prepared to determine the scope of the environmental assessment and identify which environmental topics are considered relevant, as well as the level of detail which is considered appropriate for the assessment.

4.4.2 A Scoping Report was prepared in December 2015[3] which was issued to statutory environmental bodies and other environmental stakeholders in January and February 2016 to request an opinion on the scope of the assessment. The Project Site Boundary has altered since preparation of the Scoping Report although this is not considered to affect the decision on which environmental topics are considered relevant or the level of assessment required.

4.4.3 Comments on the Scoping Report were received from the following consultees and these have been fully taken into account in preparing this EAR:

- Environment Agency
- Historic England
- Natural England
- Kent County Council
- Kent Downs Area of Outstanding Natural Beauty Unit
- Shepway District Council

4.4.4 Copies of their responses are provided in Appendix 4.1.

Scope of the Assessment

4.4.5 Following DMRB Volume 11, this EAR has considered:

[3] M20 Permanent Lorry Area – Stanford West. Environmental Impact Assessment: Scoping Report. WSP | Parsons Brinckerhoff Report No. 35111AMK-02

- Impacts during construction of the Project
- Impacts during the operation of the Project and related to ongoing maintenance
- Impacts that would be temporary
- Impacts that would be permanent
- The significance of likely effects

4.4.6 This EAR has considered short or medium term impacts (those that would last less than 15 years) and long term impacts (those that would last for 15 years or longer).

4.4.7 No environmental topics have been fully scoped out of this EAR during the scoping process. The following elements of some topics have been scoped out, with full explanations provided in the relevant chapters:

- Geology and Soils (Chapter 9) - Impacts on geological designated sites, since none are present in the study area
- Noise and Vibration (Chapter 11) - Operational ground borne vibration

4.4.8 An Environmental Management Plan (EMP) will be published separately to this EAR, as discussed in Section 4.10.

4.4.9 The scope has been widened to include an assessment on agriculture (chapter 14) due to the extent of agricultural land in the study area.

Study Area

4.4.10 The wider study area includes the footprint of the Project itself, together with any areas that would be impacted or used for its construction.

4.4.11 Topic-specific study areas (in line with DMRB guidance) are described in the relevant chapters (chapter 5 to 14).

Chapter Structure

4.4.12 Each topic chapter (chapters 5 to 14) includes:

- Executive summary
- Introduction
- Regulatory / policy framework
- Study area
- Assessment methodology
- Limitations to the assessment
- Baseline
- Proposed measures to mitigate possible adverse impacts

- Residual impacts (with mitigation)
- Further mitigation opportunities

4.4.13 Cumulative impacts are consider in Chapter 15.

4.5 Environmental Assessment Scenarios

4.5.1 To establish how the Project may impact on the environment, different scenarios are required as a basis for comparison. These are explained below:

Existing Situation

4.5.2 The existing situation is the situation at the present time, without the Project.

Baseline

4.5.3 The baseline is the situation as it would exist immediately before the Project. The baseline is identified by predicting how the existing situation would change between now and the time immediately before the Project. The effect of the Project is therefore any change from the baseline scenario that the Project causes.

4.5.4 Two baseline years are referred to: the baseline year for impacts predicted to be caused by construction of the Project is the date when construction is proposed to start (2016); and the baseline year for impacts predicted to be caused by the operation of the Project (2017).

Future Conditions

4.5.5 For some topics, impacts will be predicted for a future year (for example 15 years after opening, or the worst year in the first 15 years of operation), in line with relevant guidance. The process involves forecasting the effects by comparing a scenario with the Project against one without the Project, over a period of time.

Do Minimum and Do Something

4.5.6 The absence and presence of the Project are referred to as the Do Minimum and Do Something scenarios, respectively. The potential significant environmental effects need to be defined for the Do Minimum and Do Something scenarios in the baseline year and a future year, or series of future years depending on the topic.

4.6 Data Gathering and Consultation

4.6.1 Data gathering and consultation has been required to identify the existing situation. Data has been gathered during earlier stages of the Project and updated where necessary as part of this EAR. Data gathering also varies between environmental topics, but broadly includes:

- Consultation with relevant third parties for factual information
- Consultation with relevant third parties for opinion and comments

- Desk based surveys and information collection
- Field surveys

4.7 Identifying Potential Impacts

4.7.1 Potential impacts of the Project have been identified by considering the change that the Project would cause from the baseline conditions. Impacts have been described as direct or indirect; temporary or permanent; positive or negative.

4.7.2 Direct impacts are those caused by the Project itself. Indirect impacts can be those that alter the character, behaviour or functioning of the affected environment because of encroachment of the Project impacts over a wider area or timescale (DMRB Volume 11, section 2, part 5).

4.7.3 Temporary impacts are those that will only last for a certain amount of time, for example a change in noise levels during a construction period. Permanent impacts are those that will last for the lifetime of the Project and possibly beyond, for example a change to a view because a new bridge would be built, or a change to a pedestrian route because a pedestrian crossing has been relocated.

4.7.4 Positive, or beneficial, impacts are those which provide a benefit to the environment. Negative, or adverse, impacts are those that cause a worsening of the environment.

4.8 Cumulative effects

4.8.1 Cumulative effects are considered in chapter 15 of this EAR.

4.8.2 There are two types of cumulative effects which have been considered for the Project:

- The combined effect of a number of different environmental topic-specific impacts from the Project on a single receptor or resource. For example, an individual property that would experience noise, air quality and visual amenity impacts as a result of the Project.
- The combined effect of a number of different developments (in combination with the Project being assessed) on a single receptor or resource. For example, where an individual property would experience noise impacts from the Project and from another development that is proposed.

4.8.3 Cumulative effects may be of greater significance than the individual significance of any of the singular effects.

4.9 Significance of Impacts

4.9.1 This EAR aims to determine whether or not identified impacts have significant effects. The impact is the action, or consequence of the Project, for example a tree is removed. The effect is how that matters to the environment, for example the tree may have provided bird nesting habitat which has been lost.

4.9.2 To determine the significance of an impact, two factors are considered: the **value** (or sensitivity) of the receptor and the **magnitude** (or scale) of the impact.

Table 4.1: Environmental value of receptors (DMRB vol. 11 section 2, part 5)

Value (sensitivity)	Typical descriptors
Very High	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution.
Low (or Lower)	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

4.9.3 Table 4.2 below set out typical criteria for the value or sensitivity of receptors and for the magnitude of impacts.

4.9.4 Some topic guidance (see Table 4.1) includes specific criteria on determining significance, while other topic guidance includes no criteria at all. The approach used in this EAR is set out in the relevant topic chapters (Chapter 5 to 15).

Table 4.2: Impact magnitude (DMRB vol.11 section 2, part 5)

Magnitude of impact	Typical criteria descriptors
Major	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse).
	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Moderate	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse).
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Minor	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse).
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse).
	Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

4.9.5 When the value of the receptor and the magnitude of the impact have been identified, the matrix given in Table 4.3 can be used to determine the significance of the effect. For example, a slight adverse impact on a receptor of medium value would have a slight adverse effect.

Table 4.3: Typical significance matrix (DMRB vol. 11 section 2, part 5)

Value (sensitivity)	Magnitude of Impact (adverse or beneficial)				
	No Change	Negligible	Slight	Moderate	Major
Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Large or Very Large
High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
Medium	Neutral	Neutral or Slight	Slight	Slight or Moderate	Moderate or Large
Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

4.9.6 The significance matrix (Table 4.3) cannot be applied consistently for all environmental topic areas. Some environmental topics have topic specific criteria for value and / or impact magnitude which then gives a topic specific matrix.

4.9.7 Where impacts can be quantified, for example for changes in noise and air quality, thresholds have been set which represent a significant change. Where environmental topics have no agreed methods of assessment or scales of measurement for either the value / sensitivity of the receptor or the magnitude of impact, assessment is based on professional judgement, and impacts are assessed simply as being either significant or not significant. Where it is applied, professional judgement takes account of whether the impact is adverse or beneficial, the nature of the receptor affected and the duration of the impact (temporary or permanent, short term or long term).

4.9.8 Professional judgment is used to reach a well-reasoned conclusion, based on the relevant facts and circumstances available at the time. A fundamental part of the process is the involvement of individuals with sufficient knowledge and experience. The decision made must be impartial, even though the use of judgment is a subjective process.

4.9.9 Any impacts that are assessed as being moderate adverse / beneficial or greater, are considered as significant for the purpose of this assessment.

4.10 Mitigation Measures

4.10.1 Mitigation is the way that adverse impacts can be avoided or reduced. All mitigation measures which are committed to and are deliverable form part of the Project and have been taken into account as part of this EAR.

4.10.2 Impacts that would still occur even with the mitigation measures in place are 'residual' impacts. The impacts reported in this EAR are the residual impacts. Some measures that are designed to mitigate an adverse impact may leave the environment improved over even its existing state. In these cases, the residual impact recorded would be beneficial.

Mitigation through design

4.10.3 Mitigation through design refers to the way the Project has been designed to avoid or reduce adverse impacts. An example is the way the ground levels across the Project Site have been revised to minimise the need for earthworks and reduce the need for excavated material to be moved or transported offsite.

Other Mitigation Options

4.10.4 Where impacts could not be avoided or reduced by changes in the design, other mitigation measures have been considered. These are broadly categorised below:

- Additional measures that avoid or reduce negative impacts, for example the provision of planting trees to screen the view of the Project.
- Compensation for or replacement of features and resources, for example replacing trees that will be removed with new areas of planting in a nearby location, or replacing a pond.
- Offsetting impacts by providing a beneficial effect that is related to the impact, but is not a like-for-like replacement of the feature to be lost. For example an archaeological excavation which provides detailed archaeological records of the archaeological remains to offset the loss of the remains themselves.

4.10.5 In some cases, it may be necessary to apply a combination of two or more of these mitigation approaches.

4.10.6 Where appropriate, the measures or combinations of measures to be used in mitigation should be decided in consultation with statutory consultees and/or other third parties.

Further Mitigation Opportunities

4.10.7 Opportunities for further mitigation have been identified were applicable, within each of the topic chapters. These are measures that are not included in the assessments at this stage as the design is illustrative only, however, as we move through the preliminary and detailed design phases, these will be considered and agreed with the appropriate consultees.

Environmental Management Plan (EMP)

4.10.8 The purpose of an EMP is to manage the environmental effects of projects and to demonstrate compliance with environmental legislation. Highways England guidance on EMPs is provided in IAN 183/14.

4.10.9 An EMP is developed through the stages of the Project and helps to ensure that the effects of the Project on the environment are appropriately managed and not worse than reported in the EAR.

4.10.10 An Outline EMP is typically prepared at the preliminary design stage, which would be developed by the Contractor into a Construction Environmental Management Plan (CEMP) during the detailed design stage of a Project.

4.10.11 The CEMP would then be developed into a Handover Environmental Management Plan (HEMP) which would be provided for the ongoing maintenance or operation of the Project.

4.10.12 An Outline EMP has not been prepared at this illustrative design stage. A CEMP will be prepared at the detailed design stage by the Contractor. The CEMP will aim to present all environmental objectives, risks, mitigation and commitments against clearly identified actions, to ensure that each are effectively considered and managed.

4.10.13 This will be captured using a Register of Environmental Actions and Commitments (REAC) and Environmental Masterplan (Figure 1.2), which is a drawing (or set of drawings) detailing all the environmental requirements of the Project.

4.11 Limitations and Assumptions

4.11.1 The following assumptions and limitations apply for the environmental assessment carried out for the Project. Assumption and limitations that are specific to a topic area are set out in the relevant chapter.

- The environmental assessment has been carried out on an illustrative design for the Project, meaning that some elements of the design are uncertain. Therefore it should be seen as a living document that will be updated before construction of the area starts.
- The construction strategy is also at an illustrative stage, based on the illustrative design.
- The illustrative design does not include fully developed mitigations, for example the noise impacts of the Project have been assessed in the absence of any mitigation bunds or acoustic barriers.
- Where availability of data has been limited, this is set out in the relevant chapter.

- Where there is uncertainty or limitations in the Project design or data availability, a precautionary approach has been taken so that the worst case scenario of environmental impact is assessed.

5. Air Quality

5.1 Executive Summary

5.1.1 An air quality assessment has been undertaken to predict impacts during the construction and operational phases of the Project. Some construction activities are likely to generate dust which has the potential to cause loss of amenity (e.g. discolouration of surfaces) at nearby properties if uncontrolled. These impacts would be mitigated through the implementation of best practice measures, such as wetting down.

5.1.2 The operation of the Project has the potential to lead to changes in nitrogen dioxide (NO_2) and Particulate Matter (PM_{10}) concentrations at receptors. Existing concentrations of NO_2 and PM_{10} are expected to be well below the annual objective at receptors across the study area. The Operation Stack parking area is expected to have negligible impacts on annual mean concentrations of these pollutants, due to the low frequency of use and the low existing concentrations in the study area. The Full-time parking area will; however, be used daily and has the potential to affect annual mean NO_2 concentrations at nearby receptors. Furthermore, emissions from the engines used to power lorry refrigeration units in the Operation Stack parking area have the potential to lead to high hourly NO_2 concentrations in relation to the hourly NO_2 objective.

5.1.3 The potential operational Project impacts described above have been considered using a dispersion model. Annual mean NO_2 and PM_{10} concentrations are predicted to meet air quality objectives with the operation of the Project. Under worst-case assumptions on the parking arrangement for refrigeration lorries (where it is assumed the vehicles are aggregated together alongside receptors in Stanford), no exceedances of the hourly NO_2 objective are predicted. The overall air quality effects of the Project are expected to be non-significant. Although air quality effects are expected to be non-significant, an operational strategy that distributes refrigeration lorries throughout the parking area has the potential to minimise air quality impacts and will be adopted.

5.2 Introduction

5.2.1 This chapter presents the assessment of the potential air quality impact of the Project. The Project will include:

- 3415 lorry parking spaces for use only during Operation Stack, which has been assumed to occur eight days per year and includes the parking area to the north and south of the M20 (known as Operation Stack parking area from herein)
- 500 lorry parking spaces for daily use outside of Operation Stack, and includes only the parking area to the south of the M20 (known as Full-time parking area).

5.2.2 The construction phase of the Project has the potential to result in temporary air quality impacts due to the emission of dust, resulting in dust soiling and elevated concentrations of fine particles (Particulate Matter smaller than 10 µm aerodynamic diameter; PM_{10}).

5.2.3 The operational phase of the Project has the potential to affect ambient concentrations of nitrogen dioxide (NO_2) and PM_{10} due to vehicle emissions from the Full-time parking area, Operation Stack parking area and associated access roads.

5.2.4 During the operation phase Temporary Traffic Management will be introduced on a section of the eastbound M20 between Junction 10 and Junction 11 during Operation Stack, and will include:

- 40 mph speed limit (between marker post 96/5 and 102/1)
- Closure of lane 1 (between marker post 97/8 and Junction 11), with all remaining traffic using lane 2 and lane 3
- Use of hard shoulder for lorries entering and exiting parking area (between marker post 97/8 and Junction 11)

5.2.5 These Temporary Traffic Management measures are not expected to affect the volume of traffic flow on the M20 and Strategic Road Network (SRN). However, the Temporary Traffic Management has the potential to lead to a change in vehicle speed and emissions on the M20 and lead to a change in the distance between vehicles and receptors, affecting pollution dispersion. The Temporary Traffic Management measures will not apply when only the Full-time parking area is in use - they will be introduced during Operation Stack to manage the flow of lorries entering and exiting the Operation Stack parking area.

5.2.6 The assessment of potential air quality impacts have been considered in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3, Part 1 – Air Quality (HA207/07) [4] and Interim Advice Notes 170/12[5], 174/13[6], 175/13[7] and 185/15[8].

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[4] Highways England (2007) Design Manual for Roads and Bridges, Volume 11 Section 3, Part 1 – Air Quality (HA 207/07)
[5] Highways Agency (2012) IAN 170/12: Updated air quality advice on the assessment of future NOx and NO2 projections for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' (HA207/07)
[6] Highways Agency (2013) IAN 174/13: Update advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' (HA207/07)
[7] Highways England (2013) IAN 175/13: Updated air quality advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' (HA207/07)
[8] Highways England (2015) IAN 185/15: Updated traffic, air quality and noise advice on the assessment of link speeds and generation of traffic data into speed bands for users of DMRB Volume 11, Section 3, Part 1 'Air Quality'

5.3 Regulatory / Policy Framework

European

5.3.1 EU Directive 2008/50/EC on ambient air quality and cleaner air for Europe was adopted in May 2008. This Directive defines limit values and times by which they are to be achieved for the purpose of protecting human health and the environment by avoiding, reducing or preventing harmful concentrations of air pollutants.

5.3.2 Directive 2008/50/EC sets out that the limit values apply everywhere with the exception of:

a. Any locations situated within areas where members of the public do not have access and there is no fixed habitation

b. In accordance with Article 2(1), on factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply

c. On the carriageway of roads and on the central reservations of roads except where there is normally pedestrian access to the central reservation

National

Air Quality Legislation

5.3.3 The Air Quality Standards Regulations 2010[9] came into force in June 2010; they implement the EU's Directive 2008/50/EC on ambient air quality.

5.3.4 Part IV of the Environment Act 1995[10] requires that every local authority shall periodically carry out a review of air quality within its area, including likely future air quality. As part of this review, the authority must assess whether air quality objectives are being achieved, or likely to be achieved within the relevant periods. Any parts of an authority's area where the objectives are not being achieved, or are not likely to be achieved within the relevant period must be identified and declared as an Air Quality Management Area (AQMA). Once such a declaration has been made, authorities are under a duty to prepare an Action Plan which sets out measures to pursue the achievement of the air quality objectives within the AQMA.

5.3.5 The air quality objectives specifically for use by local authorities in carrying out their air quality management duties are set out in the Air Quality (England) Regulations 2000[11] and the Air Quality (England) (Amendment) Regulations 2002[12].

[9] Statutory Instrument (2010) The Air Quality Standard Regulations, No. 1001.
[10] Defra (2003) Part IV of the Environment Act 1995 Local Air Quality Management.
[11] Statutory Instrument. (2000) Air Quality (England) Regulations, No. 928.
[12] Statutory Instrument. (2002) Air Quality (England) (Amendment) Regulations, No. 3043.

5.3.6 The Air Quality Strategy (AQS) establishes the UK framework for air quality improvements. The air quality objectives in the AQS are a statement of policy intentions and policy targets. As such, there is no legal requirement to meet these objectives, although there is a duty on local authorities to work towards achieving the objectives.

5.3.7 The air quality objectives and limit values relevant to the assessment are summarised in Table 5.1.

Table 5.1 - Air Quality Objectives, Limit Values and Critical Level

Pollutant	Averaging Period	Concentration	Allowance	Attainment Date	
				Air Quality Objectives	EU Limit Values
Nitrogen dioxide (NO_2)	Annual	40 µg/m^3	-	31 December 2005[(a)(b)]	1 January 2010[(c)]
	1 Hour	200 µg/m^3	18 (equivalent to 99.8th percentile)	31 December 2005[(a)(b)]	1 January 2010[(c)]
Nitrogen Oxides (NO_X)[(d)]	Annual	30 µg/m^3	-	31st December 2000[(a)(b)]	
Particulates (PM_{10})	Annual	40 µg/m^3	-	31 December 2004[(a)(b)]	1 January 2005[(c)]
	24 Hour	50 µg/m^3	35 (equivalent to 90th percentile)	31 December 2004[(a)(b)]	1 January 2005[(c)]

Notes: [(a)] Air Quality (England) Regulations 2000 as amended
[(b)] Air Quality Strategy 2007
[(c)] EU Directive 2008/50/EEC on ambient air quality and cleaner air for Europe and The Air Quality Standards Regulations 2010. Derogations (time extensions) have been agreed by the EU for meeting the NO_2 limit values in some zones/agglomerations
[(d)] Designated for the protection of vegetation and ecosystems and also referred to as the 'critical level' for NO_x

5.3.8 The air quality objectives only apply in locations of relevant exposure. Table 5.2 provides details of where the respective objectives should and should not apply and therefore the types of receptors that are relevant to this assessment.

Table 5.2 - Locations where the Air Quality Objectives Should and Should Not Apply

Averaging Period	Objectives should apply at:	Objectives should not apply at:
Annual	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
24 Hour	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short-term.
1 Hour	All locations where the annual mean and 24 hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.

Source: Department for Environment, Food and Rural Affairs (2016), Local Air Quality Management – Technical Guidance (16)

5.3.9 DMRB guidance[1] states that the policy of the UK statutory nature conservation agencies is to apply the annual mean NO_x criterion (30 µg m^{-3}) in internationally designated conservation sites and SSSIs on a precautionary basis[13].

Construction Dust

5.3.10 Section 79(1)(d) of the Environmental Protection Act 1990 defines one type of ‘statutory nuisance’ as “any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance”. Where a local authority is satisfied that a statutory nuisance exists, or is likely to occur or recur, it must serve an abatement notice. Failure to comply with an abatement notice is an offence. However, it is a defence if an operator employs the best practicable means to prevent or to counteract the effects of the nuisance.

[13] The Limit Value applies only to locations more than 20 km from towns with more than 250,000 inhabitants or more than 5 km from other built-up areas, industrial installations or motorways.

National Planning Policy Framework

5.3.11 The National Planning Policy Framework (NPPF) sets out the government's planning policies for England. With regard to air quality the Policy states at paragraph 109 that:

> *"The planning system should contribute to and enhance the natural and local environment by:… preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability…"*

5.3.12 And at paragraph 124 that:

> *"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative effects on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."*

Regional

5.3.13 There is no regional air quality legislation or policy applicable to the Project.

Local

5.3.14 The Shepway Core Strategy Local Plan[14] contains a long term plan bringing together the aims and actions of the government, local councils, residents, businesses and voluntary groups, by managing land-use and developments. One of the aims of the plan (Strategic Need B) is to:

> *"Minimise local carbon emissions, maintain air quality, control pollutants and promote sustainable waste management".*

5.4 Study Area

Construction

5.4.1 Potential construction dust impacts have been considered in accordance with DMRB guidance[4], which involves identifying sensitive receptors within 200m of the construction site. Figure 5.1 shows the study area for the construction phase, which includes sensitive receptors located within 200m of the Site boundary.

Operation

5.4.2 DMRB guidance[4] provides advice on which roads should be considered when assessing local air quality impacts. Only 'affected roads' should be considered, which are those that meet any of the following criteria:

- Road alignment will change by 5m or more

[14] Shepway District Council (2013) Shepway Core Strategy Local Plan

- Daily traffic flows will change by 1,000 Annual Average Daily Traffic (AADT) flow or more
- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more
- Daily average speed will change by 10kph or more
- Peak hour speed will change by 20kph or more

5.4.3 Temporary Traffic Management introduced during Operation Stack is expected to reduce traffic speed on a section of the eastbound M20. However the speed criteria above are based on long-term annual average traffic impacts and the traffic impacts of the Project would not meet the 'affected road' criteria when considering the frequency of Operation Stack. Nevertheless, the Temporary Traffic Management arrangements have been considered in the air quality assessment as they have the potential to affect total NO_2 concentrations when combined with the contribution of emissions from the Operation Stack parking area.

5.4.4 DMRB guidance[4] does not contain assessment criteria for lorry parking areas. However, emissions from the Full-time parking area and Operation Stack parking area have the potential to affect local air quality at receptors adjacent to the Project Site due to emissions from lorries and the dedicated engines powering lorry refrigeration units. It should be noted that pollutants emitted from the parking areas will disperse with increasing distance from the source, such that maximum impacts are expected within 200m of the source. Receptors have been considered within this distance of the Project Site and associated access roads.

5.5 Assessment Methodology

Introduction

5.5.1 The air quality assessment has been completed in accordance with Defra[15] and Highways England[4 7 8] guidance.

5.5.2 Although IAN 175/13[7] is currently withdrawn pending a new version, it has been used following advice received from Highways England as it is the only DMRB associated guidance available for assessing risk related to compliance with the EU Directive on ambient air quality.

5.5.3 As discussed in Section 5.4 - Study Area, potential construction dust impacts have been considered in accordance with DMRB guidance[4], which involves identifying sensitive receptors within 200m of the construction site. Figure 5.1 shows the study area and associated receptors for the construction phase.

5.5.4 Operational air quality impacts have been considered separately for the Operation Stack parking area and the Full-time parking area, as each are likely to affect air quality in relation to different air quality objectives. The Operation Stack parking

[15] Defra (2016) Local Air Quality Management Technical Guidance

area will be of concern for the hourly NO_2 objective only and the Full-time parking area of concern for the annual NO_2 objective only, as described in more detail below.

5.5.5 The impacts of the Operation Stack parking area on annual NO_2 concentrations is expected to be non-significant in relation to IAN 174/13[6], due to the low frequency of use (estimated at eight days per year) and the low existing NO_2 concentrations in the study area (see Section 5.7 – Baseline). This has therefore not been assessed further. There is however the potential for the Operation Stack parking area to lead to air quality impacts in relation to the hourly air quality objective for NO_2 due to emissions from the dedicated engines powering lorry refrigeration units combined with lorry movements in the parking area (see Section 5.5 methodology) and these impacts have been modelled in this chapter.

5.5.6 The impacts of the Full-time parking area on annual and hourly NO_2 concentrations are expected to be non-significant in relation to IAN 174/13[6], due to the low existing NO_2 concentrations in the study area (see Section 5.7 – Baseline), the distance between receptors and the parking bays (which are located more than 200m away from receptors) and the number of lorries expected to be parked in the Full-time parking area. The access road to the Full-time parking area does however have the potential to affect annual mean NO_2 concentrations at receptors adjacent to the road, and so these impacts have been considered.

5.5.7 Project impacts on PM_{10} are expected to be not significant in relation to IAN 174/13[6]. Existing annual mean PM_{10} concentrations are well below the air quality objective (see Section 5.7 – Baseline), and it is not expected that PM_{10} emissions from the Operation Stack parking area would lead to exceedances of the daily PM_{10} objective as the parking area would be used only eight days per year (daily PM_{10} objective allows the daily mean PM_{10} threshold to be exceeded 35 days per year).

Scenarios

5.5.8 The following scenarios have been considered for the operational assessment:

- 2014 Baseline – Normal operation of the M20
- 2017 Opening Year Do Minimum – Normal operation of the M20 without the Project
- 2017 Opening Year Do Something Operation Stack – Temporary Traffic Management on the M20 with Operation Stack parking area
- 2017 Opening Year Do-Something Full-time Parking – Normal operation of the M20 with Full-time parking area (without Operation Stack)

5.5.9 The baseline scenario has been used to compare modelled annual mean NO_2 concentrations against monitoring data, in order to determine whether a model verification factor should be applied to the Opening Year results. The model verification process has been undertaken based on monitored annual mean NO_2 concentrations, as hourly NO_2 monitoring data is not available within the vicinity of the Project Site. Furthermore verification methods devised for traffic pollution are based on annual mean concentrations[15].

5.5.10 Annual mean and hourly mean NO_2 concentrations have been predicted in the Baseline and Do-Minimum scenario.

5.5.11 In the Do-Something Operation Stack scenario, hourly mean NO_2 concentrations have been predicted using five years of meteorological data (2011 to 2015) and assuming the parking area is used every day as a worst-case assumption (see Section 5.6 – Limitations to the Assessment). Five years of meteorological data have been used in order to capture the likely worst-case conditions for pollution dispersion from the dedicated engines powering refrigeration units.

5.5.12 In the Do-Something Full-Time Parking scenario, annual mean NO_2 concentrations have been predicted, assuming that the Full-time parking area is used every day of the year (note only the parking area access road has been modelled, as receptors are located more than 200m away from the Full-time parking area). As this scenario only considers road traffic emissions, only year 2014 meteorological data has been used, consistent with the Base Year and model verification undertaken.

5.5.13 It should be noted that for the Do-Minimum scenario, five years of meteorological data were used to predict hourly mean NO_2 concentrations, and only 2014 meteorological data was used to predict annual mean concentrations (for comparison against the Do-Something scenarios described above).

5.5.14 Only an assessment of Opening Year impacts has been undertaken, as this is expected to represent the worst-case scenario since emissions and background air quality are anticipated to improve year on year into the future, mainly in response to the increased uptake of Euro 6/IV vehicles on the road network and actions in Defra's 2015 air quality action plan[16].

Traffic Data

5.5.15 All of the traffic data used in the air quality assessment is presented in Appendix 5.1 and a description of this data is provided below.

5.5.16 The M20 (between J10 and J11), A20 and B2068 are the only existing roads considered in the air quality assessment. Traffic forecasts for these roads have been obtained based on traffic modelling undertaken for the M20 J10a Scheme[17] (only one junction away from the Project Site). Traffic data for the M20 J10a

[16] Defra (2015) Improving air quality in the UK, Tackling nitrogen dioxide in our towns and cities.
[17] http://www.highways.gov.uk/roads/road-projects/m20-junction-10a

Scheme was produced using a SATURN traffic model and data is available for vehicle flows, speed and % Heavy Duty Vehicles for the following periods:

- AM peak period (07:00 to 10:00)
- Interpeak period (10:00 to 16:00)
- PM peak period (16:00 to 19:00)
- Off peak period (19:00 to 07:00)

5.5.17 Modelled traffic speeds have been pivoted against observed speeds and used to derive speed band categories in accordance with IAN 185/15[8].

5.5.18 The traffic data described above is available for a Baseline year (2014) and for the Do-Minimum and Do-Something scenario (2018) of the M20 J10a Scheme. The opening year of the Project is however expected to be 2017. Table 5.3 shows traffic data used to assess the operational air quality impact of the Project.

Table 5.3 – Traffic Data used for the Project

Project Scenario	Traffic Data
2014 Base	M20 J10a Base Model (2014)
2017 Do-Minimum	M20 J10a Do-Something Model (2018)
2017 Do-Something	M20 J10a Do-Something Model (2018)

5.5.19 It should be noted that by using this traffic data the assessment of the Project assumes the M20 J10a Scheme will also be operational and therefore includes additional traffic generated as a result. The Do-Something traffic flows are greater than Do-Minimum traffic flows along the M20 and therefore this provides a worst-case assessment of total pollution concentrations in the Opening Year. The Do-Something data is representative of 2018, and it is proposed that the Project will be operational from 2017. Traffic flows are expected to be higher in 2018 than 2017 due to traffic growth and the use of this data is considered to be conservative and therefore appropriate.

Operation Stack Scenario

5.5.20 In the Do-Something Operation Stack scenario it has been assumed that the eastbound M20 between J10 and J11 operates at a speed of 40 mph during Operation Stack due to Temporary Traffic Management.

5.5.21 AADT flows in and out of the Operation Stack parking area have been assumed to be equal to the total eastbound flow of HGVs on the M20 (between J10 and J11), as there is the possibility that all eastbound HGVs on the M20 (including those not associated with crossing the channel) would be sifted in the Operation Stack parking area. This is equivalent to an AADT flow of 4695 HGVs. It has been assumed that one third of these vehicles do not initially enter the Operation Stack parking area, but travel onwards towards the coast and once turned around they enter the Operation Stack parking area through the access road to the Full time parking area. Once inside the Operation Stack parking area the movement of vehicles has been estimated based on the operation strategy of the parking area in order to disaggregate the total HGV flow across different sections of the parking area.

5.5.22 No information has been provided on the number of refrigeration lorries likely to use the Operation Stack parking area. Dearman technologies have examined the air quality impacts of refrigeration vehicles in the UK[22], and have advised that there are currently ~34,000 articulated and rigid refrigeration lorries on the UK road network[18]. In total there are approximately 480,000 licensed articulated and rigid lorries on the UK road network[19], and so approximately 7% of these are likely to be refrigeration lorries. For this assessment, it has been assumed that 10% of the parking spaces in the Operation Stack parking area are used by refrigeration lorries, which is equivalent to 342 refrigeration lorries.

Full-Time Parking Scenario

5.5.23 It has been assumed that there is a two-way AADT flow of 3000 lorries using the access road to the Full-time parking area.

Background Air Quality

5.5.24 Total NO_2 concentrations comprise a background and local component. The background concentration is determined by regional, national and international emissions, and often represents a significant proportion of the total pollutant concentration. The local component is determined by local pollutant sources such as roads, and in this case has been considered using the ADMS Roads dispersion model.

5.5.25 Hourly background NO_2 concentrations have been included in the model based on Automatic Urban Rural Network (AURN) measurements from the background station in Canterbury. The Canterbury station is located approximately 20km north of the Project Site.

5.5.26 The Canterbury AURN background air quality station has been selected as it is the nearest to the Project Site which has the greatest data capture across the five meteorological years considered in the assessment (>90% for all years). Table 5.4 shows the background NO_2 concentrations predicted by Defra[18] at the Project Site for the years 2011 to 2015, together with the annual mean concentrations monitored by the AURN station. The annual mean background NO_2 concentrations monitored are slightly lower than those predicted by Defra in 2011 to 2015, however, it should be noted that for 2017 (the Project opening year), the Defra background NO_2 concentration is in overall agreement with those monitored over the five year period. The AURN background NO_2 measurements are therefore assumed to be appropriate for the assessment.

[18] https://uk-air.defra.gov.uk/

Table 5.4 – Defra Predicted and Canterbury AURN Monitored Background Annual Mean NO_2 (µg m^{-3})

Year	Defra NO_2	Canterbury NO_2
2011	16.7	14.5
2012	16.1	15.0
2013	15.5	14.5
2014	14.9	12.1
2015	14.3	10.7
2017 (Opening Year)	13.1	-

Notes: Defra background NO_2 obtained for grid square 612500, 137500 which corresponds with the location with the greatest number of receptors (in study area).

Model Set Up

5.5.27 Emissions of NO_x have been modelled using the ADMS-Roads dispersion model (version 3.4).

5.5.28 The dispersion model was built by digitising traffic model links to the Integrated Transport Network and assigning road widths based on OS mapping and aerial photography. The layout of the Project Site and associated access roads were digitised based on a geo-referenced CAD drawing of the Project.

Emissions

5.5.29 For the Baseline, Do-Minimum and Do-Something scenarios, emissions from the M20, A20 and B2068 were derived using traffic data from the M20 J10a model (described above), using IAN 185/15[8] to calculate vehicle emissions from the speed band category of each road link. Morning (AM), inter peak (IP), evening (PM) and off-peak (OP) emissions were represented in the model using a time varying emissions file.

Operation Stack Scenario

Lorry Emissions

5.5.30 It has been assumed that the lorries entering, parking and leaving the Operation Stack area would manoeuvre at very low speeds, which is a worst-case assumption in terms of vehicle emissions. Defra[15] recommend that emissions under these conditions (e.g. from car parks) are represented by assuming a speed of 5kph in the Defra Emission Factor Toolkit. This approach has been used here, assuming a motorway road type and 100% Heavy Goods Vehicles.

Refrigeration Engine Emissions

5.5.31 In the Do-Something Operation Stack scenario, it has been assumed that 10% of the lorries using the parking area are refrigeration lorries, which use a separate diesel engine to the propulsion engine in order to power the refrigeration unit. The dedicated diesel engine powering the lorry refrigeration unit is expected to be running whilst the vehicle is parked, contributing to total emissions. These lorry refrigeration engines are typically around 11.5 kW in size[19], and are classed as Non Road Mobile Machinery (NRMM). Because of the engine size, there are no EU NRMM emission standards which currently apply to these engines, and so NO_x emissions from a conventional lorry refrigeration engine can be six times greater than from a Euro IV diesel truck propulsion engine[20].

5.5.32 For parked refrigeration lorries, the emissions from the engines powering the refrigeration units were derived based on research undertaken by CE Delft[21], who explored the potential air quality benefits of using an electric power supply on parking spaces used by long haul refrigerated transport. Consultation was also undertaken with Dearman technologies[18], who have examined the air quality impacts of the engines powering lorry refrigeration units in the UK[20]. There are currently no emission standards for refrigeration engines in the EU, as standards only apply to NRMM with engines above 19 kW which are greater than the typical 11.5 kW size for refrigerated units. The European Commission has however proposed to introduce Stage V emission regulations, which from 2019 will apply to engines below 19 kW in size.

5.5.33 The newest engines for lorry refrigeration units, produced as from 2016 are already expected to comply with Stage V emission standards (equivalent to US Tier 4 standards), and current engines on the market comply with at least US Tier II standards[18 23].

5.5.34 As a worst-case approach it has been assumed that all engines for lorry refrigeration units emit NO_x corresponding with US Tier II standards, which is equivalent to a NO_x emission factor of 6 g/kWh. The power consumption of a lorry refrigeration engine varies depending on the cooling demand, which is determined by factors such as outside temperature, the required temperature of cooling, the product being cooled, and the efficiency of the cooling system. Normally during stops, the inside temperature is close to the set temperature (required temperature of cooling), and the energy consumption varies depending on the operational mode (whether stop-start mode, often used for frozen products or continuous mode, often used for chilled products). CE Delft[21] found that during resting periods the power consumption varies between 0.37 and 4.16 kW in stop-start mode, and between 6.3 kW and 9.8 kW in continuous mode. As a worst-case assumption it has been assumed that all refrigeration vehicles are operating in continuous mode at 9.8 kW.

[19] Department for Transport (2010) Non-Road Mobile Machinery Usage, Life and Correction Factors
[20] Dearman (2015) Liquid Air on the European Highway
[21] CE Delft (2015) Electrical trailer cooling during rest projects

5.5.35 An exhaust exit velocity of 13.6 m/s has been calculated[22] for a 9.8 kW lorry refrigeration engine and has been used in this assessment. The exhaust temperature of lorry refrigeration engine emissions is relatively low[23], and has been assumed to be 170°C, which is based on exhaust temperature measurements undertaken for diesel engines[23] used to power lorry refrigeration units.

5.5.36 The NO_x emissions from the engines powering lorry refrigeration units have been represented in the model using an area source, equivalent in size to 10% of the parking spaces in the Operation Stack parking area (342 refrigeration lorries). The dispersion of emissions from the vertical exhaust associated with each dedicated refrigeration engine would be more accurately represented using a point source release, but the model does not have the capability to represent 342 exhausts as point sources. Based on advice from CERC[24] who are the ADMS-Roads model developer, in order to adequately account for cooling and mixing of area source exhaust gases with ambient air, the area source exhaust temperature and velocity has been scaled to provide concentrations equivalent to modelling point source releases at 170°C and 13.6 m/s exit velocity. Following a series of sensitivity tests, an area source exhaust temperature of 30°C and exit velocity of 0.009 m/s has been used to represent lorry refrigeration engine emissions.

5.5.37 In order to represent the potential worst-case impacts at the greatest number of receptors, impacts have been predicted under the conservative assumption that all refrigeration lorries are aggregated together at the eastern extent of the site, at the closest location to receptors on Stone Street and Kennett Lane. These receptors would typically be downwind of the parking area when accounting for the prevailing wind direction, and so the greatest air quality impacts are expected here. The location of the refrigeration vehicles considered is shown in Figure 5.2. This is expected to provide a worst-case assessment of the air quality impacts of emissions from these vehicles, since refrigeration lorries are expected to be more dispersed throughout the parking area.

Temporary Traffic Management Emissions

5.5.38 For the Temporary Traffic Management on the eastbound M20, light congestion speed band emissions for motorways were used to represent the 40 mph speed restriction. The eastbound M20 carriageway was also disaggregated to account for HGVs using the hard shoulder and others vehicles using lanes 2 and 3.

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[22] Calculated by senior principal engineer / engine specialist, based on typical exhaust flow rate for a diesel engine (5 kg/hr per kW), which is scalable per kW output.
[23] A. Mayer et al (2005) Retrofitting TRU-diesel engines with DPF-systems using FBC and intake throttling for active regeneration.
[24] Cambridge Environment Research Consultants (developers of ADMS-Roads dispersion model), contacted by Mott MacDonald on 14/06/2016.

Full-Time Parking Scenario

5.5.39 For emissions from lorries using the access road to the Full-time parking area it was assumed that these vehicles travel at a speed of 5 kph, which is a worst-case assumption for emissions (as described above).

Meteorological Data

5.5.40 The Project Site is located approximately 4 km from the south coast, and could be affected by land-sea breeze effects. The nearest meteorological station expected to be representative of conditions at the Project Site, is the Meteorological Office observation centre at Herstmonceux, which is located approximately 55 km west south west of the Project Site.

5.5.41 Herstmonceux is located 8 km from the south coast, and so is likely to be affected by similar land-sea breeze effects to the Project Site. Furthermore, due to the shape of the south coast, the prevailing wind travels over land for the same distance (approximately 20 km) before the reaching the Project Site and before reaching Herstmonceux, which should therefore lead to similar effects on the wind speed.

Operation Stack Scenario

5.5.42 For the Do-Minimum and Do-Something Operation Stack scenario, five years of hourly sequential meteorological data have been used in the air quality model covering the years 2011 to 2015. It should be noted that all of these meteorological years have at least 99% of hourly data across the year, which is considered sufficient to allow short-term pollutant percentiles to be reliably predicted according to Defra guidance[25].

5.5.43 Figure 5.3 shows the wind rose across these five years, and demonstrates that the predominant wind direction is from the south westerly quadrant.

Full-time Parking Scenario

5.5.44 Year 2014 meteorological data has been used for the Full-time parking scenario, since this corresponds with the Base year used for model verification.

NO_x to NO_2 conversion

5.5.45 The ADMS-Roads online chemistry scheme has been used to model NO_x to NO_2 conversion on an hourly basis. Hourly background O_3, NO_x and NO_2 concentrations have been derived from the Canterbury AURN site, and have been applied to each of the meteorological years considered in the Do-Minimum and Do-Something models. The data capture across all of these years and pollutants is greater than 90%, other than for O_3 in 2011 (~78%), where missing O_3 values have been substituted with O_3 measurements from the Rochester Stoke AURN station,

[25] Defra (2009) Local Air Quality Management Technical Guidance (LAQM.TG09).

giving greater than 90% data capture. Data from the Rochester Stoke station was used, as excluding Canterbury, it's the nearest background AURN monitoring station to the Project Site that measures O_3 (47km north of the Site), and is expected to be broadly representative of background oxidant chemistry at the Project Site.

5.5.46 The chemistry scheme requires a primary NO_2 fraction to be specified for emission sources. A primary NO_2 fraction of 23.8% has been used for road traffic emissions, which is the default ADMS-Roads value, and is comparable to the fraction that would be derived from the Defra NO_x to NO_2 calculator (v4.1) for 2017 motorway traffic in Shepway District Council (SDC) (primary NO_2 fraction of 24%). A primary NO_2 fraction of 9% has been assumed for refrigeration lorry emissions based on primary NO_2 measurements from diesel refrigeration engines[23].

Future NO_2 Projections

Full-time Parking Scenario

5.5.47 Vehicle emission factors assume that air quality improves in future years, as older vehicles are replaced with modern cleaner vehicles[26]. However, generally, UK monitored roadside NO_2 concentrations have not declined as would be expected in recent years. This trend is thought to be related to the increased use of modern diesel vehicles, which emit more NO_x than expected under urban driving conditions and have higher primary NO_2 emissions than petrol vehicles[27].

5.5.48 A long-term trend (LTT) gap analysis has therefore been carried out for annual mean NO_2 in accordance with IAN 170/12[5], which is based on the observed LTT in roadside NO_2 in the UK.

5.5.49 It should be noted that the interim LTT gap analysis calculator has been used in the assessment, and this takes into account anticipated emission improvements from Euro 6/VI vehicles (which are beginning to enter the UK fleet). Data is still being gathered on the emission performance of Euro 6/IV vehicles under real world driving conditions, but to date, the information suggests that these vehicles emit less pollution than earlier Euro standards and so should deliver air quality improvements[26].

Operation Stack Scenario

5.5.50 No LTT adjustment factors have been applied to the hourly NO_2 predictions in the Do-Something Operation Stack scenario, as the short term impacts are predominantly caused by lorry refrigeration engine emissions rather than emissions from vehicle propulsion engines, and it would not be appropriate to apply the same road traffic LTT adjustment factors to NO_2 concentrations

[26] Department for Environment, Food and Rural Affairs (2015), Air Quality in the UK: plan to reduce nitrogen dioxide emissions.

[27] Defra 2016 Trends in NO_x and NO_2 emissions and ambient measurements in the UK, available online at https://uk-air.defra.gov.uk/assets/documents/reports/cat05/1108251149_110718_AQ0724_Final_report.pdf

predicted from this source. Furthermore the LTT adjustment factors in IAN 170/12[5] are based on annual mean concentrations.

Assessment of Ecological Sites

5.5.51 Elevated NO_x concentrations can adversely affect ecosystems, including Special Areas of Conservation (SACs); Special Protected Areas (SPAs); Special Sites of Special Scientific Interest (SSSI) and Ramsar sites (hereafter referred to as 'Designated Sites'). DMRB guidance[4] requires an assessment of air quality impacts on statutory Designated Sites which are located within 200 m of 'affected roads'.

5.5.52 Gibbins Brook SSSI has been designated for bog relicts and alder carr wet woodland and is located within 200 m of the Operation Stack parking area, and more than 200 m from the Full-time parking area. Emissions from the Operation Stack parking area are however expected to have non-significant impacts on annual mean NO_x concentrations in relation to the critical level for NO_x (30 $\mu g\ m^{-3}$) as:

- The Operation Stack parking area will be used only eight days per year
- Existing annual mean NO_x concentrations are likely to be close to background values in the area of the SSSI within 200 m of the Project Site (~ 13.2 $\mu g\ m^{-3}$ in Project opening year, 2017)
- The SSSI is located ~70 m from the parking area at its closest point

5.5.53 The Project is therefore expected to have non-significant effects on annual mean NO_x and nitrogen deposition in Gibbins Brook SSSI, and these impacts have not been assessed further.

Receptors

5.5.54 Pollutant concentrations have been predicted at sensitive receptors, defined according to Defra[15] as:
'Locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the relevant air quality objective'.

5.5.55 Table 5.2 shows the locations where the annual mean, 24-hour mean and hourly mean objectives apply, as these are applicable to the assessment.

Operation Stack Scenario

5.5.56 For the hourly NO_2 objective, receptors were selected within ~200m of the Operation Stack parking area, which are where the greatest Project impacts are anticipated. The hourly objective will apply to residential properties, gardens and Public Rights of Way (PRoW), and these have been included. It should be noted that some sections of PRoW will be temporarily closed when the Operation Stack parking area is in use, and this has been taken into account when selecting worst-case PRoW receptors. All of the receptors have been modelled at a height of 1.5m. The receptors considered in the Operational Stack Scenario are shown in Appendix 5.2 and Figure 5.2.

Full-time Parking Scenario

5.5.57 Project impacts on annual mean NO_2 and PM_{10} concentrations have been considered at the closest receptor to the Full-time parking area access road, as this is expected to be representative of the worst-case impacts on annual mean concentrations. This receptor is a residential property located on Stone Street (R_FT) and is shown in Table 5.5 and Figure 5.2.

Table 5.5 – Annual Mean NO_2 Receptor

Receptor ID	Location	Easting (m)	Northing (m)
R_FT	Stone Street	612895	137386

Compliance Risk Assessment

5.5.58 Interim Advice Note 175/13[7] provides guidance in relation to the assessment of the risk of the Project being non-compliant with EU Directive 2008/50/EC. The compliance risk assessment is undertaken using the modelling results obtained from the local air quality assessment. To undertake the compliance risk assessment the following information is required:

- Local Air Quality Modelled Results
- Defra's Pollution Climate Mapping (PCM) model outputs for the compliance road network
- Defra's zones and agglomeration maps

5.5.59 Defra uses the PCM model to report compliance with EU Directive 2008/50/EC. 2015 PCM data has been obtained from the Defra website[28]. PCM projections are available for the years 2013, 2020, 2025 and 2030, and NO_2 concentrations decline into the future, mainly in response to cleaner vehicles and technologies, and actions in Defra's 2015 air quality action plan[29].

5.5.60 There are no PCM model links located within the Project study area. No further consideration of Project effects on compliance with EU Directive 2008/50/EC is therefore required as the Project is not expected to affect compliance with the EU Directive.

Assessment of Value / Sensitivity

5.5.61 All human health receptors are treated as been of high sensitivity / value.

[28] http://uk-air.defra.gov.uk/library/no2ten/2015-no2-projections-from-2013-data
[29] Defra (2015) Improving air quality in the UK, Tackling nitrogen dioxide in our towns and cities.

Assessment of Magnitude and Significance

5.5.62 IAN 174/13[6] provides advice for evaluating significant local air quality effects for public exposure and Designated Sites. Evaluation of the significance of local air quality effects has been undertaken in accordance with IAN 174/13, a summary of which is provided here.

5.5.63 The difference in annual mean NO_2 concentration between the Do-Minimum and Do-Something scenario has been used to describe the 'magnitude' of change in accordance with Table 5.6. It should be noted that IAN 174/13 only includes impact magnitude descriptors for annual mean NO_2 and PM_{10}, but notes that for other pollutants the magnitude criteria could be applied under the same principal, i.e. as a percentage of the air quality threshold. Hourly mean NO_2 impact descriptors have therefore been formulated for this project in a consistent manner to how the annual mean impact magnitude is described (i.e. as a percentage of the air quality objective), and these are shown in Table 5.7. It is worth noting however, that IAN 174/13 states that where it is predicted that the hourly mean NO_2 threshold is exceeded, then more significance should be attributed to these effects.

5.5.64 The larger the magnitude of change, the more certainty there is that there will be an impact as a result of the proposed Project. Where the Project impact on concentrations is less than 1% of the air quality threshold, then the change at these receptors is considered to be imperceptible, and these receptors are scoped out of the judgement on significance.

Table 5.6 - Magnitude of Change Criteria for Annual Mean NO_2

Magnitude of Change in Concentration (μg/m^3)	Value of Change in Annual Mean NO_2
Large (>4)	Greater than full MoU value of 10% of the air quality objective (4μg/m^3)
Medium (>2 to 4)	Greater than half of the MoU (2 μg/m^3), but less than the full MoU (4 μg/m^3) of 10% of the air quality objective
Small (>0.4 to 2)	More than 1% of objective (0.4 μg/m^3) and less than half of the MoU i.e. 5% (2 μg/m^3). The full MoU is 10% of the air quality objective (4 μg/m^3)
Imperceptible (</= 0.4)	Less than or equal to 1% of objective (0.4 μg/m^3)

Notes: MoU = Measure of Uncertainty

Table 5.7 - Magnitude of Change Criteria for Hourly Mean NO_2

Magnitude of Change in NO_2 Concentration ($\mu g/m^3$)	Value of Change in Hourly Mean NO_2
Large (>20*)	Greater than full MoU value of 10% of the air quality objective (20μg/m^3)
Medium (>10 to 20*)	Greater than half of the MoU (10 μg/m^3), but less than the full MoU (20 μg/m^3) of 10% of the air quality objective
Small (>2 to 10*)	More than 1% of objective (2 μg/m^3) and less than half of the MoU i.e. 5% (10 μg/m^3). The full MoU is 10% of the air quality objective (20 μg/m^3)
Imperceptible (</= 2*)	Less than or equal to 1% of objective (2 μg/m^3)

Notes: MoU = Measure of Uncertainty
*** 99.8th Percentile of Hourly Mean**

5.5.65 Only receptors which exceed the air quality objective in either the Do-Minimum or Do-Something scenarios are used to inform significance. The total number of receptors in each magnitude band are then aggregated and compared to the guideline number of receptors constituting a significant effect as shown in Table 5.8. IAN 174/13 provides guideline bands for each magnitude category, which set the upper level of likely non-significance and the lower level of likely significance. Between these two levels are the ranges where likely significance is more uncertain, and therefore professional judgment would be required.

Table 5.8 - Significance Criteria

Magnitude of Change in Concentration ($\mu g/m^3$)	Number of Receptors With:	
	Worsening of air quality objective already above objective or creation of a new exceedance	Improvement of an air quality objective already above objective or the removal of an existing exceedance
Large	1 to 10	1 to 10
Medium	10 to 30	10 to 30
Small	30 to 60	30 to 60

5.5.66 If a Project effect is above the lower level of likely significance, consideration should be given to all the evidence that may support or detract from the conclusion of a significant effect. Where no exceedances of air quality objectives are predicted at receptors, IAN 174/13 states that air quality impacts are unlikely to be considered significant.

5.5.67 The air quality impacts predicted at receptors have been compared to the criteria described in Table 5.4 to Table 5.6, along with the following key criteria to determine the overall local air quality significance:

- Is there a risk that environmental standards will be breached?

- Will there be a large change in environmental conditions?
- Will the effect continue for a long time?
- Will many people be affected?
- Is there a risk that protected sites, areas, or features will be affected?
- Will it be difficult to avoid, or reduce, or repair, or compensate for the effect?

Consultation

5.5.68 Shepway District Council have reviewed the air quality scoping report and requested that up to date baseline data is collected from locations close to existing settlements and that mitigation measures are identified to minimise construction dust impacts. These comments have been addressed in the air quality assessment, as a Project specific air quality monitoring survey has been undertaken to define the baseline. Construction dust mitigation measures are identified and outlined in Section 5.8.

5.6 Limitations to the Assessment

5.6.1 As described in IAN 174/13[6], air quality assessments are based on the most reasonable, robust and representative methodologies, taking advice from published guidance. The results are verified against monitoring data and can be used to inform a professional judgement. However, whilst the modelled results are reasonable there is still some element of residual uncertainty, referred to as a MoU, primarily as a result of:

- Uncertainties with model input parameters, such as surface roughness length and minimum Monin-Obukhov length
- Uncertainties with traffic forecasts
- Uncertainties with vehicle emission predictions
- Uncertainties with background air quality maps
- Uncertainties with recorded meteorological data
- Simplifications made in the model algorithms or post processing of the data that represent atmospheric dispersion or chemical reactions.

5.6.2 The air quality model has been evaluated using air quality measurements to verify model outputs. This model verification process has been undertaken in line with Defra guidance[15] in order to manage the uncertainties referred to above. It does this by comparing modelled and monitored pollutant concentrations and if necessary adjusting the model output to account for systematic bias. However, it should be noted that modelled results following verification can still contain an element of residual uncertainty. This model verification process has been undertaken in line with Defra guidance[15]. As discussed in Appendix 5.3, the model slightly over predicts annual mean NO_2 at monitoring sites in the study area, and has therefore not been adjusted as it provides a conservative approach to predicting NO_2 concentrations.

5.6.3 It is important to note that although there are limitations to the assessment, a number of worst-case assumptions have been made when undertaking this assessment, including:

- Assumption that every HGV on the eastbound M20 carriageway (between Junction 10 and Junction11) will enter the Operation Stack parking area. This is likely to provide an overestimate of the number of HGVs emitting pollution from the parking area.
- Assumption that all refrigeration engines would emit NOx corresponding with US Tier II emission standards. It is expected that some of these vehicles will comply with more stringent emission standards, and so would emit less NOx.
- Assumption that all refrigeration vehicles are parked together at the worst-case location for public exposure to pollution. It is expected that these vehicles would be more dispersed throughout the parking area, which would reduce their air quality impacts.
- Assumption that all lorry refrigeration engines are operating under a continuous mode of operation, at maximum cooling demand. This assumption gives an emission factor which is 26 times higher than would be derived assuming stop-start operation at a lower cooling demand[23], and is considered to be highly conservative.
- Assumption that refrigeration engine emissions occur continuously throughout every day of the year when calculating compliance with the hourly NO_2 objective. This approach captures all of the worst hours for dispersion in a year, when the likelihood of emissions occurring in these worst hours is small, since the parking area is expected to be used around eight days per year (i.e. 2% of the year).

5.6.4 The air quality scoping report also proposed that dust impacts during construction would be considered using Institute for Air Quality Management guidance[30]. DMRB guidance[4] has been used here to consider construction dust impacts, since this is consistent with the guidance used to consider impacts during operation.

5.6.5 There is little information on cold start emissions (emissions in engine warm up phase) from lorries compared to cars, and it has not been possible to represent cold start emission factors for HGVs exiting the parking area. Cold start emissions are however significantly lower for diesel vehicles (such as HGVs) compared to those fuelled by petrol[31], and excess cold start emissions were found to be minimal per HDV in a study by Boulter[32]. Taking into account the information above, additional cold start emissions are likely to be small in relation to other emission sources (e.g. lorry refrigeration engines) and not sufficient to change the outcome of the assessment.

[30] Institute of Air Quality Management (2014) Guidance on the assessment of dust from demolition and construction
[31] Weilenmann et al. (2009) Cold-start emissions of modern passenger cars at different low ambient temperatures and their evolution over vehicle legislation categories
[32] Boulter P G (1997) Environmental traffic management, A review of factors affecting cold-start emissions. Transport Research Laboratory Report 270

5.6.6 Limited information exists on idling emissions from vehicles. It is expected that in order to conserve fuel, lorries will switch off engines once parked and this will be encouraged via the operational plan. Furthermore, once parked, any idling engines would not be operating under load (i.e. to manoeuvre the vehicle), and so the emissions would be considerably smaller than those assumed for HGVs driving around the parking area.

5.6.7 Any additional emissions from idling vehicles are therefore not expected to change the outcome of the assessment.

5.7 Baseline

5.7.1 Baseline air quality conditions across the study area have been assessed by means of combined desk and field studies. The desk studies have included a review of the data collected by Shepway District Council, Defra UK-AIR[18], and national modelling undertaken by Defra for the EU Air Quality Directive compliance assessment reporting. The field study comprised a project specific NO_2 diffusion tube survey.

Air Quality Management Areas

5.7.2 The Project is located in the administrative boundary of Shepway District Council, who has not declared any Air Quality Management Areas.

Local Authority Air Quality Monitoring

5.7.3 Shepway District Council monitor air quality throughout their administrative area as part of the local authority review and assessment process. There are two roadside NO_2 diffusion tube sites located within the vicinity of the Project Site and the locations of these are listed in Table 5.9 and shown in Figure 5.4.

Table 5.9 - Shepway District Council Air Quality Monitoring

Site ID	Site Name	Site Location		Annual Mean NO_2 ($\mu g\ m^{-3}$)			
		Easting (m)	Northing (m)	2012	2013	2014	2015
SH07	Royal Oak Motel, Ashford Road, Newingreen	612694	136190	28.4	25.3	26.3	24.7
SH09	Stanford North	612900	138200	23.8	21.9	22.0	22.4

Notes: Annual Mean NO_2 Objective = 40 $\mu g\ m^{-3}$
Diffusion tube results have been bias adjusted by SDC.

5.7.4 Table 5.9 shows that the annual mean NO_2 concentrations monitored by Shepway District Council in the vicinity of the Project Site were well below the annual mean NO_2 objective (40 $\mu g\ m^{-3}$) between 2012 and 2015. It is difficult to determine a long term trend in monitored NO_2 from these measurements, but the results indicate that NO_2 concentrations have remained fairly static during this period.

Defra UK-AIR

5.7.5 Table 5.10 shows Defra[20] predicted background NO_2 and PM_{10} concentrations for the Project Site in the Base Year (2014) and Opening Year (2017) of the Project. Predicted background annual mean NO_2 and PM_{10} concentrations are well below the annual objective.

Table 5.10 – Defra Background Annual Mean NO_2 and PM_{10} (µg m^{-3})

Year	NO_2	PM_{10}
2014	14.9	18.0
2017	13.1	17.5

Notes: Defra background concentrations obtained for grid square 612500, 137500 which corresponds with the location with the greatest number of receptors (in study area).

Defra PCM Model

5.7.6 There are no Pollution Climate Mapping (PCM) model links located within 5 km of the Project.

5.7.7 NO_2 and PM_{10} concentrations are therefore considered to be below EU Limit Values within the study area.

Project Specific Air Quality Monitoring

5.7.8 A baseline survey of air quality in the vicinity of the Project has been undertaken at 30 sites using NO_2 diffusion tubes. The locations of these tubes are shown in Figure 5.4. The tubes were exposed for a period of five months and have been bias adjusted and annualised to the year 2014 in accordance with the method outlined in Appendix 5.4. Table 5.11 shows the annualised NO_2 concentrations monitored from the sites.

Table 5.11 - Project Specific Air Quality Monitoring

Site ID	Location	Easting (m)	Northing (m)	2015 Annual Mean NO_2 (µg m^{-3})
HE DT1	A20 Roadside	614826	137708	17.9
HE DT2[D]	A20 Roadside	614454	137265	29.6
HE DT3	A20 Roadside	613918	137075	19.6
HE DT4	A20 Roadside	613683	137014	25.8
HE DT5	A20 Roadside	613643	136944	21.4
HE DT6	A20 Roadside	613372	136741	19.8
HE DT7	A20 Roadside	612793	136204	23.4
HE DT8[D]	A20 Roadside	611567	136659	19.2
HE DT9[D]	A20 Roadside	610883	137203	19.8
HE DT10	A20 Roadside	610704	137733	26.9
HE DT11	A20 Roadside	610634	137917	25.1

Site ID	Location	Easting (m)	Northing (m)	2015 Annual Mean NO_2 (µg m^{-3})
HE DT12[D]	A20 Roadside	610248	138216	21.1
HE DT13	Swan Lane Roadside	611016	138428	16.8
HE DT14	Background	611526	138551	10.5
HE DT15[D]	Background	612379	138641	11.8
HE DT16	Background	612494	137990	18.2
HE DT17[D]	Stone Street Roadside	612904	137525	23.9
HE DT18	Stone Street Roadside	612943	137878	13.9
HE DT19	Stone Street Roadside	612947	138120	13.4
HE DT20	B2068 Roadside	613136	139621	13.4
HE DT21	B2068 Roadside	613113	138332	12.5
HE DT22	Background	614276	137490	21.6
HE DT23	Shrine Farm	614316	137381	16.7
HE DT24	Shrine Farm	614327	137323	17.3
HE DT25	Background	613675	137988	14.3
HE DT26	M20 Transect	611757	137744	27.8
HE DT27	M20 Transect	611779	137801	24.7
HE DT28	M20 Transect	611808	137856	20.0
HE DT29	M20 Transect	611843	137903	19.9
HE DT30	M20 Transect	611880	137941	18.7

Notes:
[D] = Duplicate Site
Annual Mean NO_2 Objective = 40 µg m^{-3}
Bias Adjustment Factor = 0.91
Annualisation Factor =1.03

5.7.9 Table 5.11 shows that monitored NO_2 concentrations are well below the annual mean NO_2 objective at all sites. The highest concentrations monitored were from locations immediately adjacent to the M20, with the highest concentration of 29.6µg m^{-3} monitored near Shrine Farm (HE DT2), where the A20 crosses the M20.

Summary

5.7.10 A review of baseline air quality within the vicinity of the Project suggests that NO_2 concentrations at receptors are likely to be well within air quality objective values. No monitoring data is available to review concentrations of PM_{10}, but on the basis of the relatively low NO_2 concentrations monitored, the low background PM_{10} concentrations and the fact that Shepway District Council has previously assessed/reviewed PM_{10} and not declared any AQMAs, it is expected that PM_{10} concentrations also comfortably meet air quality objectives at receptors in the vicinity of the Project Site.

5.8 Mitigation

Construction Phase

5.8.1 We will ensure the Contractor carries out the works in accordance with the Best Practicable Means, as described in Section 79 (9) of the Environmental Protection Act (EPA) 1990, to reduce fumes or emissions which may impact upon air quality. This could include but not be limited to the following mitigation measures that will be included within the Construction Environmental Management Plan (CEMP):

- Avoid double handling of materials
- Minimise height of stockpiles and profile to minimise wind-blown dust emissions and risk of pile collapse
- Locate stockpiles out of the wind (or cover, seed or fence) to minimise the potential for dust generation
- Ensure that all vehicles with open loads of potential dusty materials are securely sheeted or enclosed
- Provide a means of removing mud and other debris from wheels and chassis of vehicles leaving the site. This may involve a simple coarse gravel running surface or jet wash, or in the case of a heavily used exit point, wheel washers
- Maintain a low speed limit on site to prevent the generation of dust by fast moving vehicles
- Damp down surfaces in dry conditions
- Water should be sprayed during cutting / grinding operations (i.e. cutting kerbs)
- All vehicle engines and plant motors shall be switched off when not in use

Operational Phase

5.8.2 Operational air quality mitigation has been included in the assessment in the form of assuming refrigerated lorries will be dispersed across the Operation Stack parking area. The assessment has shown that this is not necessary but does provide a reduction in resultant pollutant concentrations at affected receptors.

5.9 Residual Impacts (with mitigation)

Construction Phase

5.9.1 The construction phase is likely to affect local air quality through the generation and subsequent deposition of construction dust. Figure 5.1 shows the sensitive receptors located within 200m of the construction site. With the implementation of the mitigation measures identified above, air quality impacts from the construction phase are not expected to be significant.

Operational Phase

Full-time Parking Scenario

5.9.2 Table 5.12 shows the annual mean NO_2 concentrations predicted at the worst-case receptor (Stone Street, adjacent to Full-time parking area access road) in the Base, Do-Minimum and Do-Something Scenario. The location of this receptor is shown in Figure 5.2.

Table 5.12- Modelled Annual Mean NO_2 ($\mu g\ m^{-3}$) at Worst-Case Receptor

Receptor	Pollutant	Base	Do-Minimum	Do-Something	Impact
R_FT	NO_2	23.1	24.2	30.7	6.5

5.9.3 An increase in annual mean NO_2 of 6.5 $\mu g\ m^{-3}$, is predicted at this receptor as a result of lorries entering and leaving the Full-time parking area. Annual mean NO_2 concentrations are predicted to be well below the annual objective (40 $\mu g\ m^{-3}$) in all scenarios.

Operation Stack Parking Scenario

5.9.4 Do-Something hourly mean NO_2 concentrations have been calculated for:

- **Parking Area Emission Sources** – This includes only the Operation Stack parking area, and so includes emissions from lorry movements and refrigeration engines. This scenario excludes the existing road network (e.g. M20). This allows the impact of emissions from the Operation Stack parking area to be considered in isolation to emissions from other sources such as the M20. It should be noted that corresponding Base and Do-Minimum results do not include existing road sources.
- **All Emission Sources** - This includes all emission sources, and so includes the Operation Stack parking area (including emissions from lorry movements and refrigeration engines) and the existing road network including the M20 and associated Temporary Traffic Management. It should be noted that corresponding Base and Do-Minimum results include existing road sources.

5.9.5 As stated in the Section 5.5 - Assessment Methodology, the results reported are expected to be highly conservative due to the assumptions outlined in Section 5.6 – Limitations to the Assessment, and in particular, the fact that the Operation Stack parking area and M20 Temporary Traffic Management have been assumed to be operational every day of the year. Operation Stack is only anticipated to occur for ~8 days per year (i.e. 2% of the total hours in the year), which is expected to result in less occurrences of high hourly NO_2 concentrations than predicted here. Furthermore, it has been assumed that all refrigeration lorries are aggregated together in the worst-location for public exposure, which is a worst-case and highly conservative scenario for air quality impacts from these vehicles, as it is expected that these vehicles would be more dispersed across the parking area.

5.9.6 Table 5.13 shows the maximum number of hours in a year where hourly mean NO_2 concentrations are predicted to be above 200 µg m^{-3}, based on results across all receptors in the Do-Something Scenario. The corresponding number of hourly mean NO_2 concentrations above 200 µg m^{-3} is also shown for the Base and Do-Minimum Scenario at this worst affected receptor. The maximum number of hours above 200 µg m^{-3} (in one particular year) has been derived from results across all five modelled meteorological years, and so accounts for worst-case dispersion when considering variability in meteorology.

5.9.7 As described in Table 5.1, the hourly NO_2 objective would be exceeded if there are more than 18 hours where hourly mean NO_2 concentrations are above 200 µg m^{-3}. It should be noted that results at all receptors and across all meteorological years are shown in Appendix 5.2, including the 99.8th percentile of hourly NO_2 concentrations, which is considered in the significance assessment where exceedances of the hourly NO_2 objective are predicted. The location of the receptors considered is shown in Figure 5.2.

Table 5.13- Maximum Number of Hours with Modelled Hourly Average NO_2 Greater than 200 µg m^{-3}

Emission Source	Receptor with Maximum	Base	Do-Minimum	Do-Something
Parking Area	17_G	0 hrs	0 hrs	13 hrs
All	101_G	0 hrs	3 hrs	16 hrs
Hourly NO_2 Objective		18 hrs		

5.9.8 Table 5.13 shows that with the Operation Stack Parking Area Emission Sources, the maximum number of hours where hourly mean NO_2 concentrations are above 200 µg m^{-3} are predicted at receptor 17_G. This receptor is a residential garden located between Stone Street and the Project Site, and there are 13 hours across the year where hourly NO_2 concentrations are predicted to be above 200 µg m^{-3}. This receptor is located 30 m east of the grouping of refrigeration vehicles assumed in the assessment (see paragraph 5.5.37) and these results reflect its proximity to the emissions as well as the south westerly prevailing wind direction.

5.9.9 When considering All Emissions Sources, Table 5.13 shows that the maximum number of hours where hourly mean NO_2 concentrations are above 200 µg m^{-3} are predicted at receptor 101_G. This receptor corresponds with the garden of a residential property, and is located approximately 200 m east of the Project Site and approximately 5 m north of the M20 eastbound carriageway. There are 16 hours where hourly NO_2 concentrations are predicted to be above 200 µg m^{-3} at this receptor, which are predominantly the result of vehicle emissions from the M20, rather than emissions from the parking area. It should also be noted that these 16 hours are distributed across 14 days, which is considerably more days than the Operation Stack parking area would typically be in use.

5.9.10 Based on the conservative assessment of Project impacts on hourly NO_2, no exceedances of the hourly NO_2 objective are predicted at any receptors in the Base, Do-Minimum and Do-Something scenario (as there are less than 18 hours above 200 µg m^{-3}, at worst-affected receptors) even under the assumption that the Project is operational for every hour of the year.

Impact Significance

5.9.11 A worst-case assessment has been undertaken to consider the operational air quality impact of the Project. No exceedances of annual mean NO_2 objectives are predicted in the Do-Minimum and Do-Something scenario, and there are expected to be no exceedances of the 1-hour mean NO_2 objective. The Project is also not expected to lead to exceedances of the annual or daily mean PM_{10} objective. Furthermore, as discussed in Section 5.5, the Project is not expected to affect compliance with EU Directive 2008/50/EC. The overall air quality effect of the Project is therefore expected to be non-significant in line with IAN 174/13 guidance[6].

5.10 Further Mitigation Opportunities

Construction Phase

5.10.1 No further mitigation opportunities have been identified for the construction phase.

Operational Phase

5.10.2 The operational assessment results discussed in Section 5.9, assume that refrigeration vehicles are aggregated together at the worst-case location for air quality impacts at receptors. This is expected to provide a highly conservative assessment.

5.10.3 The air quality impact of refrigeration engines could be minimised by distributing refrigeration vehicles across the Operation Stack parking area. This would allow refrigeration engine emissions to become more dispersed, and result in lower pollutant concentrations as receptors.

5.10.4 An additional Do-Something scenario has been considered, following the methodology outlined in Section 5.5 but with refrigeration vehicles equally distributed across the Operation Stack parking area.

5.10.5 Table 5.14 shows the maximum number of hours in a year where hourly mean NO_2 concentrations are predicted to be above 200 µg m^{-3}, based on results across all receptors in the Do-Something scenario. The corresponding number of hourly mean NO_2 concentrations above 200 µg m^{-3} is also shown for the Base and Do-Minimum Scenario at this worst affected receptor. The maximum number of hours above 200 µg m^{-3} has been derived from results across all five modelled meteorological years, and so accounts for worst-case dispersion when considering variability in meteorology.

Table 5.14- Maximum Number of Hours with Modelled Hourly Average NO_2 Greater than 200 μg m^{-3}

Emission Source	Receptor with Maximum	Base	Do-Minimum	Do-Something
Parking Area	2_G	0 hrs	0 hrs	2 hrs
All	101_G	0 hrs	3 hrs	16 hrs
Hourly NO_2 Objective		18 hrs		

5.10.6 Table 5.14 shows that with the Operation Stack Parking Area Emission Sources, the maximum number of hours where hourly mean NO_2 concentrations are above 200 μg m^{-3} are predicted at receptor 2_G. This receptor corresponds with the garden of a residential property, and there are only two hours where hourly NO_2 concentrations are predicted to be above 200 μg m^{-3}. This receptor is surrounded by the Operation Stack parking area to the east, south and west. Table 5.13 showed that when refrigeration vehicles were aggregated together at the worst-case location for potential impacts, there were a maximum of 13 hours where hourly NO_2 concentrations exceeded 200 μg m^{-3}. Distributing refrigeration vehicles throughout the parking area therefore has the potential to minimise the occurrence of high hourly NO_2 concentrations at receptors in the vicinity of the Project Site.

5.10.7 When considering All Emissions Sources, Table 5.14 shows that the maximum number of hours where hourly mean NO_2 concentrations are above 200 μg m^{-3} are predicted at receptor 101_G. This receptor corresponds with the garden of a residential property, and is located approximately 200 m east of the Project Site and approximately 5m north of the M20 eastbound carriageway. There are 16 hours where hourly NO_2 concentrations are predicted to be above 200 μg m^{-3} at this receptor, which are predominantly the result of vehicle emissions from the M20, rather than emissions from the parking area. It should also be noted that these 16 hours are distributed across 14 days, which is considerably more days than the Operation Stack parking area would typically be in use.

5.10.8 The air quality effects of the Project are expected to be non-significant under worst-case assumptions on the distribution of refrigeration vehicles. However the results reported in Table 5.14 above suggest that distributing refrigeration vehicles throughout the parking area has the potential to minimise the occurrence of elevated hourly NO_2 concentrations at receptors in the vicinity of the Project Site. The operational strategy of the Project should therefore aim to avoid the aggregation of refrigeration vehicles in order to minimise operational air quality impacts.

6. Cultural Heritage

6.1 Executive Summary

6.1.1 This chapter outlines the impact on heritage assets including listed buildings, scheduled monuments, registered parks and gardens and non-designated archaeological remains. The most significant heritage asset in the vicinity of the Project is Westenhanger Castle a medieval moated castle, converted to a manor house in the 16th century (designated as a scheduled monument and two listed buildings). The Project will be constructed 35m to the north of the asset, and as such it will suffer significant effects during construction and operation. The Grade II* listed Stanford Windmill and Grade II listed Gibbons Brook Farmhouse Shalom (both located only 10m from the Project Site) will also be subjected to significant effects on their setting during construction and operation.

6.1.2 Archaeological remains are expected to be present on the Project Site – investigations before and during the construction of the Channel Tunnel Rail Link (CTRL) uncovered remains from the Iron Age to medieval periods. Geophysical survey undertaken for the Project has identified enclosures of unknown date in the north-west corner of the Project Site. A permanent significant effect during construction is predicted on below ground archaeological remains. A programme of archaeological evaluation and investigation will be undertaken prior to construction to locate and record any other archaeological remains on the Project Site.

6.2 Introduction

6.2.1 The assessment has considered the impact on all heritage assets from the Project, including listed buildings, scheduled monuments, registered parks and gardens and conservation areas along with the non-designated buildings, historic landscapes and buried archaeological features.

6.2.2 The construction phase of the Project has been assessed for temporary and permanent physical and setting impacts on heritage assets. Permanent impacts have also been assessed on the setting of heritage assets through the operation of the Project.

6.3 Regulatory / Policy Framework

National

6.3.1 The overarching legislation in relation to the historic environment in Britain is provided by:

- The Ancient Monuments and Archaeological Areas Act 1979
- The Planning (Listed Buildings and Conservation Areas) Act 1990

6.3.2 The Ancient Monument and Archaeological Areas Act defines sites that warrant protection due to their being of national importance as 'ancient monuments'. A monument is defined by the Act as *"any building, structure or work above or below the surface of the land, any cave or excavation; any site comprising the remains of any such building, structure or work or any cave or excavation; and any site comprising or comprising the remains of any vehicle, vessel or aircraft or other movable structure or part thereof."* Ancient monuments are now classed as Scheduled Monuments.

6.3.3 Section 66 of the Planning (Listed Building and Conservation Areas) Act places a responsibility upon the decision maker in determining applications for planning permission for a scheme that affects a listed building or its setting to have special regard to the desirability of preserving the building or its setting or any features of special architectural or historic interest which it possesses.

National Planning Policy Framework

6.3.4 The National Planning Policy Framework[33] (NPFF) provides a framework for the management of the historic environment. It describes policies relating to heritage asset, which are buildings, monuments; places, or landscapes identified as having a degree of significance meriting consideration in planning decisions. For archaeology these are specific sites or areas of buried archaeological remains. Of particular relevance to the Project are the following policies:

- 136: Local planning authorities should not permit loss of the whole or part of a heritage asset without taking all reasonable steps to ensure the new development will proceed after the loss has occurred.
- 139: Non-designated heritage assets of archaeological interest that are demonstrably of equivalent significance to scheduled monuments, should be considered subject to the policies for designated heritage assets.
- 141: Local planning authorities should make information about the significance of the historic environment gathered as part of plan-making or development management publicly accessible. They should also require developers to record and advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner proportionate to their importance and the impact, and to make this evidence (and any archive generated) publicly accessible. However, the ability to record evidence of our past should not be a factor in deciding whether such loss should be permitted.

6.3.5 The NPPF[33] introduced the term *'harm'* into national planning policy regarding the historic environment, and it is now the policy test against which the impact of development on heritage assets is judged. Paragraph 132 of the NPPF states that *'significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting'.*

[33] DCLG, 2012 *National Planning Policy Framework*, London

6.3.6 The policy framework goes on to state that *'where a proposed development will lead to substantial harm to or total loss of significance of a designated heritage asset, local planning authorities should refuse consent, unless it can be demonstrated that the substantial harm or loss is necessary to achieve substantial public benefits that outweigh that harm or loss'.*

6.3.7 The level of impact on an asset which would constitute substantial harm is set out in the National Planning Policy Guidance[34] which states that *'in general terms, substantial harm is a high test, so it may not arise in many cases….it is the degree of harm to the asset's significance rather than the scale of the development that is to be assessed'.* It goes on to say that *'while the impact of total destruction is obvious, partial destruction is likely to have a considerable impact but, depending on the circumstances, it may still be less than substantial harm or conceivably not harmful at all…However, even minor works have the potential to cause substantial harm'.*

6.3.8 Measuring the degree of harm on an asset is a more subtle test than the Environmental Impact Assessment process allows. The level of harm cannot be equated with the significance of effect predicted as the substantial harm test does not take into account the value of the asset and that even minor works can cause substantial harm.

