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Abbreviations

AADT	Annual Average Daily Traffic Flow
ACM	Asbestos Containing Materials
ADC	Arun District Council
ADMS	Atmospheric Dispersion Modelling System
ALC	Agricultural Land Classification
AOD	Above Ordnance Datum
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
ASSI	Area of Special Scientific Interest
BCT	Bat Conservation Trust
BES	Building Research Establishment Sustainability Standard
BGL	Below Ground Level
BGS	British Geological Society
BL	The British Library
BMV	Best and Most Versatile
BNG	Biodiversity Net Gain
BoCC	Birds of Conservation Concern
BRE	Building Research Establishment
BS	British Standard
BSI	British Standards Institution
CCG	Clinical Commissioning Group
CCoP	Construction Code of Practice
CDE	Construction, Demolition and Excavation
CEMP	Construction Environmental Management Plan
C&I	Commercial and Industrial
CIL	Community Infrastructure Levy
CIfA	Chartered Institute for Archaeologists
CIEEM	Chartered Institute of Ecology and Environmental Management
CIRIA	Construction Industry Research and Information Association
CL:AIRE	Contaminated Land: Applications in Real Environments
CoPA	Control of Pollution Act
CoP	Code of Practice
CRTN	Calculation of Road Traffic Noise
CSM	Conceptual Site Model
DBA	Desk-based assessment
DEFRA	Department for Environment Food & Rural Affairs
DMP	Dust Management Plan
DMRB	Design Manual for Roads and Bridges
DoWCoP	Definition of Waste: Development Industry Code of Practice
DPA	Dwellings Per Annum
EA	Environment Agency
EHD	Environmental Health Department
EIA	Environmental Impact Assessment
EPA	Environmental Protection Act
ES	Environmental Statement
EPUK	Environmental Protection UK
EU	European Union
FRA	Flood Risk Assessment
FCS	Favourable Conservation Status
FTE	Full Time Equivalent
GCR	Geological Conservation Review
GI	Green Infrastructure
GInv	Ground Investigation
GCN	Great Crested Newt
GHG	Greenhouse Gas
GP	General Practice
GQRA	Generic Quantitative Risk Assessment

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HDV	Heavy Duty Vehicle
HEGS	Hedgerow Evaluation and Grading System
HistE	Historic England
HGV	Heavy Goods Vehicle
HMSO	Her Majesty's Stationary Office
HSE	Health and Safety Executive
IAQM	Institute of Air Quality Management
IEF	Important Ecological Features
IEMA	Institute of Environmental Management and Assessment
ISO	International Organization Standardization
JNCC	Joint Nature Conversation Committee
km	kilometre
LC:RM	Land Contamination: Risk Management
LDV	Light Duty Vehicle
LEA	Local Education Authority
LEMP	Landscape and Ecological Management Plan
LGS	Local Geological Site
LGV	Light Goods Vehicle
LNR	Local Nature Reserves
LOAEL	Lowest Observed Adverse Effect Level
LWS	Local Wildlife Sites
m	metre
MAGIC	Multi Agency Geographic Information for the Countryside
MAFF	Ministry of Agriculture, Fisheries and Food
MMP	Materials Management Plan
MSA	Mineral Safeguard Area
NE	Natural England
NERC	Natural Environment and Rural Communities
NHBC	National House Building Council
NHS	National Health Services
NHLE	National Heritage List for England
NNR	National Nature Reserve
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework
NPSE	Noise Policy Statement for England
NSRs	Noise Sensitive Receptors
ONS	Office of National Statistics
OSL	Optically Stimulated Luminescence
AHs	Poly Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenols
PIA	Personal Injury Accident
PPE	Personal Protective Equipment
PPGN	Planning Practice Guidance on Noise
PRA	Preliminary Risk Assessment
PROW	Public Right of Way
PW	Portsmouth Water
R&A	Review and Assessment
RDB	Red Data Book
REGS	Hedgerow Regulations
RIGS	Regionally Important Geological Site
RMD	Raised Marine Deposits
RPA	Root Protection Areas
RTD	River Terrace Deposits
SAC	Special Area of Conservation
SBRC	Sussex Biodiversity Records Centre
SE England	South East of England
SFRA	Strategic Flood Rik Assessment
SINC	Sites of Importance for Nature Conservation
SNCI	Site of Nature Conservation Interest
SOAEL	Significant Observed Adverse Effect Level
SPA	Special Protection Area

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SPD	Supplementary Planning Document
SPZ	Source Protection Zone
SRMS	Solent Recreation Mitigation Strategy
SSSI	Sites of Special Scientific Interest
SuDS	Sustainable Urban Drainage System
SW	Southern Water
SWMP	Site Waste Management Plan
TNA	The National Archives
TPHs	Total Petroleum Hydrocarbons
UAEL	Unacceptable Adverse Effect Level
UXO	Unexploded Ordnance
VCH	Victoria County History
WBS	Wintering Bird Surveys
WCA	Wildlife and Countryside Act
WFD	Water Framework Directive
WLP	Waste Local Plan
WRMP	Water Resource Management Plan
WSCC	West Sussex County Council
WSHER	West Sussex Historic Environment Record
WWTW	Waste Water Treatment Works
ZOI	Zone of Influence
ZTV	Zone of Theoretical Visibility

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1 INTRODUCTION

1.1 Hallam Land Management Limited (the Applicant) will be submitting two planning applications; the first for the construction of up to 480 new houses and associated open space on land at Bognor Regis Golf Course and a second for the construction of a new golf course at land south of Grevatt's Lane (A259).

1.2 The Applicant has undertaken an Environmental Impact Assessment (EIA) and has prepared this Environmental Statement (ES) to accompany these planning applications, in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017.

The Application Sites

1.3 **Site A** comprises the existing Bognor Regis Golf Course and associated club house and car parking. It measures approximately 40ha in size and is located to the north of Felpham and Bognor Regis adjacent to the north-western edge of the built-up area of Felpham. Vehicular and pedestrian access is provided from Golf Links Road. The golf course comprises fairways, greens, bunkers, tee boxes, fairway trees with occasional drainage ditches. A practice green is also looked close to the club house.

1.4 **Site B** is located south of the A259 Grevatt's Lane and measures approximately 73ha in size. It is primarily used for agricultural (arable) purposes and is generally flat and is comprises of three principal field parcels termed Western, Northern and Southern. Its boundaries are formed by a variety of woodland, hedgerows and trees.

1.5 Figure 1.1 Site Plan identifies the location and context of the two Application Sites.

The Proposed Developments

1.6 Planning permission is sought for the following two proposed developments which together comprise one project:

A. The construction of a new golf course and facilities on land south of Grevatt's Lane (A259) to enable the relocation of Bognor Regis Golf Club

B. Redevelopment of the current Bognor Regis Golf Club for new housing and open space.

1.7 The planning application for the housing scheme at the existing golf course has been submitted in outline form with "access" to be determined at the present time. Other "reserved matters" – layout, landscaping, appearance and scale - are to be approved as subsequent application(s).

1.8 The application at the new golf course is seeking full planning permission.

1.9 Parameter Plans have been prepared for each scheme that provide pictorial illustrations of the proposed development and establishes the parameters which in turn serve as the basis for the Environmental Impact Assessment that has been undertaken. These are described in Section 3 and form appendices to this ES.

The requirements of the EIA process

European Union Directive 2011/92/EU (as amended by 2014/52/EU)

1.10 Environmental Impact Assessment is a procedure required under the EU Directives to assess the effects of certain public and private projects on the environment. Article 2 requires, *before development consent is given, projects likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location are made subject to a requirement for development consent and an assessment with regard to their effects on the environment.* Article 8 states that such an assessment is to be duly taken into account in the development consent procedure.

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1.11 Following the UK departure from the European Union, the EIA Regulations have been transposed to UK law.

Town and Country Planning (Environmental Impact Assessment Regulations 2017

1.12 The Town and Country Planning Act 1990 ('the Act') requires that a person wishing to develop land or change its use seeks planning permission from the Local Planning Authority ('the LPA').

1.13 Certain types of development are categorised as Environmental Impact Assessment Development ('EIA Development') because of its nature, size or location as defined by the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 ('the Regulations). In such instances, an applicant is required to undertake an Environmental Impact Assessment (EIA).

1.14 EIA is the process of assessing the environmental impacts of a development project. The Planning Practice Guidance describes EIA as follows:

"The aim of is to protect the environment by ensuring that when a LPA is deciding whether to grant planning permission for a project which is likely to have significant environmental effects on the environment, it does so in the full knowledge of the likely significant effects, and takes this into account in the decision making process.

"The aim of Environmental Impact Assessment is also to ensure that the public are given early and effective opportunities to participate in the decision-making procedures."

(Paragraph: 002 Reference ID: 4-002-20140306)

1.15 Planning applications for EIA Development must be accompanied by an Environmental Statement (ES). The ES is the document reporting the EIA and must be provided to the LPA as part of its consenting process.

Screening

1.16 The proposed developments described in paragraph 1.4a. and 1.4b. both fall within projects listed in Schedule 2 of the EIA Regulations (10b. Urban Development Projects and 12f. Tourism and Leisure Projects).

1.17 The Applicant is of the view that when the two proposed developments are considered together as a Project, because of their nature, size and location and the potential environmental impacts, the Project is deemed to be EIA development.

1.18 The Applicant has undertaken an Environmental Impact Assessment and is reporting its conclusions in this Environmental Statement submitted with the planning applications.

Scoping

1.19 The Applicant has not scoped the Environmental Impact Assessment on this occasion but has undertaken an assessment that covers the range of matters set out in Schedule 4(2) of the Regulations. Should the LPA consider additional environmental information is required, Regulation 25 enables them to request such information from the Applicant.

Structure of the Environmental Statement

1.20 In the context of the above, the Structure of the ES is shown in Table 1.1.

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Table 1.1 Structure of the Environmental Statement

Chapter	Title	Contents
1	Introduction	This Chapter provides summary information about the Environmental Impact Assessment process and the Environmental Statement
2	The Application Sites	This Chapter provides a description of the two Application Sites. The existing Bognor Regis Golf Course to be developed for housing is termed Site A. The Site proposed for the relocated Golf Course is termed Site B.
3	The Proposed Developments	This Chapter provides a description of the two proposed developments that together comprise the project.
4	Methodology	This Chapter describes the broad methodology used in undertaking the EIA and to present the conclusions in the ES
5	Alternatives	This Chapter provides description of the reasonable alternatives studied by the developer, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment.
6	Population and Human Health	This Chapter presents the assessment of the potential effects of the proposed development on population and human health.
7	Landscape and Visual	This Chapter presents the assessment of potential landscape and visual effects of the proposed developments.
8	Biodiversity	This Chapter presents the assessment of proposed developments on the ecology and biodiversity assets within the Sites and surrounding area.
9	Water Resources and Flooding	This Chapter presents the assessment of the proposed development on water resources and flooding effects.
10	Transport and Access	This Chapter presents the assessment of the likely significant effects caused by traffic arising from the project.
11	Air Quality	This Chapter presents the air quality assessment undertaken for the Proposed Developments.
12	Noise	This Chapter presents the assessment of likely noise and vibration effects.
13	Ground Conditions	This chapter assesses the impacts associated with ground conditions and the proposed developments.
14	Agricultural Land and Soils	This Chapter assesses the likely significant effects of the development proposals in terms of agricultural land and soils
15	Climate Change	This Chapter assesses the impacts associated with Green House Gases emissions arising from activities and traffic associated with the proposed developments.
16	Climate Resilience	This Chapter considers the effects of climate change on the proposed development.
16	Material Assets and Waste	This Chapter assesses effects from the consumption of material resources, and the generation and disposal of waste.
17	Cultural Heritage	This Chapter assesses the likely significant effects of the proposed developments in terms of archaeology and cultural heritage.
18	Cumulative Effects	This Chapters considers the combined residual effects on individual environmental receptors - Type 1 effects
19	Summary and Conclusions	This Chapter provides a summary of the technical assessments of each topic matter and a conclusion as to the environmental effects of the proposed development.

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The EIA Team

1.21 The EIA process and the ES has been prepared by a team of specialists listed in Table 1.2

Table 1.2 The EIA Team

Input	Organisation	Competence
EIA Co-ordination	LRM Planning Limited	Chartered Town Planner, Royal Town Planning Institute, Institute of Environmental Management & Assessment
Population and Human Health	LRM Planning Limited	Chartered Town Planner, Royal Town Planning Institute
Landscape and Visual	Urban Wilderness	Landscape Institute
Biodiversity	FPCR	Chartered Institute of Ecology and Environmental Management.
Water Resources and Flood Risk	WSP	Chartered Member of the Chartered Institution of Water and Environmental Management Chartered Environmentalist
Transport and Access	RPS	Chartered Institute of Highways & Transportation & Institute of Highway Engineers.
Air Quality	RPS	Institute of Air Quality Management, Institute of Environmental Science, Chartered Environmentalist
Noise	RPS	Institute of Acoustics Association of Noise Consultants
Ground Conditions	WSP	Chartered Scientist Institution of Environmental Science and British Society of Soil Science
Agricultural Land and Soils	Kernon Countryside Consultant	Chartered Surveyor, British Institute of Agricultural Consultants
Climate Change (Resilience / Adaptation	WSP	Chartered Environmentalist Institute of Environmental Management and Assessment
Carbon / Green House Gases	WSP	Institute of Environmental Management and Assessment Chartered Environmentalist
Material Assets and Waste	WSP	Chartered Institute of Water & Environmental Management Chartered Scientist Institute for Environmental Management & Assessment
Cultural Heritage	Orion	Institute of Archaeology
Golf Course Design	EGD	European Institute of Golf Course Architects
Golf Course Sustainability	Golf Development	Institute of Environmental Management and Assessment Landscape Institute

1.22 The ES is comprised of the following:

- Volume 1 Non-Technical Summary (NTS)
- Volume 2 Main Text
- Volume 3 Technical Appendices
- Volume 4 Figures

1.23 The ES is available to purchase from LRM Planning Limited, 22 Cathedral Road, Cardiff, CF11 9LJ for a

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cost of £150. A version can be provided on USB for a cost of £10. The Non-Technical Summary is available free of charge.

1.24 Comments on the ES should be sent to: Arun District Council, 1 Maltravers Rd, Littlehampton BN17 5LF.

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2 THE APPLICATION SITES

2.1 This Chapter provides a description of the two Application Sites. The existing Bognor Regis Golf Course to be developed for housing is termed Site A. The Site proposed for the relocated Golf Course is termed Site B. The Sites are set out within the wider Location Plan at Figure 1.1.

Site A - The Existing Bognor Regis Golf Course

2.2 Site A is shown on *Appendix 1.1* and measures approximately 40ha. The Site currently comprises the existing Bognor Regis Golf Course and associated club house and car parking. Vehicular and pedestrian access is provided from Golf Links Road. The golf course comprises fairways, greens, bunkers, tee boxes, fairway trees with occasional drainage ditches. A practice green is also looked close to the club house.

2.3 Site A is located to the north of Felpham and Bognor Regis and is adjacent to the north-western edge of the built-up area of Felpham.

2.4 It is bounded to the west by Lidsey Rife, beyond which is the LEC Airfield, the Railway Line and beyond that are areas of commercial development. To the north is the A259. To the east and south east is the existing residential environs of Felpham and Downview Primary School. To the south are open fields extending to the B2259, Arun Leisure Centre and Felpham Community College and further afield Felpham.

2.5 The Site currently comprises a number of trees and hedgerows as part of the golf course layout and its boundaries. A Tree Preservation Order exists (ref: TPO/FP/1/07) which covers the eastern boundary of the golf course.

2.6 The Site is not part of, nor does it house any statutory designations: Scheduled Monuments, Listed Buildings, Areas of Outstanding Natural Beauty (AONB), Sites of Special Scientific Interest (SSSI), National Parks, Registered Battlefields, Registered Historic Parks and Gardens, Special Areas of Conservation (SAC), Special Protection Areas (SPA), or Ramsar Sites.

2.7 Lidsey Rife is designated as a '*Biodiversity Opportunity Area'* in the Arun Local Plan and a '*Local Green Space*' in the Felpham Neighbourhood Plan. The Golf Course is also part of the *'Gap between Settlement'* designation in the Local Plan. The northernmost part of the Site is situated within Yapton Neighbourhood Plan area but there are no specific designations that directly relate to the Site.

2.8 The Lidsey Rife flows along the western boundary of the site from north to south and in its reaches past the site is categorised as a main river by the Environment Agency. The Lidsey Rife is a tributary of the Aldingbourne Rife, with the confluence of these watercourses located near South Bersted, approximately 500m south of the site boundary.

2.9 The Aldingbourne Rife discharges into the sea within the Butlins site in Bognor Regis via two gravity outfall structures which have tidal flaps; when tidal conditions and river flows dictate, flow is pumped over the sea wall by Felpham pumping station to discharge into a stilling bay on the upper foreshore.

2.10 The tidal flaps and pumps on the Aldingbourne rife are designed to reduce the risk of tide-locking however it is understood that the tidal influence extends upstream to the reach of the Lidsey Rife which flows past the site.

2.11 There are no flood defences in the immediate vicinity of the site. However, the Environment Agency have confirmed that Bognor Regis is currently protected from coastal flood risk by two parallel formal flood defence features that extend for approximately 800m along the coastline at the Aldingbourne Rife estuary. These are a combination of walls, groynes and embankments which provide a 1 in 200 year Standard of Protection. The River Arun to Pagham Flood and Coastal Erosion Risk Management Strategy[1] details that

[1] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/469503/F1516_0552_A2P_Strategy_Appraisal_Report_v3.0.pdf

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these defences are expected to keep pace with climate change, subject to securing the appropriate funds and consents.

2.12 The Environment Agency's Flood Map for Planning shows the majority of the site, to be located within fluvial Flood Zone 3, which comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1% Annual Exceedance Probability - AEP).

2.13 As the mapping is based on strategic scale modelling, baseline hydraulic modelling has been undertaken by WSP to refine the Environment Agency's flood extents for the Site. This involved some small updates to the 2015 Aldingbourne direct rainfall ICM model, to make it suitable for the purposes of a site-specific assessment of flood risk. Further details of the updates made to the model are provided in the Flood Risk Assessment submitted with the application and included at *Appendix 9.1*.

2.14 Habitats on-site are comprised of intensively managed grass fairways with landscaping including mature trees and ditch network and ponds. On-site habitats are suitable to support badger, bats, breeding birds, dormice, reptiles, and riparian mammals.

2.15 Felpham Conservation Area is approximately 750m south of the Site. To the south of the Site there are a number of Listed Buildings within Felpham including Churchyard wall of St Mary's (Grade II); St Mary's Church (Grade II*); No 94 (Church House) (Grade II); and No 103 (Lavendar Cottage) (Grade II). These are all approximately 750m from the Site. None of these designated assets are considered sensitive to change by the proposed development due to a combination of topography, the distance from the site and the built-up nature within which they are located.

2.16 There is an existing Public Right of Way (ref: 153) that crosses the site; it extends along the eastern boundary to the residential properties that adjoin the Site and across the golf course to the northwest.

2.17 Within the site, towards its southern boundary, there is an existing telecommunications tower.

Site B - Land to the south of Grevatt's Lane

2.18 Site B is shown at *Appendix 1.2* and measures approximately 73ha in size. It comprises three principal field parcels termed Western, Northern and Southern. It is located to the north of Elmer, Ancton, Middleton-on-Sea, at the eastern edge of the Bognor Regis urban area.

2.19 The land is primarily used for agricultural (arable) purposes and is generally flat. Its boundaries comprise a variety of woodland, hedgerows and trees. The woodlands adjoining the Site's western and southern boundaries are subject to Tree Preservation Orders (ref: TPO/M/2/91 and TPO/M/1/91).

2.20 To the south is the settlement of Ancton with residential properties situated along Ancton Way and Sunneymead Close but woodlands bound the Application Site. To the north, the Site adjoins the A259 Grevatt's Lane which is the main arterial route along the coastal plain extending from Littlehampton to Chichester. There is an agricultural access along the A259. To the east is agricultural land and a small industrial complex; Baird's Business Park, part of which is identified as a Waste Site in the West Sussex Waste Local Plan. To the west are agricultural fields.

2.21 There is an existing Public Right of Way (PROW) within the woodland that adjoins the western boundary of the Site (ref: 165).

2.22 As with Site A, Site B is not part of, nor does it house any statutory designations. It is situated in the "Gap between Settlements" designation shown in the Arun Local Plan.

2.23 There are three Listed Buildings within approximately 500m of the Application Site, these are: Ancton House Hotel (Grade II); Manor Farmhouse Ancton (Grade II) and High Kettle Cottage (Grade II). None of these designated assets are considered sensitive to change by the proposed development due to a combination of topography, the distance from the site and the built-up nature within which they are located.

2.24 Habitats onsite comprise the arable fields divided by the Ryebank Rife and bordered field margins, ditches, broadleaved woodland, hedgerows, and tree lines. The habitats onsite are suitable to support badger, bats, breeding birds, dormice, reptiles and riparian mammals.

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2.25 There is one watercourse, the Ryebank Rife, which passes through the middle of the Site, and there are drainage ditches along the site's boundaries.

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3 THE PROPOSED DEVELOPMENTS

3.1 This Chapter provides a description of the two proposed developments that together comprise the project. The two developments are inter-related and mutually dependent; the new golf course is required to be laid out to allow the relocation of the existing golf club and its redevelopment for housing – the new golf course will not be constructed unless the housing scheme is consented at the existing course. Neither proposed development would happen independently of the other.

The Two Planning Applications

3.2 Two separate planning applications have been submitted to Arun District Council in respect of these development proposals.

3.3 The Housing Scheme (Site A) submitted as an outline planning application for:

Construction of up to 480 new homes (C3), the formation of a new means of access onto Golf Links Road, the creation of new surface water drainage, new landscaping and habitat creation, ground works and other infrastructure. The retention and re-purposing of the retained club house (F2).

3.4 The Golf Course Scheme (Site B) submitted as a full planning application for:

The laying out of an 18 hole par 4 golf course, a 9 hole par 3, practice greens and a driving range; the formation of a new access onto the A259; the construction of a club house with associated golf club facilities; the construction of a maintenance building and external area of hardstanding; parking, new roads and paths; new landscape planting, surface water drainage basins and water storage reservoir, and other earthworks and infrastructure.

The Housing Scheme

3.5 The following parameter plans provide a pictorial explanation of the housing scheme and are included at *Appendices 3.1* to *3.5*. These are the 'controlling' plans that are the basis of the assessment of likely significant environmental effects in this ES. Reserved Matters applications will need to accord with these plans in the event planning permission is granted.

Table 3.1 Parameter Plans

Drawing Reference	Drawing Title
171-UW-P-A-005	Land Use Parameter Plan
171-UW-P-A-006	Development Density Plan
171-UW-P-A-007	Building Heights
171-UW-P-A-008	Green and Blue Infrastructure
171-UW-P-A-009	Movement and Connections

3.6 In addition to the above, Plan 171-UW-P-010 at *Appendix 3.6* provides information about the effect of the proposed development on the Site's tree resource. An Arboricultural Assessment has also been prepared and is at *Appendix 3.7*. This shows the extent of trees to be retained, trees to be removed and new tree and hedgerow planting. Trees to be removed are summarised in Table 3.2. (The categorisation is based on BS:5837:2012 Trees in Relation to Design, Demolition and Construction).

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Table 3.2 Tree Resource and number of trees and groups to be removed

	Category A	Category B	Category C	Category U
Site A				
Number of individual trees to be removed	1	6	7	1
Number of Tree Groups to be removed	0	15	7	0
Site B				
Number of individual trees to be removed	0	0	0	0
Number of Tree Groups to be removed	0	0	5	0
Number of Hedgerow to be removed	0	0	2	0

3.7 New planting is proposed to compensate for this loss, as described below.

Built Development

3.8 The Land Use Parameter Plan (171-UW-P-A-005) identifies those parts of the Site that will be developed for new housing and the existing club house building which is to be retained and re-purposed for community use. In broad terms:

- the new housing it to be located in the central portion of the Site,
- the northern extent will comprise housing, open space and green infrastructure,
- the western portion will comprise open space and green infrastructure adjacent to Lidsey Rife.

3.9 The number of new homes to be provided totals up to 480. The average density of new housing proposed will be 40 dwellings per hectare (171-UW-P-A-006), comprised of different densities across the development parcels to reflect the characters intended. This allows for a housing mix that reflects Policy H DM1 of the Local Plan; a balanced mix of market and affordable dwelling sizes including family size accommodation.

3.10 Based on Arun's Local Plan Policy, 30% of new homes will be affordable housing as defined in the Government's National Planning Policy Framework (NPPF).

3.11 An area of 535m^2 has been identified as car parking to be associated with the re-purposed club house.

3.12 The heights of the new buildings are shown on plan 171-UW-P-A-007.

Demolition

3.13 The club house and adjacent ancillary buildings are to be retained. Two small buildings that comprise green keeper facilities and on-course refreshments will be demolished.

Means of Access

3.14 A new junction is to be created onto Golf Links Road as shown on Drawing JNY10830-04 Rev D. This is included at *Appendix 3.8* and illustrates the access and egress into the site for future residents from Golf Links Road, and the provision of an emergency access also. This access arrangement will replace the existing junction to the car park.

3.15 This new arrangement will change the traffic priority at the junction of Downview Road, Golf Links Road and Shirley Drive; creating a crossroads with the priority afforded to north south traffic rather than east west traffic as current. A new raised table will be introduced at this crossroads with tactile paving for pedestrians. New footways will tie in with the existing.

3.16 The access will comprise a 6m wide carriageway with a 3m wide shared footpath/cycleway on one side and

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a 2m wide footway on the other side. Forward visibility of 38.5m and 41m respectively can be achieved which accords with the speed measurements recorded and Manual for Streets calculations.

3.17 The section of the PRoW south of the site to Downview Primary School is currently across 3rd party land and passes through a recreation area. The route is unsurfaced and is predominantly used by dog walkers and recreational activities with a gated access. The opportunity exists to provide a surfaced footway / cycleway link between the site via this PRoW which would enable a continued direct route between the site and the existing schools and local facilities linking in with the proposals that are being proposed by WSCC. The upgrading of this section of the PRoW could be provided to be in keeping with the local area by providing a bound surface.

3.18 To the north of the site, PRoW route 153 joins the A259 Felpham Relief Road and the existing footway / cycleway. This connection also passes over 3rd party land as per the section to the south that links to Downview Primary School, however a contribution towards the upgrade of these sections to provide a continued footway / cycleway link would be provided as part of this development proposal and would be secured as part of a S106 agreement. If through a contribution, the section of PRoW 153 referenced above can be upgraded to a bridle way by WSCC through a contribution by the developer this would benefit not only the existing residents but also the wider community by providing a direct pedestrian / cycle north-south route between B2259 and A259.

3.19 Within the site the existing PRoW route will be maintained and incorporated through the design of the development. The development proposal will also provide improvements to bus stops locally to the site which will include bus shelters (where possible), raised kerbs and real time information.

3.20 As part of the mitigation measures, improvements will be provided to the Downview Road/ B2259 to improve capacity and also provide improved crossing facilities on Downview Road and Felpham Road arms of the junction. Other mitigation measures are proposed at the B2259/B2132 junction to improve capacity.

3.21 The Local Plan refers to a route for the Enterprise Bognor Regis Link Road being safeguarded (Policy T SP3). The Movement and Connectivity Parameter Plan identifies a potential route for this drawing upon published information by Bognor Regis Town Council entitled Enterprise Bognor Regis. The submitted planning application is not seeking permission for this Link Road and this has not been assessed in the EIA; rather a corridor of land has been identified at the northern extent of the Site, consistent with the Bognor Enterprise illustration, that will be safeguarded to facilitate the potential construction of that new road in the future. This will be addressed in a Section 106 Agreement should planning permission be granted.

Green Infrastructure

3.22 The Green Infrastructure Plan (171-UW-P-A-008) illustrates the different areas of open space proposed as part of the development. This is summarised in Table 3.3.

Table 3.3 Areas of Open Space

Open Space / Green Infrastructure Typology	Area (m^2)
Proposed incidental green space	6,000
Retained and proposed open space	277,000
Proposed woodland and tree groups	42,300
Areas of ecological value and enhancement	66,400
Proposed growing areas	3,000
Proposed permissive public footpaths	3,000 (linear m)

3.23 The total amount of space provided for both green and blue infrastructure stands at 27.7 ha. This covers the amount of green space to be retained in addition to that proposed for SuDS.