6.3.9 The degree of harm is *'a judgment for the decision taker, having regard to the circumstances of the case and the policy in the National Planning Policy Framework'*[34], nonetheless following the assessment of the significance of effect a statement on whether the effect constitutes substantial harm or less than substantial harm will be included in the non-statutory Environmental Assessment Report.

6.3.10 It should be noted that less than substantial harm can still be significant, and any harm should be taken into consideration when assessing whether the scheme should be allowed. The NPPF states*: 'Where a development proposal will lead to less than substantial harm to the significance of a designated heritage asset, this harm should be weighed against the public benefits of the proposal, including securing its optimum viable use'.*

Local

Shepway District Local Plan

6.3.11 The core strategy (2014) sets out aims relating to development in the district. Strategic Aim B8 in particular highlights the need to *'Enhance the character and function of Shepway's historic towns and villages, and the management of historic assets and visitor attractions'.*

[34] DCLG, 2014 *National Planning Policy Framework: Planning Policy Guidance*, London

6.3.12 Policies relating to the historic environment are also contained in the Local Plan Review (2006) Chapter 8 on the built environment contains saved policies on conservation areas and listed buildings, whilst other policies in the document relate to the location and type of development. Relevant policies are:

'Policy SD 1 – Preserve and enhance built and cultural heritage including Listed Buildings and their settings, conservation areas, sites and settings of nationally and locally important ancient monuments and archaeological sites, historic parks and gardens and historic landscapes.

Policy BE5 – In order to preserve listed buildings and their settings and any features of special architectural or historic interest which they possess the District Planning Authority will:

- Refuse listed building consent for demolition, extension, alteration or partial demolition, including internal or external works, if the proposals are considered to be detrimental to the character of the building.
- Refuse applications for development which would adversely affect the setting or character of a listed building.

Policy BE18 – Planning permission will be refused where development proposals would adversely affect the site or setting of the following parks and gardens of historic interest as shown on the Shepway District Local Plan Review (2006) – Policies Applicable 2013 onwards:

- Acrise Place
- Beachborough Park
- Horton Priory
- Lympe Castle
- Port Lympe
- Saltwood Castle
- Sandling Park

Policy TR9 – Proposals for roadside service facilities on primary routes outside settlements will be permitted as long as the following criteria are met:

a) A significant need can be demonstrated for the location and for the facilities proposed that cannot be met by existing or planned provision.

b) The layout, form of development and materials should respect the character and appearance of the locality.

c) The development can be landscaped and screened so as to minimise its effects on the surroundings.

In all cases, especially in the AONB, it will be necessary to weigh the need for the proposal against the importance of preserving the countryside and wildlife against other interests.

Policy CO1 – The District Planning Authority will protect the countryside for its own sake. Subject to other Plan policies, development in the countryside will be permitted where proposals:

a) Maintain or enhance features of landscape, wildlife, geological and agricultural importance and the particular quality and character of the countryside.

b) Demonstrate that they cannot be practicably located within an existing settlement and essentially require a countryside location.

c) Are of a high standard of design and sympathetic in scale and appearance to their setting.

d) Are acceptable in highway and infrastructure terms.

e) Preserve or enhance the amenity, character and functioning of rural towns and villages.

6.4 Study Area

6.4.1 Historic environment information was gathered within 1km radius of the Project for designated assets and 500m for non-designated assets (see Figure 6.1). Information on key designated heritage assets outside the study area have also been included where there was the potential for impacts to their setting.

6.4.2 The size of the study area is considered sufficient to compile a comprehensive baseline, identifying designated and non-designated heritage assets. This will allow a full understanding of the setting of any heritage assets within the study area and allow an assessment of the archaeological potential of the Project Site. In addition the potential impacts on designated assets beyond the boundaries of the study area were assessed, where there was a clear relationship between these assets and the assets within the study area which may be affected by the proposed Project.

6.5 Assessment Methodology

Guidance and Best Practice

6.5.1 The method for determining and appraising baseline conditions involved both desk study and walkover survey. The Cultural Heritage Baseline Report is given in Appendix 6.1. A geophysical survey (Appendix 6.2) has also been carried out across the Project Site to assist in determining the archaeological potential. The assessment was undertaken in accordance with the published standards and guidance set out below:

- National Planning Policy Framework[35]
- National Planning Policy Guidance[36]
- Design Manual for Roads and Bridges[37]
- Conservation Principles, Policies and Guidance[38]
- Historic Environment Good Practice Advice in Planning note 2 – Managing significance in decision taking in the historic environment)[39]
- Historic Environment Good Practice Advice in Planning note 3 – The setting of heritage assets[40]
- Standard and Guidance for historic environment assessment[41]

6.5.2 This assessment considers all heritage assets, designated and non-designated. These include scheduled monuments, listed buildings, registered parks and gardens, non-designated below-ground archaeological remains, locally listed and other historically important buildings and historic landscapes. There are no conservation areas and/or registered battlefields within the defined study area and therefore no assessment of such resources is required.

6.5.3 This assessment considers both temporary and permanent construction impacts on heritage assets. Temporary construction impacts will be impacts on setting through construction-related activities; permanent impacts can be physical, for example the removal of buried archaeological assets or setting related, for example the introduction of the Project into an assets setting. All operational impacts are permanent and relate to the visual and aural impact of movement of vehicles and impacts of operational lighting.

6.5.4 The temporal scope of the assessment assumes a baseline with current conditions as of the date of publication of the non-statutory Environmental Assessment Report (EAR).

6.5.5 The EIA methodology for assessing value / sensitivity, magnitude of impact and significance of effects is based on the methodology set out in DMRB[42] but adapted to take into account changes in terminology.

[35] DCLG (2012) National Planning Policy Framework, London
[36] DCLG, (2014) National Planning Policy Framework: Planning Policy Guidance, London
[37] DfT (2007) Design Manual for Roads and Bridges, Environmental Assessment (Volume 11, Section 3, Part 2 – Cultural Heritage)
[38] Historic England (2008) Conservation Principles, Policies and Guidance
[39] Historic England (2015) Historic Environment Good Practice Advice in Planning note 2 (GPA2) – Managing significance in decision taking in the historic environment)
[40] Historic England (2015) Historic Environment Good Practice Advice in Planning note 3 (GPA3) – The setting of heritage assets
[41] Chartered Institute for Archaeologists (2014) Standard and Guidance for historic environment assessment
[42] DfT (2007) Design Manual for Roads and Bridges, Environmental Assessment (Volume 11, Section 3, Part 2 – Cultural Heritage)

Assessment of Value / Sensitivity

6.5.6 The value and sensitivity of historic environments receptors is based on Table 6.1 below. Assessment of importance is based on a combination of designated status and professional judgement. It takes into account the Secretary of State's non-statutory criteria for the scheduling of ancient monuments; assessment criteria adopted by Historic England as part of its Monuments Protection Programme and the Secretary of State's Principles of Selection Criteria for Listed Buildings.

6.5.7 It is also recognised that occasionally sites can have a lower or higher than normal sensitivity within a local context. It is also recognised that assessment of sensitivity needs to take into account the component of the site that is being affected and the ability of the site to absorb change without compromising the understanding or appreciation of the resource.

Table 6.1: Criteria for assessing value (heritage significance)

Typical criteria	Typical Designation	Value / Significance
A heritage asset with outstanding qualities which contribute to its significance. A unique or fragile heritage asset or an asset whose setting is a major contributor to its heritage significance.	International or national: Typically a world heritage site, scheduled monument, Grade I or II* listed building, Grade I or II* historic park and garden. May be an asset with a lower class designation (e.g. conservation area).	High
A heritage asset with moderate qualities contributing to its significance, unusual or rare characteristics. A heritage asset whose setting is a moderate contributor to its significance.	Regional or district: Typically a Grade II or regional historic park and garden, conservation area, Grade II listed building or similar. May be an undesignated area or asset but has specific significance through association.	Medium
A heritage asset with lesser qualities contributing to its significance A heritage asset whose setting is a minor contributor to its significance. Damaged assets of poor quality.	District or local: Generally undesignated heritage assets which might be valued by the local community. May be buildings with a local importance.	Low
A heritage asset which has been badly damaged or destroyed. An asset whose setting has been altered to the extent that its significance has been lost.	None: Typically an asset identified on the Historic Environment Record which has been removed or destroyed.	Negligible

Assessment of Magnitude

6.5.8 The degree of impact to the asset from the introduction of the project will be assessed in accordance with the criteria given in Table 6.2.

Table 6.2: Criteria for assessing the magnitude of impact

Magnitude	Criteria
Major	Total loss or fundamental alteration to a heritage assets' significance and / or their setting. Addition of new features that substantially alter the setting of a heritage asset.
Moderate	Partial loss or alteration a heritage assets' significance and/or their setting. Addition of new features that partially alter setting of a heritage asset to the extent where their significance is impacted.
Minor	Minor loss of an element of a heritage asset and/or their setting. Addition of new features that form largely inconspicuous elements in the setting of a heritage asset to the extent that its significance is slightly impacted.
Negligible	Very minor loss of elements of a heritage asset and/or its setting. Addition of new features that do not alter the setting of a heritage asset.
No Change	No change to the heritage asset.

Assessment of Significance

6.5.9 Effects have been evaluated by combining the assessment of both magnitude and value to predict the significance of effect, as shown in Table 6.3. These effects can be beneficial or adverse and temporary or permanent depending on the nature of the development and the mitigation and any enhancement measures proposed.

Table 6.3: Significance of Effects

Magnitude of Impact	Value (Heritage Significance) of Heritage Asset			
	High	Medium	Low	Negligible
Major	Very Large / Large	Large / Moderate	Moderate / Slight	Slight
Moderate	Large / Moderate	Moderate	Slight	Neutral / Slight
Minor	Moderate / Slight	Slight	Neutral / Slight	Neutral / Slight
Negligible	Slight	Neutral / Slight	Neutral / Slight	Neutral
No Change	Neutral	Neutral	Neutral	Neutral

Consultation

6.5.10 In response to the scoping report[43] letters were received from Historic England and Kent County Council Heritage Conservation. Subsequently several meetings have been held with the Principal Inspector of Ancient Monuments at Historic England and the Head of Heritage Conservation at Kent County Council. The issues raised can be summarised as:

- The EIA should consider the permanent (operational) effects of the Project including when it is at full capacity and also when not in use.

[43] Highways England (2015) M20 Permanent Lorry Area – Stanford West. Environmental Impact Assessment: Scoping Report

- Effects on the historic environment through air quality, noise and flooding should also be considered.
- Non-designated archaeological remains need to be identified and assessed through geophysical survey and trial trenching.
- The scoping report does not adequately explain policy in the NPPF and address the issue of substantial and less-than substantial harm.
- Accurate Visual Representations (photomontages) should be prepared to aid the assessment and mitigation process.
- The assessment process should be iterative and aid in the provision of mitigation measures. Measures to screen or mitigate setting impacts on Westenhanger are key, with noise, air quality, flooding and visual impacts expected. The continued and viable uses of Westenhanger Castle are of concern.
- Cumulative effects need to be included, particularly relating to impacts on Westenhanger Castle.

6.6 Assumptions and Limitations to the Assessment

6.6.1 Assumptions and limitations tor the assessment which apply across all chapter topics are given in chapter 4. Those specific to this chapter are given below:

- The assessment is based on an illustrative design. Full details of the appearance of structures, size and type of planting, drainage etc have not been available.
- Aside from Westenhanger Castle, to which access was obtained, the walkover surveys were restricted to external visual inspection from publicly accessible areas, which limit the ability to assess the effects of visual intrusion and interruption of views from within property boundaries or interiors of historic buildings.
- Archaeological geophysical survey has been carried out across the Project Site, however, due to time constraints trial trenching has not been possible.
- Photomontages of the Project were not available as part of the illustrative design stage to aid the assessment process.
- Outline mitigation measures have been incorporated into the Project where possible, however, given the time constraints, detailed mitigation design has not been possible.
- Limitations described in Chapter 5: Air Quality, Chapter 7: Landscape and Chapter 11: Noise & Vibration also apply to impacts related to cultural heritage.

6.7 Baseline

6.7.1 A full description of all of the designated heritage assets and historic landscapes located within 1km of the Project can be found in Appendix 6.1. A detailed description of the key designated assets is provided in Table 6.4. The key assets have been identified due to their proximity to, and visibility of the Project, their heritage value (significance) and group value. Assets have been grouped together where they are in close proximity to and relate to each other. Heritage assets in this report are assigned a Stanford West (SW) reference number. National Heritage List (NHL) and HER (Historic Environment Record) reference numbers are recorded in Appendix 6.1 - Cultural Heritage Baseline Report.

6.7.2 There is one scheduled monument within the study area – Westenhanger Castle (SW1) located 35m to the south of the Project (refer to Figure 6.1). The scheduled area of the Castle also contains the Grade I listed buildings of Westenhanger Manor and Barns at Westenhanger Manor.

6.7.3 There is one Grade II* listed building, Stanford Windmill (SW2) and 15 Grade II listed buildings including Hayton Manor and Barn (two listings, SW3), Gibbons Brook Farmhouse Shalom (SW 4), Stream Cottage and Grove Bridge Cottage (SW5), Rhodes House and Little Rhodes (two listings, SW6), Somerfield Court and Barn (two listings, SW7), Guinea Hall (SW8), Elm Tree Farmhouse and Barn (two listings, SW9), Lees Cottage (SW10), Holly Cottage (SW11) and Hyham Hill Farmhouse (SW12).

6.7.4 One registered park and garden, Sandling Park (SW13), lies within the study area, located c. 250m to the south-east of the Project Site. The Kent Downs Area of Outstanding Natural Beauty (AONB) lies to the north and south-east of the Project Site.

Table 6.4: Designated assets in the study area

Asset No.	NHL Designation Ref.	Name	Location / Grid Ref	Designation	Distance / direction	Description (D) / Setting (S)
SW1	1020761 1045888 1344223	Westenhanger Castle Westenhanger Manor Barns at Westenhanger Manor	TR12316 37227	Scheduled Monument, two Grade I listed buildings	35m south	D: A moated castle constructed in the 14th century and converted into a country house in the 16th century. The house has aesthetic value from its domestic and military design, historic value from the numerous rich and powerful members of society who owned and lived in the house, and evidential value from the extensive associative archaeological remains. S: The immediate parkland and grounds of the manor are still intact and retains an air of tranquillity. There are views to the north towards the Kent Downs AONB. The land to the south has been converted into is Folkestone Racecourse, although this is not in use at present. 30m north of the manor house is the CTRL railway and the Dover and London Railway. Further to the north of these is the M20 motorway. The visual intrusion of the modern infrastructure is limited to glimpses of the motorway, and sight of the electricity catenary of the high speed rail. The noise of the motorway and passing trains is clearly audible in the grounds.
SW2	1370011	Stanford Windmill	TR 12798 37840	Grade II* listed building	10m east	D: Brick tower mill built by John Hill in 1851. It has a rare two-stage design and buttressing. It has strong communal value through its agricultural connections and historic value as a well preserved example of a windmill. There is also aesthetic value as a local landmark. S: The windmill sits in the village of Stanford and has residential buildings immediately surrounding it. Its height gives it views across agricultural fields to the west and east, and the hills of the AONB to the north, and also makes it visible from most places in the immediate landscape.

Asset No.	NHL Designation Ref.	Name	Location / Grid Ref	Designation	Distance / direction	Description (D) / Setting (S)
SW3	1045877 1061069	Hayton Manor Barn about 70 m North of Hayton Manor	TR 12391 38645	Grade II listed buildings	290m north	D: 17th century brick-built farmhouse with 18th century alterations. Barn built in early to mid-18th century in red brick with a stone plinth. Has aesthetic and historic value. S: The farm and barn lie adjacent to Kennett Lane in a dip in the landscape, with land rising to the south and north. It is a working farm with other modern barns and equipment present. There is pasture and arable land around the farm complex. Areas to the north are wooded.
SW4	1061068	Gibbons Brook Farmhouse Shalom	TR 11788 38362	Grade II listed building	10m north, south and east	D: 17th century farmhouse set in a complex of multi-period farm buildings, some of which are sympathetically set with the farmhouse. Has aesthetic and historic value. S: The farmhouse is enclosed on all sides by a hedgerow although there are glimpses of open farmland to the north, south and west. The land is quiet and secluded.
SW5	1054727	Stream Cottage and Grove Bridge Cottage	TR 10684 37622	Grade II listed building	135m south-west	D: 17th century house, now divided into two cottages. Brick built. Has aesthetic and historical value. S: House lies within Sellindge on the south side of the M20 and railway lines, with large bridges associated with this infrastructure directly to the north.
SW6	1344203 1054031	Rhodes House and Little Rhodes	TR 10669 37910	Grade II listed buildings	145m north and west	D: Pair of 18th century farmhouses on the southern edge of Sellindge. Brick built. Contemporary with each other. Has aesthetic and historic value. S: Set in their own grounds and surrounded by tall trees. There is a sense of peacefulness, although the M20 can be heard to the south.
SW7	1068786 1344201	Somerfield Court	TR 10449 37847	Grade II listed buildings	200m north and west	D: 17th brick-built century house by Thomas Gomeldon. Associated barn complex built in the 19th century, stone

Asset No.	NHL Designation Ref.	Name	Location / Grid Ref	Designation	Distance / direction	Description (D) / Setting (S)
		Barn Complex about 66 m west of Somerfield Court				built with brick dressings. Has aesthetic and historic value. S: Set in their own grounds. Accessed by private driveways and surrounded by tall trees. The M20 is located a short distance to the south and can be clearly heard in the grounds.
SW8	1344202	Guinea Hall	TR 10065 38350	Grade II listed building	770m west	D: Late 18th or 19th century, two storey brick built hall. Has aesthetic and historic value. S: Set in their own grounds and surrounded by tall trees. There is a sense of peacefulness, although the M20 can be heard to the south.
SW9	1054020 1061099	Elm Tree Farmhouse Barn about 5m North of Elm Tree Farmhouse	TR 10289 38361	Grade II listed buildings	650m west	D 18th century farmhouse and associated barn on the west side of Sellindge. Brick built. Contemporary with each other. Has aesthetic and historic value. S: Set in their own grounds and surrounded by tall trees. There is a sense of peacefulness, although the M20 can be heard to the south.
SW10	1367112	Lees Cottages	TR 10478 38345	Grade II listed building	570m west	Early 16th century house, now converted into cottages. Timber framed and pebble-dashed. Has aesthetic and historic value.
SW11	1061066	Holly Cottage	TR 11102 38518	Grade II listed building	570m north-west	D: 17th century house on the edge of Sellindge, stone built ground floor with rendered upper floor. Has aesthetic and historic value. S: Set back off Swan Lane in a row of multi-period properties, the surroundings are semi-rural, with farmland to the east.

Asset No.	NHL Designation Ref.	Name	Location / Grid Ref	Designation	Distance / direction	Description (D) / Setting (S)
SW12	1061122	Hyham Hill Farmhouse	TR 11378 39225	Grade II listed building	825m north	D 18th century farmhouse on the edge of the AONB. Brick built. Has aesthetic and historic value. S: Set in its own grounds with some trees surrounding and a more recent barn (not listed. Surrounding land is pasture and there is a sense of peacefulness and isolation.
SW13	1000262	Sandling Park	TR 13805 36367	Grade II listed Park and Garden	265m south-east	D: A mid 19th century to late 20th century informal woodland garden with a specialist rhododendron collection. Established on former hunting forest of Westenhanger Castle. Early 20th century formal features designed with advice from Henry Miller. Has aesthetic, evidential, communal and historic value. S: The parkland is well preserved and retains its integrity within itself. The park is bounded by Junction 11 of the M20, the A20 and the CTRL railway, all of which introduce transport noise on the northern side of the parkland.

Geology and Topography

6.7.5 The solid geology is of Folkestone Beds. This is overlain in large parts of the Project Site by Head Brickearth. There are alluvial deposits on the east side of the Project Site associated with the East Stour River, and further alluvial deposits running north-south through the centre of the Project Site and along the western edge of the Project Site, probably associated with tributaries of the East Stour River. The British Geological Map shows both of these areas of alluvium to contain peat deposits.

6.7.6 The alluvial deposits of the East Stour River have been investigated as part of the CTRL project, with analysis of the alluvial deposits undertaken immediately to the west of the Project Site (SW23). The deposits were c. 1.5m deep and contained organic material, although no dating evidence was found to securely date the alluvial layers. Further trial trenching on the East Stour River's alluvial deposits was undertaken in the south-east corner of the Project Site (SW15). This located alluvial deposits again to a depth of *c.* 1.5m, with a humic layer present above the fluvial gravels. Although this deposit remained undated, it correlated to a similar deposit identified in adjacent works – possibly dating to the Late Bronze Age or Romano-British periods.

6.7.7 The land generally slopes from north to a low point in the south where the CTRL lies. The land between the M20 and CTRL lands is mounded, up to 4m above the surrounding land, and it is thought that large amounts of excavated material from the construction of CTRL has been introduced to provide landscaping and deposit excess spoil.

Archaeological and Historical Background

Early Prehistoric (500,000BC – 3,500BC)

6.7.8 There is no direct evidence for early prehistoric activity in the vicinity of the Project Site.

Neolithic Period (3,500BC – 2,200BC)

6.7.9 Excavations in the south part of the Project Site (SW15) identified a suspected prehistoric buried soil which produced work flints of a broad Neolithic / Bronze Age date[44]. To the south-east of the study area, a flint scatter comprising of both struck flint and burnt unworked flints dating from the Neolithic to the Bronze Age period were recovered during a field walking exercise at Saltwood along the route of the Channel Tunnel Rail Link (SW16).

[44] Canterbury Archaeological Trust (2001) North of Westenhanger Castle Post-Excavation Assessment. Unpublished Report.

Bronze Age (2,200BC – 700BC)

6.7.10 The Bronze Age period in East Kent is well represented by a dense concentration of barrows of the 'Beaker period' (c.2350-c.1700BC) and remainder of Early Bronze Age (c.1700-1400BC). These structures are conventionally referred to as ceremonial / ritual mounds, with burial only an element in some cases. Such monuments have been identified to the south of the study area at Brabourne, where a cropmark of a possible ring ditch measuring c.36m in diameter was identified from an aerial photograph. Further east at Barrow Hill, Sellindge (SW21 and SW22), two probable burial mounds and a cropmark of a likely ring ditch have been identified. To the north of the study area, in an elevated position on Tolsford Hill is a cluster of scheduled bowl barrows.

6.7.11 Archaeological excavations in the south part of the Project Site (SW 15) located possible Bronze Age ditches, probably agricultural in nature. As part of an extensive scheme of archaeological investigation undertaken prior to construction of CTRL, excavations were undertaken at Saltwood Tunnel, approximately 2.4km east of the proposed Project Site. Here, a complex multi-period site was revealed, with evidence for ceremonial and funerary land use as well as for settlement and agriculture. In the early Bronze Age, a barrow cemetery developed on the site and comprised five barrows and a flat grave dated to the late 3rd-early 2nd millennium BC. Evidence for the middle Bronze Age was limited, comprising a cremation burial, a small pit and other occasional finds of Deverel-Rimbury pottery, suggest the cemetery was respected until the late 2nd millennium BC[45].

The Iron Age (700BC – AD43)

6.7.12 Significant evidence for Iron Age occupation has been found in the south part of the Project Site (SW15), where archaeological excavations ahead of the CTRL uncovered a Late Iron Age rural landscape in the form of enclosures, a droveway, and two structures[46]. To the east of the Study Area, a Late Iron Age / Romano-British settlement and associated field system were excavated at Saltwood along the route of CTRL[47].

Romano-British Period (AD 43 – AD 410)

6.7.13 An arterial Roman road which now comprises Stone Street (SW16), and follows a north / south course immediately east the Project Site. A pit containing first to fourth century pottery sherds was identified during excavations to the west of the road[48].

[45] CTRL Integrated Site Report Series (2006) The prehistoric, Roman and Anglo-Saxon funerary landscape at Saltwood Tunnel, Kent. London and Continental Railways
[46] Canterbury Archaeological Trust (2001) North of Westenhanger Castle Post-Excavation Assessment. Unpublished Report.
[47] CTRL Integrated Site Report Series (2006) The prehistoric, Roman and Anglo-Saxon funerary landscape at Saltwood Tunnel, Kent. London and Continental Railways
[48] South Eastern Archaeological Services (1994) Archaeological Evaluation of Land Adjacent to Hillhurst Farm, Westenhanger. Unpublished Report

6.7.14 The archaeological excavations in the south part of the Project Site (SW15) recovered 19 sherds of pottery and a single fragment of ceramic building material dated to the period. In the east of the study area, excavations prior to the construction of Stop24 Service Area (SW17) also found evidence for Romano-British occupation comprising of field systems, pits and ditches. The excavations undertaken along the route of CTRL at Saltwood to the east recovered Early Romano-British domestic finds abounded at the western end of the excavation. The quantity and range of finds, and the presence of two small cremation cemeteries, strongly suggest a small rural settlement lay close-by.

Early Medieval (AD410 – AD1066)

6.7.15 An indication of Anglo Saxon activity is provided by copper alloy strap-end recovered in the north part of the Project Site (SW18). A copper alloy stirrup and weight (SW19) have been found in antiquity to the west of Sellindge, near Somerfield Court. Despite suggestions of an early estate at Westenhanger, only a single sherd of Anglo-Saxon pottery (*c* 850-1050) was recovered from excavations within the Project Site (SW15).

6.7.16 RAF aerial photographs indicate the presence of crop-marks to the south-west of the grandstands on the south side of Folkestone Racecourse (SW20) which have been identified as foundations for a series of possible Anglo-Saxon halls however subsequent fieldwork (geophysical survey and limited trial trenching) in 1969 produced no evidence to corroborate this suggestion.

6.7.17 Significant evidence for Anglo-Saxon settlement was identified as part of the CTRL excavations at Saltwood. The evidence is dominated by three separate inhumation cemeteries, each located in the vicinity of a Bronze Age barrow. Seventeen graves were excavated within the eastern cemetery, 59 in the western cemetery and 141 in the central cemetery. Both the eastern and western cemeteries appear to have begun in the early 6th century. The eastern cemetery lasted only for one or two generations, whilst the western cemetery continued well into the 7th century. The central cemetery was established during the late 6th century and continued throughout the 7th century. Three early Anglo–Saxon grubenhäuser (sunken-floored buildings) were also identified, all of which lay in the vicinity of the cemeteries and a little to the north of them.[49]

Late medieval (AD1066 – AD1540)

6.7.18 Westenhanger Castle (SW1) in the south of the Study Area is thought to originate in this period. It has been suggested that the later fourteenth century fortified house had Norman origins, possibly associated with a hall, the surviving gatehouse and the moat. It has also been suggested that a house stood on the later Site of Westenhanger castle in the reign of Richard I (1157 - 1199) and belonged to Sir Wm. De Auberville, an English jurist in the reign of Henry II (1133 -

[49] CTRL Integrated Site Report Series (2006) The prehistoric, Roman and Anglo-Saxon funerary landscape at Saltwood Tunnel, Kent. London and Continental Railways

1189). Evidence for domestic occupation around this time has been found in the south part of the Project Site (SW15), comprising a late 11th century farmstead and associated enclosure system with a possible corn-drying oven[50]. The HER refers to this area as the Site of a deserted medieval village, however this has yet to be proven.

6.7.19 In 1343, the Site of Westenhanger was upgraded to a fortified manor house (SW1) under the ownership of Sir John de Criolm. Its towers and curtain walls were completed by *c*.1400.

Post-medieval (AD1540 – c.1750)

6.7.20 By the 16th century Westenhanger and Ostenhanger manors were merged to become one manor (SW1). Under the ownership of Sir Edward Poyning, the fortified house was subject to significant developments including the creation of an outer court, formal gardens and deer park. Significant developments to the castle were also under taken in the eighteenth century by its next owner, Thomas Smyth. It was during this period that the Grade I listed Barn at Westenhanger Manor was constructed in addition to significant improvements to the manor itself. This phase was represented in the Study Area by a number of disparate features in the south part of the Project Site (SW15).

6.7.21 Numerous listed 16th to18th century farmhouses (as described above) are concentrated around Sellindge and to the north of the study area (SW3, SW4, SW9, SW10, SW11, SW12).

Industrial Period (c.1750 – 1901)

6.7.22 The Grade II* windmill (SW2) in the east of the Study Area represents the climate of rural industry at this time and clearly epitomises the relationship between increasing food production and technological advancements. A series of 19th century (non-designated) farmhouses are spread around the landscape, for instance Brook Farm (SW24), The Elms (SW25), Hope Farm (SW26) and Yew Tree Farm (SW 27).

6.7.23 Railway development in the region started modestly and in line with the development of coastal towns such as Dover and Folkestone. The London to Dover railway (SW28), which follows a course between the northern and southern parts of the scheme area, was constructed by the South Eastern Railway (SER) company in the mid 1800s. The line was completed in 1844 and was the earliest of the London to Dover main lines.

50 Canterbury Archaeological Trust (2001) North of Westenhanger Castle Post-Excavation Assessment. Unpublished Report.

Modern Period (Post-1901)

6.7.24 Kent played a pivotal role in many of the most salient offensive and defensive operations of the Second World War. The Battle of Britain (summer 1940), was fought in the skies over Kent's orchards, fields and villages and as a result the countryside became littered with the debris of fighter aircraft from both sides. The RAF was based at Hawkinge, Eastchurch, Rochester, Detling and Manston as well as at Westenhanger within the Study Area. This significant period in the nation's history is represented by numerous aircraft crash sites, which include the site of a Supermarine Spitfire I (SW29) which is recorded inside the Project Site, however this is a centralised grid reference and it is unlikely that the plane actually crashed at this location.

6.7.25 The most significant impact within the study area during this period was the construction of the M20 motorway and CTRL in the latter half of the 20th century. Pictures taken during the construction of CTRL show that the majority of the area of the Project Site was topsoil stripped and excavated material mounded on the field for reinstatement post-construction. The construction of these pieces of infrastructure is likely to have impacted any earlier archaeological remains on the Project Site to the south of the M20.

Geophysical Survey

6.7.26 Archaeological geophysical (magnetometer) survey has been carried out across the entirety of the Project Area (Appendix 6.2). A complex of enclosures has been recorded in the north-west corner of the Project Site (SW30). The enclosures are rectilinear, and typical of settlement enclosures from the Iron Age to medieval periods.

6.7.27 No other significant archaeological remains have been recorded in the survey. Given the differing geology and ground conditions across the Project Site, the accuracy of the survey is uncertain, and it is possible that other archaeological remains are present on the Project Site but not detected by the geophysics.

Archaeological Potential and Value Assessment

6.7.28 There is a lack of early prehistoric activity in the area and there is therefore very limited potential for early prehistoric remains to be present within the Project Site.

6.7.29 Archaeological investigations (SW15) on the southern section of the Project Site, between the railway lines and CTRL have identified a number of phases of archaeological activity from the Neolithic, Bronze Age, Iron Age, Roman, medieval and Post-medieval periods. This archaeology has been removed by the construction of CTRL, however if the remains extend into the northern side of the Project Site (north of the M20) they would likely be of **medium value**.

6.7.30 The enclosure (SW30) in the north-western corner of the Project Site is likely to relate to settlement activity between the Iron Age and medieval period. As such, these remains are likely to be of **medium value**.

6.7.31 Alluvial deposits associated with the East Stour River have already been investigated during the CTRL works (SW15). However there are other deposits on the northern side of the M20 which have not been previously disturbed and have the potential to contain information on past-environments. The deposits on the south side of the M20 were undated, although probably from the Iron Age or Roman periods. If the deposits on the north were similar they are likely to be of **low value**.

6.7.32 A Submarine Spitfire (SW29) is recorded on the HER as having crashed on the Project Site, however it is thought unlikely that the crash actually occurred at this location, and therefore **no value has been assigned**.

6.7.33 There is the possibility of other previously unknown remains existing in the Project Site. Given the archaeological landscape within which the Project Site sits, any remains are likely to be of **medium value**.

6.8 Mitigation

Construction Phase

6.8.1 Construction will be carried out using industry best practice and in accordance with a Construction Environmental Management Plan (CEMP) to mitigate any temporary adverse effects during construction. Mitigation measures for the historic environment have been incorporated throughout the design and construction stages. These fall into two categories:

- Type 1: controls imposed on construction activities, e.g. through the CoCP/CEMP
- Type 2: further mitigation, such as compensatory measures or enhancement measures. This includes retaining aesthetics of the current (historic environment) landscape by reducing the impact on the setting of assets (listed buildings etc.) and incorporating landscaping features and design features at the detailed design stage

6.8.2 A buffer zone of a minimum of 20m will be established around the Project Site. The buffer zone will be planted with appropriate and native species to provide screening.

6.8.3 Green corridors will be introduced through the Project Site and will be lined with hedgerows to assist in breaking up the visual impact of the hard surface of the lorry park.

Archaeological Investigation

6.8.4 Archaeological investigation and recording doesn't reduce the impact on the heritage asset, as the asset is still lost. However recording archaeological remains to increase understanding of the past is important and recognised in the NPPF[51] (para 142).

6.8.5 The geophysical survey has identified enclosures in the north-west corner of the Project Site (SW30), and there is the possibility that other archaeological remains are present on the Project Site. In order to determine the likely ground conditions and potential for archaeological remains to be present, the following surveys will be undertaken:

- Archaeological monitoring of Ground Investigation will provide a deposit model of the geological and ground conditions across the Project Site, identify the geo-archaeological potential of any alluvial or peat deposits and identify the areas of the Project Site most likely to contain further archaeological remains.
- Archaeological trial trenching will take place following analysis of the Ground Investigation reports. The trial trenching will focus on the areas of the Project Site with the highest archaeological potential, with some trenching to test 'blank' areas.

6.8.6 If significant archaeological remains are located in the trial trenching, a programme of archaeological investigation and recording is likely to be required prior to, or during construction of the Project.

Operational Phase

6.8.7 Lighting will be on 12m columns with flat LED lanterns to prevent light spill. The lights will only be operable when the Lorry Area is in use, and will be dimmed in non-operational areas.

6.8.8 Run off water will be collected in attenuation ponds and underground tanks to avoid overloading the local watercourses and causing flooding in other areas, particularly at Westenhanger Castle where one of the barns is over the course of the East Stour River. Petrol interceptors and penstocks will be used to prevent pollution.

6.9 Residual Impacts (with mitigation)

Construction Phase

6.9.1 Table 6.5 and Table 6.6 detail the predicted construction effects on the key heritage assets and on heritage assets which are subject to significant effects. The predicted effects are identified using the assessment methodology set out in section 6.5. The assessment of effects takes into account the embedded mitigation measures.

[51] DCLG, 2012 *National Planning Policy Framework*, London

Temporary Construction Effects

6.9.2 Large adverse effects are predicted on Westenhanger Castle, Stanford Windmill and Gibbons Brook Farmhouse Shalom. The impacts however equate to less-than-substantial harm, as there will not be a total loss of the assets' significance through the construction works, and the impact will only be temporary. The impact does equate to serious harm and the loss of significance of these heritage assets requires justification in terms of the public benefits of the Project.

Permanent Construction Effects

6.9.3 A very large adverse effect is predicted on Westenhanger Castle and a large adverse effect on Stanford Windmill. The impact however equates to less-than-substantial harm, as there will not be a total loss of significance through the presence of the permanent Project in the setting of the asset, and its setting has already been compromised to the north by the M20 and CTRL. The impact does equate to serious harm and the loss of significance of these heritage assets requires justification in terms of the public benefits of the Project.

Operational Phase

6.9.4 Table 6.7 details the predicted operational effects on the key heritage assets and on heritage assets which are subject to significant effects. The predicted effects are identified using the assessment methodology set out in section 6.5.

6.9.5 A very large adverse effect is predicted on Westenhanger Castle. The impact, however equates to less-than-substantial harm, as there will not be a total loss of significance through the presence of the permanent scheme in the setting of the asset, and its setting has already been compromised to the north by the M20 and CTRL. The impact does equate to serious harm and the loss of significance of these heritage assets requires justification in terms of the public benefits of the Project.

Table 6.5: Predicted Temporary Construction Effects on Key Assets

Asset No.	Name	Value	Description of Impact	Magnitude of Impact	Significance of Effect
SW1	Westenhanger Castle	High	The construction of the Project, and in particular the construction of the full-time parking area will be visible from the upper floors of the castle and parts of the grounds. The noise of construction machinery will be noticeable across the scheduled monument, impacting the relative quiet and peaceful setting within which the castle sits. The setting of the asset is likely to be changed, particularly with regard to the noise environment, but not to a level where the change in setting will reduce the value / heritage significance of the asset.	Moderate adverse	Large adverse
SW2	Stanford Windmill	High	Activities to construct the Project will be visible from the lower and upper levels of the windmill, whose views are normally of agricultural fields. Views to the windmill, particularly from the series of associated farmsteads on the edges of Sellindge will also be interrupted. Construction machinery will be visible, and in association with the noise and dust of construction, the setting of the asset will be changed to a degree that it would temporarily be difficult to appreciate the asset.	Moderate adverse	Large adverse
SW3	Hayton Manor Barn about 70m North of Hayton Manor	Medium	Hayton Manor is concealed in a dip in the landscape and sits behind its own hedges and trees. There may be glimpses of the Project Site from the upper floors of the buildings, and noise of construction may be audible on certain days. The setting of the asset will suffer a minor change.	Minor adverse	Slight adverse
SW4	Gibbons Brook Farmhouse Shalom	Medium	Gibbons Brook Farmhouse will be surrounded on three sides by the Project Site. The property is currently well screened with tall trees on its western and southern sides, with buildings on the northern edge of the property, but construction machinery will still be visible, and in association with the noise and dust of construction, the setting of the asset will be changed to a degree that it would temporarily be difficult to appreciate the asset.	Major adverse	Large Adverse
SW5	Stream Cottage and Grove Bridge Cottage	Medium	The asset is on the other side of the M20 and railway line to the Project Site and will have no views of it.	No change	Neutral

Asset No.	Name	Value	Description of Impact	Magnitude of Impact	Significance of Effect
SW6	Rhodes House and Little Rhodes	Medium	The asset is screened from the Project Site, both by its own boundary trees and the existing woodland on the west side of the Project Site. Construction noise may be audible but it is unlikely to appreciably change the setting of the asset.	Negligible	Neutral
SW7	Somerfield Court Barn Complex about 66m west of Somerfield Court	Medium	The asset is screened from the Project Site, both by its own boundary trees and the existing woodland on the west side of the Project Site. Construction noise will probably not be audible on most days.	No change	Neutral
SW8	Guinea Hall	Medium	The asset is screened from the Project Site, both by its own boundary trees and the existing woodland on the west side of the Project Site. Construction noise will probably not be audible on most days.	No change	Neutral
SW9	Elm Tree Farmhouse Barn about 5m North of Elm Tree Farmhouse	Medium	The asset is screened from the Project Site, both by its own boundary trees and the existing woodland on the west side of the Project Site. Construction noise will probably not be audible on most days.	No change	Neutral
SW10	Lees Cottages	Medium	The asset is screened from the Project Site, both by its own boundary trees and the existing woodland on the west side of the Project Site. Construction noise will probably not be audible on most days.	No change	Neutral
SW11	Holly Cottage	Medium	The asset is screened from the Project Site by the ancient woodland of Gibbons Brook and intervening topography. Construction noise will probably not be audible on most days.	No change	Neutral
SW12	Hyham Hill Farmhouse	Medium	The asset is screened from the Project Site by the ancient woodland of Gibbons Brook and intervening topography. Construction noise will probably not be audible on most days.	No change	Neutral
SW13	Sandling Park	Medium	The asset is screened from the Project Site by Junction 11 of the M20, CTRL and the A20. Construction noise will also be negated by the other infrastructure.	No change	Neutral

Table 6.6: Predicted Permanent Construction Effects on Key Assets

Asset No.	Name	Value	Description of Impact	Magnitude of Impact	Significance of Effect
SW1	Westenhanger Castle	High	The Project, once constructed, will be visible from the castle and grounds. Even though the ground will be lowered in the centre of the full-time parking area to provide a flat surface for the Lorry Area, the bridge over the motorway, 4 m high retaining wall adjacent to the motorway, facilities building, lighting columns and control booths are likely to be visible from various parts of the scheduled monument. The overbridge and retaining wall in particular are likely to dominate views from the house to the north, and change the historic setting of the asset from a rural country estate to a semi-industrial landscape. The setting of the asset is likely to be changed, particularly with regard to views from the castle. The change in setting will make it more difficult to appreciate the asset whilst in the grounds, and also could affect the use of the castle as a wedding venue, or even as a residential property.	Major Adverse	Very Large adverse
SW2	Stanford Windmill	High	The Project Site will be visible from the windmill, whose views are currently of agricultural fields. Views to the windmill, particularly from the series of associated farmsteads on the edges of Sellindge will also be interrupted. The setting of the asset is likely to be changed, particularly with to its association with a rural landscape. The change is likely to harm the value / heritage significance of the asset.	Moderate adverse	Large adverse
SW3	Hayton Manor Barn about 70m North of Hayton Manor	Medium	Hayton Manor is concealed in a dip in the landscape and sits behind its own hedges and trees. There may be glimpses of the Project Site from the upper floors of the buildings. The setting of the asset will suffer a minor change.	Minor adverse	Slight adverse
SW4	Gibbons Brook Farmhouse Shalom	Medium	Gibbons Brook Farmhouse Shalom will be surrounded on three sides by the Project Site. The property is currently well screened with tall trees and out-buildings. Landscaping and further planting will be included to provide more visual screening. Given that the property is largely enclosed, the visual change to its setting of the Project being in place will not be considerable, particularly as the proposed structures such as the overbridge and control booths are set away from the asset.	Minor adverse	Slight Adverse

Asset No.	Name	Value	Description of Impact	Magnitude of Impact	Significance of Effect
SW5	Stream Cottage and Grove Bridge Cottage	Medium	The asset is on the other side of the M20 and CTRL to the Project and will have no views of the Project Site.	No change	Neutral
SW6	Rhodes House and Little Rhodes	Medium	The asset is screened from the Project Site, both by its own boundary trees and the existing woodland on the west side of the Project Site.	No change	Neutral
SW7	Somerfield Court Barn Complex about 66m west of Somerfield Court	Medium	The asset is screened from the Project Site, both by its own boundary trees and the existing woodland on the west side of the Project Site.	No change	Neutral
SW8	Guinea Hall	Medium	The asset is screened from the Project Site, both by its own boundary trees and the existing woodland on the west side of the Project Site.	No change	Neutral
SW9	Elm Tree Farmhouse Barn about 5m North of Elm Tree Farmhouse	Medium	The asset is screened from the Project Site, both by its own boundary trees and the existing woodland on the west side of the Project Site.	No change	Neutral
SW10	Lees Cottages	Medium	The asset is screened from the Project Site, both by its own boundary trees and the existing woodland on the west side of the Project Site.	No change	Neutral
SW11	Holly Cottage	Medium	The asset is screened from the Project Site by the woodland of Gibbins Brook and intervening topography.	No change	Neutral
SW12	Hyham Hill Farmhouse	Medium	The asset is screened from the Project Site by the woodland of Gibbons Brook and intervening topography.	No change	Neutral
SW13	Sandling Park	Medium	The asset is screened from the Project Site by Junction 11 of the M20, CTRL and the A20.	No change	Neutral
SW29	WWII Submarine Spitfire	High	The asset is unlikely to be present on the Project Site.	No change	Neutral
SW30	Enclosures identified through geophysical survey	Medium	The construction of the Project requires major earthmoving and ground levelling which is likely to remove the below ground remains of the enclosures. The asset will be archaeologically recorded prior to destruction, however this will still be a major adverse impact.	Major adverse	Moderate adverse

Asset No.	Name	Value	Description of Impact	Magnitude of Impact	Significance of Effect
	Buried Archaeological Remains	Medium	The construction of the Project requires major earthmoving and ground levelling which is likely to remove any as-yet unidentified below ground remains. The asset will be archaeologically recorded prior to destruction, however this will still be a major adverse impact.	Major adverse	Moderate adverse

Table 6.7: Predicted Permanent Operation Effects on Key Assets

Asset No.	Name	Value	Description of Impact	Magnitude of Impact	Significance of Effect
SW1	Westenhanger Castle	High	During the operation of the Project, the full-time parking area will be visible from the upper floors of the castle and parts of the grounds. The movement of the lorries will be visible, as will the lighting at night, The noise of lorries and particularly their refrigeration units will be intrusive to the relative tranquillity of the monument. Potentially there will be air quality impacts from the engines of the lorries. There may be an impact on the use of the asset as a wedding venue, and as such its viability and long term security. The setting of the asset is likely to be changed, particularly with regard to the noise environment, but not to a level where the contribution of the setting to the assets significance is completely lost.	Major adverse	Very large adverse
SW2	Stanford Windmill	High	When operational, the Operation Stack parking area will be visible from the windmill, whose views are currently of agricultural fields. There will be movement and noise of lorries affecting views and the introduction of lighting of the Project. However this will only be temporary when Operation Stack is running.	Moderate adverse	Moderate adverse
SW3	Hayton Manor Barn about 70m North of Hayton Manor	Medium	Hayton Manor is concealed in a dip in the landscape and sits behind its own hedges and trees. There may be glimpses of the scheme from the upper floors of the buildings, and noise of lorries may be audible on when Operation Stack is running. The setting of the asset will suffer a minor change, and only temporarily.	Negligible adverse	Slight adverse

Asset No.	Name	Value	Description of Impact	Magnitude of Impact	Significance of Effect
SW4	Gibbons Brook Farmhouse Shalom	Medium	Gibbons Brook Farmhouse Shalom will be surrounded on three sides by the Project Site. The property is currently well screened with tall trees, but the noise of lorries when the Project Site is operational is likely to be audible. During Operation Stack, the setting of the asset will be changed to a degree that it would be difficult to appreciate the asset, but only temporarily.	Moderate Adverse	Moderate Adverse
SW5	Stream Cottage and Grove Bridge Cottage	Medium	The asset is on the other side of the M20 and CTRL to the Project and will have no views of the Project Site.	No change	Neutral
SW6	Rhodes House and Little Rhodes	Medium	The asset is screened from the Project Site, both by its own boundary trees and the existing woodland on the west side of the Project Site. The noise of lorries may be audible but it is unlikely to appreciably change the setting of the asset.	Negligible	Neutral
SW7	Somerfield Court Barn Complex about 66m west of Somerfield Court	Medium	The asset is screened from the Project Site, both by its own boundary trees and the existing woodland on the west side of the Project Site.	No change	Neutral
SW8	Guinea Hall	Medium	The asset is screened from the Project Site, both by its own boundary trees and the existing woodland on the west side of the Project Site.	No change	Neutral
SW9	Elm Tree Farmhouse Barn about 5m North of Elm Tree Farmhouse	Medium	The asset is screened from the Project Site, both by its own boundary trees and the existing woodland on the west side of the Project Site.	No change	Neutral
SW10	Lees Cottages	Medium	The asset is screened from the Project Site, both by its own boundary trees and the existing woodland on the west side of the Project Site.	No change	Neutral
SW11	Holly Cottage	Medium	The asset is screened from the Project Site by the woodland of Gibbins Brook and intervening topography.	No change	Neutral
SW12	Hyham Hill Farmhouse	Medium	The asset is screened from the Project Site by the woodland of Gibbins Brook and intervening topography.	No change	Neutral

Asset No.	Name	Value	Description of Impact	Magnitude of Impact	Significance of Effect
SW13	Sandling Park	Medium	The asset is screened from the Project Site by Junction 11 of the M20, CTRL and the A20. Lorry noise will also be negated by the other infrastructure.	No change	Neutral

6.10 Further Mitigation Opportunities

6.10.1 Further mitigation opportunities will be explored following the publication of this EAR as the detailed design phase of the Project progresses. Opportunities to lessen the adverse effects would be developed through consultation with Statutory Environmental Bodies. Initial opportunities to be explored are given below:

- Bunding should be carefully designed to minimise noise and visual impacts on designated heritage assets, particularly Westenhanger Castle (SW1), Stanford Windmill (SW2) and Gibbons Brook Farmhouse Shalom (SW4).
- Bunding and associated planting closer to Westenhanger Castle, and potentially within the scheduled area i.e. outside the Project Site, should be explored in order to effectively screen the upper floors of the manor house and areas of the estate closest to the project site. Such measures would need to be carried out in conjunction with the landowner and the appropriate statutory approvals obtained.
- Planting should be carefully designed so as not to introduce alien aspects into the historic environment.
- Bunds and plantings should also be carefully designed to avoid unnecessary impacts to below-ground archaeological remains.
- If significant archaeological remains are found and recorded, consideration should be given to disseminating the results through information boards on the Project Site, online information, or further archaeological research.

7. Landscape

7.1 Executive Summary

7.1.1 The potential impact of the proposed Project upon landscape and visual amenity during Construction and Operation has been assessed as part of this report. Four Landscape Character Areas (LCAs) and 22 Visual receptors were assessed, covering a minimum 1km study area and extending beyond to capture impacts upon elevated sections within the Kent Downs Area of Outstanding Natural Beauty (AONB) and neighbouring character areas.

7.1.2 Significant Large Adverse effects would be afforded from within three of the four LCAs during Construction, with two LCAs affording Large Adverse effects and one Moderate Adverse in Year 1 of Operation. Whilst this significance of effect would reduce by Year 15, significant Moderate Adverse residual effects upon landscape character for three of the four LCAs would remain.

7.1.3 Likewise, many visual receptors would also afford significant effects during Construction and Operation phases of the Project, with the assessment reporting residual significant adverse effects for 15 of the 22 receptors identified.

7.2 Introduction

7.2.1 This landscape and visual impact assessment chapter identifies potentially significant adverse impacts of the proposed Project upon surrounding landscape character and visual receptors. The assessment follows the Design Manual for Roads and Bridges (DMRB) Volume 11[52], and also takes guidance from the Guidelines for Landscape and Visual Impact Assessment[53], identifying landscape and visual baseline including value and sensitivity to change, prior to considering appropriate mitigation, the magnitude of change and resulting significance of effect.

7.3 Regulatory / Policy Framework

International

Kent Downs Area of Outstanding Natural Beauty

7.3.1 AONBs are part of a global family of protected areas recognised and classified by the International Union for Conservation of Nature (IUCN). AONBs, National Parks and Heritage Coasts in England and Wales fall into Category V – Protected Landscapes. The IUCN definition of Protected Areas Category V is defined as, "A protected area where the interaction of people and nature over time has produced an area of distinct character with significant ecological, biological, cultural and

[52] Highways England Design Manual for Roads and Bridges Volume 11, Section 3, Part 5 Landscape Effects and IAN 135/10
[53] Landscape Institute and Institute of Environmental Management and Assessment (2013), Guidelines for Landscape and Visual Impact Assessment, third edition.

scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values. The IUCN definition of Protected Landscape aims to maintain the harmonious balance between people, landscapes and nature for now and for future generations.

7.3.2 The following policies taken from the Kent Downs Area of Outstanding Natural Beauty (AONB) Management Plan[54] are considered to be of particular relevance:

- SD1 - The need to conserve and enhance the natural beauty of the Kent Downs AONB is recognised as the primary purpose of the designation and given the highest level of protection within statutory and other appropriate planning and development strategies and development control decisions.
- SD3 - New development or changes to land use will be opposed where they disregard or run counter to the primary purpose of the Kent Downs AONB.
- SD7 - To retain and improve tranquillity, including the experience of dark skies at night, careful design and the use of new technologies should be used. New developments and highways infrastructure which negatively impact on the local tranquillity if the Kent Downs AONB will be opposed unless they can be satisfactorily mitigated.
- SD8 - Proposals which negatively impact on the distinctive landform, landscape character, special characteristics and qualities, the setting and views to and from the AONB will be opposed unless they can be satisfactorily mitigated.
- SD10 - Positive measures to mitigate the negative impact of infrastructure and growth on the natural beauty and amenity of the AONB will be supported.
- SD11 - Where it is decided that development will take place that will have a negative impact on the landscape character, characteristics and qualities of the Kent Downs AONB or its setting, mitigation measures appropriate to the national importance of the Kent Downs landscape will be identified, pursued, implemented and maintained. The removal or mitigation of identified landscape detractors will be pursued.
- SD12 - Transport and infrastructure schemes are expected to avoid the Kent Downs AONB so far as practicable. Essential developments will be expected to fit unobtrusively into the landscape, respect landscape character, be mitigated by sympathetic landscape and design measures and provide environmental compensation by benefits to natural beauty elsewhere in the AONB.

7.3.3 If undertaking works in relation to, or so as to affect land in a National Park or AONB, it would need to comply with the respective duties in Section 11A of the National Parks and Access to Countryside Act 1949 and Section 85 of the Countryside and Rights of Way Act 2000.

[54] Kent Downs AONB (2014), Kent Downs AONB Management Plan 2014-2019 http://www.kentdowns.org.uk/uploads/documents/KD_AONB_final_plan_09.09.14.compressed.pdf

7.3.4 Section 85 of the Countryside and Rights of Way Act 2000 sets out the general duties of public bodies etc., "*In exercising or performing any functions in relation to, or so as to affect, land in an area of outstanding natural beauty, a relevant authority shall have regard to the purpose of conserving and enhancing the natural beauty of the area of outstanding natural beauty*".

7.3.5 The Kent Downs AONB Management Plan 2014-19 provides the following detailed guidance in respect of the setting of the Kent Downs AONB, which is particularly relevant considering the close proximity of the Project to the Kent Downs AONB: *"The setting of the Kent Downs AONB is broadly speaking the land outside the designated area which is visible from the AONB and from which the AONB can be seen, but may be wider when affected by intrusive features beyond that. It is not formally defined or indicated on a map. The setting of the AONB should be distinguished from the setting of listed buildings and other heritage assets (on which there is legislation and also policy in the National Planning Policy Framework and elsewhere)".*

7.3.6 The following landscape policies set out in the Kent Downs AONB Management Plan 2014-19 are relevant to this assessment:

- LLC1: The protection, conservation and enhancement of special characteristics and qualities, natural beauty and landscape character of the Kent Downs AONB will be supported and pursued.
- LLC2: The promotion, management, restoration and appropriate creation of prominent views and viewpoints will be supported.
- LLC5: The revision, development and use of co-ordinated landscape character assessments for the Kent Downs AONB will be supported and pursued.

7.3.7 The Kent Downs AONB Landscape Design Handbook provides practical design guidance to ensure new landscape features conserve and enhance the special characteristics of the AONB as a whole, and the distinctiveness of its individual character areas. Project specific mitigation is described in section 7.8.

National

7.3.8 Current policy for planning and the environment is set out in the National Planning Policy Framework[55] (NPPF). The NPPF sets out the Government's planning policies for England and how these are expected to be applied. Part 11 of the NPPF sets out the framework with respect to conserving the natural environment. Section 109 states the following:

- The planning system should contribute to and enhance the natural and local environment by:
  - o *Protecting and enhancing valued landscapes, geological conservation interests and soils.*

[55] National Planning Policy Framework https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

- o *Recognising the wider benefits of ecosystem services.*
- o *Minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.*
- o *Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability.*
- o *Remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.*

Local

7.3.9 The Shepway Core Strategy 2013[56], Aims and Vision for Shepway identifies under Strategic Need B the challenge to enhance the management and maintenance of the rich and natural historic assets in Shepway. Aims arising from Strategic Need B relevant to the landscape of the study area include:

- 4. Manage sensitive landscapes shaping the character of the district, especially on the edge of settlements or within the Kent Downs AONB and its setting.
- 6. Maintain the sense of openness and tranquillity of the countryside and undeveloped coast.

7.3.10 Shepway Core Strategy Local Plan 2013 identifies the following relevant policies from the Local Plan (2006) 'saved' policies:

- Policy SD1: Requires all development proposals take account of the broad aim of sustainable development and respects the following environmental criteria:
  - o *c) Protect and enhance areas of countryside that are of special quality, particularly the Kent Downs AONB, Special Landscape Areas, Local landscape Areas, Heritage Coast, and undeveloped coast, ancient woodlands and, the best and most versatile agricultural land. Sustain the character and diversity of the wider countryside in general.*
  - o *f) Maintain and enhance the provision of recreational open space, amenity land and tree and hedgerow cover.*
- Policy CO1: requires the countryside to be protected for its own sake and states development will only be permitted where proposals meet the following criteria:
  - o *maintain or enhance features of landscape, wildlife, historic, geological and agricultural importance, and the particular quality of the countryside.*

[56] Shepway District Council (2013), Core Strategy Local Plan http://www.shepway.gov.uk/planning/planning-policy/local-plan/core-strategy

- o *demonstrate that they cannot be practicably located within and existing settlement and essentially require a countryside location*
- o *are acceptable in highway and infrastructure terms.*
- o *preserve or enhance the amenity, character and functioning of rural towns and villages.*

7.3.11 Development proposals that would significantly conflict with one or more criteria in Policies SD1 and CO1 should only be implemented where it can be shown that there is an overriding social or economic need and where negative impacts are minimised as far as possible. Adequate measures would be required to compensate for any adverse environmental effect to ensure that no net environmental loss occurs.

7.4 Study Area

7.4.1 This assessment covers not only the site itself, but also a wider area of approximately 1 km from the site boundary, to provide an insight into the potential for significant effects of the Project on the surrounding landscape and visual receptors. This distance is in accordance with guidance set out in DMRB Volume 11. However, given the rising topography around the study area and presence of long distant views from elevated ground within the Kent Downs AONB, the study area has been extended to include viewpoints some 5.2km from the site. Refer to Figure 7.5 for the Zone of Visual Influence and Viewpoints Location Plan.

7.4.2 The study area for landscape effects covers the Project site and the wider landscape context within which the Project may influence landscape character. In this case, the study area for effects on landscape character is also the potential Zone of Visual Influence (ZVI), and is the same as the study area for the assessment of visual effects.

7.5 Assessment Methodology

Overview

7.5.1 Landscape encompasses many more elements than the common association which focuses merely upon the view or appearance of the land. The notion of landscape can be applied to both rural and urban environments with the term ‘townscape’ frequently adopted within the urban context. From the perspective of environmental assessment, ‘landscape’ applies to physical elements such as topography, drainage, land use and management, and vegetation as well as ecology and historical and cultural associations.

7.5.2 No single methodology exists for assessing landscape and visual impact. However, this detailed landscape assessment follows the recommendations set out in the following documents:

- Department for Transport’s Design Manual for Roads and Bridges Volume 11: Environmental Assessment and Interim Advice Note 135/10.

- Landscape Institute and Institute of Environmental Management and Assessment (2013), Guidelines for Landscape and Visual Impact Assessment 3, third edition.
- Natural England (2014), An Approach to Landscape Character Assessment.[57]

Baseline Methodology

7.5.3 The landscape and visual baseline were established through a desk study and site survey. The desk study used mapping and literature in order to gather an understanding of the study area and its surroundings. This included a review of Ordnance Survey mapping and several Landscape Character Assessments at a regional and local level, as well as the identification of any key designations that may be impacted by the Project. Site visits were carried out in Autumn/Winter 2015 and April 2016, during which, likely visual impacts from local key receptors were identified.

Zone of Visual Influence Map

7.5.4 A ZVI map has been produced for the Project to give an indication of the extent of areas with potential views of the tallest features in the Project in the wider landscape. It is based on OS 1:25,000 scale contour information and has been established through site survey. Use of the ZVI map has the following limitations:

- There are a number of areas within the ZVI map from where there is potential to view parts of the proposal, but which comprise land where the general public do not have access.
- It does not take account of the screening and/or filtering of views from all intervening features, such as buildings, trees and hedgerows; and
- It does not take account of the orientation of a viewer – for example when travelling in a vehicle.
- The combined effect of these limitations means that ZVI mapping tends to over-estimate the extent of visibility – both in terms of the land area from which the Project would be visible, and the extent of visibility of the proposed Project from a particular viewpoint.
- The ZVI map provided does not present an absolute measure of visibility and does not represent the “visual impact” of the proposed Project.

Impact Methodology

7.5.5 Landscape and visual impacts are determined by a number of factors, which collectively provide a level of significance of effect. Significance is based on the sensitivity of an area to a perceived change, along with an assessment of the magnitude of the visual impact. Impacts upon landscape character and visual amenity are considered during both the Construction and Operational phases of the Project. The Operational Phase is assessed at Year 1 and Year 15 after opening.

7.5.6 The distance of visual receptors from the Project has been categorised as follows:

- Near – less than 1.0km
- Middle – 1.0km to 2.5km
- Distant – Further than 2.5km

Assessment of Value / Sensitivity

Table 7.1: Scenic Quality Criteria

Quality	Criteria
Highest Quality	Contributing together to create a stimulating composition which is aesthetically and scenically outstanding, or which is an outstanding example, in the area, of a well-cared for landscape and set of features.
Very attractive	Contributing together to create a composition which is aesthetically and scenically pleasing, or which is a good example, in the area, of a reasonably well cared for landscape or set of features.
Good	Contributing together to create a composition which is aesthetically and scenically unremarkable, or an area of, or set of features, which is neutral or of mixed character.
Ordinary	Contributing together to create a composition which is aesthetically and scenically poor; or which is an example of an un-stimulating landscape or set of features; or with few poorly related/unrelated features.
Poor	Contributing together to create a composition which is aesthetically and scenically very poor; or which is an example of monotonous, unattractive, visually conflicting or degraded landscape or set of features.

Table 7.2: Landscape Sensitivity to Change Evaluation Criteria

Sensitivity to Change	Evaluation Criteria	Landscape Value
High	Landscape of high scenic quality with a distinctive combination of features, elements and characteristics, outstanding views and a strong sense of place. Important cultural associations. A scarce or fragile landscape with historic or ecological elements which make major contribution to landscape character. A tranquil landscape in good condition, largely intact, with an unspoilt character and a high susceptibility to change.	International or national: the landscape might be located in world heritage site, AONB, historic park and garden, Conservation Area or similarly designated area.
Moderate	Landscape of some scenic quality with a combination of features, elements and characteristics and a moderate sense of place. Some cultural associations. A landscape with mainly common but occasionally interesting features. Some historic or ecological elements which contribute to landscape character. Some high use areas, but overall medium tranquillity. A landscape in moderate condition, demonstrating change, with some unspoilt characteristics and a moderate susceptibility to change.	Regional or district: the landscape might be located in green belt, regional park, historic park and garden, Conservation Area or similar or in an undesignated area, but is of significance through literary or cultural associations or through demonstrable use.

Sensitivity to Change	Evaluation Criteria	Landscape Value
Low	A landscape not valued for its scenic quality, with a disparate combination of features, elements and characteristics and a weak sense of place. Few cultural associations. Mainly common features and few/no historic or ecological elements that contribute to landscape character. A landscape of low tranquillity, in poor condition, demonstrating a high degree of change and a low susceptibility to change.	District or local: generally undesignated landscapes which might be valued by the local community, containing elements or features that might benefit from restoration or enhancement.

Source: Based on GLVIA, IEMA and LI, 2013 and Highways England IAN 135/10

Table 7.3: Visual Receptor Sensitivity to Change

Sensitivity	Receptor
High	• Residential properties. • Users of Public Rights of Way or other recreational trails (e.g. National Trails, footpaths, bridleways etc.). • Users of recreational facilities where the purpose of that recreation is enjoyment of the countryside (e.g. Country Parks, National Trust or other access land etc.).
Medium	• Outdoor workers. • Users of scenic roads, railways or waterways or users of designated tourist routes. • Schools and other institutional buildings, and their outdoor areas.
Low	• Indoor workers. • Users of main roads (e.g. trunk roads) or passengers in public transport on main arterial routes. • Users of recreational facilities where the purpose of that recreation is not related to the view (e.g. sports facilities).

Source: Highways England IAN 135/10

Assessment of Magnitude

7.5.7 Tables 7.4 and 7.5 present criteria for the Magnitude of Change associated with Landscape Character and Visual Amenity.

Table 7.4: Magnitude of Change to Landscape

Magnitude	Criteria
Major Adverse	Total loss or large scale damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic conspicuous features and elements.
Moderate Adverse	Partial loss or noticeable damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic noticeable features and elements.
Minor Adverse	Slight loss or damage to existing character or features and elements, and/or the addition of new but uncharacteristic features and elements.
Negligible Adverse	Barely noticeable loss or damage to existing character or features and elements, and/or the addition of new but uncharacteristic features and elements.
No change	No noticeable loss, damage or alteration to character or features or elements.

Magnitude	Criteria
Negligible Beneficial	Barely noticeable improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic features and elements, or by the addition of new characteristic elements.
Minor Beneficial	Slight improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic features and elements, or by the addition of new characteristic elements.
Moderate Beneficial	Partial or noticeable improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic and noticeable features and elements, or by the addition of new characteristic features.
Major Beneficial	Large scale improvement of character by the restoration of features and elements, and/or the removal of uncharacteristic and conspicuous features and elements, or by the addition of new distinctive features.

Source: Highways England IAN 135/10

Table 7.5: Magnitude of Change to Visual Amenity

Magnitude	Criteria
Major	The project, or a part of it, would become the dominant feature or focal point of the view.
Moderate	The project, or a part of it, would form a noticeable feature or element of the view which is readily apparent to the receptor.
Minor	The project, or a part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view.
Negligible	Only a very small part of the project would be discernible, or it is at such a distance that it would form a barely noticeable feature or element of the view.
No Change	Only a very small part of the project would be discernible, or it is at such a distance that it would form a barely noticeable feature or element of the view.

Source: Highways England IAN 135/10

Assessment of Significance

7.5.8 Effects have been evaluated by combining the assessment of both magnitude (Tables 7.4 and 7.5) and sensitivity (Tables 7.2 and 7.3) to predict the significance of effect, as set out in in Chapter 4: Approach to Environmental Assessment.

7.5.9 The significance of impact upon landscape character considers a combination of the magnitude of change against the quality, value and sensitivity to change of the affected landscape.

7.5.10 Visual Impact significance has been determined by combining the sensitivity of the visual receptor to the proposed change in conjunction with the magnitude of change. Magnitude has been assessed on the basis of the scale of the change in view, as well as the duration and distance of visual receptors concerned from the Project.

7.5.11 For the purposes of this assessment, significant effects are those reported as Moderate Adverse of greater whilst effects assessed as slight adverse or less are considered to be non-significant.

Consultation

7.5.12 Consultation was undertaken with Kent Downs AONB Unit between September 2015 and January 2016 regarding the site selection in relation to the Kent Downs AONB, and the location of representative viewpoints. Further consultation was had with both the AONB and Natural England in April and May 2016.

7.5.13 Whilst an iterative design is under development, only basic mitigation has been included in the assessment with the intention of future design development in conjunction with the AONB unit and Natural England following the publication of this document. This will in essence seek to further mitigate the 'worst case' scenario, reducing landscape and visual impacts further. Potential future mitigation that could be explored is presented in section 7.10.

7.6 Assumptions and Limitations to the Assessment

Assumptions and limitations tor the assessment which apply across all chapter topics are given in Chapter 4: Approach to Environmental Assessment. Those specific to this chapter are given below:

- It assumes the worst case scenario with the full-time parking area in use, as well as the rest of the Lorry Area during Operation Stack.
- Not every residential receptor was addressed in its own right; instead receptors were captured as small groups in some instances. When receptors were grouped, the receptor that was subject to the highest level of impact was used to describe the impact on the entire group. This ensured a worst case scenario for the group of receptors.
- The assessment was undertaken from the curtilage of properties, on publicly accessible roads and footpaths.
- Not all receptors were assessed from site visits, lack of access to private property restricted some assessments to desk based studies only using OS mapping, aerial and streetside photography.
- It is assumed landscape mitigation will be undertaken in all of the areas shown on Figure 1.2 – Illustrative Environmental Masterplan. The extent and layout of proposed landscape mitigation areas may be altered to meet water, ecology and noise mitigation objectives. It is assumed that the assessment has addressed the worst case scenario and that opportunities to enhance landscape mitigation beyond that assessed in this report will be developed following the publication of this report.
- Night time site visits were not undertaken.
- Night time impacts are not reported for rural PRoW given their unlikely use in hours of darkness.

7.7 Baseline

7.7.1 Baseline information was gathered by both desk top study and a series of site visits to confirm the existing baseline for both landscape character and identified visual receptors on site.

The Study Area

7.7.2 The proposed site sits within a largely agricultural landscape, a mix of arable and pastoral farming practices interspersed with frequent woodland plots and hedgerows. The topography is undulating with the ground rising northwards from the site up into the Kent Downs, a designated AONB. Dominant ridgelines and hill tops look down upon the site from up in the downs towards the site in the south. To the south of the site, a notable detracting infrastructure corridor is found. This corridor contains the M20 motorway and the Channel Tunnel Rail Link, as well as the local railway network which traverses the study area from west to east, at odds with an otherwise rural setting. The presence of such infrastructure is compounded by the presence of the Stop24 Service Area to the east of the site. Refer to Figure 7.1 for study area extents.

Relevant Designations

7.7.3 There are a number of designated sites within the 1km study area. Westenhanger Castle in the south of the study area is a designated Scheduled Monument and also the site of two Grade I listed buildings. There are a number of other listed buildings, five of which (Grade II and II*) lie within 500m of the site. A further seven Grade II listed buildings and Sandling Park Registered Park and Garden lie between 500m and 1km from the site.

7.7.4 The Kent Downs AONB sits outside of the site boundary (250m at its closest point) but within the study area to the north and east of the site.

7.7.5 Landscape designations are shown on the landscape constraints plan (Figure 7.2), whilst cultural heritage designations are presented in the Cultural Heritage Assessment (Figure 6.1). Ecological designations are presented on the Environmental Constraints Plan, Figure 8.1.

Landscape Character

7.7.6 The landscape of the study area is described with reference to the following landscape character assessment data available at national and local level:

- National Character Area profiles[57] No. 119 North Downs and No. 120. Wealden Greensand

[57] Natural England, 2014, National Character Area Profiles https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making/national-character-area-profiles

- Landscape Assessment of Kent[58]
- Kent Downs AONB Landscape Design Handbook[59]

7.7.7 National and local character areas are illustrated on Figure 7.3 - Landscape Character and the topography of the landscape is shown on Figure 7.4 - Topography.

National Landscape Character

7.7.8 The study area is covered by two of Natural England's National Character Areas (NCAs). NCA 119: North Downs lies in the northern part and NCA 120: Wealden Greensand in the southern part of the study area. Their key characteristics in the vicinity of the Project are as follows:

Table 7.6: NCA 119 North Downs Features

Feature	Description
Topography	Chain of chalk hills extending from the Hog's Back in Surrey and ending dramatically at the renowned White Cliffs of Dover. The scarp forms a defining feature along the length of the NCA and panoramic views provide links with adjoining NCA.
Land Use	Heavily wooded, arable farmland dominates with small irregular field pattern.
Vegetation Cover	Woodlands, many of which are ancient, are a prominent feature of the landscape found primarily on the steeper slopes of the scarp, valley sides and areas of the dip slope. Well-wooded hedgerows and shaws are an important component of the field boundaries, contributing to a strongly wooded character.
Development	Predominantly rural landscape with traditional small, nucleated villages, scattered farms and large houses. The proximity of this NCA to mainland Europe is notable, with significant activity at the Port of Dover and the Channel Tunnel Terminal at Folkestone. The M20 runs from Folkestone and Ashford along the southern boundary of the NCA until it cuts across to London. High Speed 1 (Channel Tunnel Rail Link) between Dover and London lies close to the southern boundary of the M20.
Vernacular Style	Flint, chalk, brick, timber and tiles as well as Wealden brick detailing.
Historic Features	Twisting sunken lanes, often aligned along ancient drove roads, cut across the scarp and are a feature of much of the dip slope.
Water environment	The area is cut by the deep valleys of the Stour, Medway, Darent, Wey and Mole. River valleys cut through the chalk ridge, providing distinctive local landscapes which contrast with the steep scarp slope.
Designations	The Kent Downs and Surrey Hills AONB designations are testament to the scenic qualities and natural beauty of the area.

Table 7.7: NCA 120 Wealden Greensand Features

Feature	Description
Topography	Long narrow belt of Greensand. Scarp and dip slope topography gives rise to far reaching views.

[58] Babtie for Kent County Council, October 2004, Landscape Assessment of Kent http://www.kent.gov.uk/__data/assets/pdf_file/0014/12461/Landscape-Assessment-of-Kent-October-2004_Part1.pdf
[59] Kent Downs AONB, 2006, Landscape Design Handbook http://www.kentdowns.org.uk/guidance-management-and-advice/landscape-design-handbook

Feature	Description
Land Use	Mixed agricultural land with pasture and arable farming within a wooded framework. Small to medium sized fields.
Vegetation Cover	Extensive belts of woodland including mixed ancient woodland and more recent conifer plantations. Areas of heath on acidic soils.
Development	Rural settlement pattern- mixture of dispersed farmsteads, hamlets and nucleated villages. East of LCA is more developed with many towns including Maidstone, Ashford and Folkestone as well as infrastructure corridors such as the M26, M25, M20 and CTRL.
Vernacular Style	Frequent use of varying local stones, as well as timber framing and weather boarding.
Historic Features	Sunken lanes form historic and highly characteristic feature, as do old deer parks and more recent 18th Century Parklands. Other features include: field monuments, historic military defences, pre-historic tumuli, iron age hill forts, roman forts, Royal military canal.
Water environment	Numerous streams and rivers including Great and East Stour, Western Rother, Wey, Arun and Medway rivers.
Designations	51 percent of LCA covered by the South Downs National Park, Kent Downs AONB and Surrey Hills AONB.

Local Landscape Character

7.7.9 Landscape character areas (LCA) within the study area close to the Project are defined by the Landscape Assessment of Kent and Kent Downs AONB Landscape Design Handbook. The descriptions given below are specific to the area of the LCA situated within the assessment study area.

Sellindge Plateau Farmlands LCA

7.7.10 Characteristic features of the Sellindge Plateau Farmlands LCA are:

- Large scale landscape of open arable fields with the small sprawling settlement of Sellindge and Folkestone racecourse at its centre.
- Flat to undulating farmland on good quality deep silty soils used for growing cereals, potatoes and other field vegetables. Pasture on more undulating ground.
- The M20 and the Channel Tunnel Rail Link bisect the character area east to west causing discontinuities and discordance in the landscape. Both are audible over a wide area.
- South of the A20, around Westenhanger and Moorstock large areas of pasture persist.
- Land south of the A20 rises to above 70 metres AOD towards the Hythe escarpment with small marshy pasture edging the small streams. Hedgerows are gappy or missing.
- Smaller scale wooded landscape of pastures, old mineral sites, small lanes and bushy hedgerows north of Sellindge.

- A fragmented landscape with little clear pattern and many visual detractors associated with road and rail transport corridors and linear development.
- Agricultural buildings and fences detract from the view. The area is predominantly covered with intensive arable farmland with very limited potential for natural habitats.
- Night lighting is visible at the M20 junction 11, its approaches and Stop24 Service Area, as well as in urban areas to the south east.

7.7.11 Within the study area the pattern of the landscape is fragmented and it contains visual detractors associated with road and rail transport corridors, and linear development. It is interspersed with small pockets of unaltered rural character in the vicinity of Gibbins Brook and Hyham Hill. It is predominantly covered with intensive arable farmland with limited potential for natural habitats. The flat landscape is apparent and has long views, visibility is therefore high. The scenic quality is generally **good**. It is largely aesthetically and scenically unremarkable, with areas of ordinary scenic quality in the vicinity of the M20 and Channel Tunnel Rail Link, which are unrelated features of the landscape. The condition of the landscape is **moderate**. Overall, the sensitivity of the landscape is assessed to be **moderate**.

Stowting: Postling Vale LCA

7.7.12 Characteristic features of this landscape, which includes part of the Kent Downs AONB, are:

- It is a relatively open, intensively farmed landscape with grass-scarp slopes and wooded hilltops. The M20 motorway Channel Tunnel Rail Link and ribbon development lie at the foot of the scarp on the edge of the area.
- West of Tolsford Hill and Summer Hill is a more open, intensively farmed landscape, which extends out of the AONB towards Ashford.
- Large arable fields surrounded by small shaws or overgrown hedges or by trimmed remnant hedges.
- Folkestone lies at the most easterly end of the Greensand Belt, on a narrow tongue of land contained by the Downs to the north and the flat expanse of Romney Marsh in the south.
- Parts of the landscape are dominated by major roads and the Channel Tunnel Terminal, all of which are set against the backdrop of the steep scarp, which supports botanically rich chalk grassland.
- Scrub extends up some of the lower slopes of the Pilgrim’s Way along the scarp foot giving way to a gently undulating landscape with large fields and substantial blocks of woodland.
- Further south, the flat farmland around Pedlinge is broken up by large blocks of woodland and small ditches that enclose arable fields.

- The landscape has a coherent pattern with very few detracting features. Rural heritage features – woodland, hedges and small villages – are in good condition.
- The landscape has strong cultural links.
- Night lighting is visible at the M20 junction 11, its approaches and Stop24 Service Area, as well as in urban areas to the south east.

7.7.13 The landform is a dominant element within the character area and visual connectivity is very high over the open landscape. There is an historic character to landscape elements and pattern, although field boundaries are becoming indistinct. The rounded chalk hills contribute to the sense of place which is influenced by characteristic woodland, beech stands and cross contour roads. In some areas the scenic quality of the landscape is considered to be **highest quality** reducing to **good** in areas with views of the M20 and ribbon development at the foot of the scarp. The condition of the landscape is **very good**; it has a coherent pattern of elements with few detracting features. The sensitivity of the landscape is assessed to be **high**.