3.24 Retained features within the landscape include all Category A trees with the exception of one specimen. The total loss of existing Category B trees to facilitate development stands at 15 groups and 6 specimens, whilst

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Category C trees will see a loss of 7 groups and 7 specimens. All other trees on the site shall be retained. A further key aspect to the design is the retention of the existing ditch network that runs throughout the Site. The overall coverage of existing ditches through the Site stands at circa 1,500 linear metres.

3.25 There will be an additional 4.23 ha of woodland planting and tree groupings introduced to the open green spaces of the Site along with circa 120 individual street trees incorporated within residential streets.

3.26 The enhancement of existing habitats on the Site will see an expansion of the existing ditch network for the benefit of the local water vole population present, with an additional 2,200 linear metres proposed. These extend from and tie into a series of SuDS which cover a total area of 1.36 ha.

3.27 The biodiversity net gain calculation for Site A have resulted in a habitat gain of 10.29%, which is a result of the GI that is being retained and enhanced to the west along Lidsey Rife and the newly created woodland and grassland habitats proposed. The hedgerow and river scores were also positive with 17.43% and 46.95% respectively.

3.28 Public access to the proposed Local Green Space will be permitted through the provision of 3,000m permissive public footpaths. These new routes will feed into the existing local network of pedestrian footpaths and form key links at thresholds between the Site and surrounding neighbourhoods that exist.

Drainage

3.29 To mitigate the risk of surface water flooding to the development, a comprehensive drainage / SuDS strategy has been developed. This strategy involves attenuating the surface water runoff at source, via ponds and swales, prior to discharge to the Lidsey Rife. This is described in *Appendix 9.1*.

3.30 The post-development surface water drainage strategy will restrict peak flows for all events from the impermeable areas to the equivalent greenfield rate (QBAR), thereby ensuring the risk of surface water flooding does not increase both on the Site and for the surrounding area.

3.31 The drainage strategy utilises and enhances the current ditches across the site along with the creation of a new series of ditches / swales to convey and attenuate the surface water from the various parcels of the development to the attenuation ponds. The ditches / swales feed into the northern attenuation pond, which then drains into the southern attenuation pond before discharging into the Lidsey Rife via the existing outfall.

3.32 The strategy also includes a berm that separates the north and south of the site. This helps to ensure the fluvial and surface water flood risk storage is maximised in the northern part of the Site which is already at risk of flooding. The berm will range from 1.84mAOD to 1.9mAOD, whilst the maximum modelled water level upstream is shown to be 1.54mAOD.

3.33 In addition to the drainage features the development will be located on platforms that are raised above the surrounding ground levels. This is to ensure the platforms are above the predicted flood level (1.5mAOD) and to allow for gravity drainage across the Site.

3.34 The levels of the platform will vary across the Site, with the lowest level being approximately 1.4mAOD. The individual platform heights are constrained by the presence of the trees that need to be maintained on the Site. The platform levels have therefore been set to ensure the landscaping can effectively be tied into the ground levels of the trees that are being maintained.

3.35 The platforms will include a slight ridge along the centre and the FFL will be raised a further 300mm above the platform level to allow for drainage of each platform. The lowest FFL is therefore 1.7mAOD i.e., above the 1 in 100 year plus climate change peak water level.

3.36 The 1 in 100 year including climate change post development model results demonstrate that the platforms and the surface water attenuation ponds are free from flooding. The access and egress route to the north is also shown to be dry. The primary access to the site via Shirley Drive is shown to be safe.

3.37 Foul Drainage will occur under gravity to a number of pumping stations within the site and will be pumped to the existing Southern Water Services (SWS) pumping station on Downview Road, subject to ongoing discussions with SWS.

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The Golf Course Scheme

3.38 The Golf Course Parameter Plan (drawing 1352.102.01) at *Appendix 3.10* provides a pictorial explanation of the proposed development. The development extends across the three field parcels as follows:

3.39 **Western Field** – 9 hole golf course, practice facilities and car parking.

3.40 **Northern Field** – Club House, maintenance facility, driving range and range building, practice facilities, 1st hole and 18th green of the 18 hole course.

3.41 **Southern Field** – holes 2 – 17 and the 18th fairway.

Built Development

3.42 The club house, maintenance facility and driving range are located in the northern field parcel as shown on the Golf Course Parameter Plan. The car park, providing 224 number of spaces including 176 car spaces, 6 disabled spaces and an overflow area for 42 cars, is located in the western field parcel.

3.43 The maintenance facility provides within its compound additional 12 car park spaces for staff.

3.44 The club house is a single storey building with a footprint of approx. 1470 m² and a maximum eaves/ridge height of 6.0 meters. This contains hospitality areas, change rooms, offices and ancillary rooms. The maintenance facility is also a single storey building with a footprint of approx. 1050 m² and maximum eaves/ridge height of 6.0 meters. This construction houses a maintenance vehicles workshop, various stores, offices and staff change rooms.

3.45 The driving range is a maximum height of 6.0 meters and has a footprint of 460m². This building will include 15 bays, 10 of which will be covered – the length of the range will be 290 metres from the back of the tees.

18 hole par 72 Golf Course

3.46 The 18 hole golf courses measures 6,158 meters (6,735 yards) in length. It comprises fairways, elevated tee boxes, greens, bunkers, water features and landscaping.

9 hole Short Course

3.47 The 9 hole short course measures 1,269 meters (1,388 yards) in length. It comprises fairways, elevated tee boxes, greens, bunkers, water features and landscaping.

Landscape

3.48 All of the boundary vegetation is retained other than where a new access is formed on to the A259. The formation of the access results in the loss of approximately 70m of hedgerow to accommodate the visibility splays. New hedgerow planting is proposed to compensate for that loss.

3.49 All of the vegetation astride the Ryebank Rife is retained save for two sections removed to allow access between the northern and southern fields. New planting is proposed to compensate for that loss. Access for maintenance of the Rife has been retained.

3.50 An Arboricultural Assessment has been prepared and is at *Appendix 3.10*. This shows the extent of trees to be retained, trees to be removed and new tree and hedgerow planting. Trees to be removed are summarised in Table 3.2.

3.51 Sections of the following lengths and approximate areas of vegetation within the site are to be removed to enable the laying out of the golf course and access to the car park:

G3 – Category C 27m of this group to be removed = 297m²

G4 – Category A 32m of this group to be removed = 640m²

G8 – Category C 219m removed = 435m²

G10 – Category C 26m of this group to be removed = 154m²

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G11 – Category C 88m of this group to be removed = 1608m^2

G12 – Category C 89m of this group to be removed = 534m^2

G13 – Category C 40m of this group to be removed = 449m^2

G14 – Category C 30m of this group to be removed = 201m^2

H1 – Category C 480m to be removed

H2 - Category C to be removed its entirety due to the potential impacts from the road and drainage infrastructure here

New Planting

3.52 Areas are shown on the Golf Course Parameter Plan that illustrate where new planting is proposed. This will comprise of species rich grassland, new tree and shrub planting and will in total measure approximately 11 hectares in size. This will lead to a change in the character of the Site.

3.53 There will be a minimum 10m planting buffer along both sides of the rife that will create a physical barrier, slow surface runoff from the golf course, prevent erosion of the banks and provide a habitat for wildlife. While one side of the rife will need to be kept open to allow for maintenance access, species diversity along the rife will be improved through management and the supplementary planting of scrub, meadow and specimen trees where appropriate.

3.54 Through the proposed green infrastructure across Site A and B there will be a biodiversity net gain of at least 10% in line with the requirements of the current Environment Act.

Means of Access

3.55 The access details for which permission is sought at the present time is shown on the Access Plan at *Appendix 3.11*.

3.56 This is comprised of a new priority junction being formed on to the A259 along the Site's frontage. A right turn lane is also introduced with a localised widening of the road to accommodate this. Visibility splays of 4.5m x 215m are shown corresponding with the speed limit of the A259; these require the removal of Category C trees only. These features will be replaced within the Site boundary.

3.57 A new road will be constructed from this access point to the new car park in the location shown on the Parameter Plan. The new road will be a 2 way carriageway way with a minimum width of 4.8m with a 2m footway. It will extend some 140 meters into the site and will provide access to the club house, car park and maintenance facility. To access the car park, the road will cross the Public Right of Way and pedestrian measures will be provided.

3.58 The car park will provide 224 car parking spaces; this is 187% of the available car parking at the existing golf club. In accordance with West Sussex County Council's Parking Standards, as the number of parking bays in greater than 50, at least 2% of the total number of spaces will comprise electrical vehicle charging. There will be 6 disabled parking spaces.

Drainage

3.59 The Golf Course Parameter Plan identifies water bodies which will store surface water run-off, one located in the western field and the other in the northern field. In contrast to the other water bodies, these two ponds will be lined so as to store water permanently and avoid infiltration. The two lined water bodies measure 18200m^2 with a combined volume of 55,000m^3.

3.60 An area of land adjacent to the Ryebank Rife is subject to flooding in the 1 in 100 year plus 25% climate change event. The flood risk will be appropriately managed with no loss of floodplain as a result of the re-profiling works. The golf course has been designed to avoid tees, greens and bunkers being within areas that might flood. Positive drainage measures are introduced to reduce the duration of any flood event on the fairways.

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4 METHODOLOGY

4.1 This Chapter describes the broad methodology used in undertaking the EIA and to present the conclusions in the ES.

European Union Directive 2011/92/EU (as amended by 2014/52/EU)

4.2 Environmental Impact Assessment is a procedure required under the above EU Directives to assess the effects of certain public and private projects on the environment. Article 2 requires, *before development consent is given, projects likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location are made subject to a requirement for development consent and an assessment with regard to their effects on the environment.* Article 8 states that such an assessment is to be duly taken into account in the development consent procedure.

4.3 Following the UK departure from the European Union, the EIA Regulations have been transposed into UK law.

Town and Country Planning (Environmental Impact Assessment) Regulations 2017

4.4 The EIA Directive is enacted into English Legislation in the Town and Country Planning (Environmental Impact Assessment) Regulations 2017.

4.5 The Regulations apply to two types of projects:

- Schedule 1 Projects for which an EIA is required in every case; and
- Schedule 2 Projects for which an EIA is required only if the particular project in question is judged likely to give rise to significant environmental effects.

4.6 Schedule 3 outlines the selection criteria for screening Schedule 2 development.

4.7 In this instance it has been deemed that the proposed development does constitute Schedule 2 Development under the terms Urban Infrastructure Project.

4.8 Schedule 4 prescribes information to be included in an Environmental Statement.

Environmental Topic Areas

4.9 Regulation 4(2) states that the EIA must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on the following factors –

- Population and human health;
- Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC (34) and Directive 2009/147/EC(35);
- Land, soil, water, air and climate; and
- Material assets, cultural heritage and the landscape.

4.10 The EIA process is intended to consider only likely significant effects. Potential significant environmental effects exist across a range of the above topics and therefore the Applicant has defined the scope of the EIA to include the following environmental matters:

- Population and Human Health;
- Landscape and Visual;

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- Biodiversity;
- Water Resources and Flood Risk;
- Transport and Access;
- Air Quality;
- Noise;
- Ground Conditions;
- Agricultural Land and Soils;
- Climate Change/Greenhouse Gases;
- Material Assets and Waste; and
- Cultural Heritage.

4.11 These environmental topic areas are considered in Chapters 6 to 18.

Major Accidents and Disasters

4.12 The major accident and disasters topic has been introduced to EIA to ensure that appropriate precautionary actions are taken for projects that have the potential to have significant adverse effects on the environment due to their vulnerability to major accidents and/or disasters. In this instance, new housing is not being introduced underneath the flight/glide path of the LEC airfield that is to the west of Lidsey Rife and there will continue to be separation of around 200m between new housing and the runway. Consequently, no major accident or disasters are considered likely and accordingly this subject matter has not been considered in the EIA.

Criteria to Assess Environmental Effects

4.13 The main focus of the EIA process is the prediction and evaluation of the impact or effects of the proposed development on the relevant aspects of the environment. The terms "impact(s)" and "effect(s)" are used interchangeable in the ES depending on context but represent the change that will occur. The results and credibility of an EIA depend largely on the methodologies used to assess and determine the effect of a project.

4.14 Assessing the significance of impacts relies on the interaction between:

a. The sensitivity of the environmental receptor; and

b. The magnitude of change to that environmental receptor.

4.15 The **Sensitivity** of **a Receptor / Resource** is determined by evaluating a receptors susceptibility to change and value and can be analysed from the baseline information and may be summarised and classified in a table, a rudimentary example of which is provided at *Table 4.1*.

Table 4.1 Criteria defining sensitivity of environmental receptors or resources

Sensitivity	Receptor
High	The receptor/resource has little ability to absorb change without fundamentally altering its present character, or is of international or national importance.
Moderate	The receptor/resource has moderate capacity to absorb change without significantly altering its present character, or is of high importance.
Low	The receptor/resource is tolerant of change without detriment to its character, is of low or local importance.

4.16 **Magnitude of Change** is the extent to which the proposed development will result in a change to an

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environmental receptor or resource. When assessing the magnitude of change, the scale, duration, timing and extent of effects, as well as the degree of certainty in the prediction of impacts and the likelihood of irreversible changes occurring should all be considered. *Table 4.2* defines the type of change and magnitude.

Table 4.2 Criteria defining magnitude of change to environmental receptors or resources

Magnitude of Impact	Criteria for Assessing Impact
High	Total loss or major/substantial alteration to key elements/features of the baseline (pre-development) conditions such as the post development character/composition/attributes will be fundamentally changed.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that the post development character/ composition/attributes of the baseline will be materially changed.
Low	A minor shift away from baseline conditions. Change arising from the loss/ alteration will be discernible detectable but not material. The underlying character/composition/attributes of the baseline condition would be similar to the pre-development circumstances/situation.
Negligible	Very little change from baseline conditions. Change barely distinguishable, approximating to a 'no change' situation.

4.17 *Table 4.3* provides a matrix showing the **significance of the impact or effect** derived from sensitivity and magnitude of change.

Table 4.3 Matrix for determining significance of environmental effects

Magnitude of Impact	Sensitivity of Receptor Resource		
	High	Medium	Low
High	*Major*	*Major-Moderate*	*Moderate-Minor*
Medium	*Major-Moderate*	*Moderate-Minor*	*Minor*
Low	*Moderate- Minor*	*Minor*	*Minor-Negligible*
Negligible	*Negligible*	*Negligible*	*Negligible*

4.18 There is no statutory definition of 'significance'. In this EIA/ES, the general significance criteria are outlined and defined in *Table 4.4* below.

Table 4.4 Definitions of significance of environmental effects

Significance of Impacts	Definition
Major	An effect which in isolation could have material influence on the decision-making process.
Moderate	An effect which on its own could have moderate influence on decision making, particularly when combined with other similar effects.
Minor	An effect which on its own is likely to have a minor influence on decision making, but when combined with other effects could have more material influence.
Negligible	An effect which on its own or in combination with other effects will not have an influence on decision making.

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4.19 Effects can be:

- Direct, indirect or secondary
- Cumulative
- Short, medium and long-term
- Permanent and temporary
- positive / beneficial or negative / adverse.

Mitigation

4.20 Intrinsic to the EIA process is the development of mitigation measures and their incorporation into the proposed development.

4.21 Mitigation measures are divided into three broad categories as set out in *Table 4.5*.

Table 4.5 Types of mitigation measures

Type of Mitigation	Examples
Inherent Mitigation	Measures designed into the scheme and certain to be delivered e.g., the provision of structural landscaping, habitat creation, community infrastructure shown on the parameter plans.
Standard Mitigation	Measures which are commonplace as part of such development proposals and to which there is a high degree of certainty that they will be provided e.g., the preparation of a Construction Environmental Management Plan.
Actionable Mitigation	Measures that will be secured by a controlling mechanism as part of a planning permission e.g., planning condition or planning obligation or other legal instrument.

4.22 Within each topic chapter, Inherent and Standard Mitigation Measures will be considered as part of the assessment of environmental impacts, and Actionable Mitigation is included as part of the Residual Impact Assessment.

The spatial scope of the assessment

4.23 The geographical or spatial scope of the EIA has regard to both the physical extent of the proposed development defined by the Application Sites, including the existing golf course and new golf course, and the nature of the baseline environment, which in certain instances extends beyond the sites.

4.24 The spatial scope of each topic (Study Area) is set out in the individual topic chapters. Some assessments will be limited to the application site or its immediate surroundings, while others extend across a wider area.

The temporal scope of the assessment

4.25 Potential significant environmental effects will be considered for both the construction phase and the operational phase. The broad timescales are shown in *Table 4.6*.

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Table 4.6 Temporal scope of the assessment

	New Golf Course (relocation)	Existing Golf Course (new housing
Commencement of Development – site preparation, clearance, and ground works and engineering operations to construct the new golf course and associated buildings/facilities.	2023-2026	
Construction of houses and laying out of green infrastructure and engineering works		2026-2031
Operational Phase	2026 -	2026 -
Decommissioning	N/A	N/A

4.26 The terminology for defining periods of time will be as follows unless specified differently in individual chapter:

- Short term 0-5 years
- Medium term 5-15 years
- Long-term 15+

Consultation

4.27 Throughout the preparation of the EIA, information has been gathered from a number of relevant organisations with whom the Applicant has consulted. In each of the environmental topic chapters, the organisations who have been consulted or from where data has been sourced as part of preparing this EIA is listed.

Cumulative Assessment

4.28 The Regulations require that assessment of the project also considers potential cumulative effects arising as a combination of this and other development projects. The Planning Practice Guidance refers to there being occasions when other existing or approved development may be relevant in determining whether significant effects are likely as a consequence of a proposed development.

4.29 Listed in A*ppendix 4.1* is a schedule of other existing and approved development that is considered to potentially give rise to cumulative effects alongside the proposed development. This schedule is drawn from Sites allocated in the Local Plan and other planning applications that have been submitted to Arun District Council. Where relevant, the topic chapters consider the potential for cumulative effects arising from the combination of these projects.

4.30 There is also the potential that the proposed development could have multiple effects on an individual sensitive receptor. This is considered in Chapter 19.

Environmental Topic Chapters

4.31 The structure of each Environmental Topic Chapter is shown in *Table 4.7*.

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Table 4.7 Structure of environmental topic chapters

Section	Scope/Contents
Introduction	Outlines the scope of the individual chapter and the nature of the potential environmental impacts to be considered.
Potential Effects	Summarises the likely potential effects of the proposed development on the environmental receptor/resource concerned.
Assessment Methodology	Refers to the specific methodology used within the chapter and is structured around the following headings: study area; consultation; legislation and planning policy context; assessment of process; assessment criteria; sources of information; assumptions and limitations
Baseline Conditions	The section provides more detailed topic specific information to **describe the character of the site and its environs** (the study area). This baseline situation describes the quality of the interests on the application site as they relate to this environmental topic. This description serves as a comparative measure against which changes arising from the construction and operational phases of the proposed development can be assessed or predicted. This will **identify the sensitivity of environmental receptors** (i.e., high, moderate or low by reference to *Table 1*).
Inherent and Standard Mitigation	A summary description of those 'inherent' and 'standard' mitigation measures which **primarily address the scope to avoid, reduce or remedy adverse environmental impacts** or **enhance the beneficial aspects arising from the construction and operational periods of the proposed development relating only to the topic chapter**. Actionable mitigation is considered in the assessment effects to establish residual effects.
Assessment of Environmental Impacts	The identification and assessment of the **nature, extent, magnitude of change** that the proposed development will have on individual receptors (ie major, moderate, minor, negligible, by reference to *Table 2*). By employing the sensitivity of the receptor and magnitude of change, the **significance of environmental effects** (including any, direct or indirect effects), which arise as a result of the construction and operational periods of the proposed development will be determined. This assessment will consider inherent and standard mitigation (e.g., strategic landscaping, habitat creation etc that is part of the proposed development).
Actionable Mitigation	The identification of actionable mitigation employed where applicable to **reduce the negative effects** of the proposed development.
Residual Impact Assessment	This section will identify **Residual Effects**: A description and assessment of significance of any effects that will remain after the inherent, standard and actionable mitigation measures are applied. These effects will be determined to be ***Substantial/Major, Moderate, Minor and Negligible***.
Cumulative Effects	The identification and assessment of the nature, extent, magnitude and significance of inter-project effects (i.e., different effects on the same receptor/resource).
Summary	Overall Summary and conclusions of the assessment.

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5 ALTERNATIVES

5.1 The EIA Regulations require the Environmental Statement to provide a description of the reasonable alternatives studied by the Applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment (Regulation 18(3)(d) and Schedule 4(2) refer).

5.2 In this instance the potential alternative scenarios comprise:

a. "do nothing"

b. consideration of an alternative configuration of development at Site A

c. a different location for the new golf course other than Site B

5.3 Each of the above potential alternatives is considered in the following paragraphs which explain the Applicant's choice.

5.4 It is not considered a reasonable alternative to proceed with the relocation of the golf course to Site B without Site A being developed as the housing scheme, as the latter enables that relocation.

Do Nothing

5.5 In the "do nothing" scenario neither proposed development would proceed.

5.6 Site A is not identified in the Arun Local Plan for development and in this scenario it would remain in its current state as a golf course. The Golf Club would continue to experience the limitations associated with its current use:

- drainage issues that restrict play for long periods in the winter;
- increasing concerns about health and safety with complaints from residents on the site's boundary;
- poor energy efficiency and increasing costs of maintaining the club house;
- limited and outdated facilities with significant upgrade costs.

5.7 The benefits of developing Site A for housing would not be realised. The contribution that the housing scheme would have towards meeting identified housing needs would not occur and the extent of the shortage of housing in Arun would continue. The other green infrastructure benefits, and the public access to a major area of open space, would not be achieved. The net gain in biodiversity would not be achieved.

5.8 Site B would continue in its current agricultural use. The Golf Club would not realise its vision to relocate to a new course with new and additional facilities. The green infrastructure benefits that arise with the laying out of the new golf course would not be realised either.

5.9 On the basis of its judgement that the beneficial effects of the project as a whole are considered greater than the adverse environmental effects, and that the environmental effects are not considered individually or cumulatively to preclude the proposed development, the Applicant has chosen to proceed with the Project rather than the "do nothing" alternative.

Consideration of an alternative configuration of development at Site A

5.10 Site A is subject to a number of constraints that to a large extent dictate the form of development.

5.11 Access is proposed from the current location on Golf Links Road, which represents the only place where the Site adjoins the public highway. The Site's environmental characteristics are highly material to the arrangement of land use, especially its tree stock, the extent of flood risk and the western environs associated

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with the Lidsey Rife. Consequently, the arrangement of development cannot be changed to any material extent within the envelope of environmental considerations. The iterative design process has considered small changes to the built form and adjustments have been made through that process. This process has identified that only limited variations can be made to the identified development areas and these do not lead to a fundamental change to the form of development.

5.12 The Club House and its adjacent buildings could be demolished but rather the Applicant can see the benefit of these being retained and repurposed.

5.13 The character of the development, and the density of housing, and the overall amount of new housing is considered appropriate in the context of the Site and its surrounding. A lesser number of new homes would not represent an efficient use of land and would prejudice the viability of enabling the relocation of the golf course. Conversely, a greater number of dwellings could be achieved but would require greater density of development which would be out of keeping with the context of the Site and its surroundings and give rise to potentially greater landscape and visual effects.

5.14 On the basis that the arrangement of development is considered the most appropriate and does not give rise to major adverse environmental effects, the Applicant has chosen to proceed with the Scheme as submitted, which has been arrived at through the design process.

A different location for the new golf course other than Site B

5.15 The search to identify a new location for the golf course has been conducted over a number of years and is governed by two primary considerations:

a. A site sufficiently large to allow the Golf Club to provide new and additional facilities – this requires some 70 hectares of undeveloped land.

b. A site that is available within a reasonable distance to the existing – allowing for existing land uses, the area of search has extended from Bognor to Littlehampton north and south of the A259.

5.16 The Applicant has not been able to identify and secure any other land that meets these criteria. As there is no reasonable alternative to Site B the Applicant has proceeded with Site B.

5.17 Within the land available, there is no genuinely different arrangement of land uses within the Site to that proposed; at best these are modest adjustments in the placement of development that has no discernible effect on environmental receptors.

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6 POPULATION AND HUMAN HEALTH

Introduction

6.1 This chapter of the ES presents the assessment of the potential effects of the proposed development on population and human health. It specifically considers the effects in terms of population, housing, education provision, healthcare provision, open space requirements, economic impact and community facilities.

Potential Effects

6.2 This section summarises the likely potential effects of the proposed development on the environmental topic area.

6.3 The location and nature of the development proposals suggests that the following potential effects may occur:

a) Economic effects during the construction stage

b) Effects of human health during the construction stage

c) Enhanced leisure and recreation opportunities from the new and additional golf facilities

d) The provision of new housing to meet forecast population and household growth

e) An increase in local expenditure from the new resident population

f) Demand from the new residential population for local services and infrastructure including healthcare, early years/childcare, primary and secondary school places, opens spaces.

g) Effects on the amenity of residents of existing properties close to the sites.

6.4 The proposed housing development will be built over a number of years after the existing golf course has relocated. The effects of the increase in population will therefore occur gradually over the construction period as new houses are occupied. In some instances, occupants of those new houses will become receptors themselves as construction activity continues until the development is complete. It is expected there will be approximately 100 dwellings built per year with a 5 year build programme, including both market and affordable housing.

Assessment Methodology

6.5 The section describes the methodology used to undertake the assessment within this Chapter.

Study Area

6.6 The assessment of effects is based on the following geographies which comprise the Study Area:

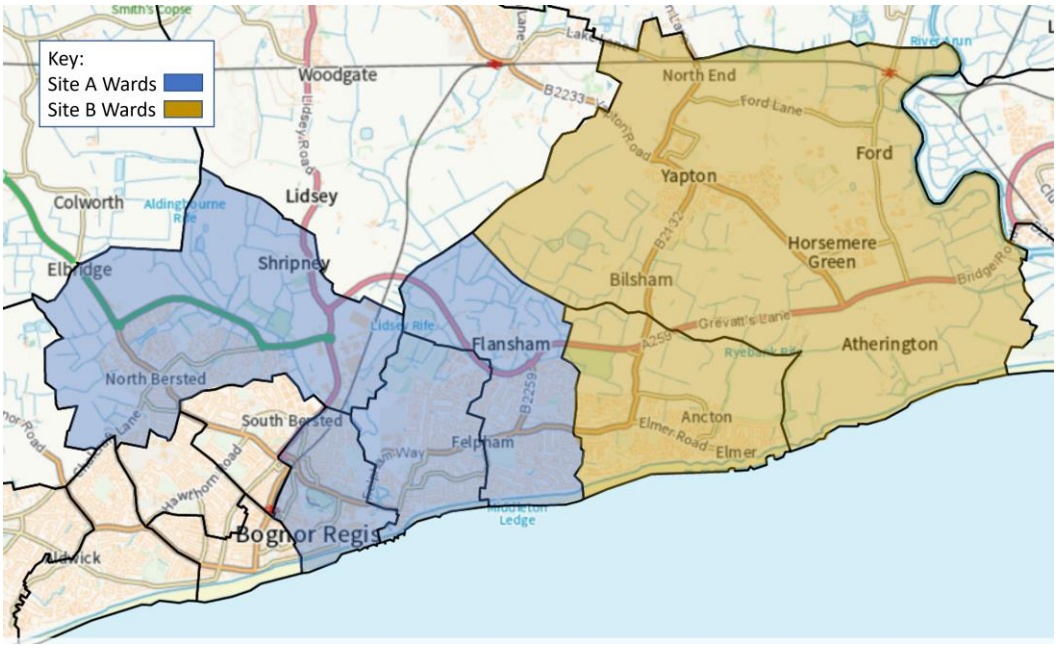
- Local – effects within the immediate environs of Site A and B (set out within Figure 6.1 below);
- Town – effects on Bognor Regis Built Up area (as identified in the adopted Local Plan); and
- District – effects within the District of Arun.

6.7 The following Wards - Hotham, Felpham West, Felpham East, Bersted - comprise the Local Area for Site A and are used for the purpose of the quantitative assessment set out in the baseline section. Similarly, the following Wards comprise the Local Area for Site B: Middleton and Yapton. These are presented on the

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Ordnance Survey extract in Figure 6.1 below. Specific data on local facilities including retail, community, education, sports and recreation facilities has been obtained from a combination of Local Authority documentation as a desk based study and a site visit undertaken on 26th August 2021.

Figure 6.1: Ward boundaries for Site A and B



Consultation

6.8 Comments received from the public consultation exercise conducted by the Applicant that are relevant to this topic area have been considered.

Legislative / Planning Policy Context

Arun Local Plan

6.9 Arun District Council adopted their current Local Plan in 2018 for the plan period 2011-2031. This Local Plan has identified the need for at least 20,000 new homes in the District across the plan period.

6.10 The delivery of new dwellings is set out in Policy H SP1 and requires 610 dwellings per annum (dpa) between 2011/12 – 2015/16; 1,120 dpa between 2016/17-2020/21; 1,310 dpa between 2021/22-2025/26 and 960 dpa between 2026/27-2030/31.

6.11 Policy AH SP2 requires the delivery of 30% affordable housing for all developments of 11 units or more.

6.12 Policy SKILLS SP1 relates to employment and skills, including the encouragement of developments which promote skills on housing sites with regards to construction skills and developments which raise skill levels and increase employability.

6.13 Policy INF SP1 relates to infrastructure and provision implementation outlining the contributions requires towards infrastructure provision both on site and off site.

6.14 Policy INF SP2 identifies the need for the development of a new secondary school. As a minimum there will be one 6 form entry secondary school with expansion land for a 4 form entry expansion adjacent within the central part of the District. The Planning School Places document published by WSCC identify that *the Arun District Council site assessment process has indicated that site options in the Ford area should be considered and policies in the Arun Local Plan facilitate a new secondary school in this area.*

6.15 Policy OSR DM1 relates to open space, sport and recreation and the delivery of suitable on and off site open

space and/or contributions to off site recreation and sports facilities.

6.16 Policy HWB SP1 relates to health and wellbeing and the need for a scheme to maximise the impact it can make to promote healthy communities and reducing health inequalities.

Public Open Space, Play Pitches and Built Facilities Supplementary Planning Document

6.17 The Public Open Space, Play Pitches and Built Facilities Supplementary Planning Document (SPD) was adopted in January 2020. The document includes an open space and play calculator which is used to determine on-site provision and off-site contributions. This is discussed further within this chapter.

Community Infrastructure Levy (CIL)

6.18 The District Council's Community Infrastructure Levy came into effect in April 2020. All planning applications after this date are subject to CIL. This allows Arun District Council to make a charge on new developments to fund infrastructure needed to support the growth of the District.

Felpham Neighbourhood Plan

6.19 The Felpham Neighbourhood Plan is also part of the Development Plan. It was 'made' first in 2014 but was amended and 'made' again in March 2021. The Neighbourhood Plan's Vision is to '*protect and promote the unique parish of Felpham'*.

6.20 Policy CLW2 concerns leisure facilities and seeks to protect existing recreational space from development. In this instance, the existing Golf Club facilities are to be reprovided so there would not be a loss of facilities, thus tempering the effect of this Policy.

Yapton Neighbourhood Plan

6.21 The Yapton Neighbourhood Plan is part of the Development Plan. It was 'made' in October 2014 and is currently under review.

6.22 Policy BE1 relates to the protection of existing commercial premises or land. This policy aims to protect the limited employment opportunities within Yapton, as set out in the supporting text of the policy. Policy E6 seeks to improve the connectivity between wildlife areas and green spaces in relation to delivery of green infrastructure. Policy KS1 relates to maintaining existing health and pharmacy services. Policy KS2 relates to the retention of community facilities.

National Planning Policy Framework

6.23 The NPPF sets out the planning policies for England and a framework for local plans to use for housing and other developments.

6.24 Paragraph 8 explains that to achieve sustainable development the planning system has three overarching objectives. These comprise economic, social, and environmental objectives.

6.25 In relation to the social objective, the NPPF states that the development should support strong, vibrant and healthy communities by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being.

6.26 The economic objective states that development should aim to help build a strong, responsive, and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure.

Assessment Process

6.27 The assessment process employed in this Chapter is consistent with that outlined in Chapter 4 – the baseline situation is described, and the sensitivity of receptors identified; the magnitude of change caused by the

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proposed development to these sensitive receptors is then set out. Combining sensitivity and magnitude of change enables the significance of the effect to be determined and explained. Professional judgement as well as quantitative measures of change are employed.

Assessment Criteria

6.28 The environmental receptors are each treated as highly sensitive as there is no standard qualitative and quantitative criteria that can be applied.

6.29 The significance of that effect will then be determined by reference to the definitions in set out at Table 4.4.

Sources on Information

6.30 The information used in this chapter is gathered from the following sources: Department of Levelling Up, Housing and Communities, Arun District Council, West Sussex County Council, Office of National Statistics (ONS), Public Health England, Arun Clinical Commissioning Group, National Health Services; and Ofsted.

Assumptions

6.31 The proposal is part of an outline application, therefore the assumption that the majority of the workforce will be derived from the local area has been made until the time that the tendering process can be complete.

Limitations

6.32 There is no set guidance or required qualification for undertaking the population and human health assessment as part of the ES. Therefore, this section is based on professional judgement using both qualitative and quantitative methods.

Baseline Conditions

6.33 The section provides more detailed topic specific information to describe the character of Sites A and B and their environs. This describes the quality of the interests as they relate to this environmental topic and serves as a comparative measure against which changes arising from the construction and operational phases of the proposed development can be assessed or predicted. This identifies the sensitivity of environmental receptors.

6.34 This is based on a desk-based assessment using online data sources.

Site A Existing golf course

Population and Households

6.35 The population data is set out in Table 6.1 below presenting the 2011 census data[2] and the mid-year estimates from the ONS for 2020[3]. This demonstrates that there is a growing population at both a local and District level. The population in the Local Area has grown by 13.7%, from 24,904 to 28,317. Whilst population growth has occurred across the District it has been at a lower level; 7.8% between 2011 and 2020. The growth locally can be attributed to the housing allocations in the earlier Local Plan being built out.

Table 6.1 Population statistics

	Local Area	Town	District
2011 Census Population	24,904	63,885	149,518
2020 Mid-year estimates of population 2020	28,317	71,086	161,123
% change between 2011 census and 2020 MYE	13.7%	11.3%	7.8%

[2] Census Data (2011) ONS
[3] Mid 2020 Estimates (2020) ONS

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6.36 The ONS[4] has set out the predicted population growth for Arun District for the period 2018 and 2043; this suggests an increase in the District's population of some 30,000 people, from 159,827 to 188,287. This is a percentage increase of 17.8%.

6.37 The Local Plan sets out at para. 3.17 that Arun *has one of the UK's highest populations of elderly people, with 27% of residents aged 65 and over, compared to 17% nationally.* It also acknowledges at para 12.6.1 that Arun also has a low proportion of people aged under 45 living within the District. Whilst there is a need to support the provision of accommodation to meet the needs of the elderly it is also important, as highlighted in para 3.34, that new housing caters for young people and families.

6.38 Household projections to 2043 for Arun is set out in Table 6.2; this is taken from ONS data. This illustrates that there is a predicted increase of 16,046 households between 2021 and 2043, a rise of 21.9%. The increase in households is consistent with the increase in population and continue a trend from previous years.

Table 6.2 Household projections

	2021	2043	Change (%)
Household Projections	73,188	89,234	14.6

6.39 To meet the growth in households that is forecast in Arun, the Local Plan has set out the requirement for 20,000 new homes to be built between 2011 and 2031 in the District. Table 6.3 records the number of completions achieved this far in the Plan period.

Table 6.3 Housing completions 2011/12 – 2019/20

Year	Completions (net)	Per Annum Requirement	Surplus/Deficit	Cumulative Performance
2011/12	722	610	+112	+112
2012/13	475	610	-135	-23
2013/14	359	610	-251	-274
2014/15	601	610	-9	-283
2015/16	890	610	280	-3
2016/17	616	1120	-504	-501
2017/18	704	1120	-416	-917
2018/19	603	1120	-517	-1434
2019/20	515	1120	-605	-2039

6.40 The Government's Standard Method for calculating local housing need indicates the need to provide 1,368 new homes each year. Over a 15-year period of a new Local Plan, this would require 20,000 new homes to be built.

Housing Stock and Tenure

6.41 Table 6.4 shows that the housing tenure for the Local Area has a 73.8% home ownership, 7.8% social rented and 17.5% private rented. In comparison this is higher than the 72.1% ownership in Bognor Regis and the same as the 73.8% of ownership in the District. However, the Local Area has the lowest level of social rented housing with 7.8% compared to the 8.7% and 8.8% in Bognor Regis and the District.

6.42 Whilst the Local Area has a higher level of home ownership compared to Bognor Regis and a lower level of social and private rented accommodation, the trends are largely similar.

[4] Population projections for local authorities (2020) ONS

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Table 6.4 Housing tenure

	Local Area		Town		District	
	No.dwgs	%	No.dwgs	%	No.dwgs	%
Owned Outright	4449	41.5	12,031	42.1	28,581	42.8
Owned with mortgage or loan or shared ownership	3467	32.3	8,545	30.0	20,673	31.0
Shared Ownership	89	0.8	204	0.7	566	0.8
Social rented: rented from council	406	3.8	1,290	4.5	3,225	4.8
Social rented: other social rented	427	4.0	1,206	4.2	2,661	4.0
Private rented: private landlord or letting agency	1653	15.4	4,653	16.3	9,427	14.1
Private rented: other private rented or living rent free	236	2.2	641	2.2	1,573	2.4
Total	10727		28,570		66,706	

6.43 Table 6.5 illustrates the housing stock for the three study areas. The majority of housing within the Local Area is either detached or semi-detached (56.7%), this is a similar proportion compared to the District (56.8%) and marginally lower than the Town (57.1%). Correspondingly, flats, maisonettes or apartments are a lower proportion. This pattern is characteristics of the resident population and age profile of the District.

Table 6.5 Housing stock

	Local Area		Town		District	
	No.dwgs	%	No.dwgs	%	No.dwgs	%
Detached house or bungalow	3,590	31.9	10,479	34.6	23,729	33.7
Semi detached house or bungalow	2,800	24.8	6,833	22.5	16,283	23.1
Terraced house or bungalow	2,053	18.2	4,675	15.4	13,773	19.5
Purpose-built block of flats or flats or tenement	1,929	17.1	5,837	19.3	11,531	16.4
Part of a converted or shared house	573	5.1	1,891	6.2	3,317	4.7
Flat, maisonette or apartment in commercial building	177	1.6	399	1.3	809	1.1
Caravan or other mobile or temporary structure	146	1.3	206	0.7	1,030	1.5
Total	11,268		30,320		70,472	

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6.44 Table 6.6 illustrates that the average household size is consistent across all three areas, at 2.2 persons per house. This is below the widely recognised average of 2.4 persons per house. Again, this reflects the demographic profile of the District with its elderly population,

Table 6.6 Average household size

	Local Area	Town	District
Average household size (persons)	2.2	2.2	2.2
Average number of rooms per household	5.3	5.2	5.4
Average number of bedrooms per household	2.6	2.6	2.6

House Prices and Affordability

6.45 Using the ONS[5] data for the mean price paid for houses in December 2020 the Local Area average is £303,755. This has increased from £261,006 in December 2015 presenting a 16.4% increase in 5 years. The affordability ratio in Arun is presently 11.4 having increased from 9.6 in 2010. The average affordability across West Sussex in 2020 was 12.42, an increase from 11.7 in 2015. The affordability of housing has worsened, again consistent with the widely understood national trend.

Employment and Economy

6.46 Table 6.7 below sets out the employment profile for of Bognor Regis from the 2011 Census data. Due to the location of Site A within the centre of the Bognor Regis built up area it is considered more appropriate to use the wider Bognor Regis area rather than the Local Area. It is assumed that this is a reasonable commuting distance by using non-vehicular, public transport and vehicular travel methods.

6.47 The table demonstrates that across Bognor Regis there is a high level of workers within the manufacturing; wholesale and retail trader; construction; accommodation and food services; and education industries. This shows that the majority of the population are in low skilled jobs.

Table 6.7 Employment classifications

	Count	Percentage
Agriculture, forestry and fishing	491	1.7
Mining and quarrying	20	0.1
Manufacturing	2,482	8.6
Electricity, gas, steam and air conditioning supply	76	0.3
Water supply, sewerage, waste management etc	244	0.8
Construction	2,711	9.4
Wholesale and retail trader, repair of motor vehicles and motorcycles	5,036	17.4
Transport and storage	1,241	4.3
Accommodation and food service activities	2,307	8.0
Information and communication	799	2.7
Financial and insurance activities	767	2.6
Real estate activities	446	1.5
Professional, scientific and technical activities	1,256	4.3
Administrative and support service activities	1,644	5.7
Public administration and defense, compulsory social security	1,356	4.7
Education	2,342	8.1
Human health and social work activities	1,564	5.4

[5] House Prices (December 2020) ONS

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6.48 The employment uses associated with Site A relate to the golf course management and club house. The existing golf club employs 19 full time members of staff and 19 part time members of staff. The economic activity associated with the golf course will be relocated in conjunction with the wider project and will not be lost through the overall project. Currently there are approximately 700 inclusive and points based golfing members and 110 social members.

Health

6.49 Table 6.8 below demonstrates that the Local Area has a marginally higher proportion of the population considering themselves to be in very good or good health at 79.8%, compared to 78.1% in the Town and 78.8% in the District. This is also reflected in lower percentages of residents in fair, bad or very bad health in the Local area compared to the Town and District.

6.50 In comparison England has a higher proportion of the population (81.4%) considering themselves as very good or good health, with 18.5% considering themselves as fair, bad or very bad.

Table 6.8 Population and health self-indication

	Local Area	Town	District
Very good or good health (%)	79.8	78.1	78.8
Fair health (%)	14.9	16.1	15.6
Bad or very bad health (%)	5.3	5.8	5.6

6.51 Within 5km of the Site there are three General Practice (GP) facilities, as shown in Table 6.9 below. The table also outlines the number of patients per GP practice and the number of GPs at the practice. This is taken from NHS digital[6] using the data from October 2021. From a review of the GP websites, they are all accepting patients.

Table 6.9 Local General Practitioners

Facility	Approximate Distance from the Site	No. of patients	No. of GPs	No. of patients per GP
Flansham Park Health Centre	2.5km	13,413	11	1,219
Bersted Green Surgery	4.6km	13,527	8	1,690
Maywood Healthcare Centre	4.8km	16,026	9	2,003

6.52 There is no specific requirement on the number of patients per GP that should be followed. Nationally, NHS England and the British Medical Association state that there is 0.45 Full Time Equivalent (FTE) GP per 1,000 patients[7]. For the above GP practices, there is 0.65 FTE GPs per 1,000 patients, showing that these practices are operating with more GPs per patient than the national average.

6.53 As well as the community health care facilities referred to above in Table 6.8 there are more facilities in Bognor Regis Town Centre, including opticians, pharmacies, dental surgeries and more GP practices. The closest pharmacy to Site A is approximately 800m to the south.

6.54 The following dental practices are located close to Site A and are accepting patients according to their websites:

- Felpham Dental – approximately 1.0km south of Site A.

[6] GP Practice Statistics (2021) NHS
[7] GP per Patient Figures (October 2021) British Medical Association

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- Summerley Dental Practice - approximately 1.5km south of Site A.

Emergency Services

6.55 The following emergency services operate within Bognor Regis:

- West Sussex Fire and Rescue
- West Sussex Police
- Bognor Regis Ambulance Service

6.56 All other services are located throughout the Bognor Regis Built Up area including opticians and dental surgeries. The nearest accident and emergency hospital is the Saint Richard's Hospital in Chichester approximately 12km to the north west in Chichester. The closest police station is located in Bognor Police Station within Bognor Regis Town Centre.

Education

6.57 WSCC as the Local Education Authority (LEA) have a statutory duty in respect of education provision. WSCC consider that primary schools and secondary schools are at capacity when they reach 95% of their pupil space.

6.58 Tables 6.10 and 6.11 demonstrate the distances between Site A to local primary and secondary schools, up to a travel distance of 4km for primary schools and 6km for secondary schools.

Table 6.10 Distance from Site A to local primary schools

Primary School	Location	Distance from the Site
Downview primary school	Downview Road	0.35km
Bishop Tufnell CE (aided) primary school	Middleton Road	2.2km
Edwards Bryant School	London Road	2.8km
South Bersted C of E primary school	Church Lane	3.5km
Bersted Green primary school	Lamburnum Grove	4km
St Mary's RC primary school	Glamis Street	4km

Table 6.11 Distance from Site A to local secondary schools

Secondary School	Location	Distance from the Site
Felpham Community College	Drygrounds Lane	1.5km
The Regis School	Westloats Lane	4.7km

6.59 Table 6.12 and 6.13 show the capacity of these primary and secondary schools. This shows that for both primary schools and secondary schools the number of pupils on roll is equivalent to 89% capacity.

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Table 6.12 Primary school capacities and pupils on roll

Primary School	School Capacity	Pupils on roll	Available space	Capacity (%)
Downview primary school	630*	582	48	92%
South Bersted C of E primary school	210	201	9	96%
Bersted Green primary school	440	300	140	68%
Edwards Bryant School	630	619	11	98%
St Mary's RC primary school	306	312	-6	102%
Bishop Tufnell CE (aided) primary school	630	507	123	80%
Total	2,846	2,521	325	89%

* the capacity at Downview Primary has increased to 630 following an extension to the primary school.

Table 6.13 Secondary school capacity and pupils on roll

Secondary School	School Capacity	Pupils on roll	Capacity (%)
Felpham Community College	1500	1409	94%
The Regis School	1800	1489	83%
Average total capacity			89%

6.60 Table 6.14 below presents the travel distances from the site to local nursery facilities within a 4km distance.

Table 6.14 Nursery capacity

Nursery	Location	Distance from the Site
Downview Nursery	Downview Road	0.35km
The Old School Nursery	Bersted Street	3.5km
Bognor Regis Nursery	Victoria Drive	3.6km

6.61 Within the Planning School Places[8] document published by WSCC they state that primary pupil numbers in the school planning area have seen a steady decline in recent years and whilst this does not reflect other areas of the county is based largely on changes to the demography in the area.

6.62 This report also outlines that for the Bognor Regis/Felpham area primary schools were operating at 85% capacity in 2020 and secondary schools were operating at 94% in 2020. This area is wider than the capacity assessment completed above and includes schools outside of the reasonable distance used within this assessment.

6.63 WSCC have published their Council Plan[9] for the period of 2021-2025. This outlines for that education there is scheduled to be £105million in funding across the County. This funding will be sourced through government grants, revenue contributions and external contributions such as S106 contributions.

Local Community and Leisure Facilities

6.64 There are a number of local community and leisure facilities in close proximity to Site A as shown in Table 6.15 and Figure 6.2.

[8] Planning School Places (2021) WSCC
[9] Council Plan (2021) WSCC

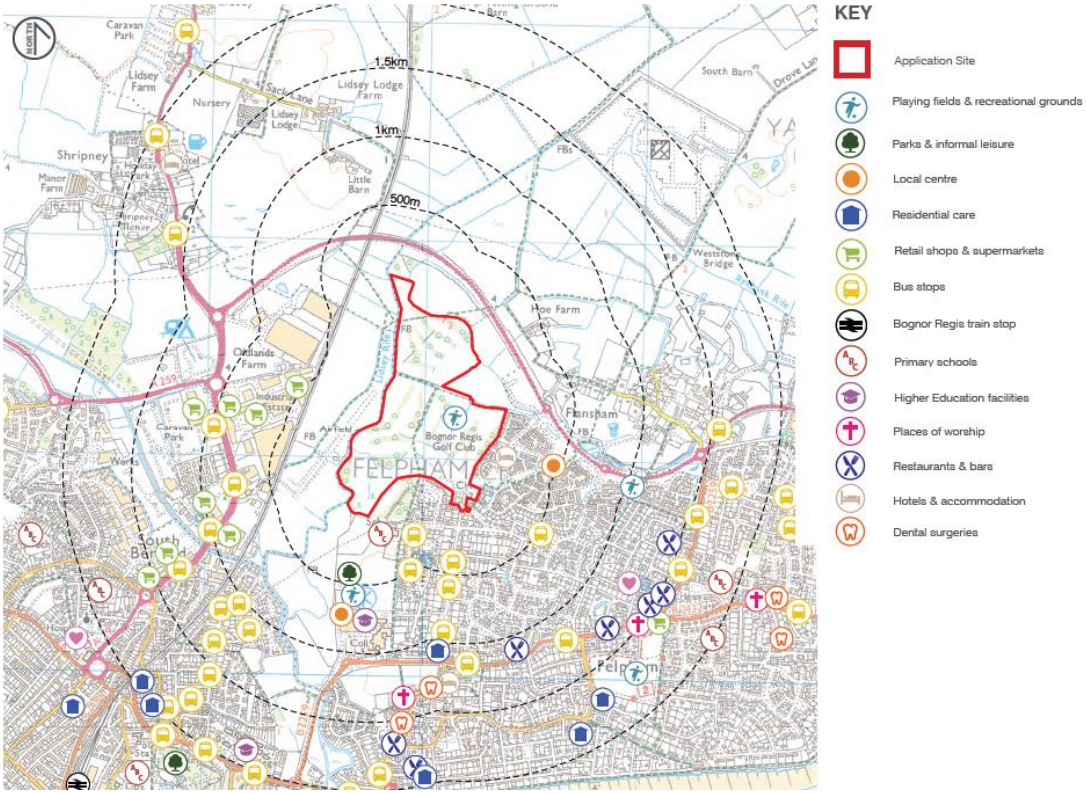
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Table 6.15 Local community facilities and proximity to Site A

Facility	Location	Distance from the Site
Felpham Community Hall	Meaden Way	600m
St Mary's Church	Grassmere Close	1km
Arun Leisure Centre	Felpham way	1.4km
Felpham Methodist Church	Felpham Way	1.7km
Bognor Regis Library	London Road	3km

6.65 There is a local supermarket 4.5km from the site, which also provides vehicular fuel and a coffee shop.

Figure 6.2 Map of local facilities



6.66 Local bus services provide access to Bognor Regis Town Centre as described in Chapter 10 and its accompanying Transport Assessment.

Open Space

6.67 There are several public rights of way (PROW) within and adjoining the Site which are part of a wider recreational network. The PROW going through Site A is route 153. These routes are presented within the accompanying Design and Access Statement.

6.68 Arun District Council adopted the Public Open Space, Playing Pitches and Built Facilities SPD in January 2020. This document sets out the requirements for open space across the District.

6.69 Table 6.16 below sets out the open space requirements. The SPD sets out that for development over 15 dwellings public open space and play space should be provided on site.

Table 6.16 Open space standards

Type of open space	Hectares per 1,000 population
Parks and gardens	0.80
Amenity greenspace	0.60
Natural and semi natural	1.80
Equipped and designated play areas (LAPS and LEAPS)	0.25
Other outdoor provision (NEAPS)	0.30
Allotments	0.25
Total	4.00

Summary

6.70 There has been an increase in population and housing stock in recent years and projections indicate the need for new housing will continue in the future. The provision of new housing to meet the growing needs of the population is of **high importance**, as set out in the adopted Local Plan through the identified housing need.

6.71 Economic growth in Arun is set out as a key priority in the adopted Local Plan. The majority of jobs, as identified in the 2011 census, are low skilled. Site A has an existing economic use related to the golf course, which will be transferred to Site B through the overall relocation project. Retaining economic activity is of **high importance**.

6.72 The Local Area has a slightly higher proportion of residents with very good or good health compared to the Town or District areas, and a slightly lower proportion than the national average. There are three GP surgeries in close proximity to Site A. Data is not available in respect of capacity levels of these surgeries although each indicate they are accepting new patients. Close to Site A are further healthcare and well-being facilities. Ensuring that adequate healthcare facilities are available for residents of the proposed development is of **high importance**.

6.73 There are emergency service provisions existing within Bognor Regis, which will cover the site area.

6.74 Local primary and secondary schools are currently at 89% capacity. There are three nurseries in close proximity to Site A. Meeting the education needs of children from the proposed development is of **high importance**.

6.75 Open space requirements are set out in the adopted SPD. New development is required to provide additional open space to meet the local standards and is of **high importance**.

6.76 There is a good provision of local community facilities in close proximity to the site including churches, libraries, recreation and leisure centres and supermarkets. These will provide the future residents with access to facilities within walking distance.

6.77 The table below provides a summary of the sensitivity of environmental receptors.

Table 6.17 Summary of sensitivity of population and human health receptors relating to Site A

Receptor/Resources	Sensitivity	Summary Reason
Population and Housing	High	In the absence of standard qualitative or quantitative criteria that can be applied, we have afforded these receptors high sensitivity
Employment and Economy		
Health		
Emergency Services		
Education		
Community Facilities		
Open Space		

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Baseline Conditions at Site B

6.78 This section provides baseline data in relation to the Site to house the new golf course (Site B). Because of the nature of that proposed development the important baseline characteristics are much narrower than those for the housing scheme at Site A and relate only to the employment that the site supports from its agricultural use and which is described in Chapter 14.

Economy

6.79 Table 6.7 reflects the employment status of residents in Bognor Regis. This is relevant to Site B as the site bounds the built up area boundary of Bognor Regis. The existing use on Site relates to agriculture. The agricultural use of the land is expected to create between 600-950 hours a year of labour. This would be spread across several people and would fluctuate across the year depending on seasonal requirements. These employs are both permanent and temporary and work across a substantially larger area of land.

6.80 To the east of the Site is the Bairds Business Park, which contains a number of services such as the Arun Waste Services Ltd; Grab and Tip; Fabco; Wadey Commercial services and Robinsons Haulage. These facilities provide employment opportunities for local residents.

6.81 The proposals for Site B are for the relocation of the golf course. This includes the associated employment uses of the golf course and club house. It is proposed the employment at the existing golf course will be transferred to this location, including 19 full time members of staff and 19 part time members of staff.

Table 6.18 Summary of sensitivity of population and human health receptors relating to Site B

Receptor/Resources	Sensitivity	Summary Reason
Economy	High	In the absence of standard qualitative or quantitative criteria that can be applied, we have afforded these receptors high sensitivity

Inherent and Standard Mitigation

6.82 This section describes those 'inherent' and 'standard' mitigation measures which primarily address the scope to avoid, reduce or remedy adverse environmental impacts or enhance the beneficial aspects arising from the construction and operational periods of the proposed development.

6.83 There are a number of Inherent Mitigation measures already designed into the proposed development which are derived from the Development Plan requirements such as the quantum of open space provided and the delivery of an appropriate housing mix including affordable housing.

6.84 Other mitigation measures will be secured by planning obligations and CIL such as financial contributions to off-site infrastructure. These require actions by the organisations that receive the financial contribution but there is a high degree of certainty that such infrastructure will be duly provided because of the legal duty that exist in relation to these services. For this reason, this aspect of mitigation is considered to be Standard Mitigation.

6.85 There will be the preparation of a Construction and Environmental Management Plan (CEMP) as part of the conditions imposed on the planning permission. This will address environmental impacts occurring during the construction phase of development. For this reason, this aspect of mitigation is considered to be Standard Mitigation.

6.86 Certain Standard Mitigation measures are contained within other chapters of this ES, these include considerations relating to noise, air quality, transport, ecology, ground conditions and construction effects which would potentially affect human beings.

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Assessment of Environmental Impacts

6.87 This section provides an assessment of the nature, extent, magnitude of change that the proposed development will have on individual receptors identified in the baseline section. By employing the sensitivity of the receptor and magnitude of change, the significance of environmental effects which arise as a result of the construction and operational periods of the proposed development will be determined.

Site A – Redevelopment of the existing golf course

Construction Phase

6.88 Throughout the construction phase, as houses are built and occupied, the population of the proposed development will increase. There will be approximately 100 dwellings built each year with a five year build programme. This will comprise both market and affordable houses. This quantum of housing equates to 2.4% of the new homes expected to be built across the district between 2011 and 2031. This will be a minor magnitude of change from the baseline. In the situation where there is a need for additional housing to be built to house the growing population and increase in households in Arun, this will provide a **direct, permanent, long-term, minor beneficial effect** each year of the build programme.

6.89 Based on the average occupancy rate from the 2011 Census, the population of the development will be in the order of 1,050 persons.

6.90 This will be a gradual increase in the population, over the lifetime of the construction programme. This will avoid the risk of sudden pressure placed on the existing services and facilities. Nevertheless, the increase in the population will give rise to some infrastructure needs that will be satisfied through utilising existing community infrastructure with Bognor Regis.

6.91 The S106 Planning Obligations will include trigger mechanisms that will require certain infrastructure contributions to be delivered at specific points in the development programme to enable that investment at appropriate times to minimise adverse effects. The Scheme's CIL payments are also likely to be phased over the life of the construction period on the basis of the Council's Installation Policy meaning that monies become available to the Council to make local investments in infrastructure. The Council's Infrastructure Funding Statements indicates CIL payments will fund the following local infrastructure; public transport, education, leisure and recreation projects, green infrastructure projects, waste management, emergency services and strategic flood risk projects.