Aldington Ridge LCA

7.7.14 Part of this character area lies in the southern part of the study area and includes the Lympne escarpment. Key characteristics include:

- Raised landscape with steep slopes down to neighbouring character areas. Essentially a rural landscape.
- Mixed, generally open farmland with dramatic views to the Low weald, Romney Marsh and the Downs.
- The Aldington Ridge stands above the plain of the Low Weald. Along the edge of the ridge south-west of Aldington are distinctive irregular pastures developed on former landslips, characteristic of the junction between the Hythe Beds and Atherfield Clay below.
- North of the B2067 the land falls away more gradually to the Sellindge plateau with the North Downs framing the views beyond.
- Settlements at Lympne and north of Port Lympne, which grew up in association with the airport (now closed) are discordant elements in the landscape as their siting appears unrelated to topography or other natural features.
- Extensive new industrial development at Lympne Industrial Park.
- Visual detractors include redundant industrial buildings off Otterpool Lane.
- Tree cover is limited and visibility is high within the area.
- Night lighting is characteristic of the M20 Junction 11 and Stop24 Service Area, as well as in urban areas to the south east.

7.7.15 There is a historic sense of place to the area which is influenced by the isolated ridgeline farms, the ridgeline road, and remaining pastures and small copses.

Ragstone farm buildings constitute a unique element in the landscape which adds to its continuity. The ridgeline landscape is strongly unified with few visual detractors. The scenic quality of this well-cared for landscape is **very attractive**. The pattern of elements is unified. The sensitivity of the landscape is assessed to be **high**.

Hythe Escarpment Lympne LCA

7.7.16 A small part of the character area lies in the very southern edge of the study area. Characteristic features include:

- Dominant Sandstone scarp landform.
- Rough grassland, including unimproved agricultural grasslands.
- Rough pasture and scrub encroachment on the scarp at base of scarp along the Royal Military Canal corridor provide much biodiversity interest.
- Numerous small streams furrow through the sandstone escarpment to the canal at the base of the scarp.
- Tree cover is limited and visibility to surrounding landscape remains high.
- Visual connectivity to and from Romney Marsh.
- Local buildings including historic farmsteads and Lympne Castle are built in local ragstone.

7.7.17 This bleak, and in places wild landscape, reflects its exposed position, elevated high on the south coast above Romney Marsh. Rough pasture is interspersed with remnant hedgerows, contrasting with areas of semi improved grassland in an essentially sparsely vegetated landscape. Historic farmsteads follow a notable pattern within the landscape, strengthening the sense of place. Few features detract from the visual unity and coherent landscape pattern evident within this LCA. The landscape condition is **good**. Its simplicity and integrity result in this LCA having a **high** sensitivity to change.

Kent Downs AONB

7.7.18 The fundamental and special characteristics that distinguish the natural beauty of the Kent Downs landscape were identified when the Kent Downs AONB was designated in 1968, and reconfirmed in the 1995 Kent Downs AONB Landscape Assessment.

7.7.19 The AONB Management Plans from 2004 and 2014 give the following vision for the AONB: *'In 2034… the qualities and distinctive features of the Kent Downs AONB, the dramatic south-facing scarp, secluded dry valleys, network of tiny lanes, isolated farmsteads, churches and oasts, orchards, dramatic cliffs, the ancient woodlands and delicate chalk grassland along with the ancient, remote and tranquil qualities, are valued, secured and strengthened.*'

7.7.20 The AONB Management Plan 2014-2019 identifies nine special characteristics and qualities as set out in Table 7.8 below.

Table 7.8: Kent Downs AONB Special Qualities

Characteristic	Quality
Dramatic landform and views	The Kent Downs dramatic and diverse topography is based on the underlying geology.
Biodiversity rich habitats	Rich mosaics of habitats, plant and animal communities of national and local importance are sustained, although they may be isolated or fragmented in a modern agricultural landscape.
Farmed landscape	A long-established tradition of mixed farming has helped create the natural beauty of the Kent Downs.
Woodland and trees	Broadleaf and mixed woodland cover 23% of the Kent Downs and frame the upper slopes of the scarp and dry valleys and plateaux tops.
A rich legacy of historic and cultural heritage	Millennia of human activity have created an outstanding cultural inheritance and strong ‘time depth’ to the Kent Downs.
Geology and natural resources	The imposing landform and special characteristics of the Kent Downs is underpinned by its geology.
Vibrant communities	The Kent Downs is a living, working landscape shaped and managed by people.
Development pressures	The position of the Kent Downs, close to London, mainland Europe, major urban centres and growth areas means that the Kent Downs AONB, perhaps more than any other of Britain’s protected landscapes - AONBs, Heritage Coasts or National Parks, has faced severe development pressure.
Access, enjoyment and understanding	The Kent Downs is an easily accessible and charming landscape; over one million people live within a kilometre of the AONB boundary.

7.7.21 These special characteristics and qualities are highly valued and susceptible to change, and cannot be replaced. They are assessed as being of **high** sensitivity.

Tranquillity

7.7.22 The Council for the Protection of Rural England’s (CPRE) Tranquillity Map for Kent (2007) indicates low levels of tranquillity in the vicinity of the Project site and extending further south to the coast. This is attributed to major transport routes, the M20 motorway, A20 and Channel Tunnel Rail Link, as well as development for residential, industrial and commercial uses with accompanying high ambient noise levels and lighting. Further north, in the Kent Downs AONB tranquillity levels are higher in the undeveloped, unlit, rural landscape. Night lighting in urban areas is visible in distant views from the Kent Downs AONB. Lighting associated with the M20 is limited to Junction 11, its approaches and the Stop24 Service Area.

7.7.23 To summarise, almost all of the Project Site and study area lies within the Kent Downs AONB or forms part of its setting, i.e. it is either visible from the AONB or the AONB can be seen from it, therefore it is assessed to be of **high** sensitivity.

Visual Baseline

7.7.24 The description of the visual baseline of the study area should be read in conjunction with the description of the existing landscape baseline described above. The existing landscape character influences the scenic quality of views, which in turn affects receptors' sensitivity. The landscape character section also identifies areas of dark landscape within the study area, enabling assessment of the effect of the proposed permanent lighting proposals for the full time parking area and more temporary use of lighting when the full site is in use during Operation Stack.

7.7.25 The visual sensitivity of individual receptors will depend upon the location and context of the view from the receptor, the activity associated with the receptor, and the importance of the view. Those receptors often considered to have a higher sensitivity to change include occupiers of residential properties and users of outdoor recreation facilities and Public Rights of Way (PRoW), who are likely to be focused upon the surrounding landscape. Other visual receptors which may be impacted to a lesser degree, due to a reduced level of visual sensitivity, include those where the vista is not the primary draw (e.g. people involved in recreation activities such as sport, road users, and people in their place of work/school). The visual sensitivity of a receptor will influence the overall impact associated with the Project as defined in Table 7.2.

7.7.26 Visual receptors were identified through analysis of Ordnance Survey Explorer maps, consultation with the Kent Downs AONB Unit, and through field survey work. The majority of the receptors assessed comprise: residential properties; Public Rights of Way (PRoW), particularly recreational trails in the Kent Downs AONB; Open Access land; and a small number of local roads. The location of visual receptors assessed is presented in Figure 7.5 - Zone of Visual Influence and Viewpoints Location Plan.

7.7.27 Within the ZVI, extensive, panoramic long distance views are available from the south facing scarp slope in the north and from the Lympne escarpment in the AONB to the south over the Project site. The escarpments form the visual horizon and limit views from beyond the ZVI. Near and middle distance views into the study area are limited by topography, vegetation and buildings. There are views within the ZVI which are also limited due to local variations in topography and vegetation.

7.7.28 Detractors in the landscape, which are visible from most of the study area due to the open views, include power lines, industrial buildings at Lympne and transportation routes such as the M20, A20 and Channel Tunnel Rail Link.

7.7.29 A description of the baseline view from each visual receptor identified is presented in the Visual Impact Schedules in Appendix 7.1.

7.8 Mitigation

7.8.1 The purpose of the landscape mitigation would be to minimise adverse landscape and visual impacts in relation to local residents; to reduce impacts on the setting of local landscape and heritage assets; and to protect biodiversity during both construction and operation. Proposed landscape mitigation measures are presented in Figure 1.2 – Illustrative Environmental Masterplan.

Construction Phase

7.8.2 The short time scale would preclude effective screening through planting. Landscape mitigation would be achieved through the following measures, which will be included in the Construction Environmental Management Plan (CEMP):

- Retention and protection of boundary vegetation wherever possible.
- Where practicable, siting topsoil bunds to screen and / or provide a physical buffer between the construction works and residential properties.
- Using access routes that would minimise visual intrusion, subject to agreement with the local planning authority.
- Prompt removal of all temporary structures and stockpiles when no longer required, and reinstatement of all disturbed land to its former use.
- Minimising use of security lighting wherever practicable - use of infrared sensor to be explored.
- Keep a tidy and well managed site.

Operational Phase

- Retention of boundary vegetation including mature trees, woodland and hedgerows where practical.
- Use of LED lanterns with minimal upward light spill to limit night time impacts.
- Careful use of neutral colours and low-reflective finishes for all structures to ensure they will blend into the surrounding landscape.
- Restricting the use of security fencing to the minimum necessary for safety and operational requirements. The aesthetic design and colour of the fence to reduce its visual impact and improve integration with the surrounding landscape, for instance a weldmesh fence, colour black or similar. Where it is required, it should be screened by locating it inside the mitigation planting. In other locations, traditional post and rail agricultural fencing would be used where possible, which would blend into the landscape.
- Bridge structure crossing M20 to be of weathered steel appearance aiding its integration within a rural environment.
- Planting to screen or reduce views of the Project from distant receptors.
- Woodland planting to integrate the Project into the surrounding landscape and link with adjoining woodland and hedgerows.

- Internal planting to break up the mass of built form and provide a more appealing character for PRoW traversing the site.

7.9 Residual Impacts (with mitigation)

7.9.1 This section provides an assessment of the likely magnitude of impacts from the Project on landscape elements and features, landscape character and visual receptors incorporating the mitigation measures outlined in section 7.8 above. This section provides a score for the significance of effect using the matrix set out in Chapter 4 (Table 4.3), which is discussed in section 7.5.

Effects upon designated sites

7.9.2 Of the designated sites identified in the baseline, none would be directly affected by the footprint of the works. Westenhanger Castle in the south of the study area would sit within a very short distance of the site and is likely to be adversely impacted by construction and operational activity to the north (refer to visual impact schedules in Appendix 7.1 for detailed description). Whilst there would not be direct effects upon listed buildings, the setting of buildings within 500m would be compromised as a result of the Project. Further detail is presented in visual impact schedules in Appendix 7.1 and Chapter 6 (Cultural Heritage). Sandling Park Registered Park and Garden is located approximately 600m away from site in the south east corner of the study area. Given its low lying nature and intervening topography, built form and vegetation, it is not considered to be impacted by the works.

7.9.3 The Kent Downs AONB sits outside of the site boundary but within the study area to the north and east of the Project site. Its elevated nature affords far reaching visual connectivity with the site and surrounding landscape and as such, key views and the setting of the AONB would be adversely affected as a result of the Project.

Construction Phase

Landscape Effects during Construction

7.9.4 The following paragraphs provide a description of the likely effect upon Landscape Character Areas (LCAs) within the study area during Construction.

7.9.5 The construction works would be of temporary duration lasting approximately 12 months. During this time, potential adverse landscape impacts would arise.

The site and immediate surrounding area

7.9.6 Construction activities would present seemingly discordant features and activities to a larger area during construction compared to the areas affected by the operational phase. During this time, potential adverse landscape and visual impacts would arise from site clearance, soil stripping, vegetation clearance, temporary construction facilities and activities. The impacts would be widespread and visually prominent, particularly in the more open areas of the Project adjacent to Kennet Lane and the tract of land between the M20 and Channel Tunnel Rail Link.

7.9.7 The magnitude of impact on the site and immediate surrounding area, which has moderate sensitivity, is assessed to be major adverse. The significance of effect would be **large adverse** and short term.

Sellindge Plateau Farmland LCA

7.9.8 The impact upon the wider Sellindge Plateau Farmlands LCA would be notable. The introduction of discordant features at odds with the existing arable farmland character would be notable during Construction. Large scale construction works, across a significant plot, with earthworks, machinery and plant movement would have a detrimental effect upon existing character including local visual and audible tranquillity. However, the change would be set in the context of existing detracting features such as the CTRL and M20. Given the visual connectivity across much of the character area, the magnitude of change is considered to be large adverse, which combined with a moderate sensitivity would result in a **large adverse** significance of effect for the duration of construction.

Stowting Postling Vale LCA including Kent Downs AONB

7.9.9 Whilst Stowting Postling LCA sits outside of the Project site, the elevated topography within the LCA allows for visual connectivity with neighbouring Sellindge Plateau Farmland and the site to the south. As such, the indirect effects of the presence of construction plant, materials and associated activity would influence the setting of Stowting Vale and Kent Downs AONB during Construction. The changes would however be set in the context of some existing detracting features in the neighbouring LCA, with the presence of the M20 and CTRL traversing the landscape. Given the high sensitivity of the area, combined with a moderate adverse magnitude of change, the significance of effect during construction is considered to be **large adverse**.

Aldington Ridge and Hythe Escarpment LCAs including Kent Downs AONB

7.9.10 The elevated nature of these character areas allows visual connectivity across a number of neighbouring LCAs. Whilst there would be no direct impact upon these LCAs as a result of the Project, there may be non-significant indirect effects where visual connectivity is available between the site and the LCAs. The presence of construction works would be set in the context of the intervening M20 and CTRL and would not dominate the setting from such a distance. Given the distance from site, the magnitude of impacts on adjoining LCAs, with potential visibility of the Project, including those in the Kent Downs AONB, which has high sensitivity, would be negligible adverse. The significance of effect would be **slight adverse.**

Visual Effects during Construction

7.9.11 Effects during construction of the Project have been detailed for each visual receptor identified within the assessment process. The Visual Impact Schedules contained in Appendix 7.1 provide a detailed description of the change in view and associated significance of effect during construction.

7.9.12 Of the 22 receptors identified, 16 would experience significant adverse effects during construction. Six of the 20 would experience a **very large adverse** effect, five a **large adverse** effect, with the remaining five experiencing **moderate adverse** effects. A summary of effects upon visual receptors, grouped by type is outlined below.

Residential Receptors

7.9.13 Of the 13 residential receptors identified within the assessment, 11 would experience significant effects during Construction. This is due to a combination of the open nature of many local views, the relatively short distance to site for many of the receptors and the large scale nature of the proposed works. Of the 11 significant effects, seven would receptors would experience **very large adverse** effects, and three would experience **large adverse** effects.

7.9.14 All 13 residential receptors were assessed from local PRoW, which given their high sensitivity to change would afford the same significance of effect as the residential properties they are representative of.

Recreational Users

7.9.15 In addition to the 13 PRoW captured within the assessment above, a further seven recreational receptors were identified within the ZVI. These include long distance views from elevated positions within the Kent Downs AONB as well as PRoW within and immediately adjacent to the site boundary. Six of the seven receptors would experience significant adverse effects during Construction with one receptor (VP20) representative of several PRoWs within or immediately joining the proposed site would experience a **very large adverse** effect during Construction, and two receptors experiencing a **large adverse** effect. Given the distance from site, the majority of elevated views from within the AONB are considered to be non-significant with the exception of receptors 9, 10, 11 and 13 which would have experience a **moderate adverse** effect.

Road users

7.9.16 Views from the road with roads considered as standalone receptors are identified and assessed in Chapter 12: People and Communities, however details are presented for some views from the road in the visual impact schedules in Appendix 7.1 where they are also representative of another receptor type such as residential properties or recreational users.

Operational Phase

Landscape Effects during Year 1 of Operation

7.9.17 The following paragraphs provide a description of the likely effect upon LCAs within the study area during Operation including when the Project is in full use for Operation Stack (includes full time parking area, resulting in a total use of 3600 spaces).

The site and immediate surrounding area

7.9.18 Landcover would be notably altered through the replacement of agricultural land with the large expanse of hardstanding accommodating the Lorry Area. There would also be a loss of small areas of woodland and scrub as a result of the Project. The fishing lake and surrounding woodland would be removed, although replacement waterbodies would be provided. The extent of existing vegetation lost to the Project would however be greatly exceeded by the proposed mitigation planting.

7.9.19 Impacts on the landscape would arise from the introduction of discordant features within the character area. What was once agricultural land would be set to a large expanse of hard paving, combined with frequent lighting columns (12m tall), signage, traffic signals and control booths. A Facilities Building would also be located within the plot south of the M20. When in use a large number of lorry movements, vehicle headlights, and higher ambient noise levels would be experienced. The use of the Lorry Area would restrict the potential long term impacts with only the southern part (south of the M20) being used as the full-time parking area (500 spaces) and the northern section only being used during Operation Stack (combined with full time parking resulting in use of 3,600 spaces). This would mean that the Lorry Area in the north would remain empty and unlit when not in use. It is anticipated that Operation Stack would be in use 8 times per year on average.

7.9.20 Whilst tranquillity in the vicinity of the Project site is currently low due to the presence of the M20 and Channel Tunnel Rail Link, lorry traffic, vehicle headlights and site lighting would be visible within the wider rural landscape and would reduce tranquillity and visual amenity. Although it would not be incongruous in the context of the M20 and Stop24 Service Area, it would be visually prominent and incompatible with the surrounding rural landscape.

7.9.21 Mitigation planting such as linear belts of trees and shrubs as well as more extensive woodland plots would have little impact at Year 1, however they would be legible within the wider landscape. Overtime, the planting would establish, increasing in height, providing more effective landscape integration and screening value to the immediate surrounding area.

7.9.22 The magnitude of impact upon the site during Year 1 of Operation is considered to be major adverse. This combined with the high sensitivity of the LCA would result in a **large adverse** significance of effect.

Sellindge Plateau Farmland LCA

7.9.23 There would be noticeable damage to the existing character through the addition of uncharacteristic, noticeable features, such as those affecting the site itself, as described above. The extent of impacts would be limited by woodland surrounding the Project site, Hayton Wood and Gibbins Brook, which would screen or reduce the extent of views of the Project to a certain degree. The magnitude of change on the character area as a whole, which has moderate sensitivity, is assessed to be major. The significance of effect would be **large adverse** during Year 1 of Operation.

Stowting Postling Vale LCA

7.9.24 As with impacts during Construction, Stowting Postling Vale LCA would not be directly affected by the operation of the Project itself, although it would be indirectly affected where visual connectivity is afforded with the site in neighbouring Sellindge Plateau Farmland. Mitigation planting would have yet to establish in Year 1, and as such, several discordant features would be apparent within the neighbouring Sellindge LCA. These would include the presence of a large expanse of hard standing, control booths, lighting, traffic signals, and movement of lorries around the site. Impacts would however reduce as mitigation planting matures to help break up the built form and screen the site. The magnitude of change In Year 1 would be moderate, which when combined with a high sensitivity to change would result in a **moderate adverse** effect during Year 1.

Aldington Ridge and Hythe Escarpment LCAs including Kent Downs AONB

7.9.25 Whilst there would be no direct impacts upon these character areas, there would be an indirect impact upon their setting where visual connectivity is afforded between these areas and the site itself. The change in baseline is considered to be barely noticeable for the character areas as a whole, which has a high sensitivity. As such a negligible magnitude of change is reported, resulting in a **slight adverse** significance of effect in Year 1 of Operation.

Landscape Effects during Year 15 of Operation

The site and immediate surrounding area

7.9.26 At Year 15 the magnitude of change to the topography, hydrology, land use and landscape pattern would be the same as Year 1. Landscape mitigation planting would have achieved its design objectives. The vegetation would have matured to the extent that it would make a significant contribution to the landscape in an area where vegetation is highly valued for its contribution to screening, enclosure and habitats. It would integrate the Project into the surrounding landscape and would limit views from nearby areas of flat landscape.

7.9.27 It is considered unlikely that lighting impacts could be fully mitigated. Site lighting and vehicle headlights would be a permanent feature of the Project. Impacts would be more noticeable during the winter when the screen planting would be less effective. The lighting would be prominent in an area that is surrounded by rural landscape; the adjoining section of the M20 is not lit.

7.9.28 The Lorry Area, associated infrastructure and service facilities would collectively form a large-scale, uncharacteristic feature in the surrounding landscape. The magnitude of change on the immediate surrounding area, which has moderate sensitivity, is assessed to be moderate adverse. The significance of effect would be **moderate adverse**.

Sellindge Plateau Farmland LCA

7.9.29 Prominent features, such as lighting, facility building, control booths, access ramps and structures, would be uncharacteristic and noticeable in other parts of this LCA. However, impacts would reduce over time as the mitigation planting matured although both day time and night time impacts could not be fully mitigated. The magnitude of change on this LCA, which has moderate sensitivity, is assessed to be moderate adverse. The significance of effect would be **moderate adverse**.

Stowting Postling Vale LCA

7.9.30 As mitigation planting matures to help enclose the site in neighbouring Sellindge Plateau, the indirect impact upon Stowting Postling Vale would reduce. This would be due to a reduction in the prominence of features discordant in the wider landscape, which in earlier years would appear heavily out of place and out of scale with existing land use and character. The magnitude of change during Year 15 would have reduced to minor, for this high sensitivity receptor, resulting in a **moderate adverse** effect.

Aldington Ridge and Hythe Escarpment Lympne LCAs including Kent Downs AONB

7.9.31 Whilst mitigation planting may have matured by Year 15, the limited nature of this application would limit the reduction in magnitude of change with elements of visual connectivity remaining. The magnitude of change on this area, which has high sensitivity, is assessed to be negligible. The significance of effect would be **slight adverse**.

Table 7.9: Summary of Landscape Character Effects

Significance of Effect	LCAs affected during Construction	LCAs affected during Yr 1 Operation	LCAs affected during Yr 15 Operation
Large Adverse	• 'The Site and immediate surrounding area' • 'Sellindge Plateau Farmland LCA' • Stowting Postling LCA	• 'The Site and immediate surrounding area' • 'Sellindge Plateau Farmland LCA'	*None*
Moderate Adverse	None	• 'Stowting Postling LCA'	• 'The Site and immediate surrounding area' • 'Sellindge Plateau Farmland LCA' • 'Stowting Postling LCA'
Slight Adverse	• 'Aldington Ridge and Hythe Escarpment LCAs including Kent Downs AONB'	• 'Aldington Ridge and Hythe Escarpment LCAs including Kent Downs AONB'	• 'Aldington Ridge and Hythe Escarpment LCAs including Kent Downs AONB'
Neutral	None	None	None

Visual Effects during Operation

7.9.32 Effects during Operation of the Project have been detailed for each visual receptor identified within the assessment process. The Visual Impact Schedules contained in Appendix 7.1 and shown on Figure 7.5 provide a detailed description of the change in view and associated significance of effect during Operation at Year 1 and Year 15. The significance of effect represents the effect when the Project is in full use for Operation Stack (includes full-time parking area, resulting in a total use of 3600 spaces).

Residential Receptors

7.9.33 Of the 13 residential receptors identified within the assessment, 11 would experience significant effects during Year 1 of Operation. Over time mitigation planting both within the main body of the Lorry Area, as well as substantial woodland blocks of planting and belts of trees and shrubs along the periphery would have established to from a notable area of 'greening', helping to reduce the visual prominence of the Project, either substantially filtering or screening views to site from nearby receptors. Receptors from elevated positions in the surrounding landscape may still afford views into site however the impact would be reduced due to the softening effect of mitigation planting. Of the 11 significant effects reported during Construction, all 11 would remain significant in Year 1 of Operation and beyond into Year 15. The number of receptors experiencing **very large adverse** effects in Year 1 would be four, reducing to three by Year 15. Of the six residential receptors experiencing **large adverse** effects in Year 1, all would remain at that level at Year 15 despite the establishment of vegetation within the Project Site boundary. One receptor would experience **moderate adverse** effects in Year 1, again remaining at that level of significance in Year 15.

7.9.34 All 13 residential receptors were assessed from local PRoW, which given their high sensitivity to change would afford the same significance of effect as the residential properties they are representative of.

Recreational Receptors

7.9.35 Five of the seven standalone recreational receptors would experience significant adverse effects during Operation with two receptors (VP13 and VP20) experiencing a **large adverse** effect with VP9, VP10 and VP11 experiencing **moderate adverse** effects in Year 1. The significance of effect would remain unchanged in Year 15 for VP20, however the presence of established mitigation planting would help to settle the Project in the wide expansive view from elevated positions in the AONB reducing significance of effects to **moderate adverse** for VP13 and **slight adverse** for VP9, VP10 and VP11 by Year 15.

Road users

7.9.36 As mentioned previously, views from the road (with roads considered as standalone receptors) are identified and assessed in Chapter 12 (People & Communities), however details are presented for some views from the road in the visual impact schedules in Appendix 7.1, where they are also representative of another receptor type such as residential properties or recreational users.

Summary

7.9.37 Of the 22 receptors identified, 14 would experience significant adverse effects during Year 1 of Operation. Five receptors would experience a **very large adverse effect**, eight experiencing a **large adverse** effect and 1 receptor experiencing **moderate adverse** effects. A summary of effects upon visual receptors in Year 1 of Operation, grouped by type is outlined in Table 7.10 below.

7.9.38 By Year 15, the number of receptors significantly affected by the Project would remain the same, however two receptors considered to experience **very large adverse** effects in Year 1 would experience **large adverse** effects by Year 15.

Table 7.10: Summary of Visual Effects

Significance of Effect	Number of visual receptors affected during Construction	Number of visual receptors affected in Year 1	Number of visual receptors affected in Year 15
Very Large Adverse	7	5	3
Large Adverse	7	9	10
Moderate Adverse	3	1	2
Slight Adverse	5	7	7

Significance of Effect	Number of visual receptors affected during Construction	Number of visual receptors affected in Year 1	Number of visual receptors affected in Year 15
Negligible	-	-	-
Neutral	-	-	-

7.10 Further Mitigation Opportunities

7.10.1 Further mitigation opportunities will be explored following the publication of this document as the detailed design phase of the Project progresses. Opportunities to lessen the adverse effects upon landscape and visual amenity would be developed through consultation with Statutory Environmental Bodies such as the Kent Downs AONB and Natural England. Initial opportunities to be explored include:

- Aligning internal planting within the main body of the parking area on an east / west axis rather than north / south as is currently proposed. The practicality of this would depend on the operational success of realigning the parking bays within the site.
- Opportunities for offsite planting to aid visual screening from more distant receptors.
- The use of a more permeable surfacing to lessen the visual prominence of the parking area currently proposed as concrete.

8. Nature Conservation

8.1 Executive Summary

8.1.1 Ecological surveys to identify habitat types and the presence of protected species were undertaken at the Project Site in autumn 2015 and throughout the 2016 season. Although the submission of the EAR is June 2016, surveys will continue until October 2016 to ensure that robust ecological data is gathered.

8.1.2 As it has not been possible to establish the presence/likely absence of bats, dormice, reptiles and great crested newts, this assessment adopts a precautionary approach.

8.1.3 During the construction phase of the Project, significant effects are predicted for great crested newts (if present) due to the risk of killing/injuring any individuals present. Significant effects are also predicted for the East Stour River due to the need to culvert/divert the watercourse.

8.1.4 During the operation of the Project, significant effects are predicted for bats, otters and water voles as a result of disturbance caused by noise, vibration and lighting.

8.1.5 An Illustrative Environmental Masterplan (Figure 1.2) has been created to ensure that habitat loss is replaced at a ratio of at least 1:1 for the benefit of nature conservation. The Environmental Masterplan also includes additional enhancement measures to ensure there is no net loss of biodiversity as a result of the Project.

8.2 Introduction

8.2.1 This chapter assesses the impacts of the proposed Project on Nature Conservation using the guidance for Detailed Assessment from DMRB Volume 11 Section 2[60], Section 3[61] (Part 4) and Section 4[62], and IANs 130/110[63] and 125/15[64]. The following parameters are described:

- The legislation and policy that have been taken into account in the assessment
- The assessment methodology, including consultation outcomes which have informed the assessment
- Baseline ecological conditions currently existing at the Site and in the surrounding area

[60] Design Manual for Roads and Bridges: Volume 11, Section 2 General Principals of Environmental Assessment (http://www.standardsforhighways.co.uk/dmrb/vol11/section2.htm)
[61] Design Manual for Roads and Bridges: Volume 11, Section 3 Environmental Assessment Techniques, Part 4 Ecology and Nature conservation (http://www.standardsforhighways.co.uk/dmrb/vol11/section3.htm)
[62] Design Manual for Roads and Bridges: Volume 11, Section 4, Part 1 HD/44 Assessment of Implications on European Sites.
[63] Interim Advice Note 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment (http://www.standardsforhighways.co.uk/ians/pdfs/ian130.pdf)
[64] Interim Advice Note 125/15 Environmental Assessment Update (http://www.standardsforhighways.co.uk/ians/pdfs/ian125r2.pdf

- The likely significant effects including consideration of embedded mitigation
- The mitigation required to prevent, reduce or offset any significant adverse effects
- The likely residual effects and cumulative effects once mitigation measures have been employed

8.3 Regulatory / Policy Framework

8.3.1 Relevant wildlife and countryside legislation has been used along with local and national planning policy guidance to inform this assessment. The following legislation and policy has been used to underpin the ecological impact assessment reported in this chapter.

European

Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora (Habitats Directive)[65]

8.3.2 The main aim of the Habitats Directive is to promote the maintenance of biodiversity by requiring member states to introduce protection for habitats and species of European importance. The mechanism for protection is through designation of Special Area of Conservation (SACs), both for habitats and for certain species listed within Annex II, and through specific protection of certain species.

Directive 2009/147/EC on the Conservation of Wild Birds (Birds Directive)[66]

8.3.3 The Birds Directive creates a comprehensive scheme of protection for all wild bird species naturally occurring in the European Union. The Directive places great emphasis on the protection of habitats for endangered as well as migratory species (listed in Annex I), especially through the establishment of a coherent network of Special Protection Areas (SPA) comprising all the most suitable territories for these species. Since 1994 all SPAs form an integral part of the Natura 2000 ecological network. The Birds Directive bans activities that directly threaten birds, such as the deliberate killing or capture of birds, the destruction of their nests and taking of their eggs, and associated activities such as trading in live or dead birds.

[65] Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992L0043:EN:NOT
[66] Directive 2009/147/EC (Birds Directive) on the conservation of wild birds (the codified version of Council Directive 79/409/EEC as amended) http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:020:0007:0025 EN:PDF

The Convention on the Conservation of European Wildlife and Natural Habitats (The Bern Convention)[67]

8.3.4 The principal aims of the convention are to ensure conservation and protection of wild plant and animal species and their natural habitats (listed in Appendices I and II of the Convention), to increase cooperation between contracting parties, and to regulate the exploitation of species (including migratory species).

National

The Conservation of Habitats and Species Regulations 2010 (as amended)[68]

8.3.1 The Conservation of Habitats and Species Regulations 2010 was created to consolidate all the various amendments made to the 1994 Regulations in respect of England and Wales and is commonly known as the 'the Habitats Regulations'. The Habitats Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European sites.

The Wildlife and Countryside Act 1981 (as amended)[69]

8.3.2 The Wildlife and Countryside Act 1981 as amended (WCA) is the principal mechanism for the legislative protection of wildlife in the United Kingdom (UK). This legislation is the means by which the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and (partially) the European Union Directives on the Conservation of Wild Birds (79/409/EEC) and Habitats Directive are implemented in the UK.

The Countryside and Rights of Way Act 2000[70]

8.3.3 The Countryside and Rights of Way Act 2000 (CRoW Act) extends the public's ability to enjoy the countryside whilst also providing safeguards for landowners and occupiers. It gives a statutory right of access to open country and registered common land; modernises the rights of way system; gives greater protection to Site of Special Scientific Interest (SSSIs); provides better management arrangements for Area of Outstanding Natural Beauty (AONBs); and strengthens wildlife enforcement legislation. The Crow Act provides stricter enforcement for wildlife offences. These include increased penalties available to the courts for offences committed under the WCA.

[67] The Bern Convention http://www.coe.int/t/dg4/cultureheritage/nature/bern/default_en.asp
[68] The Habitats Regulations http://www.legislation.gov.uk/uksi/2010/490/pdfs/uksi_20100490_en.pdf
[69] The Wildlife and Countryside Act http://www.legislation.gov.uk/ukpga/1981/69
[70] The CROW Act http://www.legislation.gov.uk/ukpga/2000/37/contents

The Natural Environment and Rural Communities Act 2006[71]

8.3.4 The NERC Act provides that any public body or statutory undertaker in England and Wales must have regard to the purpose of conservation of biological diversity in the exercise of their functions. The intention is to help ensure that biodiversity becomes an integral consideration in the development of policies and plans. In 2007, the UK Biodiversity Partnership published an updated list of priority UK species and habitats covering terrestrial, freshwater and marine biodiversity to focus conservation action for rarer species and habitats in the UK. The UK list has been used as a reference to draw up the species and habitats of Principal Importance in England under Section 42 of the NERC Act.

The Protection of Badgers Act 1992[72]

8.3.5 The Protection of Badgers Act 1992 makes it an offence to wilfully take, kill, injure or ill-treat a badger, or possess a dead badger or any part of a badger. Under the act, badger setts are also protected from interference. Sett interference includes damaging or destroying a sett, obstructing access to a sett, and disturbing a badger whilst it is occupying a sett. The Act defines a badger sett as 'any structure or place, which displays signs indicating the current use by a badger' and Natural England takes this definition to include seasonally used setts. Work that may disturb badgers or their setts is illegal without a development licence from the relevant statutory body (in this case Natural England).

The Hedgerow Regulations 1997[73]

8.3.6 The Hedgerows Regulations (1997) make provision for the protection of important hedgerows in England and Wales. The regulations affect hedgerows which are 20m or more in length, or connected at both ends to another hedgerow of any length. It is an offence to intentionally or recklessly remove or cause or permit another person to remove a hedgerow or intentionally or recklessly remove, or cause or permit another person to remove, a hedgerow which is the subject of a hedgerow retention notice.

UK Post-2010 Biodiversity Framework[74]

8.3.7 The purpose of the UK Biodiversity Framework is to set a broad enabling structure for action across the UK between 2012 and 2020:

- To set out a shared vision and priorities for UK-scale activities, in a framework jointly owned by the four countries, and to which their own strategies will contribute

[71] The NERC Act http://www.legislation.gov.uk/ukpga/2006/16/contents
[72] The Protection of Badgers Act http://www.legislation.gov.uk/ukpga/1992/51/contents
[73] The Hedgerow Regulations https://www.gov.uk/guidance/countryside-hedgerows-regulation-and-management
[74] UK Post 2010 Biodiversity Framework http://jncc.defra.gov.uk/page-6189

- To identify priority work at a UK level which will be needed to help deliver the Aichi targets and the European Union biodiversity strategy
- To facilitate the aggregation and collation of information on activity and outcomes across all countries of the UK, where the four countries agree this will bring benefits compared to individual country work
- To streamline governance arrangements for UK-scale activity

National Policy Planning Framework (NPPF)[75]

8.3.1 If a proposed development would result in significant harm to the natural environment which cannot be avoided (through the use of an alternative site with less harmful impacts), mitigated or compensated for (as a last resort) then planning permission should be refused. Opportunities to incorporate biodiversity in and around developments should be encouraged.

Local

Kent Biodiversity Strategy[76]

8.3.2 The Kent Nature Partnership has identified priorities for the natural environment and ensures that work undertaken to contribute to the delivery of the objectives are reported, capturing the contribution made in Kent to the England Biodiversity Strategy. The vision is that by 2050 our land and seas will be rich in wildlife, our biodiversity will be conserved, restored, managed sustainably and be more resilient and able to adapt to change and will be enjoyed and valued by all, underpinning our long-term economic, social and personal wellbeing. The Strategy includes a spatial plan to deliver the strategy that will enable a resilient ecological network and where the delivery of targets should be focused to secure maximum biodiversity benefits. Around the core areas are wider buffers that with beneficial land management would help ensure larger and more resilient areas of habitat.

Kent Biodiversity Action Plan[77]

8.3.3 The Kent BAP seeks to be proactive and sets out targets to achieve safeguards for biodiversity. Habitat and Species Action Plans have been produced which identify what needs to be done to enhance and restore habitats and reverse declines of species populations.

Shepway Local Plan Review (Policies 2013 onwards)[78]

8.3.4 Policy CO1 sets out the broad principles against which development proposals in the countryside will be assessed, supplementing Policy SD1 and the provisions of

[75] NPPF https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf
[76] Kent Biodiversity Strategy http://kentnature.org.uk/biodiversity-strategy.html
[77] Kent Biodiversity Action Plan http://www.kentbap.org.uk/
[78] Shepway Local Plan www.shepway.gov.uk/media/970/Local-Plan-Review-Policies-Applicable-2013/pdf/Local_Plan_Review_-_Policies_Applicable_2013.pdf

Structure Plan Policies ENV1, ENV2, RS1 and RS5 (1996 Adopted Plan). The aim of this policy is to ensure that any development that is permitted in the countryside maintains and where possible enhances local quality and character and respects other sustainability objectives. Where development is exceptionally permitted which would have negative local environmental consequences, proposals should seek to minimise these impacts in the first instance, and secondly, compensate for any unavoidable effects to ensure that no net environmental loss occurs. Other Plan Policies elaborate upon the factors that will be considered when determining applications for specific types of development. Subsequent Countryside policies also provide additional guidance on the approach that should be taken to development in particular countryside locations such as landscape and wildlife designations and areas of the best and most versatile agricultural land. The following policies are also considered relevant to this Project:

- Policy CO4 (Special Landscape Areas)
- Policy CO11 (Plant and Animal Life
- Policy CO13 (Freshwater Environment)
- Policy CO24 (Strategic Landscape Areas)

8.4 Survey Methodology

8.4.1 The area used for the desk-based study (study area) and field surveys (survey area) was established through the scoping phase (based on the Project Site boundary, shown on Figure 1.2) and in consideration of the likely significant ecological effects of the Project.

8.4.2 The study area and survey area varies for each ecological receptor in accordance with receptor-specific best practice guidance and the likely Zone of Influence (ZoI) of impacts associated with the Project. These are determined as follows:

- European designated sites: SPAs, potential SPAs (pSPAs), SACs, candidate SACs (cSACs), potential SACs (pSACs) and Ramsar sites within 2km of the Project, extended accordingly where there are potential hydrological connections present and up to 30km where bats are a qualifying feature of a SAC, cSAC or pSAC
- Statutory designated sites: National Nature Reserves (NNRs), Local Nature Reserves (LNRs) and SSSIs within 2km of the Project
- Non-statutory designated sites: Local Wildlife Sites (LWSs) and Ancient Woodland within 2km of the Project
- Desk study records of protected and notable species up to 2km from the Project Site (extended to 5km for bats)
- Habitats and protected, notable and invasive species surveys were undertaken within individually defined survey areas, determined as a result of the potential for impact and where relevant, species mobility

Desk Study

8.4.3 A desk study was undertaken in 2015 to collect and review records of protected, notable species, habitats and designated sites within defined study areas, as described above. The following data sources were used, contacted and or reviewed:

- Kent and Medway Biological Records Centre (KMBRC)[79]
- Kent Bat Group[80]
- Kent Amphibian and Reptile Group (KARG)[81]
- UK Post-2010 Biodiversity Framework
- Kent Biodiversity Action Plan
- Multi-Agency Geographic Information for the Countryside (MAGIC)[82]

Field Surveys

8.4.4 Field surveys were undertaken in 2015 and 2016 to detect the presence of protected and notable species and to identify habitats present within the Site. The Phase 1 Habitat Survey is provided in Appendix 8.1. Table 8.1 outlines the surveys undertaken and the methodologies employed. Detailed survey methodologies used for each survey can be found within Appendices 8.2 to 8.6. Surveys will continue after the EAR has been submitted in order that robust results in accordance with best practice guidelines are obtained prior to construction. Results of field surveys will be used to support European Protected Species Mitigation Licences (EPSML) where they are required.

Table 8.1: Field Surveys Undertaken

Receptor	Survey type	Date undertaken
Habitats	Phase 1 Habitat Survey Gibbin's Brook SSSI Walkover Survey	21 to 29 April 2016
Otter	Presence and absence surveys	17 to 19 November 2015 and 26 to 27 April 2016 Pre-construction survey required.
Water vole	Presence and absence surveys	17 to 19 November 2015 and 26 to 27 April 2016 Additional survey required between July and September.

[79] http://www.kmbrc.org.uk/aboutus/index/index.php
[80] http://www.kentbatgroup.org.uk/
[81] http://www.kentarg.org/
[82] http://www.magic.gov.uk/

Receptor	Survey type	Date undertaken
Badger	Presence and absence surveys	17 to19 November 2015 11 April 2016 14 June 2016 Pre-construction survey required.
Birds	Wintering Bird Survey	18 December 2015, 12 January 2016 and 10 February 2016
	Breeding Bird Survey	26 April 2016 and 23 May 2016 Final survey to be undertaken June 2016.
Great crested newts	Presence and absence surveys	21 April 2016
	eDNA	26 May 2016
Dormouse	Presence and absence nest tube survey	10 May 2016 Surveys to be undertaken monthly until October 2016
Bat	Ground level tree assessments	29 March 2016 to 1 April 2016
	Tree climbing surveys	3 May 2016 to 13 May 2016
	Transect surveys	5 May 2016 and 24 May 2016. Surveys ongoing (two per month) until October.
	Emergence surveys	25 May 2016 Surveys ongoing until October.
Reptile	Presence and absence surveys	25 April 2016 16 May 2016 20 May 2016 25 May 2016 Surveys ongoing until September 2016.

8.5 Limitations to the Surveys

8.5.1 During the completion of the baseline surveys to inform this assessment, some limitations and constraints were encountered, the details of which are provided in Table 8.2 below.

8.5.2 Access was only permitted within the Site Boundary, which has restricted the gathering of ecological baseline data. For this reason, negative survey results must be treated with caution and update surveys will be required in advance of construction to ensure the ecological status of the sites has not altered and to confirm if species have moved into the Site from the immediate surrounds.

8.5.3 It has not been possible to gain survey data in line with best practice guidelines to establish the presence or likely absence of bats, dormice or reptiles due to the submission of the EAR falling in advance of the end of the ecological survey season for these species. Adopting the precautionary approach, it is therefore assumed that these species groups are present.

8.5.4 Where relevant, a precautionary approach has also been applied in assigning the population size and composition of these species groups taking into account the habitats present, as justified in section 8.8.

Table 8.2: Survey Limitations

Survey Type	Limitations Experienced
Extended Phase 1 Habitat Survey	The survey was carried out between 21 and 29 April 2016, within the optimum Phase 1 Habitat Survey period (considered to be March – October inclusive), and it is considered that an accurate representation of the habitat types present and their potential to support protected species has been provided. **It was not possible to comprehensively access the relevant 50m surrounding area during the survey (and additional areas to add context).** However, where access was limited, the survey was conducted using aerial photographs and where possible was subsequently ground truthed from a distance using binoculars. Taking into account the predominantly arable land-use of the area and the footprint of the Project within this landscape, it is considered that the survey provided sufficient coverage to inform the impact assessment.
GCN HSI Assessment	**Access was only available within the Project Site and immediate surrounding area**. Accordingly it was not possible to complete HSI Assessments on nine of ten water bodies identified within the survey area proposed for GCN. Adopting the precautionary approach, it is therefore assumed that all un-accessed water bodies within the survey area are suitable for GCN.
Wintering Birds	The wintering bird survey observations were from only three survey days and other bird species may have been present in-between these visits. In addition, during December 2015, the UK was in a warm and moist tropical air mass for most of the month, bringing unseasonably mild conditions. It was also exceptionally wet and often windy so the results for December 2015 may not be representative of a more ‘typical’ colder winter. However, it is likely that all the regular species occurring within the Site during the winter were recorded during January and February, since the recruitment of additional species declined markedly through the survey period.
Breeding Birds	**The breeding bird surveys were not completed in advance of the EAR submission.** Therefore, the assemblage of breeding birds identified to date is likely to miss several migratory species and it is expected that more species will be recorded as the surveys progress.
Bats	**Access was only available within the Project Site Boundary. Accordingly, it was not possible to complete assessments of buildings and trees within 50m of the Site for their roosting potential.** Adopting the precautionary approach, it is therefore assumed that there may be bat roosts within 50m of the Site Boundary.
Reptile	**Surveys ongoing.** Therefore, presence and absence could not be confirmed in advance of EAR submission.

Survey Type	Limitations Experienced
Extended Phase 1 Habitat Survey	The survey was carried out between 21 and 29 April 2016, within the optimum Phase 1 Habitat Survey period (considered to be March – October inclusive), and it is considered that an accurate representation of the habitat types present and their potential to support protected species has been provided. **It was not possible to comprehensively access the relevant 50m surrounding area during the survey (and additional areas to add context).** However, where access was limited, the survey was conducted using aerial photographs and where possible was subsequently ground truthed from a distance using binoculars. Taking into account the predominantly arable land-use of the area and the footprint of the Project within this landscape, it is considered that the survey provided sufficient coverage to inform the impact assessment.
GCN HSI Assessment	**Access was only available within the Project Site and immediate surrounding area**. Accordingly it was not possible to complete HSI Assessments on nine of ten water bodies identified within the survey area proposed for GCN. Adopting the precautionary approach, it is therefore assumed that all un-accessed water bodies within the survey area are suitable for GCN.
Dormouse	**Surveys ongoing.** Therefore, presence and absence could not be confirmed in advance of EAR submission.
Badger	No access to land outside of the Project Boundary. This has led to incomplete survey results. It is likely that some setts have not had all of their entrances recorded.

8.6 Assessment Methodology

8.6.1 The methodology for this ecological assessment is in accordance with the guidance for Detailed Assessment from DMRB Volume 11 Section 2, Section 3 (Part 4) and Section 4, and IANs 130/110 and 125/15.

8.6.2 A detailed assessment is required for sites where potential significant effects are identified above the agreed value and magnitude thresholds. The method for assessment involved the following key stages:

- Assessment of Value
- Assessment of Magnitude
- Assessment of Significance

8.6.3 The methodology for each of the key stages is described below.

Assessment of Value or Sensitivity

8.6.4 The DMRB guidelines recommend that the determination of the value of the ecological receptors is based on a geographic frame of reference, as shown in Table 8.3 below.

Table 8.3: Typical descriptors of environmental value or sensitivity

International or European - Very high
Very high importance and rarity, international scale and very limited potential for substitution. Includes: • Ramsar and European designated sites, or sites that meet the published selection criteria but not designated as such. • Sites with resident or regularly occurring population/s of species at International or European level where loss would affect the conservation status or distribution at this geographic scale, or where the population forms a critical part of a wider population at this scale, or is at a critical phase of its life cycle at this scale.
UK or National – High
High importance and rarity, national scale, and limited potential for substitution. Includes: • Sites of Special Scientific Interest, National Nature Reserves and sites that meet published criteria for selection. • Key or priority habitats. • Sites with resident or regularly occurring population of species at International, European, UK or National level where loss would affect the conservation status or distribution at this geographic scale, or where the population forms a critical part of a wider population at this scale, or is at a critical phase of its life cycle at this scale.
Regional (England) – High or Medium
High or medium importance and rarity, regional scale, limited potential for substitution. Includes: • Key or priority habitats identified in the Natural Area Profile or Highways England Biodiversity Action Plan. • Resident or regularly occurring populations of species which may be considered at an International, European, UK, National levels, key or priority species where loss of these species would affect the conservation status or distribution at this geographic scale, or the population forms a critical part of a wider population at this scale, or is at a critical phase of its life cycle at this scale.
County (Kent) and District (Ashford) – Medium
High or medium importance and rarity, regional scale, limited potential for substitution. Includes • Sites of Nature Conservation Importance (SNCIs); County Wildlife Sites (CWSs); and LNRs designated in the county or unitary authority area context. • Key habitats identified in the Local Biodiversity Action Plan or Natural Area profile. • Resident or regularly occurring populations of species which may be considered at an International, European, UK or National level where loss would affect the conservation status or distribution at this geographic scale, or the population forms a critical part of a wider population at this scale, or is at a critical phase of its life cycle at this scale.

Local (Site only) – Low
Medium importance and rarity, regional scale, limited potential for substitution. Includes: • LNRs designated in the local context. • Trees that are protected by Tree Preservation Orders (TPOs). • Areas of habitat; or populations or communities of species considered to appreciably enrich the habitat resource within the local context (such as veteran trees), including features of value for migration, dispersal or genetic exchange.
Local (Site only) – Negligible
• Sites of low or very low importance, rarity and local scale.

Assessment of Magnitude

8.6.5 The magnitude of impact is the degree of change as a result of the proposed Project on an ecological receptor. The descriptions for assigning the magnitude of impact to the receptors is based on the DMRB criteria defined in Table 8.4 below. The impacts may be adverse or beneficial to the receptor.

Table 8.4: Criteria for Determining the Magnitude of Impacts

Magnitude	Criteria
Major adverse or beneficial	Loss of resource and or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse). Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Moderate adverse or beneficial	Loss of resource, but not adversely affecting the integrity; partial loss of or damage to key characteristics, features or elements (Adverse). Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Minor adverse or beneficial	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse). Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).

Magnitude	Criteria
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse). Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).
No impact (neutral)	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Assessment of Significance

8.6.6 Using the combination of the conservation value of the receptor and the magnitude of change, the significance of the effect upon Nature Conservation features as a result of the Project can be assigned, as outlined within the matrix shown in Table 8.5 below. The significance of effect is assigned after allowing for the positive contribution of all mitigation that will be delivered. The effectiveness of the mitigation must be made clear, as well as the certainty of their success.

Table 8.5: Determining the significance of effect categories

Environmental value (sensitivity)	Magnitude of effect (degree of change)				
	No Change	Negligible	Minor	Moderate	Major
Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very large
High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

8.6.7 Having determined the significance of effect using the matrix above, the categories of significance effects can be described as follows:

- **Very large**: These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category. This category would be a key consideration in the decision-making process.
- **Large**: These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.

- **Moderate**: These beneficial or adverse effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
- **Slight**: These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
- **Neutral**: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

8.6.8 For the purposes of this assessment an effect is considered to be significant if it is **Moderate or greater**. Any significant effects remaining after mitigation (the residual effects), together with an assessment of the likelihood of success in the mitigation, are factors to be considered against legislation and policy in assessing this Project.

Mitigation, compensation and enhancement

8.6.9 Avoidance, mitigation, enhancement and compensation measures have been embedded within the design process. These terms, as they have been applied within this assessment, can be defined as:

- Avoidance - measures that have been taken to prevent a potential impact that could otherwise incur a negative effect that would require assessment.
- Mitigation - measures that reduce or remedy a specific negative impact in situ. Mitigation is only required for negative effects assessed as being significant or where required to ensure compliance with legislation.
- Compensation - used to refer to measures proposed in relation to specific negative effects but where it is not possible to fully mitigate for negative effects in situ. Compensation is only required for negative effects assessed as being significant or where required to ensure compliance with legislation.
- Enhancement – refers to measures that would result in positive ecological impacts; or where measures are needed as part of the provision of alternative habitats as part of species mitigation where required to ensure compliance with legislation.

Consultation

8.6.10 Consultation has been undertaken with statutory and non-statutory organisations to identify baseline information and, where appropriate, discuss likely effects, appropriate survey effort and the environmental (ecological) design for the Project. Organisations that have been contacted and invited to discuss the Project include:

- Natural England
- Kent Wildlife Trust
- Shepway District Council
- Kent County Council Environment Agency

8.7 Assumptions and Limitations to Assessment

8.7.1 Assumptions and limitations tor the assessment which apply across all chapter topics are given in Chapter 4. Those specific to this chapter are given below:

- It has not been possible to gain baseline survey data in line with best practice guidelines to establish the presence or likely absence of bats, dormice or reptiles due to the submission of the EAR falling in advance of the end of the ecological survey season for these species. Adopting the precautionary approach, it is therefore assumed that these species groups are present.
- Where relevant, a precautionary approach has also been applied in assigning the population size and composition of these species groups taking into account the habitats present, as justified in the results section. Importance values have been assigned taking into account the precautionary principle in terms of species presence and populations to account for the lack of survey information together with a lack of detailed mitigation design.

8.8 Baseline

Designated Sites

European Designated Sites

8.8.1 No European designated sites occur within 2km of the Project and no SACs where bats are a qualifying feature occur within 30km of the Project.

8.8.2 The Project does not cross and is not located adjacent to or upstream of a European designated watercourse.

8.8.3 The Project is however located approximately 6km downstream of the Wye and Crundale Downs SAC. Although no impact pathway is considered likely to be present, an Assessment of Implications on European Sites will be produced in accordance with DMRB Volume 11, Section 4, Part 1 as it is considered appropriate to take a precautionary approach. An AIES (Appendix 8.6) has been produced and European sites will not be considered further within this assessment.

Other Designated Sites

8.8.4 The Project is located within 2km of several sites designated for their nature conservation interest, as described in Table 8.6 and shown on Figure 8.1.

8.8.5 Due to the proximity of Gibbins Brook SSSI to the site, a botanical assessment was undertaken in order to identify any potential adverse effects as a result of the Project. Further details can be found within the Phase 1 Habitat Report (Appendix 8.1).

Table 8.6: Designated Sites within 2km of the Project

Site or Designation	Description	Distance from Project
Gibbins Brook SSSI	Gibbins Brook SSSI is comprised of a number of different habitats including acid grassland, broad-leaved woodland, wet woodland and marsh grassland. The marshy grassland on peaty soils has developed from an acidic valley bog and still retains many features characteristic of a bog. The site is also notable for its invertebrates, particularly moths.	70m north west of the Project Site.
Perry Wood, Butcher Wood, Bartholomew's Wood, Cowtye Wood, Blue House Wood, Little Stone Wood, Jenkins Wood, Hayton Wood, Kiln Wood, House Wood, Sandling Park, Heane Wood Ancient Woodland[83]	Ancient woodland blocks listed on the Ancient Woodland Inventory (AWI) are located in the 2km area surrounding the Site.	Located throughout the area surrounding the Project. The closest fragment, Butchers Wood is situated approximately 700m east.
Postling Wents Wood, Tolsford and Summerhouse Hills, Chesterfield Wood, Sandling Park, Brockhill Country Park, Saltwood, Folks Wood, Pedlinge LWS[84]	LWS are located in the 2km area surrounding the Project, designated variously for their nature conservation interest.	The closest area of designated LWS is Folks Wood, Pendlinge located approximately 1.3km south.
Area of Outstanding Natural Beauty (AONB)[85]	The Kent Downs AONB partnership describes the AONB as comprising 878km^2 located between Dover and Folkestone and the Surrey Border. Some of the most important physical features of the AONB include: One of south east England's highest points at 250 metres on the Sevenoaks Greensand ridge; Three main river catchments, which cut through the AONB, draining in a south to north direction, namely the Rivers Darent, Medway and Great Stour (including the Nailbourne or	Located to the north and east and south and east, approximately 525m at its closest point.

[83] Ancient Woodland does not have statutory protection; however is covered by planning policy and can receive additional protection if also listed under a national or local designation
[84] Local authorities may designate certain areas as being of local conservation interest. These sites, together with statutory designations, are defined in local and structure plans under the Town and Country Planning system and are a material consideration when planning applications are being determined.
[85] AONBs are designated under the National Parks and Access to the Countryside Act 1949, amended in the Environment Act 1995. The Countryside and Rights of Way Act 2000 clarifies the procedure and purpose of designating AONBs.

Site or Designation	Description	Distance from Project
	Little Stour with its source deep in the east Kent Downs); The dramatic chalk cliffs where the chalk reaches the English Channel. The whole of the Dover and Folkestone White Cliffs are defined as Heritage Coasts; and The folded and undulating chalk, Greensand and ragstone escarpments rising high above the low Weald and Romney Marsh below. Rich mosaics of habitats, plant and animal communities of national and local importance are reported as present, including semi-natural chalk grassland and chalk scrub; ancient semi-natural woodland; chalk cliffs, foreshore and sea platform; chalk rivers and wet pasture; ponds and spring lines; heath and acid grassland; woodland pasture and ancient trees; and networks of linear features of species-rich hedgerows, flower-rich field margins and road verges. Nature conservation interest is associated with individually designated sites and as such the AONB is not considered further in this assessment. Potential impacts to the AOMB are addressed in Chapter 7: Landscape.	

Habitats

8.8.6 The survey area supported a number of habitat types as defined by the JNCC standard methodology for Phase 1 Habitat Survey. Table 8.7 lists the habitats recorded and their description and value. The Phase 1 Habitat Map within Appendix 8.1 shows the extent of these habitats.

8.8.7 The Site comprises largely arable cereal crops bounded by species poor hedgerows. In the northern section of the Site, there is a fishing lake in the centre of the Site which is surrounded by trees and shrubs which extend away to the south to form a linear belt of trees and scrub. Gibbins Brook SSSI lies to the north west of the Site. Within the southern section of the Site, there is a stream, ditches and a pond along with a reed bed. The majority of the southern section of the Site comprises arable farmland with hedgerows and some broadleaved woodland towards the Site boundaries.

Table 8.7: Description of Habitat within survey area

Habitat	Description and Extent within Survey area	Resource Value
Gibbins Brook SSSI	To the north east of the site, species-poor acid grassland habitat is present. This habitat is often found as a constant in the field layers of a number of woodland, scrub and underscrub communities. The short sward, likely to be grazed by rabbits, is comprised of frequent common bent and occasional red fescue. The composition of forbs is very species poor comprising heath bedstraw, spear thistle and creeping thistle. The alder carr comprised of occasional semi-mature alder, downy birch, silver birch and ash. The understory is sparse and contains immature elder. The ground flora comprised of locally frequent soft rush, opposite-leaved golden saxifrage, marsh marigold and yellow flag. The bryophyte layer consists of locally frequent common feather-moss and rough-stalked feather moss, plus occasional common tamarisk moss and river feather-moss. To the far east of the SSSI lies a small woodland block approximately 5,900m² in size which is comprised of dominant mature hawthorn. The ground flora was very species poor and consisted of dominant common nettle, plus lords-and-ladies and cleavers. The marsh grassland can be considered a relic of bog habitat with patches of dominant purple moor grass, locally frequent bog moss Sphagnum species, plus occasional heath-spotted orchid and bogbean. Other species present amongst the forbs include occasional marsh marigold, water forget-me-not, jointed rush and creeping buttercup.	This habitat is a SSSI, considered to be of National importance and has limited potential for substitution. It is therefore considered that this habitat is of National and High conservation value in relation to the Project.
Broad-leaved woodland	Two small areas of broad-leaved woodland (A1.1) were recorded within the survey area. North of the Site this habitat type comprised of a small strip of dense wet woodland associated with the fishing lake. This was	This habitat is widespread within the local area and where occurring within the Project Site was relatively species-poor (with the exception of very discrete areas of more diverse wet woodland).

Habitat	Description and Extent within Survey area	Resource Value
	dominated by grey willow *Salix cinerea*. Poor quality ground flora with nettle *Urtica dioica* as the dominant vascular species and the bryophytes *Kindbergia praelonga* and *Hypnum andoi* dominant on tree stumps and roots. To the south of the M20 small blocks of woodland were also recorded including riparian woodland strips (<12m wide) to the west and east along the East Stour River.	However, broad-leaved woodland is capable type of being listed as a Priority Habitat and as such; this habitat was considered to be of **County and Medium** conservation value in relation to the Project.
Hedgerow	One species-rich and two species-poor intact hedgerows (J2.1.2) were found at several locations adjacent to the Project site bordering the large numbers of pastoral and arable fields. The species-rich continuous hedgerow occurs on the southern boundary between arable and network rail land. Managed species-rich hedge, flailed at different heights (1.2m and 2m). Species comprised of hawthorn and elder *Sambucus nigra*, oak species, hazel, blackthorn *Prunus spinosa*, dog rose, ash, goat willow, bramble *Rubus fruticosus agg*. and honeysuckle *Lonicera periclymenum*. Outside of the Project Boundary, both north and south of the M20 contained areas of species-rich intact hedges (J2.1.1) within a number of mature standard ash *Fraxinus excelsior* and oak together with hawthorn, elder *Sambucus nigra*, blackthorn *Prunus spinosa* and hazel *Corylus avellana*. A number of intact but species poor hedges with trees were also noted across the survey area (J2.3.2) outside of the Project Boundary. These hedgerows did not qualify as 'Important' under the Hedgerow Regulations.	These features are of small extent and occur outside of the Site. However, hedgerows provide connectivity in the wider landscape (field boundaries situated between woodland sections) and this habitat is capable of being listed as a habitat of Principal Importance. Therefore, hedgerows are considered to be of **County and Medium** conservation value in relation to the Project.
Reed bed	A small area of reed bed (F2) was found present to the north of the survey area. Dense stands of common reed *Phragmites australis* were present and interspersed with great willowherb *Epilobium hirsutum*, bramble *Rubus fruticosus* and nettle. High nutrient levels in the soil was considered likely to be leading to the dense growth and low diversity	This habitat is found in only small discrete areas outside of the Project Site (but within the 50m ZoI). However, is less common in the local area and is capable of being listed as a Priority habitat. It is therefore considered to be of **County and Medium**

Habitat	Description and Extent within Survey area	Resource Value
	exhibited and thus reducing the overall biodiversity value of this habitat.	conservation value in relation to the Project. Reed bed associated with the attenuation pond is described separately below under 'Standing water'.
Semi-Improved Neutral Grassland	Areas of semi-improved neutral grassland (B2.2), gradating into damp grassland were located in several areas to the south of the M20. The species composition to the west of the survey area suggested that in the past this has supported good quality MG5 (neutral) grassland, but is now suffering from abandonment and was becoming more rank and species poor. Common knapweed *Centaurea nigra* was overwhelmingly dominant alongside small amounts of meadow buttercup *Ranunculus acris* and damp meadow specialists such as ragged robin *Lychnis flos-cuculi* and sneezewort *Achillea ptarmica*, but large amounts of creeping thistle *Cirsium arvense* and creeping buttercup *Ranunculus repens* were found throughout the sward. Other species include common sorrel *Rumex acetosa*, black medick *Medicago lupulina*, false oatgrass *Arrhenatherum elatius*, and great willowherb. In many areas the vegetation had damper characteristics with dense clumps of hard rush *Juncus inflexus*, pond sedge *Carex riparia*, and occasional slender tufted sedge *Carex acuta*.	This habitat is less common in the local area and has the potential to be of higher value as restored neutral grassland (hay meadow), which is a habitat of Principal Importance. However it is found in only small discrete areas outside of the Project Site (but within the 50m ZoI) and therefore is considered to be of **Local and Low** conservation value in relation to the Site.
Poor Semi-Improved Grassland	The arable fields to the north and south contain improved grassland (B6) borders, which have been subject to improvement by application of fertilisers or modification by herbicides and often sown. They are species-poor and offer little opportunity for biodiversity.	This habitat contained generally common species and low diversity and was considered to be of **Negligible** conservation value in relation to the Project.
Marsh Grassland	Two areas of marsh grassland were identified. One area was situated to the south eastern extent of the Project. This was rabbit grazed, species-poor rush pasture with dominant creeping bent *Agrostis stolonifera*, locally dominant creeping buttercup *Ranunculus repens*, locally abundant hard rush *Juncus*	This habitat is less common in the local area and has the potential to be of higher value as restored neutral grassland (hay meadow), which is a habitat of Principal Importance.

Habitat	Description and Extent within Survey area	Resource Value
	inflexus, locally frequent common fleabane *Pulicaria dysenterica*, occasional rosebay willowherb *Chamerion angustifolium* and water forget-me-not *Myosotis scorpioides*)plus rare creeping cinquefoil and common ragwort. The other area is at the northern extent of Gibbins Brook with locally dominant birch saplings *Betula spp.* and rare gorse *Ulex europaeus* and goat willow *Salix caprea* on margins. Vegetation comprised of locally abundant jointed rush *Juncus articulatus*, marsh marigold *Caltha palustris*) water forget-me-not, elder and creeping buttercup.	However it is found in only small discrete areas outside of the Project Site (but within the 50m ZoI) and therefore is considered to be of **Local and Low** conservation value in relation to the Project .
Tall Ruderal	To the south of the M20, grass tracks bordering the stream with diverse tall ruderal vegetation (C3.1) were present to both the west and east. The stream was bounded by meadowsweet *Filipendula ulmaria*, bristly oxtongue *Helminthotheca echioides*, curled dock *Rumex crispus*, hemp agrimony *Eupatorium cannabinum*, bulrush *Typha latifolia*, lesser pond sedge *Carex acutiformis*, cock's-foot *Dactylis glomerata*, greater willowherb, meadow vetchling *Lathyrus pratensis*, hemlock, creeping thistle, teasel *Dipsacus fullonum*, angelica *Angelica archangelica* and bramble. In some areas this vegetation developed into wetland vegetation with dense stands of lesser pond sedge, and occasional water mint *Mentha aquatica*, bulrush, water chickweed *Myosoton aquaticum*, common figwort *Scrophularia nodosa*, water forget-me-not *Myosotis scorpioides* and tufted vetch *Vicia cracca.*	This habitat contained generally common species and low diversity and was considered to be of **Negligible** conservation value in relation to the Project.
Coniferous plantation	A number of immature conifers have been planted to the north-western extent of the site, south of the M20.	Coniferous plantations are a nationally dominant habitat type with negligible conservation interest. The conifer plantation was considered to be of **Negligible** conservation value in relation to the Project.

Habitat	Description and Extent within Survey area	Resource Value
Arable	Arable land (J1.1) occurred throughout to the north, and centrally to the south, of the M20. These appeared to be characterised by heavy soils and margins of permanent grassland dominated by broadleaved grasses including creeping bent, cock's-foot, perennial ryegrass *Lolium perenne*, tall fescue *Festuca arundinacea* and forbs including creeping buttercup and hogweed *Heracleum sphondylium*. The fields themselves supported over wintering wheat stubble with a limited range of forbs present on the fields including, dove's-foot crane's-bill *Geranium molle,* Yorkshire fog *Holcus lanatus*, creeping bent *Agrostis stolonifera*, shepherd's-purse *Capsella bursa-pastoris*, groundsel *Senecio vulgaris*, yellow foxtail *Setaria pumila* and black-grass *Alopecurus myosuroides.*	Arable farmland is a nationally dominant habitat type with negligible conservation interest. The Arable habitat was considered to be of **Negligible** conservation value in relation to the Project.
Arable Field Margins (Flora)		The presence of heavy soils and a lack of chalk substrate suggest these areas are less likely to support plant assemblages of conservation value. However, the arable flora survey was conducted at a sub-optimal time and as such a precautionary assessment is provided. Given that this habitat has the potential to qualify as a habitat of Principal Importance; Arable Field Margins are considered to be of **County and Medium** conservation value in relation to the Project.
Running Water	Streams (G2) and ditches present were typically bounded by ruderal vegetation achieving a tall dense sward. Species typically include great willowherb, hogweed and hedge bindweed *Convolvulus arvensis*, bramble, nettle, creeping thistle and occasional meadowsweet. Very occasional young trees including oak, field maple *Acer campestre*, and spindle *Euonymus europaeus.*	The wet ditch within the Project Site was considered to be generally species poor (and of limited value due to encroachment of dense ruderal vegetation). However, the stream to the east and west of the Project Site (but within the 50m ZoI) has potential to meet the criteria of Priority Habitat. This habitat is therefore considered to be of **County and Medium** conservation value in relation to the Project.
Standing Water	A fairly intensive angling lake (G1.1) was present supporting few macrophytes due to turbidity of water (located centrally within the Project Boundary north of M20). This lake was bounded by planted trees and angling stations with occasional stands of yellow flag iris, reed sweetgrass *Glyceria maxima*, reed canary grass *Phalaris arundinacea*, common reed, and reedmace. To the north the lake is bounded by dense secondary woodland	Heavily stocked fishing lake with limited intrinsic value and species poor; however likely to be functionally important to a number of species of conservation importance. These species are discussed separately. The balancing pond and complex of woodland and wetland (reed bed habitat comprising approximately 0.5ha within

Habitat	Description and Extent within Survey area	Resource Value
	dominated by alder and a ground flora of dense nettle and bramble. In addition, a balancing pond was located south of M20 and north of the CTRL.	the Project Boundary has the potential to meet the criteria of Priority Habitat considered to be of **County and Medium** conservation value in relation to the Project .

Identification of protected and notable species receptors

8.8.8 The Extended Phase 1 Habitat Survey identified signs of, or potential for, the presence of protected or notable species. Target notes were made for notable features and/or areas that required further description beyond the Phase 1 Habitat categorisation. Target notes and the Phase 1 Habitat Map are contained within the Phase 1 Habitat Survey (Appendix 8.1).

Protected Species

8.8.9 Records of protected and or notable species have been returned for the 2km to 5km study area surrounding the Project Site. These are summarised below for each species group along with the results of any species-specific surveys and or precautionary assessments completed.

Bats

8.8.10 A number of bat species have been recorded within the 5km study area over the past ten years. Of particular note, 22 unspecified roosts and one confirmed hibernation roost were identified within 2km of the Project Site. The hibernation roost was located in 2010 within a building in Stanford approximately 350m to the east of the Project Site (refer to Table 8.8).

Table 8.8: Desk Study data, Behaviour Characteristics and National Status of Bats

Species	UK status[86]	Details of Record 2005 – 2015 within 5km Area Surrounding Site	Flight Speed and Height and Light Tolerance[87 88 89]	Ecological Niche
Common pipistrelle *Pipistrellus pipistrellus*	Common	61 flying records and 12 roost records. Closest record; TR1236 (04/08/2011).	Medium flight speed. Tend to fly within 10m of the ground or linear feature. Light tolerant, will often predate insects drawn to lights.	Edge habitat species - Will regularly cross small and medium sized gaps.

[86] Mitchell-Jones T. & Carlin C. (2012) Natural England Technical Information Note TIN051; Bats and onshore wind turbines. Natural England
[87] Stone, E.L. (2013) Bats and lighting: Overview of current evidence and mitigation guidance
[88] Frey-Ehrenbold A., Bontadina F., Arlettaz R., Orbist M. K. (2013) Landscape connectivity, habitat structure and activity on bat guilds in farmland-dominated matrices. *Journal of applied Ecology*, **50**, 252,-261
[89] Russ J (2012) British Bat Calls: A Guide to Species Identification. Pelagic Publishing, UK

Species	UK status[86]	Details of Record 2005 – 2015 within 5km Area Surrounding Site	Flight Speed and Height and Light Tolerance[87 88 89]	Ecological Niche
Nathusius' pipistrelle *Pipistrellus nathusii*	Rare	Four flying records and six roost records. Closest record: TR145357 (08/08/2012)		
Soprano pipistrelle *Pipistrellus pygmaeus*	Common	20 flying records and six roost records. Closest record: TR145357 (10/08/2011)		
Daubenton's bat *Myotis daubentonii*	Common	19 flying records and five roost records. Closest record: TR145357 (05/08/2000)	Slow flight speed. Generally fly close to linear features, when crossing open habitat will usually fly close to the ground. Least tolerant of light. Artificial lighting may present a barrier to these species.	Cluttered habitat species - Least willing to cross gaps and open ground.
Natterer's bat *Myotis nattereri*	Fairly common	Two flying records and nine roost records. Closest record: TR162358 (07/10/2009)		
Brown long-eared bat *Plecotus auritus*	Common	Six flying records and twenty roost records. Closest record; TR127399 (27/08/2014)		
Noctule *Nyctalus noctula*	Uncommon	11 flying records and one roost record. Closest record: TR145357 (08/08/2012)	Fast flight speed. Usually fly high 10m+ above open habitat. Light tolerant, will often predate insects drawn to lights.	Open habitat species – open habitats do not present a problem for these species.
Serotine *Eptesicus serotinus*	Widespread in South	Eight flying records and nine roost records. Closest record: TR117398 (22/03/2002)	Medium flight speed. Tend to fly within 10m of the ground or linear feature. Light tolerant, will often predate insects drawn to lights.	Edge habitat species - will regularly cross small and medium sized gaps.

8.8.11 In the time available prior to submission of this EAR, it was not possible to complete the full range of surveys necessary to establish the presence and absence, composition, distribution and abundance of bat species potentially affected by the Project. Accordingly, a precautionary assessment is provided below.

Trees and buildings within the Project Site and surrounding area (roosting bats)

8.8.12 No buildings are located within the Site Boundary. However, buildings within the wider survey area were considered to have potential to support bat roosts. Trees within and surrounding the Site Boundary were considered to have potential to support roosting bats. (Refer to Appendix 8.2 for assessment of bat roosting features).

Habitats (foraging and commuting bats) within the Project Site and surrounding area

8.8.13 The majority of habitats present within the Site are arable and of negligible value for commuting or foraging bats. However, to the north of the M20, a fishing lake and associated wet woodland complex form part of the Site Boundary. In addition, to accommodate new infrastructure there will be impacts to scattered scrub and trees adjacent to the M20, all of which offer commuting and foraging potential.

8.8.14 To the south of the M20, discrete areas of high quality foraging habitat, comprising semi-improved grassland, woodland and scrub associated with the existing attenuation pond form part of the Site Boundary. To the east of the Site, ruderal vegetation north of the East Stour River and a small ditch will also be lost, which also offer some value to commuting and foraging bats.

8.8.15 Taking into account the potential presence of maternity roosts, the Site is considered to be of **county and medium** conservation value for roosting bats despite the low numbers of trees with bat roost potential within the Site Boundary and the alternative high quality habitats in the surrounding area.

Otter

8.8.16 The desk study did not return records of otter within 2km of the Project Site over the past ten years. Otters are currently re-colonising Kent and have only previously been recorded on the Medway catchment[90].

Foraging, commuting and resting habitat within the Project Site and surrounding area

8.8.17 A targeted ‘bridge survey’ was conducted downstream of the Project Site. Numerous otter footprints and a single spraint were found on mud banks under the central arch of the road bridge at Godmersham on the Great Stour. Otters are therefore known to be present within the catchment.

8.8.18 North of the M20, the wetland, fishing lake, wet woodland and stream within the Project Site as well as Gibbins Brook within the wider area offer particularly good foraging and lying-up habitat for otters; although connectivity to potential habitat off-site is limited. South of the M20, the attenuation pond within the Project Site and streams and wetland with connective woodland habitat immediately adjacent to the Project Site were also considered suitable for otters.

[90] Young, J.S., Ryan, H., Thompson, S., Newcombe, M. and Puckett, J. (2015) Mammals of Kent. Kent Mammal Group, Kent

8.8.19 The East Stour crosses under the CTRL three times and the M20 once on its course through the Project Site. Each of these crossings was inspected and at the time of survey and during low flow rates, it is considered that none would impede the passage of otters.

8.8.20 A burrow in the bank of the East Stour near Westenhangar Railway Station approximately 40m from the Project Boundary was examined. It was located approximately 1.5m above the water level on a near vertical bank and beneath the roots of a tree. There were signs of recent digging but no clear path between it and the river. The dimensions appeared to be indicative of otter although photographs of the interior did not reveal any recognisable otter spraints. No definitive signs of otters within the Project Site were found during the survey.

8.8.21 Further details can be found within Appendix 8.3.

8.8.22 The Project Site contains limited habitat suitable for otters; in the absence of full survey data the site is considered to be of **local** and **low** conservation value for the species.

Water vole

8.8.23 The desk study did not return records of water vole within 2km of the Project Site over the past ten years. The second national water vole survey showed a 62% decline in the Southern Water area and states that water voles have been lost from the Great Stour[91]. However, the map indicates that there may have been one or two sites on the East Stour where water voles were still present in 1997. The Kent Mammal Atlas[92] also shows that the species is present over a wide area in Romney Marshes as well as in three tetrads through which the East Stour River flows to the west of the Site, centred around Brabourne Lees.

Habitat within the Project Site and surrounding area

8.8.24 Of the three water bodies within the Project Boundary, two (the Fishing Lake and the East Stour River) are suitable for water voles. Throughout the Site, the stream banks were of a suitable substrate for burrowing and comprised of dense herbaceous vegetation on both banks, in some cases extending several metres away from the water.

8.8.25 Evidence of water voles was found in the East Stour River at the western extent within the Site Boundary, over a distance of approximately 500m. Numerous burrows were observed (76), albeit some unused at the time of survey. It was also noted that the presence of geotextile bank cladding in this stream did not appear to impede the construction of burrows as the geotextile was seen to have been

[91] Jeffries, DJ, (Ed.) (2003) The water vole and mink survey of Britain 1996-1998 with a history of the long-term changes in the status of both species and their causes. Published by The Vincent Wildlife Trust, Ledbury.
[92] http://www.kentmammalgroup.org.uk/index.php?option=com_content&view=article&id=103:kent-mammal-atlas&catid=35:news&Itemid=53

incised in several areas. Two latrines were found and evidence of grazed vegetation surrounding several burrows was seen. Several pathways through vegetation were also noted.

8.8.26 Some evidence of the presence of the water voles was found on the eastern border of the fishing lake. Cropped grass and four burrows were found at this location, but no footprints or droppings seen.

8.8.27 There were no field signs of water vole presence evident within the SSSI woodland through which Gibbins Brook flows. However, further downstream on emerging from the woodland, the stream banks were found to house several burrows (14) with grazed lawns and two latrines found.

8.8.28 The Project Site contains considerable habitat suitable for water voles and is therefore considered to be of **county and medium** conservation value.

8.8.29 Further details can be found within Appendix 8.3.

Badgers

8.8.30 Badger records were returned through the desk study within 2km of the Project Boundary over the past five years. The closest record was located approximately 600m west of the Project Boundary.

Habitat within the Project Site and Surrounding Area

8.8.31 Field surveys confirmed the presence of several badger setts within proximity to the Project Site and evidence of low density badger foraging and commuting was recorded throughout. This includes three outlier setts which will need to be closed under a Natural England licence.

8.8.32 The badger report will remain confidential in line with the Protection of Badgers Act.

8.8.33 Overall the Site is considered to be of **Local and Low** conservation value for badgers as a result of the significance of the setts identified in proximity to the Project Site.

Wintering and breeding birds

8.8.34 There are a number of records of notable and protected bird species within the search area of the Site. Of particular note is WCA Schedule 1 species barn owl *Tyto alba* and Species of Conservation Concern golden plover *Pluvialis apricaria* and lapwing *Vanellus vanellus*, which have been observed feeding at Hillhurst Farm to the south of the M20, approximately 600m from the Project Site. More than 50 yellowhammer *Emberiza citrinella*, Jack snipe *Lymnocorn buntingcryptes minimus*, corn bunting *Emberiza calandra*, skylark *Alauda arvensis*, meadow pipit

Anthus pratensis, linnet *Carduelis cannabina* and reed bunting *Emberiza schoeniclus* were also recorded at Hillhurst Farm.

8.8.35 The wintering bird survey identified a total of 37 bird species over the three winter survey visits (refer to Table 8.9). Relatively few farmland birds were recorded owing to the current intensive arable use of the fields (within winter wheat). However, a number of declining farmland species including yellowhammer were recorded.

Table 8.9: Winter Bird Survey – Site Counts

Bird Species recorded and Conservation Status	BoCC*	17-12-2015 (08:40 – 12:05)	19-01-2016 (08:30 – 11:10)	10-02-2016 (11:30 – 12:15)	11-02 2016 (08:25 – 11:30)
Mallard *Anas platyrhynchos*	Amber	4	-	3	3
Little egret *Egretta garzetta*	Green	-	1	-	-
Grey heron *Ardea cinerea*	Green	-	1	-	-
Common buzzard *Buteo buteo*	Green	-	-	-	2
Moorhen *Gallinula chloropus*	Green	1	-	-	-
Coot *Fulica atra*	Green	-	-	1	-
Common snipe	Amber	6	13	-	26
Black-headed gull *Chroicocephalus ridibundus*	Amber	-	1	10	-
Common gull *Larus canus*	Amber	-	-	48	-
Wood pigeon *Columba palumbus*	Green	2	15	-	4
Collared dove *Streptopelia decaocto*	Green	-	3	-	1
Kingfisher	Amber	1	-	1	-
Green woodpecker *Picus viridis*	Green	-	2	-	-
Kestrel *Falco tinnunculus*	Amber	1	1	-	2
Peregrine *Falco peregrinus*	Green	-	-	-	1
Magpie *Pica pica*	Green	2	2	-	2
Jay *Garrulus glandarius*	Green	2	-	-	-
Carrion crow *Corvus corone*	Green	2	10	-	21
Goldcrest *Regulus regulus*	Green	-	3	-	1
Firecrest *Regulus ignicapilla*	Green	1	-	-	-
Blue tit *Cyanistes caeruleus*	Green	5	8	-	10
Great tit *Parus major*	Green	1	6	-	4
Cetti's warbler *Cettia cetti*	Green	-	-	1	-
Long-tailed tit *Aegithalos caudatuis*	Green	-	4	-	1
Treecreeper *Certhia familiaris*	Green	-	-	-	1
Wren *Troglodytes troglodytes*	Green	8	6	-	5
Blackbird *Turdus merula*	Green	14	17	-	7
Fieldfare *Turdus pilaris*	Red	4	-	-	5
Song thrush *Turdus philomelos*	Red	2	3	-	4
Robin *Erithacus rubecula*	Green	8	8	-	11
Dunnock *Prunella vulgaris*	Amber	2	4	-	9
Grey wagtail *Motacilla cinerea*	Red	-	1	-	1
Pied wagtail *Motacilla alba yarrellii*	Green	-	1	-	1
Chaffinch *Fringilla coelebs*	Green	45	24	-	7
Bullfinch *Pyrrhula pyrrhula*	Amber	-	-	-	1
Siskin *Carduelis spinus*	Green	-	7	-	-
Yellowhammer	Red	-	-	-	35

* Birds of conservation concern

8.8.36 The breeding bird survey identified a total of 42 bird species during the first two of three survey visits (refer to Table 8.10). It should be noted that the assemblage identified to date will miss several migratory species and so we would expect to record more species as the surveys progress.

Table 8.10: Breeding Bird Survey Results

Bird Species recorded and Conservation Status	BoCC*	Breeding Evidence
Greater Canada Goose *Branta canadensis*	Unlisted	Probable
Mallard *Anas platyrhynchos*	Amber	Probable
Kestrel *Falco tinnunculus*	Amber	Possible
Sparrowhawk *Accipiter nisus*	Green	No Evidence
Moorhen *Gallinula chloropus*	Green	Possible
Common Gull *Larus canus*	Amber	No Evidence
Herring Gull *Larus argentatus*	Red	No Evidence
Woodpigeon *Columba palumbus*	Green	Possible
Collared Dove *Streptopelia decaocto*	Green	Probable
Cuckoo *Cuculus canorus*	Red	Possible
Green Woodpecker *Picus viridis*	Green	Possible
Great Spotted Woodpecker *Dendrocopos major*	Green	Possible
Magpie *Pica pica*	Green	Possible
Jackdaw *Corvus monedula*	Green	Possible
Carrion Crow *Corvus corone*	Green	Possible
Goldcrest *Regulus regulus*	Green	Probable
Blue Tit *Cyanistes caeruleus*	Green	Probable
Great Tit *Parus major*	Green	Probable
Skylark *Alauda arvensis*	Red	Probable
Swallow *Hirundo rustica*	Green	No Evidence
Long-tailed Tit *Aegithalos caudatus*	Green	Possible
Chiffchaff *Phylloscopus collybita*	Green	Probable
Blackcap *Sylvia atricapilla*	Green	Probable
Lesser Whitethroat *Sylvia curruca*	Green	Possible
Garden Warbler *Sylvia borin*	Green	Probable
Whitethroat *Sylvia communis*	Green	Probable
Reed Warbler *Acrocephalus scirpaceus*	Green	Probable
Wren *Troglodytes troglodytes*	Green	Probable
Starling *Sturnus vulgaris*	Red	Possible
Blackbird *Turdus merula*	Green	Probable
Song Thrush *Turdus philomelos*	Red	Probable
Mistle Thrush *Turdus viscivorus*	Red	Possible
Robin *Erithacus rubecula*	Green	Confirmed
Dunnock *Prunella modularis*	Amber	Probable
House Sparrow *Passer domesticus*	Red	Probable
Chaffinch *Fringilla coelebs*	Green	Probable
Greenfinch *Carduelis cannabina*	Green	Possible
Goldfinch *Chloris chloris*	Green	Probable
Linnet *Carduelis cannabina*	Red	Probable
Bullfinch *Pyrrhula pyrrhula*	Amber	Probable
Yellowhammer *Emberiza citrinella*	Red	Probable
Reed Bunting *Emberiza schoeniclus*	Amber	Possible

* Birds of conservation concern

8.8.37 Given the time available prior to submission of this EAR, it was not possible to complete a full set of breeding bird surveys. Two surveys were completed prior to submission of the EAR with the remaining survey to be completed in June 2016.

8.8.38 The Project Site contains discrete areas of habitat suitable for wintering and breeding birds (within the fishing lake north of the M20 and the attenuation pond south of the M20) and also immediately adjacent to the Site (wetland areas west and east of the Site, south of the M20). Schedule 1 species are potentially present within the Site and a precautionary assessment is therefore taken. The Site is considered to be of **county and medium** conservation value for its assemblage of breeding and wintering birds.

Great crested newt (GCN)

8.8.39 GCN have been recorded approximately 1km north of the Site within Gibbins Brook and have also been recorded present within Folkestone Racecourse, approximately 500m to the south.

Aquatic (breeding) habitat within the Project Site and Surrounding Area

8.8.40 To the north of the M20, eight water bodies suitable for GCN are present within the relevant 250 – 500m surrounding area. These comprised of ditches north of the fishing lake and adjacent to Gibbins Brook; a reed bed located north of the fishing lake; and five ponds located within Gibbins Brook SSSI, farmland, and gardens. To the south of the M20, two water bodies are present within the relevant 250 500m area comprising the attenuation pond and a pond adjacent to the Stop24 Service Area to the east of the Site.

8.8.41 A Habitat Suitability Index (HSI) assessment was undertaken of the one balancing pond (Pond 1) within the Project Site Boundary in April 2016 for the M20. Pond 1 is located immediately south of the westbound verge. The balancing pond is dominated by common reed *Phragmites australis*, with the majority of the base of the balancing pond silted over and dry. A narrow crescent of shallow aquatic habitat lies around the south eastern edge of the balancing pond, with willow *Salix sp*. and bramble *Rubus fruticosus* around the edge. The slopes and crest of the bank comprises short grassland. Around the outer edge of the boundary of the balancing pond is a headland of long grass with a small area of dense scrub along the bank of a ditch (which comprises flowing water and unsuitable for GCN). The adjacent land comprises an arable field. The HSI indicated that the balancing pond had good suitability to provide breeding habitat for GCN. Presence and absence surveys were therefore undertaken.

8.8.42 Pond 1 was surveyed using torching, netting, refugia and egg searching sampling techniques. It was not possible to bottle trap due to the shallow water level. The refugia comprised of 12 carpet tiles laid around the water edge. No GCN or any other amphibian species have been found to date.

8.8.43 No detailed HSI or presence and absence surveys were undertaken on ponds within the wider surrounds as land access was not permitted. Although it is assumed on a precautionary basis that GCN are present within those water bodies, given the locations of those ponds relative to the Site, the likelihood of GCN migrating from those ponds into terrestrial habitat within the Project Site Boundary is low – medium risk as the majority of the habitat within the Project Site Boundary is of poor suitability and as there are suitable habitats close to the ponds that are of equal or higher quality.

Terrestrial (Foraging, Refuge and Hibernation) Habitat within the Project Site and Surrounding Area

8.8.44 GCN will disperse from breeding ponds over land to forage for food, and to move between ponds. The distances moved during dispersal vary widely according to habitat quality and availability. However, at most sites, the majority stay within around 250m of the breeding pond.

8.8.45 The majority of the Project Site is of low value for terrestrial-phase GCN comprising arable land > 50m distant from (potential) breeding sites. Arable farming can negatively impact upon GCN. The use of pesticides can reduce the density of prey; run-off from fertilisers can reduce the quality of breeding water bodies and in addition, can present physical barriers to dispersal. Discrete areas of the Project Site are suitable for terrestrial-phase GCN (although these habitats present a small proportion of the total habitat of value available in the wider area outside of the Project Boundary).

8.8.46 The majority of habitats within the Project Site are not suitable for terrestrial-phase GCN and in the absence of any suitable breeding ponds within 250m, it is considered that the site is of **Low and Local** value. Refer to Appendix 8.4 for further details regarding GCN surveys.

Dormice

8.8.47 No records of dormice were identified within 2km of the Project over the past ten years. However, dormice are known to be present within the region as Kent is a stronghold for the species.

Habitat Assessment (foraging, dispersing and breeding) within the Project Site and surrounding area.

8.8.48 The potential dormouse habitat is confined to woodland associated with the fishing lake, which totals approximately 1.5ha. This woodland is linked by a heavily flailed hedge to approximately 6ha of woodland at Gibbins Brook SSSI, to the west of the Project Boundary. In addition, there are several small woodlands within 2km of Gibbins Brook, which are sufficiently close and well-connected to allow for dispersal. These range between 1ha and 10ha in size and could collectively support a viable population of dormice.

8.8.49 The habitat around the lake is considered reasonably diverse overall in terms of species and structure although willow and alder dominate in some areas. On the western side there are several clusters of trees with gaps between and on the eastern side a continuous belt of good quality woodland is present. Although not directly connected, the gap between this woodland and the M20 is small enough to allow dormice to cross overland and there is an additional, considerable length of suitable dormouse habitat extending west along the motorway.

8.8.50 South of the M20, potential dormouse habitat is present outside of the Project Site within woodland bordering the stream and within a species-rich hedge along the railway embankment. However, this area is much more isolated than the woodland to the north thus limiting its value as dormouse habitat; it lies between the motorway and the railway with very patchy habitat.

8.8.51 A dormouse survey was set up by across the Project Site on 7 April 2016. A total of 140 tubes were deployed; 50 in the north of the site and 90 in the south. The first nest tube survey was undertaken on 10 May 2016, no evidence of dormice was identified. The tubes will be checked for evidence of dormice once a month from June to September 2016 or until evidence of dormice is identified onsite.

8.8.52 In the absence of survey data and adopting a precautionary approach to the assessment, it is assumed that dormice are foraging, dispersing between and breeding in the suitable habitats onsite. Taking into account the small size of the areas within the Project boundary and the amount of suitable habitat present in the wider area, the Project Site is considered to be of up to **low and local** conservation value for dormice. In addition, if a dormouse population is found to be present onsite the loss of the population is unlikely to affect the conservation status of the species at county level or higher, due to Kent being a stronghold for the species.

8.8.53 For further details regarding dormice, please see Appendix 8.5.

Reptiles

8.8.54 There are records of viviparous lizard *Zootoca vivpara*, grass snake *Natrix natrix*, slow worm *Anguis fragilis* and adder *Vipera berus* within the 2km study area. The closest record related to adder recorded within Gibbins Brook SSSI to the west of the Project Site in 2007.

8.8.55 The Site contains discrete areas of habitat suitable for reptiles. A reptile survey was set up within suitable habitat on 8 April 2016. One survey was undertaken within suitable weather conditions on 25 April 2016. Fourteen adult slow worms and three lizards were recorded during the first survey.

8.8.56 In the absence of full survey data and considering the limited suitable habitat on site, the Site is considered to be of up to **local and low** conservation value.

8.9 Mitigation

Construction Phase

General mitigation measures to be employed during construction

8.9.1 Construction impacts are assessed with consideration given to the implementation of a Construction Environmental Management Plan (CEMP). The CEMP would identify measures that will be implemented to avoid/minimise dust, noise and vibration as well as the potential for fuel and chemical spills. For example, spill kits would be ready to hand in the unlikely event of a fluid spill; there would be no storage of potentially contaminating materials in areas of ecological/hydrological sensitivity; and a pollution incident response plan would be included as part of the CEMP.

8.9.2 In addition to the CEMP, the following measures would be included to reduce impacts during the Construction Phase:

- Work compounds and access tracks will not be located in, or adjacent to, areas that maintain habitat value.
- Site fencing will be used to prevent access to areas outside working areas, particularly in areas adjacent to features of ecological value (including root protection areas).
- Procedures will be implemented to address site safety issues, including storage of potentially dangerous materials.

8.9.3 Briefings and instruction would be given to contractors regarding the biodiversity issues associated with the site.

Habitat Mitigation

8.9.1 The CEMP would include a number of embedded measures to minimise the risk of accidental pollution incidents and indirect construction impacts upon adjacent habitats. Due to the proximity of valued habitats to the Project Site (<50m); there is potential that the CEMP may not fully control dust deposition and the release of pollutants. However, any such impact is considered likely to be limited in extent and duration and would be reversible in the short-term.

Badgers

Risk of Death, Injury or Disturbance to Badgers

8.9.2 The operational extent of the Project requires works within 30m of a main sett. At this stage, the construction methodology is unknown and therefore this main sett may require closure under licence depending on the extent of works and finalisation of the construction methodology. If the main sett must be closed as a result of likely damage or disturbance then an artificial sett must be created, installed and confirmed as used by the badgers prior to sett closure.

8.9.3 Disturbance from construction is envisaged in the form of noise/vibration from increased levels of activity and from piling works. Piling is associated with higher levels of noise and vibration than normal construction activities. However, the presence of the retained residential buildings along the northern Site Boundary would preclude the use of any equipment that would result in significant noise/vibration levels at the badger sett.

8.9.4 Disturbance through nocturnal lighting could result from security lighting in work compounds and laydown areas. However, this lighting would be kept to minimum and would be directed into the compound with minimal light spill outside of these areas.

8.9.5 To mitigate the risk of badger mortality it is proposed that all open excavations deeper than 1m will either be covered overnight where this is practical or a suitable means of access and egress will be provided in the form of wide wooden planks at no more than a 45 degree inclination. Compounds and storage areas will not be located within proximity to setts or important foraging/commuting routes. All chemicals and fuels will be stored in secured areas and will be appropriately fenced to prevent badgers from entering.

Habitat loss

8.9.6 The construction phase of the development will not result in any land-take or fragmentation of hedgerows or woodland, which are located outside of the Project footprint (although <50m).

8.9.7 The current known extent of proposals would not result in direct impacts on main badger setts. However, the construction of the Project would result in the permanent loss of at least three outlying setts and foraging habitat. It is also possible that a main sett will require closure depending on the extent of the construction zone. The outliers will require closure prior to construction commencing. Badger sett closure is only permissible during the period July – November inclusive under a development licence issued by Natural England.

Additional considerations

8.9.8 The construction of the Project would result in the permanent loss of at least three outlying setts and foraging habitat. It is also possible that a main badger sett will require closure. Where main setts are to be closed, artificial badger setts must be constructed in advance of closure of the natural sett. The outliers will also require closure prior to construction commencing. Badger sett closure is only permissible during the period July – November inclusive under a development licence issued by Natural England.

8.9.9 As badgers are highly mobile and the use of land can change over short periods of time an update badger survey would be required to be undertaken before commencement of works to update and confirm the current baseline.

Bats

8.9.10 Night-time working will be avoided therefore disturbance to roost sites and foraging/commuting bats in the form of security lighting at night will be localised to the construction compounds and laydown areas. It is recommended that these are situated within open arable areas, >100m distant from any potential roost sites or boundary features. In addition, all lighting should be designed in accordance with best practice guidance and directed away from any sensitive locations.

Additional considerations

8.9.11 In order to satisfy Regulation 53 of the Habitats Regulations, a European Protected Species (EPS) Mitigation Licence will be required from Natural England prior to the removal of trees/buildings containing bat roosts.

Dormice

Risk of Death, Injury or Disturbance to Individuals during habitat removal

8.9.12 To ensure the construction programme is met and to avoid impacts such as killing, injuring or disturbance to dormice during vegetation clearance, habitat would be cleared during the active season (referred to as 'summer clearance method'), in accordance with the Dormouse Conservation Handbook (2006). This method aims to persuade dormice to move out of the cleared vegetation and into adjacent retained habitats. This is a tried and tested technique that involves taking out small amounts of vegetation (no more than $50m^2$) on successive days at a time of year when the animals are active and able to respond immediately.

8.9.13 Such clearance should be done by hand and should be combined with thorough searches for nests by a licenced and experienced dormouse worker. Clearance using this method would be undertaken in late September or October in order to avoid separating females from dependant young. A Method Statement for the clearance will be needed, as part of a Natural England European Protected Species (EPS) development licence to legally permit this activity.

8.9.14 Other sensitive working methodologies should be employed such as night time security lighting being directed away from retained boundary features and into the compounds and laydown areas, and fitted with cowls to direct light away from any sensitive locations.

Habitat loss

8.9.15 To mitigate for the loss of nesting habitat and to provide immediate replacement habitat whilst landscaping matures, 50 dormouse nest boxes will be installed in retained woodland and hedgerows prior to the commencement of construction. The provision of nest boxes is a tried and tested method to increase available habitat for hazel dormice and has found to increase the size of hazel dormouse populations, as a lack of nest sites is considered to be a limiting factor.

Additional considerations

8.9.16 In order to satisfy Regulation 53 of the Habitats Regulations, an EPS Mitigation Licence will be required from Natural England prior to the removal of dormouse habitat.

Otter and Water Vole

8.9.17 To avoid impacts on individual water voles, habitat will be cleared under the supervision of a licensed handler following the methods described in the Water Vole Mitigation Guidance during periods of least sensitivity, either by trapping and translocation during the spring (1 March to 15 April) or autumn (15 September to 30 November). Trapping and translocation during the autumn should only be considered as a last resort as may necessitate taking trapped individuals into captivity during the winter.

8.9.18 In order to ensure that no disturbance occurs to resting otters during the construction, a re-survey of the adjacent areas will be undertaken before the commencement of works to identify any signs of otter use. Should otter resting places be found, Natural England would be contacted for advice and assessment made whether a disturbance licence is necessary. The loss of water vole habitat will require licensing.

8.9.19 The removal of water vole habitat will require a licence from Natural England. It will be necessary to demonstrate that there will be a conservation benefit for water voles as a result in order to obtain a licence (i.e. an increase in habitat quality and quantity). It will also be necessary to demonstrate that the habitat provided at the receptor area is suitable for water voles prior to the translocation exercise commencing. Where possible, replacement habitat would be created a minimum of one year in advance of any proposed trapping and translocation efforts on Site to allow sufficient time for plant and invertebrate communities to establish. If the construction programme precludes this, mature planting is recommended as an interim measure whilst the habitat establishes.

8.9.20 If it is not possible to sufficiently prepare a receptor site at least a year in advance of water vole translocation, or implement mature planting then it is likely that water vole will need to be kept in captivity over the winter. Once a receptor site has been established sufficiently, the water vole can be released.

Wintering and breeding birds

8.9.21 All clearance works will be undertaken outside the nesting season therefore reducing disturbance to active bird nests. This is widely considered to be from March to August inclusive, but can vary depending on the species and or seasonal conditions. Where vegetation cannot be removed outside of the nesting season, pre-clearance checks will be undertaken by an experienced ecologist to identify if any birds are nesting within or close to the vegetation due to be removed. An informed decision would then be made if the vegetation clearance can be undertaken. If a bird nest is found, it must be left in-situ and protected from works; no works can be undertaken in that area until the young birds have fledged from the nest site. This may take several weeks and will vary depending on the species.

8.9.22 All construction related lighting will be designed and fitted to minimise any adverse impacts on the retained surrounding vegetation. Such measures include the use of hoods and cowls and directional lighting away from features such as hedgerows and scrub.

Great Crested Newt

8.9.23 Based on the negative survey results to date for Pond 1 and in the absence of surveys for the other ponds within 250m of the Project, a precautionary approach is recommended during construction works. The precautionary approach would include the implementation of a sensitive methodology during habitat removal to safeguard the welfare of individuals. This would include the reduction of suitable GCN habitat to 500mm above ground level under ecologist supervision following hand searches; a second search of the vegetation would then be undertaken, with a final cut taken to ground level. This would have the effect of making the habitat unsuitable for GCN, encouraging any GCN present to disperse into more suitable habitat outside the construction footprint. After a few days to allow for any individuals present to move away, features such as tree roots would be removed using a supervised destructive search methodology, and soil stripping undertaken under ecologist supervision. Without survey data to determine the level of risk of GCN presence the number of GCN that could be found is not known. There is potential for aggregations of GCN to be found within a short time scale, particularly with large population/s, with destructive search operations posing the highest risk of finding and killing or injuring GCN. In the event of an individual/s being found, works would need to stop and the welfare of the individual/s found safeguarded.

8.9.24 It is recommended that any compounds and laydown areas that are lit at night are situated within open arable areas, >100m distant from any boundary features. In addition, all lighting should be directed into the compounds/laydown areas, and fitted with cowls to direct light away from any sensitive locations.

Additional considerations

8.9.25 In order to satisfy Regulation 53 of the Habitats Regulations, a European Protected Species (EPS) Mitigation Licence will be required from Natural England if GCN are identified onsite.

Reptiles

Risk of death, injury or disturbance to individuals

8.9.26 Site clearance and construction activities have the potential to result in the killing and injury of reptiles present within and dispersing through construction areas or colonizing building footprints, spoil heaps or rubble piles.

8.9.27 Activities during the site clearance and construction phase may result in harm to reptiles and would therefore need to be mitigated to avoid a legal offence. If the surveys identify the presence of reptiles, these populations would need to be persuaded to move away from the works area using sensitive vegetation clearance. If the reptile population is shown to be 'good' as a result of the surveys, capture and relocation is likely to be required.

8.9.28 Persuasion using vegetation clearance removing vegetation to 500mm above ground, so that covering habitat is not removed entirely. Log piles, part buried hay bales and woodchip piles provided in the remaining areas outside the works footprint would attract reptiles and provide additional refuge and foraging opportunities to increase the carrying capacity within the remaining areas. By persuading reptiles away first, the numbers of individuals that would need to be handled would therefore be reduced, minimising stress and loss of fitness.

8.9.29 A capture and translocation programme would be the only effective means of depleting the populations within areas where there are good populations, as vegetation clearance is more likely to cause direct mortalities and is therefore not appropriate. If it becomes necessary to capture and translocate reptiles, a suitable receptor site must be identified. In this instance, a reptile mitigation strategy will be produced.

8.9.30 Construction activities would be undertaken in accordance with the CEMP and Construction Ecological Mitigation Strategy. These documents would include measures to prevent reptiles from incurring into the working footprints, spoil heaps and rubble piles. This is to mitigate for the very low risk of presence as exclusion fencing is not considered necessary to encompass the entirety of the site.

Operational Phase

Gibbins Brook SSSI

8.9.31 Mitigation in the form of bunding will be used to control flow pathways between pollutant source and sensitive receptor habitats. Plant species of local provenance will be planted on the bund to reduce visual impact. By using bunds to slow and filter the surface flow, pollutants from source can be attenuated at the local scale. Any contaminated material stored by the bund, can be collected and treated appropriately.

Habitats

8.9.32 The Illustrative Environmental Masterplan (Figure 1.2) will create 1.5 ha of wetland, 12 ha woodland/linear trees, 2.5 ha scrub, and 23 ha of grassland habitat. This will result in an increase in connectivity and in the habitat mosaics present in the wider area. This would also provide compensation for the temporary impacts caused by construction related activities.

Aquatic and wetland

8.9.33 Mitigation for the loss of wetland habitat is proposed to comprise the provision of 3.6ha compensatory ponds and 1.4ha wetland to the south and north of the proposed Project Site (as shown in the Illustrative Environmental Masterplan, Figure 1.2). The proposed landscaping will replace the lost aquatic habitat at > 1:1 ratio. The pond located in the south west corner of the northern half of the Site will be designed exclusively for nature conservation rather than for drainage.

Dormice

Habitat loss and fragmentation

8.9.34 The Project involves the permanent removal of dormouse habitat (approximately 1.5ha), largely around the fishing lake and the perimeter of the Site. This may result in dormice not having sufficient food or resting places to survive, or mates for breeding. Compensation and enhancement measures are recommended to provide alternative areas of habitat to mitigate the loss of habitat.

8.9.35 Compensation planting around the perimeter of the Project Site will be undertaken to ensure a no net loss of dormouse habitat, which in the long term will provide optimal habitat for dormice and provide connectivity across the wider landscape, which will benefit the population. This amounts to 12ha of woodland and 2.5ha of scrub which will be managed for the benefit of dormice.

8.9.36 Compensation planting will comprise of nut and berry producing tree and shrub species which will provide good foraging habitat and will also ensure a net gain of hazel dormouse habitat. All new planting will comprise of native and appropriate species of trees and shrubs which will be sourced as locally as possible and will comprise of the following species:

- Hazel
- Oak
- Honeysuckle
- Bramble
- Wayfaring Tree
- Hornbeam
- Field Maple
- Broom
- Sweet Chestnut
- Blackthorn
- Hawthorn
- Cherry
- Crab apple
- Holly

8.9.37 These trees are of particular value to dormice as they provide excellent sources of food as well as shelter which are essential for nesting. However, this new planting would take time to establish and become useable by hazel dormice. Using more mature pot-grown hedging plants would provide connected replacement habitat more quickly than newly planted hedges. Additionally, the compensation planting would be undertaken in advance of the construction phase, to ensure the habitat establishes as quickly as possible, minimising the duration between loss of habitat and replacement. Areas temporarily damaged during works would also be planted as soon as a defined area of works has been completed.

8.9.38 Following Project completion 100 dormouse nest boxes (additional to the 50 installed prior to construction) will be installed into surrounding habitat (retained and installed landscaping) to offer optimal summer nesting opportunities. The nest boxes would be retained during the operational period and used for dormouse monitoring in subsequent years.

8.9.39 An underpass will be used (following the specification described in the DMRB Volume 10) in the location where the access road segregates the perimeter landscaping.

Disturbance

8.9.40 Permanent lighting should be directed away from retained boundary features and towards the Site, with lighting directed away from any sensitive locations. In addition, lighting should be switched off or dimmed in non-operational areas. Perimeter planting will provide more optimal habitat available to dormice away from the Site.

Badgers

8.9.41 The proposed landscape strategy will lead to the creation of a mosaic of grassland, scrub, wetland, woodland and hedgerow, which will provide optimal habitat for badger foraging and a net gain in habitat quality. The landscape strategy will also provide additional opportunities for sett creation and connectivity across the wider landscape which would benefit the badger population in the long-term.

8.9.42 Although mature planting will be installed to create immediate cover, it is recognised that there will be residual impacts in the short-medium term during the establishment of landscaped areas. Therefore, a minimum of 30 log piles (approximately 500mm in height) will be provided in several locations (see Figure 1.2 Illustrative Environmental Masterplan) and will be left to decay naturally, which will provide suitable habitat for a variety of invertebrates providing additional foraging opportunities for badgers in the short-medium term.

Bats

8.9.43 The Illustrative Environmental Masterplan (Figure 1.2) will lead to the creation of a mosaic of grassland, scrub, wetland, woodland and hedgerow, which will provide optimal habitat for bat foraging and an overall net gain in habitat quality. The Environmental Masterplan will additionally enhance the existing connectivity and linkages across the landscape through the perimeter landscaping, which will benefit the local bat population and create an enhanced environment for commuting.

8.9.44 Although mature planting will be installed to create immediate cover, it is recognised that there will be residual impacts in the short-medium term. Log piles proposed for as mitigation for other species will also be of benefit to bats as they will be left to decay naturally, providing suitable habitat for a variety of invertebrates in the short-medium term resulting in improved foraging opportunities for bats.

8.9.45 To mitigate for the loss of habitat, whilst landscaping matures, 40 wooden double-chambered bat boxes would be installed on trees to be retained and within newly landscaped areas away from accessible areas. The bat boxes would be erected prior to the commencement of construction to provide immediate replacement habitat. To avoid killing or injuring bats, exclusion of tree roost features and subsequent soft-felling would be undertaken by a licensed bat worker during periods of least sensitivity (therefore November – March inclusive if hibernation potential can be discounted). Bat boxes erected as compensation will be monitoring for a period of three years post construction where an EPSML is required.

Otters and Water Vole

8.9.46 Mitigation for the loss of aquatic and bankside habitat is proposed to comprise the provision of 3.6ha of compensatory new pond and 1.4ha of wetland/marshy grassland (as shown in Figure 1.2 Illustrative Environmental Masterplan). The proposed landscaping will replace the lost aquatic habitat at > 1:1 ratio and provide greater connectivity across the landscape.

Breeding and Wintering Birds

8.9.47 The proposed Environmental Masterplan will lead to the creation of a mosaic of 23ha grassland, 2.5ha scrub, 12ha woodland, 3.6ha of new pond and 1.4ha of wetland. This will mitigate the amount of habitat lost > 2:1 basis and will likely lead to an increase of habitat mosaics present in the wider area.

Great Crested Newts

8.9.48 Habitat within the Site would be inhospitable to GCN on completion of the construction works. However, the Environmental Masterplan would replace terrestrial habitat lost, and improve habitat connectivity in the wider area as part of landscape and biodiversity mitigation. The proposed Environmental Masterplan would provide scrub, woodland and hedgerow habitats, which in the long-term would provide optimal terrestrial habitat for GCN, and replace suitable terrestrial habitat lost on a > 2:1 ratio. The Environmental Masterplan would also provide connectivity and linkages across the wider landscape which would benefit GCN.

8.9.49 To mitigate for the interim period whilst landscaping matures, log piles and a minimum of four hibernacula (as per the design within the GCN Mitigation Guidelines; a minimum of $1m^2$ each) would be installed to provide foraging and refuge areas within areas of retained habitat (refer to Environmental Masterplan for location and details). New water bodies would also be created as part of the environmental design. Therefore GCN may colonise the periphery of the Project Site Boundary in the long term, as part of their terrestrial phase. These measures would also benefit other amphibian species (i.e. common toad) as GCN occupy similar habitat types.

8.9.50 Given the potential for GCN to colonise the landscaped area around the Project Site Boundary, any drainage features (i.e. man holes, catch pits, gullies and kerb drainage) around Project Site Boundary would need to be made safe for GCN. Individuals could otherwise become trapped in the features and die. Examples of design solutions are included in the DMRB or gully pot ladders can be fitted.

8.9.51 As no ponds supporting GCN would be lost during the construction phase, no replacement aquatic habitat would be necessary. However, the provision of aquatic habitat, such as the attenuation ponds and swales would provide new opportunities for GCN and other amphibious species, particularly for the provision of breeding opportunities. This would be a net benefit for nature conservation in the long term, once the aquatic habitat becomes established.

Reptiles

8.9.52 Reptiles will occupy the same ecological niches as described above for GCN. As such, the mitigation proposals proposed for GCN will also be adequate to negate any significant effects for this species group. Furthermore, the Environmental

Masterplan described above will replace suitable habitat lost > 2:1 basis and will improve habitat connectivity in the wider area.

8.9.53 Reptile monitoring over a five year period for works where translocation is undertaken is recommended following completion for works to confirm efficacy of actions undertaken to safeguard the populations and to ensure that should the populations be considered at risk measures are taken to rectify habitat quality.

8.10 Residual Impacts (with mitigation)

Construction Impacts

8.10.1 Impacts as a result of construction are summarised within Table 8.11.

Gibbins Brook SSSI

8.10.2 An increase in vehicle emissions and dust may occur during the construction phase of the Project. Landscaping, habitat creation and the implementation of a CEMP would be required to mitigate this impact, especially the creation of hedgerows and woodland, which act as buffers to chemical and air pollution caused by vehicle exhaust emissions and construction activities. It is anticipated that the works would have a **Minor Adverse** magnitude of impact resulting in a **Slight Adverse** effect, therefore being **Non-Significant**.

Semi-mature trees with riparian habitat

8.10.3 The Project involves the removal of semi-mature trees including ash, elder, oak, hazel, hawthorn, blackthorn and hawthorn. This habitat is suitable for dormice and breeding birds. Mitigation will include planting new trees of the same species, from sources of local provenance. This should be sensitively landscaped to provide suitable habitat for dormice and breeding birds, at 1:1 ratio and provide greater connectivity across the landscape. It is anticipated that the works would have a **Major Adverse** magnitude of impact resulting in a **Slight Adverse** effect, therefore being **Non-Significant**.

Reed bed

8.10.4 Removal of reed bed habitat, dominated by common reed will occur as a result of the Project. This habitat is suitable habitat for a number of breeding bird species. Mitigation for the loss of aquatic and bankside habitat is proposed to comprise the provision of compensatory new pond, wetland and wet woodland habitat will replace the lost aquatic habitat at > 1:1 ratio and provide greater connectivity across the landscape. A **Moderate Adverse** magnitude of impact is anticipated, resulting in a **Slight Adverse** impact, therefore being **Non-Significant**.

Species poor hedgerow

8.10.5 Species poor hedgerows will be removed. However, new species rich hedgerows will be planted using tree and shrub species of local provenance. In addition, these hedgerows will offer improved connectivity around the boundary of the site. A **Moderate Beneficial** magnitude of impact is anticipated which would result in a **Slight Beneficial** effect, therefore being **Non-Significant**.

East Stour River

8.10.6 Part of the East Sour River will need to be culverted which will involve the removal of riparian habitat including coppiced tree species such as alder, blackthorn, goat willow, oak and hawthorn. In order to mitigate the removal of trees surrounding the pond and stream in the centre of the site, new tree planting will be implemented. This planting will create a buffer between the development and the surrounding habitat. Habitat enhancement of other areas of the River East Stour will be undertaken as compensation. Despite the proposed mitigation, a **Major Adverse** magnitude of impact is anticipated which would result in a **Slight Adverse** effect, therefore being **Non-Significant**.

Badgers

The Project has the potential to cause death or injury and disturbance to badgers during the construction phase. Badger setts will need to be closed in advance of construction to facilitate the Project, therefore habitat loss will occur. The implementation of the CEMP together with the mitigation measures outlined above and the badger licence from Natural England will result in a **Moderate Adverse** magnitude of impact resulting in a **Slight Adverse** effect, therefore being **Non-Significant**.

Bats

8.10.7 Approximately 1ha of commuting and foraging habitat will be lost, which is currently situated around the lake in the centre of the Site. However, with the provision of planting being undertaken in advance of construction and the installation of twenty bat boxes, the impacts can be mitigated. Providing mitigation is adhered to, it is anticipated that the works will have a **Minor Adverse** magnitude of impact at the County level. This would cause a **Slight Adverse** effect, therefore being **Non-Significant**.

Dormice

8.10.8 Approximately 1.5ha of dormouse habitat will be lost as a result of the Project. The habitat around the fishing lake (approximately 1.5ha) has been assessed as reasonably diverse in terms of species structure, although willow and alder dominate in some areas, The dormouse conservation handbook suggests that the average mean spring density of dormice per hectare is likely between four and ten adults in optimal habitat (diverse deciduous woodland with abundant scrub and vigorous understorey). Therefore, the affected dormouse population is estimated to be between six and 15 adults due to the sub-optimal habitat onsite. It is therefore considered the population is likely to reflect the lower end of the scale. With the provision of perimeter planting being undertaken in advance of construction and the installation of 50 dormouse nest boxes, the impacts can be mitigated. Therefore, providing the mitigation outlined above is adhered to, it is anticipated that vegetation clearance as a result of construction would constitute a **Minor Adverse** magnitude of impact at the Local level. This would cause a **Slight Adverse** residual effect and would therefore be **Non-Significant**.

8.10.9 In addition providing mitigation outlined above is adhered to, it is anticipated that disturbance from lighting, noise and vibration and fragmentation of habitat would constitute a **Negligible** magnitude of impact at the Local level. The residual effect is **Neutral** and would therefore be **Non-Significant**.

Otter and Water Vole

8.10.10 During the construction phase of works, the destruction of ditches, which may be occupied by water voles, will occur. Water vole mitigation proposals are to replace like-for-like (with a 1:1 ratio) any viable habitat which will be destroyed. Best practice techniques on water vole trapping and mitigation will be used to ensure that any resident populations are either taken into care or displaced onto alternative nearby habitat. The disturbance created by these actions however will result in a **Minor Adverse** magnitude of impact, despite the above mitigation efforts. As such, a **Slight Adverse** effect is anticipated as a result of habitat disturbance and loss, therefore being **Non-Significant**.

Wintering and Breeding Birds

8.10.11 During construction, disturbance and mortality during vegetation clearance may occur. Therefore, all clearance works will be undertaken outside the nesting season which will reduce disturbance to active bird nests. This is widely considered to be from March to August inclusive, but can vary depending on the species and or seasonal conditions. Where vegetation cannot be removed outside of the nesting season, pre-clearance checks will be undertaken by an experienced ecologist to identify if any birds are nesting within or close to the vegetation due to be removed. An informed decision would then be made if the vegetation clearance can be undertaken. If a bird nest is found, it must be left in-situ and protected from works; no works can be undertaken in that area until the young birds have fledged from the nest site. This may take several weeks and will vary depending on the species. It is considered that the magnitude of impact is **Minor Adverse**, resulting in a **Slight Adverse** effect, therefore being **Non-Significant**.

8.10.12 Noise Disturbance as a result of construction has the potential to result in a **Moderate Adverse** magnitude of impact, resulting in a **Moderate Adverse** effect. However, no specific noise mitigation has currently been considered within the assessment and there is therefore the potential for this effect to be **Significant**.

8.10.13 Disturbance to nocturnal species may occur due to construction related lighting. This will be designed and fitted to minimise any light spill on the retained surrounding vegetation. Such measures include the use of hoods and cowls and directional lighting away from features such as hedgerows and scrub. It is considered that construction phase disturbance as a result of artificial lighting will result in a **Minor Adverse** magnitude of impact, resulting in a **Slight Adverse** effect, therefore being **Non-Significant**.

Great Crested Newt

8.10.14 Overall, the likelihood of GCN presence in Project Boundary is considered low, with presence most likely concentrated in discreet locations terrestrially connected to ponds outside the Project Boundary. As the ponds have not been surveyed, presence and the population size is not known, therefore the level of risk of killing or injuring GCN cannot be confirmed and the number of individuals at risk is unknown. A precautionary mitigation strategy would be applied but cannot guarantee the welfare of individuals, particularly if the ponds support large populations as an aggregation of GCN could be uncovered during earth works or destructive search. The magnitude of impact is considered **Moderate Adverse** on a receptor of Medium and County value. This would have a **Moderate Adverse** if GCN populations were found to be present, resulting in a potentially **Significant** effect.

8.10.15 A small amount of suitable terrestrial habitat would be lost as part of the Project (although at the time of this assessment the quantity is not known). Given the amount of suitable terrestrial habitat that would be damaged that has the potential to support terrestrial GCN, and the mitigation measures applied as outlined above, i.e. habitat enhancement of retained habitat, the magnitude of impact of the loss of habitat is considered to be **Minor Adverse** at the County level. This would cause a **Slight Adverse** effect, therefore being **Non-Significant**.

8.10.16 Given that the risk of GCN presence would be mitigated during habitat removal to ensure no GCN presence within the Project Boundary during works, and with consideration as to the location of the site compound, it is anticipated that disturbance from lighting, noise and vibration and fragmentation of habitat would constitute a **No change** magnitude of impact. The residual effect would be **Neutral** and therefore **Non-Significant**.

Reptiles

8.10.17 The construction phase of the Project poses a risk of causing death, injury or disturbance to individual reptiles. Mitigation will include phased habitat clearance which will be fully supervised by an ecologist. This would result in a **Negligible** magnitude of impact. The residual effect would therefore be **Slight Adverse** and therefore **Non-Significant.**

Table 8.11: Construction Phase Residual Impacts (with mitigation)

Receptor	Importance	Potential effect	Mitigation and Compensation	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)
Gibbins Brook SSSI	High	Increase in dust and emissions.	Landscaping and habitat creation, implementation of the CEMP.	Minor Adverse	Slight Adverse
Semi-mature trees within riparian habitat	Low	Removal of semi-mature trees comprised of ash, elder, oak, hazel, hawthorn, blackthorn and hawthorn. Suitable habitat for dormice and breeding birds.	Planting new trees of same species, from sources of local provenance. This should be sensitively landscaped to provide suitable habitat for dormice and breeding birds, at 1:1 ratio and provide greater connectivity across the landscape.	Major Adverse	Slight Adverse
Reed bed	Low	Removal of reed bed habitat, dominated by common reed. This habitat is suitable habitat for a number of breeding bird species.	Mitigation for the loss of aquatic and bankside habitat is proposed to comprise the provision of compensatory new pond, wetland and wet woodland habitat will replace the lost aquatic habitat at > 1:1 ratio and provide greater connectivity across the landscape.	Moderate Adverse	Slight Adverse
Species-poor hedgerow	Negligible	Removal of habitat.	Planting new species-rich hedgerows, from sources of local provenance.	Moderate Beneficial	Slight Beneficial
East Stour River	Low	A section of the East Stour River will be culverted. There will also be loss of many coppiced tree species; alder, black thorn, goat willow, oak and hawthorn.	In order to mitigate the removal of trees surrounding the pond and stream in the centre of the site, new tree planting will be required. This planting would ideally create a buffer between the development and the surrounding habitat. Habitat enhancement of other areas of the River East Stour should be undertaken.	Major Adverse	Slight to Moderate Adverse
Otter and Water Vole	Low to Medium	Risk of Death or Injury to Individuals during habitat removal.	Water vole trapping and displacement under licence to ensure adequate provision for water vole populations. Trapping would be followed by vegetation clearance and a destructive search in order to discourage water vole from the surrounding area re-inhabiting the works area. Landscaping and habitat creation required to commence at least one year prior to release to ensure receptor site is suitable. There is little likelihood of death or injury to otters, due to the scarcity of the species within the catchment as a whole.	Minor	Slight Adverse

Receptor	Importance	Potential effect	Mitigation and Compensation	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)
		Habitat loss.	Mitigation for the loss of aquatic and bankside habitat is proposed to comprise the provision of compensatory new pond, wetland and wet woodland habitat which will replace the lost aquatic habitat at > 1:1 ratio and provide greater connectivity across the landscape.	Minor	Slight Adverse
		Disturbance.	Disturbance may arise as a result of security lighting at night in work compounds and laydown areas. This lighting will be kept to minimum, will be directed into the compound and light spill outside the secured areas will be minimal. No illumination of watercourses suitable for otter or water vole will take place.	Minor	Slight Adverse
		Pollution of water courses.	Mitigation and avoidance measures detailed in the CEMP will ensure that habitat degradation from incidental pollution of the watercourses is avoided. All chemicals and waste materials will be stored in secured containers (with drip trays) in designated areas away from watercourses.	Negligible	Slight Adverse

Receptor	Importance	Potential effect	Mitigation and Compensation	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)
Badger	Negligible	Risk of Death, Injury or Disturbance to Badgers.	The operational extent of the Project requires works within 30m of Main sett 1. At this stage the construction methodology is unknown and therefore, Main sett 1 may require closure under licence depending on the extent of works and finalisation of the construction methodology. If Main sett 1 must be closed then an artificial sett must be created, installed and confirmed as used by the badgers prior to sett closure. Disturbance through nocturnal lighting could result from security lighting in work compounds and laydown areas. However, this lighting would be kept to minimum and would be directed into the compound with minimal light spill outside of these areas. To mitigate the risk of badger mortality it is proposed that all open excavations deeper than 1m will either be covered overnight where this is practical or a suitable means of access and egress will be provided in the form of wide wooden planks at no more than a 45 degree inclination. Compounds and storage areas will not be located within proximity to setts or important foraging and commuting routes. All chemicals and fuels will be stored in secured areas and will be appropriately fenced to prevent badgers from entering.	Moderate Adverse	Slight Adverse
		Habitat Loss.	If the closure of a Main Sett is required, an artificial sett will be constructed in advance of sett closure. A mitigation strategy and method statement will be required to support the Natural England licence application. Compensatory planting will be delivered as shown on the Environmental Masterplan to ensure that there is no net loss of forging habitat for badgers.	Minor Adverse	Slight Adverse
Wintering and Breeding Birds	Medium	Disturbance / mortality during vegetation clearance.	All clearance works will be undertaken outside the nesting season therefore reducing disturbance to active bird nests. This is widely considered to be from March to August inclusive, but can vary depending on the species and or seasonal conditions. Where vegetation cannot be removed outside of the nesting season, pre-clearance checks will be undertaken by an experienced ecologist to identify if any birds are nesting within or close to the vegetation due to be removed. An informed decision would then be made if the vegetation	Minor Adverse	Slight Adverse

Receptor	Importance	Potential effect	Mitigation and Compensation	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)
			clearance can be undertaken. If a bird nest is found, it must be left in-situ and protected from works; no works can be undertaken in that area until the young birds have fledged from the nest site. This may take several weeks and will vary depending on the species.		
		Noise Disturbance.		Moderate Adverse	Moderate Adverse
		Disturbance to nocturnal species.	All construction related lighting will be designed and fitted to minimise any adverse impacts on the retained surrounding vegetation. Such measures include the use of hoods and cowls and directional lighting away from features such as hedgerows and scrub.	Minor Adverse	Slight Adverse
GCN	Low	Death or injury to individuals during habitat removal.	Phased habitat clearance undertaken by licenced ecologist.	Negligible	Slight Adverse
		Reduce the availability of terrestrial habitat for foraging and dispersal purposes.	Given distance from ponds, no mitigation required.	No change	Neutral
		Disturbance from lighting, noise and vibration as a result of construction activities.	No GCN expected to be present therefore no mitigation required.	No change	Neutral
		Death or injury to individuals during habitat removal.	Phased habitat clearance undertaken by licenced ecologist.	Negligible	Slight Adverse
Dormouse		Death or injury to individuals during habitat removal.	Phased habitat clearance undertaken by licenced ecologist.	Minor Adverse	Slight Adverse
		Reduce the availability of breeding and resting sites for dormice.	Provide immediate replacement habitat in the form of dormouse nest boxes to be installed in retained woodland and hedgerows prior to the commencement of construction. In addition undertake perimeter planting in advance of construction.	Minor Adverse	Slight Adverse
		Severe commuting corridors for dormice.	Boundary vegetation will not be impacted. Other areas of affected vegetation are considered gappy in nature and do not provide a continuous corridor.	Negligible	Neutral

Receptor	Importance	Potential effect	Mitigation and Compensation	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)
		Disturbance to dormice from lighting, noise and vibration as a result of construction activities.	Night time security lighting should be directed away from retained boundary features and into the compounds and laydown areas, and fitted with cowls to direct light away from any sensitive locations.	Negligible	Neutral
Bat	Medium	Death or injury to individuals during habitat removal.	Exclusion of suitable features, followed by soft-felling under supervision of a licensed ecologist and inspection of features followed by soft-felling under supervision of a licensed ecologist.	Minor Adverse	Slight Adverse
		Reduce the availability of roosting sites for bats.	Provide immediate replacement habitat in the form of bat boxes to be installed in retained woodland and prior to the commencement of construction. In addition, undertake perimeter planting in advance of construction.	Minor Adverse	Slight Adverse
		Sever commuting corridors for bats.	Boundary vegetation will not be impacted. Other areas of affected vegetation are considered gappy in nature and do not provide a continuous corridor. New planting which will improve the commuting habitat for bats. However, this will take time to establish before a beneficial effect can be gained.	Negligible	Neutral
Reptile	Low	Risk of death, injury or disturbance to individuals.	Phased habitat clearance undertaken by licenced ecologist.	Negligible	Slight Adverse

Operational Impacts

8.10.18 Impacts as a result of operation of the Project are summarised within Table 8.12.

Gibbins Brook SSSI

8.10.19 Due to the close proximity of the Site, the water quality of Gibbins Brook SSSI has the potential to be affected by increased amounts of pollutants, from vehicles and other sources within the Site. These pollutants have the potential to be spread to Gibbins Brook by a number of water courses, which are located between Gibbins Brook and the Site, especially during flooding events. Cumulative negative ecological impacts caused by pollutants, as well as, a steady increase in eutrophication levels would also be exacerbated, by the poor draining soils of wet woodland and marsh grassland habitat. Other pollutants from vehicles and hard standing areas, which can flow through water-based pathways, include; chemicals from fuel, anti-freeze fluids and engine oil. Also gritting of hard standing areas with salt materials in winter months, would have the potential to alter the plant species composition of receptor habitats. The rapid spread of Danish scurvey-grass *Cochleria danica* nationally, on habitats adjacent to road surfaces, is due to the salt-tolerating properties of this species. The use of bunding can be used to control flow pathways between pollutant source and sensitive receptor habitats. Plant species of local provenance can be planted on the bund to reduce visual impact. By using bunds to slow and filter the surface flow, pollutants from source can be attenuated at the local scale. Any contaminated material stored by the bund, can be collected and treated appropriately. Bunding may cause ponding, though only if the water level is higher than the bund height (thus spilling over into adjacent habitats) and or if the bund is blocked and not maintained adequately. If the correct bund structure and height is installed and the bund is regularly maintained, then ponding is unlikely to occur.

8.10.20 It is anticipated that the Operation of the Lorry Area would have a minor adverse magnitude of impact resulting in a slight adverse effect, therefore **non-significant**.

Badgers

8.10.21 Current proposals would result in the loss of considerable areas of poor quality foraging habitat but the screening plantations provide scope to replace these with higher quality foraging areas. The proposed landscape strategy will lead to the creation of a mosaic of grassland, scrub, wetland, woodland and hedgerow, which will provide optimal habitat for badger foraging and a net gain in habitat quality. The landscape strategy will also provide additional opportunities for sett creation and connectivity across the wider landscape which would benefit the badger population in the long-term. This will result in a **Negligible** magnitude of effect therefore a **Neutral** residual impact (precautionary) which has the potential to result in beneficial impacts following the habitat loss and gain calculations from the Environmental Masterplan. The effect is therefore considered **Non-Significant**.

Bats

8.10.22 It is assumed that once operational, there will be no net loss of bat habitat due to the proposed landscape planting. Therefore a **Negligible** magnitude of impact at County level is anticipated. This means a **Neutral** residual effect is assumed and will be **Non-Significant**.

8.10.23 Lighting is considered to have a **Moderate Adverse** magnitude of impact at County level. Without mitigation, the residual effect would be **Moderate Adverse** and therefore be considered to be **Significant**.

8.10.24 Noise and vibration is also considered to have a **Moderate Adverse** magnitude of impact at County level resulting in a **Moderate Adverse** effect. However, it will not be possible to mitigate for this, therefore a **Significant** effect is anticipated.

8.10.25 Fragmentation of habitat is not anticipated due to boundary vegetation being retained and the provision of perimeter planting to allow bats to traverse the area. A portion of the fishing lake will be retained and other riparian habitat will be created, as illustrated on Figure 1.2 – Illustrative Environmental Masterplan. Therefore, following mitigation, it is considered a **Negligible** magnitude of impact at a County level is anticipated, which would constitute a **Neutral** residual effect and which is considered to be **Non-significant**.

Dormice

8.10.26 Habitat loss as a result of the Project would not be significant due to the considerable amount of optimal dormouse habitat planting proposed around the periphery of the Site. This is anticipated to be approximately 14.5ha. There will also be the installation of 100 additional dormouse nest boxes to be installed in retained habitat following Project completion. It is therefore anticipated there will be a no net loss of dormouse habitat. The effect of habitat loss will constitute a **Negligible** magnitude at a Local level, which would result in a **Neutral** residual effect and therefore **Non-Significant**.

8.10.27 It is anticipated that disturbance from continuous night-time lighting caused as a result of the Project would constitute a **Minor Adverse** magnitude of impact at local level. It is considered likely that adherence with the mitigation and compensation planting outlined above would successfully mitigate this impact. The residual effect would therefore be **Neutral** and therefore **Non-Significant**.

8.10.28 It is considered that dormice are generally tolerant to noise and vibration levels as they are found in highly disturbed environments such as highways verges, and that they will habituate to higher background noise as a result of operational plant. Therefore this effect is considered to be of **Negligible** magnitude of impact at a local level which would constitute a **Neutral** residual effect and **Non- Significant**.

8.10.29 Fragmentation of habitat is not anticipated due to boundary vegetation being retained and the provision of perimeter landscaping bordering the Site, will provide secure areas for dormice to move across the Site and to disperse into the wider landscape without risk of interaction with traffic. However, proposed access roads both north and south of the M20 will require small (approximately 8m) breaks in this perimeter landscaping. On the basis of recent research, it is considered likely that dormice will cross the roads in these locations and as such, the introduction of breaks in the landscaping is not considered to result in fragmentation effects. Taking into consideration the above and by implementing proposed mitigation, the effect is considered to be of **Negligible** magnitude of impact at a local level which would constitute a **Neutral** residual effect and **Non- Significant.**

Otter and Water Vole

8.10.30 No further habitat loss or fragmentation will occur during the operational phase of the Project. With the implementation of the mitigation measures proposed during the construction phase (allowing for appropriate crossings of watercourses) it is considered that otters and water voles will not be isolated by the Project.

8.10.31 Water voles are considered to be generally tolerant to noise and vibration levels and otters also so within approximately 30m of their resting sites (both species are often found being found in very disturbed environments, such as on road verges). Therefore, this would constitute a **Negligible** magnitude of impact which would result in a **Neutral** residual effect, therefore being **Non-Significant**.

8.10.32 The operation of the Project will introduce new lighting into a predominantly arable landscape. Lighting proposals may require columns up to 12m high, and would operate 365 days a year in some parts of the Project. Reduced levels of lighting will be employed at other times in unknown locations of the Site where associated with the commercial element of the Project.

8.10.33 The Project is assessed (on a precautionary basis) as being lit continuously at night (when otters will be active and water voles resting within their burrows). It is highly probable that water bodies associated with the newly landscaped areas, as well as retained habitats at some distance from the Project will be subject to light pollution, which will be of significance to otters at night. The landscaped areas will attenuate the light spill on the water bodies in the surrounding area to an. However, there is expected to be some loss of habitat integrity for otter overall, particularly during Operation Stack level lighting. This will result in an impact of **Moderate Adverse** magnitude and a **Moderate Adverse** effect which is therefore considered to be **Significant**.

8.10.34 Several wet ditches will be created following construction of the Project which will channel run-off water to the existing water bodies. In line with the drainage strategy, the Site drainage will include filter drains, swales or oil interceptors to remove pollutants and all necessary treatment will take place on the site before it is discharged to the existing watercourses. It is considered that this will result in a

Negligible magnitude of impact, resulting in a **Neutral** residual effect, which is therefore **Non-Significant**.

Wintering and Breeding Birds

8.10.35 The operational phase of the Project will result in loss of habitat suitable for wintering and breeding birds. The proposed Environmental Masterplan will lead to the creation of a mosaic of x ha grassland, scrub, woodland, hedgerow, pond and wetland. This will mitigate the amount of habitat lost > 2:1 basis and will likely lead to an increase of habitat mosaics present in the wider area. This will lead to a **Minor Adverse** magnitude of impact and therefore a **Slight Adverse** effect which is therefore **Non-Significant**.

8.10.36 Noise during the operational phase of the Project has the potential to disturb wintering and breeding birds. It is anticipated that this would result in a **Moderate Adverse** magnitude of impact and therefore a **Moderate Adverse** effect which is considered to be **Significant**.

Great Crested Newt

8.10.37 The Environmental Masterplan and SuDS features would provide new habitat opportunities for GCN, providing breeding, foraging and resting opportunities in the long term once the habitats become established. This would have a **Moderate Beneficial** magnitude of impact, with a **Slight Beneficial** residual effect at County level.

8.10.38 As no GCN would be present within the Project Boundary on completion of works, any GCN that colonise the site, would acclimatise to the conditions present at the time so would not be disturbed by any lighting or noise. Therefore a **Negligible** magnitude of impact is anticipated which would result in a **Neutral** residual effect and is therefore **Non-Significant**.

8.10.39 The presence of drainage features around the Project Site Boundary could pose risks to individuals that colonise the peripheral edges. With sensitive design and the inclusion of escape ramps to facilitate their egress, mortalities of trapped GCN can be avoided. Therefore the magnitude of impact is considered **No change** and resulting in a **Neutral** effect considered to be **Non-Significant**.

Reptiles

8.10.40 There will be permanent loss of habitat suitable for reptiles as a result of the Project. Landscape planting will be undertaken which will provide replacement habitat for reptiles. This will include grassland, scrub, woodland edge and riparian habitats. It is anticipated that this will have a **Moderate Beneficial** magnitude of impact resulting in a **Slight Beneficial** effect.

8.10.41 Disturbance as a result of lighting, noise and vibration is likely to occur during the operational phase of the Project. Individuals are likely to acclimatise to the conditions during colonisation of the peripheral habitats. Therefore the magnitude of impact is anticipated to be **Negligible**, resulting in a **Neutral** effect and is therefore **Non-Significant**.

8.10.42 New drainage features have the potential to trap reptiles. As mitigation, a sensitive design will be employed which will to allow trapped individuals to escape. There will therefore be **No change** to the magnitude of impact, resulting in a **Neutral** effect and is therefore **Non-Significant**.

Table 8.12: Operational Phase Residual Impacts (with mitigation)

Receptor	Importance	Potential effect	Mitigation and Compensation	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)
Gibbins Brook SSSI	High	Pollutants from vehicles and other sources within the Site causing eutrophication.	Mitigation in the form of bunding will be used to control flow pathways between pollutant source and sensitive receptor habitats. Plant species of local provenance will be planted on the bund to reduce visual impact.	Minor Adverse	Slight Adverse
Otter and Water Vole	Low and Medium	Habitat Loss	With the implementation of the mitigation measures proposed during the construction phase (and allowing for appropriate crossings of watercourses) it is considered that otters and water voles will not be isolated by the Project.	Negligible	Neutral to Slight Adverse
		Disturbance	The Project is assessed (on a precautionary basis) as being lit continuously at night in some areas (when otters will be active and water voles resting within their burrows). It is highly probable that water bodies associated with the newly landscaped areas as well as retained habitats at some distance from the Project will be subject to light pollution, which will be of significance to otters at night. The landscaped areas will attenuate the light spill on the water bodies in the surrounding area to an extent.	Moderate **Adverse**	Moderate Adverse
Badger	Negligible	Habitat Loss	The proposed landscape strategy will lead to the creation of a mosaic of grassland, scrub, wetland, woodland and hedgerow, which will provide optimal habitat for badger foraging and a net gain in habitat quality. The landscape strategy will also provide additional opportunities for sett creation and connectivity across the wider landscape which would benefit the badger population in the long-term. Although mature planting will be installed to create immediate cover, it is recognised that there will be residual impacts in the short-medium term during the establishment of landscaped areas. Therefore, a minimum of 30 log piles (approximately 0.5m in height) will be provided in several locations (see Figure 1.2 – Illustrative Environmental Masterplan) and will be left to decay naturally, which will provide suitable habitat for a variety of invertebrates providing additional foraging opportunities for badgers in the short-medium term.	Negligible	Neutral

Receptor	Importance	Potential effect	Mitigation and Compensation	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)
Wintering and Breeding Birds	Medium	Habitat Loss	The Illustrative Environmental Masterplan will lead to the creation of a mosaic of 23ha grassland, 2.5ha scrub, 12ha woodland, 3.6ha pond and 1.4ha wetland. This will mitigate the amount of habitat lost > 2:1 basis and will likely lead to an increase of habitat mosaics present in the wider area.	Minor **Adverse**	Slight Adverse
		Noise Disturbance	No mitigation provided.	Moderate **Adverse**	Moderate Adverse
GCN	Low	Permanent loss of habitat	No mitigation required. However, landscape planting would be undertaken and aquatic habitats provided as part of drainage strategy so GCN may colonise in the long term.	Moderate Beneficial	Slight Beneficial
		Lighting, noise and vibration	No mitigation required as any individuals would acclimatise to the conditions during colonisation of the peripheral habitats.	Negligible	Neutral
		Drainage features trapping GCN	Sensitive design to allow trapped individuals to escape.	No change	Neutral
Dormouse		Reduction of suitable habitat	Replacement planting to ensure no net loss of dormouse habitat.	Negligible	Neutral
		Habitat Fragmentation	Enhancement planting and the provision of an underpass.	Negligible	Neutral
		Disturbance - Noise and vibration	Dormice are generally tolerant to noise and vibration levels as they are found in highly disturbed environments such as highways verges, and that they will habituate to higher background noise as a result of operational plant.	Negligible	Neutral
		Disturbance - Lighting	Lighting should be directed away from retained boundary features and towards the Site and fitted with cowls. In addition lighting should be switched off and dimmed in non-operational areas. Perimeter and buffer planting to be undertaken lessen the anticipated light spill into sensitive areas.	Minor Adverse	Slight Adverse
Bat	Medium	Reduction of suitable habitat	Replacement planting to ensure no net loss of bat commuting habitat.	Negligible	Neutral
		Habitat Fragmentation	Enhancement planting.	Negligible	Neutral

Receptor	Importance	Potential effect	Mitigation and Compensation	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)
		Disturbance - Noise and vibration	No mitigation provided.	Moderate Adverse	Adverse
		Disturbance - Lighting	Lighting should be directed away from retained woodland edges and switched off or dimmed when not required. Perimeter and buffer planting to be undertaken to reduce light spill into sensitive areas.	Moderate Adverse	Moderate Adverse
Reptile	Low	Permanent loss of habitat	No mitigation required. However, landscape planting would be undertaken and aquatic habitats provided as part of drainage strategy so GCN may colonise in the long term.	Moderate Beneficial	Slight Beneficial
		Lighting, noise and vibration	No mitigation required as any individuals would acclimatise to the conditions during colonisation of the peripheral habitats.	Negligible	Neutral
		Drainage features trapping reptiles	Sensitive design to allow trapped individuals to escape	No change	Neutral

8.11 Further Mitigation Opportunities

8.11.1 Further mitigation opportunities will be explored following the publication of this EAR as the detailed design phase of the Project progresses. Opportunities to lessen the adverse effects would be developed through consultation with Statutory Environmental Bodies. Initial opportunities to be explored are given below:

- In addition to the aquatic and riparian habitat being replaced on Site, habitat enhancement of other areas of the East Stour River could be undertaken to compensate for the loss of riparian habitat, as a result of the Project.
- To mitigate the removal of trees surrounding the fishing lake and stream in the centre of the site, new tree planting will be required. This planting would ideally create a buffer between the development and the surrounding habitat. Options to increase and enhance the priority habitats in Gibbins Brook should also be explored.
- Mammal ledges (in accordance with DMRB) could be installed in all new and existing culverts within the Project Boundary to improve connectivity for otters and water voles between the northern and southern sections of the Site. These are shown on the Illustrative Environmental Masterplan (Figure 1.2).

9. Geology & Soils

9.1 Executive Summary

9.1.1 An assessment of the impact of the Project construction and operation on the geology and soils of the area was undertaken using the generic sensitivity–magnitude–significant methodology.

9.1.2 The methodology allows the identification of potential sensitive receptors which may be impacted as a result of the proposed Project, with the development of appropriate mitigation ensures to minimise potential adverse impacts or enhances beneficial impacts.

9.1.3 The Project Site is located in an agricultural setting and no sensitive geological or receptors were identified that would be affected by construction or operation of the Project.

9.1.4 Agricultural soils of good to excellent quality (Best and Most Versatile) were identified as comprising more than half of the Project Site.

9.1.5 Historical and active land uses identified are not considered to constitute a significant source of contamination. However, the historical demolition of agricultural buildings (potentially containing asbestos materials) and localised littering/fly tipping within the Project Site boundary may have resulted in localised soil contamination. Additionally, the presence of oil filled electricity cables may represent an onsite source of hydrocarbon contamination.

10.1.6 With the implementation of the relevant mitigation measures, the predicted environmental effects on soils and geology are generally considered to be **neutral** or **slightly adverse**. The exception is loss of agricultural soils which is assessed as **moderate to large** adverse.

9.2 Introduction

9.2.1 Superficial and solid geology is a key factor when determining the environmental character and quality of any given geographic area. Solid geology is a key determinant of the landform, whilst the physical and chemical properties of the rocks and overlying soils influence the type and variety of vegetation that will grow, the agricultural quality, flood risk and water storage capacity. Historical land uses may have altered the geology and soils by introducing contaminants or disturbed ground.

9.2.2 Geological conditions, resources and geographic location can determine the distribution and scale of some types of industry. Industry, even if long closed, can have long-term effects on the environment, through the alteration of landforms and the nature of surface deposits, changes in drainage or the contamination of land.

9.2.3 Construction of highways and pavements can have a significant impact on geological and soil resources, while the nature and condition of the soil and solid geology can be a major constraint of the Project. Under some circumstances, construction work can also compound the environmental effects caused by previous activities.

9.2.4 This chapter is concerned with the following aspects of geology and soils which are considered relevant to the Project:

- General geology and geomorphology
- Designated sites
- Soil deterioration
- Impacts of construction
- Land contamination
- Unexploded ordnance

9.2.5 The assessment of the quality and loss agricultural land is given in Chapter 14: Agriculture. The loss of agricultural soils as a soil resource is included within this chapter.

9.2.6 Key construction activities relating to soils and geology are discussed below.

9.2.7 During the construction stage, site clearance involving vegetation clearance and soils stripping will take place, followed by earthworks to level the Project Site, remove unsuitable soils and create the required ground levels before hardstanding is constructed. Where required, in-situ treatment of unsuitable soils may be undertaken to stabilise the sub-grade prior to pavement construction.

9.2.8 Foundations for structures are likely to comprise reinforced concrete shallow spread footings or deep piled type foundations depending on specific structural loads and ground conditions. The proposed overbridge is likely to be piled.

9.2.9 There is overlap with other environmental topics considered in this EAR and reference should be made to the following chapters:

- Creation of dust (Chapter 5: Air Quality)
- Potential impacts of land contamination on ecology (Chapter 8: Nature Conservation)
- Materials and earthworks balance (Chapter 10: Materials)

- Risk of flooding and changes to the hydrogeology and hydrology of the study area and the potential impacts of land contamination of groundwater and surface water (Chapter 13: Road Drainage and the Water Environment)
- Quality and loss of agricultural land (Chapter 14: Agriculture)

9.3 Regulatory / Policy Framework

9.3.1 The regulatory framework for assessment of potential impacts associated with soils and geology is outlined below:

Land Contamination

9.3.2 Part 2A of the Environmental Protection Act 1990 ('Part 2A') sets out a regime for identifying and dealing with Contaminated Land in the UK. The Contaminated Land Regulations 2006 (as amended by the Contaminated Land (Amendment) Regulations 2012) and associated Statutory Guidance (Environmental Protection Act 1990; Part 2A Contaminated Land Statutory Guidance April 2012) set out the procedural matters for the Part 2A regime.

9.3.3 For a site to constitute 'contaminated land', one or more significant pollutant linkages must be identified through which (a) significant harm is being caused or there is the significant possibility of significant harm being caused or (b) significant pollution of controlled waters is being caused or there is a significant possibility of such pollution being caused.

National Planning Policy Framework

9.3.4 The National Planning Policy Framework (NPPF) published in March 2012 sets out to make the planning system less complex. The NPPF replaces planning policy statements (PPS) and planning policy guidance. The NPPF sets out how the planning system should protect and enhance geological conservation interests and states that 'local planning authorities should set criteria based policies against which proposals for any development affecting geodiversity sites will be judged.'

9.3.5 Chapter 11 of the NPPF, 'Conserving and Enhancing the Natural Environment' states:

'The planning system should contribute to and enhance the natural and local environment by:

- 'protecting and enhancing valued landscapes, geological conservation interests and soils;' for example any Sites of Special Scientific Interest
- 'preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability'

- ‘remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate’

9.3.6 Circular 06/2005 referenced within NPPF provides further guidance in respect of statutory obligations for biodiversity and geological conservation and their impact within the planning system. It stipulates that English Nature (now Natural England) are to be consulted by both the relevant planning authority and the project developer.

9.3.7 Paragraphs 120 to 121 of NPPF require that planning policies should ensure that the development site is suitable for its new use taking account of ground conditions, land instability from natural or historical uses such as mining and pollution or contamination arising from previous uses. Further NPPF technical guidance on land affected by contamination[93] highlights the requirement for developers to undertake appropriate assessment of the potential risks where there is reason to believe contamination could be an issue.

Regional Planning Policy Framework

9.3.8 The Regional South East Plan (adopted in May 2009) was revoked on 25 March 2013 under the Regional Strategy for the South East (Partial Revocation) Order 2013. As such, Development Plans across the region comprise the relevant Local Plan, as described below.

Local Planning Policy Framework

9.3.9 The Shepway District Council (SDC) Local Plan was adopted in 2006, the following retained policies have been taken into account for this chapter:

- SD1: All development proposals should take account of the broad aim of sustainable development, including maintaining and enhancing water, soil and air quality.
- CO1: Development will be permitted only if it maintains or enhances features of landscape, wildlife, historical, geological and agricultural importance, and the particular quality and character of the landscape.
- CO13: Development proposals likely to have a harmful effect on the freshwater environment, including watercourses, natural ponds and adjoining banks will only be permitted if harmful impact is minimal.
- U4: Development will be permitted unless it is demonstrated that it would lead to an unacceptable risk to the quality or potential yield of surface or groundwater resources or lead to an unacceptable risk of pollution.
- U10a: If development proposed on or near a site that has been used for the purpose of waste disposal or known or believed to be contaminated, the

[93] NPPF Technical Guidance on Land Affected by Contamination, June 2014, http://planningguidance.communities.gov.uk/blog/guidance/land-affected-by-contamination/land-affected-by-contamination-guidance/, [Accessed, May 2016]

applicant is required to carry out a site assessment and submit a report of the conclusions. Development will only be permitted if measures are taken to treat and contain or control any contamination so as to reduce risk to site users and site neighbours, the structural integrity of current and proposed buildings and structures on and offsite and surface watercourses and groundwater. Remedial actions agreed by the authority must be completed prior to development.

9.3.10 In addition to the SDC Local Plan, the following Kent County Council (KCC) Local Plan[94]. This outlines the local planning context for the safeguarding of minerals of economic importance.

9.4 Study Area

9.4.1 The study area referred to in this chapter extends up to the Project Site Boundary and includes a 250 m buffer zone beyond the perimeter. The Project Site Boundary is identified on Figure 9.1 – Potential Sources of Land Contamination.

9.4.2 Where reference is made to 'the Project Site' this relates to land within the Project Site Boundary only, which is split into the northern and southern sections, separated by the M20. The study area lies within the administrative boundary of SDC and KCC.

9.5 Assessment Methodology

9.5.1 The assessment of the value of the resource associated with soils and geology and the significance of potential impacts has been carried out in accordance with the following:

- DMRB (1993); Volume 11: Environmental Assessment, Section 2: General Principals of Environmental Assessment, Part 5: Assessment and Management of Environmental Effects (HA 205/08)
- DMRB (1993); Volume 11: Environmental Assessment, Section 3: Environmental Assessment Techniques, Part 11: Geology and Soils

9.5.2 The DMRB does not provide any quantitative guidance on the assessment of potential impacts. In the absence of published guidance to determine potential impacts and the associated significance, professional judgement and experience has been used.

9.5.3 To assess land contamination, desk study information was reviewed and updated to develop a preliminary conceptual site model (CSM). The CSM forms the basis to investigate potential pollutant linkages via a source-pathway-receptor model. This is considered best practice to evaluate environmental risks arising from

[94] Draft Kent Minerals and Waste Local Plan 2013-2030

potential land contamination according to Department of the Environment, Food and Rural Affairs (DEFRA) and Environment Agency guidance[95]. The risk assessment methodology adopted for the CSM is provided in Appendix 9.1.

9.5.4 Relevant desk based and site reconnaissance information for this chapter has been taken from the Project Preliminary Sources Study Report (PSSR)[96].

9.5.5 The Project PSSR is included as Appendix 9.2. This contains the historical and geological mapping, environmental sensitivity information and site reconnaissance observations used to inform this chapter.

9.5.6 The assessment of potential risks in relation to geotechnical engineering including earthworks has been considered where these may have an impact on the soils and geological aspects of the environment (e.g. settlement, instability). These risks will be managed via the geotechnical reporting, design assessment and certification procedures as prescribed within HD22/08. All other geotechnical risks (e.g. failure of retaining wall / foundations, pile wall installation) are beyond the scope of this assessment.

Assessment of Value / Sensitivity, Magnitude and Significance

9.5.7 The significance of potential impacts has therefore been reviewed based on professional judgement on the **value** (sensitivity) of each criteria and **magnitude** of each impact in accordance with the principles set out in HA 205/08. As such, it is considered whether an impact is:

- Adverse or beneficial
- Permanent or temporary
- Direct or indirect
- Significant or has insignificant effect

9.5.8 The sensitivity matrix in Table 9.1 has been used.

Table 9.1: Environmental Value & Description

Value (Sensitivity)	Typical descriptors
High	**Geology & Geomorphology** Geological feature / resource of national importance (RIG/SSSI) **Soils:** Site contains >50% good to excellent quality “Best and Most Versatile” (BMV) agricultural soils by area

[95] CLR11 Model Procedures for the Management of Land Contamination
[96] MMSJV (April 2016) Preliminary Sources Study Report (PSSR) for Highways England (M20 Stanford West Site)

Value (Sensitivity)	Typical descriptors
	Ground Contamination Receptors: Site workers, site users or adjacent site users/residents Locally abstracted groundwater or nearby surface water Designated sites of ecological importance
Medium	**Geology & Geomorphology** Geological feature/resource of regional importance (RIGS) **Soils:** Site contains <50% good to excellent quality BMV agricultural soils AND <50% very poor quality agricultural soils, e.g. made ground, with little potential for agricultural reuse, by area
	Ground Contamination Receptors: Aquifer which is not abstracted or non-sensitive surface water feature Buried services, foundations and services Sites of local ecological importance
Low	**Geology & Geomorphology** Geological feature/resource not classified as regionally/nationally important **Soils:** Site contains >50% very poor quality agricultural soils, e.g. made ground, with little potential for agricultural reuse
	Ground Contamination Receptors: Waste disposal / treatment facility

9.5.9 The magnitude of impacts given in Table 9.2 have been used to assess the significance of impacts associated with geology and soils.

Table 9.2: Magnitude of Impacts

Magnitude of impact	Typical criteria descriptors
Major	**Geology & Geomorphology / Soils** Permanent and large scale loss / damage of resource
	Ground Contamination Receptors: Potential risk from ground contamination assessed as high or very high using the source-pathway-receptor model[97]
Moderate	**Geology & Geomorphology / Soils** Permanent and partial loss / damage of resource
	Ground Contamination Receptors: Potential risk from ground contamination assessed as moderate using the source-pathway-receptor model[97]

[97] Refer to risk assessment methodology given in Appendix 9.1

Magnitude of impact	Typical criteria descriptors
Minor	**Geology & Geomorphology / Soils** Temporary or very partial loss / damage of resource
	Ground Contamination Receptors: Potential risk from ground contamination assessed as moderate/low using the source-pathway-receptor model[97]
Negligible	**Geology & Geomorphology / Soils** Temporary loss of resource and no net damage
	Ground Contamination Receptors: Potential risk from ground contamination assessed as low or negligible using the source-pathway-receptor model[97]
No change	**Geology & Geomorphology / Soils** No permanent or temporary loss / damage of resource
	Ground Contamination Receptors: No risk from ground contamination sources identified

9.5.10 The magnitude of predicted impacts and sensitivity (value) was used to assess the significance of potential environmental effects as described in HA 205/08[98].

Consultation

9.5.11 Data searches were carried out as described in section 9.7.1 below and no other specific consultation was undertaken.