6.92 As such, it is likely that during construction and thereafter there will be a **negligible impact** to existing and future residents through in terms of the availability of local community infrastructure.

6.93 The potential for existing businesses and local residents to be adversely affected by the construction period has been considered in terms of negative effects on the wellbeing and health of the residents and the impact on business activity.

6.94 There is potential to have disturbance on the existing residents during construction towards the south and east of Site A. This is considered specifically in the noise, air quality and visual assessments. There is substantial tree planting along the site boundaries which will be maintained during construction and is likely to provide some protection from the construction activities. This, alongside the mitigation measures set out in the other ES chapters and the preparation of the CEMP will therefore mean there will be a negligible change from the baseline situation and overall, a **negligible impact** on local residents and business during construction in regard to health.

6.95 Prior to the tendering of the construction contracts, it is not possible to accurately identify where the workforce will originate from. However, an assumption can be made that the majority of the workforce will be from the local area. The construction work will be providing both full time and part time jobs in a range of sectors and skills. The construction programme will include tasks for a range of occupational levels including unskilled or labouring jobs to a range of professional and highly skilled jobs. The Home Builders Federation (HBF) have published a report[10] which presents the predicted economic and local community

[10] The Economic Footprint of Housing Building in England and Wales (2018) Home Builders Federation

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benefits of house building. For 480 units it estimates that this will support the employment of 1,488 people including 16 apprentices, graduates or trainees. This employment opportunities for the local workforce will have a **direct, temporary, major beneficial effect** on the economy.

6.96 An indirect impact from the employment of the construction workforce is the increase in expenditure at local businesses. This will have an **indirect, temporary, short term, moderate beneficial effect**.

6.97 Overall, the impacts of the construction phase on the population and human health with have a **negligible to major beneficial impact** given the mitigation measures embedded within the construction programme and the increased employment and expenditure in the local area.

Operational Phase

Effect on population and housing

6.98 The proposed development will be providing housing to meet the identified housing need and the forecast population growth across the District.

6.99 The proposed development provides a mix of housing types and sizes, including both affordable and market housing. Although the specific mix is not defined at this stage there will be 1, 2, 3 and 4+ bed houses delivered, reflecting evidence of housing need and demand including the Council's Strategic Housing Market Assessment, this will comprise predominantly family housing. The availability of housing on this site will cause a high level of change and together will increase housing opportunity locally.

6.100 This is a **direct, permanent**, **long-term, major beneficial effect.**

Effect on the economy

6.101 The proposed development will increase the local population by approximately 1,050. This means there will be employment, retail expenditure and economic activities increased through the growth of population. The HBF report estimates that 480 units generate £5,785,400 in tax revenue including £542,140.80 in council tax revenue.

6.102 The existing employment of the golf course will be transferred to Site B through the delivery of the wider project. Taken together, this represents a minor change from the baseline situation on Site A. The overall effect on the economy for Site A will be a **direct, permanent, long-term, moderate-minor beneficial local effect.**

Effect on healthcare facilities and emergency services

6.103 The increased population arising from the scheme will generate demand on the local healthcare facilities. It is predicted that the development will generate a population of approximately 1,050 persons. Based on the NHS UK average of 0.45 FTE GPs per 1,000 patients, the proposed development will require 1 additional GP in the local area.

6.104 The number of patients per GP in the local area to Site A compared to the national average is demonstrating there is potential for these practices to accommodate the future residents of the proposed development. There are currently 0.2 more FTE GP per 1,000 persons in Arun compared to the national average, presenting a surplus in GPs in the District. This in combination with all GP practices accepting new patients presents the opportunity for the existing services to meet the needs of the additional population arising from the proposed development. However, if the Arun Clinical Commissioning Group (CCG) required capacity to be created in the local area then monetary contributions could be sought through a S106 Planning Obligation.

6.105 The population arising from the proposed development (1,050 persons) comprises 0.66% of the District's MYE population and 1.49% of the Town's MYE population and is therefore considered a minor increase to the population. There is a fully operational set of services in place across the District and no identified capacity concerns from WSCC. Should there need to be enhancements to these services monetary contributions should be sort through Planning Obligations.

6.106 Accordingly, the impact on healthcare facilities and emergency services is **negligible.**

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Effect on education facilities

6.107 WSCC set pupil yield figures which represent the number of new pupils each new house will generate. An extract from the WSCC pupil yield is presented in Table 6.19 below.

Table 6.19 West Sussex County Council child product figures

School type	Child product
Primary (ages 4 – 11)	25 per 100 dwellings
Secondary (ages 11 – 16)	18 per 100 dwellings
Secondary (ages 16-18)	4 per 100 dwellings

6.108 The occupation of 480 new homes will generate approximately 120 primary school pupils and 87 secondary school pupils. From a review of the capacity in the local school network it is considered that there is capacity for these pupils to be accommodated at the local education facilities in overall terms, however there is not capacity in one single school to accommodate all children. This will require amendments to school catchment areas and the ability for more than one school to address the needs arising from the proposed development. The magnitude of change is therefore considered to be minor and there will be a **negligible** effect on education facilities.

6.109 If the Local Education Authority deems there not to be capacity for all the future pupils, then monetary contributions will be delivered through the CIL payment.

Effect on community and leisure facilities

6.110 The existing use as a private golf course will be transferred over to Site B. This means that Bognor Regis will not lose access to the golf course facilities for its members and there will be no impact on local residents in terms of the existence of this facility. There will be minor changes in travelling distance for some golf course users, which is assessed in the transport chapter and accompanying Transport Assessment, however the availability of new and additional facilities are considered to counterbalance this so this chance is considered low and therefore of negligible effect.

6.111 The existing golf club house is proposed to be kept on site and is proposed to be re-purposed as a community facility. If taken forward, this will provide a facility that does not presently exist and would represent a large change to the baseline situation. This would have a **major beneficial effect**.

6.112 There is good accessibility for future residents from Site A to local services and facilities both by foot and through public transport connections.

6.113 The proposed development will increase the local population and therefore the users of these local facilities but there is no identified shortfall in facilities or capacities. Therefore, it is considered there will be a **direct, permanent, long-term, moderate-minor beneficial effect.**

Effect on public open space

6.114 With a resident population of 1,050 persons, the SPD would require the following amounts of open space.

Table 6.20 Quantum of open space provided by the housing scheme

Type of open space	Requirement for proposed scheme (ha)	Proposed delivery on site
Parks and gardens	0.84	8
Amenity greenspace	0.63	6.7
Natural and semi natural	1.9	11.4
Equipped and designated play areas (LAPS and LEAPS)	0.26	0.5
Other outdoor provision (including NEAPS)	0.32	0.6

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Type of open space	Requirement for proposed scheme (ha)	Proposed delivery on site
Allotments	0.26	0.5
Total	4.21	27.7

6.115 This illustrates that the scheme is meeting policy requirements.

6.116 Although the existing use on Site A is a golf course, this is a private area of land. The new publically accessible areas of open space on site will provide a substantially larger area of land accessible for existing and future residents. This represents a high magnitude of change.

6.117 Accordingly, the proposed development will have a **direct, permanent, long-term, major beneficial effect**.

Summary

6.118 The table below outlines the summary of the magnitude of change to environmental receptors arising from the proposed development at Site A.

Table 6.21 Magnitude of change to population and human health receptors at Site A

Receptor/Resources	Summary of Change to Receptor/Resource	Summary Reason
Construction Phase		
Housing	Minor	During construction some of the houses will be complete and occupied whilst other stages are still being constructed.
Economy	Major	There will be an increase in employment and expenditure in the local area during construction.
Health	Negligible	Through the mitigation embedded within the scheme and CEMP there will little change to the baseline for health.
Operation Phase		
Population	Moderate	Alteration to the baseline condition as population will grow.
Housing	Major	Substantial increase in the number of houses in the local area to contribute to meeting local housing need.
Economy	Minor	There will be a small change to the local economy as a direct impact expenditure from residents in the development.
Health	Negligible	There will be very little change from the baseline condition towards healthcare facilities.
Emergency Services	Negligible	There will be an indistinguishable change to the demand on emergency services.
Education	Negligible	Through the existing capacity and the potential to provide monetary contributions, if required, there will be very little change to availability of education facilities in the local area
Community Facilities	Minor	The repurposing of the existing club house to a community hub will provide a small change from the baseline.
Open Space	Major	There will be substantial change to the baseline conditions on Site A through the delivery of public open space as part of the scheme.

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6.119 The table below outlines the significance of environmental effects for Site A by combining the sensitivity of the receptor and the magnitude of change.

Table 6.22 Significance of environmental effects on population and human health receptors at Site A

Receptor/Resources	Sensitivity	Magnitude of Change	Significance of Effect
Construction Phase			
Housing	High	Minor	Moderate-Minor beneficial
Economy	High	Major	Major beneficial (short-term)
Health	High	Negligible	Negligible (short-term)
Operation Phase			
Population	High	Moderate	Major beneficial
Housing	High	Major	Major beneficial
Economy	High	Minor	Moderate-Minor beneficial
Health	High	Negligible	Negligible
Emergency Services	High	Negligible	Negligible
Education	High	Negligible	Negligible
Community Facilities	High	Minor	Moderate-Minor beneficial
Open Space	High	Major	Major beneficial

Site B – Relocation of golf course

Construction Phase

6.120 The construction of the golf course will be the first element of the overall project. The existing golf course will continue to be in use on Site A until the time the construction has finished on Site B.

6.121 There is a well-established tree line to the south and west of Site B which will provide some protection to existing residents along these boundaries from the construction of the site. This, alongside the mitigation measures set out in the other ES chapters, including air quality (Chapter 11) and noise (Chapter 12) and the preparation of the CEMP will therefore mean there will be a **negligible impact** on local residents and business during construction in regard to health.

6.122 It is predicted that the new golf course will take up to 3 years to construct. During this time there will be an increase in the local economy through the construction employment, and local expenditure. Prior to the tendering of the construction contracts, it is not possible to accurately identify where the workforce will originate from. However, an assumption can be made that the majority of the workforce will be from the local area. The construction work will be providing both full time and part time jobs in a range of sectors and skills.

6.123 The construction programme will include tasks for a range of occupational levels including unskilled or labouring jobs to a range of professional and highly skilled jobs. Through consultation with the golf course designer they have advised that there will between 25-30 FTE during the construction of the golf course and there is a predicted construction cost in the region of £11.5million, which is currently an assumption. There will also be additional employment and cost for the construction of the club house. This is a moderate magnitude of change. This uptake in workforce will have **a direct, temporary, short term, major beneficial effect** on the economy.

6.124 An indirect impact from the employment of the construction workforce is the increase in expenditure at local businesses. This will have an **indirect, temporary, short term, moderate beneficial effect**.

6.125 Overall, the impacts of the construction phase on the population and human health with have a **negligible**

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to major beneficial impact given the mitigation measures embedded within the construction programme and the increased employment and expenditure in the local area.

Operation Phase

Effect on economy

6.126 Through the relocation of the golf course there will be a change in the local economy. The new facilities will allow for an additional 25 annual events, increased membership numbers by approximately 45% compared to baseline with the ability to offer 900 inclusive and points based golfing memberships and 300 social memberships, with increased employment by 30% more compared to the baseline. The new golf course has the potential to become a tourist attraction through the new facilities and inclusion of a driving range and smaller Par 3 course in additional to the Par 4 course attracting membership and visitors from around the local area and UK.

6.127 There will be a **direct, permanent, long-term, moderate-minor beneficial effect** on the local economy.

Effect on Open Space

6.128 One PROW passes through the Site's interior and along the eastern boundary. There will be a road crossing the PROW as part of the wider scheme. This has been identified within Chapter 10 as part of the transport assessment. Therefore, in terms of population and human health the impact is considered **negligible**.

Summary

6.129 The table below outlines the summary of the magnitude of change to environmental receptors arising from the proposed development at Site B.

Table 6.23 Magnitude of change to population and human health receptors at Site B

Receptor/Resources	Summary of Change to Receptor/Resource	Summary Reason
Construction Phase		
Economy	Moderate	There will be an increase in employment and expenditure in the local area during construction.
Health	Negligible	Through the mitigation measures outlined in the CEMP there will be no change to the baseline for health.
Operation Phase		
Economy	Minor	There will be increased spending at the golf course facility alongside the employment from the operational stage of the scheme. Therefore, there will be a minor shift away for the economic baseline on Site B from agricultural to golf course use.
Open Space	Negligible	The PROW will still be useable following the relocation of the golf course.

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6.130 The table below outlines the significance of environmental effects for Site B by combining the sensitivity of the receptor and the magnitude of change.

Table 6.24 Significance of environmental effects on population and human health receptors at Site B

Receptor/Resources	Sensitivity	Magnitude of Change	Significance of Effect
Construction Phase			
Economy	High	Moderate	Major beneficial
Operation Phase			
Economy	High	Minor	Moderate-Minor beneficial
Open Space	High	Negligible	Negligible

Actionable Mitigation

6.131 This section describes actionable mitigation to be employed to reduce the negative effects of the proposed development

6.132 A number of beneficial socio-economic impacts are predicted from the overall project, on Site A and B, derived from the inherent measures that have been incorporated from the outset.

6.133 A high degree of certainty exists that financial contributions paid by the development will be expended in the manner that any S106 Agreement obliges. Similarly, the payment of CIL is an obligation upon the development. For this reason, this aspect of mitigation is considered to be Standard Mitigation. There is no Actionable Mitigation in this instance for either Site A or B.

Residual Impact Assessment

6.134 There are no adverse impacts identified on human beings in this part of the assessment. The impacts are as set out in Table 6.22 and Table 6.24 demonstrating impacts to range from negligible to major-beneficial.

Cumulative Effects

6.135 This Section identifies and assesses the nature, extent, magnitude and significance of inter-project effects (i.e., effects from other development in combination with those from the proposed development).

6.136 In undertaking the assessment consideration must be given to the cumulative impact that the proposals would have along with other relevant development proposals.

6.137 For this chapter, Cumulative Effects arising from the strategic allocations within the adopted Local Plan and nearby live planning applications have been considered. These include allocations SD1-SD11; the planning application at the land to the south of Ford Lane (ref: Y/80/16/OUT); the two planning appeals at Nursery Fields (ref: BE/148/20/OUT) and the land south of Barnham Station (ref: BN/142/20/OUT). These provide new housing to meet the identified need in the District and are included at *Appendix 4.1*.

6.138 In respect of the strategic allocations these have been adopted in the Local Plan to address housing need as well as the delivery of necessary infrastructure such as new educational facilities and community facilities. Alongside on site delivery the approved planning permissions are subject to planning obligations to secure further infrastructure to support the growth of the District.

6.139 An example of this is at Pagham where planning permissions have been granted for new housing, elderly persons accommodation, a local centre and the provision of land for a new primary school. There are also planning obligations in respect to education, fire and rescue, footpaths, leisure facilities, community facilities, healthcare facilities, and playing pitches.

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6.140 It is considered that through the on site provision of community and educational facilities and the off-site monetary contributions for these applications the population and health impacts arising from each development is addressed.

6.141 From this review it is unlikely that there will be a cumulative effect in respect to population and human health.

Summary

6.142 The population and human health impacts arising from the overall project addresses the following receptors: population, housing, economy, healthcare, education, community facilities and open space and are generally beneficial in nature. The impacts are summarised as follows:

6.143 Population – The development at Site A will increase the local population. However, the local population is already forecast to grow and the housing scheme will be enabling the growth of the area and meeting the identified housing need. Overall, it is considered the impact on population is a **direct, permanent**, **long-term, major beneficial effect.**

6.144 Housing – The housing on Site A will help to address the housing requirements for the District and the forecast growing population. Overall, there will be a **direct, permanent**, **long-term, major beneficial impact**.

6.145 Economy – the employment of staff at the golf club will be transferred from Site A to B but is forecast to be greater than at present. The increased population will provide additional expenditure in the local area. Overall, there will be a **direct, temporary and permanent**, **long-term, major beneficial impact**.

6.146 Healthcare – The additional housing on Site A will give rise to a higher demand on the local healthcare facilities capacity. The relocation of the golf course is not expected to give rise to any healthcare demands. However, there will be a beneficial impact on the development of the new golf course in promoting well-being and healthy lifestyles. When including financial contributions, if sought by the Arun CCG, there will be an overall **negligible effect**.

6.147 Education – Through the development of Site A there will be an increased demand on education facilities. There is existing capacity in nurseries, primary and secondary schools in the local area. Should there be a need to improve the local education facilities to accommodate the delivery of the housing scheme then CIL monies are intended to fund education projects. The overall impact on educational facilities is **negligible**.

6.148 Community facilities – The existing clubhouse is being retained with the intention it will be repurposed for use as a community facility. This is a potential benefit of the proposed development. Site B will host a new club house and associated facilities which would be available for community use. The increase in population from the development of Site A will lead to an increased expenditure and use of local services and facilities. There is not an identified shortfall of local services. Overall, there will be a **negligible effect.**

6.149 Open Space – Site A currently hosts a private golf course, which provides limited opportunity for public open space opportunities. Site B currently comprises two agricultural fields. The relocation of the golf course and redevelopment of Site A will provide a substantial enhancement to the public open space in this area. This will be in line and above policy requirements. Overall, there will be a **direct, permanent, long-term, major beneficial effect.**

6.150 The proposed development will result in an increase in new housing which will have a major beneficial effect on meeting the identified housing need of the District. During the construction stage the economic effects are moderately beneficial and on occupation of the development there will be increased expenditure in the local area with a moderate beneficial effect. There is also major beneficial effect from the delivery of public open space on Site A. There will be negligible effects on education, healthcare, emergency services and local community facilities as part of the overall project.

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7 LANDSCAPE AND VISUAL

Introduction

7.1 This Chapter of the ES considers the landscape and visual effects of the proposed developments.

7.2 A Landscape and Visual Assessment (LVIA) has been undertaken in accordance with Guidelines for Landscape and Visual Impact Assessment (GLVIA).[11]

7.3 This assessment considers the change resulting from the development on both the landscape resources of the sites and on the visual amenity of people who live, work and travel in the area. Landscape character and resources are considered separately from visual amenity. While these two important landscape considerations are interlinked, they perform different roles within their environment, have different pressures exerted on them and require separate evaluation.

Potential Effects

7.4 This section summarises the likely potential effects of the proposed development on the environmental topic area.

7.5 The proposed developments will involve a change in land use, which will alter the character of the sites. There will be some loss of existing vegetation and also new planting within the sites

7.6 Temporary works during the construction phase which may have an effect on landscape and visual receptors are:

- Site clearance; including loss of existing vegetation within the Site;
- Presence of site compounds, site offices and welfare facilities;
- Movement and presence of construction vehicles, plant and equipment;
- Earthworks, construction of internal road infrastructure and laying out of practical development platforms; and
- Minor changes to the existing road layout to facilitate access with associated loss of boundary vegetation.

7.7 Permanent effects on landscape and visual receptors could arise from:

- The built form of the new development, including road infrastructure; and
- Mitigation integrated into the proposed development (i.e., Green Infrastructure) including retained trees and hedgerows, open space provision, flood attenuation areas, new planting and new footpaths.

Assessment Methodology

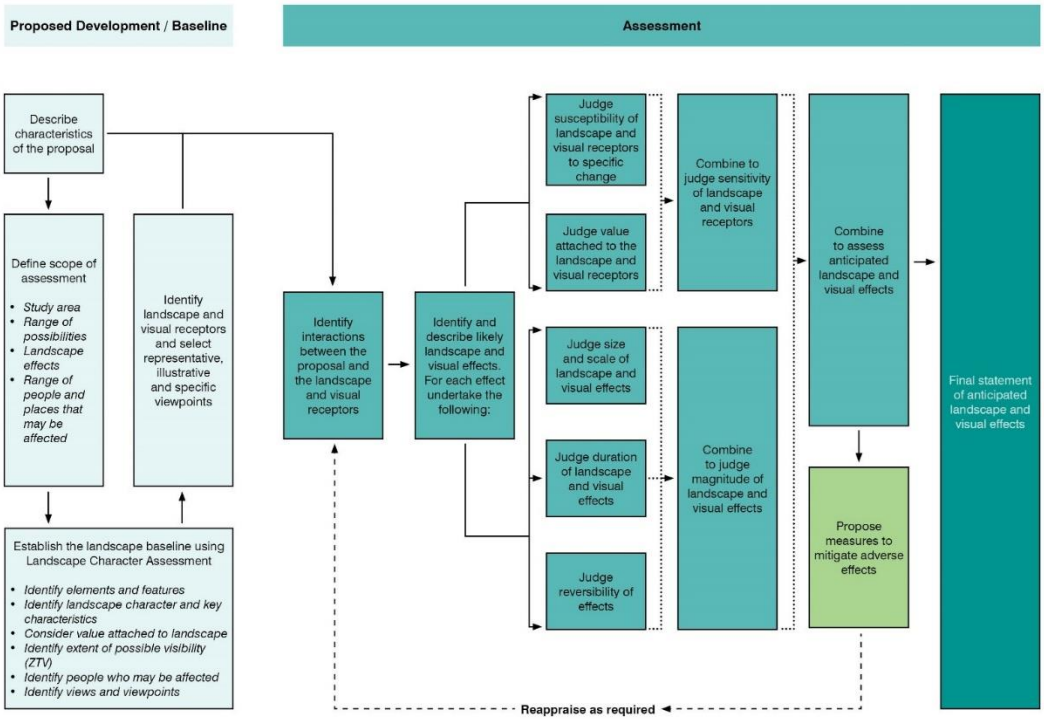
7.8 The section describes the methodology used to undertake the assessment within this Chapter.

7.9 The assessment studies the effects of the development on (i) the landscape character and landscape resources of the site and its environs, and (ii) the visual amenity experienced by people within, through and surrounding environment. These two components are described separately within this assessment as shown in Figure 7.1.

[11]Guidelines for Landscape and Visual Impact Assessment, Third Edition, 2013, The Landscape Institute and the Environmental Management and Assessment

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Figure 7.1 Landscape and Visual Assessment Methodology



7.10 There are six principal parts to the assessment process, namely:

- Identify the changes that are likely to occur as a result of proposed development and their likely effects, considering inherent mitigation from the outset.
- Describe the baseline condition of the Sites, its environs and the extent of visibility available to surrounding receptors.
- Provide an evaluation of the landscape's sensitivity to change, combining judgments of the landscape's susceptibility to change of the type proposed and the value attached to the landscape.
- Provide an evaluation of each visual receptor's sensitivity, combining judgments of their susceptibility to change and the value attributed to their view.
- Identify any impacts predicted to occur within the landscape and within views towards the development.
- Identify further mitigation (as required) to prevent, reduce or alleviate anticipated negative effects and assess any residual effects predicted to occur once further mitigation has become established.

7.11 Predicted effects may occur during construction as well as the operation / occupation phase and as such each stage should be assessed individually.

7.12 Whilst quantitative measurements should be employed, where practicable, a degree of professional experience and judgment should be exercised during the process and these judgments should be "appropriate and proportional". Professional opinions are given within the framework of "clear and transparent methods so that the reasoning applied at different stages can be traced and examined by others".

Defining the Baseline

7.13 The baseline study aims to provide an appropriate benchmark from which an appraisal of effects is based. The baseline sets out what the landscape is comprised of, describing its constituent parts, its function, its

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character, condition, value and susceptibility to change. It also describes the visual resource i.e., the area within which the development may be visible, the people (visual receptors) who may have views of the development and the nature of those views, e.g., whether they are distant, up close, open, constrained, transient, or prolonged.

7.14 Where existing landscape character assessments are available, the baseline landscape is described with reference to published reports.

Sensitivity to Change

7.15 Sensitivity is "the nature of the receptor likely to be affected." Both the landscape and visual receptors with potential views of the proposed development are given a 'sensitivity'. Judgments on sensitivity are derived by assessing the landscape value or value attributed to the view of the visual receptor and the landscape or visual receptor's susceptibility to change of the type proposed. Judgements regarding sensitivity are taken forward in combination with an assessment of magnitude of change to determine the significance of the effects.

Value

7.16 The value of a landscape receptor is defined as: "...the relative value that is attached to different landscapes by society, bearing in mind that a landscape may be valued by different stakeholders for a whole variety of reasons...Landscapes or their component parts may be valued at the community, local, national or international levels."

7.17 The value of the landscape is recorded on a scale of 'National', 'Regional' or 'Local'. Where there is no published evidence to support an assessment of value, an evaluation should be made based on the criteria outlined in Box 5.1 of the GLVIA3 (reproduced at Table 7.1). It is important to note however, that an assessment of value requires professional judgment, a standard approach cannot be considered appropriate in all cases and will vary from place to place.

7.18 The value of a visual receptor is determined through judgments made by combining an assessment of susceptibility to change of the type proposed with visual amenity, and the value attached to particular views as described in Table 7.1. An assessment is made for each receptor with reference to representative views.

7.19 Where published evidence is not available to support an assessment of value the following will be applied:

- International or national landscape designations, such as National Parks, Areas of Outstanding Natural Beauty, World Heritage Sites, and Scheduled Ancient Monuments (SAMs), typically comprise settings of high landscape quality and as such should be considered of High landscape value.
- Regional designations such as Special Landscape Areas or Conservation Areas, listed buildings, registered parks and gardens, Green Belt and ancient woodland should be considered on their individual merits, but are typically considered to be of Moderate or High value depending upon their extents and the cultural and / or natural links they have to the landscape.
- Local landscape designations such as Public Open Space, Tree Preservation Orders, Areas of Local Landscape Importance etc, may be considered important at a local level and as such their value should be considered on a scale of Low to High. An assessment against Table 7.1 should be undertaken.

Table 7.1 Value of landscape receptors

Assessment of Landscape Receptor Value		
Low	Moderate	High
Condition /quality		
A landscape with little or no sign of management and / or a neglected landscape, with individual elements in a poor state or repair.	A landscape with signs of piecemeal management and / or showing signs of decline, with individual elements in a moderate state of repair.	A well-managed and / or largely intact landscape, with individual elements in a good state or repair.
Scenic quality		

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Assessment of Landscape Receptor Value		
A landscape with little or no aesthetic appeal and/or amenity value.	A landscape with moderate aesthetic appeal and/or amenity value.	A landscape with high aesthetic appeal and/or amenity value.
Rarity and representativeness		
A landscape which does not contain rare landscape types or features.	A landscape which contains characteristic but un-unique landscape types or features.	A landscape which contains one or more rare landscape types or features.
Conservation interests		
A landscape with no or limited heritage /cultural /nature conservation content.	A landscape with some heritage /cultural /nature conservation content.	A landscape with rich heritage /cultural /nature conservation content.
Recreational value		
A landscape, with no or limited contribution to recreational experience and/or amenity value.	A landscape which provides some contribution to recreational experience and/or amenity value.	A distinct landscape which forms a strong contribution to recreational experience and/or amenity value.
Perceptual aspect		
A landscape with prominent detractors intrinsic to its character.	A landscape that retains some perceptual values (wildness/ tranquillity etc) amidst some perceptual detractors.	A wild, tranquil or unspoilt landscape without noticeable detractors.
Cultural associations		
A landscape without recorded cultural associations.	A landscape with some and/or moderately valued cultural associations.	A landscape of rich and/or highly valued cultural associations.
Overall Judgment of Receptor Value		
Low value – receptor poorly reflects high and moderate value criteria above.	Moderate value – receptor moderately reflects high and moderate value criteria above.	High value – receptor strongly reflects high and moderate value criteria above.

Table 7.2 Value of visual receptors

Assessment of Visual Receptor Value		
Low	Moderate	High
Value attached to particular views		
Views from and visual amenity associated with every-day locations or routes that do not benefit from any designation or cultural associations.	Views from and visual amenity associated with viewpoints of district or local importance, local visitor attractions or public open space and routes where views and visual amenity form an integral part of the attraction. Views from regional or local landscape designations such as Special Landscape Areas or equivalent.	Views from and visual amenity associated with viewpoints of regional or national importance, popular visitor attractions where views and visual amenity form a key part of the attraction or route. Inclusion within guidebooks or cultural references such as literature and art or as part of heritage character. Views from areas with national designations such as National Parks and Areas of Outstanding Natural Beauty or regional or local landscape designations such as Special Landscape Areas or equivalent.

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Susceptibility

7.20 Susceptibility is the ability of a landscape to accommodate change "without undue consequences for the maintenance of the baseline situation". With regard to visual amenity, susceptibility relates to the occupation or activity of receptors and 'the extent to which their attention or interest relates to the view'.