9.6 Assumptions and Limitations to the Assessment

9.6.1 The assumptions and limitations tor the assessment which apply across all chapter topics are given in chapter 4. Those specific to this chapter are given below:

- The assessment is based on a review of desk based and site reconnaissance information contained in the Project PSSR (April 2016). The extent of the site reconnaissance observations covers the majority of the Project Site but excludes agricultural fields to the north, southwest and east, as shown on Figure 9.1 - Potential Sources of Contamination.
- The Preliminary and Detailed Unexploded Ordnance (UXO) Report obtained as part of the Project PSSR (2016) does not cover the northern-most areas of the Project Site.
- Site investigations are proposed for the Project, however no data was available at the time of reporting for this EAR. This assessment is therefore based on the available desk study information and without site specific information on soils, geology, hydrogeology, geotechnical or chemical analytical data.

[98] http://www.standardsforhighways.co.uk/dmrb/vol11/section2/ha20508.pdf

- An exception is the report[99] on Agricultural Land Classification (ALC) which was commissioned by Highways England in January 2016 and included shallow soil sampling and analysis.

9.7 Baseline

Introduction

9.7.1 The establishment of baseline conditions within the study area has been undertaken following a detailed review of the following:

- Site reconnaissance completed on 21 March 2016 and 22 October 2015
- Groundsure Reports: GS-2557819 (EnviroInsight) GS-2557820 (GeoInsight) and GS-2557821 (large and small scale mapping) dated Monday 25 April
- British Geological Survey, The BGS Geoindex, Lexicon of Names Rock Units and Borehole Records accessed 25 April 2016 *(http://mapapps2.bgs.ac.uk/geoindex, http://www.bgs.ac.uk/lexicon/, www.bgs.ac.uk/data/boreholescans/)*
- British Geological Survey, England and Wales Sheet 305 & 306 Folkestone & Dover Solid and Drift Edition, 1:50,000, (1990)
- Aerial photography reviewed from *https://www.google.co.uk/maps* and *http://www.bing.com/maps/* accessed 25 April 2016
- Landmark Envirocheck Report: 83292930_1 Detailed Unexploded Ordnance (UXO) Threat & Risk Assessment dated 6 April 2016
- MMSJV. April 2016. M20 Lorry Area Stanford West, Preliminary Sources Study Report (Appendix 9.2)
- Reading Agricultural Consultants Ltd. January 2016. M20 Permanent Lorry Area, Stanford West, Kent. Agricultural Land Classification and Soil Resources (Appendix 14.1).
- MAGIC website accessed 25 April 2016 (http://www.magic.gov.uk/MagicMap.aspx)
- Natural England.1985. Gibbins Brook SSSI Citation accessed 25 April 2016 (http://www.sssi.naturalengland.org.uk/citation/citation_photo/1003701.pdf)
- GeoConservation Kent Website accessed 25 April 2016 *(http://www.geoconservationkent.org.uk/index.php?option=com_mapio&view=maps&id=1&markerzoom=56&Itemid=19)*
- The Environment Agency's 'What's in your backyard?' accessed 25 April 2016: (http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e)

[99] M20 Permanent Lorry Area, Stanford West, Kent. Agricultural Land Classification and Soil Resources. Reading Agricultural Consultants Ltd, January 2016

- Animal and Plant Health Agency (APHA) Response to written information request dated 21 April 2016
- Kent County Council Historic Environment Record, accessed 25 April 2016 (http://webapps.kent.gov.uk/KCC.ExploringKentsPast.Web.Sites.Public/SingleResult.aspx?uid=MKE76274)
- Archaeology Data Service accessed 25 April 2016 *(http://archaeologydataservice.ac.uk/)*

Geology and Geomorphology

Geological Mapping - Superficial Geology

9.7.2 The Project Site is shown to be underlain by superficial deposits comprising Head, Alluvium and a localised region of Peat. Geological mapping indicates that Head deposits are present beneath the majority of the Project Site, whereas Alluvium is shown to be locally present along the line of three watercourses running to the east, centre and west of the Project Site. The Peat deposits are shown to be localised to a small region in the north of the Project Site. There are also shown to be localised, discontinuous areas where no superficial deposits are present.

9.7.3 In general, the Head deposits (dominated by sub aerial slopes) typically comprise variable constituents of clay, silt, sand and gravel. The Alluvium deposits typically comprise soft to firm, unconsolidated, compressible silty clay, with occasional layers of silt, sand, peat and gravel. The Alluvium is generally shown to be related to the valley of the East Stour River and its tributaries. The Peat deposits are described as an accumulation of wet, dark brown, partially decomposed vegetation and / or an organic rich clay.

9.7.4 Head, Alluvium and Peat deposits may represent poor ground conditions which would potentially be susceptible to ground instability, settlement and heave during the proposed Project, unless appropriated control measures are adopted during construction.

Geological Mapping - Solid Geology

9.7.5 Geological mapping indicates that the majority of the Project Site is underlain by solid geology of the Folkestone Formation with the South West of the Project Site being underlain by the Sandgate Formation. A small area towards the extreme south west of the Project Site is indicated to be underlain by the Hythe Formation.

9.7.6 The Folkestone Formation is generally described as medium to coarse grained, well sorted cross-bedded sands and weakly cemented sandstones.

9.7.7 The Sandgate Formation generally comprises fine sands, silts and silty clays along with soft sandstones.

9.7.8 The Hythe Formation generally comprises sandy limestones and glauconitic sandy mudstones.

9.7.9 A detailed summary of geology underlying the Project Site, including geological map extracts of the study area, is presented in the Project PSSR contained within Appendix 9.2.

Historical Borehole Records

9.7.10 There are nineteen historical BGS borehole records located on-site or along the line of the M20 between the northern and southern sections.

9.7.11 The boreholes located towards the west of the Project Site (TR13NW16 and TR13NW204) recorded ground conditions comprising up to 0.50m of topsoil overlying 2.13 - 3.70m of Head deposits over bedrock of the Sandgate Formation, proven to a thickness of 0.92m. The Head deposits were recorded as loose to medium dense brown and yellow brown silt interbedded clay and sand, whereas the Sandgate Formation was recorded as medium dense yellow brown fine sand.

9.7.12 The boreholes located in the centre and east of the Project Site (TR13NW37, TR13NW36 and TR13NW17) recorded ground conditions comprising 0.10 - 0.30 m of topsoil overlying 2.14 - 3.40m of Head deposits, over bedrock of the Folkestone and Sandgate Formation, proven to a thickness of 0.76 and 2.90m respectively. The Head deposits were recorded as loose to medium dense brown grey clayey coarse silt with occasional gravel of flint. The Folkestone Formation was descried as medium dense pale grey green coarse silt, whereas the Sandgate Formation was described as medium dense and dense dark grey clayey silt.

9.7.13 The boreholes located in the southeast of the Project Site (TR13NW226, TR13NW152, TR13NW232 and TR13NW228) recorded ground conditions comprising 0.25 - 0.40 m of Topsoil overlying 2.50 – 3.35 m of Alluvium over bedrock of the Sandgate Formation, proven to a thickness of 22.0 m. The Alluvium deposits were recorded as soft to firm orange brown clay with occasional roots and flint gravel. The Sandgate Formation was described as soft to stiff dark green grey very sandy clay interbedded with medium to very dense silty sand and sandy silt.

9.7.14 The boreholes located in the south of the Project Site (TR13NW1 and TR13NW151) recorded ground conditions comprising 0.30 - 0.53m of topsoil directly overlying bedrock of the Sandgate Formation, proven to a thickness of 7.55m. Superficial deposits were not present in this area beyond a thin layer of topsoil. The Sandgate Formation was described as firm to stiff grey silty sandy clay interbedded with dense silty fine sand.

9.7.15 The boreholes located in the southwest of the Project Site (TR13NW157, TR13NW158, TR13NW159, TR13NW161, TR13NW162, TR13NW195, TR13NW208 and TR13NW224) recorded ground conditions generally comprising 0.20 - 0.50m of topsoil overlying 1.95 – 4.00m of Alluvium over bedrock of the Sandgate Formation, proven to a thickness of 2.49m. The Alluvium deposits were recorded as soft to firm orange brown sandy clay with occasional roots and quartz gravel. The Sandgate Formation was described as soft to stiff dark green grey very sandy clay interbedded with fine to coarse gravel. At the extreme south west extent of the Project Site boundary the Hythe beds are shown to be present to a depth of 15.40 m below ground level, described as strong to very strong slightly weathered grey limestone.

9.7.16 In general, the conditions presented in the historical records agree well with the geological mapping. A summary of the general ground conditions across the Project Site based on BGS boreholes records as presented in Table 9.3.

Table 9.3: Summary of General Strata

Stratum	Unit	Description	Depth (mbgl)[1]	Notes
Superficial	Peat	Wet, dark brown, partially decomposed vegetation and / or an organic rich clay.	Not proven	Localised around existing fishing lake.
	Alluvium	Soft to firm Clay with occasional roots and gravel.	1.95 – 4.00 (where present)	Discontinuous across the Project Site. Localised around watercourses.
	Head	Loose to medium dense Silt interbedded with clay and sand.	0.92 - 3.40 (where present)	Discontinuous across the Project Site.
Bedrock	Folkestone Formation	Medium to coarse grained, well sorted cross- bedded sands and silts, and weakly cemented sandstones.	>0.76 (where present)	Present over the majority of site except southwest area.
	Sandgate Formation	Fine sands, silts and silty clays. Some soft sandstones.	>0.92 - 22.0 (where present)	-
	Hythe Formation	Sandy limestones and sandy mudstones.	15.40 (where present)	-

[1]metres below ground level. Minimum and maximum extents as determined from historical borehole logs. Extents and depths may vary locally across the site.

9.7.17 For further information related to ground conditions across the Project Site refer to the Project PSSR presented in Appendix 9.2.

Designated Geological Sites

9.7.18 There are no Geological SSSIs or RIGS on or within 250 m of the Project Site. The nearest Geological SSSI is indicated to be Otterpool Quarry which is located approximately 890 m to the south. The MAGIC interactive map viewer indicates that the site is not located within the impact risk zone for this Geological SSSI.

Mining, Mineral Extraction and Ground Instability

9.7.19 There are no historical or present coal mining areas on or within 250 m of the Project Site. The Groundsure report notes occasional minor mining / quarrying of sand may have occurred within the Project Site boundary, but of a restricted extent. No other mining or quarrying is recorded within 250 m of the Project Site boundary.

9.7.20 There are no records of brine extraction areas, gypsum extraction areas, tin mining areas or clay mining areas or natural cavities on or within 250 m of the Project Site.

9.7.21 It is considered unlikely that past underground mine workings are present in the area and if present, it is considered likely that they are uncommon, localised and of limited area. The rock types present in this area are such that minor mineral veins may be present within them on which it is possible there have been attempts to work these by underground methods and/or it is possible that small scale underground extraction of other materials may have occurred. All such occurrences are likely to be restricted in size and infrequent. It should be noted, however, that there is always the possibility of the existence of other sub-surface excavations, such as wells, cess pits, follies, air raid shelters / bunkers and other military structures etc. that could affect surface ground stability but which are outside the scope of the Groundsure dataset.

Ground Hazards

9.7.22 The Groundsure report records the following information related to ground hazards at or within 250 m of the Project Site:

- Compressible ground - high risk (thought to relate to the shallow Head, Alluvium and Peat deposits)
- Landslides - low risk
- Collapsible Rocks – low risk
- Running Sands – low risk (thought to relate to the sands of the Folkestone and/or Sandgate Formation)
- Shrink-Swell Clays – low risk (thought to relate to the high plasticity clays of the shallow Head, Alluvium and Peat deposits)
- Ground Dissolution – negligible risk of soluble rocks

9.7.23 The Project PSSR (Appendix 9.2) also identifies the following potential ground hazards which may be present on the Project Site:

- Low bearing capacity soils
- Potential for concrete attack from aggressive ground
- Potential for elevated ground gas from organic soils
- Heavily saturated soils

Hydrogeology

9.7.24 The Environment Agency classifies the superficial head and peat deposits as unproductive strata. The Alluvium is classified as a Secondary 'A' Aquifer.

9.7.25 The Site is predominantly underlain by sandstone bedrock attributed to the Folkestone Formation which is designated as a Principal Aquifer. The sandstone bedrock attributed to the Sandgate Formation in the southwest of the Project Site is designated as a Secondary 'A' Aquifer. The extreme southwest of the Site is underlain by limestone bedrock attributed to the Hythe Formation which is designated as a Principal Aquifer.

9.7.26 There are no licensed groundwater abstraction points within the study area. The Project Site is not located within a groundwater Source Protection Zone.

9.7.27 A detailed description of the hydrogeological setting of the Project is discussed in Chapter 13: Road Drainage and the Water Environment.

Hydrology

9.7.28 The East Stour River (Primary River) meanders into and out of the southern section of the Project Site, flowing in a general westerly direction.

9.7.29 An unnamed Secondary River enters the northern section across the northern boundary and flows southwards into a fishing lake in the centre. Hayton's Stream flows southwards from the lake and into a closed culvert beneath the M20. Hayton's Stream emerges as an open channel into the southern section and flows as a tributary into the East Stour River. A Tertiary River flows through the eastern area of the southern section southwards into the East Stour River.

9.7.30 A linear drainage channel runs parallel with the Channel Tunnel Rail Link along the southern boundary of the southern section.

9.7.31 An offsite Tertiary River flows parallel with the western boundary of the northern section. This river flows southwards in an open channel before flowing into a culvert beneath the M20 and joining the East Stour River at the western boundary of the southern section.

9.7.32 There are two small ponds within the study area, in the west of the northern section at Holmdene and offsite adjacent to the northern boundary at Wagon

Lodge. A balancing pond is located within the Project Site Boundary just to the south of the M20.

9.7.33 There is one active licensed discharge consent within the study area. The licence regulates the release of final / treated sewage effluent from Foo Cwaft House and is positioned on the western boundary of the northern section. There are no details of the receiving watercourse.

9.7.34 There are no licensed surface water abstraction points on or in close proximity to the Project Site. The Project Site is located within a Surface Water Nitrate Vulnerable Zone.

9.7.35 A detailed description of the hydrological setting of the Project is discussed in Chapter 13: Road Drainage and the Water Environment.

Agricultural Land Use

9.7.36 The study area is predominantly occupied by agricultural land. Agricultural land within the boundaries of the Project Site is classified as Grade 2 '*Very Good*'[100].

9.7.37 The Agricultural Land Classification investigation undertaken in January 2016 (Appendix 14.1) identified that 92.3ha of agricultural land was contained within the boundaries of the Project Site. Over this area, 65.9ha was classified as Grade 2 / 3a good or very good agricultural land (i.e. Best and Most Versatile (BMV) land), 25.7ha was classified as Grade 3b moderate quality and 0.7ha was classified as Grade 4 poor quality.

9.7.38 Consequently, the Project will result in the loss of agricultural land which has potential to be the BMV Land.

9.7.39 The impacts on the loss of agricultural land use is assessed in Chapter 13: Agriculture although the loss of agricultural soils as a resource is addressed in this chapter.

Ecology

9.7.40 Gibbins Brook Site of Special Scientific Interest (SSSI) bounds the north western boundary of the northern section of the Site. Gibbins Brook comprises marshy grassland on peaty soils which is notable for its invertebrates (particularly moths) and ground flora.

9.7.41 The Project Site falls within the SSSI Impact Risk Zone for Gibbins Brook SSSI.

[100] The Agricultural Land Classification Map, 1:250,000 scale (London and South East Region) (2010).

9.7.42 Detailed discussion of ecological considerations is presented in Chapter 8: Nature Conservation.

Potential for Land Contamination

9.7.43 The following paragraphs should be read in conjunction with Figure 9.1 - Potential Sources of Land Contamination.

9.7.44 There are no sites within the study area determined as Contaminated Land under Part 2A.

9.7.45 There has been limited historical development onsite between *circa* 1870[101] and the present day, with current land use predominantly comprising agriculture. Some littering, localised fly tipping and bonfires / burning was noted during the site reconnaissance.

9.7.46 Historical potentially contaminating activities are located offsite and include railway lines adjacent to the south (now the Channel Tunnel Rail Link), a former brick and tile works adjacent to the southeast boundary and earthworks activities associated with construction of the M20.

9.7.47 There are limited active industrial land uses within the study area. The only potential source is offsite, identified as the Southern Water pumping station to the east of the southern section of the Site. Given the distance and nature of these off-site historical activities, these have not been considered further.

9.7.48 Potentially infilled land is present onsite between the M20 and the Channel Tunnel Rail Link (refer to Figure 9.1 - Potential Sources of Land Contamination). This is likely to comprise reworked natural soils associated with construction of the Channel Tunnel Rail Link and M20.

9.7.49 Other areas of potentially infilled land located offsite include a pit to the northwest of the northern section of the Site and wider areas associated with the Channel Tunnel Rail Link, former railway, construction of the M20 and housing development to the west.

9.7.50 Underground 275 kV oil-filled electrical cables run beneath the northern embankment of the M20 and potentially within the northern section of the Site. There is the potential for localised leakages of hydrocarbon contaminants.

9.7.51 Herbicides and pesticides associated with agricultural use across the study area is not considered a significant potential source of soil contamination. The use of pesticides / herbicides is regulated under the Plant Protection Products (Sustainable Use) Regulations 2012 and by the Code of Practice for the Safe Use

[101] Date of the earliest historical map available for review

of Pesticides. Application rates are therefore controlled and unlikely to result in concentrations in soil which are likely to represent significant contamination. This potential source is not therefore considered further.

9.7.52 Several agricultural buildings associated with Fairmead Farm in the southern section of the Site were demolished between 1989 and circa 2002. Since the nature of the building fabric or the disposal route for demolition waste is unknown, there is a potential for localised asbestos contamination in soil.

9.7.53 A former WW2 ammunition store is also located near Fairmead Farm. This was described in the site reconnaissance for the PSSR (April 2016) as derelict stables. Given the nature and short period of use, the potential soil contamination arising from munition storage is considered unlikely.

9.7.54 Animal Health and Veterinary Laboratories (AHVLA) and DEFRA records indicate there are no recorded burial sites of animals affected by Notifiable Diseases in the study area. There is a potential for unrecorded buried animal remains to be present, as prior to 1997 it was considered best practice to bury fallen stock on the farm although this is now prohibited.

9.7.55 There is no recorded active landfill or waste management sites in the study area. The closest recorded historical landfill ('Land off Hayton Road' (Ref: P/13/21)) is located approximately 110 m north of the northern section of the Site. The landfill accepted inert waste from 1976, it is unclear when landfill operations ceased. It is unlikely to constitute a potential source of landfill gas or leachate and has been considered further.

Conceptual Site Model

9.7.56 The conceptual site model (CSM) provides a qualitative evaluation of potential pollutant linkages relevant to the Project. The CSM has been developed based on the preliminary design taking into account potential linkages during construction/ operation and the available information on potential sources of contamination within the study area considered as significant.

9.7.57 The CSM is summarised in Table 9.4. Using the risk assessment methodology given in Appendix 9.1, the CSM was used to determine the potential risk from ground contamination to each identified receptor. The risk assessment is given in Appendix 9.3.

Table 9.4: Conceptual Site Model

Potential Source	Pathway	Receptor
Asbestos (associated with the demolition of former agricultural buildings at Fairmead Farm).	Inhalation of asbestos fibres in soils.	Construction workers.
		Adjacent site users / residents.
		Future site users, including PRoW users.
Littering / localised fly-tipped waste. Localised areas of infilled ground. Hydrocarbons associated with buried oil filled electricity cables. Unrecorded farm animal burials. Former WW2 ammunition store.	Ingestion, direct contact, inhalation.	Construction workers.
		Adjacent site users / residents.
		Future site users, including PROW users.
	Leaching/dissolution from contaminated soil.	Principal Aquifers (Folkestone Formation and Hythe Formation bedrock).
		Secondary 'A' Aquifers (Alluvium and Sandgate Formation bedrock).
	Leaching and migration of contaminants via groundwater and surface water run-off.	East Stour River and tributaries.
		Fishing lake and onsite pond.
		Offsite balancing pond and pond to adjacent to northwest.
		Offsite Gibbins Brook SSSI.
	Direct contact with buried structures.	Highway pavement, foundations and buried utilities.

Unexploded Ordnance

9.7.58 The KCC Historic Environment Record indicates an ammunitions store lies in the vicinity of Fairmead Farm in the southern section of the Project Site. The store was used during World War II for 12-inch railway gun shells.

9.7.59 A Detailed UXO Risk Assessment was undertaken by 6 Alpha Associates as part of the Project PSSR (April 2016). The probability of UXO was assessed as medium to high given the records of nearby air raid bombing and military activity within the area.

9.8 Mitigation

Mitigation measures to be implemented during construction to minimise impacts to and from geology, geomorphology and soils are summarised in Table 9.5.

9.8.1 Geotechnical risks that may have an impact on the soils and geological aspects of the environment (e.g. settlement, instability) have been identified and potential mitigation identified. These will be managed (together with all other geotechnical risks) in accordance with HD22/08. All other geotechnical risks including general design / construction risk (e.g. failure of retaining walls / foundations), are beyond the scope of this EAR and are reported in the Geotechnical Risk Register contained within the Project PSSR presented as Appendix 9.2. The Geotechnical Risk Register remains a 'live' document, to be updated throughout the duration of the Project.

Table 9.5: Mitigation of potential impacts during construction

Potential Impact	Proposed Mitigation
Settlement of sections of new hardstand / highway or adjacent land due to consolidation of underlying soils as a result of increasing ground load.	• Planned ground investigation to determine extent of compressible soils. • Settlement monitoring of sensitive areas / elements during the works to assess impact. • Stockpiles / ground bearing loads to be limited where settlement issues anticipated.
New or existing development being put at risk from land instability or slope failure.	• Planned ground investigation to determine extent of unstable soils. • Safe temporary slope angles to be controlled during construction. • Seeding of earthworks slopes. • Appropriate temporary works design.
Loss or damage of topsoil / subsoil preventing reuse onsite.	• Development of project specific Construction Environmental Management Plan (CEMP). • Careful stripping of topsoil using suitable soil handling equipment. • Storage of soils in temporary low stockpiles, providing protection from contaminants and sowing with grass if stored for longer than 6 months. • No repetitive handling of soils.
Erosion of shallow soils due to drainage and surface runoff.	• Runoff and drainage control measures to be applied throughout construction. • Temporary drainage paths to be cleaned / maintained.
Exposure to potential asbestos fibres in localised areas.	• Planned ground investigation prior to construction. • Asbestos watching brief during groundworks. • Site workers to use appropriate PPE and safe systems of work as outlined in a CEMP. This will include how potentially contaminated materials are managed (Materials Management Plan), stored and disposed of to mitigate exposure (e.g. vehicle loads to be covered, roads to be kept clean, damping down of stockpiles to prevent airborne release of contaminants. • Adherence to Control of Asbestos at Work Act. • Use of dust suppression systems to ensure any potential for fibre release is minimised. • Made ground materials to be subject to asbestos screening as part of validation analysis prior to reuse or disposal.

Potential Impact	Proposed Mitigation
Exposure to soils potentially containing elevated concentration of contaminants in localised areas.	• Planned ground investigation prior to construction. • Site workers to use appropriate PPE in accordance with Principal Contractor requirements and as outlined within the CEMP. • Use of dust suppression systems to minimise generation of dust from soils which may contain elevated concentrations of contaminants. • Management, storage and disposal of potentially contaminated materials in accordance with the CEMP to reduce risk of exposure. • Validation sampling to verify excavated material meets specific criteria to ensure it is suitable for reuse or proposed treatment/disposal route. • Potentially contaminated material to be excavated, segregated and stored appropriately prior to removal from site. • Use of tool box talks and undertake dynamic risk assessments.
Increased leaching of potential contaminants.	• No re-use of impacted soils without appropriate treatment to ensure they are suitable for reuse without impacting controlled waters receptors. • Controlled stockpile management.
Risk of encountering and detonating UXO.	• Adhere to safe systems of work in accordance within Explosive Ordnances Safety and Awareness Briefings. • Mitigation programme to be developed and adhered to for works in areas of medium to high risk (as recommended by Alpha 6 Associates, see PSSR, Appendix 9.2). • Appropriate supervision by specialist Explosive Ordnance Disposal Engineer for earthworks and piling in areas of medium to high risk. • Where applicable, use of low magnetic susceptibility casing for use with down hole magnetometer.
Generation of excavated materials which cannot be reused onsite.	• Develop and implement Materials Management Plan and Site Waste Management Plan. • Undertake works in accordance with the CEMP. • Validation sampling for waste classification using Environment Agency's WM3[102]. • Waste Acceptance Criteria testing to determine the appropriate disposal route.
Release of contaminants within groundwater / run-off which may impact local water quality.	• Piling methodology to be selected to minimise the potential for 'down-drag' of contaminants. • A Foundation Works Risk Assessment (FWRA) to be undertaken in accordance with Environment Agency guidance[103] to ensure appropriate foundation solutions are designed and undertaken to mitigate risks to controlled waters. • Best practice methodologies to be implemented and outlined in the CEMP to control discharges to drains and run-off. • Only compliant discharges to sewer or surface water via consent / permit.

[102] Waste Classification – Guidance on the classification and assessment of waste. WM3. Environment Agency, May 2015
[103] Piling into Contaminated Sites (2002) Environment Agency , Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention (2001) NC/99/73, Environment Agency

9.8.2 Mitigation measures to be implemented during operation to minimise impacts to and from geology, geomorphology and soils are summarised in Table 9.6.

Table 9.6: Mitigation of potential impacts during operation

Potential Impact	Proposed Mitigation
Piles as a preferential pathways for the downward migration of contaminants in groundwater.	• Piling methodology and design to be selected to minimise the potential for piles to act as a vertical pathway for migration of contaminants in groundwater. • A piling risk assessment should be undertaken to ensure appropriate foundation solutions are designed and undertaken to mitigate the risks to controlled waters.
Direct contact of buried services and structures with potentially aggressive components in soils.	• Planned ground investigation to determine the potential for aggressive ground conditions. • Where required, selection of design service ducts and materials in consideration of ground conditions where impacted soils are present. • All concrete to be specified in accordance with the recommendations published within Concrete in Aggressive Ground, Special Digest 1:2005, Third Edition, BRE Construction Edition.
Exposure of future site users to potentially elevated concentration of contaminants in localised areas.	• Planned ground investigation to obtain soil and groundwater samples for chemical analysis. • Adhere to requirements of CEMP e.g. if asbestos, soil or groundwater contamination identified this should be appropriately managed such that it will not pose an unacceptable risk to receptors. • No re-use of impacted soils without appropriate treatment to ensure they are suitable for reuse without impacting receptors.
Leaching and migration of contaminants via groundwater and surface water run-off.	

9.9 Residual Impacts (with mitigation)

Construction

9.9.1 Residual impacts from the Project to the soils, geomorphology and geology together with risks to the Project and environment associated with potential contamination are summarised in Table 9.7.

9.9.2 The geology underlying the Project is not protected by statutory or non-statutory designations, utilised locally in any meaningful way and there are no geological or geomorphological features of importance onsite or within the zone of influence of the Project. This potential receptor is therefore not considered further.

9.9.3 Residual impacts during construction are generally considered to be **neutral / slight adverse** (relating to waste disposal / treatment facility if excavated materials cannot be re-used onsite**)**. The exception is residual impacts to agricultural soils which are considered to be **moderate/large adverse**.

Operation

9.9.4 Residual impacts from the Project to the soils and geology together with risks to the Project and environment associated with potential contamination are summarised in Table 9.8.

9.9.5 Residual impacts during operation are considered to be **neutral**.

Table 9.7: Residual Risks Associated with Soils / Geology During Construction

Activity	Potential Hazard	Risk Receptor	Value (See Table 9.1)	Magnitude of Risk (See Appendix 9.3)	Magnitude of Risk with Mitigation (See Table 9.5)	Significance of Risk
Land-take, topsoil stripping.	Loss / change of use of agricultural soils (also refer to Chapter 13: Agriculture)	Soils	High Project Site contains >50% agricultural land and associated soils classified as "Best and Most Versatile" (BMV) for agricultural use.	Moderate adverse Permanent loss of agricultural soils, some of which are classified BMV.	Moderate adverse Although top soils are likely to be reused within the Project, these will be non-agricultural (general fill, landscape fill, topsoil etc.).	Moderate/large adverse
Earthworks	Exposure to potential asbestos fibres in localised soils	Human (construction workers)	High	Minor adverse[104]	No change	Neutral
		Human (adjacent users)	High	Negligible adverse[104]	No change	Neutral
Earthworks	Exposure to potentially elevated concentrations of contaminants in soils	Human (construction workers)	High	Minor adverse[104]	No change	Neutral
		Human (adjacent users)	High	Negligible adverse[104]	No change	Neutral

[104] As defined using the CSM and risk assessment to assess the risk from land contamination given in Appendix 9.3

Activity	Potential Hazard	Risk Receptor	Value (See Table 9.1)	Magnitude of Risk (See Appendix 9.3)	Magnitude of Risk with Mitigation (See Table 9.5)	Significance of Risk
		Principal and Secondary 'A' bedrock aquifers	Medium Aquifers which are not abstracted	Negligible adverse[104]	No change	Neutral
		East Stour River and tributaries	High	Negligible adverse[104]	No change	Neutral
		On and offsite surface water features	Medium	Negligible adverse [104]	No change	Neutral
		Offsite Gibbins Brook SSSI	High Statutory designated ecological receptor	Negligible adverse [104]	No change	Neutral
Piling	Potentially contaminated groundwater	Principal and Secondary 'A' bedrock aquifers	Medium Aquifers which are not locally abstracted	Minor adverse [104]	Negligible adverse	Neutral
Earthworks	UXO risk	Human	High	Moderate adverse	No change	Neutral
Piling	UXO risk	Human	High	Moderate adverse	No change	Neutral
Earthworks	Generation of excavated soils which cannot be re-used onsite and requires offsite treatment	Offsite disposal	Low	Moderate adverse	Minor adverse	Slight adverse

Table 9.8: Residual Risks Associated with Soils / Geology During Operation

Activity	Potential Hazard	Risk Receptor	Value	Magnitude of Risk	Magnitude of Risk with Mitigation (See Table 9.6)	Significance of Risk
Operation	Potentially elevated concentrations of contaminants in soils and leachable contaminants	Human (site users and adjacent site users)	High	Negligible adverse[104]	No change	Neutral
		Proposed surface water features	Medium Non-sensitive surface water	Negligible adverse [104]	No change	Neutral
		Principal and Secondary 'A' bedrock aquifers	Medium Aquifers which are not abstracted	Negligible adverse [104]	No change	Neutral
		East Stour River and tributaries, on/offsite ponds, Gibbins Brook SSSI	Medium	Negligible adverse [104]	No change	Neutral
	Piles as a preferential migration pathway for downward migration of contaminants in groundwater	Principal and Secondary 'A' bedrock aquifers (not abstracted).	Medium Aquifers which are not abstracted.	Minor adverse[104]	No change	Neutral
	Direct contact of with potentially contaminated soils or aggressive ground conditions.	Highway pavement, foundations and utilities	Medium	Negligible adverse [104]	No change	Neutral

9.10 Further Mitigation Opportunities

9.10.1 The mitigation measures outlined in Table 9.5 and Table 9.6 are considered standard best practices and achievable for the Project.

9.10.2 No further mitigation opportunities have been identified at this stage, with exception of maximising the re-use for high and good quality agricultural soils.

10. Materials

10.1 Executive Summary

10.1.1 The assessment of the construction and operation impacts of the Project with regard to the use of materials and generation of waste was undertaken using methodology outlined in Volume 11 of the Design Manual for Roads and Bridges (DMRB), HA205/08 and Interim Advice Note (IAN) 153/11.

10.1.2 The methodology allows the identification of potential sensitive receptors which may be impacted as a result of the Project and the development of appropriate mitigation measures to minimise potentially adverse impacts or enhance beneficial impacts.

10.1.3 The Environment Agency and Highways England have a Memorandum of Understanding[105], which sets out the aim to adopt practices to reduce waste, increase recycling and increase the use of recycled / recovered materials.

10.1.4 The Project would generate significant volumes of construction, demolition and excavation waste (CDEW), principally from the excavation of soils (e.g. top soil stripping, soil profiling, excavation and replacement of soft compressible soils, culvert works, etc.) to allow the pavement construction and associated works. There is currently limited potential for the re-use of CDEW within the Project. The illustrative design assumes that there is no earth bunds within or around the perimeter of the Project Site.

10.1.5 Since the re-use of excavated materials onsite is restricted, the predicted environmental effects in relation to materials and waste are considered to be adverse.

10.2 Introduction

10.2.1 Material resources are defined as materials and construction products needed for construction, improvement and major maintenance of the Project. They refer to all types of resources, including primary raw materials, secondary manufactured or recycled materials.

10.2.2 The Project would require significant quantities of both primary and secondary materials. The production, transport, handling, storage, use and disposal of these materials has the potential to result in environmental impacts.

10.2.3 Potential impacts associated with materials require consideration in regards to two main areas:

[105] Memorandum of Understanding between the Environment Agency and the Highways Agency (November, 2009)

- Use of material resources
- Generation and management of waste

10.2.4 Waste will arise from two main sources; site materials (such as excavated soils, cleared vegetation); and excess materials brought to the Project Site during construction and not used (damaged stock, surplus etc.). Waste is defined[106] as "...*any substance or object which the holder discards or intends or is required to discard*".

10.2.5 Waste which is regarded as harmful to human health or the environment in the short term or long term is described as 'hazardous[107]' (e.g. fuels and lubricants, batteries, asbestos, paint waste). Waste which is chemically or biologically inactive and will not decompose is described as 'inert' (e.g. bricks, concrete, waste glass, sand, gravel). 'Non-hazardous' waste includes reactive waste such as organic matter contained in garden or household waste. Hazardous, non-hazardous and inert wastes would be generated by the Project.

10.2.6 To avoid repetition, there is overlap with other sections of this EAR and reference should be made to the following chapters:

- Creation of dust (refer to Chapter 5: Air Quality)
- Impacts of potentially contaminated land (refer to Chapter 9: Geology and Soils)
- Impacts to the water environment (refer to Chapter 13: Road Drainage and the Water Environment)
- Quality and loss of agricultural land (refer to Chapter 14: Agriculture)

10.3 Regulatory / Policy Framework

European Legislation

10.3.1 The Waste Framework Directive (2008/98/EC) sets the basic concepts and definitions in relation to waste management. It provides an overarching framework for waste management across Europe and sets requirements to prioritise waste prevention, implementing the following hierarchy with regards to waste management as shown in Figure 10.1 below.

[106] as given by the European Commission Waste Framework Directive 2008/98/EC
[107] refer to the Waste Classification – Guidance on the classification and assessment of waste. WM3. Environment Agency, May 2015

Figure 10.1: Waste Management Hierarchy

Source: http://ec.europa.eu/environment/waste/framework/, accessed May 2016

National Legislation and Guidance

10.3.2 Various legislation is in place to regulate the management of waste and best practice guidance which promotes the sustainable use of materials and waste minimisation. Key legislation and guidance relevant for this Project include:

- Waste (England and Wales) Regulations 2011 (as amended 2012) – implement the Waste Framework Directive and imposes a 'duty of care' on anyone who imports, handles, carries, treats, or disposes of waste in relation to the waste hierarchy, to ensure waste is dealt with appropriately through authorised means.
- Environmental Protection Act 1990, Part II, Section 34 - sets out the legal framework for 'duty of care'.
- Hazardous Waste (England and Wales) Regulations 2005 (as amended, 2009) – implement the Hazardous Waste Directive (91/689/EC), including the required controls and tracking of movements for all hazardous materials.
- Environment Permitting (England and Wales) Regulations 2010 (as amended 2011 and 2012) - provides the framework for environmental permits and exemptions, including waste operations.
- Environment Agency (EA) (Standard Rules SR2015No39) Use of waste in a deposit for recovery operation - outlines the standard rules under the Environmental Permitting regime to allow operators to store and use waste in construction.
- Climate Change Act 2008 - creates a statutory framework for reducing greenhouse gas emissions and includes reduction targets.
- Strategy for Sustainable Construction 2008 – a joint government and industry standard which outlines commitments to reduce carbon footprints and consumption of natural resources.
- CL:AIRE Definition of Waste: Development Industry Code of Practice Version 2, 2011 - sets out good practice on establishing whether excavated materials

are waste and determining when treated excavated waste can cease to be regarded as a waste for a particular use.

- DEFRA Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, 2009 - provides detailed guidance on the use, management and movement of soils onsite.

National Planning Policy

10.3.3 The National Planning Policy Framework (NPPF) published in March 2012, sets out to make the planning system less complex. The NPPF replaces the majority of planning policy statements (PPS) and planning policy guidance. The NPPF sets out how the planning system should facilitate the sustainable use of minerals and states that local planning authorities should '*take account of the contribution that substitute or secondary and recycled materials and minerals waste would make to the supply of materials, before considering extraction of primary materials, whilst aiming to source minerals supplies indigenously*'.

10.3.4 The Good Practice Guidance: Sustainable Design and Construction was also published in 2012 to underpin the NPPF. Although it focuses on sustainable buildings and design, it promotes the use of sustainable construction techniques including the re-use and recycling of building materials and reducing carbon emissions.

10.3.5 The Waste Management Plan for England (WMPE) published in December 2013 sets the obligation to implement measures to ensure that at least 70% by weight of construction and demolition waste is subjected to material recovery by 2020.

10.3.6 The WMPE refers to the national planning policy on waste (Planning Policy Statement 10[108]) which supports the use of Site Waste Management Plans (SWMPs) for planned developments. SWMPs are recognised as encouraging opportunities for the re-use and recovery of materials, minimising offsite disposal of waste, although not a regulatory requirement.

10.3.7 The National Planning Policy for Waste (October 2014)[109] requires local planning authorities when considering planning applications to ensure that the handling of waste arising from the construction and operation of the development maximises reuse/recovery opportunities, and minimises offsite disposal

Local Planning Policy

10.3.8 The Kent Minerals and Waste Local Plan (MWLP) 2013-30 was submitted to the Secretary of State on 3 November 2014 for independent examination. Once

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[108] Planning for Sustainable Waste Management, March 2011
[109] Available via https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/364759/141015_National_Planning_Policy_for_Waste.pdf [Accessed, May 2016]

adopted, the MWLP shall set the strategy for mineral provision and waste management in Kent.

10.3.9 The Shepway District Council (SDC) Local Plan was adopted in 2006, the following remaining policies have been taken into account for this chapter:

- SD1: All development proposals should take account of the broad aim of sustainable development, including energy efficiency and conservation, re-use and recycling of materials and the sensitive development of renewable energy resources.
- U10: Development proposals including commercial or residential uses should include provision for the storage of waste and recyclable materials awaiting collection.

Highways England Policy

10.3.10 The Memorandum of Understanding[110] with the Environment Agency (2009) sets out the aim to adopt and implement standards for good practice in reducing waste, increasing recycling and increasing the use of recycled and recovered materials.

10.3.11 The Highways England Strategic Plan 2015-2020 also outlines the commitment to reduce the impact of activities to ensure long term and sustainable benefit to the environment. The Sustainable Development Plan 2012-2015 also identified the aim to reduce the organisation's carbon footprint, take a positive approach to reducing waste where possible and having a better understanding of the supply chain's use of resources, including confidence in the responsible sourcing of materials.

10.4 Study Area

10.4.1 The study area includes the maximum physical extent within the Project Site Boundary and retaining wall on the eastbound approach from the M20.

10.4.2 The study area lies within the administrative boundary of Kent County Council (KCC) and SDC.

10.4.3 Although the location and likely availability of waste management facilities and material suppliers have been considered, the assessment of direct impacts (e.g. effects on communities) local to these facilities are not considered.

10.5 Assessment Methodology

10.5.1 The DMRB guidance on the assessment of potential environmental effects associated with materials is provided in Interim Advice Note (IAN) 153/11 and has been followed in the chapter.

[110] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/341284/MoU_Env_Agency.pdf[

10.5.2 Two levels of assessment (simple and detailed) are identified in IAN 153/11. Given the limited design information available at this stage, a detailed assessment has been carried out as far as possible.

10.5.3 Information on the use of material resources and waste for the Project has been reported using both the simple and detailed assessment reporting matrix, in accordance with the IAN 153/11 guidelines, and any mitigation measures outlined.

10.5.4 The matrix has been completed for the four main Project activities, in accordance with IAN 153/11. This includes:

- Site remediation / preparation / earthworks
- Site construction
- Operation and maintenance of assets

10.5.5 Desk study reports which provide information on the potential classification of materials proposed to be generated as a result of the Project include:

- Preliminary Sources Study Report for M20 Stanford West Site (refer to Appendix 9.2)

10.5.6 No data from the planned site investigations for the proposed Project was available at the time of reporting for this EAR.

Assessment of Value / Sensitivity, Magnitude and Significance

10.5.7 IAN 153/11 does not provide specific guidance on assessing the significance of the effect. The significance of potential impacts has therefore been reviewed based on professional judgement on the **value** (sensitivity) of each criteria and **magnitude** of each impact in accordance with the principles set out in HA 205/08. As such, it is considered whether an impact is:

- Adverse or beneficial
- Permanent or temporary
- Direct or indirect
- Significant or has insignificant effect

10.5.8 For material use, the scale of magnitude of these impacts has then been assessed, depending on the estimated quantity of materials required and value (sensitivity) of the material resource.

10.5.9 To assess the impacts from the generation of waste, the quantities of waste generated during construction have been broadly estimated, together with consideration of the capacity of regional waste management facilities and the potential for re-use/recycling of waste either on or offsite.

10.5.10 For the operation and on-going maintenance of the Project, the volumes and types of all material and waste to be generated are not known. Potential impacts have been assessed using general assumptions only.

10.5.11 Since no definition for the value (sensitivity) of criteria is given in IAN 153/11, the sensitivity matrix in Table 10.1 has been used.

Table 10.1: Environmental Value & Description

Value (Sensitivity)	Typical Descriptors
Very High	**Materials:** Very scarce resource on an international and national scale.
	Waste: There is no or very limited capacity available at local or regional waste management facilities.
High	**Materials:** Scarce resource on a national scale.
	Waste: Limited capacity available at local or regional waste management facilities.
Medium	**Materials:** Readily available resource on a national scale.
	Waste: Capacity available at regional waste management facilities and limited capacity available locally.
Low	**Materials:** Readily available resource on a local and national scale.
	Waste: Capacity available at local and regional waste management facilities.
Negligible	**Materials:** Abundant local and sustainable resource.
	Waste: High capacity available at local waste management facilities.

10.5.12 The magnitude of impacts given in Table 10.2 have been used to assess the significance of impacts associated with both material use and generation of waste.

Table 10.2: Magnitude of Impacts

Magnitude of Impact	Typical Criteria Descriptors
Major	**Materials:** Large scale use of primary materials or materials with high tonnes CO_2e[111] associated with their manufacture (embodied carbon) and transport. No use of recycled materials.
	Waste: Significant quantities of waste (or smaller quantities of hazardous waste, such as asbestos). Treatment and disposal options are limited, capacity is restricted and limited segregation, sorting, consideration of material re-use or recycling has been undertaken. Majority of waste is sent to landfill.
Moderate	**Materials:** Use of primary materials or materials with high tonnes CO_2e associated with their manufacture (embodied carbon) and transport. Limited use (<20% of total) of recycled materials or materials with low tonnes CO_2e.
	Waste: Some segregation of waste takes place and recycled, sorted, composted or recovered at a recycling facility. Less than half of waste generated is sent to landfill.
Minor	**Materials:** Use of primary materials or materials with high tonnes CO_2e associated with their manufacture (embodied carbon) and transport. Increased use (20-50% of total) of recycled materials or materials with low tonnes CO_2e.
	Waste: All waste is segregated and primarily recycled, sorted, composted or recovered at a recycling facility. Some re-use of materials onsite or offsite at an appropriately licensed or registered exempted site. Volumes of waste sent to landfill are minimal.
Negligible	**Materials:** Limited use of primary materials or materials with high tonnes CO_2e associated with their manufacture (embodied carbon) and transport. Significant use (50–75% of total) of recycled materials or materials with low tonnes CO_2e.
	Waste: Waste is predominantly re-used onsite or offsite at an appropriately licensed or registered exempted site, with no waste going to landfill.
No change	**Materials:** Large scale use (>75% of total) of recycled materials, with very low overall tonnes CO_2e associated with material manufacture and transport.
	Waste: No net production of waste.

10.5.13 The magnitude of predicted impacts and sensitivity (value) was used to assess the significance of potential environmental effects as described in HA 205/08.

[111] Tonnes CO_2e = tonnes of carbon dioxide equivalent

Consultation

10.5.14 Kent County Council's Kent Waste Business Guide[112] and the Environment Agency's public register of licenced waste operators[113] were consulted to identify potential sites for local and regional waste management.

10.5.15 The latest Annual Minerals and Waste Monitoring Report published by Kent County Council (dated Feb 2015)[114] was consulted to determine approximate capacity of local waste management sites. This is to assess whether there is likely to sufficient future capacity to deal with the proposed volumes of waste associated with the Project.

10.5.16 Note that the BRE[115] website which provides an on-line tool to identify local waste management sites was temporarily unavailable at the time of reporting and could not be accessed.

10.6 Assumptions and Limitations to the Assessment

10.6.1 Assumptions and limitations tor the assessment which apply across all chapter topics are given in chapter 4. Those specific to this chapter are given below:

- The assessment of potential environmental effects has considered the estimated quantities of materials used and wastes generated for the Project, the potential for the re-use, recycling and recovery of materials and likely capacity of waste management facilities.
- Offsite impacts relating to the extraction of raw materials, depletion of non-renewable resources and the manufacture of construction materials are excluded from the scope of IAN 153/11.
- Carbon emissions associated with the manufacture (embodied carbon) and transport of materials and waste has been considered qualitatively only. Since only broad volume estimates are known for materials to be used or waste generated within the Project, no calculations for embodied carbon and carbon emissions through the transportation of materials or waste have been estimated at this stage. Highways England require contractors to submit quarterly reports on carbon emissions using their Carbon Emissions Calculation tool[116]. This will allow material use to be quantified in terms of net volumes and carbon, allowing greater confidence in the detailed assessment of significance of the associated impacts.
- Only primary material types and waste have been included at this stage. Estimates for material quantities for fencing and lighting were also excluded since these were not available at the time of reporting. Estimates for domestic and office waste from contractor's compounds and welfare facilities are

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[112] Available via http://www.kent.gov.uk/__data/assets/pdf_file/0004/4783/Kent-Waste-Business-Guide.pdf
[113] Available via http://epr.environment-agency.gov.uk/ePRInternet/searchregisters.aspx
[114] 10th Annual Minerals and Waste Monitoring Report 2013/2014. Kent Minerals and Local Plan. February 2015. Available at http://www.kent.gov.uk/__data/assets/pdf_file/0004/28516/Minerals-and-waste-annual-monitoring-report-2013-14.pdf
[115] BREMAP, available via http://www.bremap.co.uk/Default.aspx [Accessed May 2016]
[116] Highways England, Carbon emissions calculation tool, August 2015. Available at https://www.gov.uk/government/publications/carbon-tool

excluded, as well as energy and fuel consumption from site offices, fixed / mobile plant and operation of the network (such as lighting).

- All volumes given are based on preliminary estimates only and will change at the detailed design stage. Since no data from the planned site investigations for the Project was available at the time of reporting for this EAR, broad assumptions on ground conditions from desk study information have been made (as detailed in Chapter 10: Geology & Soils).
- Estimates of the volumes of inert, non-hazardous and hazardous waste are also based on the assumption of ground conditions and anticipated limited potential for soil contamination (as detailed in Chapter 10: Geology & Soils).
- There is currently limited potential for the re-use of excavated materials within the Project. The illustrative design assumes that there is no earth bunds within or around the perimeter of the Project Site. Excavated materials which is geotechnically or chemically[117] unsuitable for re-use will also require disposal or treatment prior to any re-use offsite.

10.7 Baseline

10.7.1 This section provides a description of the waste management facilities in the vicinity of the Project, details the range of activities resulting in material use / generation of waste and the estimated volumes anticipated.

10.7.2 The type and location of waste handling facilities within the Kent region were identified through the KCC Kent Waste Business Guide[112] and Environment Agency's public register.

10.7.3 The Project is not due for completion until 2018, with the majority of the waste being generated during construction in 2016 / 2017.

10.7.4 The Annual Minerals and Waste Monitoring (AMWM) report[114] for Kent indicates that overall landfill capacity decreased between 2012/2013 and 2013/2014 but the capacity of non-landfill waste management increased by 2.6 million tonnes (recorded at approximately 15 million tonnes for 2013/2014).

10.7.5 This includes an increase in composting and anaerobic digestion capacity by 141% (recorded at 572,398 tonnes for 2013/2014). The number of inert landfills within the region fell from sixteen sites to ten sites, with an 8% reduction in total capacity. A marginal increase (4%) in non-hazardous landfill capacity was recorded within this period (4%) but this may be attributed to landfill settlement and recalculation.

10.7.6 The majority of waste generated during the Project will be excavation materials. The AMWM Report indicated a 20% reduction in the capacity of construction, demolition and excavation waste (CDEW) recycling facilities from the previous

[117] Due to the presence of soil contaminants at unacceptable concentrations

year (recorded at approximately 2,546,195 tonnes for 2013/2014). Capacity fluctuates with demand and the AMWM report did not identify limited capacity as a concern which would impact the management of CDEW.

10.7.7 A proportion of CDEW produced will also not reach permitted waste management facilities since volumes of CDEW go to exempted sites. Since exempted sites are not required under the Environmental Permitting Regulations 2010 to submit waste returns, there is limited information on throughput and capacity.

10.7.8 The AMWM report also lists three hazardous waste disposal sites within Kent. Hazardous waste is also is sent to hazardous waste landfills and management sites within the wider south east region. The majority of these waste disposal and treatment sites within the wider region hold permanent or temporary planning permissions that were stated to remain open for the duration of Kent Minerals and Waste Local Plan 2013-2030.

10.7.9 The capacity of waste transfer sites within Kent also increased by 63% between 2012/2013 and 2013/2014 (recorded at approximately 3,763,270 tonnes for 2013/2014).

10.7.10 Table 10.3 lists waste disposal and treatments sites within Kent and their distance from the Project.

Table 10.3: Waste Management Facilities

Facility	Waste Class Received	Location	Approximate distance
Ham Farm Landfill	Non-biodegradable wastes	Faversham, ME13 7EU	26 km northwest
Shelford Landfill	Household, commercial and industrial waste.	Canterbury, CT2 OPR	21 km northeast
Greatness Quarry Landfill	Demolition and construction waste, non-hazardous industrial, commercial and domestic waste.	Sevenoaks, TN14 5BP	62 km northwest
Arnolds Lodge Landfill	Inert waste	Tonbridge, TN12 5HL	46 km northwest

Facility	Waste Class Received	Location	Approximate distance
Bramling Lime Works Landfill	Non-biodegradable waste	Canterbury, CT3 1NA	18 km northeast
Pinden Quarry	Hazardous waste	Dartford, DA2 8EB	60 km northwest
Norwood Farm	Hazardous waste	Isle of Sheppey, ME12 3AJ.	37 km northwest
Margett's Pit	Hazardous waste	Rochester, ME13 1XX	47 km northwest
Conningbrook Recycling Facility	Aggregates recycling	Ashford, TN24 0UL	11 km northwest
Johnsons Recycling Scrap Metal	Metal recycling	Folkestone, CT19 5DU	7 km east
Redhill Soil Treatment Facility	Contaminated soil treatment	Redhill, RH1 3ER	80 km northwest
Shelford Landfill	Composting facilities	Shelford, CT2 0PR	21 km northeast
Viridor Waste Management	Construction, demolition and excavation waste transfer station	Whitfield, CT16 3EH	17 km northeast

10.7.11 The Project shall involve a range of activities during construction resulting in the use of materials and generation of waste. Main activities include (but not limited to):

- Site clearance and preparatory works, including vegetation clearance, demolition of existing structures (e.g. former ammunition stores, if planned) and earthworks such as top soil stripping, site re-profiling, removal of unsuitable soils and excavations for foundations, new drainage/culverts and retaining walls, infilling of existing pond, creation of replacement fish laking and new attenuation ponds, re-routing and widening of culverts, National Grid cable diversions
- Construction of bridges, pavement, retaining walls, drainage, control booths, facilities building and other associated infrastructure
- Installation of signage / lighting

- Landscaping and boundary treatment

10.7.12 As described in Chapter 9: Geology & Soils, information on the geological sequence beneath the Project is based on desk-study information and will be confirmed through the planned site investigation works. The findings from the planned site investigation will provide an indication on whether excavated material is geotechnically or chemically suitable for re-use either on or offsite.

10.7.13 In accordance with IAN 153/11 guidance, a simple assessment matrix for materials and waste arising are given in Table 10.4 and Table 10.5, respectively. These lists the anticipated nature of materials / waste and broad quantity estimates.

Table 10.4: Simple Assessment of Material Resource Use associated with the Project

Project Activity	Material Resources Required	Estimated Quantities of Primary Material Resources Required	Additional Information
Site preparation	▪ Site preparatory works	▪ Aggregate 18,840 tonne ▪ Cement aggregate mix 378,000 tonne ▪ Geotextile 789,600 m^2	Estimates are based on information available at the illustrative design stage for the EAR and assumes no re-use of materials onsite.
Site Construction	▪ Construction of bridges, pavement, retaining walls, drainage, control booths, facilities building and other associated infrastructure ▪ Installation of signage, lighting ▪ Landscaping and boundary treatment	▪ Macadam 108,960 tonne ▪ Aggregate 10,680 tonne ▪ Bricks 1,560 nr ▪ Timber 84 m^3 ▪ Clay pipe 1,920 m ▪ Plastic pipe 21,600 m ▪ Readymix concrete 8,640 m^3 ▪ Pre-cast concrete (pipework) 11,760 m ▪ Steel 528 tonne	Quantities are broad estimates only and shall change during the detailed design stage.
Operation and maintenance of asset	Specific details relating to operation and maintenance are currently known. However, materials likely to be required include the following associated with localised repairs and re-surfacing: ▪ Macadam ▪ Concrete ▪ Aggregate	Quantities are difficult to estimate over the lifetime of the Project but are anticipated to be less than 10% of those outlined above for construction.	

Table 10.5: Simple Assessment of Waste Arising as a result of the Project

Project Activity	Waste Arising from the Project	Estimated Quantities of Waste Arising		Additional Information
Site remediation, preparation and earthworks	▪ Site preparatory works ▪ Earthworks	▪ Cleared vegetation ▪ Cleared littering / fly tipped waste ▪ Excavated soils (inert)[118] ▪ Excavated soils[118] (non-hazardous) ▪ Excavated soils[118] (hazardous)	Not quantified Not quantified 98,100 m^3 57,225 m^3 8,175 m^3	Volumes are estimated on a worst case scenario (assuming no re-use of materials onsite) using the illustrative design. Changes are likely during development of the detailed design. Capacity within local and regional waste treatment / disposal facilities and exempted sites to handle receive waste from the Project is anticipated. Specific locations shall be identified during detailed design. Based on the estimated volume of excavated material for offsite disposal, this equates to approximately 16,350 vehicle loads or 32,700 vehicle movements (i.e. outbound and return trip) for the construction works[119]
Demolition	▪ Demolition of existing structures	▪ Bricks / concrete / timber	Not quantified	
Site Construction	▪ Construction of bridges, pavement, retaining walls, drainage, toll booths, facilities building and other associated infrastructure ▪ Installation of signage, lighting ▪ Landscaping and boundary treatment	▪ Packaging ▪ Residual plastic ▪ Residual concrete ▪ Residual timber ▪ Residual steel	Not quantified	

[118] Assuming 60% of excavated soils will be inert, 35% non-hazardous, 5% hazardous although figures to be confirmed by site investigation results and soil analysis
[119] Assuming an average of 2 tonnes/$m^3$for excavated material and a 20 tonne load capacity for HGVs

Project Activity	Waste Arising from the Project	Estimated Quantities of Waste Arising	Additional Information
Operation and maintenance of asset	Waste may be generated from the following likely activities: ▪ domestic waste from Facility building / toll booths ▪ road sweepings and gully clearing ▪ replacement signage and light fixtures ▪ landscape maintenance ▪ road debris / littering ▪ road resurfacing	Quantities of waste generated over the lifetime of the Project have not been quantified but are considered likely to comprise less than 10% of those generated during construction and will be associated with general maintenance and road surfacing works.	None

10.8 Mitigation

10.8.1 Proposed mitigation measures to be implemented during the construction and operation of the Project are summarised in Table 10.6.

10.8.2 Since the illustrative design does not include provision for earth bunds within or around the perimeter of the Project Site, it is assumed that there shall only be limited potential for the re-use of site won materials within the Project itself (e.g. top soil re-use within landscaped areas, infilling of fishing pond).

10.9 Residual Impacts (with mitigation)

10.9.1 The detailed assessment matrix is given in Table 10.6, which takes into consideration the magnitude of the impact and value of the receptor, together with mitigation measures which shall be implemented during construction and operation.

Construction

10.9.2 Residual adverse impacts in relation to materials and waste during construction are considered to be **moderate** at worst.

10.9.3 Measures for addressing any material and waste management during construction (including opportunities for re-use or recycling of excavated materials and waste arisings) will be included in the Material Management Plan (MMP) and Site Waste Management Plan (SWMP) which shall be referenced in the Construction Environmental Management Plan (CEMP).

10.9.4 Best practicable means will also be outlined in the CEMP and implemented during construction to ensure that impacts from the generation of dust, noise, emissions to land or water are mitigated and waste is handled in accordance with current regulations.

Operation

10.9.5 Residual impacts in relation to materials and waste during operation are considered to be **slight adverse** or **neutral**.

10.9.6 Measures for addressing any material and waste management during operation shall be referenced in the Handover Environmental Management Plan (HEMP). This will then be implemented through the Environmental Management Plan of the Asset Support Contractor, responsible for the ongoing maintenance of the Project. Implementation of an Environmental Management System accredited to ISO14001 (or similar) is also proposed during operation of the Project.

Table 10.6: Detailed Assessment (Materials and Waste)

Project Activity	Potential Impacts Identified	Description/Assessment of the Impacts				
		Nature	Sensitivity	Planned Mitigation	Magnitude (with mitigation)	Significance (with mitigation)
Site preparation / earthworks / construction	Depletion of natural resources (i.e. use of materials for earthworks including aggregates, geotextiles, cement, steel, timber, plastics)	Adverse, permanent, indirect	Medium	• Optimise material efficiency (e.g. use of standardised components/pre-fabricated materials, avoid use of hazardous materials) • Where possible, responsible resourcing of materials through frameworks such as BES 6001:2009120. Includes use of only timber accredited to schemes such as Forest Stewardship Council (FSC) or Programme for Endorsement of Forest Certification (PEFC) • Adopt Designing for Resource Efficiency and Design out Waste principles in accordance with WRAP best practice121 • Development and use of a Materials Management Plan (MMP) in accordance to manage material procurement, delivery, storage, handling use and disposal	Moderate	Moderate Adverse

[120] Building Research Establishment (BRE) Framework Standard for the Responsible Sourcing of Construction Products
[121] WRAP Designing out Waste : A design team guide for civil engineering ISBN 1-84405-434-9 and Guidance Note : Design for Resource Efficiency http://www.wrap.org.uk/sites/files/wrap/DfRE_Process_summary_guide_v3.pdf

Project Activity	Potential Impacts Identified	Description/Assessment of the Impacts				
		Nature	Sensitivity	Planned Mitigation	Magnitude (with mitigation)	Significance (with mitigation)
				• Development and use of SWMP to support the MMP		
	Energy/fuel consumption (embodied carbon) and climate change through manufacture of materials	Adverse, permanent, indirect	Medium[122]	• Where possible, responsible resourcing of materials through frameworks such as BES 6001:2009 • Use the Highways England Carbon Calculator tool (or similar methodology) to monitor total carbon emission of materials against Key Performance Indicators (KPIs)	Moderate	Moderate Adverse

[122] The general criteria given in HA208/05 for assigning magnitude of impact, sensitivity and assessing significance have been used where not included in Table 10.1 and Table 10.2

Project Activity	Potential Impacts Identified	Description/Assessment of the Impacts				
		Nature	Sensitivity	Planned Mitigation	Magnitude (with mitigation)	Significance (with mitigation)
Site preparation / earthworks / construction	Release of contaminants to air (dust), land or the water environment due to handling/movement of materials and waste (including transport)	Adverse, temporary, direct	High[122]	• Best practice methodologies to be outlined in the CEMP and implemented to control generation of dust, noise, discharges to land, drains and run off	Minor[122]	Slight / Moderate Adverse
	Demand on handling capacity of regional waste management and disposal facilities	Adverse, temporary /permanent , indirect	Medium	• Promote re-use, recycling or recovery of materials either on or offsite • Management of subcontractors to ensure they adhere to appropriate waste minimisation procedures • Asbestos Demolition Survey of building/structures prior to scheduled demolition • Waste segregation onsite (including plastics, timber, steel, hazardous, general waste etc...) • Undertaking appropriate environmental validation to identify if subsoil is suitable for reuse (or nominated treatment/disposal route) and maximising re-use of excavated materials in accordance with CL:AIRE Code of Practice • Identify potential for re-use of CDEW at exempted or permitted sites subject to suitability	Minor	Slight Adverse

Project Activity	Potential Impacts Identified	Description/Assessment of the Impacts				
		Nature	Sensitivity	Planned Mitigation	Magnitude (with mitigation)	Significance (with mitigation)
				• Minimise volumes of hazardous waste generated (e.g. by excavation of any hotspots of soil contamination, segregation and stored appropriately prior to treatment) • Use of Key Performance Indicators (KPIs) to monitor progress of the Project including total waste volumes sent to or diverted from landfill • Use of Material Management Plan (MMP) to manage the use, treatment and placement of excavated materials (including re-use on/offsite or disposal)		
	Energy/fuel consumption (transport carbon emissions) and climate change through plant use and transportation of materials and waste	Adverse, permanent, indirect	Medium[122]	• Prioritise use of local suppliers • Promote re-use of materials onsite where possible (e.g. retention of topsoil) • Chipping/mulching of green waste from site clearance for re-use onsite • Employ CTC/or similar methodology to monitor total carbon emission of materials against Key Performance Indicators (KPIs)	Moderate	Moderate Adverse

Project Activity	Potential Impacts Identified	Description/Assessment of the Impacts				
		Nature	Sensitivity	Planned Mitigation	Magnitude (with mitigation)	Significance (with mitigation)
Operation and maintenance of asset	Depletion of natural resources (e.g. from maintenance activities such as macadam re-surfacing)	Adverse, permanent, indirect	Medium	• Adopt best practice methodologies from the MMP/SWMP/CEMP to be outlined within the Handover Environmental Management Plan (HEMP). • On-going operation of the Project under an Environmental Management System accredited to ISO 14001 (or similar) is recommended.	Negligible	Neutral / Slight Adverse
	Energy/fuel consumption (embodied carbon) and climate change through manufacture of materials	Adverse, permanent, indirect	Medium		Negligible	Neutral / Slight Adverse
	Release of contaminants to air (dust), land or the water environment and generation of noise due to handling/movement of materials and waste (including transport)	Adverse, temporary, direct	Low		Negligible	Neutral
	Demand on handling capacity of regional waste management and disposal facilities	Adverse, temporary/ permanent, indirect	Low		Negligible	Neutral
	Energy/fuel consumption (transport carbon emissions) and climate change through plant use and transportation of materials and waste	Adverse, permanent, indirect	Low		Negligible	Neutral

10.10 Further Mitigation Opportunities

10.10.1 Further mitigation opportunities will be explored following the publication of this EAR as the detailed design phase of the Project progresses. Opportunities to lessen the adverse effects would be developed through consultation with Statutory Environmental Bodies. Initial opportunities to be explored are given below:

- There is currently limited potential for the re-use of CDEW within the Project since the preliminary design assumes that there are no earth bunds within or around the perimeter of the Project Site.
- Balancing of the earthworks cut and fill volumes and minimising the requirement to export and import of fill materials shall reduce potentially adverse impacts from the Project by reducing the demand on imported fill, the demand on the handling capacity on or offsite waste management, disposal or exempt sites and associated impacts from the transport of materials/waste. This may include the placement of bunds outside for the Project Site Boundary to provide screening to off-site receptors although this would be subject to the appropriate statutory procedures.
- The prioritisation of the use of secondary or recycled materials, with full consideration of appropriate Environment Agency / WRAP Quality Protocols and regulatory position statements[123] should also be considered. Use of recycled materials (such as recycled aggregate) or selection of construction materials with lower embodied carbon, will also reduce potentially adverse impacts from the use of materials.

10.10.2 Opportunities may also exist to minimise the potential impacts from material use and the generation of waste by implementing further specific design-related mitigation measures such as:

- Grading of embankments and site profiling to minimise cut and fill requirements
- Use of a pervious pavement and sustainable drainage systems (SuDS), reducing overall use of materials (e.g. macadam, pre-cast drainage pipes)
- Lorry Area lighting limited where possible, reducing overall use of materials (e.g. lighting columns etc.)

[123] For example, Quality Protocol: Aggregates from inert waste, October 2013; and the Regulatory Position Statement 017: The regulation of materials being considered for development of an end of waste Quality Protocol

11. Noise & Vibration

11.1 Executive Summary

11.1.1 Construction and operation of the Project will have adverse noise and vibration impacts for the local community. This chapter describes how they have been assessed and the outcome of the assessment. It is based on a robust and established methodology even though there are some unusual aspects of the Project in comparison with more typical highways projects. The chapter includes assessments of construction and operation of a full-time parking area and Operation Stack.

11.1.2 The study area includes 960 receptors. During construction four receptor groups are likely to be adversely affected in the daytime and there is one receptor that is likely to be subject to significant adverse effects. During operation, the noise analysis predicts that, in the short-term, five receptors will be subject to adverse effects and two receptors will be subject to significant adverse effects in the daytime due to operation of the full-time parking area. At night there will be 232 receptors with adverse effects and 19 receptors with significant adverse effects. During Operation Stack the assessment predicts there will be 216 receptors with adverse effects and three receptors with a significant adverse effect in the daytime. At night there will be 346 receptors with adverse effects and 29 receptors with significant adverse effects.

11.1.3 The objectives of national policy statements and guidance are to mitigate and reduce adverse impacts and to avoid significant adverse impacts. The Illustrative Design does not achieve these aims; further mitigation would enable the Project to reduce its noise effects by some degree but none of the mitigation measures considered within this assessment would eliminate all the significant adverse effects.

11.1.4 There are unlikely to be any operational vibration impacts but two receptors are expected to be adversely effected by vibration during construction.

11.2 Introduction

11.2.1 This chapter discusses the noise and vibration assessment of the Project comprising a full-time parking area accommodating 500 lorries and a temporary parking area accommodating an additional 3100 lorries for Operation Stack when required. Both construction and operational noise and vibration impacts and effects are considered. Operational impacts for the full-time parking area and Operation Stack parking area are considered separately.

11.2.2 Noise is a general term that is used to characterise unwanted sound. In the case of construction, such noise may arise from on-site construction activity or from vehicles travelling to and from the site. When operational, the Project will also produce noise from sources that include lorries entering and leaving the Site and from refrigeration units and engine idling on parked lorries. Close to access roads and to heavily trafficked routes within the area, individual vehicles may be audible within the traffic stream. Further away, the influence of separate vehicles will be less audible and the noise from lorries will become more steady. Most of the lorry movements will be at relatively low speeds and in low gears so the noise will be dominated by noise from the engines, exhaust and transmission systems and will be predominantly low frequency[124]. Conversely background noise from the M20 running at high speed and comprising a mix of heavy and light vehicles will be dominated by the interaction of tyres with the road surface. This tyre noise contributes a significant proportion of high frequency noise, especially in wet weather.

11.2.3 Vibration is a low frequency disturbance producing physical movement in buildings and their occupants and, like noise, can be produced during both the construction and operational phases of the Project. Vibration can be transmitted through the air or through the ground. Airborne vibration can be produced by the engines and exhausts of lorries, and is predominantly at low frequencies (below 100Hz). When it arises, ground-borne vibration is predominantly at very low frequencies (8-20Hz) and is produced by machinery during construction and by the interaction between wheels and the road surface.

11.2.4 Appendix 11.1 contains details of the traffic data used in this assessment and an error sensitivity analysis.

11.3 Regulatory / Policy Framework

Legislation

Local Authorities have statutory controls on noise and vibration. Under Section 60 of the Control of Pollution Act 1974 the Local Authority has powers to impose conditions on how construction work should be carried out to control noise. Alternatively, an application can be made in advance to the Local Authority under Section 61 of the Act, to obtain prior consent for construction works setting out the details of the steps that will be taken to control noise.

11.3.1 The Environmental Protection Act 1990[125] places a duty on Local Authorities to serve abatement notices where noise from premises, vehicles and machinery is judged to constitute a statutory nuisance. The Act does not apply to road traffic noise but may apply to construction activity and to the Lorry Area.

[124] Frequency relates to the pitch of a sound and has units of cycles per second, denoted by Hz. Environmental noise below 250Hz is often described as low frequency and noise above 1kHz as high frequency.

[125] Parliament of the United Kingdom (1990) Environmental Protection Act, C.43.

Noise Insulation Regulations

11.3.2 The Noise Insulation Regulations 1975 (amended 1988)[126] were made under Part 2 of the Land Compensation Act 1973[127] for the obligatory and discretionary provision of noise mitigation measures for dwellings adjacent to new highways. One of the criteria for a property to qualify for insulation in living rooms and bedrooms is that the façade level is at least 68dB $L_{10,18h}$[128].

National Planning Policy Framework

11.3.3 The National Planning Policy Framework[129] (NPPF) came into force in March 2012.

11.3.4 The NPPF states that*: "the planning system should contribute to and enhance the natural and local environment by: ...preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability."*

11.3.5 The NPPF also states that: *"Planning policies and decisions should aim to:*

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions placed on them because of changes in nearby land uses since they were established
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions"

11.3.6 In describing the factors that influence whether noise could be a concern the NPPF states that "*In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the overall noise level may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur*."

[126] Statutory Instrument (1975) The Noise Insulation Regulations. No. 1763 "Building and Buildings".
[127] Parliament of the United Kingdom (1973) Land Compensation Act – Part 1, C24.
[128] noise indices are defined fully in paragraph 12.5.2, below.
[129] Department for Communities and Local Government (2012) National Planning Policy Framework.

Noise Policy Statement for England

11.3.7 The Noise Policy Statement for England[130] (NPSE) was issued by the Department for the Environment, Food and Rural Affairs (DEFRA) in 2010. Its purpose is to *promote "good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development." The three main aims are to:*

- "Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development
- Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development
- Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development"

11.3.8 There are no pre-defined criteria for these adverse and significant adverse impacts as it is acknowledged that they will be different for different sources, different receptors and at different times.

National Planning Practice Guidance

11.3.9 National Planning Practice Guidance[131] (NPPG) is the web-resource launched in March 2014 by the Department for Communities and Local Government providing guidance in a "usable and accessible way" enabling information that was previously only published in separate documents to be found quickly and simply.

11.3.10 NPPG advises that *"noise needs to be considered when new developments may create noise"*. It states that noise can override other planning concerns but that *"neither the NPSE nor the NPPF expects noise to be considered in isolation, separately from the economic, social and other environmental dimensions of [a] proposed development."*

11.3.11 It also advises that: *"local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:*

- Whether or not a significant adverse effect is occurring or likely to occur
- Whether or not an adverse effect is occurring or likely to occur
- Whether or not a good standard of amenity can be achieved

[130] DEFRA,(2010) "The Noise Policy Statement for England".
[131] Department for Communities and Local Government (2014), http://planningguidance.communities.gov.uk/

In line with the Explanatory Note of the NPSE, this would include identifying whether the overall effect of the noise exposure (including the impact during construction wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation."

11.3.12 It defines the significant observed adverse effect level (SOAEL) as *"the level of noise exposure above which significant adverse effects on health and quality of life occur"* and the lowest observed adverse effect level (LOAEL) as *"the level of noise exposure above which adverse effects on health and quality of life can be detected."*

11.3.13 The guidance expands on adverse effect levels by stating *"noise has no adverse effect so long as the exposure is such that it does not cause any change in behaviour or attitude. The noise can slightly affect the acoustic character of an area but not to the extent that there is a perceived change in quality of life. If the noise exposure is at this level no specific measures are required."* However, as the exposure increases it crosses the LOAEL boundary and may lead to changes in behaviour and attitude such as *"having to turn up the volume on the television or needing to speak more loudly to be heard."*

11.3.14 Above LOAEL *"consideration needs to be given to mitigating and minimising those effects."* Increasing noise exposure further leads to crossing the SOAEL boundary. At this *level "noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present."* For exposure above SOAEL *"the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout."*

11.3.15 The noise levels used for LOAEL and SOAEL in this assessment are defined in Section 11.5.

11.3.16 The guidance continues to state that at *"the highest extreme, noise exposure would cause extensive and sustained changes in behaviour without an ability to mitigate the effect of noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be prevented from occurring."*

11.3.17 The guidance has effectively therefore introduced an Unacceptable Adverse Effect level (UAEL) above SOAEL. A table in the guidance states that the action for development that leads to exposure above SOAEL is "avoid" and the action above UAEL is "prevent". The table cites examples of the effects above UAEL as *"extensive and regular change in behaviour and/or an ability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant medically definable harm, e.g. auditory and non-auditory."*

11.3.18 As there is some similarity between the required actions of "avoid" and "prevent" and because UAEL is not cited in the NPPF or NPSE, no value for UAEL has been provided in this assessment although it is acknowledged that exposures above the SOAEL defined in Section 11.5 produce progressively greater adverse effects as exposure is increased.

Local Policy

11.3.19 Although Shepway District Council (SDC) has procedures for dealing with noise nuisance, there are no noise and vibration related planning policies.

11.3.20 Kent County Council (KCC) has a memorandum of understanding[132] (MOU) between listed local authority services (including SDC) in relation to noise aspects of applications for roadworks through the county. The purpose of this is to prevent unnecessary disturbance from roadworks. The MOU states that KCC will not issue permits for work outside of weekdays (0700 to 1900) and Saturdays (0800 to 1300) unless certain conditions are met, except in the event of emergencies.

11.3.21 As with the SDC, the KCC does not have a noise and vibration related planning policy.

Guidance

IEMA Guidelines for Environmental Noise Impact Assessment

11.3.22 The Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Assessment[133] provide guidance on noise assessment in the Environmental Assessment context. The guidelines define key methodologies used within the noise impact assessment process, and provide advice on their limitations. They are relevant to all scales of project. In the context of this assessment the IEMA guidelines have been used to inform the definition of receptor sensitivity and the relation between magnitude of impact and significance of effect of noise changes upon those receptors.

11.3.23 As noise levels generally vary with time, a considerable effort has been devoted to the development of noise metrics to characterise a noise climate as a readily-understood single-figure description. Examples of these are the L_{10} and L_{eq} indices discussed in paragraph 11.5.2. However, the guidelines point out that although many of the adverse effects of noise increase with noise level, whichever metric is used, the precise exposure-response relationships are still the subject of research.

11.3.24 The guidance sets out a cause-effect model for the behavioural reaction to noise in three levels. At the first level noise disturbs activity by causing distraction or interference. Such effects may be classified as *"detection, distraction, speech*

[132] Kent County Council, http://www.kent.gov.uk/__data/assets/pdf_file/0004/5278/Kent-Permit-Scheme-noise-memorandum-of-understanding.pdf
[133] Guidelines for Environmental Noise Impact Assessment, V1.2 (2014), Institute of Environmental Management and Assessment.

interference, disruption of work or mental activity and sleep disturbance." The response to noise at the second level is *"annoyance"* and the response at the third level is *"overt reaction, including complaints."* The guidance points out the dose-response curves represent typical responses and not the response of any particular individual. There is generally no point at which noise is "acceptable" or equally "intolerable". There is no step change in response to noise and some people will *"remain highly annoyed [by noise] despite the fact that they are exposed to relatively low noise levels."*

11.3.25 The guidance notes that while many dose-response relationships are based on steady states, research indicates that "relatively higher levels of disturbance are experienced in the short-term immediately after a change in noise has occurred." This seems particularly relevant to the Lorry Area both in terms of the short-term impact on the opening of the full-time parking area and the short-term nature of Operation Stack (typically 24hrs at a time, eight times per year).

11.3.26 The guidance provides useful terminology definitions for noise impact assessments:

- Noise **impact** is the difference in the acoustic environment before and after implementation of the proposals, and may be an increase or a decrease.
- Noise **effect** is the consequence of the noise impact such as the degree of annoyance and is therefore dependent on both the receptor and its sensitivity, and may be negative or positive.
- **Significance** of effect is the evaluation of the noise effect and the decision on whether or not the noise impact is significant.

11.3.27 This terminology has been adopted within this assessment.

The Design Manual for Roads and Bridges

11.3.28 The Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 7; HD213/11[134] describes a methodology for the assessment of road projects in the UK and reflects conventional EIA methodology. A method for assessment of both long and short-term impacts is provided. Paragraph 11.5.25, below, shows that DMRB describes a short-term change in noise levels (noise impact) of 1dB or more as non-negligible but raises this to 3dB for the long-term. Note however, that NPPF makes an exception for locations that are already subject to high noise levels as discussed in 11.3.6: for these locations even a small increase in noise may result in a significant adverse effect and for the purposes of this assessment a small increase is define as increase of 1dB and applies in both the short-term and the long-term.

[134] DMRB (2011) Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD213/11 Noise and Vibration.

Calculation of Road Traffic Noise

11.3.29 Calculation of Road Traffic Noise (CRTN)[135] provides procedures for predicting noise levels at sensitive receptors for a given flow of road traffic. These methodologies are used in the determination of entitlement under the Noise Insulation Regulations (see paragraph 11.3.2, above) and for traffic noise change assessments undertaken in accordance with the DMRB methodology cited in 9, above.

The World Health Organisation Guidelines for Community Noise

11.3.30 The World Health Organisation (WHO) Guidelines for Community Noise, 1999[136] are intended to guide the long-term management of community noise to help meet the WHO's core objective of *"the attainment by all peoples of the highest possible levels of health."* They set out various recommended noise guide values for specific activities.

11.3.31 The guidelines state that *to "protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB L_{eq} on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB L_{eq}. Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development*."

World Health Organisation Night Noise Guidelines for Europe

11.3.32 The WHO Night Noise Guidelines for Europe, 2009[137] reviewed available evidence of health effects of night-time noise across Europe, and derived health-based guideline values. For levels of $L_{night,outside}$ between 30dB and 40dB the guidance states that a number of effects on sleep are observed including *"body movements, awakening, self-reported sleep disturbance, arousals. The intensity of the effect depends on the nature of the source and the number of events. Vulnerable groups (for example children, the chronically ill and the elderly) are more susceptible. However, even in the worst cases the effects seem modest. $L_{night,outside}$ of 40 dB is equivalent to the lowest observed adverse effect (LOAEL) for night noise."*

11.3.33 The guidelines state that an interim target (IT) of 55dB $L_{night,\ outside}$ is recommended *"in the situations where the achievement of night noise guidelines is not feasible in the short run for various reasons. It should be emphasized that IT is not a health-based limit value by itself. Vulnerable groups cannot be protected at this level.*

[135] Department of Transport (1988) Calculation of road traffic noise.
[136] World Health Organisation (1999) Guidelines for Community Noise.
[137] World Health Organisation (2009) Night Noise Guidelines for Europe

Therefore, IT should be considered only as a feasibility-based intermediate target which can be temporarily considered by policy-makers for exceptional local situations."

British Standard (BS) 5228 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise

11.3.34 BS 5228[138] provides a methodology for predicting noise levels generated by fixed and mobile plant used in a range of typical construction operations. The standard includes a database of noise levels at a reference distance of 10m from the source and a simple noise propagation model that can be used to make allowances for effects such as source-receiver distances, ground properties and utilisation time.

BS 5228 Code of construction practice for noise and vibration control on construction and open sites – Part 2: Vibration

11.3.35 BS 5228[139] provides guidance on the effect of vibration and the likelihood it will cause complaint and cosmetic damage to buildings. The assessment of vibration impacts arising due to the Project has been carried out in accordance with this Standard.

EU Directive 2002/49/EC

11.3.36 Under Directive 2002/49/EC[140], more commonly known as the Environmental Noise Directive (END), member states are required to draw up Action Plans for major roads to aid in management of environmental noise. The Lorry Area is not a major road so it outside of scope of this Directive.

11.3.37 However, it is noted that there are three Important Areas within the study area, at Sellindge, Newingreen and Stanford. Important Areas, described as noise "hotspots" by DEFRA[141], correspond to locations where 1% of the population are affected by the highest noise levels from major roads according to the results of the strategic noise mapping produced under the END. DEFRA report that it has been estimated that there about 1130 such Important Areas due to major roads outside agglomerations in England and that these are associated with just over 50,000 people.

[138] BSI (2009, amended 2014) British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.
[139] BSI, 2009, amended 2014. "British Standard BS 5228 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration."
[140] European Commission (2002) Environmental Noise Directive 2002/49/EC.
[141] DEFRA, (2006, amended 2013) Draft Noise Action Plan: Roads (Including Major Roads) Environmental Noise (England) Regulations.

11.4 Study Area

11.4.1 Construction and operational noise and vibration have been assessed with a desktop study over an area that extends to 2 km from Project Site Boundary. The main source of operational noise associated with this Project is from moving vehicles, predominantly lorries. In the UK the assessment methodology that is used for road projects is the design manual for roads and bridges (DMRB) described paragraph 9. While DMRB is generally associated with a study area derived from a boundary 1 km from a carriageway edge, a wider area is used in this study because the nature of the source is somewhat different from a conventional road project: the Lorry Area is associated with atypical traffic flows (comprising a very high proportion of lorries and high night-time flows) and the Project Site is itself a wide area in lieu of the linear form of a road. The selection of an unusually large study area ensures that the effects on all sensitive receptors that may be adversely affected are captured. It is noted that there are 960 receptors including residential and non-residential human receptors, farms, offices, and places of worship within the study area.

11.4.2 Noise from the vehicles on the local roads (including minor roads, the B2067 and B2068) within the study area has been assumed to be the same both with and without the Project. The assessment therefore does not include noise impacts arising from any changes on the local roads. It also does not include changes in roads throughout Kent that are affected by the current implementation of Operation Stack or any part of the strategic road network (including the M20 and A20) because there is insufficient data to evaluate these effects and consideration of them would lead to an impractically large study area. Unfortunately, this does mean that any beneficial noise and vibration effects associated with the Project as an alternative to the current implementation of Operation Stack are not included in this assessment although there is significant anecdotal evidence that noise from Operation Stack currently adversely affects large numbers of receptors both with short-term parking along the M20 carriageway and transit to so-called “fly-parking”. These improvements cannot be quantified at present but do contribute to the NPSE aim (11.3.7) of improving the health and quality of life.

11.4.3 A map of the study area is shown in Figure 11.1. The figure also shows the Project Site Boundary within the (shaded) study area.

11.5 Assessment Methodology

11.5.1 The assessment of construction and operational noise, and construction and operational vibration, are each considered separately.

Metrics and indices

11.5.2 In this assessment, noise is expressed in terms that include both ambient levels and changes in noise level from the existing baseline (noise impacts – see 7). The metrics used include L_{A10}, the A-weighted[142] sound level in decibels[143] (dB) that is exceeded 10% of the time which is used widely as the standard index for traffic noise and the L_{Aeq} which is the equivalent continuous sound level that has the same A-weighted acoustic energy as a fluctuating noise. Both L_{A10} and L_{Aeq} are associated with periods of time such as 18 hours of daytime (from 0600 to midnight) so are usually denoted with nomenclature that includes the A-weighting and the time period as in $L_{A10,18h}$. In this assessment all dB values are A-weighted unless specified otherwise and so the A suffix has been omitted[144]. A further metric used for night-time noise assessment is $L_{night,outside}$; this is $L_{eq,8h}$ for the night-time period from 23:00 to 07:00. Unless stated otherwise all the noise values in this assessment are free-field levels representing the noise levels that are unaffected by reflections in close proximity to reflecting surfaces such as buildings but they do include the effects of topography, and all highway cuttings and embankments. In some cases noise values are expressed as façade levels – these are typically 2 to 3dB higher than free-field levels because they include the reflection of noise close to the façade of a building that faces the noise source.

11.5.3 The IEMA guidelines (3) show that *"the use of standard noise indicators may fail to reveal adequately the actual noise impact"* of a project. In particular, the guidance points out that changes in noise character may require the use of additional metrics to fully characterise the impact and significance of the new noise source particularly if, say, a source of transient noise is introduced into an environment that is dominated by steady-noise or vice-versa. For most receptors the noise from the Project will be dominated by the passage of vehicles in and out and within the Lorry Area. Despite the differences set out in paragraph 11.2.2, the character of this noise is likely to be somewhat similar to the existing ambient noise from road traffic, from both the M20 and local roads for which the L_{10} index is widely used in the UK, albeit with an increase in low frequency noise as discussed in 11.2.2. Moreover the IEMA guidelines state *"L_{10} can be used for road traffic in specified situations."*

11.5.4 A further justification for the use of L_{10} and (L_{eq} values derived from L_{10}) is that these indices may be calculated for the Lorry Area using the established, robust calculation procedures set out in CRTN (30) incorporating the vehicle sources and local topography. There is no known equivalent calculation procedure for other indices such as L_{max} (the maximum transient sound level) or L_{90} (the level exceeded 90% of the time, often described as background noise level) so these cannot be computed for either the baseline or Lorry Area scenarios.

11.5.5 Ground-borne vibration is usually assessed in terms of peak particle velocity (PPV) which has units of mm/s. The low frequency of this vibration means that it is not

142 A-weighting compensates for the relatively low sensitivity of human hearing to low and very high frequencies and A-weighted sound levels are usually expressed in dB(A) or in dB if the A-weighting is already implied.
143 Decibels are the units used for sound pressure levels. The decibel scale is logarithmic (rather than linear). The threshold of human hearing is approximately 0dB(A) and the threshold of pain is approximately 130dB(A). In practice these levels are seldom experienced and typical levels lie in the range 30dB(A) for the night-time level in a quiet bedroom and 90dB(A) for the kerbside of a busy street.
144 Some of the metrics (such as L_{10}, but not L_{eq}) also involve specification of a sound meter time constant. For all metrics in this report the time constant is F and so no F suffix is used in the nomenclature.

audible but can be felt when at higher levels, but still well below the levels needed to produce cosmetic damage in buildings.

Construction

11.5.6 BS5228 (5) provides guidance concerning methods of predicting and assessing noise and vibration from construction sites including ground treatment and related civil engineering works. The standard is divided into two parts. Part 1 is concerned with noise and Part 2 is concerned with vibration.

11.5.7 Construction noise has been calculated in accordance with BS5228-1 for the plant listed in the table below for three activity phases: site clearance and preparation; road construction and laying; and construction of buildings. The percentage on-time column indicates an estimate of the proportion of time during which the item will be producing noise. The data source column shows the plant reference data from BS 5228-1.

Table 11.1: Plant used in BS5228 assessment of construction noise

Activity phase	Main items of noise emitting plant	Sound Pressure Level [dB] at 10m	On-time %	Data Source
Site clearance and preparation	Excavator	78	70	Table C2 ref 3
	Dump Truck	79	30	Table C2 ref 30
	Tipper Truck	79	30	Table C2 ref 30
	Roller	81	30	Table C2 ref 36
	Dozer	79	30	Table C2 ref 11
Road construction and laying	Asphalt paver and tipper lorry	77	50	Table C5 ref 31
	Vibratory roller[145]	80	L_{max}	Table C5 ref 21
Construction of buildings	Tracked support crane	67	20	Table C3 ref 28
	Concrete mixer and concrete pump	78	20	Table C4 ref 32
	Forklift truck	76	50	Table C6 ref 27
	Hammering	77	50	Table C3 ref 4
	Lorries delivering materials[23]	80	L_{max}	Table C2 ref 34
Concrete batching	Water pump	77	65	Table D7 ref 11
	Concrete batching plant	80	65	Table D6 ref 11
	Dump truck	82	80	Table D9 ref 23

[145] The noise values given for the vibratory roller and for lorries delivering materials are maximum sound pressure levels, L_{max}. The transient noise from these sources is of short duration and has not been included in the calculation of receptor noise levels for construction.

11.5.8 Table 11.2 shows the approximate distances from the receptors to the closest point of the Project Site Boundary and to the centre of the Project Site. The highest noise levels at receptors are produced when construction activity takes place at the closest point to the Project Site Boundary and more typical construction noise levels are produced for activity at the Project Site centre. The concrete batching plant will be installed within the Project Site and close to a water source but not close to any receptors.

Table 11.2: List of groups of sensitive receptors used in the construction noise assessment

Location	Distance [m]	
	Project Site Boundary	Project Site Centre
Stanford North	430	950
Kennett House	35	400
1-8 Kennett Lane	75	640
Holmdene	100	620
Stanford South	210	940
Westenhanger North	100	1100
Westenhanger Castle	180	780
Westenhanger South	590	1330
Red House Farm	880	1370
Barrow Hill Farm Cottages	860	1370
Barrowhill South	700	1240
Barrowhill North	800	1240
Sellindge South	500	1300
Sellindge North	670	1100
Brookgate Cottage	240	750
Brook Farm Kennels	50	540
Benham Villa	80	750
Gyminge Brook Cottage	30	460
Wagon Lodge	20	450
Hope Farm	240	780
Hayton Manor Farm	410	810

11.5.9 BS 5228 Part 1 does not define strict criteria to determine the significance of noise impacts although examples of how limits of acceptability have been applied historically and some examples of assessing significance are provided in the standard: Example Method 2 - 5 dB(A) change (Annex E 'Significance of Noise Effects' Section E.3.3) has been adopted for the assessment of effects at sensitive receptors as the approach considers the expected changes in ambient noise levels and better reflects conventional environmental assessment methodologies compared with the use of fixed or absolute noise limits.

11.5.10 Noise levels generated by construction activities are deemed to be potentially significant if the total noise (pre-construction baseline noise plus construction noise) exceeds the pre-construction baseline noise by 5dB or more, subject to lower cut-off values from the site alone of 65dB (daytime), 55dB (evening) and 45dB L_{eq} (night-time) from construction noise alone; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact.

11.5.11 The daytime period is defined in BS5228 as 07:00 to 19:00, the evening period as 19:00 to 23:00 and the night-time period as 23:00 to 07:00.

11.5.12 The standard also includes examples of thresholds to determine the eligibility for noise insulation and temporary rehousing. For week-day construction activity between 0800 and 1800 the noise level threshold is 75dB$L_{eq,10h}$.

Construction traffic

11.5.13 Construction traffic including both material deliveries and staff access using the existing road network is evaluated based upon its likely contribution to increase in the overall traffic flows on approach routes. An increase in traffic flow of 25% would be required to increase noise levels by 1dB - the lowest change perceptible in the short-term (9). This is considered to be unlikely as access is likely to be predominantly via the M20 and therefore construction traffic is out of scope of this assessment.

Construction Vibration

11.5.14 In general, vibration arising from construction activities is ground-borne and, for example, in the case of typical earthworks activities, may be generated by operations such as ground compaction, piling and the movement of vehicles over irregular surfaces. It is generally recognised that it is not realistic to undertake a detailed prediction and assessment of construction vibration as it is a complex subject comprising many factors.

11.5.15 The Transport Research Laboratory (TRL) has published the results of a series of measurements of vibration levels at distances from a range of construction works146. The ground conditions in the area of the source and receiver position and of the intervening ground are not specified in that report, however it is considered to be sufficiently representative for the purposes of this assessment. The data is reproduced in Table 11.3 with vibration levels expressed as peak particle velocity.

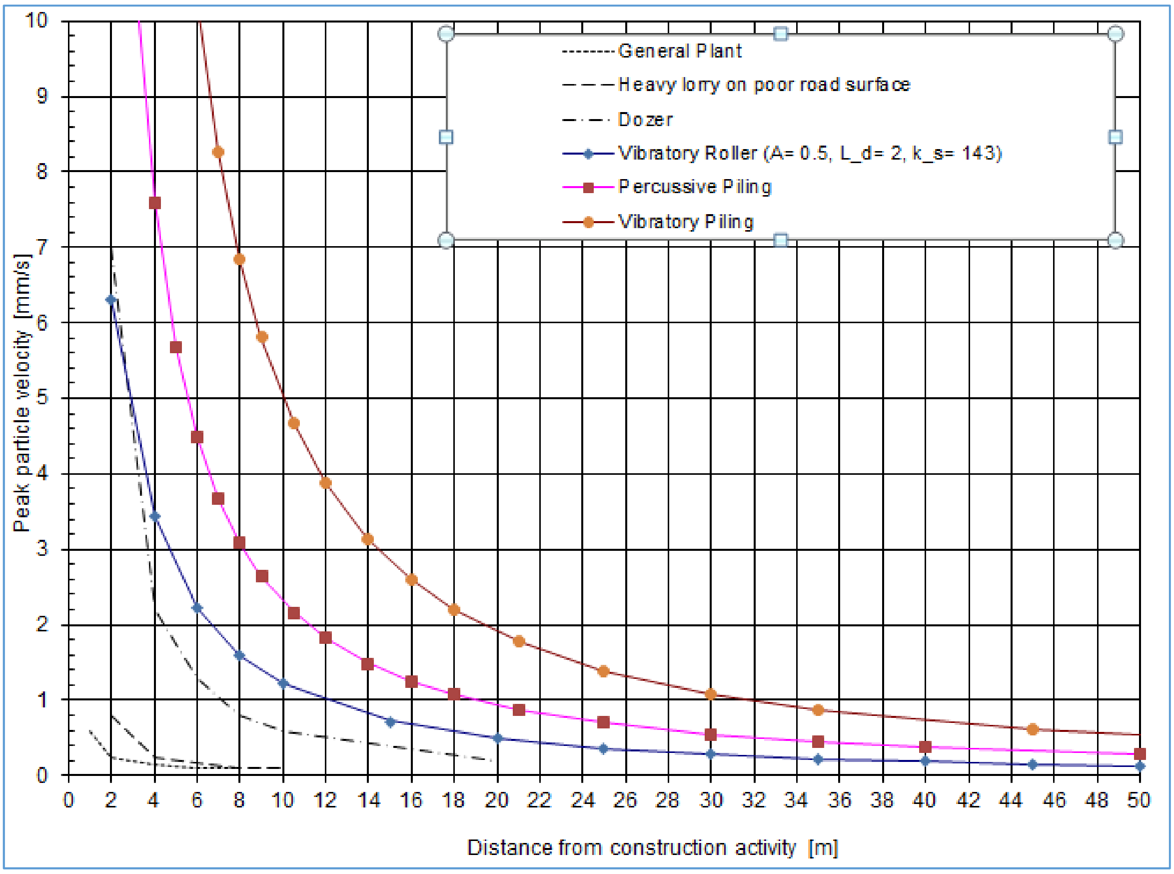
[146] DoT (1986) Transport and Road Research Laboratory Report 53. Ground Vibration Caused by Civil Engineering Works.

Table 11.3: Estimated peak particle velocities at distances between construction plant and vibration measurement positions

Construction plant	Distance between construction Site and vibration measurement position [m]	Peak particle velocity at measurement position [mm/s]
General construction traffic including haul routes	1	0.60
	2	0.24
	4	0.14
	6	0.10
	≥8	<0.10
Heavy lorry on poor road surface	1	2.20
	2	0.80
	4	0.24
	6	0.16
	8	0.10
	≥10	<0.10

11.5.16 BS 5228 Part 2 provides empirical relationships for ground-borne vibration arising from a range of mechanised construction activities including vibratory compaction. The chart below shows the level of vibration from typical construction plant expressed as peak particle velocity (mm/s) as a function of distance from the works.

Construction Generated Vibration Based on BS5228 Part



11.5.17 BS 5228 Part 2 provides guidance on the effect of ground-borne vibration and the likelihood that this will cause complaint and cosmetic damage to buildings. The standard does not indicate whether particular vibrations are significant.

11.5.18 However, the standard does provide the following guidance on effects:

- At a vibration level of 0.14mm/s “vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction”
- At a vibration level of 0.3mm/s “vibration might be just perceptible in residential environments”
- At a vibration level of 1.0mm/s “it is likely that vibration in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents”
- At a vibration level of 10mm/s “vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.”

Operational noise

11.5.19 This assessment is based on the following operational scenarios:

- Do minimum – normal flows on all routes (that is without the full-time parking area or Operation Stack parking area).
- Do something scenario 1 – full-time parking area. Normal flows on all routes and with the full-time parking area in daily use with 500 lorry spaces and 3000 lorry movements (1500 in and 1500 out) in any 24 hour period with a maximum of 1000 lorry movements (500 in and 500 out) in any one hour period in the daytime. Half the lorries enter the Lorry Area from each of the eastbound and westbound carriageways of the M20 via junction 11 through the Stop24 Service Area and half the lorries leave the Lorry Area using each of the eastbound and westbound carriageways via junction 11. The full time parking area is south of the M20 and area the north of the M20 is not used. The M20 entry and exit ramps to the Operation Stack parking area are not used.
- Do something scenario 2 – Operation Stack. Normal flows on all routes except the eastbound M20 with the whole parking area used for Operation Stack comprising up to 3600 lorry spaces. The eastbound M20 is speed-limited to 40 mph. 67% of eastbound lorries leave the M20 via the new exit lane (diverge) and enter the parking area to the north of the M20. The remaining 33% continue east towards Dover where they are turned around and then join the Lorry Area from the westbound junction 11 exit. These lorries then proceed over the new bridge to join the lorries entering direct from the new eastbound exit. A proportion of lorries entering the Operation Stack parking area proceed to the parking area to the south of the M20 via the new bridge over the M20 from the parking area to the north. All lorries eventually leave the parking area via the new lane (merge) direct on to eastbound carriageway of the M20. Flow rate is approximately 250 lorries per hour in the daytime and 50 lorries in the night-time. Peak hour flow is a maximum of 1600 lorry movements (800 in and 800 out) in any one hour period in the daytime.

11.5.20 The Lorry Area in Do something scenarios 1 and 2 represents a noise source that is somewhat different from a conventional road widening or new road project so the assessment methodology set out in DMRB (9) is not directly applicable. The Lorry Area is different for several reasons including:

- The path taken by lorries around the area is not the same for all vehicles because each lorry will proceed from the M20 to the Lorry Area entrance and then follow one of a large number of routes to a unique parking space. Following the parked period, the lorry will follow one of several routes to the Lorry Area exit and from there proceed back on to the M20.
- The traffic volume and mix will not correspond to conventional traffic flows during Operation Stack periods particularly at the times corresponding to the maximum hourly number of movements.
- Speeds within the Lorry Area will be lower than highway speeds.
- Some of the lorries within the area will have refrigeration units that will produce sound for extended periods when parked.
- Sources may include horns, air-brakes, starter motors, door slamming, shouting, and vehicle audio systems which are not included within DMRB.
- Operation Stack is not a daily occurrence so is not adequately represented by the annual average AAWT[147] flow figures.

11.5.21 For these reasons the noise due to the Project is calculated as follows:

- For *noise calculation purposes only*, the Project operational noise sources are assumed to comprise 'roads' within the Project Site boundary and stationary lorries. The 'road' within the area boundary represents the routes taken by lorries between the Site entrance and exit. For the full-time parking area this route is the shortest route from the Stop24 Service Area entrance and exit to the 500 space area and the periphery of the 500 spaces. For the larger, 3600 space Operation Stack Lorry Area the routes are in close proximity to the periphery of the parking area boundary but are segmented to represent typical routes that will be traversed within the parking area. In this way the routes represent the total distance typically travelled by lorries within the area and include coverage of the whole area so that noise levels are not underestimated as they would be if, say, the lorries were assumed to be noise sources concentrated at the centre of the Lorry Area. The routes are shown in Figure 11.2 and the number of lorries traversing each route is in direct proportion to the number of lorry parking spaces enclosed by the route.
- The stationary sources represent lorries that produce a continuous steady noise including lorries running at idle and refrigerated lorries. These are assumed to be uniformly distributed throughout the full-time parking area or Operation Stack parking area as appropriate. 10% of the parked lorries (50 or 360 respectively) are assumed to produce noise that has a sound power level[148] of 93dB(A) at a

[147] Annual Average Weekday Traffic is used in DMRB to represent traffic flows from which noise levels are calculated.
[148] Sound power level is the conventional way of describing the noise output of a source and is A-weighted as for sound pressure levels. The figure of 93dB(A) was based on seven sets of data in the impact assessment of an earlier design for the Lorry Area.

source height of 4 m and radiating noise equally in all directions. Calculations have assumed that the lorries produce no effective barrier to shield noise (there are too many gaps between lorries for them to be an effective barrier) but also no reflections of noise from the sides of any of the lorries.

11.5.22 Notwithstanding these limitations the calculation procedure and impact magnitude assessment methodology given in DMRB are broadly applied in this assessment. The principal calculation methodology is CRTN (11.3.29) as implemented in CadnaA and makes source adjustments including corrections for vehicle speeds, percentage of heavy vehicles and gradient, and propagation corrections for distance, ground absorption and topography. CadnaA has been used to calculate baseline (existing) conditions in the study area in addition to noise levels arising from the Project. This has the advantage that any systematic errors in the noise estimation calculations are the same for both baseline and the Project, and therefore have less influence when considering differences between the scenarios and baseline. A disadvantage is that baseline noise levels are underestimated due to the exclusion of all non-road traffic sources including animals (particularly farm animals and birds), and anthropogenic sources such as aircraft, railways and farm machinery.

11.5.23 The DMRB standard states that the impact of a road project at any location should be reported in terms of changes in the absolute noise level and that in the UK the standard index used for traffic noise is the $L_{10,18h}$ level. The standard also states that $L_{night,outside}$ (11.5.2) is to be used to assess the impact from road traffic at night.

11.5.24 It is noted that the Do-something scenarios (11.5.19) include maximum one-hour traffic flows at higher rates than the average rate for the 24-hour period. The increased traffic flow during these ‘peak’ hours will produce higher noise levels than the average flows so it is appropriate to consider the impact of these peak hours separately from the day and night-time impacts. This separate consideration of the peak hours is a departure from the procedure set out in DMRB which would normally only require an assessment over the 18-hour day from 06:00 to 24:00 and 8-hour night from 23:00 to 07:00 but is necessary to assess the impact of these peak flows which could give rise to higher noise levels than for average flow rates.

11.5.25 DMRB recognises that different criteria apply to the perceptibility of noise level changes over the short and long-terms. For short-term changes in road traffic noise, the smallest change in road traffic noise level that is considered perceptible is 1dB L10, 18h. In the long-term, a change of 3dB L10, 18h in road traffic noise is considered to the smallest perceptible change. Consequently, different scales are applied for assigning magnitude of impact for short and long-term impacts due to changes in road traffic. These are presented in Table 11.4 and are also be applied to changes in Leq and Lnight, outside within this assessment.

Table 11.4: Classification of Magnitude of Short and Long-term Noise Impacts due to Changes in Road Traffic Noise

Magnitude of Impact	Noise Change [dB]	
	Short-term	Long-term
No change	0	0
Negligible	0.1 to 0.9	0.1 to 2.9
Minor	1 to 2.9	3 to 4.9
Moderate	3 to 4.9	5 to 9.9
Major	5+	10+

11.5.26 As the full-time parking area is expected to operate every day of the year it has been assessed using the changes in L_{10} for both the short-term and the long-term on an annual average basis. Conversely Operation Stack is a temporary measure that will be used infrequently and only for short periods. Its impact has therefore been assessed using only the short-term criteria and only to compare noise changes for the daytime and night-time periods in which Operation Stack is invoked (and not therefore averaged over a whole year.) For both the full-time parking area and the Operation Stack parking area, the baseline is the same annual average for daytime or night-time as appropriate. For the full-time parking area the assessment is made using the $L_{10,T}$ change for the annual average 18 hour daytime and 8 hour night-time but for Operation Stack the assessment is made against the change in the 18 hour day and 8 hour night for the days and nights which Operation Stack is invoked: an assessment using the **annual average** noise levels including the small number of days in which Operation Stack is invoked and remaining days in the year in which it is not invoked would significantly underestimate the noise impact for the days when Operation Stack was invoked.

Operational vibration

11.5.27 DMRB advises *"Significant ground-borne vibrations may be generated by irregularities in the road surface. Such vibrations are unlikely to be important when considering disturbance from new roads and an assessment will only be necessary in exceptional circumstances. Furthermore, as the irregularities causing ground-borne vibration can be rectified during maintenance work, relief of these vibrations should not be presented as a benefit of a new road project."*

11.5.28 For the above reasons, ground-borne vibration is scoped out of this assessment and has not been considered further in this assessment although care will be taken to ensure that there are no discontinuities between sections of hardstanding or drainage infrastructure.

11.5.29 Low frequency noise from vehicle exhausts may induce vibration (rattle) in light building elements such as windows i.e. airborne vibration. DMRB advises that vibration disturbance most closely parallels exposure to traffic noise levels, and that subject to professional judgement relating to conditions under which the research was undertaken, disturbance from vibration may be quantified along similar lines to nuisance from noise (the original research was restricted to properties within 40 m of the carriageways where there were no noise barriers or other screening). DMRB notes that traffic induced vibration is expected to affect a very small percentage of people at noise exposure levels below 58 dB $L_{A,10}$.

Assessment of Value / Sensitivity

11.5.30 Noise affects people in a number of different ways. This may include factors such as annoyance and sleep disturbance, enjoyment of quiet spaces, ability to communicate with others, ability to concentrate at home or at work, participation in social and community activities. As a consequence, it is not appropriate to consider a single criterion when assessing the value of an existing noise environment. This echoes the advice in the IEMA guidelines as discussed in paragraph 11.5.3. Table 11.5 sets out sensitive receptors that are considered in this assessment and Table 11.6 sets out criteria to be used in determining the sensitivity of a receptor. It should be noted that, generally, the variation in the sensitivity of receptors in terms of noise impact is taken into account by applying different scales to classify magnitude of impact (e.g. by using different scales for daytime and night-time) rather than by varying the assignment of sensitivity to specific types of receptors.

Table 11.5: Noise and vibration resources and receptors

Resource / Receptor	Description
Dwellings	Houses and any other building in residential use such as public houses, hotels etc.
Commercial premises	Shops, offices etc.
Community facilities	Libraries, public halls, sports centres, theatres, concert halls, places of worship etc.
Recreational facilities	Amenity areas, footpaths, sports grounds etc.
Educational establishments	Schools, university campus etc.
Designated sites	If relevant, environmentally sensitive areas and buildings sensitive to the effect of noise and vibration.
Other	Any other premises highly sensitive to noise and vibration such as laboratories etc.

Table 11.6: Sensitivity criteria

Sensitivity	Criteria
High	Receptors where occupants or activities are particularly susceptible to noise. Examples include: Residences, quiet outdoor areas used for recreation, conference facilities, auditoria/studios, schools in daytime, hospitals/residential care homes and religious institutions e.g. churches or mosques.

Sensitivity	Criteria
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance. Examples include: offices, restaurants and sports grounds where spectator noise is not a normal part of the event and where quiet conditions are necessary (e.g. golf or tennis).
Low	Receptors where distraction or disturbance from noise is minimal. Examples include: residences and other buildings not occupied during working hours, factories and working environments with existing high noise levels and sports grounds where spectator noise is a normal part of the event.

11.5.31 The majority of the receptors that would be affected by noise and vibration impacts from the Project are residential dwellings and places of worship. This assessment therefore focuses on these receptors.

Assessment of Significance

11.5.32 Environmental assessment regulations and the NPPF (11.3.3) require that the assessment considers the significance of effects on noise sensitive receptors resulting from predicted noise impacts. LOAEL and SOAEL, introduced by NPSE (11.3.7) and applied in NPPG (11.3.9), have been defined for the Project based upon noise insulation threshold levels (11.3.2), WHO guidance (11.3.31, 11.3.33) and, for construction noise and vibration, guidance from BS5228 Parts 1 and 2 (11.3.35, 11.3.36).

11.5.33 The following sections set out LOAEL and SOAEL for each of the noise and vibration impacts described above. It should be noted that, where necessary, the daytime period base has been modified to 18 hours to align with the CRTN (11.3.29) assessment methodology.

Construction Noise

11.5.34 LOAEL for construction noise is considered to be an external free-field level of 65dB $L_{eq,T}$ from the site alone during daytime consistent with the lower cut-off value (daytime) of BS5228-1 example method 2 (11.5.9).

11.5.35 LOAEL for construction noise is considered to be a free-field level of 45dB $L_{eq,T}$ from the site alone during the night-time consistent with the lower cut-off value (night-time) of BS5228-1 example method 2 (11.5.9).

11.5.36 SOAEL for construction noise is derived from BS5228 Part 1 and is the noise insulation trigger level of 75dB $L_{eq,10h}$ for a 10-hour construction activity daytime (11.5.12).

11.5.37 SOAEL for night-time construction noise is based upon the WHO Night Noise Guidelines for Europe proposed Interim Target Level of 55dB $L_{night,outside}$ (11.3.34).

11.5.38 LOAEL and SOAEL thresholds for construction noise are summarised in Table 11.7, below.

Table 11.7: LOAEL and SOAEL thresholds for construction noise

Time Period	Adverse Effect Level	Free Field Noise Level	Criteria / Guidance
Day	LOAEL	65 dB $L_{eq,T}$	BS5228-1 lower cut-off value example method 2 daytime
Day	SOAEL	75 dB $L_{eq,T}$	BS5228-1 noise insulation trigger threshold
Night	LOAEL	45 dB $L_{eq,T}$	BS5228-1 lower cut-off value example method 2 night-time
Night	SOAEL	55 dB $L_{night, outside}$	WHO Interim Target Level

Construction Vibration

11.5.39 LOAEL for construction vibration is considered to be a PPV of 0.3mm/s. This is considered by BS5228 Part 2 (11.5.18) to be just perceptible in residential environments.

11.5.40 SOAEL for construction vibration is considered to be a PPV of 1.0 mm/s. This is the threshold for vibration that is likely to cause complaint in BS5228 Part 2 (11.5.18).

11.5.41 LOAEL and SOAEL thresholds for construction vibration are summarised in Table 11.8, below.

Table 11.8: LOAEL and SOAEL thresholds for construction vibration

Time Period	Adverse Effect Level	PPV level [mm/s]	Criteria / Guidance
Day	LOAEL	0.3	BS5228 Part 2
Day	SOAEL	1.0	BS5228 Part 2

Operational noise

11.5.42 Although DMRB states that a methodology has not yet been developed to assign a significance according to both the value of a resource and the magnitude of an impact, it is possible to set LOAEL for the operational noise assessment based on the WHO guidelines for community noise (11.3.31). This is a free-field level of 50dB $L_{eq,T}$ during daytime consistent with the threshold for moderate annoyance.

11.5.43 LOAEL for the night-time operational noise assessment is set to be a free-field level of 40dB $L_{night,outside}$ during the night-time consistent with the threshold for sleep disturbance from the WHO Night Noise Guidelines (11.3.32).

11.5.44 Operational noise effects due to the Project will predominantly result from lorry movements. SOAEL for daytime operational noise is based upon the lower value for the onset of health effects cited within WHO guidelines for community noise (11.3.31). Although expressed as L_{Aeq}, this is broadly equivalent to the criteria for secondary insulation set within the Noise Insulation Regulations for road traffic noise which is a façade level of 68dB $L_{10,T}$ (11.3.2).

11.5.45 SOAEL for night-time noise has been based upon the WHO Night Noise Guidelines for Europe proposed Interim Target Level of 55dB $L_{night,outside}$ (11.3.34).

11.5.46 LOAEL and SOAEL thresholds for operational noise are summarised in Table 11.9 below. Façade levels are taken as free field levels +2.5dB, so that the equivalent daytime SOAEL of 68dB $L_{10,T}$ façade is 65.5dB $L_{10,T}$ free-field.

Table 11.9: LOAEL and SOAEL thresholds for operational noise

Time Period	Adverse Effect Level	Free Field Noise Level	Criteria/Guidance
Day	LOAEL	50 dB $L_{eq,T}$	WHO moderate annoyance threshold
Day	SOAEL	68 dB $L_{10,T}$ (façade)	WHO onset of health effects
Night	LOAEL	40 dB $L_{night,\ outside}$	WHO sleep disturbance threshold
Night	SOAEL	55 dB $L_{night,\ outside}$	WHO Interim Target Level

Significance criteria

11.5.47 The NPPF (11.3.3) and NPSE (11.3.7) aims are to avoid significant adverse impacts and mitigate adverse impacts. However, simply breaching the LOAEL and SOAEL thresholds do not form adequate significance criteria because:

- Receptors that are already above SOAEL may be still be subject to minor, moderate or major impacts (Table 11.4) but would not be classified as subject to significant adverse impact as the threshold for SOAEL would not be crossed.
- Similarly receptors that are already above LOAEL may be subject to minor, moderate or major impacts that while insufficient to cross SOAEL would otherwise not be classified as subject to adverse impact.
- Receptors may cross the SOAEL / LOAEL threshold with a negligible impact when only just below the threshold under the prevailing conditions whereas it is customary for the increase in noise levels to pass a minimum threshold such as the 1dB increase set out in the Noise Insulation Regulations, the 5dB increase set out in BS5228 and the 1dB and 3dB increases set out for the short-term and long-term respectively in DMRB.

11.5.48 Therefore, for the assessment of construction noise from the Project:

- A significant adverse impact is one for which total noise (pre-construction baseline noise plus construction noise) exceeds the pre-construction baseline noise by 5dB or more, and where SOAEL (Table 11.7) is exceeded.

- An adverse impact is one for which total noise (pre-construction baseline noise plus construction noise) exceeds the pre-construction baseline noise by 5dB or more, and where LOAEL (Table 11.7) is exceeded but SOAEL is not exceeded.

11.5.49 For the assessment of operational noise from the Project:

- A significant adverse impact is one for which noise level changes by at least 1 dB and where SOAEL (Table 11.9) is exceeded. This reflects the NPPF interpretation of significant adverse effects as set out in 11.3.6.
- An adverse impact is one for which the noise level changes have a minor, moderate or major impact in accordance with Table 11.4 and where LOAEL (Table 11.9) is exceeded but SOAEL is not exceeded. This also means that different criteria apply in the short-term and the long-term. In the short-term a non-negligible noise impact is a change of 1 dB or more, whereas in the long-term a non-negligible noise impact is a change of 3dB or more in accordance with DMRB (11.3.28).

Consultation

11.5.50 A Shepway District Council (SDC) environmental health officer was contacted to discuss the baseline noise survey, noise sensitive receptors and council's policies on noise and vibration in December 2015. This was for a study for an earlier design of the Lorry Area but in the same location as for the current design.

11.5.51 The SDC Cabinet considered an interim report at its meeting on 16 December 2015[149] and a key message considered by Cabinet members at that meeting was that *"Shepway District Council believes that to work for residents and businesses any solution"* to Operation Stack must (inter alia) *"minimise visibility and environmental impact on local residents."*

11.5.52 Shepway District Council[150], Kent County Council[151] and Dover District Council[152] rated the importance of environmental impact as 9th out of 12 for a range of priorities in choosing a site location for the Project. Stanford Parish Council[153] (SPC) rated the importance of environmental impact as 3rd out of 12 from the same range of priorities. In its response SPC also stated that lorries need to be *"made to turn off engines (trickle feed must be provided for refrigeration units so that engines can be turned off). Management of the lorry holding area will need to be firm to ensure horns are not sounded in frustration."*

[149] Folkestone, Hythe and Romney Marsh, Shepway District Council Report C/15/70, 19 January 2016.
[150] Shepway DC Highways England Consultation proforma Response, January 2016.
[151] Letter from Matthew Balfour, Cabinet Member for Environment and Transport, Kent County Council to Highways England dated 25 January 2016.
[152] Letter from Paul Watkins, Leader of the Council to Highways England dated 22 January 2016 with reference RW/PAW/DJD.
[153] Letter from the Clerk to the Council to Highways England dated 25 January 2016.

11.5.53 Historic England noted[154] that a detailed process of assessment was required so that a preferred site and a proposed design could be put forward by applying NPPF but did not otherwise comment specifically on noise.

11.5.54 The RAC foundation[155] stated that it *"is crucial that adequate mitigation measures are put in place to reduce or negate the detrimental effects of the lorry park on local residents"* and specifically mentioned *"noise barriers"* for *"protecting neighbouring properties from noise."*

11.5.55 Folkestone Town Council's Planning Committee met on the 7 January 2016 and the following comment was made[156] (inter alia): *"Refrigerated lorries should be segregated on the park furthest* away *from residents."*

11.6 Limitations to the Assessment

11.6.1 In this section we record some of the assumptions made in the assessment and the limitations that these impose.

11.6.2 The 2 km boundary for the study area was selected as a compromise between the area where receptors may be adversely affected by noise from the Lorry Area and the range of validity of CRTN – the main tool used in the calculation of road traffic noise. It is noted that many of the formulae in CRTN have a quoted range of validity of 300 m and while extrapolation beyond this range may lead to progressive and significant error, calculations can be extended outside the quoted range for the purpose of assessing *changes* in noise levels. Restricting the study area to 2 km does not imply that all receptors within this range are likely to be adversely affected by noise but an area this wide should ensure that consideration has been given to all receptors for which there is a non-negligible increase in noise levels.

11.6.3 The calculations further assume that:

- The L_{10} noise level over a given time interval for arrival, travel around the Lorry Area to a parking space and subsequent departure is the same as the noise level for a non-stop arrival, travel around the Lorry Area and departure when the number of lorries arriving at the Lorry Area is the same as the number of lorries leaving the Lorry Area in the given time interval. This is because parked lorries make no noise except of the refrigerated lorries that are considered separately.
- Lorries travel around the Lorry Area at a steady 20km/h. Currently no data is available for the likely speed of lorries in the Lorry Area and 20km/h is the minimum speed in the CRTN prediction procedure. In some parts of the Lorry Area it is likely that speeds will be less than this (certainly this will be the case near the entry and exit 'control' booths) but the Lorry Area is so extensive that it is also possible that speeds may be higher elsewhere. It is noted that noise levels between 20km/h and 40km/h change by less than 2dB in CRTN.

[154] Letter from Peter Kendall, Principal Inspector of Ancient Monuments, Historic England to Highways England dated 25 January 2016.
[155] Representation from RAC Foundation, Managing Freight Vehicles through Kent, January 2016.
[156] Shepway DC, Supplementary information to report to cabinet, report reference C/15/70, 19 January 2016

- The noise from horns, air-brakes, starter motors, door slamming, shouting and vehicle audio systems is not included in this analysis as there is currently no data available for these noise sources. They are predominantly transient so are unlikely to contribute to L_{10} values (the metric used by DMRB) although they may make a small contribution to L_{eq} values depending on the context.
- The Lorry Area has a concrete surface that reflects most of the sound that is incident upon it. The routes around the Lorry Area have an acoustically hard surface but are traversed at low speeds for which a 1dB correction is applied as set out in CRTN (11.3.29).
- CRTN methodology has been applied throughout and is generally expected to represent a moderate down-wind worst case for traffic noise.
- Calculation distances from any source to any receiver are limited to 5 km. That is, no source can contribute to noise levels more than 5 km from that source.
- The ground between the noise sources in the Lorry Area and receptors is assumed to have a ground absorption parameter of 0.5 (CRTN) indicating an estimate that the proportion of acoustically absorbing ground between sources and receptors is an average of 40% and 59% over the study area.
- Parked lorries are assumed to produce no noise except for refrigerated units and engines running at idle that are assumed to produce omnidirectional noise with a sound power level of 93dB(A) at a height of 4m above the ground.
- The shielding benefit of parked lorries and the acoustic reflections from the sides of parked lorries are assumed to cancel each other so that no net benefit has been assumed.
- The railway line (to the south of the site) contributes negligible noise. This is likely to be the case for L_{10} because of frequency of trains means that train noise is inaudible for more than 90% of the daytime or night-time. It is possible that train noise contributes to L_{eq} so its omission, producing an underestimate of the baseline, tends to increase the calculated noise impact of the project (change in noise level) and reduce the likelihood of exceeding the LOAEL and SOAEL boundaries, but this effect is likely to be very small over most of the study area.
- All buildings are assumed to have a height of 6 m (providing some acoustic shielding for buildings that are behind them relative to a noise source) with surfaces with an acoustic absorption coefficient of 0.03 (value for brick in Bies and Hansen[157]) making them highly reflective.
- All receptors are 4m above the ground corresponding to a typical first floor window.
- Flows for all roads are listed in Appendix 11.1 and represent annual average weekday traffic (AAWT). The CRTN low flow correction has been applied for flows below 4000 vehicles in 18 hours, and flows below 1000 vehicles have been included in the assessment due to their potential impact in rural areas.

[157] Engineering noise control, theory and practice (2009), D A Bies and C H Hansen, CRC.

- There are no bunds around the Lorry Area and no acoustic barriers within or around the Lorry Area.
- The existing noise barrier for the M20 at Sellindge has an assumed height of 2m.

11.6.4 Appendix 11.1 includes a sensitivity analysis that shows the number of receptors that are adversely affected and significantly adversely affected if the following departures are made to the model used in this assessment (and where the value used in this assessment is shown in a **bold** typeface.)

- The proportion of refrigeration units was modelled at 5%, **10%** or 20%
- The receptors were at 1.5 m or **4 m** above ground level
- All buildings in the study area had a height of 6 m, **8 m** or 10 m
- The proportion of soft ground in the study area was <10%, **between 40 and 59%** or >90%
- Operation Stack traffic is routed around the Lorry Area over **routes corresponding to eight zones** (with flow volumes that are proportional to the zone areas) or all traffic is routed around the perimeter of the Lorry Area
- The road surface for lorry routes within the Lorry Area is **acoustically hard concrete** or low-noise acoustically-pervious type (for which a 3.5dB CRTN correction applies)
- The speed of lorries travelling around the Lorry Area is **20kph**, 30kph or 40kph (approximately **12mph**, 19mph or 25mph)

11.6.5 The influence of these assumptions may be characterised as:

- The number of adverse effects increases as the proportion of refrigeration units increases
- The analysis is not very sensitive to receiver height
- Building height does not strongly influence the number of adverse effects although there is a small decrease as building height increases
- The number of significant adverse impacts generally increases with the proportion of acoustically hard ground but the number of adverse impacts generally falls with the proportion of acoustically hard ground
- Routing all lorries around the boundary of the perimeter of the Operation Stack parking area increases the number of adverse and significant adverse effects
- The analysis indicates that a pervious surface in lieu of concrete could potentially reduce noise and hence the number of adverse effects
- Increasing the speed of the lorries around the Lorry Area at the low speeds between 20kph and 40kph reduces their basic noise level in CRTN (11.3.30) and so reduces the number of adverse and significant adverse effects

11.6.6 Peak flows will produce higher noise levels than average flows (11.5.24). The full-time parking area assumes there will be 3000 lorry movements in 24 hours (an average of 125 per hour) with a maximum of 1000 movements in any one hour. The difference between 125 and 1000 movements may lead to a temporary increase in noise levels of up to 9dB above the predicted noise levels depending on distance from the Lorry Area and ambient conditions. Operation Stack assumes there will be 9458 lorry movements in 24 hours (an average of 394 per hour) with a maximum of 1600 movements in any one hour. The difference between 394 and 1600 movements may lead to an increase in noise levels of up to 6dB above the predicted noise levels depending on distance from the Lorry Area and ambient conditions. These peak hour flows are, by definition, very short-term and if achieved, would plausibly result in lower flows for the remaining period of the day or night for a finite traffic volume.

11.6.7 The traffic flow data used in this assessment is described more fully in Appendix 11.1 – clearly any errors in traffic flows will have a direct impact on both the baseline and predicted Lorry Area noise levels although it is worth noting that an error of 20% in traffic flow would produce an error of less than 1dB. The Appendix 11.1 also includes schematics which show how traffic flows between the Lorry Area and the M20 has been modelled by both the introduction of the full-time parking area and Operation Stack.

11.6.8 Other factors that may influence the accuracy of noise level prediction over long distances include meteorological conditions (particularly wind speed and direction) and atmospheric absorption, the accuracy and precision of relief data, ground obstructions, and noise source levels. The influence of most of these factors increases with distance from the source and is potentially large for the study area for this Project. Many sources of error will be systematic so affect the baseline calculation in a similar way to the prediction of noise due to the Project.

11.6.9 Some of the indices used in the LOAEL and SOAEL operational noise criteria are not the L_{10} indices that have been computed directly from the traffic data using CRTN in CadnaA. The conversions that have been applied for these are described in the Appendix 11.1 and, although based on standard calculation methodology, are still subject to error when flows do not exactly correspond with the datasets used in the development of these procedures.

11.7 Baseline

11.7.1 The survey methodology was established with reference to the guidance in BS 7445 Part 1[158] and Part 2[159] defining best practice during the recording and reporting of environmental noise.

11.7.2 The unattended baseline noise survey was carried out by suitably qualified engineers using measurement equipment conforming to the class 1 specifications of BS EN 61672-1[160] over a period of five days from 29 October 2015 to 3 November 2015. The survey strategy was developed in consultation with Shepway District Council's Environmental Health Department and a member of their Environmental Health team attended the site during the survey. The weather conditions (negligible rainfall, acceptably light winds) were suitable for the survey.

11.7.3 Logging sound level meters were deployed at six locations in close proximity to some of the noise sensitive receptors within the study area to establish the typical range in baseline noise levels. Each sound level meter recorded logged data over five minute intervals continuously throughout the survey.

11.7.4 All measurements were undertaken in free-field conditions (i.e. away from any hard, acoustically reflective surfaces other than the ground) with calibrated meters. A field calibration validation check was made before each measurement, and a subsequent check was made immediately after each measurement, with no significant drift in levels recorded.

11.7.5 The measurement locations are shown in Figure 11.1 and described in Table 11.10, together with the noise environment as experienced at the time the equipment was installed and removed.

[158] BS 7445 Part 1 (2003), Description and measurement of environmental noise: guide to quantities and procedures.
[159] BS 7445 Part 2 (1991), Description and measurement of environmental noise: guide to the acquisition of data pertinent to land use.
[160] BS EN 6167201 (2013), Electroacoustics, sound level meters, specifications.

Table 11.10: Measurement Locations

ID	Location	Grid reference	Noise environment at the time of installation / removal
ML1	Near Fairmead, Stone Street (north of the M20), Ashford TN25 6DF	612722, 137540	Dominated by road traffic on the M20.
ML3	Near Kennett Lane Cottages, Ashford TN25 6DG	612633, 137882	Dominated by road traffic on the M20. Some local activity at nearby residences, including cars on Kennett Lane.
ML4	Near Wagon Lodge, Gibbons Brook Farm, Brook Lane, Ashford TN25 6DG	611768, 138373	No single source dominant. M20 in the background, with local vegetation noise, car movements and talking.
ML5	Near Fairmead Farm, Stone Street (south of the M20), Westenhanger CT21 4HX	612552, 137446	Dominated by road traffic on the M20, with occasional train movement on the Channel Tunnel Rail Link (approx. 100m to the south).
ML6	Near Shrine Farm, Postling CT21 4HE	614305, 137425	Dominated by road traffic on the M20, but muted due to cutting/embankment. Occasional local car movements.
ML7	Near Batholomew's Wood/ Wents Cottage, Sandling Road, Postling CT21 4HD	614434, 137981	No single source dominant. M20 in the background, with local vegetation noise.
ML8	Near St David's Bungalow, Stone Street TN25 6DW	613020, 138635	Dominated by road traffic on the B2068, with the M20 clearly audible in the background.
ML9	Near the B2068/ Waverley, private lane off Stone Street, Ashford TN25 6DL	613362, 138071	Dominated by road traffic on the B2068, with the M20 clearly audible in the background.

11.7.6 An automated logging anemometer was located close to ML1 to register wind speed and direction at regular intervals. The logged data showed that there were no periods of wind in excess of 5 m/s to adversely affect data quality. The wind direction data showed that a mixture of conditions were experienced including both worst case and best case conditions for the transmission of noise from the M20.

11.7.7 The meteorological data also included a tipping bucket rain gauge to record any significant periods of rainfall; no such periods were identified. No periods of the recorded noise data have been excluded due to adverse or atypical weather conditions.

11.7.8 A summary of the data obtained during the survey is presented in Table 11.11 below. The measurement data may be compared with the CRTN predictions calculated using CadnaA.

Table 11.11: Summary of measured noise survey data

Position	Weekday daytime $L_{eq,16h}$ [dB]	Weekday night-time $L_{eq,8h}$ [dB]	Weekend daytime $L_{eq,16h}$ [dB]	Weekend night-time $L_{eq,8h}$ [dB]	Weekday daytime $L_{10,18h}$ [dB]	Weekend daytime $L_{10,18h}$ [dB]
ML1 (near Fairmead, Stone Street)	64	60	63	59	68	68
ML3 (near Kennett Lane Cottages)	55	53	55	52	57	55
ML4 (near Wagon Lodge, Gibbin's Brook Farm)	52	49	53	48	55	56
ML5 (near Fairmead Farm, Stone Street)	60	57	60	59	64	64
ML6 (near Shrine Farm, Ashfield Road)	53	49	52	48	56	54
ML7 (near Bartholomew's Wood/Wents Cottage, Sandling Road)	46	39	46	39	44	44
ML8 (near St David's Bungalow, Stone Street)	66	57	64	55	75	74
ML9 (near Waverley, Stone Street)	63	55	61	54	65	63

Table 11.12: CadnaA predictions for noise level at the long-term measurement locations

Position	daytime $L_{eq,16h}$ [dB]	night-time $L_{eq,8h}$ [dB]	daytime $L_{AF10,18h}$ [dB]
ML1 (near Fairmead, Stone Street)	68	61	70
ML3 (near Kennett Lane Cottages)	57	50	58
ML4 (near Wagon Lodge, Gibbin's Brook Farm)	53	46	54
ML5 (near Fairmead Farm, Stone Street)	64	57	66
ML6 (near Shrine Farm, Ashfield Road)	53	47	54
ML7 (near Bartholomew's Wood/Wents Cottage, Sandling Road)	49	43	**50**
ML8 (near St David's Bungalow, Stone Street)	**57**	56	**59**
ML9 (near Waverley, Stone Street)	**57**	55	**59**

11.7.9 In general there is a reasonably close agreement between the predictions and the measurements indicating that the procedure to determine baseline levels is reasonably representative of the ambient conditions. Differences of more than 5dB have been highlighted and the reasons for these differences may include:

- Modelling is done at a height of 4 m above ground whereas the survey microphone height was 1.2 m.
- There is some uncertainty over the exact location of the microphones used in the survey relative to the traffic sources and small positional errors lead to large changes in noise level where the noise level contours are closely spaced near roads.
- The calculated noise is only for road traffic and does not include other sources such as fireworks, anthropogenic sources or animals (particularly birds and farm animals).
- Different traffic flows at the time of the survey than were used in the calculations.

11.8 Mitigation

11.8.1 No noise mitigation measures have been considered within the current noise assessment in order to assess the worst case scenario. In particular, it has been assumed that neither the full-time parking area nor the Operation Stack parking area will be surrounded by bunds or by any kind of acoustic fence.

11.8.2 Candidate mitigation opportunities are described in Section 11.10.

11.9 Residual Impacts (with mitigation)

Construction Noise

11.9.1 The results of the construction noise assessment are shown in Table 11.13 and Table 11.14. The table shows the predicted noise levels when the construction activity is concentrated at the Project Site Boundary closest to the receptor representing worst-case construction noise and when activity is concentrated as the centre of the Lorry Area giving typical construction noise levels, respectively. The baseline conditions at the sensitive receptors are also shown. The values highlighted in blue and green respectively exceed the LOAEL and SOAEL adverse effect criteria set out in paragraph 11.5.48, above.

Table 11.13: Noise levels at sensitive receptors during construction at the Project Site Centre

Location	Baseline levels		Project Phase					
			Site Preparation		Road Construction		Building Construction	
	Day $L_{eq,16h}$ [dB]	Night $L_{eq,8h}$ [dB]	Day $L_{eq,16h}$ [dB]	Night $L_{eq,8h}$ [dB]	Day $L_{eq,16h}$ [dB]	Night $L_{eq,8h}$ [dB]	Day $L_{eq,16h}$ [dB]	Night $L_{eq,8h}$ [dB]
Stanford North	48	42	49	43	48	42	48	42
Kennett House	56	50	57	51	56	50	56	50
1-8 Kennett Lane	56	49	56	50	56	50	56	50
Holmdene	56	49	56	50	56	50	56	49
Stanford South	59	52	59	52	59	52	59	52

Location	Baseline levels		Project Phase					
			Site Preparation		Road Construction		Building Construction	
	Day $L_{eq,16h}$ [dB]	Night $L_{eq,8h}$ [dB]	Day $L_{eq,16h}$ [dB]	Night $L_{eq,8h}$ [dB]	Day $L_{eq,16h}$ [dB]	Night $L_{eq,8h}$ [dB]	Day $L_{eq,16h}$ [dB]	Night $L_{eq,8h}$ [dB]
Westenhanger North	61	55	61	55	61	55	61	55
Westenhanger Castle	54	48	54	48	54	48	54	48
Westenhanger South	51	45	51	45	51	45	51	45
Red House Farm	66	62	66	62	66	62	66	62
Barrow Hill Farm Cottages	53	47	53	47	53	47	53	47
Barrowhill South	56	49	56	49	56	49	56	49
Barrowhill North	61	55	61	55	61	55	61	55
Sellindge South	57	51	57	51	57	51	57	51
Sellindge North	54	49	54	49	54	49	54	49
Brookgate Cottage	50	44	51	45	50	45	50	44
Brook Farm Kennels	60	53	60	54	60	53	60	53
Benham Villa	55	48	55	49	55	49	55	48
Gyminge Brook Cottage	55	48	55	50	55	49	55	48
Wagon Lodge	54	47	54	49	54	48	54	48
Hope Farm	51	44	51	46	51	45	51	45
Hayton Manor Farm	50	44	51	45	51	44	50	44

Table 11.14: Noise levels at sensitive receptors, during construction at the Project Site Boundary

Location	Baseline levels		Project Phase					
			Site preparation					
	Day $L_{eq,16h}$ [dB]	Night $L_{eq,8h}$ [dB]	Day	Day $L_{eq,16h}$ [dB]	Night $L_{eq,8h}$ [dB]	Night	Day $L_{eq,16h}$ [dB]	Night $L_{eq,8h}$ [dB]
Stanford North	48	42	50	**47**	49	45	49	43
Kennett House	56	50	**71**	**71**	**67**	**67**	64	**63**
1-8 Kennett Lane	56	49	64	**63**	61	**60**	59	**56**
Holmdene	56	49	62	**61**	59	**57**	58	**54**
Stanford South	59	52	60	56	59	54	59	53
Westenhanger North	61	55	64	**61**	62	59	62	57
Westenhanger Castle	54	48	57	**55**	56	53	55	50
Westenhanger South	51	45	52	47	52	46	51	45
Red House Farm	66	62	66	62	66	62	66	62
Barrow Hill Farm Cottages	53	47	53	47	53	47	53	47
Barrowhill South	56	49	56	50	56	49	56	49
Barrowhill North	61	55	61	55	61	55	61	55
Sellindge South	57	51	58	52	57	51	57	51
Sellindge North	54	49	55	50	54	49	54	49
Brookgate Cottage	50	44	54	**52**	52	49	51	47
Brook Farm Kennels	60	53	**68**	**67**	**65**	**64**	62	**60**
Benham Villa	55	48	63	**63**	59	**57**	58	**56**
Gyminge Brook Cottage	55	48	**72**	**72**	**69**	**68**	**65**	**64**
Wagon Lodge	54	47	**76**	**76**	**72**	**72**	**68**	**68**
Hope Farm	51	44	54	**53**	53	**50**	52	47
Hayton Manor Farm	50	44	52	48	51	46	51	45

11.9.2 For construction activity at the site centre it should be noted that there are no receptor groups for which the adverse effect criteria are exceeded. However, when construction activity is at the site boundary, there are several receptor groups at which the adverse effect criteria are exceeded for construction at night, and four receptors where the LOAEL criterion is exceeded including one (Wagon Lodge) where the SOAEL criterion is exceeded for construction in the daytime. A further study with more detailed information about construction plant is required to assess the noise level at these locations. If noise levels are as high as predicted and will be sustained for long periods then mitigation action will be considered potentially including the erection of temporary noise barriers or restrictions on the hours of operation.

Construction Vibration

11.9.3 LOAEL and SOAEL for construction vibration were defined in Table 11.8 as 0.3mm/s and 1.0mm/s respectively. Piling is unlikely anywhere except for the construction of the new bridge over the M20 and the entry and exit slips. The chart in section 11.5.16, shows that vibration levels are below these criteria at distances of above 30 m and 12 m respectively for all activity excluding piling. All known receptors are at distances in excess of 30 m from the Project Site Boundary except for Gyminge Brook Cottage and Wagon Lodge (Table 11.2) so there are unlikely to be any adverse effects due to vibration except these two locations. A further study with more detailed information about construction plant is required to assess the vibration level at these two locations.

Operational Impacts

11.9.4 The results of the operational noise calculations are shown in Figures 11.3 to 11.8 that show contour maps of the L_{10} noise levels in the study area. The contours are shown with shading to represent 5dB band intervals and with contour lines within each shaded area to show 1dB level changes. They have been produced by interpolating between calculated noise levels on a grid at 10m intervals.

11.9.5 Figures 11.3 and 11.4 show noise levels for day and night respectively for the baseline – Do minimum scenario. The figures show that noise levels, calculated from road noise only, are highest along the existing roads within the study area, particularly the M20, and gradually fall with distance from carriageway. Within the study area the daytime noise L_{10} is above 40dB. Most properties within Stanford are subject to levels between 50dB and 70dB and most properties within Sellindge are subject to levels between 45dB and 70dB. At night the levels are generally lower than in the daytime as would be expected for the lower traffic flows.

11.9.6 Figures 11.5 and 11.6 correspond to full time parking area – Do something scenario 1, for day and night respectively. Noise levels continue to reflect the road network and noise levels have clearly risen in the area between the M20 and the railway due to the Lorry Area.

11.9.7 Figures 11.7 and 11.8 show the noise contours for Operation Stack – do something scenario 2, for day and night respectively. The shape of the Lorry Area is clearly evident and in the vicinity of heavily trafficked routes the shading shows that noise levels are comparable with the M20.

11.9.8 It is also useful to look at changes in noise level – described in the IEMA guidelines as noise impact (11.3.27). These are shown in Figures 11.9 to 11.12. Figures 11.9 and 11.10 show noise impact of the full-time parking area in the daytime and night-time respectively. The daytime noise impact is predominantly confined to the area in the immediate vicinity of the full-time parking area between the M20 and the Channel Tunnel Rail Link (CTRL). At night the area affected by the full-time parking area is considerably more extensive reflecting the relatively lower levels of background noise. Although Figure 11.10 shows areas around the boundary of the study area with increases of 1 to 3dB, a comparison with the baseline night-time noise contour map (Figure 11.4) shows that this is because the noise levels due to traffic noise in these areas are already very low (generally below 45dB). In reality other sources of noise, including traffic on roads outside the study area, are likely to contribute to noise levels in these areas so the increase has therefore been over-predicted.

11.9.9 Figures 11.11 and 11.12 show the noise impact of the Operation Stack parking area in the daytime and night-time respectively. The area that is affected by more than 3dB is within the study area in both cases but extends well beyond the Project Site Boundary. The high noise spots within the parking area that are not at the Project Site Boundary are due to the 10% of lorries that produce noise when parked, largely due to refrigeration plant. The reduced noise levels at the west end of the Project near the M20 at Sellindge is primarily due to the 40mph speed restriction on the M20.

Impact magnitude

11.9.10 In this section the magnitude of the noise impact is recorded for both the full-time parking area and the Operation Stack parking area for the 960 receptors that are within the study area. These impacts correspond to the impact magnitude definitions in Table 11.4 for both operational scenarios, and for day and night in the short-term. The impact of the full-time parking area in the long-term (day and night) is also presented.

11.9.11 Tables 11.15 – 17 present the short and long term operation noise impacts in accordance with DMRB HD213/11.

Table11.15: Short-term impact magnitude of the full-time parking area

Scenario: Full-time parking area short-term			
		Number of sensitive receptors	
Change in noise level [dB]		Daytime	Night-time
Increase in noise level, $L_{10,T}$	0.1-0.9	634	621
	1.0-2.9	7	262
	3.0-4.9	0	16
	5.0+	0	1
No change	0	272	59
Decrease in noise level, $L_{10,T}$	0.1-0.9	46	1
	1.0-2.9	1	0
	3.0-4.9	0	0
	5.0+	0	0
		960	960

Table 11.16: Short-term impact magnitude of Operation Stack parking area

Scenario: Operation Stack short-term			
		Number of sensitive receptors	
Change in noise level [dB]		Daytime	Night-time
Increase in noise level, $L_{10,T}$	0.1-0.9	341	373
	1.0-2.9	244	248
	3.0-4.9	77	93
	5.0+	20	65
No change	0	83	69
Decrease in noise level, $L_{10,18h}$	0.1-0.9	194	111
	1.0-2.9	1	1
	3.0-4.9	0	0
	5.0+	0	0
		960	960

Table 11.17: Long-term impact magnitude of the full-time parking area

Scenario: Full-time parking area long-term			
		Number of sensitive receptors	
Change in noise level [dB]		Daytime	Night-time
Increase in noise level, $L_{10,T}$	0.1-2.9	641	883
	3.0-4.9	0	16
	5.0-9.9	0	1
	10.0+	0	0
No change	0	272	59
Decrease in noise level, $L_{10,T}$	0.1-2.9	47	1
	3.0-4.9	1	0
	5.0-9.9	0	0
	10.0+	0	0
		960	960

11.9.12 Table 11.15 -17 present the short and long term operation noise impacts in accordance with DMRB HD213/11. Table 11.15 shows that 7 receptors are subject to noise increases of 1dB or more in the short-term in the day-time for the full-time parking area but this increases to 279 at night including 16 receptors that are subject to increases between 3dB and 5dB and one receptor subject to an increase of more than 5dB. The changes in noise level for the long-term for the full-time parking area are shown in Table 11.17 using the criteria applicable to the long-term as set out in Table 11.4.

11.9.13 The number of receptors subject to noise changes for Operation Stack given in Table 11.16 shows that in the day-time 341 receptors are subject to increases up to 1dB, a further 244 are subject to increases between 1dB and 3dB, a further 77 receptors are subject to increases between 3dB and 5dB and a further 20 receptors are subject to an increase of 5dB or more. At night-time 373 receptors are subject to an increase of up to 1dB, a further 248 receptors are subject to an increase between 1dB and 3dB, 93 receptors are subject to an increase of between 3dB and 5dB and 65 receptors are subject to an increase of 5dB or more.

11.9.14 Some of the increases set out in 11.9.12 and 11.9.13 are against existing low noise levels within the study area. The significance of these increases in the context of the criteria set out in 11.5.49 is considered below

Impact severity

11.9.15 In this section we record the significance of the noise effects of the Project for the 960 receptors that are within the study area based on the impact severity definitions given in paragraph 11.5.49 for both operational scenarios and for day and night in the short-term. The impact of the full-time parking area in the long-term (day and night) is also presented.

Table 11.18: Number of receptors that receive an adverse impact or a significant adverse impact for the operational scenarios

Impact severity	Short-term day		Short-term night		Long-term day	Long-term night
	Full-time parking area	Operation Stack	Full-time parking area	Operation Stack	Full-time parking area	
Adverse	5	216	232	346	0	3
Significant Adverse	2	3	19	29	2	19

11.9.16 Table 11.18 show that there are adverse and significant adverse noise impacts for both scenarios and in both the daytime and night-time. The worst case is the impact of the Operation Stack parking area at night that has an adverse impact at 346 receptors and a significant adverse impact at 29 receptors. It has an adverse impact at 216 receptors and a significant adverse impact at 3 receptors in the daytime.

These impacts may be expected for each day and night for which the Operation Stack parking area is used.

11.9.17 There are fewer receptors that are subject to adverse and significant adverse impacts for the full-time parking area than for the Operation Stack parking area. The numbers of receptors subject to these impacts are shown in Table 11.18 for the daytime and night-time in both the short-term and long-term. There are 19 receptors that are subject to a significant adverse impact due to the full-time parking area at night. In the daytime there are two receptors that are subject to a significant adverse impact. It is also noted that 232 receptors are subject to an adverse impact in the night-time in the short-term for the full-time parking area.

11.9.18 The objectives of the NPPF and NPSE are to mitigate and reduce adverse impacts and to avoid significant adverse impacts. The analysis of the data in Table 11.18 shows that the Project does not achieve these aims for operational noise and further mitigation is required to enable the Project to reduce its noise effects. Candidate suggestions for such mitigation are described in paragraph (11.10.2).

11.10 Further Mitigation Opportunities

Construction

11.10.1 Mitigation in construction noise will be controlled using a Construction Environment Management Plan (CEMP) that will include measures such as:

- Hours of operation – these would be in line with standard good practice for major construction works, meaning that all main construction works would be undertaken within weekday daylight hours. For the months of October through to March this would generally be limited to 08:00 to 18:00 weekdays and 08:00 to 14:00 on Saturdays. For the months of April to September these would increase in line with the daylight availability to 07:00 to 19:00 weekdays and 07:00 to 16:00 at the weekends. Works outside these hours would generally be subject to liaison with the local Environmental Health Officer.
- Some minor activities, such as changes in traffic management operations, may be required out of hours on a more frequent basis, but this would not be expected to create effects that would be more intrusive than the existing movement of traffic.
- Plant (machinery) will be chosen to minimise noise impacts.
- It will be appropriate to erect temporary acoustic barriers when construction activity takes place close to sensitive receptors.
- Best Practicable Means will be adopted for all construction work including the selection of modern, quiet plant that is well-maintained.
- Consideration will be given to use of the M20 exclusively in lieu of local roads for the delivery of bulk materials such as aggregates, and deliveries should avoid the evening and night hours (19:00 to 07:00).

- Site access routes will be restricted for both site workers (estimated to be a maximum of 200 at any one time) and delivery vehicles.

Operation

11.10.2 Further mitigation opportunities to control operational noise:

- The provision of bunds and acoustic fences. These are most effective when close either to the source or receptor but since both the sources within the Lorry Area and the receptors are widely distributed, neither form of barrier will be universally beneficial although they may be able to provide significant benefit for the receptors that are closest to the site. Analysis of the potential benefits of an acoustic fence around the Project Site Boundary is shown in the Appendix 11.1. The analysis shows that such a 4m barrier could reduce the number of night-time significant adverse effects from 19 and 29 for the full-time parking area and Operation Stack respectively to 12 and 2. Although this is a large reduction, no barriers of reasonable height can eliminate all the significant adverse effects.
- Noise emissions have been modelled assuming that the Lorry Area has some access routes around the perimeter of the Lorry Area (see Figure 11.2) but some noise reduction will be achieved by controlling alignment to maximise the separation distance between the access routes around the Lorry Area and sensitive receptors. The benefit of this approach is greatest where receptors are close to the Lorry Area. For example increasing a separation distance from 100 m to 200 m will typically reduce noise levels by up to 3dB. However the same 100 m increase from 400 m to 500 m will only produce a benefit of 1dB. In any event care needs to be given to routing within the Lorry Area: Appendix 11.1 shows that routing all lorries around the perimeter significantly increases the number of significant adverse effects during Operation Stack.
- Restricting speed around the Lorry Area will help to minimise maximum noise levels because vehicle noise levels are lower at lower speeds but may not have a significant benefit on L_{10} values because the lower speeds will also mean that the lorries are in motion (and therefore producing noise) for a longer period. The analysis is Appendix 11.1 shows a reduced number of impacts as lorry speeds within the park are increased from 20kph to 40kph.
- All sources of extraneous noise such as unnecessary engine idling, use of horns, door slamming, radios and so on will be kept to minimum by implementing site conduct regulations. Although these sources have not been included in the analysis leading to the results shown in Table 11.18 they are nevertheless likely to lead to complaints and to adverse effects if not controlled with an operational noise management plan.
- If practicable, vehicles with refrigeration units that produce continuous noise even while parked should be kept as far away from sensitive receptors so a section of the Lorry Area could be reserved for these vehicles and it could be surrounded by an acoustic barrier.
- An acoustically absorbing road surface for the main routes around the Lorry Area could be used to reduce noise levels though its effectiveness would be limited due to the relatively low speeds of the lorries within the Lorry Area.

12. People & Communities

12.1 Executive Summary

12.1.1 This chapter assesses the impact of the Project on non-motorised users (NMUs), vehicle travellers (in terms of driver stress and view from the road) and local communities. Public Rights of Way within the study area are identified, including bridleways. An assessment of changes in journey length and amenity value potentially arising from the Project is provided. Impacts on paths are used to determine potential severance impacts on communities and access to local facilities. The Project incorporates provision for NMUs during operation by maintaining the existing path alignments within the Project Site Boundary.

12.1.2 This chapter assesses the impact of the Project on non-motorised users (NMUs), vehicle travellers (in terms of driver stress and view from the road) and local communities. Public Rights of Way within the study area are identified, including bridleways. An assessment of changes in journey length and amenity value potentially arising from the Project is provided. Impacts on paths are used to determine potential severance impacts on communities and access to local facilities. The Project incorporates provision for NMUs during operation by maintaining the existing path alignments within the Project Site Boundary.

12.1.3 As a result of higher levels of noise and visual intrusion from parked and moving traffic, a permanent severe loss of amenity on NMU journeys is anticipated. In addition, during an Operation Stack event, it will be necessary to temporarily close the footpaths within the Project Site Boundary in the interest of NMU safety and site security requirements. During these times, NMU journey length would temporarily increase.

12.1.4 Beneficial effects on driver stress are predicted during an Operation Stack event as traffic is anticipated to flow as it would during a normal day. Additionally, the Project will provide off-road parking for lorries, reducing the number of illegally parked lorries on the highway network resulting in a beneficial effect on vehicle travellers and the local community.

12.1.5 Some significant impacts arising from the operation of the Project on views from the road are anticipated for vehicle travellers using the A20 Ashford Road, Stone Street and Kennet Lane. Some of these impacts are anticipated to reduce following the establishment of mitigation planting.

12.2 Introduction

12.2.1 This assessment follows the updated DMRB interim guidance contained within IAN 125/15, combining published guidance in DMRB Volume 11, Section 3, Part 6 (Land Use), Part 8 (Pedestrians, Cyclists, Equestrians and Community Effects) and Part 9

(Vehicle Travellers) into one assessment of People and Communities. Effects on Agricultural Land (Part 6), is assessed and reported in Chapter 15 (Agriculture).

12.2.2 The assessment considers any impacts the Project may have upon:

- Non-motorised users (NMUs) (i.e. pedestrians, cyclists and equestrians), including journey length and amenity.
- Vehicle travellers (VTs), in terms of driver stress and views from the road.
- Community and private assets, including private and community land, development land and community severance.

12.3 Regulatory / Policy Framework

12.3.1 Relevant national and local policy in relation to this chapter is set out below.

National

National Planning Policy Framework (NPPF)

12.3.2 The NPPF (Department for Communities and Local Government, March 2012) sets out a number of 'Core Planning Principles', which are necessary to deliver sustainable development. One of the principles most relevant to this chapter emphasises the need to manage patterns of growth to make the fullest possible use of public transport, walking and cycling.

12.3.3 Chapter 4 (Promoting sustainable transport) of the NPPF sets out how transport should be considered within the context of planning decisions and sustainable development. The framework states that encouragement should be given to solutions that seek to reduce congestion and serve to facilitate the use of sustainable transport.

12.3.4 The NPPF also encourages development that exploits opportunities for sustainable transport. Particularly by giving priority to pedestrian and cycle movements, and providing access to high quality public transport facilities. In addition, the NPPF encourages development that minimises conflict between vehicular traffic, cyclists and pedestrians.

12.3.5 The NPPF states that local authorities should "develop strategies for the provision of viable infrastructure necessary to support sustainable development". This is of particular relevance, as the Project will support development which is proposed in the draft Core Strategy and the Hereford Enterprise Zone.

12.3.6 Chapter 7 (Requiring good design) of the NPPF encourages planning policies and decision that aim to ensure development:

- Will function well and add to the overall quality of the area, not just for the short term but over the lifetime of the development.
- Optimise the potential of the site to accommodate development, create and sustain an appropriate mix of uses (including incorporation of green and other public space as part of developments) and support local facilities and transport networks.

The Countryside and Rights of Way Act 2000 (CRoW Act)

12.3.7 The CRoW Act regulates all PRoW and ensures access to them. It requires local highway authorities to publish a Rights of Way Improvement Plan (RoWIP), which should be reviewed every ten years. The Act also obliges the highway authority to recognise the needs of the mobility impaired when undertaking improvements. KCC published their Countryside Access Improvement Plan in 2007, to be effective until 2017 (see below).

The Equality Act 2010

12.3.8 The Act consolidates nine pieces of primary legislation, including the Disability Discrimination Act 1995, to provide the UK with a law which protects individuals from unfair treatment and promotes a fair and more equal society. The Act requires Design Organisations to ensure that, where reasonable, accessibility for disabled people is equal to that of other NMUs. Disabled people, defined as those having a range of physical, sensory or mental impairments, represent approximately 6% of children, 16% of working adults and 45% of adults over state pension age, in the UK[161].

Local

Kent Council Countryside Access Improvement Plan

12.3.9 Under the requirements of the CRoW Act (2000) to produce a RoWIP, the KCC Countryside Access Improvement Plan sets out a ten year strategy for improving access to the countryside within Kent. It was produced to fulfil the following purposes relevant to the Project:

- Evaluates the extent to which local rights of way meet the present and likely future needs of the public.
- Assess the opportunities provided by local rights of way for exercise and other forms of open-air recreation and the enjoyment of Kent.
- Assess the accessibility of local rights of way to blind or partially sighted persons and others with mobility problems.

[161] Department for Work and Pensions (2014) Disability Facts and Figures. Available at: https://www.gov.uk/government/publications/disability-facts-and-figures/disability-facts-and-figures

- Provide a strategy for the future proactive management of countryside access in Kent to put in place a more meaningful and sustainable network.

12.3.10 The 2007 Plan was reviewed in 2013 and was replaced by the Countryside and Coastal Access Improvement Plan 2013 to 2017.

Kent County Council Local Transport Plan

12.3.11 The KCC Local Transport Plan sets out the strategy and implementation plans for local transport from 2011 to 2016. KCC looks to promote and improve the social, economic and environmental well-being of the area and implements local transport schemes that support these long term objectives. KCC also lobbies on behalf of the people of Kent for major transport infrastructure, including a solution to Operation Stack. The Local Transport Plan explains how they will prioritise their planned measures under the following five themes, based on the previous Government's five National Transport Goals as set out in the Local Transport Plan 3 Guidance, but made relevant to Kent:

- Growth without Gridlock
- A Safer and Healthier County
- Supporting Independence
- Tackling a Changing Climate
- Enjoying Life in Kent

Shepway District Council Local Plan

12.3.12 The following policies taken from the Shepway Core Strategy & Local Plan (2006) are relevant to the topics of this chapter:

12.3.13 Policy TR6: "New development will not be permitted unless provision is made for the needs of pedestrians. The layout and design of development should provide for safe, attractive and convenient pedestrian routes, particularly to public transport routes".