7.21 Receptor susceptibility is identified in Table 7.3 and is applicable to landscape character areas as a whole, designated areas, individual characteristics that contribute to the overall landscape as well as to visual receptors. Susceptibility can relate to particular aesthetic or perceptual aspects or the compliance or otherwise to current landscape planning policy.

7.22 Susceptibility of a landscape receptor and / or visual receptor to change is specific to the type and scale of development proposed. Judgments on susceptibility are considered on a scale of High, Moderate or Low as per Table 7.3.

Table 7.3 Susceptibility to change of landscape and visual receptors

Susceptibility	Description
High	Little or no ability to accommodate the proposed development without adverse consequences for the retention of the existing landscape baseline situation and / or the achievement of landscape planning policies and strategies. Little or no ability to accommodate the proposed development without adverse consequences to visual receptors whose primary viewing interest is proprietary, relates to heritage assets, visitor attractions, recognised scenic routes or whose attention or interest is focused on the landscape.
Moderate	Some ability to accommodate the proposed development without adverse consequences for the retention of the existing landscape baseline or the delivery of landscape planning policies and strategies. Some ability to accommodate the proposed development without adverse consequences to visual receptors with a secondary interest in the landscape such as travellers passing through the landscape (motorists) or the users of recreation areas whose attention or interest is not the primary focus.
Low	An ability to accommodate the proposed development without adverse consequences for the retention of the existing landscape baseline or the delivery of landscape planning policies and strategies. An ability to accommodate the proposed development without adverse consequences to visual receptors with no or limited visual interest in the landscape such as people at work, travellers passing through an area at speed.

7.23 Sensitivity to change is determined by combining judgments relating to value and susceptibility to change of the type proposed. Judgments on sensitivity are considered on a scale of High, Moderate or Low as per Table 7.4.

Table 7.4 Sensitivity to change of landscape and visual receptors

Susceptibility	Description
High	The receptor/resource has little ability to absorb change without fundamentally altering its present character, or is of international or national importance.
Moderate	The receptor/resource has moderate capacity to absorb change without significantly altering its present character, or is of high importance.
Low	The receptor/resource is tolerant of change without detriment to its character, is of low or local importance.

Magnitude of Change

7.24 Magnitude of Change is "the nature of the effect likely to occur". The prediction of the magnitude of change

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is determined by the size and scale of effects on the landscape, the duration and reversibility of anticipated effects, the integration of effects with the baseline and the geographical extent of the area that will be affected.

7.25 With regard to visual receptors, the magnitude of change is considered in relation to the degree of change in the view, change in the composition of a view, the manner to which the proposed development visually integrates with its surroundings (blends in or contrasts), the angle of view, the distance of the viewpoint from the proposed development and the extent of the development that will be visible i.e., all of the development or only a small proportion.

7.26 Effects on the landscape and visual receptors can be permanent or temporary i.e., long-term or short term. Also, they can be direct or indirect, i.e., directly as a result of the development or indirectly through for example off-site services diversions or junction alterations, etc. For transient receptors, for example motorists, the relative amount of time over which views of the proposed development will be available is considered.

7.27 The magnitude of change is considered during construction, on completion of the development and following the establishment of planting, usually taken at 15 years post completion. A variation of this period can be applied dependent upon the specific project and its location.

7.28 The size and scale of the change includes the proportion or extent of the landscape or view that will be lost or altered, the degree to which aesthetic or perceptual elements are altered and whether changes affect key characteristics of the landscape or view which are considered critical to this character.

7.29 Scale relates to whether effects are considered to affect the Sites and / or the wider landscape setting of the Sites (local), the wider character area within which the Sites are located (regional) or the wider region (national).

7.30 Reversibility considers whether changes are fully reversible or irreversible, i.e., the landscape or view can be returned to its baseline condition.

7.31 Duration is defined in GLVIA as long-term, between 10 to 25 years, mid-term 5 to 10 years and short term 0 to 5 years.

7.32 The following scale is used to quantify the magnitude of change:

Table 7.5 Magnitude of change experienced by landscape and visual receptors

Magnitude of Change	Description
Major	Total loss or major/substantial alteration to key elements/features of the baseline (pre-development) conditions such as the post development character/composition/attributes will be fundamentally changed.
Moderate	Loss or alteration to one or more key elements/features of the baseline conditions such that the post development character/composition/attributes of the baseline will be materially changed.
Minor	A minor shift away from baseline conditions. Change arising from the loss/ alteration will be discernible detectable but not material. The underlying character/composition/attributes of the baseline condition would be similar to the pre development circumstances/situation.
Negligible	Very little change from baseline conditions. Change barely distinguishable, approximating to a 'no change' situation.

Significance of Effects

7.33 The anticipated significance of landscape and visual effects are calculated by combining the descriptors for sensitivity and magnitude of change. This assessment is based on a clear narrative that explains the reasoning behind judgments made, including whether effects are adverse or beneficial.

7.34 The following matrix identifies the correlation between receptor sensitivity and the anticipated magnitude of change experienced. This matrix acts as a guide to be used in conjunction with the professional judgment, to

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determine the anticipated effect the proposal may have upon each receptor.

Table 7.6 Anticipated effect as defined by sensitivity and magnitude of landscape and visual receptors

Magnitude of Impact	Sensitivity of Receptor		
	High	Moderate	Low
Major	Major	Major-moderate	Moderate-minor
Moderate	Major-moderate	Moderate-minor	Minor
Minor	Minor	Minor	Minor-negligible
Negligible	Negligible	Negligible	Negligible

7.35 Predicted effects on a landscape or visual receptors are defined through the described methodology and, where applicable, to specific site related factors, and the professional judgment of the individual undertaking the LVIA. Where the latter is necessary, the professional judgment is acknowledged and explained within the context of the assessment.

Mitigation

7.36 Three types of mitigation are considered as follows:

- 'Inherent' Mitigation - or primary mitigation, where mitigation has been designed into the proposals and is considered from the outset. Inherent mitigation may include screen planting, open space and habitat creation, assessed for its impact on the landscape or change to visual amenity;
- Standard Mitigation - Measures which are not commonplace as part of such development proposals and to which there is a high degree of certainty that they will be provided e.g. The preparation of a Construction Environmental Management Plan. and
- 'Actionable' Mitigation - or secondary mitigation, where possible interventions will help prevent, reduce or offset the anticipated significant adverse effects on landscape or visual amenity predicted to arise as a result of development.

7.37 Inherent and Standard Mitigation is included within the assessment of effects. Due to the 'Inherent' measures taken within this iterative design process 'Actionable' measures are not typically required. Should any 'Actionable' measures be identified these will be identified accordingly and residual effects reported.

Cumulative Assessment

7.38 The cumulative impact assessment will describe the ways in which the Proposed Development will have additional impacts on both the existing landscape character and visual amenity when considered together with other developments that are either, under construction, consented or in the planning process.

7.39 Two types of cumulative landscape character effects will be assessed:

- On the physical fabric of the landscape, such as when two or more developments affect landscape components, such as woodland or hedgerows; and
- On the landscape character, such as when two or more developments introduce new features into the landscape, which would change the overall character or value.

7.40 Two types of cumulative visual amenity effects will be assessed:

- Combined: This occurs when the viewer is able to see two or more developments from one viewpoint. Combined visibility may either be in combination, where several developments are within the viewer's arc of vision at the same time, or in succession, where the viewer has to turn to see the various

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developments; and

- Sequential: This occurs when the viewer has to move to another viewpoint to see different developments. Sequential effects occur along regularly used routes like major roads or paths. Sequential effects may range from frequent (appear regularly and with short time lapses, depending on speed of travel and distance between viewpoints), to occasional (long time lapses between appearance as the viewer is moving slowly and/or there are large distances

Study Area

7.41 The initial step is the establishment of the study area, within which the Proposed Developments are visible and where there is the potential for significant effects on the landscape and visual resource. This has been determined through an iterative process combining desktop research, including the preparation of computer-generated Zone of Theoretical Visibility, and initial surveys of the wider surrounding area.. The physical characteristics of the areas (landform, land-use, vegetation pattern, existing character studies etc.) together with a preliminary assessment of the likely visibility of the Proposed Developments. In this instance, the potential for significant effects on the landscape and visual resources is considered to be contained within a radius of 2 kilometers (km) around each Application Site.

7.42 The extent of the study areas is shown on Figure 7.2 and 7.19 and reflect a number of limiting factors that relate These include: the proposed uses of the sites compared with other forms of development within the context; the low-lying topography of the wider area; the location of the sites alongside the built-up edges of Ancton and Felpham, all of which have a limiting effect on views; and the lack of highly sensitive landscape or visual receptors immediately beyond 2km with likely visibility of the Proposed Developments.

Zone of Theoretical Visibility

7.43 A desktop exercise of the 2km radius study area produced a computer generated Zone of Theoretical Visibility (ZTV) for both sites – Refer to Figure 7.7 for the ZTV for Site A and Figure 7.24 for Site B. The ZTVs were based on the topographical OS data for the study area, combined with both Digital Terrain Modelling (DTM) and a Digital Surface Model.

7.44 A DSM expresses a digital representation of the elevation of all objects within an area of interest, including trees and buildings for example, whilst DTM data provides a digital rendition of the ground elevation of a surface of interest.

7.45 Potential views within the ZTV area were selected on the basis that these views were available from the public highway or from Public Rights of Way (PROWs). Specific locations were chosen adjacent to places of education, play, recreation or sport where the view is considered to be one of the reasons for visiting or being at the location.

7.46 The potential views determined by the ZTV were tested on the ground by an experienced Chartered Landscape Architect driving the roads and walking the PROWS in order to determine the actual extent of visibility towards the sites from the surrounding landscape/receptors.

Legislative/Planning Policy Context

7.47 *Appendix 7.1* provides the planning policy context relevant to landscape matters.

7.48 Landscape policies in the National Planning Policy Framework and the Arun Local Plan promote the conservation and enhancement of the natural and historic environment, the maintenance and improvement of Green Infrastructure networks, and the promotion of high quality and sustainable design; to achieve a distinctiveness in settlement pattern, a sense of place and development without detriment to landscape character.

7.49 Both sites fall within land designated as *Gaps Between Settlements*. New development in such locations will only be permitted in the gaps if:

a. It would not undermine the physical and/or visual separation of settlements;

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b. It would not compromise the integrity of the gap, either individually or cumulatively with other existing or proposed development;

c. It cannot be located elsewhere; and

d. It maintains the character of the undeveloped coast;

e. or, if a subsequent DPD or Neighbourhood Plan deems it appropriate through an allocation.

Limitations

7.1 No technical difficulties or practical problems were encountered in carrying out the visual appraisal presented in this document. The primary site visits were conducted on 19th and 20th October 2021 and so a comparison of visibility and visual effects over four seasons or during a wide range of light and weather conditions was not possible for the locations visited.

7.2 GLVIA3 suggests that consideration be given to seasonal variation in effects where appropriate but acknowledges that the timing of the appraisal may mean that this is not practical (p112, para 6.28). In this LVIA we adopt an approach that where there would be potentially significant differences between seasonal views, this would be indicated in the appraisal and taken into consideration in reaching conclusions.

Assumptions

7.3 The LVIA has been undertaken on the basis of the parameter plans and that the development will be laid out in substantial accordance with these.

Baseline Conditions

7.4 The section provides more detailed topic specific information to describe the character of Sites A and B and their environs. This describes the quality of the interests as they relate to this environmental topic and serves as a comparative measure against which changes arising from the construction and operational phases of the proposed development can be assessed or predicted. This identifies the sensitivity of environmental receptors.

Landscape Baseline

7.5 The various elements of a landscape when viewed in combination, including historical and cultural associations, set one landscape apart from another and make its character unique to the people who both live in or visit the area.

7.6 Landscape Character Assessment (LCA) is a process of critically examining a landscape, recognising 'Character Areas' through the identification of distinctive features. This presents a benchmark from which an assessment of each character area's capacity to accommodate change can be measured.

7.7 There are a number of sources, produced nationally and at the local level which can help form this baseline, including Natural England's 'National Character Area Profiles, District-Level Assessment and Local Landscape Assessment'. Together these reflect a division into areas with particular combinations of geology, soil, plants, animals, settlement history, land use, scenery, heritage and culture.

Site A – Redevelopment of existing golf course

National Character Area Profile (NCA) 126

7.8 At a national level Site A and its environs fall within National Character Area (NCA) 126: South Coastal Plain (refer to Figure 7.6) prepared by Natural England (NE).

7.9 The South Coast Plain NCA is a flat, coastal landscape with an intricately indented shoreline lying between the dip slope of the South Downs and South Hampshire Lowlands and the waters of the English Channel, Solent and part of Southampton Water. The coastline includes several major inlets which have particularly

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distinctive local landscapes and intertidal habitats of international environmental importance for wildfowl and waders. Chichester Harbour AONB lies within the NCA and the foothills of the South Downs, along the northern boundary, fall within the South Downs National Park.

7.10 The key characteristics of this NCA and Opportunities for improvements, which are directly relevant to understanding the study area are set out in *Appendix 7.2*.

Local Landscape Character Assessment

7.11 At a local level, an assessment of landscape character types and areas was undertaken in 2003 by West Sussex County Council.

7.12 The site falls within the Landscape Character Type SC9: Chichester to Yapton Coastal Plain[12]. See Figure 7.6: National and Local Character Areas Plan. The Character Area is summarised as follows:

"This Character Area extends from Chichester in the west to the edge of the Arun Valley in the east, and around Bognor Regis to the south. Over time a large part of this area has been reclaimed from the sea, and remains below the current high spring tide level. It comprises a mainly flat, open landscape crossed by meandering rifes. Dominated by highly productive arable fields and modern farm buildings, it has a fragmented hedgerow and hedgerow tree pattern. The spire of Chichester Cathedral is a widely visible feature. Rows of large light reflecting glasshouses, equestrian facilities, horse paddocks and industrial buildings, for instance in the Ford and Tangmere areas, are strong suburban elements. Where these occur, they create visual confusion and poor definition between town and countryside, and erode distinctive landscape character. Major suburban settlements in the area are Tangmere, Barnham, Yapton, and Westergate. In contrast, there are areas of a smaller scale, more varied rural landscape with quiet hamlets and traditional villages enclosed by small pastures."

7.13 Key Characteristics of the SC9 Landscape Character Area of relevance to this study, are described in *Appendix 7.1*.

Site and Immediate Context

7.14 The following represents an assessment of the site and the immediate context, providing a record of landscape character and contributing features.

Landform and Drainage

7.15 The site is generally very low lying and relatively flat, with spot heights ranging between 0-3m Above Ordnance Datum (AOD). Land falls on a slight gradient from the eastern boundary to the internal site area, whilst the lowest points of the site are situated towards the northern half of the course.

7.16 There are several drainage ditches within the site. The majority are straight and follow a north-east to south-west orientation. At the south-western end of the site, three curvilinear ditches are present.

7.17 Much of the rural and urban land stretching as far as Bognor Regis, Littlehampton and Yapton experience minor changes in levels, approximately between 1-10m AOD. The land does however begin to rise at the borderline of the South Downs National Park, with notable high points located at Rewell Wood (approximately 150m AOD). The prominent Arundel Castle is situated on land at around 35m AOD, overlooking the town of Arundel and the southern context beyond.

Vegetation

7.18 The site is currently defined by a belt of trees and shrubs along the eastern boundary, whilst much of the internal land is characterised by strong, intermittent avenues and groupings of mature trees. There is one Tree Protection Order covering a group of trees on the eastern boundary of the site; this group is identified in the tree survey[13] as being a group of Category B trees. The tree survey identifies large numbers Category

[12] West Sussex Landscape Character Assessment, (2003) West Sussex County Council
[13] Tree Survey Plan, (2021) FPCR

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B trees across the site. In addition, there are several large groups of Category A trees across the south part of the site and some individual specimens scattered across the site.

7.19 Vegetation along the bordering watercourses presents a contrasting character to that present within the focal expanse of the golf course grounds. Dense bodies of reedbeds and other vegetative types that are characteristic of wetland environments define these boundaries.

7.20 Many of the trees within the internal spaces of the site and to the eastern and southern boundaries are large, of good quality, and effectively envelope the site. In contrast, the western boundary possesses a much more open and exposed character, featuring small groupings of mature trees, rather than dense belts or avenues.

7.21 Within the wider context, large scale areas of woodland are not prevalent, and mature tree planting is rather associated with defining boundaries and river corridors, as is exemplified by the application site. The built form of various settlements within the wider context such as Flansham and Shripney are interwoven with tree planting, providing a good network of green infrastructure which effectively ties into the neighbouring rural landscape.

7.22 Some pockets of designated ancient woodland are present within the wider site study area. All of these are located to the far north towards Barnham and Aldingbourne.

Land Use and Pattern

7.23 The site is characterised by its current function as a recreational and sporting facility. It is generally irregular and organic in form due to the nature of the localised network of rifes and drainage ditches which surround the site. Inherently, being a golf course, it covers a relatively large area and features a small number of buildings. Three of these form the core of the main club house facility and are positioned in a cluster towards the primary vehicular and pedestrian access point from Golf Links Road. One further structure is present towards the centre of the golf course.

7.24 To the north, north west and north east of the study area lie an extensive series of arable fields. These form the gaps between the site and the settlements of Barnham, Bilsham, Woodgate and Yapton. Within these gaps, the occasional presence of farmhouses is evident, albeit infrequent. Charles Purley Way (A259) forms a notable, intersecting boundary between arable land within the immediate northern context of the site and the expansive rural land further afield.

7.25 A belt of arable fields is also present to the south west of the study area, though these are less frequent and expansive as those situated north of the site. These fields provide the gap between settlements before merging with the residential areas of western Felpham and eastern South Bersted.

7.26 Adjacent land to the west is open and exposed, supporting the visibility required for aviation purposes as it is currently serving as LEC Airfield. Further west, the airfield is bounded by the Bognor Regis Branch railway line before the character of the land and its associated developments of the built form become contrastingly compact in pattern, due to the presence of Bognor Regis Retail Park.

7.27 Areas of particular suburban, residential character become apparent beyond the eastern and southern boundaries of the site. The settlement of Flansham presents a traditional, rural village character whilst modern housing developments adjoining the eastern site boundary form an extension to the 20th century residential core of Felpham. Essentially, the settlement of Felpham envelops the site, forming its immediate eastern and southern surroundings.

7.28 A range of educational and retail facilities are found within the study area, the nearest school being the Downview Primary School, located within 100m from the southern-most edge of the site. Felpham Community College is also located immediately south of Downview Primary School. Some buildings associated with the University of Chichester are also present towards the heart of Bognor Regis.

7.29 Additionally, there are several places of worship within the wider site study area, the nearest of which is St. Mary's Church, situated approximately 0.8km south of the site.

7.30 Several recreational grounds and sporting facilities fall within the site study area. Of these, the King George V Recreational Ground is the nearest to the site, around 1km away to the south east. Further to this, Felpham

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Beach is sited approximately 1.4km to the south as the nearest stretch of coastal shoreline. A number of smaller play areas are scattered around the study area, two of which form part of the overall scheme for the modern residential development to the east.

7.31 The suburban area of Felpham comprises a large proportion of the study area, with the town centre of Bognor Regis also holding a strong presence to the south west. The surrounding countryside beyond the northern and eastern boundaries of the golf course represents a fragmented edge to the town, with substantial belts of farmland and an extensive rife and ditch network forming this portion of the study area.

Circulation

7.32 The site is bounded to the south by relatively quiet and unimposing residential streets, being Golf Links Road and Shirley Drive. Two existing vehicular and pedestrian points stem from Golf Links Road into the site.

7.33 The site itself contains two rectangular areas designated for vehicular parking upon entry, and further parking bays which follow the edge of the main club house building and access road.

7.34 A series of clearly defined pedestrian footpaths are present around the main club house. These footpaths give way to the open lawns of the golf course whereby visitors are guided by the presence of the fairways and vegetation as navigational aids.

7.35 A series of Public Rights of Way (PROWs) exist in and around the site.

7.36 PROWs with reference FEL/153/6, YAP/153/4 and YAP/153/3 intersect the site. These footpaths are interconnected and extend beyond the site boundaries to the wider network of PROWs in the study area.

7.37 To the north, the highways infrastructure which forms the A259 is apparent. The road rises, forming a viaduct which passes over Lidsey Rife and several other channels within the wider drainage network, in addition to the Bognor Regis Branch railway line. Vehicular accessibility into and out of the site is currently unavailable towards the north due to the structural complexity and nature of the active highway.

7.38 The Bognor Regis Branch railway line is present beyond the LEC Airfield. The line runs from north to south linking Bognor Regis with Barnham, before branching off to the east and west, further connecting with Chichester, Brighton and beyond.

Scale and Enclosure

7.39 The main internal areas of the site experience a range of exposed and sheltered conditions. The scale and design of the existing site present certain areas where expansive vistas across fairways are available and exposed to the elements, whilst other spaces offer shelter provided by the canopies of mature tree groupings and shrubs.

7.40 The boundaries of the site are also contrasting in terms of enclosure. Along the southern and eastern boundaries, tree belts of varying densities envelope the internal spaces of the golf course, whereas the western and northern boundaries are more exposed. Defined by the channel of Lidsey Rife, these boundaries see vegetation of mostly low-level heights, and the groupings of trees which exist here are few in number and positioned sporadically.

Settlement and Built Form

7.41 There are presently four buildings situated within the site boundaries. The largest of these is the main club house facility, covering an area in footprint of approximately 755m². There are two further structures within the immediate vicinity of the club house, one is a 'Pro Shop' and the other is used for maintenance purposes and cover a combined area of around 265m². These buildings are located immediately upon entry into the site from Golf Links Road, whilst one further structure is located towards the centre of the golf course .

7.42 The main club house building and its smaller accompanying structures are consistent in external character, featuring a material composition of timber, brick and flint stone facades.

7.43 Beyond the site, the character of surrounding architecture is varied with several Conservation Areas identified in Figure 7.4 – Features and Designations, each containing a range of features and qualities.

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7.44 Immediately to the east and south east of the site, the settlement of Felpham presents typically residential streets fronted by a mix of brick bungalows, semi-detached and detached housing units on either side. Of these, housing developments immediately east of the site are notably more modern and larger in scale than dwellings situated within the main residential core of Felpham to the south.

7.45 Patterns of the built form within the wider context contrast between a fairly dense, suburban form to the south, and a largely rural, scattered and irregular character to the north. A number of small to medium sized villages lie to the north, including Flansham and Woodgate. Isolated dwellings and farmsteads are also present, sitting within the wider rural landscape.

Infrastructure

7.46 A compact area of industrial and commercial character is located within 300m beyond LEC Airfield and the Bognor Regis Branch railway line to the west. A solar farm exists within 1km north east of the site. A small number of electrical masts are situated on the southern boundary of the site.

Visual Connection

7.47 The central open lawns of the golf course provide the context for the neighboring grounds of the LEC Airfield, Bognor Regis Branch railway line and Bognor Regis Retail Park to the west, and also the northern A259 viaduct.

7.48 Through partially permeable tree coverage existing along the eastern boundary, the site is visibly presented intermittently to certain dwellings within the adjacent residential area. Additionally, the main club house building and much of its associated access road and parking upon entry provide the setting for a number of dwellings along Downview Road and adjacent streets to the south and south east.

7.49 Visibility across the internal areas of the Site is varied due to the spatial arrangement of the overall planting scheme. Direct vistas are occasionally presented along fairways, whilst other points throughout the meandering lawns of the course are screened by the mature trees and shrubs present.

Landscape Character Value

7.50 The landscape of the site represents a recreational sporting ground, being an established golf course; with a scattering of organic woodland pockets integrated within and around expansive manicured lawns. The built form is low in both density and area coverage when considered within the overall context of the site. The buildings present exist solely for the functioning of the grounds as a golf course.

7.51 The study area captures a few of the characteristics identified within the Chichester to Yapton Coastal Plain landscape character area. Those that are applicable are notably:

- Low lying flat open landscape.
- Meandering rifes and straight drainage ditch systems, with associated unimproved grassland and edged by reed beds.
- A low density of hedgerows and hedgerow trees with occasional shelterbelts.
- Large-scale arable farming and market gardening. Extensive farms with both traditional and modern farm buildings and silos.
- Scattered, historically nucleated villages with mixed building materials of flint, brick, half timber and stone.
- Large farmsteads along roads, and on dead-end tracks
- Frequent urban fringe influences of horse paddocks, light industry and disused airfields, with busy minor and major roads.
- The urban fringes associated with Bognor are particularly obvious, with sporadic urban development in suburban settlements of Tangmere, Barnham, Yapton, and Westergate.
- Low lying species-rich grasslands adjacent to the rifes, artificial water bodies of Chichester canal (SNCI) and gravel pits together with remnant semi-natural broadleaved woodlands form pockets of high nature

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conservation importance.

7.52 The landscape character and landscape condition of the Chichester to Yapton Coastal Plain landscape character area is considered to be strong.

7.53 Located on the fringes of Bognor Regis, the Site sits within the context of a wider landscape of both agricultural and suburban character. The Site is distinctive within its context and is not particularly representative of the landscape character area in which it lies.

7.54 The Site represents a managed, manicured landscape with moderate aesthetic value and is not characteristic of the rural landscape setting. The Site has limited conservation interest and offers recreational value as a positive setting to the existing PROW network. The Site offers perceptual value as a positive setting to residents and walking routes and contains some cultural value due its current purpose as a local recreational and sporting attraction.

7.55 Overall, it is judged that the Site exhibits moderate landscape value at a local and Site level.

Landscape Character Susceptibility

7.56 The Site is level and low-lying, with an irregular and organic form, characterised by its use as a golf course. The Site features a range of vegetation, with belts of mature trees and shrubs defining its southern and eastern boundaries and creating a series of avenues and glades within the site interior. Three Public Rights of Way traverse the Site and the Site is free of built infrastructure that is not associated with the Site's existing recreational use. The Site is judged to have a Moderate susceptibility to change from the proposed development.

7.57 The wider study area is characterised by the wide, flat coastal plain between the coastline and the foot of the South Downs National Park. Vegetation within the wider context is largely associated with defining boundaries and river corridors. To the south, west and east of the site is the urban area of Felpham and Bognor Regis that extends to the edge of the coast. The landscape to the north is characterised by irregular arable fields scattered with villages, hamlets, and light industry. Overall, the sense of character is urban and suburban to the south, with a rural character to the north, though with urbanising influences of larger villages and industrial sites. The wider study area is judged to have an overall Moderate susceptibility to the proposed development.

Landscape Character Sensitivity

7.58 Consistent with the assessment of the Site to be of Moderate Value and Moderate susceptibility, the Site is considered to be of Moderate sensitivity.

7.59 Consistent with the assessment above, the wider study area is considered to be of Moderate value and Moderate susceptibility, the wider study area is considered to be of Moderate sensitivity.

Table 7.7 Summary of sensitivity of landscape character at Site A

Receptor/Resources	Sensitivity	Summary Reason
National Character Profile 126	Moderate	The landscape character and condition are considered to be strong, though its relevant characteristics are not rare nor only found at this site.
Local Landscape Character Type SC9: Chichester to Yapton Coastal Plain	Moderate	The landscape character and condition are considered to be strong, though its relevant characteristics are not rare nor only found at this site.
Site A	Moderate	The site is representative of the character of the NCA and local character area, though its relevant characteristics are not rare nor only found at this site.

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Site B – Relocation of golf course

National Character Area Profile (NCA) 126

7.60 The key characteristics of the NCA, as relevant to Site B, are the same identified for Site A, and set out in *Appendix 7.2*.

Local Landscape Character Assessment

7.61 The key characteristics of the Local Landscape Character Assessment, as relevant to Site B, are the same identified for Site A, and set out in *Appendix 7.2*.

Site and Immediate Context

7.62 The following represents an assessment of the site and the immediate context, providing a record of landscape character and contributing features.

Landform and Drainage

7.63 The site comprises principally three fields; these are termed the northern, southern and western field. The northern field is very low lying and relatively flat, with spot heights ranging between 1-2m Above Ordnance Datum (AOD). The southern field falls on a slight gradient from west to east. Spot heights along the western boundary of this field range between 5-8m AOD, whilst the eastern boundary sees heights of between 4-6m AOD.

7.64 Forming the dissection line between the two existing fields on which the site stands, Ryebank Rife presents the most dramatic level changes within the site, with a depth of around 3m. Along the eastern boundary line a further drainage channel is present.

7.65 As with Site A, being situated within just 300m from the coast, the site generally sits within a very low-lying context. Much of the rural and urban land stretching as far as Bognor Regis, Littlehampton and Yapton experience minor changes in levels, approximately between 1-10m AOD. The land does however begin to rise at the borderline of the South Downs National Park, with notable high points located at Rewell Wood (approximately 150m AOD). The prominent Arundel Castle is situated on land at around 35m AOD, overlooking the town of Arundel and the southern context beyond.