12.3.14 Policy TR11: "*Proposals which involve the formation of a new access, or would result in the intensification of the use of an existing access, will only be permitted where:*

a. *the access is not detrimental to the safety of vehicle traffic, cyclists and pedestrians; or*

b. *the access can alternatively be improved to a standard acceptable to the Highway Authority; or*

c. *the applicant can demonstrate by means of a transport impact study that the proposal would not increase the risk of accidents or create delays.*

12.3.15 Policy LR8: *"Rights of way will require to be properly integrated into the design and layout of development sites. The District Planning Authority will not permit development which would interrupt existing rights of way unless alternative provision can be made which will provide a facility of equal or greater benefit. Regard will be had to a route's attractiveness, safety and convenience for public use."*

12.4 Study Area

NMUs

12.4.1 The study area for NMUs comprises the Public Right of Way (PRoW) within the Project Site, as shown on Figure 12.1.

Vehicle Travellers

12.4.2 The study area for VTs includes the road network surrounding the Project, including the M20 motorway, A20/Ashford Road, Stone Street (Stanford) and Kennett Lane.

Community and Private Assets

12.4.3 The study area for Community and Private Assets (as defined under the following headings) consists of the land parcels required to accommodate the Project.

Private Property

12.4.4 Private property is land outside the existing highway boundary that does not accommodate public open space or any other community facility or asset. It can be residential, commercial or industrial land.

Community Land

12.4.5 Community land is any area of public open space and other facilities such as schools, hospitals, libraries and outdoor recreation areas relied upon for community health and well-being.

Development Land

12.4.6 Development land is land designated within the Shepway District Council Local Plan for particular development purposes, or for which planning permission has been granted or is pending. Other developments, in proximity to the Project, are discussed in Chapter 16 (Consideration of Cumulative Effects) of this EIAR.

Community Severance

12.4.7 Community severance is defined as the separation of residents from facilities and services that they use within their community. The study area for 'community severance' extends to include communities that may potentially be directly affected by the Project, for example, through severance. This includes communities directly connected by routes used by NMUs and VTs.

12.5 Assessment Methodology

12.5.1 Guidance in DMRB Volume 11, Section 2 and Section 3 on methods for establishing the significance of effects was used for the assessments, as described below.

NMUs: Journey Length and Changes in Amenity

12.5.2 For NMUs, the assessment focused on changes in journey lengths and times and the effect on the amenity value of journeys and changes in community severance. Changes in journey lengths and times can be temporary or permanent; this depends on whether the identified changes are associated with construction, such as temporary PRoW closures and route diversions, or if they relate to permanent severance and route diversions.

12.5.3 NMU amenity is considered to be the pleasantness of a journey, including exposure to traffic; fear/safety; noise; air quality; and visual intrusion. Amenity factors can affect NMUs in different ways. For example, the DMRB states that safety is particularly important for equestrians, whilst footpath width and distance from traffic may be more important for pedestrians. The DMRB also states that for ramblers, landscape quality will generally be an important factor.

12.5.4 PRoW condition surveys were undertaken on 17 November 2015 (Appendix 12.1). The information collected included the physical characteristics of the PRoW; the landform on either side; the presence of accesses serving dwellings and farm buildings; evidence of use by NMUs; and a count of any users.

12.5.5 As no NMUs were encountered on the day of survey, information on the condition of the PRoW and signage was also used to give an indication of usage and inform the sensitivity criteria (as given in Table 12.1) and the magnitude of the change to the PRoW (as given in Table 12.2).

Assessment of Value / Sensitivity

12.5.6 The sensitivity criteria of NMU routes, as presented below, have been developed using both DMRB and professional expertise.

Table 12.1: Sensitivity Criteria of NMU routes

Sensitivity	Description
Very High	PRoW routes* that: • are used for both recreational and utility** journeys; • are suitable for all types of NMU, are lit and are provided with all-weather surfaces; and • national strategic routes and long-distance trails.
High	PRoW routes* that: • are used for both recreational and utility** journeys; • use at night or in bad weather is limited by the nature of the surface or lack of lighting, or which are not suitable for all types of NMU; • named and/or way marked trails designated on a local or regional basis; and • other routes whose use by NMU is principally for recreational journeys, where amenity value is enhanced by the quality of the landscape to which they provide access (including landscapes protected by designations at national, regional or local level).
Medium	PRoW routes* used principally for recreational journeys that: • are provided with all-weather surfaces, and are not obstructed by stiles or other barriers that restrict the accessibility of the route, or act as 'feeder routes'*** to other NMU routes of 'Very High' or 'High' sensitivity; and • bridleways.
Low	PRoW whose accessibility is restricted by the nature of the surface or by barriers such as stiles, and which meet none of the other criteria detailed above.
Negligible	Roads carrying little non-motorised traffic, or not suitable for non- motorised use****. PRoW shown on the Definitive Map, but already severed or otherwise permanently unusable.

* including roads suitable for non-motorised use, PRoW or any other route on which there is a right of way that is suitable for use by any category of NMU.
** utility journeys are those that are made for non-recreational purposes, such as commuting, to access a community facility either within the same community or elsewhere, or to travel between communities.
*** feeder routes are those that link two other routes of higher degrees of sensitivity, or that link a community to a more sensitive route.
**** routes such as busy dual carriageways, where non-motorised use is not restricted by law but on which such use is rare or dangerous due to the volume and speed of traffic and where no dedicated facilities are provided.

Assessment of Magnitude

12.5.7 The criteria for magnitude of change for NMU routes, as presented below, have been developed using both DMRB and professional expertise.

Table 12.2: Magnitude of Change for NMU routes

Magnitude	Adverse Impact	Beneficial Impacts
Major	Permanent closure of NMU route. Permanent severance of any NMU route that would prevent access between the parts. Severe permanent loss of amenity on any PRoW due to noise and visual intrusion.	Provision of new surfaced NMU route. Provision of new linkage between communities that is shorter or safer for NMU than existing links.
Moderate	Temporary closure of any NMU route for more than 1 month. Increase in journey time of 10% or more. Introduction of new intersection with a highway, with at-grade road crossing that is not controlled by signals. Moderate permanent loss of amenity on any PRoW due to noise and visual intrusion.	Reduction in journey time of 10% or more for utility journeys. Replacement of existing at-grade, uncontrolled crossing with signal -controlled or grade-separated facilities. Two or more improvements in accessibility on a public right of way, through removal of stiles or other barriers, improvements in surface, provision of lighting, etc. Substantial improvements to amenity on any NMU route.
Minor	Temporary closure of any NMU route for 1 month or less. Increase in journey time of less than 10%. Introduction of new intersection with a highway, with at-grade road crossing that is controlled by signals or a grade-separated crossing. Minor permanent loss of amenity, or any temporary loss of amenity, on any NMU route.	Reduction in journey time of less than 10% for utility journeys. Improved accessibility on a public right of way, through removal of stiles or other barriers or improvements in surface or provision of lighting, etc. Minor improvements to the amenity of any NMU route.
Negligible	Temporary closure of any NMU route for up to 1 day.	N/A
No Change	Changes in the physical environment on a NMU route that does not affect journey time, accessibility or amenity.	

Assessment of Significance

12.5.8 Significance of impact was determined in accordance with Table 2.4 within DMRB Volume 11, Section 2, Part 5 (HA 205/08) Assessment and Management of Environmental Effects (The Highways Agency et al., 2008).

Vehicle Travellers: Views from the Road

12.5.9 Views from the road have been assessed in accordance with DMRB Volume 11, Section 3, Part 9 Vehicle Travellers.[162]

12.5.10 The assessment takes into account the types of scenery or landscape character, the extent to which travellers may be able to view the scene, the quality of the landscape and features of particular interest or prominence in the view.

12.5.11 The extent to which travellers are able to perceive the landscape through which they are passing varies with the relative level of the road and its surrounding ground and vegetation. The following categories have been used to assess the travellers' ability to see the surrounding landscape:

- No view - road in deep cutting or contained by earth mounds, environmental barriers or adjacent structures.
- Restricted view - frequent cuttings or structures blocking the view.
- Intermittent view - road generally at ground level but with shallow cuttings or barriers at intervals.
- Open view - view extending over many miles, or only restricted by existing landscape features.

12.5.12 As this Project is not a linear road project, the assessment focused on views from the surrounding roads that may be affected as a result of the Project. The assessment of potential impacts of the Project on VT views should be read in conjunction with Chapter 7: Landscape.

12.5.13 Baseline information was collated through site visit photographs and assessment of Google Streetview imagery.

Vehicle Travellers: Driver Stress

12.5.14 Driver stress has been assessed in accordance with DMRB Volume 11, Section 3, Part 9 Vehicle Travellers.

12.5.15 The Project is proposed as a solution to Operation Stack events (Phases 1 and 2 only), which occur infrequently and are unpredictable in time period and length. These events cause congestion and delays on the regional road network and are

[162] http://www.standardsforhighways.co.uk/dmrb/vol11/section3/11s3p09.pdf

considered to cause, or contribute to, some degree of driver stress. As the DMRB guidance is generally applicable to linear road schemes, the methodology has been adapted to enable a qualitative assessment of driver stress to be undertaken, comparing existing levels of driver stress during an Operation Stack event with the predicted levels of driver stress during an Operation Stack event with the Project in place.

12.5.16 The assessment provides a description of driver stress using the following DMRB three point descriptive scale – low, medium or high:

- Frustration: the assessment considers potential delays and congestion affecting VT on the routes around the Project.
- Fear of potential accidents: the assessment takes a high level view of factors that may induce greater driver fear on the routes surrounding the Project (e.g. higher proportion of lorries, high congestion).
- Route uncertainty: the assessment takes a high level view of route uncertainty based on road design and sign layout.

Community and Private Assets

12.5.17 DMRB Volume 11, Section 3, Part 6 (Land Use) describes the methodology for assessing impacts on land use, which is as follows:

- Confirm the number of properties potentially affected by demolition and/or land take and categorise the impacts on affected land accordingly.
- Review the Shepway District Council Local Plan designations and other ‘committed’ developments (refer to Chapter 15: Consideration of Cumulative Effects) to ensure an accurate baseline is established in respect of potential effects on future development land.
- Assess the value of identified community assets likely to be affected by land take, including an indication of the amount of public use, where possible.

12.5.18 In respect of land take, DMRB recommends consideration of four types of community and private assets: private property, community land, development land and agricultural land. As stated above, effects on private property, and community and development land have been assessed in this chapter. Agricultural land is assessed separately in Chapter 15 (Agriculture).

12.5.19 Community severance has been assessed according to the guidance within DMRB Volume 11, Section 3, Part 8 (Pedestrians, Cyclists, Equestrians and Community Effects).

Consultation

12.5.20 A meeting was held with a PRoW officer from Kent County Council (KCC) on 13 April 2016 to discuss the Project and to agree the guiding principles to be adopted throughout the design process to minimise the impacts on the affected PRoW network.

12.5.21 The regulatory powers to be utilised to temporarily close the affected PRoW during both construction and operation of the Project were also discussed and there has been ongoing dialogue with KCC on this issue following the meeting. KCC provided an extract of the Definitive Public Rights of Way Map in the vicinity of the Project, which provided details of both the alignments and reference numbers (e.g. HE357) for the PRoW and the accompanying statement for each PRoW.

12.6 Assumptions and Limitations to the Assessment

12.6.1 The assumptions and limitations tor the assessment which apply across all chapter topics are given in chapter 4. Those specific to this chapter are given below:

- During the PRoW condition surveys, it was not possible to survey all PRoW due to a lack of safe access at some points. It is also considered likely that the season and weather (overcast with heavy rain showers) may have contributed to the lack of NMUs observed on the day of survey.
- A subsequent walk-over of some of the affected PRoW was undertaken on 13 April 2016 during warm and sunny weather. However, the alignments of some PRoW shown on the Definitive Public Rights of Way Map, namely HE272 and HE273, were not evident on the ground due to fields having been ploughed. Again, no NMUs were encountered on this subsequent walk-over.
- DMRB guidance has been adhered to where applicable; however, as this Project is not a traditional linear road scheme, the prescribed methods of assessing Views From The Road and Driver Stress have been amended to better fit the Project.

12.7 Baseline

NMUs

12.7.1 There are seven existing PRoW of local importance located within the Project Site Boundary. With the exception of HE271 which is a bridleway, all are classified as footpaths and are detailed in Table 12.3, located from east to west, and are shown on Figure 12.1. Appendix 12.1 provides a summary of the condition of these PRoW, using the information from the November 2015 survey. Although located outside of the Project boundary, footpath HE359 will be affected by the construction activities and by the Project once operational, and is therefore included in the assessment.

Table 12.3: PRoW within Project Site Boundary

PRoW Type	Number	Location / Description
Footpath	HE274	1.8km stretch of footpath following the north side of the Channel Tunnel Rail Link, south of the M20 motorway. It connects to Stone Street in the east (close to Westenhanger railway station) and the A20 Barrow Hill in the west. Views extend over the surrounding landscape comprising primarily of arable land and include Stanford Windmill.
Footpath	HE357	1.7km stretch of footpath running east to west along a field boundary and the northern boundary of the M20 motorway from Stone Street in Stanford to bridleway HE271 south west of Brook Farm, which continues on to the A20 Barrow Hill in Sellindge. Views extend over the surrounding landscape comprising primarily of arable land and include Stanford Windmill.
Footpath	HE269	430m stretch of footpath traverses agricultural land and runs south from Kennett Lane Cottages in Stanford to the M20 motorway boundary where it connects with footpath HE357. Views extend over the surrounding landscape comprising primarily of arable land and include Stanford Windmill.
Footpath	HE270	880m stretch of footpath traversing agricultural land west from Kennett Lane to Brook Farm, forming part of a network of footpaths which continue on to Gibbins Brook and Sellindge. This footpath also connects with footpaths HE272 and HE273. During the site walk-over the alignment of the footpath was not evident due to the field having been ploughed. Views extend over the surrounding landscape comprising primarily of arable land and include Stanford Windmill.
Footpath	HE262	570m stretch of footpath running connecting stone Street with to bridleway HE271 near The Old Farmhouse. Views extend over the surrounding landscape comprising primarily of arable land and include Stanford Windmill.
Footpath	HE272	520m stretch of footpath traversing from footpath HE357 to Gyminge Brook Cottage, forming part of a network of footpaths which continue on to Gibbins Brook and Sellindge. This footpath also connects with footpaths HE270 and HE273. Partly blocked by electric fencing for horses and during the site walk-over the alignment of the footpath from footpath HE357 was not evident due to the field having been ploughed. Views from this PRoW extend over the surrounding landscape comprising primarily of arable land and include Stanford Windmill.
Footpath	HE273	410m stretch of footpath running between the bridleway HE271 at Brook Farm and footpath HE272 which runs between footpath HE357 and Gyminge Brook Cottage and then onwards to Gibbins Brook and Sellindge. During the site walk-over the alignment of the footpath was not evident due to the field having been ploughed. Views extend over the surrounding landscape and include Stanford Windmill.
Footpath	HE359	330m stretch of footway running between the northern and southern sections of Stone Street which traverses the M20 motorway via a bridge which also carries a private access road. Views from the footpath are limited due to the presence of the motorway, fencing and the bridge parapets.
Bridleway	HE271	420m stretch of bridleway from footpath HE357 to Brook Farm, forming part of a network of footpaths which continue on to Gibbins Brook and Sellindge. The bridleway also connects to footpath HE272 and footpath HE273. Views extend over the surrounding landscape.

12.7.2 Footpaths HE274, HE269, HE262 and HE272 are classified as having low sensitivity, as there is no evidence to suggest that their primary purpose is anything other than for recreational use. These footpaths are local field footpaths and use is limited by poor surfacing and lack of lighting. Access to footpath HE274 from Stone Street is via narrow steps and does not provide sole direct access to any Long Distance Paths.

12.7.3 Footpaths HE357, HE270 and HE273 are classified as having medium sensitivity. Although these footpaths provide a link between Stanford and Sellindge, either directly or via minor roads or other footpaths, they will be principally used for recreation since their use is limited by poor surfacing and lack of lighting.

12.7.4 Footpath HE359 is classed as having high sensitivity. It is likely that the footpath is used for both recreation and utility journeys since it provides a link between Stanford and Westenhanger Railway Station.

12.7.5 Bridleway HE271 is classed as having medium sensitivity. Although principally used for recreation it is considered to be an important link in the local PRoW network.

12.7.6 There are no national or regional cycle network routes directly, or indirectly, affected by the Project.

12.7.7 In summary, although the existing PRoW are located within a rural landscape dominated by agricultural land and some have views of Stanford Windmill, the existing M20 motorway and the surrounding road network affect NMU's enjoyment and amenity of existing PRoW. The motorway and surrounding roads reduce the sense of rurality created when using PRoW in close proximity to the highway network which increases the levels of traffic noise and visual intrusion into the environment. This is further discussed in Chapter 7: Landscape.

Vehicle Travellers: Views from the Road

12.7.8 The existing views from the roads directly affected by the Project are described below in Table 12.4. A full set of viewpoints in the vicinity of the Project is considered in Chapter 8 (Landscape).

Table 12.4: Existing Views from Surrounding Roads

Road Name	Location	Proximity at Closest Point	Description
A20 (Ashford Road)	South west of the Project	1km	Open/Restricted view: Distant views comprise the chalk scarp in Kent Downs AONB and the mast at Tolsford Hill Radio Station. Grazing land in the foreground and agricultural land in the middle distance beyond Channel Tunnel Rail Link (CTRL). Views of CTRL and M20 are restricted where the road runs in cutting and views are screened by hedgerows and trees.
Stone Street, Stanford	North of merging with B2068.	0km	Restricted/Intermittent view: Views from the road south are restricted by vegetation and hedgerows, with intermittent views across agricultural land.
Kennett Lane, Stanford	Situated on the northern boundary of the Project	0km	Open view: The view is of Kennet House and the Project site in the foreground. Agricultural land dominates the view. The M20 lies in the middle distance and bisects the site. M20 traffic is visible where the route is at ground level.

12.7.9 In general, the views from the road for VT on the surrounding road network provide a positive experience, with occasional long distance views over the surrounding agricultural landscape and attractive residential streets.

Vehicle Travellers: Driver Stress

12.7.10 The M20 provides a link between the M25, the Channel Tunnel and ports at Dover and Folkestone. The M20 carries high volumes of traffic, which cause disruption and delays to the surrounding road network when emergency closures of Eurotunnel of the Port of Dover are in place. M20 Junction 11 is particularly susceptible to congestion and high levels of traffic as it provides access to the A20, an alternate route to the M20.

12.7.11 During 2015, Operation Stack was implemented 32 times, the majority of which required closures of the M20 Junctions 8 to 11. This also impacted on the linking road network, causing delays, congestion and route diversions.

12.7.12 During Operation Stack, lorries park up on the M20 when there are emergency closures. Non-freight vehicle movements are diverted from the M20 onto the County local road network via the A20, which is predominantly a single carriageway road between Maidstone and the coast. Lorries also park illegally on the local road network. As a consequence, very large volumes of traffic are forced to use this local road network resulting in extreme congestion, delays and unreliable journey times for both business and non-business trips across Kent. With mid- and east Kent effectively coming to a stand-still, the resulting negative economic, environmental and social impacts are significant and can be long lasting.

Frustration

12.7.13 Frustration is considered to be high for road users during Operation Stack, caused by delays to journeys and route diversions on both the M20 and the surrounding road network. There is also frustration experienced by local residents caused by lorries parking illegally on the road network.

Fear of Potential Accidents

12.7.14 Where increased numbers of lorries are diverted onto the local road network, or take local roads as a preferred route to avoid congestion during Operation Stack, there is considered to be a greater fear of potential accidents for VTs in smaller vehicles.

Route Uncertainty

12.7.15 VTs may experience increased levels of route uncertainty during Operation Stack, owing to network congestion and choosing alternative, less familiar routes to avoid network congestion.

12.7.16 In summary, VTs using the local road network and main routes (including the M20, A20 and B2068) are likely to be subject to higher levels of frustration, fear of potential accidents and route uncertainty during an Operation Stack event, than during an average day, resulting in high driver stress.

Community and Private Assets: Private Property

12.7.17 The Project is located within and surrounded by agricultural land and some private properties. The effects on agricultural land are assessed in Chapter 14: Agriculture.

Community and Private Assets: Community Land

12.7.18 There are no allotments, playgrounds, sports pitches or formal open spaces which are located within the land required for the Project. There are also no areas designated as Open Access Land under the Countryside and Rights of Way Act (2000). An area of registered common land known as Gibbins Brook borders the site to the north-west, but will not be directly affected by the Project.

12.7.19 There are no proposed developments or land allocations listed under the Shepway District Local Plan and therefore Community Land is not considered any further in this assessment.

Community and Private Assets: Development Land

12.7.20 There are no proposed developments or land allocations listed under the Shepway District Council Local Plan and therefore Development Land is not considered any further in this assessment.

Community and Private Assets: Community Severance

12.7.21 The Project is located within agricultural land in the district of Shepway, Kent, and is traversed by the M20 and will be accessed from the M20 via a new junction, west of J11. The nearest communities (within 1km) to the Project are located in the villages of Sellindge (to the west), Stanford (to the east) and Westenhanger (to the south-east).

12.7.22 The nearest road link between the communities of Stanford and Sellindge to Westenhanger is the A20 (accessed from the B2068 from Stanford), and the road connecting Stanford and Sellindge is Kennett Lane.

12.7.23 Communities and community facilities within the study area are shown on Figure 12.1.

12.7.24 There are a number of footpaths which traverse the area of land to be used by the Project which provide a pedestrian link between Sellindge and Stanford. They may be used by residents utilising the services provided by these community facilities. However, as these footpaths are not lit, the surfaces are uneven, and routes between Swan Street, Sellindge and Stone Street, Stanford are over 2km in length, it is likely that the majority of journeys to access community services and facilities are made by vehicle, whilst PRoW are used mainly for recreational purposes.

Community: Sellindge

12.7.25 The 2011 census states the Parish of Sellindge has a population of 1,601 people. Sellindge is identified within the Shepway Rural Services Study (Shepway District Council, 2011) as a secondary community service cluster, providing fairly scarce services including a primary school, post office and health care. It also has other community facilities such as a village hall, a sports and social centre.

12.7.26 Journeys likely to be made to and from Sellindge include:

- From Sellindge to Hythe via the A20 to access further community facilities, employment premises and secondary schools.
- From Stanford to Sellindge via Kennett Lane to access services.
- It is most likely that if used for travelling between communities, footpaths HE270 and 273 or footpath HE357 will be used to reach Sellindge from Stanford as they provide the most direct routes. Sellindge can be reached on foot from Westenhanger via footpath HE274.

Community: Stanford

12.7.27 The 2011 census states the Parish of Stanford has a population of 429 people. Stanford is identified within the Shepway Rural Services Study (Shepway District Council, 2011) as forming part of a tertiary community service cluster with Westenhanger due to the presence of a public house and railway station. Stanford also has a place of worship – the All Saints Church.

12.7.28 Journeys likely to be made to and from Stanford include:

- From Stanford to Sellindge to access doctor's surgery, post office, village hall and primary school via Kennett Lane.
- From Stanford to Hythe via the B2068 and A261 to access additional essential services, retail facilities and employment premises.

Community: Westenhanger

12.7.29 Westenhanger falls within the Parishes of Stanford and Saltwood. The closest facilities available to residents of Westenhanger are located within Lympne, Sellindge or Hythe. Westenhanger is home to other recreational facilities such as Folkestone Racecourse and a camping site.

12.7.30 Journeys likely to be made to and from Westenhanger include:

- Lympne via the A20 and Stone Street to access the primary school, post office and shop/supermarket.
- Sellindge via the A20 to access the doctor's surgery, primary school, post office and sports/social club.
- Hythe via the A261 for numerous schools and community facilities.
- Westenhanger railway station.

12.7.31 DMRB guidance states that with regards to use of community facilities, it should be assumed that people will use their nearest facility. On this assumption, residents of Sellindge and Stanford will seek to use the community facilities (GP, food store and primary school) within Sellindge. Residents of Westenhanger are located approximately the same distance between Hythe and Sellindge, so are likely to use community facilities within both, in addition to other facilities in other smaller settlements further to the south, such as the primary school within Lympne.

12.8 Mitigation

NMUs

12.8.1 During the construction period, temporary, alternative routes for the footpaths to be closed will be agreed between the Contractor and KCC. Increases in journey length will inevitably occur when the footpaths are temporarily closed; however, this is deemed acceptable given the over-riding need to protect public safety.

12.8.2 During operation, the alignments and widths of the existing footpaths will be maintained within the Project Site Boundary. The alignment and width of the bridleway will also be maintained. The surfaces of the footpaths currently comprise a mixture of grass across arable land, grass across pasture land and grass along field boundaries and no distinct alignment is evident on the ground in several places. The alignments of the PRoW within the Project Site Boundary will be demarked on the new concrete surfacing to be implemented as part of the Project with the exception of a section of footpath HE357. The section of footpath HE357 which runs adjacent to the proposed slip road will be upgraded to a 2.0 metre footway. At grade crossings of the proposed Site access slip roads will be provided as appropriate.

12.8.3 Lockable gates will be provided at both ends of the footpaths affected by the Project to prevent use of the PRoW when an Operation Stack event occurs. Peripheral “permissive” paths will be provided within the 20m landscape buffer zones to provide alternative routes for NMUs when an Operational Stack event occurs.

Vehicle Travellers: Views from the Road

12.8.4 The following measures implemented during construction will partly mitigate impacts on any views from the surrounding roads caused by construction activities.

- Retention and protection of boundary vegetation wherever possible.
- Where practicable, siting topsoil bunds to screen and / or provide a physical buffer between the construction works and residential properties.

12.8.5 During operation, mitigation planting will surround the site to aid screening and break up the built form of the site from within. Further details of the landscape mitigation strategy are included in Chapter 7: Landscape. Visual intrusion from the Project will be greater in opening year as mitigation planting would have yet to establish to form an effective screen. Over time as vegetation matures, it would aid the integration of the site into the surrounding landscape, either filtering or screening views to site from the local road network. The screening function would, however, reduce somewhat during winter months when trees are not in leaf.

Vehicle Travellers: Driver Stress

12.8.6 During construction, traffic management will be implemented on roads directly affected by the construction activities. Traffic management will be agreed with the relevant local authority in advance and the public will be notified as required.

12.8.7 During operation, there will be no requirement for mitigation as the M20 will be open to all traffic. Traffic management or managed motorway speed restrictions may be required during an Operation Stack event; however this will ensure that the flow of traffic and lorries is managed to prevent congestion.

Community and Private Assets

12.8.8 No mitigation is required for community severance.

12.9 Residual Impacts (with mitigation)

NMUs: Journey Length and Changes in Amenity

Construction

12.9.1 During construction, the eight PRoW that traverse and/or run parallel to the Project Site, including footpath HE359, will be temporarily closed and temporary diversions will be put in place by the Contractor. These diversions are likely to increase journey lengths; however, any adverse impacts would be temporary in nature.

12.9.2 Amenity will be reduced for users of the footpaths and the bridleway in the vicinity of the Project due to higher levels of noise and visual intrusion from construction activities. The magnitude of effects on PRoW during the construction period is summarised in Table 12.5.

Table 12.5: Magnitude of Change of PRoW within the Project Site Boundary during Construction

Right of Way Type	Number	Magnitude of Change During Construction
Footpath	HE274	The section of this footpath between Stone Street and the western extremity of the site will need to be temporarily closed or diverted during construction of the Project – Moderate adverse impact.
Footpath	HE357	The section of this footpath between Stone Street and the bridleway HE271 will need to be temporarily closed or diverted during construction of the Project – Moderate adverse impact.
Footpath	HE269	The section of this footpath to the south of Kennett Lane will need to be temporarily closed or diverted during construction of the Project – Moderate adverse impact.
Footpath	HE270	The section of this footpath which runs westwards from Kennett Lane to footpath HE273 and beyond to bridleway HE271 will need to be temporarily closed or diverted during construction of the Project – Moderate adverse impact.
Footpath	HE262	This section of footpath which runs westwards from Stone Street to the bridleway HE271 will need to be temporarily closed or diverted during construction of the Project – Moderate adverse impact.
Footpath	HE272	The section of this footpath which runs between footpath HE357 and the bridleway HE271 will need to be temporarily closed or diverted and a short section will be permanently closed during construction of the Project – Moderate adverse impact.
Footpath	HE2273	The section of this footpath which runs between footpath HE272 and bridleway HE271 will need to be temporarily closed or diverted during construction of the Project – Moderate adverse impact.
Footpath	HE359	The section of footpath which runs between the northern and southern sections of Stone Street will need to be temporarily closed or diverted construction of the Project – Minor adverse impact.
Bridleway	HE271	The section of bridleway which runs between Brook Farm and A20 Barrow Hill will need to be temporarily closed or diverted during construction of the Project – Moderate adverse impact.

12.9.3 During construction, an impact significance of **slight adverse** is anticipated on footpaths HE274, HE269, HE262 and HE272. An impact significance of **moderate adverse** is anticipated on footpaths HE357, HE270, HE273, HE359 and bridleway HE271, as detailed in Table 12.6.

Table 12.6: Significance of Effect on PRoW within the Project Boundary during Construction

Right of Way Type	Number	Sensitivity	Magnitude of Change	Significance of Effect
Footpath	HE274 HE269 HE272 HE262	Low	Moderate adverse	Slight adverse
Footpath	HE357 HE270 HE273	Medium	Moderate adverse	Moderate adverse
Footpath	HE359	High	Minor adverse	Moderate adverse
Bridleway	HE271	Medium	Moderate adverse	Moderate adverse

Operation

12.9.4 The alignments and widths of the eight PRoW which traverse the Project Site Boundary will be maintained as part of the Project. The alignment and width of footpath HE359 will also be maintained.

12.9.5 During the day to day operation of the Project, there will be no impact on journey length for NMUs. However, there is anticipated to be a permanent severe reduction in amenity experienced by NMUs due to the proximity of the Project and higher levels of noise and visual intrusion from parked and moving traffic. This is particularly the case for users of footpath HE274, which runs to the south of the Full-time parking area and footpath HE359, which will be crossed by the new access road linking the Project to the Stop24 Service Area.

12.9.6 In addition to a permanent severe loss of amenity due to the proximity of the Project, during an Operation Stack event, it will also be necessary to temporarily close all of the footpaths, with the exception of footpath HE359, in the interest of safety for NMUs and due to security requirements. During these times, journey length for users of the PRoW network will increase, but only for a temporary period.

12.9.7 The magnitude of the effects on PRoW during operation are summarised in Table 12.7.

Table 12.7: Magnitude of Change of PRoW within the Project Site Boundary during Operation

PRoW Type	Number	Magnitude of Change During Operation
Footpath	HE274 HE357 HE269 HE270 HE272 HE273 HE262	The alignment and width of the footpaths will be maintained (albeit they will be closed temporarily for short periods). However, a permanent severe loss of amenity will be experienced by users due to the proximity of the Project and its impact on the pleasantness of the journey, resulting in an adverse impact of Major magnitude.
Footpath	HE359	The alignment and width of the footpath will be maintained. However, a permanent moderate loss of amenity will be experienced by users due to the proximity of the new access road linking the Project to the Stop24 Motorway Service Area, which will cross the footpath, resulting in an adverse impact of Moderate magnitude.
Bridleway	HE271	The route will remain open during operation. However, a permanent severe loss of amenity will be experienced by users due to the proximity of the Project and its impact on the pleasantness of the journey, resulting in an adverse impact of Moderate magnitude.

12.9.8 Although footpaths HE274, HE269, HE262 and HE272 within the Project Site Boundary have been identified as having low sensitivity and their respective alignments and widths will be maintained, the permanent severe loss of amenity experienced by users is considered to result in an impact of major adverse magnitude and therefore **moderate adverse** significance during operation (Table 12.8). A similar scenario is anticipated for footpaths HE357, HE270 and HE273, resulting in an impact of major adverse magnitude and therefore **large adverse** significance.

12.9.9 The permanent moderate loss of amenity experienced by users of footpath HE359 is considered to result in an impact of moderate adverse magnitude and therefore Large adverse significance during operation.

12.9.10 The permanent severe loss of amenity experienced by users of bridleway HE271 is considered to result in an impact of moderate adverse magnitude and therefore Moderate adverse significance during operation.

Table 12.8: Significance of Effect on PRoW within the Project Site Boundary during Operation

Right of Way Type	Number	Sensitivity	Magnitude of Change	Significance of Effect
Footpath	HE274 HE269 HE272 HE262	Low	Major adverse	Moderate adverse
Footpath	HE357 HE270 HE273	Medium	Major adverse	Large adverse
Footpath	HE359	High	Moderate adverse	Large adverse
Bridleway	HE271	Medium	Moderate adverse	Moderate adverse

Vehicle Travellers: Views from the Road

Construction

12.9.11 Effects arising from visual impacts during construction are assessed within Chapter 7: Landscape.

Operation

12.9.12 A range of impacts arising from the operation of the Project on views from the road are anticipated, as shown in Table 12.9 below.

Table 12.9: Change in Views from Surrounding Roads

Road Name	Existing Views	View from Road (Year 1)	View from Road (Year 15)
A20 (Ashford Road)	Open/ Restricted view	A large swathe of hardstanding, lorry movements, control booths, lighting columns, and traffic signals, would form a noticeable feature in the view looking north whilst travelling along the A20. Night time lighting in the full time parking area to the south of the M20 would be seen from the road set in the context of passing headlights from vehicles on the intervening M20 which traverses the view in an otherwise unlit landscape. The Project would dominate the view when the site was in full use for Operation Stack due to the increased extent of lighting use, lorry presence and traffic movement. Night time lighting would be noticeable in an area that is currently unlit. The remainder of the site to the north of the	Although mitigation planting would screen or reduce views of ground level activities, the upper part of high sided lorries, lighting columns and service building may remain visible. Mitigation planting would go some way to settling the Project within the view and reducing its visual prominence. Lorry movements and vehicle headlights would be perceptible, particularly in winter following leaf fall. Night time lighting would be a noticeable part of the view and could not be fully mitigated from this location.

Road Name	Existing Views	View from Road (Year 1)	View from Road (Year 15)
		M20 would remain unlit when Operation Stack is not in force. Landscape mitigation planting, whilst visible, would not be effective at Year 1.	
Stone Street, Stanford	Restricted/ Intermittent view:	The service building and permanent 24 hour lorry parking area, in addition to 4 control booths, may be prominent in views where there are breaks in vegetation and as road users drive closer to the site. The new access to the southern section of the site would be in the immediate foreground of the view, as would a new overbridge connecting the southern and northern sections of the Lorry Area. Lorry movements and vehicle headlights, and site lighting would present an additional focal point of the view. Night time lighting would be dominant in an area that is currently unlit. Landscape mitigation planting would not be effective at Year 1.	Although mitigation planting would screen or reduce views of ground level activities, lorry movements into the facility would still be visible and vehicle headlights noticeable, particularly in winter following leaf fall. Night time lighting would be a noticeable part of the view and could not be mitigated.
Kennett Lane, Stanford	Open view	Whilst the permanent 24 hour Lorry Area would be placed to the south of the M20, the presence of the northern section of the site even outside periods of Operation Stack would be an entirely dominant feature in the view. Farmland in the foreground of the view would be replaced by hard surfaced areas for lorry parking with lighting columns, toll booths (adjacent to the M20) and signage visible from this location. Views are also likely to be afforded to the 24 hour facility south of the M20. Lorry movements and vehicle headlights, and site lighting would exacerbate the visual prominence of the site when Operation Stack is in use. Night time lighting in the full time parking area to the south of the M20 would be seen from the road set in the context of passing headlights from vehicles on the intervening M20 which traverses the view in an otherwise unlit landscape. Night time visual intrusion would be heavily dominated by static site lighting and vehicle headlights during periods of Operation Stack. Landscape mitigation planting would not be effective at Year 1.	Although mitigation planting would screen or reduce views of ground level activities, elements of the site may still remain visible, particularly in winter months when lorry movements and vehicle headlights would be noticeable following leaf fall. Night time lighting would remain a noticeable part of the view and could not be fully mitigated. As the screen planting matured, the open character and composition of the existing view, which is aesthetically and scenically pleasing, would be replaced by near distance views of woodland planting screening open views of the Lorry Area that were afforded in Year 1.

Vehicle Travellers: Driver Stress

Construction

12.9.13 As a phased approach will be taken during construction to allow partial capacity to be utilised as it becomes available, there will be some alleviation of driver stress on the M20 and surrounding road network. However, should Operation Stack be implemented before any part of the Project is available for use, or where traffic management is implemented on surrounding roads, driver stress is likely to remain high during these temporary periods, resulting in no change from the existing scenario.

Operation

12.9.14 Driver stress will be reduced as a result of the Project as the M20 will remain open to traffic during operation, avoiding the level of disruption on the local road network currently experienced when Operation Stack is implemented. Whilst the eastbound off-slip of Junction 11 will be closed during implementation of Operation Stack with the project in place, a diversion route via Junction 12 will allow traffic to return to Junction 11 via the westbound carriageway of the M20. It is anticipated that driver stress will be reduced from high to low during Operation Stack, resulting in a **beneficial** effect on VTs during these periods.

12.9.15 Additionally, the Project will provide additional off-road parking for lorries, reducing the number of illegally parked lorries on the road network resulting in a **beneficial** effect on VTs and the local community.

Community and Private Assets

12.9.16 During construction, the M20 and local road network (including the A20, B2068 and Kennett Lane) will be subject to some traffic management measures, resulting in potential diversions and delays along routes (both vehicular and NMU) between communities. However, these impacts would be temporary in nature.

12.9.17 During operation, the Project is anticipated to result in improved access for VTs between communities at times when Project Stack is in place.

12.10 Further Mitigation Opportunities

12.10.1 None have been identified.

13. Road Drainage and the Water Environment

13.1 Executive Summary

13.1.1 This chapter assesses the impacts of the Project on Road Drainage and the Water Environment, using published guidance provided in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 10 Road Drainage and the Water Environment (HD 45/09).

13.1.2 The majority of potential effects during the construction phase can be mitigated through the Project design and provision of, and adherence to, the measures outlined in a Construction Environment Management Plan (CEMP). The greatest residual risks are likely to be associated with direct impacts due to construction works taking place directly within or adjacent to water features or below the water table, in particular risks associated with spillage and sedimentation. The removal of these risks would be not possible, but the residual risks post-mitigation are likely to be temporary and not pose a risk to the long-term quality of any water features or local habitats. Risks associated with dewatering such as impacts on water features and settlement would be mitigated by the earthworks design.

13.1.3 Adverse impacts associated with the operation of the Project would be mitigated through the detailed design of the Project and measures contained within the CEMP, and are not significant.

13.2 Introduction

13.2.1 This chapter assesses the impacts of the Project on Road Drainage and the Water Environment, using published guidance provided in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 10 Road Drainage and the Water Environment (HD 45/09).

13.2.2 It assesses potential impacts to surface water features, groundwater features and flood risk predominantly associated with the creation of surface-borne pollutants, works within close proximity of surface water features, surface water runoff and works within areas identified to be at risk of flooding.

13.2.3 This chapter also considers potential impacts on groundwater flow and quality associated with the earthworks during the construction phase, including dewatering and the disturbance of contaminated land, and potential impacts associated with the operational phase such as structures within the saturated aquifer and the loss of infiltration area. Impacts to groundwater resources and groundwater quality associated with these aspects are considered in more detail in the Groundwater Report (Appendix 13.3).

13.3 Regulatory / Policy Framework

13.3.1 The management of water resources is governed by a range of legislative guidance set out in international, national and regional policies and plans. This assessment has been prepared whilst taking these plans and policies into account.

13.3.2 The most significant regulatory requirements related to this assessment are set out within the Water Framework Directive (WFD), Environmental Permitting Regulations, National Planning Policy Framework (NPPF) and local planning policy.

European and National

Water Framework Directive

13.3.3 Water Framework Directive (2000/60/EC). The main aim of the WFD is to bring about the effective co-ordination of water environment regulation and policy across Europe and ensure that all surface water and groundwater bodies reach 'good' status in terms of ecological and chemical quality and water quantity, as appropriate. Other key aims of the WFD that are most closely related to the proposed development are to:

- Prevent further deterioration and protect and enhance the status of water bodies.
- Ensure the progressive reduction of pollution of surface water and groundwater resources and prevent their further pollution.
- Contribute to mitigating the effects of floods and droughts.

The Environmental Permitting (England and Wales) Regulations

13.3.4 The Environmental Permitting (England and Wales) Regulations 2010 replaced the Groundwater Regulations (1999, 2009) and the relevant sections of the Water Resources Act 1991 as the key legislation for water pollution in the UK. Under the Environmental Permitting Regulations 2010 it is an offence to cause or knowingly permit a water discharge activity, including the discharge of polluting materials to freshwater, coastal waters, relevant territorial waters or groundwater, unless complying with an exemption or an environmental permit. An environmental permit is obtained from the Environment Agency. The Environment Agency sets conditions which may control volumes and concentrations of particular substances or impose broader controls on the nature of the effluent, taking into account any relevant water quality standards from European Directives.

National Planning Policy Framework

13.3.5 National Planning Policy Framework and supporting Planning Practice Guidance (PPG) identify how new developments must take into account flood risks, including making allowance for climate change impacts. The sequential test is used as the principal step to identify preferred locations, i.e. those not exposed to risk of flooding. Then, if development is deemed necessary in a flood zone, an exception test can be conducted through an appraisal of risk, and appropriate reduction and management measures can be implemented.

13.3.6 The NPPF and supporting PPG also set out recommendations for the management of surface water run-off. SUDS should be promoted where appropriate, with preference given to the infiltration of surface water run-off to ground before considering the discharge of water to a watercourse or sewerage system.

Regional

13.3.7 Kent County Council Drainage and Planning Policy Statement (2015) sets out the requirements of Kent County Council (KCC), as Lead Local Flood Authority (LLFA), in regard to the management of surface water run-off. KCC is a statutory consultee and will review the proposed drainage strategy for the Project.

13.3.8 The Policy Statement promotes the use of sustainable drainage and sets out the Council's requirements within ten drainage and water environment policies as follows:

- Drainage Policies (Sustainable Urban Drainage Systems - SUDS, Policy 1 to 6) that set out the requirements for a drainage strategy to be compliant with the NPPF and DEFRA's Non-Statutory Technical Standards for Sustainable Drainage.
- Wider Environment Policies (SUDS Policy 7 to 10) that set out expectations to be considered within a drainage strategy in response to environmental legislation and guidance that Kent County Council and the Local Planning Authorities have a duty to comply with.

13.3.9 A summary of the key requirements pertinent to this Project are as follows:

- The application of the drainage hierarchy with preference given to the infiltration of surface water run-off to ground before considering the discharge of water to a watercourse or sewerage system.
- Ensure no increased flood risk to people and property elsewhere, including the management of exceedance flows.
- Match greenfield discharge rates and mimic natural drainage routes as far as possible.
- Seek to reduce existing sources of flood risk, where a risk has been identified.

- Consider the potential impacts of climate change and potential changes in impermeable area over the design life of the development.
- Consider maintenance requirements and the authority responsible for maintenance.
- Consider pollution risks and ensure that surface water discharges do not adversely impact the water quality of receiving water bodies, both during construction and when operational.
- Strive to achieve opportunities to enhance amenity and biodiversity value and contribute to the wider landscape.

13.3.10 In addition to the above, the Policy Statement also states that culverting of open watercourses will not normally be permitted except where essential to allow highways and / or other infrastructure to cross.

Local

13.3.11 Shepway District Council Core Strategy Local Plan (2013) contains Policy SS3, in which the Council states that all development at risk of flooding should be subject to a site-specific flood risk assessment appropriate to the scale and type of development, and that developers will be required to contribute to mitigation of flood risks elsewhere. In addition, Policy CSD5 states that developers are required to consider SUDS, and this should include provisions in proposals to confirm long-term management arrangements for features.

13.4 Study Area

Site Description

13.4.1 The Site lies to the north and south of the M20, to the west of Junction 11. The southern portion of the Site overlies an area of undulating topography, thought to have been formed from the deposition of excess material resulting from the construction of the M20 and Channel Tunnel Rail Link (CTRL). The land is used for arable cropping, and it bordered to the south by the CTRL, by the M20 to the north, by the East Stour River to the east, and Haytons Stream to the west.

13.4.2 The northern portion of the Site lies to the north of the M20 and is also used for arable cropping, interspersed with residential properties and a farm. There are numerous small watercourses throughout the Site. These are mostly field drains, although Haytons Stream forms a larger watercourse running north-south through the centre of the Site. Haytons Stream flows through agricultural land to the north of the Site, before reaching a large fishing lake at the north of the Site, then continuing to flow in an open channel before being culverted under the southern end of the Site and the M20, as shown in Figure 13.2.

13.4.3 Gibbins Brook flows to the west of the Site, flowing under the M20 through a culvert, before joining Haytons Stream to the southwest of the Site. The Gibbins

Brook supports an area of marshy grassland to the northeast of the Project Site, which is designated as a Site of Special Scientific Interest (SSSI).

13.4.4 The geology underlying the Study Area is considered in more detail in Chapter 9: Geology and Soils and in the Groundwater Report (Appendix 13.3). Figure 13.6 shows that the bedrock geology primarily comprises sandstone of the Folkestone Formation although sandstone, siltstone and mudstone of the underlying Sandgate Formation are present across the western part of the Site and there is also a small area of Hythe Formation (sandstone with subordinate, interbedded limestone). All three formations are part of the Lower Greensand Group of Cretaceous age. Gault Formation (clay) overlies the Lower Greensand to the north of the Site. The strata dip gently to the northeast.

13.4.5 The Lower Greensand Group does not behave as a distinct aquifer unit. In broad terms, the Folkestone Formation and the Hythe Formation act as two different aquifers separated by the clay and silt layers of the Sandgate Formation. The Folkestone and Hythe formations are both classed by the Environment Agency as a Principal Aquifer (layers of rock or drift deposits that have high intergranular and/or fracture permeability meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale), whereas the intervening Sandgate Formation is classed as a Secondary A Aquifer (permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers)[163] The overlying Gault Formation is classed as unproductive strata (rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow).

13.4.6 The South East River Basin Management Plan (RBMP) indicates that the Lower Greensand aquifer underlying the Project area is included in the Kent Greensand Eastern Groundwater Body (GB40701G501400). Both the current (2015) WFD chemical and quantitative status of this groundwater body are Poor. The reasons for not achieving Good status are the impacts of agriculture and rural land management, and urban and transport. The 2027 objectives for both are Good but no specific measures are identified[164].

13.4.7 Figure 13.7 shows the distribution of superficial deposits. The area to the west of Junction 11 is predominantly covered by Quaternary Head deposits consisting of clay and silt. A ribbon of Alluvium consisting of silty clay with layers of silt, sand, gravel and peat broadly follows the route of the East Stour River and its tributaries, including Gibbins Brook and Haytons Stream. More substantial peat deposits are present to the northwest of the Site underlying Gibbins Brook SSSI and on the northern boundary of the Site along the line of Haytons Stream. British Geological

[163] Environment Agency Interactive maps, http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e, accessed 21/06/2016
[164] Southeast River Basin management Plan, Environment Agency 2016, https://www.gov.uk/government/collections/river-basin-management-plans-2015, accessed 21/06/2016

Survey (BGS) records indicate that the superficial deposits are generally up to 4 m thick.

13.4.8 Some of the superficial deposits are designated as a Secondary (undifferentiated) aquifer (assigned in cases where it has not been possible to attribute either Secondary category A or B status due to the variable hydraulic characteristics of the layer). This aquifer status is applied to both Head deposits and some Alluvium but only to a relatively small proportion of the superficial deposits in the area.

13.4.9 Figure 13.8 displays groundwater vulnerability zones published by the Environment Agency[165]. The Lower Greensand and superficial deposits underlying the Site is assigned Major Aquifer High and Major Aquifer Intermediate vulnerability, reflecting the underlying geology and freely draining slightly acid loamy soils[166].

13.4.10 The Site does not intersect any Source Protection Zones (SPZ). The closest licensed abstraction is around 700 m to the southeast and is used for irrigation purposes. It is likely to be abstracting from the Hythe Formation, which is at depth below the Project Site and separated from the outcropping Folkestone Formation by the Sandgate Formation. The nearest public water supply abstractions are from the Chalk to the northeast of the Project Site and hydraulically isolated from the Lower Greensand by the clays of the intervening Gault Formation. Details of unlicensed abstractions have not been obtained to date.

13.4.11 Potential sources of pollution are identified in Chapter 9: Geology and Soils. Historical and active land uses identified are not considered to constitute a significant source of contamination. However, the historical demolition of agricultural buildings and localised littering / fly tipping within the Project Site boundary may have resulted in localised soil contamination. Additionally, the presence of oil filled electricity cables (running parallel along the north side of the M20) may represent an on-site source of hydrocarbon contamination.

Proposed Illustrative Design

13.4.12 The proposed illustrative design is described in Chapter 2: The Project, but parts of the design that are relevant to this chapter are summarised below.

13.4.13 The shape of the fishing lake would be modified, as it would be split into two separate lakes in order to accommodate lorry parking and a Public Right of Way (PRoW), but the total area and volume would be maintained. The southern section of the existing fishing lake would be in-filled, with a new lake created to the northeast of the remaining portion of the existing fishing lake. The total volume and

[165] Environment Agency Interactive maps, http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e, accessed 21/06/2016
[166] Environment Agency Interactive maps, http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e, accessed 21/06/2016

area of the fishing lake would be maintained. Haytons Stream would be culverted from the southern outfall of the fishing lake to south of the M20.

13.4.14 A new access road would be constructed for lorries to access and egress the Site, which would cross a drainage ditch (OD3) that runs along the northern edge of the M20. OD3 would be maintained under the proposed Project, although sections of it would need to be culverted to allow for access.

13.4.15 A two-way link road would cross the East Stour River to the southeast of the Site to provide access between the Site and the existing Stop24 Service Area. This would be achieved by an extension to the existing culvert. The culvert would be designed to match the dimensions of the existing culvert to ensure no restrictions to flows, although a loss of aquatic habitat and connectivity would result from the extension.

A two-way link road would cross the East Stour River to the southeast of the Site to provide access between the Site and the existing Stop24 Service Area. This would be achieved via an extension to the existing culvert. The culvert would be designed to match the dimensions of the existing culvert to ensure no restrictions to flows, although a loss of aquatic habitat and connectivity would result from the extension.

13.4.16 To the south of the M20, ditch OD5 would be partially culverted and partially diverted to meet the East Stour River on the southern Project Site boundary.

13.4.17 The proposed drainage design would capture all surface water run-off from the impermeable area of the Project Site and convey it to attenuation features. The northwest section of the Site would drain via an attenuation pond and interceptor to the culverted section of Haytons Stream, the northeast section would drain via underground attenuation tanks, catchpits and an interceptor to the culverted section of Haytons Stream, and the southern would drain via an underground storage tank and interceptor to the open reach of Haytons Stream.

13.4.18 A landscape strip would be planted around the perimeter of the Site where space allows.

13.4.19 A facilities building would be constructed close to the southern boundary of the M20. Sewerage for the building will be connected to the mains sewerage.

13.4.20 During the construction stage, site clearance involving vegetation removal and soils stripping is likely to take place, followed by earthworks to level the Site, remove unsuitable soils and create the required ground levels before hardstanding is constructed. Where required, in-situ treatment of unsuitable soils may be undertaken to stabilise the sub-grade prior to pavement construction.

13.4.21 Foundations for structures are likely to comprise shallow spread footings or deep piled type foundations depending on specific structural loads and ground conditions. It is considered likely that the proposed M20 overbridge and retaining walls will be piled.

13.4.22 Where appropriate, the spatial scope of this assessment extends further than the proposed study area. This is most applicable to impacts associated with downstream watercourses, which could be affected by pollutants transported further downstream.

13.5 Assessment Methodology

13.5.1 The method of assessment of potential impacts to identified receptors and the reporting of significant effects has been based broadly on guidance contained in the DMRB HD 45/09.

Assessment of Value / Sensitivity

13.5.2 The importance (value / sensitivity) of the attribute is considered in terms of indicators, such as quality, scale, rarity and substitutability. The following criteria have been developed following the general guidance of HD 45/09 as set out in Table A4.3 Annex IV, as reported in Table 13.1 below.

Table 13.1: Estimating the Importance of Water Environment Receptors

Importance	Criteria	Example
Very High	Attribute has a high quality and rarity on regional or national scale	**Surface Water**: Site protected under EU wildlife legislation (Special Areas of Conservation (SAC), Special Protection Areas (SPA) or Ramsar site); WFD high status waterbodies. **Groundwater**: Principal aquifer providing a regionally important resource or supporting site protected under EU wildlife legislation; Source Protection Zone 1 (SPZ1); archaeological feature or structure with very high importance and rarity, international scale and very limited potential for substitution, or more than 100 residential, commercial or industrial properties, which may be affected by changes to the groundwater regime. **Flood Risk**: Receptor is at high risk from flooding (FZ3b); or floodplain or defence protecting more than 100 residential properties from flooding.
High	Attribute has a high quality and rarity on local scale	**Surface Water**: Site protected under UK wildlife legislation (SSSI); WFD status (or potential) is currently ‘good’ or has a target of good. **Groundwater**: Principal or Secondary aquifer providing locally important resource or supporting site protected under UK wildlife legislation; SPZ2; or archaeological feature or structure with high importance and rarity, national scale, and limited potential for substitution, or between 10 and 100 residential, commercial or industrial properties, which may be affected by changes to the groundwater regime. **Flood Risk**: Receptor is at high risk from flooding (FZ3a); floodplain or defence protecting between 10 and 100 residential properties or industrial premises from flooding.
Medium	Attribute has a medium quality	**Surface Water**: Site protected under Local wildlife legislation (Site of Nature Conservation Interest (SNCI), Local Natural Reserve (LNR)); WFD status (or potential) is moderate.

Importance	Criteria	Example
	and rarity on local scale	**Groundwater**: Secondary aquifer which is of limited value because the water quality does not allow potable or other quality sensitive uses, exploitation may be for agricultural or industrial use but is not extensive; limited connection to surface water and may provide some support to local site of nature conservation interest; SPZ3; archaeological feature or structure with high or medium importance and rarity, regional scale, limited potential for substitution, or 10 or fewer residential, commercial or industrial properties, which may be affected by changes to the groundwater regime. **Flood Risk**: Receptor is at moderate risk from flooding (FZ2); floodplain or defence protecting 10 or fewer industrial properties from flooding.
Low	Attribute has a low quality and rarity on local scale	**Surface Water**: WFD status (or potential) is poor, or waterbody is not classified under the WFD. **Groundwater**: Unproductive strata, with no known past or existing exploitation and not providing baseflow to rivers or supporting a site of nature conservation interest; no archaeological feature or structure and no residential, commercial or industrial properties that may be affected by changes to the groundwater regime. **Flood Risk**: Receptor is at low risk from flooding (FZ1); floodplain with limited constraints and a low probability of flooding of residential and industrial properties.

Assessment of Magnitude

The criteria for assessing the magnitude of a potential impact are summarised in

13.5.3 Table 13.2, as developed from HD 45/09 Table A4.4 Annex IV.

Table 13.2: Estimating the Magnitude of an Impact

Magnitude	Criteria	Example
Major Adverse	Results in loss of attribute and / or quality and integrity of the attribute	Loss or extensive change to a designated nature conservation site. Change to the environmental status/classification of a water feature, including water quality classification. Major permanent or long-term change to groundwater quality or available yield. Existing resource is lost or irreparably impacted upon. Changes in groundwater quality, levels or yields that may present a major risk to structures or archaeological features. Increase in potable demand beyond that which can be supplied by existing infrastructure or by upgrade works to existing infrastructure within vicinity of development. Changes to site resulting in an increase in discharge/run-off of >75% with flood/sewerage exceedance potential. Increase in peak flood level (1% annual probability event) >100mm. Loss of flood storage areas.

Magnitude	Criteria	Example
Moderate Adverse	Results in effect on integrity of attribute, or loss of part of attribute	Partial loss or change to a designated nature conservation site. Partial loss or change of the integrity of a groundwater-supported site of nature conservation interest. Pollution of a receiving water body, but insufficient to change the environmental status/classification, including water quality classification. Substantial changes to the groundwater quality, levels or yields predicted to have impact on resource use. Partial loss or change of the integrity of a groundwater-supported designated site of nature conservation interest. Changes in groundwater level and/or quality that may present a moderate risk to structures or archaeological features. Increase in potable demand beyond that which can be supplied by existing infrastructure, but which can be met with moderate upgrade works to existing infrastructure within vicinity of development. Changes to site resulting in an increase in discharge/run-off within system capacity. Changes to site resulting in an increase in discharge/run-off of >50% with flood/sewerage exceedance potential. Increase in peak flood level (1% annual probability event) >50mm.
Minor Adverse	Results in some measurable change in attributes quality or vulnerability	Potential low risk of some pollution to a surface water body, but insufficient to cause loss in quality or biodiversity. Some measurable changes to groundwater quality, levels or yields but the changes represent no more than a slight risk to resource use, sites of nature conservation interest, structures or archaeological features. Increase in potable demand beyond that which can be supplied by existing infrastructure, but which can be met with minor upgrade works to existing infrastructure within vicinity of development. Changes to site resulting in an increase in discharge/run-off of >25% with flood/sewerage exceedance potential. Increase in peak flood level (1% annual probability event) >10mm.
Negligible	Results in effect on attribute, but of insufficient magnitude to affect its use or integrity	The proposed Project is unlikely to affect the integrity of the water environment. No measurable impact upon an aquifer. No measurable increase in discharge/run-off and/or no flood/sewerage exceedance potential. Negligible change in peak flood level (1% annual probability event) <10mm. Increase in potable demand within capacity of existing infrastructure.

Magnitude	Criteria	Example
Minor Beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	Minor improvement in groundwater quality and/or resource availability. Calculated reduction of spillage risk by 50% or more to an aquifer. Minor improvement to the integrity of a groundwater-supported designated site of nature conservation interest. Reduction in peak flood level (1% annual probability) >10mm
Moderate Beneficial	Results in a moderate improvement of attribute quality	Moderate improvement in groundwater quality and/or resource availability Calculated reduction of spillage risk by 50% or more to an aquifer Moderate improvement to the integrity of a groundwater-supported designated site of nature conservation interest. Reduction in peak flood level (1% annual probability) >50mm
Major Beneficial	Results in a major beneficial effect on attribute	Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Major improvement in groundwater quality and/or resource availability. Moderate improvement to the integrity of a groundwater-supported designated site of nature conservation interest. Reduction in peak flood level (1% annual probability) >100mm

Assessment of Significance

13.5.4 The overall significance of potential effects considers both the magnitude of the impact against the value of the receptor, as demonstrated in Table 13.3. Where two values are given in the table, professional judgement has been used assess the potential effect significance.

Table 13.3: Assessment Criteria for Effect Significance

Receptor Sensitivity	Magnitude of Impact			
	Negligible	**Minor**	**Moderate**	**Major**
Very high	Neutral	Moderate/Large	Large/Very large	Very large
High	Neutral	Slight/Moderate	Moderate/Large	Large/Very large
Medium	Neutral	Slight	Moderate	Large
Low	Neutral	Neutral	Slight	Slight/Moderate

13.5.5 Effects that are moderate and above are considered to be significant. Effects that are neutral or slight are considered to be non-significant.

13.5.6 Information has been collected from the following sources:

- RBMP South East River Basin District[167]
- Environment Agency's Catchment Data Explorer[168]
- Environment Agency's website: "What's In Your Backyard?"[169]
- DEFRA's "Magic" interactive map[170]
- Technical design drawings of the Project options (add drawing numbers at a later date).

Consultation

13.5.7 A site walkover visit was held with representatives of the Environment Agency and Kent County Council (KCC) on the 17 of November 2015. Site layout plans were not available for the purposes of the walkover visit, which therefore limited the Statutory Environmental Bodies' (SEBs) ability to respond to consultation documents. Nevertheless, a response to the Scoping Reports was provided by the Environment Agency on the 29 March 2016. A response to the public consultation was received from the Environment Agency on the 25 January 2016.

13.5.8 Both of these responses noted the need for a Flood Risk Assessment (FRA) for the Site; see Appendix 13.1 for the site specific FRA which has been carried out. Advice was also provided in water quality and pollution prevention, culverting and watercourse crossings, and biodiversity. The sensitivity of the groundwater underlying the Site was also highlighted. All of these comments have been taken into account when preparing this Environmental Assessment Report (EAR), and supporting FRA and Water Framework Directive (WFD) assessments (See Appendices 13.1 and 13.2 respectively).

13.5.9 In order to inform the ongoing illustrative design, a further meeting was held with the Environment Agency and KCC on the 5 April 2016, at which the proposed illustrative drainage strategy was introduced. Discussion were also held regarding the proposed FRA methodology.

13.5.10 An SEB workshop was held on the 14 April 2016, which was attended by the Environment Agency, KCC, Natural England, Historic England and the Kent Downs Area of Outstanding Natural Beauty. The purpose of this meeting was to provide an update on the evolving illustrative design, and enable a discussion between all SEBs to resolve potential conflicting requirements. The discussions and recommendations from this SEB workshop have also been taken into consideration when preparing this EAR.

[167] Environment Agency, 2015, River Basin Management Plan South East River Basin District, available online at https://www.gov.uk/government/collections/river-basin-management-plans-2015, accessed 07/07/2016
[168] http://environment.data.gov.uk/catchment-planning/WaterBody/GB107040019640, accessed 07/07/2016
[169] http://apps.environment-agency.gov.uk/wiyby/default.aspx, accessed 07/07/2016
[170] http://magic.defra.gov.uk/, accessed 07/07/2016

13.6 Limitations to the Assessment

13.6.1 The assessment is based on available third party data combined with a visual site inspection, which was carried out on the 11 April 2016. No detailed surveys were undertaken relating to water quality, therefore information relating to water quality, hydromorphology and aquatic ecology has been taken from publicly available information.

13.6.2 To date, no Ground Investigation (GI), or detailed surveys or monitoring programmes have been undertaken. Therefore conclusions with respect to the geology, hydrogeology, hydrology, water quality and aquatic ecology have been drawn from publicly available information. It should be noted that there is almost no geological or hydrogeological data relating to the area within the Project Site Boundary (other than that collected as part of the construction of the M20 and CTRL) and therefore it is not possible at present to confirm the detailed geology and hydrogeology of the Project Site, for example the lithologies and groundwater levels underlying the proposed attenuation basins.

13.6.3 Groundwater level information is limited to that available from BGS records available on Geoindex, which generally relates to groundwater strikes and levels at the time boreholes were drilled. No recent groundwater levels are available for the purposes of this assessment, therefore assumptions have been made regarding groundwater levels. It is not possible to determine the hydraulic gradient from the data available at present.

13.6.4 To date, details of unlicensed abstractions have not been obtained from KCC.

13.6.5 No assessment of the potential requirements for dewatering during construction has been carried out but it is acknowledged that this will be carried out during the detailed design. Similarly, an assessment of the potential impacts of foundations / earthworks on groundwater levels and flow (if any) will be undertaken following the GI and monitoring programme, and during the detailed design.

13.6.6 The Project Site overlies an area of Flood Zone 2/3 associated with the channel of the East Stour to the southeast of the site. In order to inform a more detailed assessment of risks, further information is provided in the Flood Risk Assessment included at Appendix 13.1. No detailed drainage survey or topographic survey were available to inform either this EAR or the FRA. Information was obtained from the Environment Agency regarding the extent of flood zones, including the hydraulic model for the East Stour River. However, the hydraulic model for the Stour does not extend upstream as far as the Site, and therefore could not be used for the purposes of this assessment. The assessment of flood risk and potential effects on the downstream Aldington Flood Storage Reservoir has therefore been assumed on a worst-case basis. Additional flood modelling will be carried out during the detailed design stage, with the methodology for this work to be agreed with the Environment Agency.

13.6.7 Discussions held with the Environment Agency and KCC regarding the proposed drainage strategy for the Site have highlighted a potential area of conflict. As the Site lies at the top of the River Stour catchment, the additional volume of runoff that would be generated from the impermeable area have the potential to affect flood risk for some distance downstream. It would therefore be preferable to incorporate infiltration SuDS within the Project design, to reduce the volume of surface water runoff. However, the groundwater underlying the Site is very sensitive, which limits the potential for infiltration. Due to the limited timescales involved in the production of this EAR, and iterative design process has not been possible to find a solution to this conflict, therefore the assessment below assumed a fully impermeable surfacing solution, although it is acknowledged that permeable surfacing may be considered further during the detailed design.

13.6.8 The methodology contained within the DMRB HD 45/09 requires that the Highways Agency Water Risk Assessment Tool (HAWRAT) be used to inform the drainage design and inclusion of pollution control devices. However, the HAWRAT methodology was designed to be used on roads, as it uses Annual Average Daily Traffic (AADT) figures to estimates flows of vehicles and the potential pollutants within the runoff from a site. The methodology is therefore not applicable to the Project Site, and a HAWRAT assessment has not been carried out.

13.7 Baseline

13.7.1 Two WFD waterbodies are located within the Project Site, namely the East Stour River and Kent Greensand Eastern groundwater body. In addition there are numerous waterbodies that are not classified under the WFD, which contribute to the hydraulic system of the area. A summary of the receptors that have the potential to be affected by the proposed Project is provided below, see Figure 13.2 Waterbodies and Designated sites for the location of these receptors.

13.7.2 One WFD waterbody, Great Stour between Ashford and Wye, has the potential to be indirectly affected by the proposed Project as located downstream of the East Stour River.

13.7.3 A detailed assessment of ecological features for each watercourse is provided within Chapter 8: Nature Conservation.

Fishing Lake

13.7.4 There is a fishing lake on-line within the Haytons stream, as shown in Figure 13.3. The lake measures approximately 300m in length and 50m in width, with an approximate area of approximately 1.5ha. There are no known flow control devices at the inlet or outlet of the lake and it is currently assumed that the water level of the lake is maintained by the invert level of the outgoing pipe which passes beneath a small access track.

Figure 13.3: View of fishing lake from the south

Haytons Stream

13.7.5 Haytons Stream is an Ordinary Watercourse under the jurisdiction of KCC as LLFA. It has a small rural catchment of approximately 1.5km^2 and flows through the on-line fishing lake. On leaving the fishing lake, Haytons Stream (OD1) flows south through an area of woodland, before being culverted beneath the M20 and discharging to the East Stour River to the south-west of the Site. The size of the existing culvert beneath the M20 is currently unknown but from a visual inspection during the site visit of the 11 April 2016, it is estimated to be 600mm diameter.

Figure 13.4: Haytons stream (left: outfall from fishing lake, right: under the M20)

Motorway attenuation basin

13.7.6 An attenuation basin with an approximate area of 0.5ha is located immediately to the south of the M20, in the western part of the southern area of the Site, which receives flows from the M20 motorway. Water from this basin discharges to Haytons Stream, which subsequently flows into the East Stour River.

Gibbins Brook

13.7.7 An Ordinary Watercourse known as Gibbins Brook (OD4), under the jurisdiction of KCC as LLFA, flows to the west of the northern area of the Site. The source of the Gibbins Brook lies within the Gibbins Brook SSSI, which is adjacent the north-west of the Project Site. The SSSI comprises marshy grasslands, peaty soils and wet woodland and the watercourse is therefore considered to form an important part of this designated site.

13.7.8 The Gibbins Brook continues to flow south-west of the SSSI, passing beneath the M20 and discharging to the East Stour River to the south-west of the Site. The size of the existing culvert beneath the M20 is currently unknown.

East Stour River

13.7.9 The East Stour River is located to the southeast and southwest of the Project boundary, flowing south beneath the M20 and continuing in a south-westerly direction adjacent to the south-eastern boundary of the proposed Project and continuing beneath the CTRL, as can be seen in Figure 13.2 Waterbodies and Designated sites. The watercourse subsequently turns to flow in a northerly direction back beneath the CTRL at a point immediately adjacent to the western extent of the Site, before turning again to flow in a westerly direction away from the Site.

13.7.10 The entire East Stour waterbody (GB107040019640) is classified by the Southeast RBMP as ‘not designated artificial or heavily modified’ with a current moderate status and the objective to achieve good status by 2027. The current moderate classification is due to the elevated level of phosphate, which reflects upon macrophytes and phytobenthos, while other biological quality elements are classified as being good. Physico-chemical elements are at high status.

Figure 13.5 - East Stour River (left: culvert after M20, right: from culvert towards CRTL)

Other surface watercourses

13.7.11 A drainage ditch (OD2) flows parallel to the northern embankment of the CTRL, which forms the southern edge of the Site and outfalls to the East Stour River to the west of the Site.

13.7.12 A drainage ditch (OD5) is located within the east of the Project Site to the south of the M20. An additional ditch (OD3) flow east to west to the north of, and at the base of, the M20 embankment. Another drainage ditch originating from Gibbins Brook (OD4) flow parallel to the north east Project Site Boundary. The flow of water within this drain is likely to be ephemeral.

13.7.13 A small pond is located within to the east of the Project Site, within the boundary vegetation of the access track to Holmdene. This pond is not considered to be at risk of adverse effects, since it is not considered to be in hydraulic connectivity with the Project, therefore it will not been discussed further.

Great Stour between Ashford and Wye

13.7.14 The Great Stour between Ashford and Wye waterbody is located approximately 11km to the north-west of the Project Site and is the downstream waterbody of the East Stour River.

13.7.15 The entire waterbody (GB107040019741) is classified as ‘not designated artificial or heavily modified’ with a current moderate status and the objective to achieve a moderate status by 2015. The current classification is due to the moderate level of phosphate, while other biological quality elements are classified as good / support good and physico-chemical are high.

Aldington Flood Storage Reservoir

13.7.16 The Aldington Flood Storage Reservoir (FSR) lies approximately 8km downstream of the Project Site. It was constructed in in 1991 after a number of instances of widespread flooding of both rural and urban areas in the vicinity of Ashford from the headwater tributaries of the River Stour[171]. The Aldington FSR has two online storage areas which are comprised of earth embankments with vortex flow control devices and a maximum storage capacity of 1.3 million m^3. The scheme is design to retain floods of up to a 100-year return period with a controlled discharge.

Surface water abstractions

13.7.17 There is one known licenced surface water abstraction within 1km of the Project Site. This is from the East Stour River located approximately 500m to the south of the Project Site and is for agricultural and irrigation purposes. However, as this abstraction does not form a potable water supply, it is considered that it would not be affected by the Project and will therefore not be considered further within this assessment.

Groundwater

13.7.18 The WFD Kent Greensand Eastern Groundwater Body (GB40701G501400) underlies the Project Site. It is currently classed as being at poor status by the Southeast RBMP, with a status objective of good by 2027. The current classification is due to the poor status of the 'quantitative dependent surface water body' element and poor status of the general chemical test element. All other quantitative and chemical elements are classified as being at good status.

13.7.19 Within the study area, the Kent Greensand Eastern Groundwater Body comprises Lower Greensand strata. The Lower Greensand is a principal aquifer with known use for agricultural water supply in the study area, although the Site is not located within an SPZ. The aquifer may provide baseflow directly to water courses where not overlain by superficial deposits or indirectly via more permeable superficial deposits.

13.7.20 The aquifer may provide support to Gibbins Brook SSSI where in hydraulic continuity with overlying superficial deposits and where groundwater levels approach ground level (although from the very limited information available, groundwater levels appear to be greater than 5m below ground level).

13.7.21 The aquifer underlying the Site is classed as having Major Aquifer High and Major Aquifer Intermediate vulnerability, reflecting the underlying geology and freely draining, loamy soils. Surface-borne contaminants could therefore infiltrate to ground and potentially contaminate the aquifer and watercourses that receive baseflow.

[171] Ashford Borough Council (2006) Strategic Flood Risk Assessment

13.7.22 A review of information included within the Groundsure report indicates there are no known licensed groundwater abstractions within 1km of the Project boundary.

13.7.23 Within the Project Site, the Alluvium is classed as a Secondary (A) aquifer, while the more permeable Head deposits are classed as a Secondary (undifferentiated) aquifer.

13.7.24 The aquifers not used for water supply in the study area but they are likely to be in hydraulic continuity with, and provide baseflow to, watercourses or may receive water from watercourses and ponds. The aquifers are likely to partially support Gibbins Brook SSSI.

East Kent Chalk Stour Groundwater Body (GB40701G501500)

13.7.25 The East Kent Chalk Stour Groundwater Body (GB40701G501500) is located to the north of the Project Site, as shown in Figure 13.2 Waterbodies and Designated sites. This groundwater body is hydraulically isolated from the Kent Greensand Eastern Groundwater Body by the clays of the intervening Gault Formation, which are classed as unproductive strata. Therefore, it will not be considered further within this assessment.

Flood risk

13.7.26 A detailed assessment of flood risk from all sources of flooding is provided within a standalone FRA in Appendix 13.1. A summary is provided here for information.

13.7.27 For the most part, the current development proposals are indicated to be located outside of the extents of the mapped fluvial flood risk. However, land within the east of the Project Site (to the south of the M20) is indicated to be located within the extents of the medium risk Flood Zone 2, where the risk of fluvial flooding is between the 1 in 100 (1%) annual probability event and the 1 in 1000 (0.1%) annual probability event.

13.7.28 The current fluvial flood depths and velocities in the East Stour were received from the Environment Agency, for the Q100 event on the Project Site. Flooding could reach a depth of up to 400mm, with flood flow velocities in the East Stour reaching 0.6 m/s in bank and 0.05 m/s out of bank (see FRA in Appendix 13.1 for further detail).

13.7.29 Review of the Environment Agency's Risk of Flooding from Surface Water map indicates a potential risk of flooding associated with Gibbins Brook to the west of the Project Site and Haytons Stream that flows through the centre of the Site. Flood risk associated with these watercourses was unlikely to have been illustrated as part of the fluvial flood risk mapping due to the small size of the watercourse catchments. The surface water flood mapping suggests that land immediately adjacent to these watercourses may be at risk of flooding during events up to the 1 in 100 (1%) annual probability event, particularly in areas that are north of the M20 which may be at greater risk due to the surcharging of culverts that convey these watercourses beneath the motorway.

Value (importance) of receptor

13.7.30 The value of receptors, as discussed in section 13.5, has been considered in accordance with guidance provided within DMRB HD 45/09. The assessment is summarised in Table 13.4.

Table 13.4: Estimating the Importance of Water Environment Receptors

Receptor	Key Attributes	Value (importance)
Fishing lake	Not classified under the WFD. Value as a local fishing lake.	Low
Gibbins Brook (OD4)	Flows through Gibbins Brook SSSI.	High
East Stour River (GB107040019640)	Moderate WFD classification, status objective of good by 2027. Used for non-potable water supply.	High
Haytons stream (OD1)	Not classified under the WFD.	Low
Drain adjacent to CTRL (OD2)		
Ditch OD5 (south-east of Project area)		
Drainage ditch (OD3)		
Drainage ditch (from Gibbins Brook, north-west Project Boundary)		
Great Stour between Ashford and Wye (GB107040019741)	Moderate WFD classification, moderate status by 2015.	Medium
Kent Greensand Eastern (GB40701G501400)	Principal aquifer, although Site does not intersect a SPZ. Poor WFD quantitative and chemical status. Aquifer may provide baseflow directly to water courses where not overlain by superficial deposits or indirectly via more permeable deposits. Aquifer may provide support to Gibbins Brook SSSI where in hydraulic continuity with overlying superficial deposits and where groundwater levels approach ground level.	High
Aldington Flood Storage Reservoir	Flood defence providing protecting more than 100 residential properties	Very high

Receptor	Key Attributes	Value (importance)
Superficial deposits	Alluvium classed as Secondary (A) aquifer; more permeable Head deposits classed as Secondary (undifferentiated) aquifer. Aquifers not used for water supply in study area. Aquifers are likely to be in hydraulic continuity with, and provide baseflow to watercourses or may receive water from watercourses and ponds. Aquifer(s) likely to provide some support Gibbins Brook SSSI.	Medium

13.8 Mitigation

13.8.1 Mitigation measures would be implemented during construction and operation and will be primarily related to:

- Pollution management
- Loss of existing aquatic habitat
- Potential increase in the rate and volume of surface water run-off
- Dewatering
- Earthworks, and placement of below ground structures and retaining walls
- Impacts due to a reduction in groundwater recharge due to the large areas of hardstanding

Construction Phase

13.8.2 During construction, best practice for pollution prevention and water management would be implemented as part of the overall CEMP. Guidance on best practice in relation to pollution prevention and water management is set out in the CIRIA's Environmental good practice on site and the Environment Agency's Groundwater Protection: Policy and Practice (GP3).

13.8.3 No pollution pathways would be created between the construction site and watercourses, as measures would be implemented to prevent surface water run-off containing suspended sediment reaching watercourses through overland flow during rainfall events.

13.8.4 Discharges to sewer or surface water, including those from construction dewatering, will only be made with the appropriate consents or permits in place. Any non-compliant discharges would be collected and disposed of off-site.

13.8.5 The potential for impacts to occur as a result of contamination of water by oil or other liquids and storage of materials would be minimised by the following measures:

- Storage compounds for fuels, oils or other liquid chemicals would be located away from surface water drains. They would have an impermeable base and impermeable bunds with a capacity of 110%, and would not drain directly into the surface water drains. Where practicable, drainage from storage compounds would be passed through oil interceptors prior to discharge.
- Small plant such as pumps would be equipped with drip trays.
- Storage compounds of construction materials or temporary stockpiling of excavated soils, would be located away from surface watercourses and drains.
- Drums and barrels would be stored in a designated, bund-shielded, safe area within the site compound.
- All drums and barrels would be properly labelled and fitted with flow control taps.

13.8.6 The potential for impacts to occur as a result of works over or adjacent to watercourses would be minimised by the following measures:

- The placing of any wet concrete in or close to any watercourse would be controlled in order to minimise the risk of leakage of wet cement into the watercourse.
- The washing of any concrete mixing plant or ready-mix lorries would be carried out in a way that prevents cleaning effluent to flow into any watercourse or drain.
- Haul roads on the site and the approaches to the watercourse would be cleaned regularly in order to prevent the build-up of mud.
- Before any discharge of water were to be made from the site, adequate provisions for preventing pollution would be made, such as by incorporating silt settlement techniques. The techniques employed would be chosen as appropriate for each specific site. Techniques may include settlement lagoons, use of straw bales for silt trapping and use of flocculants.
- Areas of bare soil would be kept to a minimum to reduce silty run-off.

13.8.7 The potential for impacts to occur as a result of disturbance of silt would be minimised by the following measures:

- All pumped drainage from the construction works, including areas used for temporary storage of construction materials or excavated soils, would be passed through silt settlement treatment prior to discharge to surface watercourses or drains.
- All roads and hardstanding would be kept clean and tidy in order to prevent the build-up of oil and dirt that may be washed into a watercourse or drain during heavy rainfall.
- Where appropriate, watercourses would be shielded by bunds in order to prevent contamination from surface water run-off.
- The use of water sprays for reducing dust or washing construction areas would be carefully regulated in order to avoid washing substantial quantities of

silt (etc.) into surface water drains. Where large quantities of gravel, mud or other such material required clearing, the area would be swept clean prior to any subsequent hosing down.

13.8.8 The potential for impacts to occur as a result of contamination of water by wet cement or concrete would be minimised by the following measures:

- The washing of any concrete mixing plant or ready-mix lorries would be carried out so as to prevent the resulting effluent from being allowed to flow into any watercourse or drain.

13.8.9 The potential for impacts to occur as a result of contamination from accidental spillages would be minimised by the following measures:

- Emergency response procedures included in the CEMP to handle any leakages or spillages of potentially contaminating substances.
- Spill kits would be located on sites near to watercourses and within the works compounds and staff would be trained in their use.

13.8.10 In addition, the following measures would be implemented, if required, to minimise potential impacts upon surface water and groundwater during earthworks:

- The design and construction of foundations and embankments, including selection of piling methodologies, would aim to minimise the potential for alteration of the hydraulic properties of the surrounding ground, down-drag of contaminants so as to avoid cross-contamination between aquifer units, and generation of suspended solids.
- Construction materials would be chosen appropriately to minimise groundwater contamination via direct contact.
- Groundwater abstraction required as part of construction dewatering would be carried out in accordance with Environment Agency requirements and with the necessary authorisations. Under the Water Resources Act 1991 (as amended), abstraction exceeding 20 m^3/d (excluding the contribution from direct rainfall to the excavation that would previously have infiltrated into the ground) would require a transfer licence. The Environment Agency would need to be satisfied that there would be no significant adverse impacts on groundwater receptors before this is granted.
- Groundwater would be pumped from excavations into lagoons/settlement tanks in order to enable sediment to drop out, and if necessary, sediment removal would be aided by the addition of flocculants, subject to the agreement of the Environment Agency. After sediment removal, water would be discharged to a watercourse subject to agreement with the Environment Agency.
- Subsoil would be exposed for a minimum length of time after topsoil strip. Cut-off trenches, where necessary, would be excavated in order to prevent massive surface water run-off into watercourses. Cut-off trenches would discharge into sediment lagoons, with discharge to watercourses subject to the prior consent of the Environment Agency.

- Topsoil / vegetation along watercourses would be retained in order to aid attenuation and sediment infiltration.
- Construction phase operations would be carried out in accordance with the guidance contained within the Environment Agency Pollution Prevention Guidelines, and with due regard to the Environment Agency Policy and Practice for the Protection of Groundwater (GP3).

13.8.11 Monitoring of watercourses at risk from pollution would be carried out during the construction phase. This would comprise visual assessments for oil and silt, as well as watercourse monitoring using portable field indicator equipment, where necessary. Whilst construction operations are in progress, selected watercourses would be sampled at locations up and downstream of the works (and tested for suspended solids, pH changes and hydrocarbons). Monitoring requirements would be discussed and agreed with the Environment Agency prior to construction.

13.8.12 A groundwater monitoring plan would also be included in the CEMP and implemented prior to, during and following construction to ensure the changes in groundwater levels are within acceptable limits. Groundwater quality would also be monitored at key locations. The Environment Agency would be consulted about the level of monitoring required.

13.8.13 A CEMP that sets out a series of proposed measures and standards of work that would be applied by the contractors throughout the construction period would be produced. This would set out the requirements for a CEMP and Handover Environmental Management Plan (HEMP). These documents would describe the requirements for mitigation and control measures during construction and operation.

13.8.14 There should be inspections and audits along with general monitoring and reporting of effectiveness of control measures throughout the construction programme. The mitigation strategies implemented should be reviewed regularly to best suit the practices currently being undertaken on site.

13.8.15 The management of flood risk to construction workers and construction plant when working within an area at risk from flooding, most notably in the west of the Project Site, should be managed through raising awareness of the risks within the construction team. If a flooding event is considered likely to occur, construction workers should be made aware of this risk and any construction plant should be made safe. In addition it is recommended that no construction plant should be stored within 10 m of a watercourse when it is not required for use.

13.8.16 The management of flood risk to people and property elsewhere caused by the compaction of soils and introduction of impermeable surfaces that may increase the rate and volume of surface water runoff should be managed by the implementation of a construction-phase drainage system. The temporary drainage system should aim to attenuate and treat surface water runoff prior to discharge to prevent increased flood risk to people and property elsewhere and manage pollution risks most commonly associated with increased sediment loading. For details, refer to the FRA in Appendix 13.1.

Operational Phase

13.8.17 The proposed drainage design would capture all surface water run-off from the impermeable area of the Project Site within a below ground drainage system and convey it to below-ground attenuation features. The northwest section of the Site would drain via an attenuation pond and interceptor to the culverted section of Haytons Stream, the northeast section would drain via underground attenuation crates, catchpits and an interceptor to the culverted section of Haytons Stream, and the southern section would drain via an underground storage tank and interceptor to the open reach of Haytons Stream south of the M20.

13.8.18 All drainage features including the attenuation basins would be lined and therefore would prevent infiltration to the underlying aquifer. Therefore DMRB HD 45/09 Method C - Assessment for Routine Runoff on Groundwaters and Method D – Assessment of Pollution Impacts from Spillages are not applicable.

13.8.19 It is possible that salt would need to be applied to the operational site during the winter period for de-icing purposes. The removal of salt from surface water run-off is not possible and therefore it would be managed through the appropriate and measured application of salt when weather conditions dictate. Receiving watercourses and groundwater in hydraulic continuity with these in the immediately vicinity of the site may notice a temporary ‘spike’ in salinity following the application of salt. However, salt is quickly diluted within surface water run-off and within the receiving watercourses, and therefore typically does not pose a long term risk to water quality.

13.8.20 Potential localised dewatering or groundwater mounding impacts due to retaining walls would be minimised by careful design informed by the GI and subsequent groundwater monitoring.

13.8.21 Potential localised groundwater mounding up-gradient of structures where these extend below the water table(s) are likely to be minimal due to relatively small size of the proposed structures, but would be mitigated by careful design informed by the GI and subsequent groundwater monitoring.

13.8.22 Groundwater levels would be measured during the GI and as part of the monitoring plan. If possible, the design of the attenuation basins would be such that they are entirely within the unsaturated zone. However, if they extend below the water table, they would be designed such that there is no risk of ground heave or the liner lifting when the basins are empty.

13.8.23 The potential for mobilisation of existing contamination within the superficial deposits due to changes in groundwater flow patterns within zones of influence resulting in a reduction in groundwater quality would be mitigated by any remediation required as part of the earthworks design and by the groundwater monitoring plan.

13.9 Residual Impacts (with mitigation)

13.9.1 The potential magnitude of the impact on the water environment is summarised in Table 13.5 for construction and Table 13.6 for operation. This assessment takes into consideration the current Project proposals and mitigation measures embedded within the Project design.

13.9.2 A detailed assessment of flood risks from all sources of flooding is provided within a standalone FRA in Appendix 13.1.

Construction Phase

13.9.3 The risk of pollution to surrounding water bodies would be temporary and localised during the construction of the Project. The implementation of mitigation measures presented in section 13.8 above is considered sufficient to mitigate any potential significant adverse effects on surface water quality.

13.9.4 Impacts on groundwater levels or flow due to dewatering of temporary excavation works are unlikely to persist beyond the end of the construction period, although impacts due to permanent structures would remain. Water quality impacts may persist beyond the end of the construction period, depending on, for example, baseline ground conditions and the degree of ground disturbance. From the limited information relating to groundwater levels available at present, it is considered that dewatering is more likely to cause limited, localised drawdown in the superficial deposits than in the Lower Greensand.

13.9.5 Earthworks, piling, and placement of foundations within the saturated aquifers may impact on groundwater flow in the superficial deposits and the Lower Greensand, including causing groundwater mounding, with unintended impacts on structures and existing road drainage systems. However, careful design and application of appropriate construction methods would be sufficient to mitigate such adverse impacts.

13.9.6 There would be a potential increase in risk of contamination arising from the removal of lower permeability superficial deposits that currently protect the Lower Greensand during site clearance and excavation works. There would also be a possible increase suspended sediment concentrations in groundwater in areas where permeable superficial deposits are exposed. However, the implementation of mitigation measures presented in section 13.8 above is considered sufficient to mitigate any potential significant adverse effects on groundwater quality.

13.9.7 Any works in, under, over or within 8m of a Main River or ordinary watercourse would require a flood defence / land drainage consent under the Land Drainage Act 1991. As part of the consenting process, the Environment Agency or other Lead Flood Authority would be requested to advise on and agree to the final method statement for works within watercourses, including appropriate pollution control measures (based guidance on best practice in relation to pollution prevention and water management).

Operational Phase

13.9.8 The shape of the fishing lake would be modified, as it would be split into two separate lakes in order to accommodate lorry parking and a Public Right of Way (PRoW), but the total area and volume would be maintained. The southern section of the existing fishing lake would be in-filled, with a new lake created to the north-east of the existing fishing lake. The total volume and area of the lake would be maintained. The southern section of Haytons Stream would be culverted from the southern outfall of the retained portion of the fishing lake to south of the M20.

13.9.9 A two-way link road would cross the East Stour River to the southeast of the Project to provide access between the Site and the existing Stop24 Service Area. This would be achieved via an extension to the existing culvert. The culvert would be designed to match the dimensions of the existing culvert to ensure no restrictions to flows, although a loss of aquatic habitat and connectivity would result from the extension.

13.9.10 Aquatic habitat would be lost with the culverting of the section of Haytons stream between the fishing lake and the M20, and with the partial culverting of drainage ditch OD5, located in the south-east of the Project area. The total length of ditches lost would be approximately 580m.

13.9.11 The proposed Project would increase the area of impermeable surfacing, thereby potentially increasing surface water run-off rates and the potential for pollution within the run-off. Pollution sources include vehicle emissions (including atmospheric deposition), vehicle part wear and vehicle leakages, catalytic converters, road surface erosion, and seasonal and regular maintenance practices. Possible contaminants include: particulate solids; hydrocarbons (diesel, petroleum, lubricating oil leakages, and grease); heavy metals (especially copper and zinc but also cadmium, iron, lead and chromium in lesser amounts); oxides of nitrogen; sulphates; rubber; asbestos; tyre wear deposits including lead, zinc and hydrocarbons; and de-icer during cold weather.

13.9.12 Surface water runoff rates would be controlled to greenfield runoff rate for rainfall events up to the 1-in-100 year event, plus a 20% allowance for climate change (with a sensitivity test carried out for a 40% climate change allowance, to identify areas on onsite flooding and potential overland flow routes). There would therefore be no increase in surface water run-off rates from the Project.

13.9.13 However, given the large increase in impermeable area, there would be an increase in the volume of surface water runoff. Given the sensitivity of the underlying groundwater, the Site's surfacing would be completely impermeable, with no discharge of surface water runoff made to soakaway (see section 13.6 above). The increased volume of surface water runoff could therefore affect the downstream Aldington FSR, the function of which could be affected by the increased volume, which represents approximately 5% of the overall volume of the FSR (see FRA in Appendix 13.1 for further detail). However, flood modelling would be carried out, using a methodology agreed with the Environment Agency, to fully assess the effects on the FSR. The Project detailed design would reflect the results of this modelling and ensure no adverse effects on the FSR and therefore also downstream flood risk.

13.9.14 There would be a localised reduction in recharge to the aquifers due to increase the area of impermeable surfacing. However all run-off would be collected and returned to the catchment through discharge to watercourse.

13.9.15 There may be localised changes to groundwater levels (dewatering or groundwater mounding) due to retaining walls where these extend below the water table. However the design and groundwater monitoring plan would ensure that these would not adversely impact on groundwater receptors and that groundwater level variations are within the ranges observed during baseline monitoring.

13.9.16 Potential localised groundwater mounding up-gradient of structures where these extend below the water table(s) are likely to be minimal due to relatively small size of the proposed structures, but would be mitigated by careful design informed by the GI and subsequent groundwater monitoring.

13.9.17 Compression of more cohesive superficial deposits due to placement of embankments may affect hydraulic properties but would be mitigated by careful design informed by the GI and subsequent groundwater monitoring.

13.9.18 There may be a small increase in aquifer vulnerability where culverts, infiltration basins and the replacement fishing pond have required the excavation of less permeable superficial deposits that were previously protecting the underlying aquifer(s). However, most of the Site will be covered by impermeable paving and therefore isolated from the underlying aquifers.

13.9.19 The proposed drainage design would include pollution prevention measures, which would reduce the risk of spillages reaching watercourses.

13.9.20 With the implementation of best practice the proposed Project is expected to have the following non-significant effects during operation:

- Negligible impact on the fishing lake, which would be a neutral effect.
- Minor adverse impact on Gibbins Brook (OD4), which would be a slight adverse effect.

- Minor adverse impact on East Stour, which would be a slight adverse effect.
- Moderate adverse on Haytons stream (OD1), ditch, drain and attenuation basin/ponds, which would be slight adverse effect.
- Negligible impact on the downstream waterbody, the Great Stour between Ashford and Wye, which would be an effect of neutral significance.
- Negligible impact on the Kent Greensand Eastern Groundwater Body, which would be an effect of neutral significance.
- Negligible impact on the superficial deposits aquifer(s), which would be an effect of neutral significance.

13.9.21 Mitigation for the habitat loss would be provided by the creation of new attenuation pond/basins and wildlife habitat ponds would be also created, as shown on Figure 1.2 Illustrative Environmental Masterplan. Further details of habitat loss and mitigation can be found in Chapter 9: Nature Conservation.

Table 13.5: Summary of potential residual impacts during the construction phase

Receptor	Sensitivity	Potential effect	Mitigation	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)
Fishing lake	Low	Pollution from suspended sediment during earthworks	Compliance with CIRIA Guidance.	Moderate adverse	Slight adverse
Gibbins Brook (OD4)	High	Pollution from spillage and water run-off	Compliance with CIRIA Guidance. No routine discharges of any contaminated water to surface waters. CEMP to include measures such as designated wheel and plant wash facilities, designated concrete and cement mix areas secondary containment for oil and fuel storage, and site security.	Minor adverse	Slight adverse
		Suspended sediment in surface water run-off	Minimising the amount of exposed ground and soil stockpiles, silt traps or settlement lagoons, sheeting or seeding of soil stockpiles.	Minor adverse	Slight adverse
		Pollution from contaminated run- off if contaminated land is encountered	GI is underway that will identify potentially contaminated ground. Remediation would be carried, where required, if appropriate.	Minor adverse	Slight adverse
East Stour River (GB107040019640)	High	Pollution from spillage and water run-off	Compliance with CIRIA Guidance. No routine discharges of any contaminated water to surface waters. CEMP to include measures such as designated wheel and plant wash facilities, designated concrete and cement mix areas secondary containment for oil and fuel storage, and site security.	Minor adverse	Slight adverse

Receptor	Sensitivity	Potential effect	Mitigation	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)
		Suspended sediment in surface water run-off	Minimising the amount of exposed ground and soil stockpiles, silt traps or settlement lagoons, sheeting or seeding of soil stockpiles.	Minor adverse	Slight adverse
		Pollution from contaminated run- off if contaminated land is encountered	GI is underway that will identify potentially contaminated ground. Remediation would be carried, where required, if appropriate.	Minor adverse	Slight adverse
Haytons stream (OD1) Motorway attenuation basin Drain adjacent to CTRL (OD2) Ditch OD5 (south-east of Project area) Motorway drainage ditch (OD3) Drainage ditch (from Gibbins Brook, north-west Project Boundary)	Low	Pollution from spillage and water run-off	Compliance with CIRIA Guidance. No routine discharges of any contaminated water to surface waters. CEMP to include measures such as designated wheel and plant wash facilities, designated concrete and cement mix areas secondary containment for oil and fuel storage, and site security.	Moderate adverse	Slight adverse
		Suspended sediment in surface water run-off	Minimising the amount of exposed ground and soil stockpiles, silt traps or settlement lagoons, sheeting or seeding of soil stockpiles.	Moderate adverse	Slight adverse
		Pollution from contaminated run- off if contaminated land is encountered	GI is underway that will identify potentially contaminated ground. Remediation would be carried, where required, if appropriate.	Moderate adverse	Slight adverse
Great Stour between Ashford and Wye (GB107040019741)	High	Pollution from spillage	Natural dilution / dispersion as located 19 km downstream. Compliance with CIRIA Guidance. No routine discharges of any contaminated water to surface waters. CEMP to include measures such as designated wheel and plant wash facilities, designated concrete	Negligible	Neutral

Receptor	Sensitivity	Potential effect	Mitigation	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)
			and cement mix areas secondary containment for oil and fuel storage, and site security.		
		Suspended sediment in surface water run-off	Natural dilution/dispersion as located 19 km downstream. Minimising the amount of exposed ground and soil stockpiles, silt traps or settlement lagoons, sheeting or seeding of soil stockpiles.	Negligible	Neutral
		Pollution from contaminated run-off during operation	Natural dilution/dispersion as located 19 km downstream. GI is underway that will identify potentially contaminated ground. Remediation would be carried, where required, if appropriate.	Negligible	Neutral
Kent Greensand Eastern Groundwater Body (GB40701G501400)	High	Pollution from contaminated run-off	No routine discharge to ground, closed drainage system discharging to watercourse. Refer to mitigation for surface water.	Minor adverse	Slight adverse
		Changes to groundwater level or flow	Design of excavations penetrating the Lower Greensand mitigates groundwater dewatering risks. Appropriate design of retaining wall to minimise localised dewatering or groundwater mounding impacts. Appropriate design of earthworks including piling and embankments, and placement of foundations. Groundwater monitoring plan to include water level monitoring prior to, during and after construction (to be agreed with Environment Agency).	Minor adverse	Slight adverse
		Changes to groundwater quality as a result of direct contact with construction materials	Suitable materials and installation techniques chosen so as to minimise potential for groundwater pollution.	Negligible	Neutral

Receptor	Sensitivity	Potential effect	Mitigation	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)
			Groundwater monitoring plan to include water quality monitoring prior to, during and after construction (to be agreed with Environment Agency).		
		Mobilisation of contamination and suspended solids through ground disturbance	GI is underway that will identify potentially contaminated ground. Remediation would be carried, where required. Shallow soils stockpiled separately on site. Where required, in-situ treatment of unsuitable soils may be undertaken to stabilise the sub-grade prior to pavement construction. Piling methodology selected to minimise ground disturbance, generation of suspended solids and the potential for down-drag of contaminants. Best practice methodologies implemented and outlined in method statements and a CEMP to ensure any potential cause or spread of contamination is mitigated during construction.	Minor adverse	Slight adverse
Superficial deposits	Moderate	Pollution from contaminated run-off	No routine discharge to ground, closed drainage system discharging to watercourse. Refer to mitigation for surface water.	Minor adverse	Slight adverse
		Changes to groundwater level or flow	Design of excavations penetrating the Lower Greensand mitigates groundwater dewatering risks. Appropriate design of retaining walls to minimise localised dewatering or groundwater mounding impacts. Appropriate design of earthworks including piling and embankments, and placement of foundations. Groundwater monitoring plan to include water level monitoring prior to, during and after construction (to be agreed with Environment Agency).	Minor adverse	Slight adverse

Receptor	Sensitivity	Potential effect	Mitigation	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)
		Changes to groundwater quality as a result of direct contact with construction materials	Suitable materials and installation techniques chosen so as to minimise potential for groundwater pollution. Groundwater monitoring plan to include water quality monitoring prior to, during and after construction (to be agreed with Environment Agency).	Negligible	Neutral
		Mobilisation of contamination and suspended solids through ground disturbance	GI is underway that will identify potentially contaminated ground. Remediation would be carried, where required.. Shallow soils stockpiled separately on site. Where required, in-situ treatment of unsuitable soils may be undertaken to stabilise the sub-grade prior to pavement construction. Piling methodology selected to minimise ground disturbance, generation of suspended solids and the potential for down-drag of contaminants. Best practice methodologies implemented and outlined in method statements and a CEMP to ensure any potential cause or spread of contamination is mitigated during construction.	Minor adverse	Slight adverse

Table 13.6: Summary of potential impacts during the operational phase

Receptor	Sensitivity	Potential effect	Mitigation	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)
Fishing lake	Low	Pollution from contaminated run-off	Landscaped perimeter between the lakes and the hardstanding area will allow isolation in the event of a spillage.	Negligible	Neutral
		Loss of aquatic habitat	No overall loss of volume or area, two proposed new lakes would increase marginal habitat.	Moderate adverse	Slight adverse
		Elevated salinity level due to salt spread for de-icing in winter	Strictly managed salt application accordingly to weather condition. Implementation of robust surface water drainage system that incorporates full retention separators and SuDS features.	Negligible	Neutral
Gibbins Brook (OD4)	High	Pollution from contaminated run-off	Landscaped perimeter between the stream and the hardstanding area will allow isolation in the event of a spillage.	Minor adverse	Slight adverse
		Elevated salinity level due to salt spread for de-icing in winter	Strictly managed salt application accordingly to weather condition. Implementation of robust surface water drainage system that incorporates full retention separators and SuDS features.	Minor adverse	Slight adverse
East Stour River (GB107040019640)	High	Pollution from contaminated run-off	Penstocks upstream and downstream of the pond / basins will allow isolation in the event of a spillage within the catchment.	Minor adverse	Slight adverse
		Loss of aquatic habitat due to culvert construction	Culvert would match the dimensions of the existing, to avoid effects on flow conveyance.	Minor adverse	Slight adverse
		Elevated salinity level due to salt spread for de-icing in winter	Strictly managed salt application accordingly to weather condition.	Minor adverse	Slight adverse

Receptor	Sensitivity	Potential effect	Mitigation	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)
			Implementation of robust surface water drainage system that incorporates full retention separators and SuDS features.		
Haytons stream (OD1) Attenuation pond/basins Drain adjacent to CTRL (OD2) Motorway drainage ditch (OD3) Drainage ditch (from Gibbins Brook, north-west Project Boundary)	Low	Pollution from contaminated run-off	Penstocks upstream and downstream of the ponds / underground geocellular storage will allow isolation in the event of a spillage within the catchment.	Moderate adverse	Slight adverse
		Elevated salinity level due to salt spread for de-icing in winter	Strictly managed salt application accordingly to weather condition. Implementation of robust surface water drainage system that incorporates full retention separators and SuDS features.	Moderate adverse	Slight adverse
Motorway drainage ditch (OD3)	Low	Loss of aquatic habitat due to infilling of ditches	New attenuation ponds / basins would be created (two on the north of the M20, one on the south) on the south-west of the Project Site. There would also be an additional wildlife habitat ponds.	Minor adverse	Neutral
Great Stour between Ashford and Wye (GB107040019741)	High	Pollution from contaminated run-off	Natural dilution / dispersion as located 19km downstream. Minimising the amount of exposed ground and soil stockpiles, silt traps or settlement lagoons, sheeting or seeding of soil stockpiles.	Negligible	Neutral
		Elevated salinity level due to salt spread for de-icing in winter	Natural dilution / dispersion as located 19km downstream. Strictly managed salt application accordingly to weather condition.	Negligible	Neutral

Receptor	Sensitivity	Potential effect	Mitigation	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)
			Implementation of robust surface water drainage system that incorporates full retention separators and SuDS features.		
Kent Greensand Eastern Groundwater Body (GB40701G501400)	High	Pollution from contaminated run-off.	No discharge to ground, closed drainage system discharging to watercourse. Refer to mitigation for surface water.	Negligible	Neutral
		Elevated salinity level due to salt spread for de-icing in winter		Negligible	Neutral
		Changes to groundwater level or flow	Design of earthworks, including piling and embankments, and foundations to mitigate any potential groundwater mounding. Appropriate design of retaining wall to minimise localised dewatering or groundwater mounding impacts. Groundwater monitoring plan to include water level monitoring after construction (to be agreed with Environment Agency).	Minor adverse	Slight adverse
		Reduction in aquifer recharge due to reduction in infiltration area	All rainfall that would have previously infiltrated through grassed areas now replaced by hardstanding will be collected by the drainage system, but will be returned to the catchment via the receiving watercourses	Minor adverse	Slight adverse
		Changes to groundwater quality due to changes in flow patterns	Groundwater monitoring plan to include water quality monitoring for a period after construction (to be agreed with Environment Agency).	Negligible	Neutral

Superficial Deposits Aquifer(s)	Moderate	Pollution from contaminated run-off	No discharge to ground, closed drainage system discharging to watercourse. Refer to mitigation for surface water.	Negligible	Neutral
		Elevated salinity level due to salt spread for de-icing in winter	No discharge to ground, closed drainage system discharging to watercourse. Refer to mitigation for surface water.	Negligible	Neutral
		Changes to groundwater level or flow	Design of earthworks, including piling and embankments, and foundations to mitigate any potential groundwater mounding. Appropriate design of retaining wall to minimise localised dewatering or groundwater mounding impacts. Groundwater monitoring plan to include water level monitoring after construction (to be agreed with Environment Agency).	Minor adverse	Slight adverse
		Reduction in aquifer recharge due to reduction in infiltration area	All rainfall that would have previously infiltrated through grassed areas now replaced by hardstanding will be collected by the drainage system, but will be returned to the catchment via the receiving watercourses	Minor adverse	Slight adverse
		Changes to groundwater quality due to changes in groundwater flow patterns	Groundwater monitoring plan to include water quality monitoring for a period after construction (to be agreed with Environment Agency).	Negligible	Neutral
Areas susceptible to surface water flooding	Low	Increased surface water flood risk to and from the Project.	Run-off from the Project would be attenuated to agreed levels in accordance with the requirements of the NPPF.	Minor adverse	Neutral
Aldington Flood Storage Reservoir	Very High	Increased volume of surface water runoff causing changes to the operation of the FSR, in particular the rate at which it empties following rainfall and is therefore available to attenuate and store flows from subsequent events.	Flood modelling will be carried out, using a methodology agreed with the Environment Agency, to fully assess the effects on the FSR. The Project detailed design will reflect the results of this modelling and ensure no effects on the FSR and therefore also downstream flood risk.	Negligible	Neutral

13.10 Further Mitigation Opportunities

13.10.1 As none of the impacts and effects identified above is significant, no additional mitigation measures are required. However, as the design progresses, there may be the opportunity to incorporate enhancement measures.

13.10.2 As described above, the Site lies at the top of the River Stour catchment and therefore the additional volume of runoff that would be generated from the impermeable area has the potential to affect flood risk for some distance downstream. It may be preferable to incorporate infiltration SuDS within the Project design, to reduce the volume of surface water runoff, assuming the pollution prevention measures required to protect the underlying groundwater could be incorporated. Due to the limited timescales involved in the production of this EAR, the assessment below assumes a fully impermeable surfacing solution, although it should be noted that impermeable surfacing may be considered further during the detailed design.

13.10.3 In order to construct the two-way link road would cross the East Stour River to the southeast of the Project to provide access between the Site and the existing Stop24 Service Area, it is proposed that the existing culvert under the M20 be extended.

14. Agriculture

14.1 Executive Summary

14.1.1 This chapter presents the results of an assessment of the potential impacts of the Project on agricultural receptors during both the construction and operation phases.

14.1.2 The assessment has identified that the Project will result in the permanent loss of 92.3ha of agricultural land, of which 65.9ha is the "best and most versatile land". This is considered to be a significant adverse effect.

14.1.3 The assessment also identified that the Project will not result in significant effects on individual farm businesses.

14.2 Introduction

14.2.1 This chapter sets out the Agricultural Impact Assessment (AgIA) of the Project.

14.2.2 The Project will be located within prominently agricultural land located immediately to the north and south of the M20, in an area west of Junction 11 (J11) in Kent. Agricultural land take will be required to facilitate the construction and operation of the Project. An AgIA has therefore been undertaken to assess the potential agricultural impacts of the Project in accordance with the 'Design Manual for Roads and Bridges' (2011).

14.3 Regulatory / Policy Framework

European

Legislation

14.3.1 No legislation or planning guidance exists at European Union (EU) level which is concerned specifically with maintaining the commercial viability of individual farm holdings affected by major new developments.

14.3.2 Maintaining the financial integrity of agricultural businesses however is a key priority of the long-standing European Common Agricultural Policy (CAP). Within the context of EU policy it is therefore important that impacts on agricultural holdings arising from major developments are assessed and the commercial viability of individual farms are maintained where appropriate.

National

Policy

14.3.3 It is a principle of UK planning policy, as stated in the National Planning Policy Framework (NPPF) (Department for Communities and Local Government (DCLG), 2012) (and further elaborated upon in the Natural England (2012) Technical Information Note TIN0492), to protect the “best and most versatile” (BMV) agricultural land. BMV land is defined in section 14.5.3 below and can be considered both as a national resource in terms of contributing to national food security and generating an economic revenue stream, and also from the perspective of individual farm businesses whose commercial viability is dependent on the availability and quality of agricultural land.

14.3.4 Another principle of the NPPF is to support thriving rural communities. The NPPF recognises agriculture and other land-based enterprises as being central to delivering sustainable development in the UK countryside. Maintaining the viability of existing agricultural enterprises can be considered important for rural communities if they are going to thrive. From a national perspective, it is important that any potential impacts of the Project on the viability of farming enterprises are assessed, and that the commercial integrity of the affected farms be maintained as far as possible.

Local

Policy

14.3.5 The Shepway District Local Plan Review (2006), Policies Applicable 2013 Onwards, accompanies the Core Strategy Local Plan and states in Policy CO1 that:

14.3.6 "*The District Planning Authority will protect the countryside for its own sake. Subject to other Plan policies, development in the countryside will be permitted where proposals: maintain or enhance features of landscape...and agricultural importance, and the particular quality and character of the countryside.”*

14.3.7 The policy goes on the state that where development conflicts with the criteria set out in CO1, it will only be permitted where it can be shown that:

14.3.8 "*Adequate measures will be taken to compensate for any adverse environmental effect. Compensatory measures should, as a minimum, ensure that no net environmental loss occurs*.”

14.3.9 There are no specific references to agricultural receptors in relation to local planning policy, either for documents authored by the Shepway District Council or Kent County Council.

Guidance

14.3.10 Related to the quality of agricultural land, the “Construction Code of Practice for the Sustainable Use of Soils on Construction Sites” has been produced by the Department for Environment, Food and Rural Affairs (Defra) on how soils should be managed during construction operations in the UK to ensure that they can be reused and are not degraded as a resource.

14.3.11 The AgIA methodology was based on the Highways Agency’s (now Highways England) (2009) Design Manual for Roads and Bridges (DMRB) Volume 11. This provides guidance for carrying out environmental assessments in relation to road projects. Section 3, Part 6 (Chapters 6 to 10 inclusive) sets out how the impacts of a road Project on agricultural receptors are to be assessed.

14.3.12 The AgIA was undertaken with due regard and reference to the national and local policies outlined above.

14.4 Study Area

14.4.1 The extent of the AgIA study area includes only the agricultural land within the Project Site boundary and the individual farm units with commercial interests in that agricultural land. The Agricultural Land Classification of the Project Site is shown on Figure 14.1 - Agricultural Land Classification.

14.5 Assessment Methodology

14.5.1 The purpose of an AgIA is to assess the potential impacts of the Project on agricultural receptors within the proposed Project Site during both the construction and operational phases. The AgIA methodology is based on DMRB (2011), Volume 11, Section 3, Part 6.

14.5.2 The potential impacts of the Project were assessed for two types of agricultural receptor:

- Agricultural land, and the Best and Most Valuable (BMV) agricultural land in particular – i.e. agricultural land as a national resource.
- Individual farm businesses – i.e. their viability as commercial entities.

14.5.3 BMV land is defined as agricultural land classified as Grades 1 (Excellent), 2 (Very Good), or 3a (Good) according to the Agricultural Land Classification (ALC) of England and Wales (MAFF, 1988). This is the agricultural land that is the most flexible, productive and efficient in response to inputs. It is suited to adapting to the changing needs of agricultural production and maintaining the competitiveness of UK agriculture against international competitors. It is considered a national resource. An ALC study was commissioned to provide the evidence base on BMV land to the AgIA (refer to Appendix 14.1 - Agricultural Land Classification and Soil Resources Study).

14.5.4 For the purposes of the AgIA, the term "farm", "farm holding", "individual farm holding", or "farm business" was defined as:

"*an area of land that consists of one or more land parcels or group of fields that are managed by a named person or named business entity as an owner, tenant or in any other commercial agricultural capacity, for the production of food, forage or fibre*".

14.5.5 This definition groups land parcels according to individuals or business entities that have commercial interests in that land and provides the unit of study for the assessment of impacts on this type of agricultural receptor.

14.5.6 Soil resources (including agricultural soils) are assessed in Chapter 9: Geology & Soils.

Assessment of Value / Sensitivity

14.5.7 As described in section 14.5.2 above, the two types of agricultural receptor that were assessed as part of the AgIA were agricultural land and individual farm businesses. The sensitivities of these receptors are described in Table 14.1.

Table 14.1: Sensitivity of agricultural receptors

Sensitivity	Agricultural Land	Individual Farms
Low	Non-BMV land – ALC grades 3b, 4 and 5.	Large-scale farming enterprises operating on a total land area of over 50ha and/or farming enterprises with a wide range of crop/livestock types, a large degree of operational flexibility or diverse sources of income, and not operating an Environmental Stewardship Agreement.
Medium	Not applicable.	Medium-sized farming enterprises operating on a total land area of between 20 and 50ha and/or farming enterprises with a good range of flexible crop/livestock types, some degree of operational flexibility or some degree of income diversification, and operating an Entry Level Environmental Stewardship Agreement.
High	BMV land – ALC grades 1, 2 and 3a.	Small-scale farming enterprises operating on a total land area of less than 20ha and/or farming enterprises with a limited or highly specific range of high-value crops/livestock, a low degree of operational

Sensitivity	Agricultural Land	Individual Farms
		flexibility or low income diversification, and operating a Higher Level Environmental Stewardship Agreement.

Assessment of Magnitude

14.5.8 Based on DMRB Volume 11, Section 3, Part 6, the AgIA was focused on effects caused by the following potential impacts arising from the Project during the construction and/or operational phases:

- land-take
- field severance
- farm or field access alterations
- diversion of field irrigation systems or livestock drinking water supplies;
- slope regrading, soil degradation, or alterations to land drainage regimes likely to induce more frequent flooding or periods of soil moisture deficiency, which is likely to induce changes in the quality of the agricultural land and its ALC grade
- husbandry and the impacts that are determined by the activities taking place on the affected land

14.5.9 The criteria that were used to determine the magnitude of these impacts on each agricultural receptor are defined in Table 14.2.

Table 14.2: Criteria for determining the magnitude of impacts

Magnitude	Description
Major adverse	Loss of over 50ha of agricultural land, and/or require major day-to-day changes in the land management activities of the farm business which would threaten its commercial viability.
Moderate adverse	Loss of between 20 and 50ha of agricultural land, and/or require major day-to-day changes in the land management activities of the farm business which might threaten its commercial viability.
Minor adverse	Loss of less than 20ha of agricultural land, and/or require slight changes in land management activities of the farm business that would not threaten its commercial viability.
Negligible	No loss of agricultural land, and/or require no notable change in land management activities of the farm business with no appreciable consequences for its commercial viability.
Minor beneficial	Increase the provision of agricultural land by less than 20ha, and/or entail positive changes in land management activities of the farm but not enhance its commercial viability.
Moderate beneficial	Increase the provision of agricultural land of between 20 and 50ha, and/or entail changes in land management activities of the farm businesses which might enhance its commercial viability.
Major beneficial	Increase the provision of agricultural land of over 50ha, and/or entail changes in land management activities of the farm businesses which would enhance its commercial viability.

Assessment of Significance

14.5.10 By combining the sensitivity of the agricultural receptor and the magnitude of the impact, the significance of the effect on the agricultural receptors was determined using Table 14.3 below. Only those effects of moderate or major impact are considered to be significant.

Table 14.3: Agricultural significance criteria

Significance of impact			
Magnitude of impact	**Low sensitivity**	**Medium sensitivity**	**High sensitivity**
Negligible	Negligible	Negligible	Negligible
Minor adverse/beneficial	Not significant	Not significant	Not significant
Moderate adverse/beneficial	Not significant	Significant	Significant
Major adverse/beneficial	Significant	Significant	Significant

Consultation

14.5.11 Farm questionnaires have been conducted with landowners and tenants to gather relevant baseline information on farm holding(s) with land interests within the study area. However only limited information has been acquired. Therefore, aside from consultation with statutory consultees, no other consultation has been carried out for the AgIA. Expert judgement regarding the nature of the baseline and the subsequent assessment of impacts has therefore been used (for assumptions and limitations see section 14.6 below).

14.6 Assumptions and Limitations to the Assessment

14.6.1 The assumptions and limitations tor the assessment which apply across all chapter topics are given in Chapter 4: Approach to Environmental Assessment. Those specific to this chapter are given below:

- The study area was assumed to be limited to the agricultural land and the farm units with interests in agricultural land within the Project Site.
- All of the agricultural land within the study area is owned and actively farmed by a single individual farm business, this land is not tenanted out to other individual farm businesses.
- All of the agricultural land within the study boundary is managed for arable (plant-based crops) production only.
- The baseline for each individual farm business and the condition of the agricultural land represent average conditions likely to be found throughout the average year.
- All of the agricultural land within the RLB will be acquired through agreement purchase, at market value or better and will be permanently converted from agriculture for use by the Project.
- There will be no temporary land-take (e.g. use of agricultural land during construction for site compounds, temporary storage areas, etc.).
- No new or compensatory agricultural land will be created or made available.
- The purchasing of land through agreement will sufficiently compensate individual farm businesses for any land-take and/or associated disturbance to existing operations.
- Impacts on agricultural receptors will occur on agricultural receptors within the study area only and only these will be assessed.
- The assessment criteria used were qualitative in nature and do not provide a detailed, quantitative financial assessment of the impacts of the Project, therefore the results cannot be used to form the basis of financial appraisals or as evidence for compensation claims.
- Assumptions have been made about baseline conditions for individual farms and their impacts due to the lack of farm specific information available.

14.7 Baseline

Agricultural land as a national resource

14.7.1 Most of the agricultural land at the Project Site is classified as Grade 2 and 3a (Very Good to Good quality), with a smaller area classified as Grade 3b agricultural land (Moderate quality).

14.7.2 For an indicative overview of the temporal spatial distribution placement of agricultural land quality at the Project Site refer to Figure 14.1 - Agricultural Land Classification.

Table 14.4: Agricultural Land by ALC Grade

Grade	Description	Sensitivity of receptor	Area (ha)	Proportion of agricultural land
1 (BMV)	Excellent Quality	High	0	N/A
2 (BMV)	Very good quality	High	41.6	45
3a (BMV)	Good quality	High	24.3	26
3b	Moderate quality	Low	25.7	28
4	Poor quality	Low	0.7	1
5	Very Poor Quality	Low	0	N/A
-	Total BMV	NA	65.9	71.4
-	Total Agricultural	NA	92.3	100
-	Non Agricultural	NA	22.2	-

Source: Highways England (2016) Stanford West Appendix 14.1

Individual farm businesses

14.7.3 The Project Site forms part of one arable unit (Farm 01) of approximately 260 hectares of owned and tenanted land in total. Most of the land lies to the west of Stanford, with land to the south of the M20 and other land farmed at Stelling Minnis and Stone Street. It is assumed that all of the agricultural land (92.3 ha) within the study area is owned and managed by this farm.

14.7.4 The farm buildings situated to the north of Kennett Lane comprise a range of modern steel portal-framed grain storage buildings, which provide a commercial grain storage facility for farmers in the region. The traditional brick buildings at the farm have been converted to commercial business uses and are let to local businesses.

14.7.5 Based on the size of Farm 01 and its diversified sources on income, the sensitivity of this receptor is **low**.

14.8 Mitigation

14.8.1 It is assumed all of the land required for the Project will be purchased by agreement from the landowner and that the price paid will sufficiently compensate individual farm businesses for any land-take and/or associated disturbance to existing operations (section 14.6). The purpose is to offset the financial impacts of the Project on the individual farm business.

14.8.2 No additional mitigation will be included and no new or compensatory agricultural land will be created or made available.

14.9 Residual Impacts (with mitigation)

14.9.1 It is assumed that the land-take associated with the Project will be permanent and will be effective from the beginning of the construction phase. The residual impacts will therefore be the same during both the construction and operation phases.

Agricultural land as a national resource

14.9.2 Table 14.5 details the assessment of agricultural land as a national resource.

Table 14.5: Assessment of agricultural land as a national resource

ALC Grade	Sensitivity of receptor	Land-take (permanent)	Magnitude of impact	Significance of residual effect
1 (BMV)	High	0	No impact	Not significant
2 (BMV)	High	41.6	Moderate adverse	Significant
3a (BMV)	High	24.3	Moderate adverse	Significant
3b	Low	25.7	Moderate adverse	Not significant
4	Low	0.7	Minor adverse	Not significant
5	Low	0	No impact	Not significant

14.9.3 The Project will have significant adverse impacts on Grade 2 and Grade 3a agricultural land and in total will entail the loss of 65.9 ha of BMV land. The Project will therefore have significant adverse impacts on agricultural land as a national resource.

Individual farm businesses

14.9.4 Table 14.6 details the assessment for individual farm businesses.

Table 14.6: Assessment of Farm 1

DMRB Impact	Impact details	Impact magnitude
Land-take	The Project will result in 92.3ha of permanent agricultural land take. It is assumed the purchase process will sufficiently compensate individual farm businesses for this land-take; no new or compensatory agricultural land will be created or made available.	Negligible
Access and severance	The Project will result in the closure of all field access points within the study area because it is assumed that all of this land is being permanently purchased for the Project. The Project will not require alterations to existing field access arrangements outside of the study area. The Project will not sever agricultural land within the study area into separated residual field portions because all of the land in the study area managed by this farm will be purchased by agreement for the Project.	Negligible
Irrigation and water supply	It is assumed that no agricultural irrigation or livestock water supply systems outside of the study area will be affected by the Project. All irrigation or livestock water supply systems within the study area will be removed, but this will not affect the viability of Farm 01 since all of the agricultural land within the study area will be purchased by agreement.	Negligible
Factors affecting ALC grade, including soils	The Project will impose no temporary land-take on this farm and all of the land within the study area will be permanently purchased. No reinstatement of agricultural land will be required to occur; no land outside of the land-take area will be tracked, regraded, etc., to the detriment of the soil quality and existing grade of the land.	Negligible
Husbandry-specific	The Project will result in a reduction in productive arable area by 36% of the total land area managed by this farm. This impact has been assessed under the land-take section above, and there are no additional husbandry-specific effects relating to arable production. No farm buildings will be lost to the Project and use of farm buildings used to store grain or rent to local businesses by this farm outside of the study area will not be altered.	Negligible

14.9.5 The impacts of the Project on Farm 01 have been assessed as Negligible. Farm 01 is a Low sensitivity receptor. The Project will therefore not have a significant effect on Farm 01.

15. Consideration of Cumulative Effects

15.1 Executive Summary

15.1.1 This chapter considers potential for combined effects of the Project and cumulative effects of the Project in combination with other developments, based on DMRB HA 205/08 guidance.

15.1.2 The overall significance of combined effects for the Project during the construction phase was assessed as Major Adverse due to the significant loss of best and most versatile (BMV) agricultural soils and adverse impact on the temporary setting of the nearby scheduled monument and Grade II*/II Listed Buildings. The significance of combined effects during operation was considered overall to be Moderate adverse, as although the permanent loss of BMV agricultural soils and impact on the setting of nearby cultural assets could not be mitigated, the proposals for mitigation planting will reduce adverse impacts over time (qualitatively assessed at 15 years after Project opening) and the Project will result in a beneficial impact on vehicle travellers and local communities during an Operation Stack event.

15.1.3 Nine 'committed' developments were considered in combination with the Project. The Masterplan development at Sellindge (Development 1) and Stop24 Service Area extension (Development 2), located within 1km of the Project, were considered most likely to result in cumulative effects on the environment. With the exception of Agriculture and Materials, no cumulative effects of these developments, considered together with the Project, were assessed to result in cumulative effects.

15.1.4 The potential loss of additional BMV agricultural land to other developments, when considered in combination with the Project, will result in a Major Adverse cumulative effect during construction and operation. During construction only, the demand on material resources and on the capacity of regional waste management facilities could potentially conflict with the other proposed developments in the area; the significance of cumulative effects were considered to be Moderate Adverse.

15.2 Introduction

15.2.1 This chapter presents the assessment of cumulative effects for the Project. Cumulative effects result from multiple actions on receptors over time and are generally additive or interactive (synergistic) in nature.

15.2.2 The Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 5 HA 205/08: Assessment and Management of Environmental Effects (The Highways Agency et al., 2008) (hereafter referred to as DMRB HA 205/08) provides guidance on cumulative impact assessment. A cumulative impact may result from two scenarios, which comprise of:

- The combined effects from the Project (the inter-relationship between different environmental topics, e.g. nature conservation and hydrology).
- The cumulative effect of a number of different developments (in combination with the Project being assessed).

15.2.3 The environmental assessments reported in Chapters 5 to 14 of this EAR above have considered the potential for cumulative effects. Relevant information from these topic-specific assessments is included in this chapter to provide a holistic and aggregated assessment of cumulative effects.

15.3 Regulatory / Policy Framework

15.3.1 International, national and local level policy and legislation relevant to each topic-specific assessment is presented in the environmental chapters above (Chapters 5 to 14).

15.4 Study Area

15.4.1 DMRB HA 205/08 requires that the spatial boundary of the receptor or resource with potential to be affected either directly or indirectly is considered in the assessment of cumulative effects.

Combined Effects

15.4.2 The study area for the assessment of combined effects of the Project reflects the study areas identified in each of the respective topic-specific environmental chapters above (Chapters 5 to 14). This reflected the area over which receptors have the potential to experience cumulative effects.

Cumulative Effects

15.4.3 A consideration of other developments included investigation over a much wider study area, as shown on Figure 15.1 - Other Developments Considered in Cumulative Effects. Developments within 1km of the Project are considered to have more potential to result in cumulative effects although the study area was extended to encompass ‘committed’ developments (refer to section 15.5.5) up to 20km from the Project.

15.5 Assessment Methodology

15.5.1 As stated above, the DMRB HA 205/08 requires a consideration of both combined and cumulative effects, which is described in more detail below.

Assessment of Combined Effects of the Project

15.5.2 The assessment methodology for combined effects involves the identification of impact interactions associated with the Project upon separate environmental receptors. The significance of construction and operational phase environmental impacts were cross-examined from the preceding chapters of this EAR and the significance of combined effects upon each environmental receptor was determined based upon the balance of scores and using professional judgement.

Assessment of Cumulative Effects of the Project in combination with Other Developments

15.5.3 Cumulative effects can result from incremental changes caused by other past, present or reasonably foreseeable actions together with the Project. The term reasonably foreseeable, or in other words 'committed' developments, comprise of:

- Confirmed trunk road and motorway projects (i.e. gone through the statutory processes)
- Development projects with valid planning permissions as granted by the local planning authority and for which formal EIA is a requirement or non-statutory environmental impact assessment has been undertaken.

15.5.4 Only 'committed' developments were considered in this assessment and those in close proximity to the Project (within 2km) were given most focus. Other known or potential developments where planning permission had either elapsed or where no planning applications currently exist were discounted from the assessment. Consideration was given to the likely timing, location (proximity to site) and nature of the development in relation to the Project. Committed developments within 1km of the Project were given most focus as these were considered more likely to result in cumulative effects.

15.5.5 Committed developments in the vicinity of the Project were identified through a review of the online planning portals of Shepway District Council, Ashford Borough Council and Highways England and a review of the following documents:

- Growth without Gridlock: a Transport Delivery Plan for Kent, Kent County Council (December 2010)
- Local Transport Plan for Kent 2011-2016, Kent County Council (April 2011)
- Shepway District Council Core Strategy Local Plan (2013) and Local Plan Review (2006)
- Ashford Borough Council Core Strategy 2006-2021 (2008)

Assessment of Value or Sensitivity

15.5.6 The criteria to define and assign an environmental value/sensitivity to a receptor or resource are presented in each of the respective environmental chapters above (Chapters 5 to 14) and is not duplicated here.

Assessment of Magnitude

15.5.7 The criteria to assign an impact magnitude to a receptor or resource are presented in each of the respective environmental chapters above (Chapters 5 to 14) and is not duplicated here. The impact magnitude could be either adverse or beneficial.

Assessment of Significance

15.5.8 Impact significance is a function of the likelihood and magnitude of impact, and the sensitivity of the receptor and its ability to absorb change. The significance of impact was carried forward from the respective topic-specific environmental chapters (Chapters 5 to 14) to enable an 'on balance' assessment of combined significance upon environmental receptors, as well as to identify the significance of cumulative effects with other developments.

15.5.9 The matrix for determining cumulative significance is shown in Table 15.1. The cumulative impact significance could be either adverse or beneficial and is based on residual impact (i.e. the remaining impacts after implementation of mitigation). Where there are two alternatives provided in the table, a single significance rating has been chosen based on professional judgement.

Table 15.1: Matrix for determining the Significance of Cumulative Effects

Value/Importance (sensitivity)	Magnitude of Impact (degree of change)				
	No Change	Negligible	Minor	Moderate	Major
Very High	Not Significant	Minor	Moderate or Major	Major or Severe	Severe
High	Not Significant	Minor	Minor or Moderate	Moderate or Major	Major or Severe
Medium	Not Significant	Not Significant or Minor	Minor	Moderate	Moderate or Major
Low	Not Significant	Not Significant or Minor	Not Significant or Minor	Minor	Minor or Moderate
Negligible	Not Significant	Not Significant	Not Significant or Minor	Not Significant or Minor	Minor

15.5.10 Having determined the significance of impact using the matrix above, the categories of significance can be described as follows (based on DMRB HA 205/08):

- **Severe**: effects that the decision-maker must take into account as the receptor or resource is irretrievably compromised.
- **Major**: effects that may become key decision-making issues.
- **Moderate**: effects that are unlikely to become issues on whether the Project design should be selected, but where future work may be needed to improve

on current performance. Moderate significance and above is considered 'significant' in the context of the EIA Regulations.

- **Minor**: effects that are locally significant.
- **Not Significant (NS)**: effects that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

Consultation

15.5.11 Relevant consultation is included in each of the respective topic-specific environmental chapters above (Chapters 5 to 14) and is not duplicated here.

15.5.12 Consultation was undertaken with Shepway District Council, Ashford Borough Council and Highways England, as required, to identify relevant committed developments in the vicinity of the Project.

15.6 Limitations to the Assessment

15.6.1 There was generally a lack of detailed information on other committed developments, or likely timing, and therefore the assessment of cumulative effects was based on professional judgement using the information currently available.

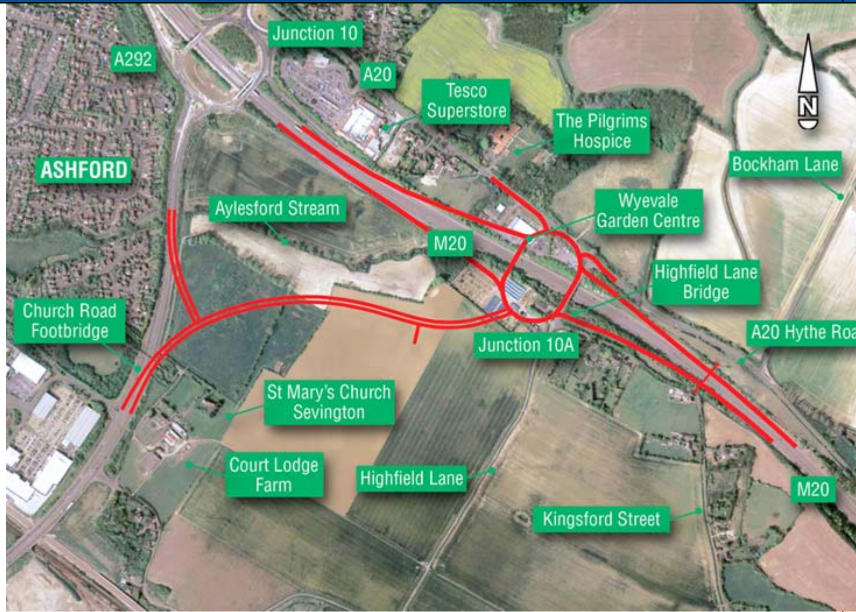
15.6.2 The identification and evaluation of cumulative effects is potentially complex and subject to change, for example if developments are delayed or postponed. Additional 'committed' developments may be proposed following submission of this EAR and the conclusions may change as more detailed design information comes to light. Developments that had already been constructed were excluded from the assessment as they form part of the existing scenario, which is already considered in the baseline assessment of the environmental chapters.

15.7 Baseline

15.7.1 The baseline conditions for each environmental topic is described in detail for Air Quality, Cultural Heritage, Landscape, Nature Conservation, Geology and Soils, Materials, Noise and Vibration, People and Communities, Road Drainage and the Water Environment and Agriculture (Chapters 5 to 14). Table 15.2 presents a schedule of the nine committed developments considered in combination with the Project. The location of these developments is shown on Figure 15.1.

Table 15.2: Other Committed Developments

Reference	Relevant Planning Authority	Project/Plan	Application Ref.	Planning Decision	Location in relation to the Project
1	Shepway District Council	Sellindge Village Expansion – mixed-use development at Sellindge, as identified in the SDC Core Strategy, consisting of up to 250 dwellings, offices and commercial floorspace, together with access from the A20, associated roads, car parking, open space and landscaping. The development includes junction improvements and traffic calming measures on the A20.	Y14/0873/SH	Approved with conditions (January 2016).	Between M20 and A20 to the south of Sellindge, 0.5km west of Project.
2	Highways England/ Shepway District Council	Stop24 Motorway Service Area to be extended with an additional 60 parking spaces for lorries, located immediately to south-west of Junction 11.	Y14/1395/SH	Approved with conditions (March 2015).	Accessed from M20 J11, 0.5km east of Project.
3	Highways England	A new M20 Junction 10A, 700m south east of J10 at Ashford with a new dual carriageway link road to the existing A2070. Will also include a new NMU crossing over the M20. Construction may overlap with the Project.	N/A	Nationally Significant Infrastructure Project. Application for DCO to be submitted (July 2016).	J10 to the east of Ashford, 7.5km west of Project.

Reference	Relevant Planning Authority	Project/Plan	Application Ref.	Planning Decision	Location in relation to the Project
		 Photo from http://www.highways.gov.uk/roads/road-projects/m20-junction-10a/			
4	Ashford Borough Council	Land On The North Side Of, Highfield Lane, Sevington, Kent. Development to provide an employment led mixed-use scheme, to include site clearance, alteration of highways, engineering works and construction of new buildings and structures of up to 157,616m^2 together with ancillary and associated development including utilities and transport infrastructure, car parking and landscaping.	14/00906/AS	Deposited (i.e. valid and registered). Subject to EIA (pending decision).	Immediate south of M20 J10a proposal, 7.5km west of Project.

Reference	Relevant Planning Authority	Project/Plan	Application Ref.	Planning Decision	Location in relation to the Project
5	Shepway District Council	45MW combined heat and power (CHP) renewable energy power station, including 70m stack at Link Park/Lympne Industrial Estate	Y15/0751/SH	EIA required (July 2015).	Link Park/Lympne Industrial Estate 2km south of Project.
6	Shepway District Council	Extension to time limit of planning permission Y06/0552/SH for outline permission for an extension to Link Park/Lympne Industrial Estate consisting of the erection of up to 52,000m^2 of employment development Business (Class B1), General Industry (Class B2) and Storage and Distribution (Class B8).	Y15/0880/SH Y06/0552/SH	Approved with conditions (February 2016).	Link Park/Lympne Industrial Estate 2km south of Project.
7	Shepway District Council	Redevelopment at Shorncliffe Garrison, Folkestone, a strategic site in the SDC Core Strategy, consisting of demolition of existing buildings, construction of 1,200 new dwellings, primary school and sports facilities, together with associated roads, car parking and landscaping.	Y14/0300/SH	Approved with conditions (December 2015).	On western edge of Folkestone, 6km east of Project.
8	Ashford Borough Council	Chilmington Green mixed use development. The Chilmington Green Area Action Plan provides a detailed policy framework to deliver a major urban extension to Ashford of up to 5,750 homes, a secondary school, four primary schools, open space and transport infrastructure over a period of 25 years.	12/00400/AS	Approved with conditions (June 2016).	To the south west of Ashford, 12.5km west of Project.
9	Highways England	Dover Traffic Assessment Project (TAP). A traffic management scheme to hold eastbound lorries on the A20 to prevent severe congestion in and around Dover. It exists as a temporary, reversible system of traffic management. The scheme is within Kent Downs AONB but is almost entirely on the existing A20 hardstanding. The scheme is currently temporary although Highways England may make it permanent. The Project is likely to allow the Dover TAP to be removed or reduce its impact/scale.	N/A	EIA required. Scheme ongoing.	Dover area, 19km east of Project.

15.8 Mitigation

15.8.1 Avoidance of environmental impacts through design and the incorporation of mitigation to prevent or reduce impacts have been an integral part of the design process, and investigation by environmental specialists has not identified any additional appropriate mitigation which would be effective in addressing the cumulative effects that have been identified. It is considered that the mitigation measures proposed in the environmental chapters of this EAR will reduce impacts of the Project as far as is practicable.

15.8.2 In the event that the timing of construction of the Project (approximate 12 month duration) and other committed developments overlap, best practice measures including adherence to defined working hours and noise thresholds, dust suppression measures and other careful programming of construction activities, will help to minimise cumulative effects on any nearby residential and sensitive receptors.

15.9 Residual Impacts (with mitigation)

15.9.1 This section describes the likely significant and insignificant combined and cumulative effects remaining after implementation of mitigation.

Combined Effects of the Project

15.9.2 The anticipated residual combined effects of the Project during construction and operation are summarised in the following section. A summary of the residual significance of impacts is provided in Table 15.3 and Table 15.4. Impacts are adverse unless stated otherwise.

Table 15.3: Combined Residual Effects of the Project (Construction)

	Topic Area											
Receptor	Air Quality	Cultural Heritage	Landscape	Nature Conservation	Geology and Soils	Materials	Noise and Vibration	People and Communities	RDWE	Agriculture	Significance of Combined Effects	Comments
Cultural Features	NS	Major	Moderate	-	-	-	Moderate	-	-	-	Major	Construction will have an adverse impact on views from and to the scheduled monument (Westenhanger Castle and grounds) and Grade II*/II listed buildings (Stanford Windmill and Gibbons Brook Farmhouse Shalom). Construction noise will have an adverse impact on their setting to a degree that it would be difficult to appreciate these assets in the short term.
Landscape	-	Moderate	Major	Minor	Moderate	-	-	-	-	Major	Major	Potential adverse landscape and visual impacts would arise from site clearance, soil stripping, vegetation clearance, temporary facilities and construction activities. Impacts would be widespread and visually prominent, particularly in the more open areas of the Project adjacent to Kennett Lane and the land between the M20 and CTRL. The Project is located in a predominantly rural setting which would be significantly altered due to loss of agricultural land.
Ecology and Water Environment	NS	-	Minor	Minor	-	-	Minor	-	Minor	-	Minor	Site works will include clearance of small areas of woodland and scrub. Significant effects are predicted for great crested newts (direct mortality/injury if present) and East Stour River, based on a precautionary approach due to lack of survey data. Construction works could potentially result in pollution of the river and groundwater due to spillages of oils/chemicals and silt-laden runoff, impacting on water quality and aquatic ecology, although planned mitigation measures are considered sufficient to mitigate potential significant adverse effects.

	Topic Area											
Receptor	**Air Quality**	**Cultural Heritage**	**Landscape**	**Nature Conservation**	**Geology and Soils**	**Materials**	**Noise and Vibration**	**People and Communities**	**RDWE**	**Agriculture**	**Significance of Combined Effects**	**Comments**
												Construction noise and vibration could have a temporary adverse impact on local ecology.
Geology and Soils	-	-	-	-	Major	-	-	-	Minor	Major	Major	There will be a significant loss of good to excellent quality agricultural soils, which is regarded as a national resource.
Material Resources	-	-	-	-	Major	- Moderate	-	-	-	Major-	Major	There will be a significant loss of good to excellent quality agricultural soils, which covers more than half the Project site.
Communities	NS	-	Major	-	-	-	Major	Moderate	-	NS	Major	Construction-generated dust may cause impacts on respiratory functions/health and loss of amenity (e.g. discolouration of surfaces) at nearby residential properties and cultural assets if uncontrolled although best practice measures will reduce these impacts. Temporary noise impacts will have an adverse impact on nearby residential and cultural receptors. Landscape and visual impacts would also arise from site clearance, soil stripping, vegetation clearance, temporary construction facilities and activities. The proposed land purchase process is assumed to sufficiently compensate individual farm businesses for any land-take and/or associated disturbance to existing operations

Receptor	Air Quality	Cultural Heritage	Landscape	Nature Conservation	Geology and Soils	Materials	Noise and Vibration	People and Communities	RDWE	Agriculture	Significance of Combined Effects	Comments
Vehicle Travellers and NMUs	NS	-	Major	-	-	-	Minor	Minor	-	-	Major	Temporary road and footpath diversions are likely to increase vehicular and NMU journey times and lengths. Amenity will be reduced for users of the footpaths and bridleway in the vicinity of the Project due to higher levels of noise and visual intrusion from construction activities.
Overall Significance of Combined Effects during Construction for the Project (On Balance)											**Major**	**Overall Major Adverse impact due to significant loss of high quality agricultural soils, landscape and visual impacts and impact on temporary setting of nearby cultural assets.**

Table 15.4: Combined Residual Effects of the Project (Operation)

Receptor	Air Quality	Cultural Heritage	Landscape	Nature Conservation	Geology and Soils	Materials	Noise and Vibration	People and Communities	RDWE	Agriculture	Significance of Combined Effects	Comments
Cultural Features	NS	Major	Moderate (Year 1) Moderate (Year 15)	-	-	-	Moderate	-	-	-	Major	A number of features of the completed Project will be visible from Westenhanger Castle and Stanford Windmill, such as the overbridge structure and retaining wall. The permanent setting of the assets is likely to be changed which may harm the value/heritage significance of these cultural assets. Adverse noise impacts are also predicted. Mitigation planting, once established, will integrate the Project into the surrounding landscape and limit views from nearby cultural assets to some extent.
Landscape	-	Moderate (Year 1) Minor (Year 15)	Major (Year 1) Moderate (Year 15)	NS	Moderate	-	-	-	-	Moderate	Moderate	Permanent landscape impacts anticipated due to loss of agricultural land. When in use a large number of lorry movements, vehicle headlights, site lighting and higher ambient noise levels will be experienced within the wider rural landscape, reducing tranquillity and visual amenity. Tranquillity in the vicinity of the Project is currently low due to the presence of the M20 and CTRL, although views and setting of the Kent Downs AONB will be adversely affected as a result of the Project. Mitigation planting, once established, will integrate the Project into the surrounding landscape and limit views from nearby areas of flat landscape. However, impacts from permanent site lighting and vehicle headlights cannot be fully mitigated, with greater impacts anticipated during winter when the screen planting is less effective.

Receptor	Topic Area: Air Quality	Cultural Heritage	Landscape	Nature Conservation	Geology and Soils	Materials	Noise and Vibration	People and Communities	RDWE	Agriculture	Significance of Combined Effects	Comments
Ecology and Water Environment	NS	-	Minor Beneficial	NS	-	-	Minor	-	Minor	-	Minor	The completed Project will result in loss of small areas of woodland, scrub and a fishing lake. However, replacement waterbodies will be provided and mitigation planting will more than offset the existing vegetation lost to the Project. Significant impacts are predicted for bats, otters and water voles as a result of disturbance caused by noise and lighting. Surface and groundwater quality and aquatic ecology will be protected from operational routine runoff from new hardstanding areas through incorporation of lined SuDS in the drainage design prior to discharge to Haytons Stream. Drainage discharges will also be attenuated to the greenfield runoff rate and attenuation features sized accordingly to prevent increased flooding.
Geology and Soils	-	-	-	-	Major	-	--	-	NS	Major	Major	The completed Project will result in the permanent loss of agricultural land
Material Resources	-	-	-	-	Major	NS-	-	-	-	Major	Major	The completed Project will result in the permanent loss of agricultural land No significant impacts on individual farm businesses are anticipated as any impacted farm business will be sufficiently compensated.
Communities	NS	-	Major (Year 1) Major (Year 15)	-	-	-	Major	Moderate	-	NS	Major	Over time, mitigation planting both within the main body of the Lorry Area and along the periphery of the Project Site will have established, helping to reduce the visual impact of the Project on nearby residential receptors and recreational receptors, to some extent. Adverse noise impacts are also predicted for local receptors.

Receptor	Air Quality	Cultural Heritage	Landscape	Nature Conservation	Geology and Soils	Materials	Noise and Vibration	People and Communities	RDWE	Agriculture	Significance of Combined Effects	Comments
	Topic Area											
Vehicle Travellers and NMUs	NS	-	Moderate	-	-		Moderate	Minor Beneficial (VTs) Moderate (NMUs)	-	-	Moderate	Beneficial effects on driver stress are predicted during an Operation Stack event as traffic should flow as it would during a normal day. Provision of off-road parking will reduce the number of illegally parked lorries on the highway network resulting in a beneficial effect on vehicle travellers and the local community. Some predicted significant impacts arising from the operation of the Project on views from the road along the A20, Stone Street and Kennett Lane will reduce following the establishment of mitigation planting. A permanent loss of amenity on NMU journeys is anticipated due to higher levels of noise and visual intrusion from parked and moving traffic. An Operation Stack event will require the temporary closure of footpaths within the Project Site, which will temporarily increase NMU journey length.
Overall Significance of Combined Effects during Operation for the Project (On Balance)											**Major**	**Major Adverse impact due to permanent significant loss of high quality agricultural land, landscape and visual and impact on permanent setting of nearby cultural assets. Mitigation planting will reduce adverse impacts to some extent over time and a beneficial impact will be experienced by vehicle travellers during an Operation Stack event.**

Construction

15.9.3 The overall significance of combined effects for the Project during the construction phase has been assessed as **Major Adverse** due to the significant loss of best and most versatile (BMV) agricultural soils, landscape and visual impacts and adverse impact on the temporary setting of the nearby scheduled monument and Grade II*/II Listed Buildings.

Operation

15.9.4 The overall significance of combined effects for the Project during the operational phase has been assessed as **Major Adverse**.

15.9.5 Major Adverse impacts are anticipated due to the permanent significant loss of BMV agricultural soils and significant adverse impact on the permanent setting of nearby cultural assets. Mitigation planting however will reduce adverse impacts to some extent over time (qualitatively assessed at 15 years after Project opening) and the Project will result in a beneficial impact on vehicle travellers during an Operation Stack event.

Cumulative Effects of the Project in combination with Other Developments

15.9.6 The majority of the nine committed developments shown in Table 15.2 are located at a sufficient distance from the Project that cumulative effects are considered highly unlikely to result. However, there are two developments located within 1km of the Project, which could result in cumulative effects on the environment and comprise:

- Development 1: the Masterplan development at Sellindge (Planning Application reference Y14/0873/SH).
- Development 2: Stop24 Service Area extension (Planning Application reference Y14/1395/SH).

15.9.7 The assessment of cumulative effects therefore focused on these two committed developments, as detailed in Table 15.5. The exception is for Nature Conservation, where development 3 (M20 Junction 10a) was also considered.

Table 15.5: Assessment of Cumulative Effects of Other Developments in combination with the Project

Topic	Cumulative Effect
Air Quality	The Masterplan development at Sellindge (Development 1) and Stop24 Service Area extension (Development 2) could affect traffic emissions in the vicinity of receptors. However, taking into account the location of air quality receptors and the likely traffic impacts of these developments, cumulative effects are anticipated to be Not Significant.

Topic	Cumulative Effect
	There are anticipated to be no cumulative effects associated with the construction phase of the Project and other developments.
Cultural Heritage	Development 1 is located adjacent to the listed buildings at Somerfield Court (SW7) and those at Rhodes House and Little Rhodes (SW8) and it is expected that the development, when implemented, will have an effect on those buildings. However there are no impacts predicted on these listed buildings from the Project. Archaeological trial trenching was carried out on the site of Development 1; however no significant archaeological remains were discovered. Therefore there is not anticipated to be any cumulative effects when considering Development 1 and the Project together. There is not anticipated to be any impacts to heritage assets resulting from Development 2, which includes a small amount of additional land take on its western side, and therefore no cumulative effects are predicted when considering Development 2 and the Project together.
Landscape	Development 1 would see an expansion of the village of Sellindge into farmland to the south, seeing a change in landscape character in the immediate area. Whilst there would be a change in land use, it is not considered there would be a significant effect upon wider landscape character particularly with the existing M20 and CTRL traversing the area. Whilst not considered significant in its own right, the combined extent of greenfield land taken by the development and the Project would add to the developed landscape arising within this more rural landscape. For impacts on agricultural land, refer to Agriculture assessment below. Given the visual receptors affected by the proposals, there may be a cumulative effect of Development 1 and the Project together from short distance receptors. As well as local receptors, there is also likely to be a cumulative effect upon elevated long distance views from Kent Downs AONB, which would see a massing of development in what is currently essentially a rural scene albeit with the presence of the M20 and CTRL. This would also have adverse implications upon landscape character. However on balance, it is not considered that cumulative effects of the two developments together would alter the significance of effect reported within this assessment. For impacts on views from the road, refer to Vehicle Travellers assessment below. Development 2 would require the removal of an existing earth bund on the western boundary of the site which would be replaced with parking spaces, and a narrow width of planting along the periphery of the site. Whilst there may be some adverse effects upon neighbouring properties, it is not considered effects would be significant given the localised nature of the works in the context of the existing Stop24. Therefore there is not anticipated to be a change in landscape character or a change to visual receptors as a result of Development 2. The landscape and visual impacts resulting from lorry traffic, vehicle headlights and site lighting associated with the completed Project will be mitigated somewhat by the existing presence of the M20 and CTRL in close proximity. Therefore there is anticipated to be no cumulative effects when considering Development 2 and Project together.
Nature Conservation	The new M20 Junction (10a for Ashford and the Project are likely to occur within different territories for species such as dormouse, badger, reptile and GCN. Species with larger ranges, such as bats and wintering and breeding birds, have the potential to be impacted by the cumulative effects.

Topic	Cumulative Effect
	The removal of an unmanaged hedgerow and trees associated with Development 1 may impact on local species and habitats, However, it is not considered that these potential impacts would alter the significance of effects reported within the Nature Conservation assessment.
Geology and Soils	The cumulative effect for agricultural soils is assessed as moderate/large adverse
Materials	During construction, the demand on material resources and on the capacity of regional waste management facilities could potentially conflict with the other proposed developments in the area. The significance of cumulative effects are considered to be Moderate Adverse. During operation, the Project is not anticipated to have any significant demand requirements on materials or requirements for waste disposal. The significance of cumulative effects are therefore considered to be Not Significant.
Noise and Vibration	Taking into account the existing traffic-generated noise from the M20 and CTRL, cumulative effects during operation are anticipated to be Not Significant. There are anticipated to be no cumulative effects associated with the construction phase of the Project and other developments.
People and Communities	NMUs The nature and location of Developments 1 and 2 are not anticipated to result in any additional impacts on journey lengths or journey times of NMUs or any further adverse effect on users' amenity, when considered in combination with the Project. Vehicle Travellers It is not anticipated that Developments 1 or 2 will result in any further effects on views from the road when considered in combination with the Project. Views from the M20 and surrounding road network are intermittently screened by woodland/vegetation and existing structures such as housing. The topography is also undulating meaning that views do not extend for miles and existing landforms limit the length of views. It is also not anticipated that driver stress will be further impacted by the other developments in combination with the Project. There will be an overall beneficial effect on driver stress as the Project will provide an alternative to Operation Stack. Community Severance It is not anticipated that Developments 1 and 2, or other developments in the wider area, will further impact on community severance. The links between the local communities and the services/facilities in the surrounding area will not be further impacted.
Road Drainage and the Water Environment	Additional hardstanding and facilities associated with Development 2 have the potential to result in additional flood and pollution risks to the East Stour River and groundwater. However, review of the proposed drainage plans for Development 2 indicate that attenuation of runoff would be provided within below ground storage crates and treatment would be provided by a full retention separator prior to the proposed outfall to the East Stour River. SuDS proposals for the Project are proposed to be lined to prevent infiltration and avoid

Topic	Cumulative Effect
	groundwater pollution. Therefore, there are no anticipated cumulative effects when considering Development 2 and the Project together. The application of road salt to the additional parking areas of Development 2 could increase the cumulative pollution risk to the East Stour River. However, the river would provide sufficient dilution of pollutants that no cumulative effects are anticipated.
Agriculture	Developments 1 and 2, and any other committed developments, constructed on existing BMV agricultural land will likely have significant adverse effects on this national resource. Therefore, the potential loss of additional BMV agricultural land when considering the developments together is considered to result in a Major Adverse cumulative effect. It is considered unlikely that Developments 1 and 2, and other committed developments, will have cumulative effects on individual farm businesses as receptors. This is based on the assumption that any impacted farm business will be sufficiently compensated through the appropriate land purchasing process.

16. Glossary

AADT	Annual Average Daily Traffic Flow
AgIA	Agricultural Impact Assessment
AHVLA	Animal Health and Veterinary Laboratories
ALC	Agricultural Land Classification
AONB	Area of Outstanding Natural Beauty
ACO	Artificial Cover Objects
BAP	Biodiversity Action Plan
BOA	Biodiversity Opportunity Area
BGS	British Geological Survey
BMV	Best and Most Versatile
BRE	Building Research Establishment
BRP	Bat Roost Potential
CAP	European Common Agricultural Policy
CDEW	Construction, Demolition and Excavation Waste
CEMP	Construction Environmental Management Plan
CIEEM	Charted Institute of Ecology and Environmental Management
CPRE	Council for the Protection of Rural England
CRTN	Calculation of Road Traffic Noise
CSM	Conceptual Site Model
CTC	Carbon Tool Calculator
CTRL	Channel Tunnel Rail Link
Crow Act	The Countryside and Rights of Way Act 2000
CWS	County Wildlife Sites
CSAC	Candidate Special Area of Conservation
DEFRA	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EAR	Environmental Assessment Report
EC	European Commission
EPS	European Protected Species
EPSML	European Protected Species Mitigation License
FEH	Flood Estimation Handbook
FRA	Flood Risk Assessment

FSC	Forest Stewardship Scheme
BRE	Building Research Establishment
FWRA	Foundation Works Risk Assessment
GCN	Great Crested Newt
GI	Ground Investigation
GLVIA	Guidelines for Visual Impact Assessment
GWDTE	Groundwater Dependent Terrestrial Ecosystem
HAGDMS	Highways Agency Geotechnical Data Management System
HAWRAT	Highways Agency Risk Assessment Tool
HEMP	Handover Environmental Management Plan
HSI	Habitat Suitability Index
IEMA	Institute of Environmental Management and Assessment
IRZ	Impact Risk Zone
IT	Interim Target
IUCN	International Union for Conservation of Nature
KCC	Kent County Council
KMBRC	Kent and Medway Biological Records Centre
KPI	Key Performance Indicators
KRAG	Kent Reptile and Amphibian Group
LCA	Landscape Character Area
LLFA	Lead Local Flood Authority
LNR	Local Nature Reserve
LOAEL	Lowest Observed Adverse Effect Level
LWS	Local Wildlife Site
MAGIC	Multi-Agency Geographic Information for the Countryside
MMP	Materials Management Plan
MOU	Memorandum of Understanding
MWLP	Minerals and Waste Local Plan
NCA	National Character Area
NERC Act	The Natural Environment and Rural Communities Act 2006
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPS	National Policy Statement
NPSE	Noise Policy Statement for England
PEFC	Programme for Endorsement of Forest Certification

PRoW	Public Right of Way
PSSR	Project Preliminary Sources Study Report
PPG	Planning Practice Guidance
PPS	Planning Policy Statements
pSAC	Potential Special Area of Conservation
pSPA	Potential Special Protection Area
RBMP	River Basin Management Plan
RIG	Resource of Regional Importance
RLB	Red Line Boundary
SAC	Special Area of Conservation
SDC	Shepway District Council
SEB	Statutory Environmental Body
SFRA	Strategic Flood Risk Assessment
SLA	Special Landscape Areas
SNCI	Sites of Nature Conservation Importance
SOAEL	Significant Observed Adverse Effect Level
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Urban Drainage System
SWMP	Site Waste Management Plan
TRL	Transport Research Laboratory
TPO	Tree Preservation Order
UAEL	Unacceptable Adverse Effect Level
UKBAP	UK Biodiversity Action Plan
UXO	Unexploded Ordnance
VT	Vehicle Traveller
WCA	The Wildlife and Countryside Act 1981
WFD	Water Framework Directive
WHO	World Health Organisation
WMPE	Waste Management Plan for England
ZVI	Zone of Visual Influence

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Highways England Company Limited registered in England and Wales number 09346363