Vegetation

7.66 The site is currently defined predominantly by dense belts of mature native trees and shrubs along its boundaries, with much of the inner expanse of land being characterised by a monoculture of agricultural crops. The north east edge of the site is across an open field but a hedgerow exists immediately to the east.

7.67 Two dense native hedgerows are also present, one of which dissects the larger southern-most field into two. The other follows the channel of Ryebank Rife from the west before diverting northwards at an angle.

7.68 The trees to the boundary of the site are large, of good quality and effectively enclose the site which would otherwise be extremely exposed.

7.69 Within the wider context, there is no prevalence of large-scale areas of woodland and none of those that are present are designated as Ancient. Rather, mature tree planting is associated with field boundaries and river corridors, as is exemplified by the application site, and transport infrastructure, in addition to which is substantial tree planting associated with parks and field boundaries. The built form of various settlements within the wider context such as Yapton and Bognor Regis are interwoven with tree planting, providing a good network of green infrastructure which effectively ties into the neighbouring rural landscape.

Land Use and Pattern

7.70 The site predominantly comprises open, agricultural land with one small and enclosed industrial storage compound in the north eastern corner of the southern-most field.

7.71 Land within the immediate context to the north, east and west is largely rural and expansive in character, with occasional farmhouses and small settlements such as Bilsham to the north west present. To the immediate

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south lies the eastern residential area of Elmer, comprised primarily of bungalows, semi-detached and detached housing types. Baird's Business Park is located to the north east and is a complex of industrial premises.

7.72 A range of establishments offering accommodation and leisure opportunities are presented within the site study area. Notably, the Lane End Farm Caravan Site stands alongside the south western site boundary line, whilst Jay Belle Grange Lodge Park lies around 600m north east of the site at the junction of the A259 and Yapton Road. Several hotels are also situated south of the site within the residential area of Elmer.

7.73 A range of educational and retail facilities are found within the study area. The nearest school being the St Mary's Church of England Primary School, located approximately 1.3km away from the site to the east. Additionally, there are several places of worship nearby, including St. Nicholas Church, situated approximately 0.7km away, south west of the site.

7.74 Several recreational grounds and sporting facilities fall within the site study area. Of these, Shrubbs Field is the nearest, around 0.7km away from the site in Middleton-on-Sea to the south west. Informal recreational opportunities exist at Elmer Beach, situated around 400m south of the site. Additionally, a paintball centre 'Ground Control Paintball' is situated immediately east of the site, beyond the belt of trees along Ryebank Rife.

7.75 The suburban area of Middleton-on-Sea comprises a large proportion of the study area, with the town centre of Bognor Regis located further afield to the south west. The surrounding countryside represents a fragmented edge to town, with substantial belts of farmland framing the north, west and east of the study area.

Circulation

7.76 The site is bounded to the north by the A259, Grevatt's Lane; strategic route that carries a relatively high volume of traffic. One single access point leading directly into the site exists from the road at the boundary defining the two northern field parcels within the site, providing access for agricultural vehicles to both.

7.77 A single-track road of particular rugged surface character runs alongside the eastern boundary of the southern-most field, which leads from the site to Grevatt's Lane. This connects with Baird's Business Park north east of the site. The Ryebank Rife is culverted along a portion of the boundary line between Baird's Business Park and the proposed site for development, allowing for the existing gated access way into and out of both parcels of land.

7.78 One PROW,165, passes through the Site's interior. The PROW begins at the same point as the existing vehicular access off Grevatt's Lane in the north and travels south along the existing hedgerow, contained by the vegetation that defines the boundary between the two northern field parcels. The PROW crosses Ryebank Rife and then continues in a southerly direction outside the Site extents, following the edge of the tree belt that adjoins the western boundary of the Site into Elmer.

7.79 The River Arun is present within the site study area, leading to the southern coast. Within its closest point of proximity to the site, the river lies around 2km away beyond the village of Climping.

Scale and Enclosure

7.80 The main internal areas of the site are open, expansive and exposed, though they are typically enveloped by mature rows of trees and hedgerows along each boundary line.

7.81 The local context predominantly comprises open fields, similar in character to those which form the current setting of the site. This becomes less apparent to the south as rural land transitions into a context of more suburban, residential character. The residential area of Elmer abuts the southern boundary of the site, with fence lines to rear gardens forming the divisive line along with the dense belt of woodland within the site boundary.

Settlement and Built Form

7.82 There are no buildings situated within the site.

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7.83 Beyond the site, the character of surrounding architecture is varied, with the two Conservation Areas identified in Figure 7.21– Features and Designations, each containing a range of features and qualities.

7.84 Immediately south of the site, the residential area of Elmer presents typically residential streets lined by bungalows, semi-detached and detached housing units on either side.

7.85 Patterns of the built form within the wider context contrast between a fairly dense, suburban form to the south, and a largely rural, scattered and irregular character to the north, east and west. A number of small-medium sized villages lie in these directions, including Yapton, Climping and Flansham. Isolated dwellings and farmsteads are also present, sitting within the wider agricultural landscape.

Infrastructure

7.86 Immediately to the north east of the Site is a collection of industrial premises at Bairds Business Park. Rudfield Industrial Estate also features within the wider context, around 1.1km away towards Climping.

7.87 There is no presence of electrical pylons within the immediate context of the site.

Visual Connection

7.88 The site is well contained to the east, south and west due to dense tree belts. To the north, a more permeable tree coverage along the road edge allows some visual connection, particularly within the north-west parcel of the site. Overall, the site is disconnected from the immediate context due to the level of vegetation and the A259 dividing the site from the landscape to the north, despite sharing an arable agricultural character.

Landscape Character Value

7.89 The Site's landscape features are comprised of large agricultural fields, subdivided by mature trees and hedgerows.

7.90 The study area captures some of the characteristics identified within the Chichester to Yapton Coastal Plain landscape character area. Those that are applicable are notably:

- Low lying flat open landscape
- Meandering rifes and straight drainage ditch systems, with associated unimproved grassland and edged by reed beds.
- A low density of hedgerows and hedgerow trees with occasional shelterbelts.
- Large-scale arable farming and market gardening. Extensive farms with both traditional and modern farm buildings and silos.
- Frequent urban fringe influences of horse paddocks, light industry and disused airfields, with busy minor and major roads.
- The urban fringes associated with Bognor are particularly obvious, with sporadic urban development in suburban settlements of Tangmere, Barnham, Yapton, and Westergate.
- Long views to Arundel, the Downs and to the distinctive spire of Chichester Cathedral.

7.91 The landscape character and landscape condition of the Chichester to Yapton Coastal Plain landscape character area is considered to be strong.

7.92 Located on the eastern fringe of Bognor Regis, the Site sits within the context of a wider landscape of both agricultural and suburban character. The Site is typical to the character of the wider landscape to the north and east and contains Ryebank Rife, a distinctive feature of the local area.

7.93 The Site exhibits characteristics of the wider landscape in which it sits, notably expressing a rural character with flat, open agricultural fields, with an urbanising influence from the residential setting to the south and A259 to the north. The Site has limited conservation and recreational interest. One PROW passes through the north part of the Site, contained on both sides by existing hedgerows. The Site offers perceptual value as a positive setting to those using the PROW network and residents to the south.

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7.94 Overall, it is judged that the Site exhibits moderate landscape value at a local and Site level.

Landscape Character Susceptibility

7.95 The Site is generally flat and low-lying, with gentle sloping towards the south extents. It is characterised by its semi-rural nature and use as arable farmland. The Site is enclosed by dense belts of native mature trees and hedgerow to the south, east and western boundaries; to the north, a less dense native hedgerow and trees defines the boundary between the Site and Grevatt's Lane. Vegetation is present within the Site, defining field parcels and along the Ryebank Rife. The presence of the A259, Grevatt's Lane exerts a light urbanising influence on the Site, as does the industrial site to the north-east of the Site and residential area of Elmer to the south. The Site is judged to have a Moderate susceptibility to change from the proposed development.

7.96 The wider study area is characterised by the wide, flat coastal plain between the coastline and the foot of the South Downs National Park to the north. Vegetation within the wider context is largely associated with defining boundaries and river corridors. To the south of the Site is the residential area of Felpham, which extends south to the edge of the coastline. To the east, west and north, the landscape is characterised by arable agricultural land, scattered with villages and light industry. Some recreational uses can be found around the Site including a caravan park immediately west and a paintball ground immediately east. The wider study area is judged to have an overall Low susceptibility to the proposed development.

Landscape Character Sensitivity

7.97 Consistent with the assessment of the Site to be of moderate value and moderate susceptibility, the Site is considered to be of Moderate sensitivity.

7.98 Consistent with the assessment above, the wider study area is considered to be of moderate value and low susceptibility, the wider study area is considered to be of Moderate sensitivity.

Table 7.8 Summary of sensitivity of landscape character at Site B

Receptor/Resources	Sensitivity	Summary Reason
National Character Profile 126	Moderate	The landscape character and condition are considered to be strong, though its relevant characteristics are not rare nor only found at this site.
Local Landscape Character Type SC9: Chichester to Yapton Coastal Plain	Moderate	The landscape character and condition are considered to be strong, though its relevant characteristics are not rare nor only found at this site.
Site B	Moderate	The site is representative of the character of the NCA and local character area, though its relevant characteristics are not rare nor only found at this site.

Visual Baseline

7.99 The interaction of urban and rural areas, vegetation, landform, buildings etc. in combination determine the potential for views towards the sites. This baseline seeks to establish the visibility of the sites from a representative sample of surrounding receptors (i.e., people who have a viewing opportunity over or towards the Site).

Site A – Redevelopment of existing golf course

Visual Envelope

7.100 The ZTV (Figure 7.7) illustrates that the visual envelope of the site is limited by the following factors:

- The north western residential boundary of Felpham; including Downview Road, Sutton Close, Golf Links Road, Mid Acre Close, Red Barn Crescent, Wellers Close and Bridger Close, which wrap in close proximity to the east and west of the site;

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- Structural vegetation defining the boundary of the site and the course within;
- Built form located within the boundary of the club;
- The bridge associated with the Felpham Relief Road;
- The complex of warehouses and commercial enterprise located to the west of the site;
- The eastern residential edge of South Berstead;
- Substantial vegetation, including woodland throughout the study area and particularly to the north east and north west; and
- The gentle topography throughout the study area.

Visual Receptors and Sensitivity

7.101 Receptors encompass residents of nearby houses, users of Public Rights of Way and views from highways. In overall terms, the first two categories are considered to be of higher sensitivity than the latter two due to the prolonged and or proprietary interest in the view, although the context of individual receptors can have a bearing on their sensitivity. The principal groups of visual receptors identified within the study area are considered in more detail below

Residents

7.102 These receptors include those people living in properties within the immediate vicinity of the site. This includes existing residents within the urban edge of Felpham, where it aligns, or directly overlooks the north and east of the site.

7.103 Other residents within the study area with the potential to see the site are located at mid distance, to the eastern edge of South Bersted.

7.104 The sensitivity of receptors change across the study area and is dependent on their proximity and experienced visibility of the site. Therefore, residents are considered to range in value and susceptibility.

7.105 The residents facing the site from the edge of Felpham include Downview Road, Sutton Close, Golf Links Road, Mid Acre Close, Red Barn Crescent, Wellers Close and Bridger Close, are physically close to the site and with close range views into the interior. These are considered to have a high value and high susceptibility to change, resulting in a high sensitivity to development.

7.106 Other residential viewpoints within the study area, are not thought likely to place more than a moderate value on the site within the scene and would have a low susceptibility to change, with a consequent low sensitivity to the nature of the development.

Road Users

7.107 These are considered to be road users driving, cycling or walking along Downview Road or Golf Links Road, immediately to the south of the site, and Felpham Relief Road (A259), within close proximity of the north and eastern boundaries.

7.108 Drivers along Downview Road or Golf Links Road would be journeying at speeds of up to 30mph when experiencing views of the site. Views would be partial and close range. The value and susceptibility of these receptors would be moderate, with a moderate sensitivity to change.

7.109 Those using the Felpham Relief Road would be travelling at up to 40mph, with an oblique view towards the site. The value and susceptibility of the site would be low for these receptors, realising a low sensitivity to change.

Public Rights of Way

7.110 Several PROW run through or within the immediate vicinity of the site. PROW FEL/153/6, YAP/153/4 and YAP/153/3run through the site and have high value and high susceptibility, with a high sensitivity to the development proposed. PROW with the vicinity of the site, namely ALD/152/1, ALD/152/3 and

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BET/152/2, have views towards the boundary of the site.

7.111 As visual receptors, users of the PROW network are considered to be of high value with either moderate or high susceptibility to change, depending on their context, proximity and bearing to site. Users of PROWs who are within or close to the site from a rural or undeveloped setting, and who can view the interior are judged to have a high sensitivity to the nature of the development proposed. Users of the PROW network who obtain views of the site over a greater distance, or from a predominantly developed or residential context, are considered to have a moderate sensitivity to the proposed development.

Representative Viewpoints

7.112 Representative viewpoints have been selected to assess the effects on views experienced by receptors in the area surrounding the Site. Refer to Figure 7.8.

Table 7.9 Representative viewpoints for Site A

Viewpoint	Figure	Location	Type	Direction
1	7.9	Downview Road	Road User	0.05km North
2	7.10	PROW (FEL/153/6)	PROW	0km North
3	7.11	PROW (FEL/153/5)	PROW	0.04km North
4	7.12	PROW (BET/152/2)	PROW	0.13km East
5	7.13	PROW (YAP/153/4)	PROW	0km East
6	7.14	Charles Purley Way	Road User	0.14km South
7	7.15	PROW (YAP/153/1)	PROW	0.13km West
8	7.16	PROW (YAP/146/3)	PROW	0.79km West
9	7.17	Stanhorn Grove / Charles Purley Way	Road User	0.15km West
10	7.18	South of Wellers Close	Residential	0.03km East

Site A - Viewpoint Summary

7.113 A series of viewpoints have been taken to illustrate the views of a representative sample of receptors that have varying degrees of visibility over the site. The viewpoint locations are illustrated on Figure 7.8. In addition, photos taken from within the site have been used to understand the likely intervisibility between the site and any potential receptor. A full description of the viewpoints can be found within a series of tables within Figures 7.9 to 7.18, with a summary provided below.

7.114 Views are available from the rear of the house and garden for a number of residential properties that align with the south and east of the site. Such houses are found upon Sutton Close, Golf Links Road, Mid Acre Close, Red Bar Crescent, Wellers Close and Bridger Close; all located at the urban edge of Felpham, within a residential setting. Views of site features would be partially obscured by vegetation within gardens, existing boundary treatments and tree cover found within the site. The screening quality of planting would be at its most effective during summer months. Views from ground floors would typically be restricted to higher levels of planting within the site, whilst upper storey windows would present views into the nearest part of the site rather than across the whole golf course. Any available view into the site's interior would likely be restricted by intervening structural vegetation, limiting the extent. Residents with the view described above would have a high sensitivity to the development.

7.115 Properties aligning roads that are perpendicular to those listed above are Downview Road (Refer to Figure 7.9) and Salham Way. Some of these houses may have an oblique view of the site along the route. Properties on Downview Road with a view, would perceive the south eastern edge of the site and the golf club house, associated parking and tree planting to the foreground and as a backdrop, which terminate the road. This infrastructure is seen within a residential context. Views from properties upon Salham Way are restricted to mature tree planting within the site interior, viewed above the bungalows that define the residential area. These residents would have a moderate sensitivity to the development.

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7.116 South west of the site, a number of bungalows are located to the north east of South Bersted. These may appreciate the western boundary of the golf course from gardens and rear facing windows, but only at a distance. Any view of the site would be glimpsed through vegetation aligning the intervening farmland. These residents would have a low sensitivity to the development.

7.117 The vast majority of properties within Flansham would not receive views of the site, owing to the configuration of dense structural vegetation. It may be possible for a small number of houses to the south side of Hoe Lane to gain oblique and distant views of the boundary to the northern section of the site from first floor windows. This would likely be seen within the context of neighbouring housing and the relief road. These residents would have a low sensitivity to the development.

7.118 It is not anticipated that views would be possible from any other residential receptor within the study area, primarily owing to intervening vegetation.

7.119 Downview Road connects directly with the site entrance and receives a framed view of the golf club house, car park and vegetation seen to the front of the golf club and within the interior, providing the backdrop (Refer to Figure 7.9). The club house obscures the interior beyond. The view is from a residential context and the site is seen neighbouring housing in both directions. This receptor would have a moderate sensitivity to the development.

7.120 It is possible to see large groups and specimens of mature trees within the golf course above bungalows and between gaps in two storey housing from roads within close proximity of the site, for example, along Stalham Way, Golf Links Way, Wellers Close and Bridger Close. The surface of the golf course is not visible. These receptors would have a low sensitivity to the development.

7.121 Glimpsed views of features of the golf course, seen at distance across intervening farmland, may be visible from a small number of locations upon Whitfield Close and Marylands Crescent to the north east of South Bersted. These receptors would have a low sensitivity to the development.

7.122 Felpham Relief Road passes close to the north eastern boundary of the site and would appreciate the defining vegetation and glimpsed views of the interior beyond (Refer to Figure 7.14 and 7.17). During winter months a greater proportion of the ground plane of the site would be seen. The site would be visible beyond farmed fields and within the setting of housing, the train line and warehouses, within a dynamic scene, appreciated obliquely and at speed. From the bridge, an elevated view of the site is afforded, including distant views of built form within Bognor Regis. This receptor would have a low sensitivity to the development.

7.123 PROW FEL/153/6 runs south to north through the centre of the southern section of the site (Refer to Figure 7.10), before joining YAP/153/4 (Refer to Figure 7.13), which runs to and along the north western boundary of the site. The former crosses the course and alongside the maintenance area, between a ditch and planting, entirely immersed within the setting of the club. The latter is framed between vegetation across the centre before following the watercourse within open grassland. At this point the context of the airfield, warehouses and the elevated section of the relief road are clear. These receptors would have a high sensitivity to the development.

7.124 South of FEL/153/6, FEL/153/5 connects towards Felpham Way. For a small section of this route, facing north, only the dense southern boundary of the site is visible, obscuring the interior of the site. The boundary is seen within the context of residential properties to the east of the route. These receptors would have a low sensitivity to the development.

7.125 PROW YAP/153/3 crosses the northern section of the site, from and to farmland. From this stretch the site would be appreciated as a functional golf course, with mature tree planting, and seen in the context of the relief road and warehouses. This receptor would have a high sensitivity to the development.

7.126 To the east the PROW links with YAP/153/1 and YAP/146/3, crossing the relief road and heading north east towards a wider footpath network and Barnham. From beyond the site, only glimpsed views of the site interior through boundary vegetation are possible. With distance, the site becomes increasingly obscured from intervening vegetation within the view. The site, where seen, is typically viewed within the context of the relief road and across farmland. These receptors would have a high sensitivity to the development. Neighbouring sections of PROW, including YAP/147/1 and YAP/154_1/1 are screened by boundary

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vegetation and have a low sensitivity to development.

7.127 PROW BET/152/2 runs parallel with the western boundary of the site, in close proximity to it. Views of the site from this route are seen across the airfield and through the defining mesh fence of (Refer to Figure 7.12). A fringe of grassland is seen to the west of the site, with the heart of the site dominated by dense tree planting. Again, the site can be seen within the context of the relief road.

7.128 PROW ALD/152/3 includes a short section with a comparable relationship with the site to that described for PROW BET/152/2, focussing on the north of the site. The remainder of the route appears screened by hedgerow defining the agricultural fields. These receptors would have a moderate sensitivity to the development.

7.129 FEL/154/2 navigates through modern housing located to the eastern edge of the site and for short stretched appreciates views of the site, including the roofline of the golf clubhouse and mature tree planting (Refer to Figure 7.18). These elements represent a small part of any scene and are viewed from and across a residential setting. This receptor would have a moderate sensitivity to the development. It is not anticipated that the site would be perceivable from any other receptor within the study area.

Site B – Relocation of golf course

Visual Envelope

7.130 The ZTV (Figure 7.24) illustrates that the visual envelope of the site is limited by the following factors:

- The northern residential boundary of Elmer; including Sunnymede Close and Acton Way, which wrap in close proximity to the south of the site;
- Structural vegetation defining the boundary of the site and the Ryebank Rife within;
- Warehouses neighbouring the north eastern boundary;
- The built form of Northwood Farm to the north east of the site;
- Built form associated with Yapton and isolated farmsteads within the study area;
- Substantial vegetation, including structural hedge and tree planting aligning roads and farmland throughout the study area, and woodland, in particular, located to the immediate east of the site; and
- The gentle topography throughout the study area.

Visual Receptors and Sensitivity

Residents

7.131 These receptors consist of existing residents within the urban edge of Elmer, where it aligns the south of the site, or in close proximity to it. A small number of houses may also glimpse the boundary of the site from Yapton Road to the north, seen across farmland and through boundary vegetation. It is not anticipated that any other resident has the potential to see the site, owing to the composition of built form and vegetation within the study area.

7.132 The sensitivity of receptors changes across the study area and is dependent on their proximity and experienced visibility of the site. Therefore, residents are considered to range in value and susceptibility.

7.133 Housing backing onto the site, or with views across a road include Sunnymede Close and Acton Way. These are considered to have a high value and high susceptibility to change, realising a high sensitivity to development.

7.134 A number of houses upon Yapton Road may gain distant and partial views of the northern vegetated boundary of the site, from the front of properties, seen across arable fields. These properties would have moderate value, low susceptibility and low sensitivity to change.

Road Users

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7.135 These are considered to be road users driving, cycling or walking along Grevatt's Lane (A259), Sunnymede Close, Ancton Way, The Layne, Arundel Way, Elm Drive, Alleyne Way and The Hard, all running within close proximity to the site, Yapton Road further north and Climping Street, as it heads towards Atherington.

7.136 Drivers upon residential roads close to the site would travel at speeds of up to 30mph along the routes and would typically receive an oblique view of the site boundary. The value, susceptibility and sensitivity of these receptors would be moderate.

7.137 Drivers upon the Grevatt's Lane would travel at speeds of up to 60mph and would receive an oblique view of the northern boundary at speed. The value, susceptibility and sensitivity of this receptor would be low. Similarly, users of Yapton Road and Climping Street would received a glimpsed and distant view of the site boundaries at best and are therefore judged to be low sensitivity to change.

Public Rights of Way

7.138 A PROW runs within the western edge of the site, connecting the residential area to the south with Grevatt's Lane and a network of footpaths. This footpath is of high value, moderate susceptibility, and high sensitivity to change.

7.139 Users of the PROW network who obtain views of the site over a greater distance are considered to have a moderate sensitivity to the proposed development. This includes PROW YAP/166/5 and CLI/166/4, running from Grevatt's Lane north. It is not anticipated that any other routes would receive views towards the site.

Representative Viewpoints

7.140 Representative viewpoints have been selected to assess the effects on views experienced by receptors in the area surrounding the Site. Refer to Figure 7.25.

Table 7.10 Representative viewpoints at Site B

Viewpoint	Figure	Location	Type	Direction
1	7.26	Alleyne Way	Residential	0.01km North
2	7.27	Sunnymede Close	Residential	0.61km North East
3	7.28	PROW (MOS/165/1)	PROW	0km North
4	7.29	PROW (YAP/165/2)	PROW	0km North
5	7.30	Grevatt's Lane	Road User	0.02km South
6	7.31	PROW (CLI/166/4) /	Road User	0.16km South East
7	7.32	PROW (YAP/144/1)	PROW	0.4km South East
8	7.33	Grevatt's Lane	Road User	0.14km South West
9	7.34	Junction of Yapton Rd. / Horsemere Green Lane	Road User	0.69km South West
10	7.35	Climping Street	Road User	0.86km West
11	7.36	PROW (CLI/829/4)	PROW	0.73km North West

Site B - Viewpoint Summary

7.141 A series of viewpoints have been taken to illustrate the views of a representative sample of receptors that have varying degrees of visibility over the site. The viewpoint locations are illustrated on Figure 7.25. In addition, photos taken from within the site have been used to understand the likely intervisibility between the site and any potential receptor. A full description of the viewpoints can be found within a series of tables within Figures 7.26 to 7.35, with a summary provided below.

7.142 Views from housing within the vicinity of the southern boundary of the site would perceive the edge of the site as defined by a dense belt of mature trees, preventing views from most positions of the site interior.

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Properties backing onto the site, along Sunnymede Close (Refer to Figure 7.27) and Ancton Way would receive an unobstructed view of the vegetative buffer from the rear of the property and gardens. It is possible that some of these residents would receive a heavily filtered view through the tree line to the farmland beyond. These receptors would have a high sensitivity to the development. It is anticipated that the remainder of the residents would see the canopy level of the trees only, above the built form lying between. All views are appreciated from within a residential context.

7.143 The site may be apparent from a small number of houses on Yapton Road, seen across intervening arable fields and through vegetation (Refer to Figure 7.34). The boundary tree planting may be visible, but the interior of the site is likely to be screened. These receptors would have a moderate sensitivity to the development.

7.144 It is not expected that views from any other housing within the study area would be possible, owing to screening elements. This includes views from properties upon Climping Street, owing to vegetation and built form screening within the landscape.

7.145 Grevatt's Lane runs directly past the north of the site (Refer to Figure 7.30, 7.31 and 7.33). During summer months, the oblique view of the site, that would typically be experienced at speed, is broadly contained by the mature vegetation aligning the boundary. During summer months, the same view would reveal the filtered interior, as arable farmland, subdivided by a linear belt of planting and against a backdrop of woodland. A small break within the vegetation occurs, permitting a narrow view into the site, at the PROW access. The road within the vicinity broadly runs between farmland, with occasional warehouses punctuating the route. Consistent with this, the neighbouring business premises, east of the site, are visible during winter months. Receptors upon Grevatt's Lane have a low sensitivity to the development.

7.146 A number of roads within close proximity to the south of the site; namely, Sunnymede Close, Ancton Way, The Layne, Arundel Way, Elm Drive, Alleyne Way and The Hard, may all experience views from an immersed residential setting, towards the southern wooded boundary, above and between intervening bungalow properties (Refer to Figure 7.26). It is unlikely that the interior of the site would be perceptible through gaps in built form and vegetation, but if it were possible, it would be glimpsed only. These receptors would have a high sensitivity to the development.

7.147 Users of Yapton Road may experience oblique and partial views towards the site boundary, likely experienced at speed. They would appreciate the vegetated boundary as a containing feature in summer months, permitting filtered views of the site interior during winter months. These receptors would have a low sensitivity to the development.

7.148 MOS/165/1 travels through the western fringe of the site within a narrow woodland belt and, whilst immersed within the site, has only a filtered visual connection with the arable fields to the east (Refer to Figure 7.28). This perception of the neighbouring fields is peripheral to the direction of the route, which remains the focus throughout. This receptor would have a high sensitivity to the development.

7.149 MOS/165/1 connects to YAP/165/2 around Ryebank Rife, continuing the intended access through the centre of the site, as defined by hedgerow to either side (Refer to Figure 7.29). The route is currently impenetrable owing to overgrown brambles, however, it is clear that the hedgerows would prevent views from the path to the neighbouring sections of site. This receptor would have a high sensitivity to the development.

7.150 South of the site, routes continue and combine to provide access to both the coast and towards Bognor Regis. MOS/163/2 follows the Layne, a road within close proximity of the south of the site and would experience the site in the same manner. This receptor would have a high sensitivity to the development. There are no further routes to the west, south and east, including those aligning the coast or marrying into Climping Street, that would not experience views of the site, because of intervening vegetation.

7.151 PROW CLI/166/4 continues a route north from Grevatt's Lane, within 100m of the site (Refer to Figure 7.30 and 7.31). The path crosses an arable field defined itself by structural vegetation. This vegetation restricts views towards the northern boundary vegetation of the site, which can be seen above. This receptor would have a moderate sensitivity to the development. This footpath connects to a wider network providing

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access to and from Yapton. It is not anticipated that the site can be seen from any additional PROW, owing to existing obstructions within the landscape.

Inherent and Standard Mitigation

7.152 This section describes those 'inherent' and 'standard' mitigation measures which primarily address the scope to avoid, reduce or remedy adverse environmental impacts or enhance the beneficial aspects arising from the construction and operational periods of the proposed development.

7.153 Chapter 3 describes the development proposals. The design approach has adopted measures to avoid, reduce or mitigate adverse impacts by considering the scale, location, extent, siting and massing of the built development, the routing of site infrastructure, the filtering of key views, the retention and enhancement of existing landscape resources and new planting for screening and softening.

7.154 It is assumed that the development proposals would be built to reflect the local vernacular and neighbouring building heights, to aid assimilation.

7.155 It is anticipated that the appropriate specification, implementation and management of proposed and existing planting would be enforced by the local planning authority through planning condition.

7.156 The proposals will limit cut and fill operations to those absolutely necessary and will avoid engineered profiles, whilst also promoting opportunities for sensitive water management, with associated ecological and amenity benefits.

Assessment of Environmental Effects

7.157 This section provides an assessment of the nature, extent, magnitude of change that the proposed development will have on individual receptors identified in the baseline section. By employing the sensitivity of the receptor and magnitude of change, the significance of environmental effects which arise as a result of the construction and operational periods of the proposed development will be determined.

Impact on Landscape

7.158 This section considers the landscape effects that would arise as a result of the development. The changes experienced from the proposed development would be permanent in nature.

7.159 Landscape features within the Site may be physically altered, removed or added to by the Proposed Development. The Magnitude of Change arising for these alterations is explained and qualified for the various components of the landscape and for the landscape character of the site and study area.

7.160 The identification of effects will be considered at Year 1 prior to the establishment of the landscape mitigation proposed.

Site A – Redevelopment of existing golf course

Landform and Drainage

7.161 Topography across the Site is generally low lying and relatively flat. Areas of localised excavation and levelling will occur where necessary to form plots, with a 500mm maximum increase in depth above existing levels. These changes will not fundamentally alter the characteristics of the site landform. The magnitude of change caused by the development to the topography is negligible realising a **negligible effect**.

7.162 The development will accommodate various Sustainable Drainage Systems (SuDS), which will include the use of ditches and swales, provided within public open space. Ditches and swales will form part of the Site's green infrastructure and reflect the nature of existing drainage features on Site. These will also provide additional amenity and ecological benefits. The magnitude of change caused by the development drainage as a landscape component of the Site is minor beneficial, realising **a minor beneficial, direct, permanent and long-term effect**.

Vegetation

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7.163 The site is currently defined by a belt of trees and shrubs along the eastern boundary, whilst much of the internal land is characterised by strong, intermittent avenues and groupings of mature trees amongst amenity grassland. Vegetation within the Site is generally of good quality and creates areas of enclosure. There will be some loss of trees and hedgerows, with the development largely responding to the existing vegetation structure within the Site. All but one Category A trees will be retained; 22 groups and 13 individual Category B and C trees are proposed to be removed, amounting to an approximate area of 2.4ha, with 62 groups and 129 individual trees remaining[14]. Circa 125 individual new trees will be planted across the site along with woodland, hedgerow and shrub planting extending across areas of some 4 hectares which will increase the diversity of habitats and will define areas of recreational open space, contributing to both amenity and ecology objectives. Front gardens to new houses would be defined with mixed ornamental borders or hedges and lawn. Some areas of existing grassland will be lost and replaced by development, but the quality of diversity of the existing offering will improve. The magnitude of change caused by development is considered to be moderate adverse and therefore the anticipated effect is considered to be **moderate-minor adverse direct, permanent and long-term**.

Land Use and Pattern

7.164 The existing land use of the site is currently a golf course, a recreational and sporting facility, comprised of a landscape of managed vegetation with a small number of buildings that support its inherent function. The proposed development of the Site will change the use of the Site from a purely recreational and sport function to one of a predominantly residential and informal recreational use. Whilst the Site retains aspects of its recreational character, the form of recreation will change from formal to informal; additionally, the amount of recreational space will decrease but with greater and more widespread public access. The magnitude of change caused by the development is considered to be moderate adverse and therefore the anticipated effect is considered to be **moderate adverse direct, permanent and long-term**.

Circulation

7.165 The Site has two existing vehicular and pedestrian links from Golf Links Road to the south, providing access to the vehicular parking and the Site interior. A series of clearly defined pedestrian footpaths are present around the main club house, which then give way to the open lawns of the golf course. Three PROWs pass through the Site and connect beyond the Site to a wider network. The proposed development will retain and improve the existing PROW and create a series of new permissive footpaths across the Site. A new internal road network will be created within the southern extents of the Site, around plots of residential development with a hierarchal design, with most roads being secondary or private drives. The magnitude of change caused by the development is considered to be negligible and therefore the anticipated effect is considered to be negligible.

Scale and Enclosure

7.166 The main internal areas of the site experience a range of exposed and sheltered conditions. Within the site interior, a range of spaces exist between fairways with expansive vistas and those that are more sheltered. Along the southern and eastern boundaries, tree belts of varying densities envelope the internal spaces of the golf course, whereas the western and northern boundaries are more exposed. The proposed development retains the existing vegetative structure within the Site. Where residential plots are being proposed between belts of existing vegetation, this will result in a strong sense of enclosure within the southern extents of the Site. Additional tree planting is proposed to the west and northern boundaries, creating a greater sense of containment and screening for persons within the new areas of open space. The magnitude of change caused by the development is considered to be minor adverse and therefore the anticipated effect is considered to be **minor adverse direct, permanent and long-term**.

Settlement and Built Form

7.167 Presently, there are four buildings within the Site. Three of these buildings are sited in the south, upon entry

[14] Tree Retention Plan (2021) FPCR

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from Golf Links Road and the fourth is located towards the centre of the golf course. All existing buildings are associated with the golf course facilities. The amount of built form within the Site will increase, with significant numbers of private dwellings. The existing club house to the south will be repurposed to form a new community centre. New built form will be designed to match the vernacular style of existing settlements. The magnitude of change caused by the development is considered to be moderate adverse and therefore the anticipated effect is considered to be **moderate-minor adverse, direct, permanent and long-term**.

Infrastructure

7.168 There is no notable infrastructure within the Site presently. The proposed development will result in the addition of new highway infrastructure and services. The magnitude of change will be moderate adverse and therefore the anticipated effect is considered to be **moderate-minor adverse**,. **direct, permanent and long-term**.

Visual Connection

7.169 The existing site forms part of the context for the LEC Airfield, Bognor Regis Branch railway line and Bognor Regis Retail Park to the west, and also the northern A259 viaduct. Through partially permeable tree coverage existing along the eastern boundary, the site is visibly presented intermittently to certain dwellings within the adjacent residential area. Additional tree planting to the west and north will alter the extent of visibility into (but not of) the Site from the airfield, railway, retail park and A259. The magnitude of change will be negligible and therefore the anticipated effect is considered to be **negligible**.

Landscape Character

7.170 The site represents a very small part of NCA 126 South Coastal Plain and therefore has very little influence over the overall character of the area. The Site exhibits characteristics of the NCA such as being part of the coastal plain and being on the fringe of 'significant urban development', however no key characteristics of NCA 126 would be altered or lost and consequently the NCA would be unaffected. The magnitude of change will be negligible and therefore the anticipated effect is considered to be **negligible**.

7.171 The site sits within the local landscape character type SC9: Chichester to Yapton Coastal Plain. The site exhibits a limited number of key characteristics such as being a 'low lying flat landscape', 'meandering rifes and straight drainage systems' and forming part of the Bognor Regis urban fringe. These key characteristics will not be lost through and aspects such as the drainage systems will be extended and improved. A key issue of change for the area is 'urban development pressures, especially in the gaps between settlements' of which the proposed development will be contributing to, although proposed open space maintains an openness between the Lidsey Rife and proposed housing. The magnitude of change will be minor adverse and therefore the anticipated effect is considered to be **minor adverse, direct, permanent and long-term**.

7.172 The site is not located within a designated landscape and is therefore considered to be of local and not wider importance. The existing character of the site is defined by its recreational function as a golf course and belts and avenues of mature vegetation that form the spaces within. The site is also defined by its mix of enclosed and open spaces, as well as its visual relationship primarily with the airfield, railway and employment areas to the west and A259 to the north. Additionally, the site forms part of the setting to the neighbouring residential area to the south and east. The proposed development will alter aspects of the site character, most prominently its existing function. However, the design of the development aims to respond to the existing character by retaining and enhancing the vegetation structure and enhancing the characteristic drainage ditches.

7.173 For the Site as a whole, the magnitude of change to its landscape character, which has a moderate sensitivity, is considered to be moderate adverse and therefore the anticipated effect is considered to be **moderate-minor adverse, direct, permanent and long-term**.

Table 7.11 Summary of magnitude of change to landscape character at Site A

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Receptor/Resources	Summary of Change to Receptor/Resource	Summary Reason
National Character Profile 126	Negligible	The site represents a small part of the character area. No key characteristics of the character area are lost.
Local Landscape Character Type SC9: Chichester to Yapton Coastal Plain	Minor adverse	The proposed development represents a small part of the character area and is not designated. The existing site exhibits a limited number of key characteristics of the character area and these will not be lost through the development. Where appropriate, these key characteristics will be improved. The development will contribute to urban development, a key issue of change in the area.
Site A	Moderate adverse	Key characteristics of the site - mature vegetation belts, flat land and straight drainage ditches – will be retained within the development. The character of the site will change from a fully recreational semi-rural nature. The amount of open space will be reduced and the east extents of the site will change to an urban character. Change will be of a permanent nature.

Table 7.12 Significance of landscape character effect for Site A

Receptor/Resources	Sensitivity	Magnitude of Change	Significance of Effect
National Character Profile 126	Moderate	Negligible	Negligible
Local Landscape Character Type SC9: Chichester to Yapton Coastal Plain	Moderate	Minor adverse	Minor adverse
Site A	Moderate	Moderate adverse	Moderate-minor adverse

Site B – Relocation of golf course

Landform and Drainage

7.174 Topography across the Site is generally low lying and relatively flat. Areas of localised excavation and levelling will occur where necessary to form plots, but these changes will not fundamentally alter the overall Site landform. The magnitude of change caused by the development to the topography is negligible realising a negligible effect.

7.175 The development will accommodate Sustainable Drainage Systems (SuDS), which will include the use of drainage basin at various locations. As well as fulfilling a drainage function, these water bodies also contribute amenity and ecological benefits. The magnitude of change caused by the development to the drainage of the Site is minor beneficial, realising a **minor beneficial, direct, permanent and long-term effect**.

Vegetation

7.176 The site is currently defined by dense belts of mature native trees and shrubs along its boundaries, between field parcels and along Ryebank Rife, with much of the inner expanse of land being characterised by a monoculture of agricultural crops. There will be minimal loss of existing trees and hedgerows, with the loss occurring to provide access across Ryebank Rife and internal hedge boundaries between the various field

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parcels. An entire narrow hedgerow within the southern field will be lost. Areas of new native tree and shrub planting will be created in clumps across the site, defining proposed fairways for the golf course and contributing to amenity and biodiversity objectives. The magnitude of change caused by the development is considered to be moderate beneficial and therefore the anticipated effect is considered to be **moderate-minor beneficial, direct, permanent and long-term effect**.

Land Use and Pattern

7.177 The site predominantly comprises open, agricultural land with one small and enclosed industrial storage compound to the north eastern corner of the southern-most field. The proposed development of the site will change the use in its entirety, from arable land to a recreational and sports function. The magnitude of change caused by the development is considered to be moderate adverse and therefore the anticipated effect is considered to be **moderate-minor adverse, direct, permanent and long-term effect**.

Circulation

7.178 The Site is bounded by the A259 to the north. One single access point leading directly into the site exists at the boundary defining the two northern field parcels, providing vehicular access to both. A single PROW passes through the Site; access to the PROW will be retained and management improved. Foot access will be opened up across the site through the proposed grass fairways. The existing vehicular access from Grevatt's Lane will be retained and new surfacing laid to create formal access to a car park, clubhouse and maintenance area. The vehicular access runs along the existing field boundary between the two northern field parcels and does not extend south to Ryebank Rife. The magnitude of change caused by the development is considered to be minor beneficial and therefore the anticipated effect is considered to be **minor beneficial direct, permanent and long-term effect**.

Scale and Enclosure

7.179 The main internal areas of the site are open and expansive, though they are typically enveloped by mature rows of trees and hedgerows along boundaries. The proposed development will result in a less open landscape with areas that offer a range of openness and enclosure. Tree and shrub planting to define fairways will create a greater sense of enclosure across all parts of the site, particularly towards the north and west of the site. The structure of proposed vegetation will create and frame a series of long views across fairways. The existing sense of openness is characteristic of the local area, and this will largely be lost. The magnitude of change caused by the development is considered to be moderate adverse and therefore the anticipated effect is considered to be **moderate-minor adverse, direct, permanent and long-term effect**.

Settlement and Built Form

7.180 There are no buildings presently situated within the Site. The proposed development will implement three single storey structures within the north extents of the site and will be associated with the existing urbanising influence of the A259. All proposed buildings will contribute to the function of the golf course and include the club house, a maintenance building and a structure at the head of the practice range. The built form will be designed in a contemporary style, reflecting local material use. The magnitude of change caused by the development is considered to be moderate adverse and therefore the anticipated effect is considered to be moderate-**minor adverse-negligible, direct, permanent and long-term effect**.

Infrastructure

7.181 There is no notable infrastructure within the Site presently. New infrastructure associated with the development will include electricity and other services. The magnitude of change caused by the development is considered to be minor adverse and therefore the anticipated effect is considered to be **minor adverse, direct, permanent and long-term effect**.

Visual Connection

7.182 The existing site provides a setting to Bairds Business Park and the A259 to the north, which separates the site from a similar arable landscape to the north. The site also forms the setting to the Elmer residential area to the south, though dense vegetation belts along the east, west and south boundaries largely contain views from the existing residential area. As a result, this means the site feels largely disconnected from its

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surrounding context. Additional tree planting to the northern boundary and proposed trees and shrubs within the site will alter the character of the setting experienced particularly from the north, changing its shared agricultural character. The magnitude of change is considered to be minor adverse and therefore the anticipated effect is considered to be **minor adverse, direct, permanent and long-term effect**.

Landscape Character

7.183 The site represents a very small part of NCA 126 South Coastal Plain and therefore has very little influence over the overall character of the area. It exhibits characteristics of the NCA such as being part of the coastal plain and being on the fringe of 'significant urban development', however, no key characteristics of NCA 126 would be altered or lost as a result of the proposed development and consequently the NCA would be unaffected. The magnitude of change will be negligible and therefore the anticipated effect is considered to be **negligible**.

7.184 The site sits within the local landscape character type SC9: Chichester to Yapton Coastal Plain. The site exhibits several key characteristics such as being a 'low lying flat landscape', 'meandering rifes', 'low density of hedgerows and hedgerow trees with occasional shelterbelts' and ' large-scale arable farming'. The proposed development will not alter the majority of the defining key characteristics, bar the land use which will change entirely from an arable farming use to a recreational golf course. Key characteristics such as the hedgerows, trees will be extended, and the rife will experience improved management in response to the development. The site represents a small percentage of the wider character areas and most key characteristics will not be altered as a result of the proposed development. The magnitude of change will be minor adverse and therefore the anticipated effect is considered to be **minor adverse.**

7.185 The site is not located within a designated landscape and is therefore considered to be of local and not wider importance. The existing site character is largely rural in character and defined by its agricultural land use, dense belts of vegetation to the boundaries and the presence of the Ryebank Rife that intersects the site. The site also experiences an urbanising influence from the residential area to the south and from the A259 and business park to the north. The proposed design will change aspects of the site's character, most prominently its existing land use and the extent and arrangement of vegetation, altering the existing sense of openness within the site.

7.186 The changes experienced from the proposed development would be permanent in nature and result in a change of character from a rural agricultural setting to a recreational and sport landscape. The magnitude of change will be minor adverse and therefore the anticipated effect is considered to be **minor adverse, direct, permanent and long-term effect**.

7.187 Tables 7.14 and 7.15 summary the predicted magnitude of change and the significance of effects on landscape character.

Table 7.13 Summary of magnitude of change to landscape character at Site B

Receptor/Resources	Summary of Change to Receptor/Resource	Summary Reason
National Character Profile 126	Negligible	The site represents a small part of the character area. No key characteristics of the character area are lost.
Local Landscape Character Type SC9: Chichester to Yapton Coastal Plain	Minor Adverse	The site contains key features of the character area – flat landscape, meandering rifes, hedgerows and shelter belts – that will be retained within the proposed development. The existing land use will change from agricultural to recreational but will retain its rural character.
Site B	Minor adverse	Key characteristics of the site - flat landscape, meandering rifes, hedgerows and shelter belts – will be retained within the development. The existing land use will change from agricultural to recreational but will retain its

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Receptor/Resources	Summary of Change to Receptor/Resource	Summary Reason
		rural character. Change will be of a permanent nature.

Table 7.14 Significance of effect on landscape character at Site B.

Receptor/Resources	Sensitivity	Magnitude of Change	Significance of Effect
National Character Profile 126	Moderate	Negligible	Negligible
Local Landscape Character Type SC9: Chichester to Yapton Coastal Plain	Moderate	Minor Adverse	Minor Adverse
Site B	Moderate	Minor adverse	Minor adverse

Impact on Visual Amenity

7.188 This section considers the visual effects that would arise as a result of the development.

Site A – Redevelopment of existing golf course

Residents

7.189 From the rear of houses and gardens of residential properties aligning the south and east of the site, any view of the golf course would be replaced with views of housing within a mature tree framework. Such views would typically be partial, restricted to roof lines when seen from the ground level and through boundary vegetation defining the gardens and site. Any new housing would be set back from the boundary. The change of view described would apply to residents backing onto the site upon Sutton Close, Golf Links Road, Mid Acre Close, Red Bar Crescent, Wellers Close and Bridger Close. The sensitivity to development of these properties is considered high and the magnitude of change would be moderate. The change is perceived from the rear aspect only, however, these properties would move from an urban edge position to one surrounded by housing in a perceptible way. The significance of the impact is judged to be **major-moderate adverse, direct, permanent and long-term effect**.

7.190 Residents within Downview Road may experience change to the entrance of the site obliquely from the front of house and garden. The development would substitute the car park with an access road and traffic associated with the new housing. The sensitivity to the development of these properties is high, with a minor magnitude of change, as the proposal is congruous with the overriding residential character, realising a **moderate-minor adverse direct, permanent and long-term effect**.

7.191 Views from Salham Way would similarly be oblique. It is not anticipated that the baseline position would change for these residential receptors, owing to the intervening built form and the retention of trees to the southern boundary of the site. The sensitivity of the houses are high, but the magnitude of change and significance of effect is **negligible**.

7.192 A number of properties to the north east of South Bersted may experience distant views of the tree planting within the grounds of the golf club. It is not expected that the built form proposed to the site interior would be perceptible from these viewpoints and therefore the baseline position will not change, with a **negligible** effect.

7.193 The small number of residential properties to the south west of Flansham with a rear view to the site may appreciate a filtered view of new housing, seen beyond the relief road and through existing boundary vegetation. Any new housing would be seen alongside recent residential development and would appear as a natural extension to it. The receptors would have a low sensitivity and the change would be negligible, with a **negligible** effect.

7.194 It is judged that no other resident within the study area would experience a change to their view as a result

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of the development.

Road Users

7.195 Users of Downview Road would receive a direct view of change occurring to the site entrance, with the car park replaced by the primary access road to the residential development. New housing would be visible beyond, partially obscured by the retained clubhouse and seen against neighbouring properties to the east. The magnitude of change is deemed minor, with a **minor adverse, direct, permanent and long-term effect**.

7.196 Several roads within close vicinity of the site can see tree planting within the interior, through and above existing housing. From the roads to the south; Stalham Way and Golf Links Way, it is unlikely that built form within the site would be visible. From roads to the east; Wellers Close and Bridger Close, new housing within the site may be glimpsed through breaks in existing buildings. For both situations the change is minor, realising a **minor adverse, direct, permanent and long-term effect**.

7.197 Whitfield Close and Marylands Crescent, to the edge of South Bersted, would not experience a, as proposed built form is screened from view by existing vegetation to the periphery of the site. The effect would be **negligible**.

7.198 Users of the Felpham Relief Road would experience a dynamic view of the site, obliquely and at speed. Proposed housing within the southern extents of the site would be visible, glimpsed through existing vegetation and seen within the context of recent residential developments. However, the majority of the route would not perceive change. The sensitivity of the receptor is low and the magnitude of change is judged to be minor, with a **minor-negligible adverse, direct, permanent and long-term effect**.

7.199 It is judged that no other resident within the study area would be affected upon by the development.

Public Rights of Way

7.200 PROW FEL/153/6 runs south to north through the centre of the southern section of the site. Structural vegetation framing the current path is predominantly retained, however, the character of the route would fundamentally change from one immersed within the setting of a golf course to that of an urban residential development. The sensitivity of the receptor is high, the magnitude of change is deemed to be major resulting in a **major adverse, direct, permanent and long-term effect**.

7.201 PROW YAP/153/4 continues the path west from the centre of the site. The physical characteristic of the route would remain unchanged, as would the parkland character to the north. Views south, however, would reveal the proposed development and would both reduce the extent of view available and alter the character from parkland to urban edge. The sensitivity of the receptor is high, the magnitude of change is moderate, resulting in **major-moderate adverse, direct, permanent and long-term effect**.

7.202 South of PROW FEL/153/6, FEL/153/5 connects towards Felpham Way. Only views of boundary vegetation are currently available and the development proposals would be screened. There would therefore be no change to this receptor.

7.203 PROW YAP/153/3 crosses the north of the site, within an area that will not be developed. Existing vegetation would be expected to screen views towards the south of the site and proposed housing. No change from the development would be experienced by this receptor.

7.204 PROW YAP/153/1 may experience distant and glimpsed views of development occurring to the south eastern edge of the site, seen heavily filtered through existing boundary vegetation, across farmland, the relief road, and in the context of recent housing. The receptor is moderately sensitive and the magnitude of change would be minor, realising a **minor adverse, direct, permanent and long-term effect**.

7.205 The impact upon YAP/146/3 would be diminished further, as the distance of the receptor increases. The effect would however, remain **minor adverse, direct, permanent and long-term**.

7.206 PROW BET/152/2 would receive filtered views of the development, through existing tree planting to the western edge of the site. Views would continue to be compromised by the mesh fencing to the boundary of the airfield, through which the site is perceived. The development would be seen across the airfield and the

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edge and would introduce housing to the scene, set within a mature vegetative framework. The receptor is deemed moderately sensitive, owing to the urbanising effect of the mesh fencing, and the magnitude of change is judged moderate. The development would have a **moderate-minor adverse, direct, permanent and long-term effect**.

7.207 PROW ALD/152/3 includes a short section with a comparable relationship with the site to that described for PROW BET/152/2. The development would have a **moderate-minor adverse, direct, permanent and long-term effect**.

7.208 A stretch of FEL/154/2 would experience the development, above the boundary of the public open space associated with new housing, replacing the trees and some grassland within the golf club with housing. The context is residential and the PROW is deemed moderately sensitive to development owing to this context. The magnitude of change is judged moderate, with the effect judged to be a **moderate-minor adverse direct, permanent and long-term**.

7.209 It is judged that no other PROW within the study area would be impacted upon by the development

Construction

7.210 The significance of visual effects during construction would also be limited by the factors outlined above. The predominant construction effects are likely to be associated with the visibility of construction equipment and traffic.

7.211 The magnitude of the visual effects of construction may be high at times experienced by the closest visual receptors although temporary in nature and reducing as the development progresses. The overall effects for the majority of receptors would be no more than minor adverse. A small number of receptors would experience a greater effect, occurring within close vicinity of the site and are localised, or for small distances.

Table 7.15 Summary of magnitude of change on visual amenity at Site A.

Receptor	Summary of Change to Receptor/Resource	Summary Reason
Residents of Sutton Close, Golf Links Road, Mid Acre Close, Red Bar Crescent, Wellers Close and Bridger Close	Moderate adverse	Introduction of housing within view – partial view
Residents of Downview Road	Minor adverse	Introduction of housing within view – glimpsed/oblique view
Residents of Salham Way	Negligible	Likely imperceptible change to baseline
Residents of South Bersted	Negligible	Likely imperceptible change to baseline
Residents of Flamsham	Negligible	Likely imperceptible change to baseline
Users of Downview Road	Minor adverse	Introduction of housing to baseline
Users of Stalham Way, Golf Links Way, Wellers Close and Bridger Close	Minor adverse	Introduction of housing to baseline - glimpsed
Users of Whitfield Close and Marylands Crescent	Negligible	Likely imperceptible change to baseline
Users of Felpham Relief Road	Minor adverse	Introduction of housing within view – glimpsed/oblique view
Users of PROW FEL/153/6	Major adverse	Golf course replaced with residential setting
Users of PROW YAP/153/4	Moderate adverse	Golf course replaced with residential setting to one side of route
Users of PROW FEL/153/6 and FEL/153/5	No Change	No change to baseline
Users of PROW YAP/153/3	No Change	No change to baseline

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Receptor	Summary of Change to Receptor/Resource	Summary Reason
Users of PROW YAP/153/1	Minor adverse	Introduction of housing within view – glimpsed/distant
Users of YAP/146/3	Minor adverse	Introduction of housing within view – glimpsed/distant
Users of PROW BET/152/2	Moderate adverse	Introduction of housing within view – glimpsed/distant
Users of PROW ALD/152/3	Moderate adverse	Introduction of housing within view – glimpsed/distant
Users of PROW FEL/154/2	Moderate adverse	Introduction of housing within view

Table 7.16 Significance of visual amenity effects at Site A.

Receptor/Resources	Sensitivity	Magnitude of Change	Significance of Effect
Residents of Sutton Close, Golf Links Road, Mid Acre Close, Red Bar Crescent, Wellers Close and Bridger Close	High	Moderate adverse	Major-moderate adverse
Residents of Downview Road	High	Minor adverse	Moderate-Minor adverse
Residents of Salham Way	High	Negligible	Negligible
Residents of South Bersted	High	Negligible	Negligible
Residents of Flamsham	High	Negligible	Negligible
Users of Downview Road	Moderate	Minor adverse	Minor adverse
Users of Stalham Way, Golf Links Way, Wellers Close and Bridger Close	Moderate	Minor adverse	Minor adverse
Users of Whitfield Close and Marylands Crescent	Moderate	Negligible	Negligible
Users of Felpham Relief Road	Low	Minor adverse	Minor adverse
Users of PROW FEL/153/6	High	Major adverse	Major adverse
Users of PROW YAP/153/4	High	Moderate adverse	Major-moderate adverse
Users of PROW FEL/153/5	High	No Change	No Change
Users of PROW YAP/153/3	High	No Change	No Change
Users of PROW YAP/153/1	High	Minor adverse	Minor adverse
Users of YAP/146/3	High	Minor adverse	Minor adverse
Users of PROW BET/152/2	Moderate	Moderate adverse	Moderate-Minor adverse
Users of PROW ALD/152/3	Moderate	Moderate adverse	Moderate-Minor adverse
FEL/154/2	Moderate	Moderate adverse	Moderate-Minor adverse

Site B – Relocation of Golf Course

Residents

7.212 A number of houses on Sunnymede Close and Acton Way back onto the south of the site. The mature tree planting framing this section of the site would remain and golf course activity, if perceptible, would be heavily

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filtered through this belt of vegetation. This would replace any view existing of the arable field. These receptors have a high sensitivity to change, the magnitude of change would be negligible and impact of the development would also be **negligible**.

7.213 From a small number of residential receptors on Yapton Road there are views towards the site, across an intervening field and associated boundary vegetation, of trees to the edge of site. It is not anticipated that development within the site would be visible from these locations, therefore, the proposals would have no impact. If visible, any change to the interior would be heavily filtered, not the focus of the view and would realise no more than a **negligible** impact.

7.214 It is judged that no other house within the study area would be impacted upon by the development.

Road Users

7.215 Users of Grevatt's Lane would receive a view of change occurring to the site entrance and within. Works to the boundary would include the loss of vegetation associated with the visibility splay and the consequent exposure of the interior of the northern parcel. This would present club facilities to the receptor, including the maintenance compound, car park and clubhouse, within a grassland setting. Existing vegetation would screen sight of the southern parcel. The view of the site would be oblique, fleeting and not the focus of the route. The receptor sensitivity would be low, the magnitude of change moderate and the significance of effect is **minor adverse, direct, permanent and long-term effect**.

7.216 The roads within close proximity to the south of the site would experience no change from the baseline, as intervening built form and boundary vegetation would screen development proposals.

7.217 As from the residential receptors on Yapton Road, discussed above, there would be no view of the development and therefore no visual impact.

7.218 It is judged that no other house within the study area would be impacted upon by the development.

Public Rights of Way

7.219 PROW MOS/165/3 and MOS/165/1 would experience only negligible change for the near full extent of the western boundary, with heavily filtered and oblique views of farmland to the east, replaced with the same of a golf course. The clubhouse may become perceptible during winter months and at close proximity, but this too would be heavily filtered and not the focus of the view. It is deemed that the developmental impact of the proposals upon these sensitive receptors would be no more than minor adverse, owing to the very small area affected and the category of the effect.

7.220 YAP/165/2, would experience a greater degree of change, as it passes in close proximity to the clubhouse and car park, which would both be clearly visible through gaps in vegetation, facilitating access between the two. These features would have an urbanising effect on the route, would represent a moderate adverse magnitude of change, realising a **major-moderate adverse, direct, permanent and long-term effect**.

7.221 PROW MOS/163/2 follows a residential road to the south - The Layne - and would experience impacts the same.

7.222 North of Grevatt's Lane, users of PROW CLI/166/4 would experience views towards the site entrance and the route and facilities beyond. This view, of a golf club, would replace an agricultural boundary. The sensitive receptor would, for a small stretch, experience a moderate magnitude of change and a **major-moderate adverse, direct, permanent and long-term effect**. For the route in its entirety, the change and effect would be **minor and moderate adverse, direct, permanent and long-term** respectively.

7.223 It is judged that no other PROW within the study area would be impacted upon by the development

Construction

7.224 The significance of visual effects during construction would also be limited by the factors outlined above. The predominant construction effects are likely to be associated with the visibility of construction equipment and traffic.

7.225 The magnitude of the visual effects of construction may be high at times experienced by the closest visual

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receptors although temporary in nature and reducing as the development progresses. The overall effects for the majority of receptors would be no more than minor adverse. A small number of receptors would experience a greater effect, occurring within close vicinity of the site and are localised, or for small distances.

Table 7.17 Summary of visual amenity effects at Site B

Receptor	Summary of Change to Receptor/Resource	Summary Reason
Residents of Sunnymede Close and Acton Way	Negligible	Substitute filtered view of farmland with golf course
Residents of Yapton Road	Negligible	Possible filtered distant view of development to interior
Users of Grevatt's Lane	Moderate adverse	View of development to interior
Users of Sunnymede Close, Ancton Way, The Layne, Arundel Way, Elm Drive, Alleyne Way and The Hard	No change	No change to baseline
Users of YaptonRoad	Negligible	Possible filtered distant view of development to interior
Users of PROW MOS/165/3	Minor adverse	Substitute filtered view of farmland with golf course
Users of MOS/165/1	Minor adverse	Substitute filtered view of farmland with golf course
Users of YAP/165/2	Moderate adverse	Introduction of built form along route
Users of MOS/163/2	No change	No change to baseline
Users of PROW CLI/166/4	Minor adverse	Agricultural boundary replaced with view of golf club facilities

Table 7.18 Significance of visual receptor effect for Site B

Receptor/Resources	Sensitivity	Magnitude of Change	Significance of Effect
Residents of Sunnymede Close and Acton Way	High	Negligible	Negligible
Residents of Yapton Road	Moderate	Negligible	Negligible
Users of Grevatt's Lane	Low	Moderate adverse	Minor adverse
Users of Sunnymede Close, Ancton Way, The Layne, Arundel Way, Elm Drive, Alleyne Way and The Hard	High	No change	No change
Users of Yapton Road	Low	No change	No change
Users of PROW MOS/165/3	High	Minor adverse	Minor adverse
Users of MOS/165/1	High	Minor adverse	Minor adverse
Users of YAP/165/2	High	Moderate adverse	Major-moderate Adverse
Users of MOS/163/2	High	No change	No change
Users of PROW CLI/166/4	High	Minor adverse	Moderate adverse

Actionable Mitigation

7.226 There is no actionable mitigation proposed in respect of landscape and visually matters.

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Residual Impact Assessment

7.227 This section identifies residual effects and their significance.

7.228 Residual effects are those that remain following the implementation of the scheme, including the inherent mitigation measures detailed above. These effects are assessed in year 15 and consider the scheme once new planting has established and buildings have weathered.

Impact on Landscape

Site A – Redevelopment of existing golf course

Landform and Drainage

7.229 No further manipulation of levels or drainage will occur, so the residual effects upon landform will remain **negligible**.

7.230 No change to the status of the introduced SuDS would occur and the **minor beneficial** effect would endure.

Vegetation

7.231 Proposed vegetation associated with private gardens, public open space and the site boundaries will reach maturity and contribute to the amenity and ecological value of the site. The retention and enhancement of retained structural tree and shrub planting in conjunction with the maturing of proposed vegetation would result in a **minor beneficial** effect on vegetation.

Land Use and Pattern

7.232 The loss of the golf course and its recreational use would be permanent and will not be recovered. Therefore, residual effects are considered to remain **moderate adverse**.

Circulation

7.233 The proposed footpaths and internal road network would be a permanent feature of the site. Therefore, residual effects are considered to **negligible**.

Scale and Enclosure

7.234 As landscaping matures, a greater sense of enclosure will be achieved within the site, however, the effect would remain minor adverse.

Settlement and Built Form

7.235 The proposed buildings on site will still exist and will not have evolved since implementation. Therefore, residual effects are considered to remain moderate-**minor adverse**.

Infrastructure

7.236 The proposed infrastructure and services associated with the residential development will still exist and will not have evolved since implementation. Therefore, residual effects are considered to remain moderate-**minor adverse**.

Visual Connection

7.237 Additional tree planting to the western and northern boundary of the site will have matured and will have altered the experience and extent of visibility into the site from neighbouring sites, however, the residual effect will remain negligible.

Landscape Character

7.238 Key characteristics of NCA 126 South Coastal Plain will still remain unaltered or lost as a result of the development and therefore the effect of the development is still judged to be **negligible**.

7.239 Key characteristics of local landscape character type SC9: Chichester to Yapton Coastal Plain will remain

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unaltered within the site. The proposed buildings and development on site will remain and permanently reduce the existing gap between development at Felpham and Bognor. As a result, the residual effects are considered to remain **minor adverse**.

7.240 Aspects of the site's character that changed at implementation of the proposed development will still be altered. Increased urbanisation of the site would be evident; however existing mature vegetation on site and the maturation of proposed vegetation would soften the built form, reducing the impression of the scale and mass. Therefore, residual effects are considered to remain **moderate-minor adverse**.

Site B – Relocation of golf course

Landform and Drainage

7.241 No further manipulation of levels or drainage will occur, so the residual effects upon landform will remain negligible.

7.242 No change to the status of the introduced SuDS would occur and the **minor beneficial** effect would endure.

Vegetation

7.243 The maturation of the proposed native vegetation associated with the design of the golf course and layout of the fairways, would result in a in a **moderate-minor beneficial** effect.

Land Use and Pattern

7.244 The loss of the arable field and its agricultural use would be permanent and will not be recovered. Therefore, residual effects are considered to remain moderate-**minor adverse**.

Circulation

7.245 The proposed vehicular access and car parking areas will still exist and will not have evolved since implementation. Therefore, residual effects are considered to remain **minor beneficial-negligible**.

Scale and Enclosure

7.246 With the maturation of proposed vegetation, a greater sense of enclosure will be achieved within the site, resulting in a moderate-**minor adverse** effect.

Settlement and Built Form

7.247 The proposed buildings on site will still exist and will not have evolved since implementation. Therefore, residual effects are considered to remain moderate-**minor adverse**.

Infrastructure

7.248 The proposed infrastructure and services associated with the proposed development will still exist and will not have evolved since implementation. Therefore, residual effects are considered to remain **minor adverse**.

Visual Connection

7.249 Additional tree planting to the northern and north eastern boundary of the site will have matured and will have altered the experience and extent of visibility into the site from the A259 and beyond, resulting in a **negligible** effect.

Landscape Character

7.250 Key characteristics of NCA 126 South Coastal Plain will still remain unaltered or lost as a result of the development and therefore the effect of the development is still judged to be **negligible**.

7.251 Key characteristics of local landscape character type SC9: Chichester to Yapton Coastal Plain will remain unaltered by the proposed development. The loss of arable land use will be permanent and will not be recovered. Therefore, the effect of the development is still judged to be **negligible**.

7.252 Aspects of the site's character that changed at implementation of the proposed development will still be altered. Proposed native vegetation will have matured, reducing the sense of openness and further altering

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the character of the site. Therefore, residual effects are considered to remain **minor adverse.**

Impact on Visual Amenity

Site A – Redevelopment of existing golf course

7.253 Once landscape planting has been successfully implemented the vast majority of visual receptors within the study area would experience either improvements to or no material change in their view.

7.254 For residents backing onto the site within Sutton Close, Golf Links Road, Mid Acre Close, Red Bar Crescent, Wellers Close and Bridger Close, built elements within the view would have weathered and planting associated with the development would have matured, aiding integration of the proposals with the view. The residual effect, however, would remain categorised as **major-moderate** adverse.

7.255 Planting associated with the entrance and public open space beyond would have matured to soften and screen the built form north of the clubhouse. The magnitude of change would reduce to negligible, realising a residual effect of **negligible** also.

7.256 Residents of Salham Way, South Bersted and Flamsham would continue to experience **negligible** impacts from the development.

7.257 The maturing of vegetation within the south of the site, as appreciated by residents on Downview Road, will similarly benefit the experience of road users, reducing the development effect to **negligible**.

7.258 Users of Salham Way, Golf Links Way, Wellers Close and Bridger Close would continue to experience **minor adverse** effects from the development, despite the weathering of housing within any view.

7.259 Users of Whitfield Close and Marylands Crescent would continue to experience **negligible** effects from the development.

7.260 Users of Felpham Relief Road would continue to experience **minor adverse** effects from the development, despite the maturing of bolstered boundary planting to the east of the site.

7.261 Planting associated with the proposals would mature, soften and filter views of the housing, aiding integration within any scene. The experience of PROW FEL/153/6 would therefore improve over time. However, the change from baseline situation still be categorised as major, realising a residual impact of major adverse upon the receptor. Similarly, whilst the situation would subtly improve over time from the route of PROW YAP/153/4, the fundamental shift in character would remain and therefore the residual impact of the scheme is **major-moderate** adverse.

7.262 PROW FEL/153/5 would continue to experience no change to the baseline situation.

7.263 The ecological enhancements described in Chapter 8, including tree planting, would have matured to provide a richer environment and screening of the relief road, for the benefit of users of PROW YAP/153/3. This would realise a **minor beneficial effect** upon this receptor.

7.264 PROW YAP/153/1 and YAP/146/3 would continue to experience a **minor adverse** effect from the baseline situation, as filtered views to the development remain.

7.265 The planting to the west of the site would have matured to offer complete screening of the proposed housing from PROW BET/152/2. This would achieve a negligible magnitude of change from the baseline situation and a **negligible** effect on this receptor. Views from FEL/154/2 of housing would similarly be obscured by tree planting, realising a **negligible** residual impact.

7.266 From the stretch of FEL/154/2 with visibility of the site, the maturing vegetation would soften, filter and screen the new housing, reducing the magnitude of change to minor and the effect of the development to **minor adverse**.

Table 7.19 Residual landscape effects at Site A.

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Receptor/Resources	Significance of Effect	Landscape maturing 15 years	Residual Effect
Residents of Sutton Close, Golf Links Road, Mid Acre Close, Red Bar Crescent, Wellers Close and Bridger Close	Major-moderate Adverse	Management of landscape	Major-moderate Adverse
Residents of Downview Road	Moderate-Minor adverse	Management of landscape	Negligible
Residents of Stalham Way	Negligible	Management of landscape	Negligible
Residents of South Bersted	Negligible	Management of landscape	Negligible
Residents of Flamsham	Negligible	Management of landscape	Negligible
Users of Downview Road	Minor adverse	Management of landscape	Negligible
Users of Stalham Way, Golf Links Way, Wellers Close and Bridger Close	Minor adverse	Management of landscape	Minor adverse
Users of Whitfield Close and Marylands Crescent	Negligible	Management of landscape	Negligible
Users of Felpham Relief Road	Minor adverse	Management of landscape	Minor adverse
Users of PROW FEL/153/6	Major adverse	Management of landscape	Major adverse
Users of PROW YAP/153/4	Major-moderate adverse	Management of landscape	Major-moderate adverse
Users of PROW FEL/153/5	No Change	Management of landscape	No Change
Users of PROW YAP/153/3	No Change	Management of landscape	Minor beneficial
Users of PROW YAP/153/1	Minor adverse	Management of landscape	Minor adverse
Users of YAP/146/3	Minor adverse	Management of landscape	Minor adverse
Users of PROW BET/152/2	Moderate-Minor adverse	Management of landscape	Negligible
Users of PROW ALD/152/3	Moderate-Minor adverse	Management of landscape	Negligible
FEL/154/2	Moderate-Minor adverse	Management of landscape	Minor adverse

Site B – Relocation of golf course

7.267 Once landscape planting has been successfully implemented the vast majority of visual receptors within the study area would experience either improvements to or no material change in their view.

7.268 The impact upon residents of Sunnymede Close, Acton Way and Yapton Way would remain negligible, as effective vegetative screening of the site would remain in place.

7.269 For users of Grevatt's Lane the impact from the development would improve, as vegetation matures to soften the entrance and screen the interior of the site. The magnitude of residual change would be minor and the

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impact would be **minor adverse**.

7.270 For users of Sunnymede Close, Ancton Way, The Layne, Arundel Way, Elm Drive, Alleyne Way, The Hard and Yapton Road, the residual effect would remain no change, as the site would remain screened from any view.

7.271 The effect upon users of PROW MOS/165/3 and MOS/165/1 would remain **minor adverse**, as the relationship with the subtle changes to the baseline would stay the same over time.

7.272 For users of YAP/165/2, the residual impact would remain major-moderate adverse, despite experiencing a subtle improvement to the setting as planting matures to soften the aligning facilities.

7.273 For users of PROW MOS/163 the residual effect would remain **negligible**, owing to the retention of existing vegetation.

7.274 From PROW CLI/166/4, the magnitude of change would diminish over time, as the boundary to the site developed, appearing consistent with neighbouring fields, whilst also screening the interior to the site. The magnitude of change from the baseline position would be neglible, when considering the route, realising a minor adverse impact from the development.

Table 7.20 Residual landscape effects at Site B.

Receptor/Resources	Significance of Effect	Landscape maturing 15 years)	Residual Effect
Residents of Sunnymede Close and Acton Way	Negligible	Management of landscape	Negligible
Residents of Yapton Road	Negligible	Management of landscape	Negligible
Users of Grevatt's Lane	Minor adverse	Management of landscape	Minor adverse
Users of Sunnymede Close, Ancton Way, The Layne, Arundel Way, Elm Drive, Alleyne Way and The Hard	No change	Management of landscape	No change
Users of Yapton Road	No change	Management of landscape	No change
Users of PROW MOS/165/3	Minor adverse	Management of landscape	Minor adverse
Users of MOS/165/1	Minor adverse	Management of landscape	Minor adverse
Users of YAP/165/2	Major-moderate Adverse	Management of landscape	Major-moderate adverse
Users of MOS/163/2	No change	Management of landscape	No change
Users of PROW CLI/166/4	Moderate adverse	Management of landscape	Minor adverse

Cumulative Effects

7.275 This Section identifies and assesses the nature, extent, magnitude and significance of inter-project effects (i.e., effects from other development in combination with those from the proposed development).

7.276 This section assesses the likely significant effects of development upon the landscape and visual amenity when considered in the context of the potential development sites within the boundary of the study area. The sites considered within this cumulative assessment are summarised below. In addition, the cumulative effects of developing Site A and Site B together are considered.

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Allocation SD5

7.277 The land is currently agricultural and is located to the south of Barnham, approximately 1.5km north west of Site A. The allocation within the local plan is for 2,300 residential units within the plan period and up to 3000 in total. The site falls within the study area of Site A only.

Allocation SD7

7.278 The land is currently agricultural and is located to the south west of Yapton, approximately 1km north west of Site B. The allocation within the local plan is for 300 dwellings and there is currently Outline and Reserved Matters approval covering landscape, layout, scale & appearance. The site falls within the study area of Site B only.

Allocation SD8

7.279 The land is currently agricultural and is located to the eastern edge of Yapton, approximately 650m north west of Site B. There is an allocation within the local plan and currently an outline planning application for up to 1500 dwellings, a 60 bed care home, 9000 sqm of employment, a local centre, a primary school and public open space. The site falls within the study area of Site B only.

Allocation SD10

7.280 The land is currently agricultural land and is located the south of Climping, approximately 350m north of Site B. The allocation within the local plan is for 300 dwellings and there is currently Outline and Reserved Matters approval in place. The site falls within the study area of Site B only.

Site A – Redevelopment of existing golf course

Impact on Landscape

7.281 Only a single arable field within Allocation SD5 occurs within the study area of Site A. The field is defined by Lidsey Road to the west and a rural lane to the north and lies amongst farmland and opposite a caravan park. There are no formal plans in place for the development of this site, however, it is allocated for residential units and will therefore be housing or associated landscape and/or infrastructure.

7.282 The potential development outlined above also sits within those occupied by Site A; NCA 126 and SC9.

7.283 For NCA 126 the effect of the development of Site A was considered to be negligible. Owing to the scale of the combined proposals and the nature of the receiving environment, the cumulative effect upon this character area would remain the same.

7.284 The development of Site A incurs a minor adverse effect upon local landscape character type SC9, in part, owing to the limited number of key characteristics exhibited within the baseline condition and the retention of those present within the development proposals. The development of Allocation SD5 would additionally reduce the open character of the study area, whilst also replacing farmland with residential. Owing to the small scale of change within the study area and the visual disconnection of the two sites, the cumulative effect of this development with Site A would be no more than minor adverse.

7.285 Site B occurs outside of the study area for Site A and would contribute no cumulative effects.

Impact on Visual Amenity

7.286 Allocation SD5 occurs to the northern edge of the study area for Site A and the study area of Site B overlaps with the eastern edge of Site A.

7.287 There is no intervisibility between any of the sites and it is not anticipated that any receptor would be able to view any combination of sites from a single location within the study area. Nor would the developments be experienced in sequence along commonly travelled routes or within a meaningful time period. Even where experienced in succession, each development would appear sufficiently distinct from one another and both Site A and Site B would appear congruous to and settled within their landscape context. There would therefore be negligible cumulative visual impact as a result of each of the described developments occurring together.

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Site B – Relocation of Golf course

Impact on Landscape

7.288 Allocation SD7, SD8 and SD10 all occur to the urban edge of Yapton and Climping, to the north and north east of Site B. All are farmland proposed for housing, to extend the neighbouring villages. This would have the effect of enlarging the villages and diminishing the agricultural setting and openness of the study area.

7.289 These potential development fall ithin NCA and SC9, alongside Site B.

7.290 For NCA 126 the effect of the development of Site B was considered to be negligible. Owing to the scale of the combined proposals and the nature of the receiving environment, the cumulative effect upon this character area would remain the same.

7.291 The development of Site B incurs a minor adverse effect upon local landscape character type SC9. Whilst the agricultural land use characteristic of the local area would be substituted for recreation and road improvements and built form introduced to the site would contribute some urbanizing features, the vegetative framework and relative openness would remain.

7.292 The development of Allocation SD7, SD8 and SD10 would additionally reduce the agricultural content, whilst expanding urbanization within the local character area. Combined the development of these allocations and Site B would realise a minor adverse magnitude of change upon SC9 and a minor adverse effect.

7.293 Site A occurs outside of the study area for Site B and would contribute no cumulative effects.

Impact on Visual Amenity

7.294 The allocations occur to the northern edge of the study area for Site B and the study area of Site A overlaps with the western edge of the study areas for Site B. It is not anticipated that there would be intervisibility between Site B and the allocations and it is not possible to see any element of Site B from Site A. Similarly, there is no receptor within the study area that would experience the combination of sites and the changes within, owing to intervening vegetation screening sites. Therefore, the effects recorded for each receptor would remain the same.

7.295 Experienced as a sequence, from local PROWs and roads, the housing allocations and Site B experienced within a journey would lead to the perception of an increasingly urbanized area. This would not, however, lead to the recategorization of the effects incurred by any one route.

Summary

Impact on Landscape

Site A – Redevelopment of existing golf course

7.296 The development would result in minimal manipulation of levels and the effect on landform is considered to be neutral. Through the introduction of SuDS the development would realise a **slight beneficial** effect on drainage.

7.297 Existing vegetation within the site includes belts of trees and shrubs along stretches of the site boundary and strong avenues of trees and shrubs characterise the site interior. Vegetation would be predominantly retained, with improved management and supplemented with areas of new planting to add screening and define areas of public open space. The maturation of the proposed vegetation associated with gardens, public open space and field boundaries, in conjunction with the retention and enhancement of retained structural planting would result in a **minor beneficial** effect on vegetation.

7.298 The development would result in a total change of land use from recreational golf course to a mix of residential use and public open space. The amount of built form on site would increase and become a prominent feature within the site realising a **moderate adverse** and **moderate-minor adverse** effect on land use and built form respectively.

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7.299 The creation of proposed footpaths and roads within the site will significantly increase the amount of formal circulation, realising a negligible effect. In addition, the implementation of infrastructure such as utilities and services associated with the introduction of dwellings to the site would result in a **moderate-minor adverse** effect.

7.300 The existing sense of scale and enclosure is defined by the rows of mature trees and hedgerows along the site boundary and within the site interior. The majority of vegetation would be retained and the addition of new planting and development will strengthen the existing sense of enclosure and long internal views in the west and north of the site. Additionally, this will impact on local visual connections into the site, where the extent of visibility into the site as a setting for adjacent land will be reduced. The change to scale, enclosure and visual connection is considered to be **minor adverse**.

7.301 At a site level the whole landscape is being developed and would largely change in character. The development would result in a change from the recreational landscape of the golf course to a mix of residential and public open space, expanding the existing character to the south and east of the site. Aspects of the site character such as the clumps of mature vegetation will be retained and strengthened through the development, whilst some openness would be lost. At a site level, the effects of the development are considered to be **moderate-minor adverse**.

7.302 The site represents a small area of local landscape character type SC9: Chichester to Yapton Coastal Plain and therefore has little influence over the overall character of the area. Impacts on the local landscape character area are considered to be **minor adverse**.

7.303 The site represents a small area of NCA 126 South Coast Plain and therefore has little influence over the overall character of the area. Impacts on the National Character Area are considered to be **negligible**.

Site B – Relocation of golf course.

7.304 The development would result in minimal manipulation of levels and the effect on landform is considered to be neutral. Through the introduction of SuDS the development would realise a **slight beneficial** effect on drainage.

7.305 Existing vegetation within the site consists of dense belts of native dense belts of mature native trees and shrubs along its boundaries, between field parcels and along Ryebank Rife. Existing vegetation will be retained with improved management and supplemented with extensive areas of new planting to add screening and define the structure of fairways within the development. The maturation of this vegetation in conjunction with the retention and enhancement of retained structural planting would result in a **moderate-minor beneficial** effect on vegetation.

7.306 The development would result in a total change to land use, substituting agricultural land for a recreational and sporting use. The change in land use is considered to be a **moderate-minor adverse** effect.

7.307 Presently, there is no built form or infrastructure on the site and therefore both landscape features will increase as a result of the proposed development. Three buildings will be created to support the function of the development as a golf course and vehicular access and car parking will be constructed to provide access. New built form will be designed to match the vernacular style of existing settlements. The anticipated effect is considered to be **moderate-minor adverse**.

7.308 The existing site is open and expansive internally, with strong belts of mature vegetation along the boundary lines. The open character of the site, characteristic of the local area, will change due to the introduction of various belts of vegetation to define the golf course structure within the site interior. The addition of new vegetation will alter the visual connection and experience of the site from the neighbouring landscape, particularly from the north, changing the shared agricultural character. The anticipated effect on scale and enclosure is considered to be moderate-minor adverse and the effect on visual connection is considered to be **negligible**.

7.309 At a site level the whole landscape is being developed and would largely change in character. The development would result in complete change from an agricultural, rural landscape to a recreational and sporting landscape, disconnecting the site from its shared character with land to the east, west and north. Aspects of the site

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character such as the belts of mature vegetation and Ryebank Rife will be retained and strengthened through the development. At a site level, the effects of the development are considered to be **minor adverse**.

7.310 The site represents a small area of local landscape character type SC9: Chichester to Yapton Coastal Plain and therefore has little influence over the overall character of the area. Impacts on the local landscape character area are considered to be **minor adverse**.

7.311 The site represents a small area of NCA 126 South Coast Plain and therefore has little influence over the overall character of the area. Impacts on the National Character Area are considered to be **negligible**.

Impact on Landscape - Cumulative

7.312 The fringe of a housing allocation, SD5, occurs to the north of the study area of Site A, but would realise no cumulative effect.

7.313 The development of Allocations SD7, SD8 and SD10 alongside Site B would further reduce the agricultural content of the study area, a defining characteristic of SC9, in favour of increased urbanisation. The developments combined would result in a **minor adverse** effect upon the local character area SC9.

Impact on Visual Amenity

Site A – Redevelopment of existing golf course

7.314 The site has a visual envelope, predominantly shaped by the existing urban edge of Felpham and South Bersted, the bridge associated with Felpham Relief Road and the substantial structural vegetation found within the site and the local context. Views experiencing the site and change are limited to receptors within the site and the vicinity of. These include houses defining the south and east site boundaries, PROW running through and within close range of the site and the Felpham Relief Road, travelling parallel to the east.

7.315 A number of residents of Sutton Close, Golf Links Road, Mid Acre Close, Red Bar Crescent, Wellers Close and Bridger Close would experience major-moderate adverse effects, as housing is introduced to the rear of properties, replacing views of the golf club. A small number of residents on Downview Road may appreciate a moderate-minor adverse impact as a consequence of the development to the main access. This would diminish to a negligible impact by year 15. The remaining residential receptors would receive no more than a **negligible** impact from the development.

7.316 A small number of roads would experience a minor adverse impact, resulting from the introduction of additional housing into the scene, including Downview Road, Stalham Way, Golf Links Way, Wellers Close, Bridger Close and Felpham Relief Road. Receptors on Downview Road would experience negligible change by year 15. Users of Whitfield Close and Marylands Crescent would appreciate negligible impact and the remaining roads within the study area would see no change from the development.

7.317 At implementation there is one major adverse impact, experienced by users of the PROW FEL/153/6, running through the centre of the site. Users of this route will see the golf course setting replaced with a new residential extension. The connecting section of PROW, YAP/153/4 would be major-moderate adversely impacted, as a single side of the route is substituted in the same fashion. Three PROWs beyond the fringe of the site, BET/152/2, ALD/152/3 and FEL/154/2 would see moderate-minor adverse impact, with the introduction of housing into the scene, at mid distance and filtered. The impacts for each would reduce to negligible, negligible and minor adverse, respectively, by year 15 with the maturing of intervening vegetation. The remaining PROW receptors would experience no more than minor adverse impacts, with the majority of routes within the study area seeing either negligible effect or no change from the baseline.

Site B – Relocation of golf course.

7.318 The site has a visual envelope, predominantly shaped by the existing urban edge of Elmer and substantial belts of tree and structural planting, within the site, framing it, and within the local context. Views experiencing the site and change are limited to receptors within the site and the vicinity of. These include houses defining the southern boundary, PROW running through and within close range of the site and Grevatt's Road travelling parallel to the north.

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7.319 No residential receptor within the study area would experience more than a negligible effect from the development, including those aligning the southern boundary of the site upon Sunnymede Close and Acton Way, owing to the dense boundary vegetation defining the site.

7.320 Users of Grevatt's Lane would see a minor adverse impact from the development, resulting from the reconfiguration of the access road to the site and the framing of introduced elements within the interior. Users of Sunnymede Close, Ancton Way, The Layne, Arundel Way, Elm Drive, Alleyne Way, The Hard and Yapton Road would experience no change from the development. No additional receptor within the study area would be impacted.

7.321 Users of PROW MOS/165/3 and MOS/165/1 would both experience minor adverse impacts from the development from the introduction of the clubhouse, which may be perceptible from the route. YAP/165/2 would see **major-moderate adverse** impact owing to the proximity of the clubhouse and the addition of associated golf facilities within a former agricultural setting.

7.322 CLI/1666/4 would initially experience a moderate adverse impact from the development, as views from the route allowed appreciation of the built form and infrastructure proposed to the site, alongside a diminishment to the planted boundary. Once the planted boundary has matured, the site will be screened in the main, reducing the impact of the development to **minor adverse**. There are no other PROW receptors within the study area that would experience adverse impacts.

Impact on Visual Amenity - Cumulative

7.323 The combined development of Allocation SD5, with Site A and B, would realise no cumulative visual impact, owing to the lack of intervisibility between sites and receptors within the study area.

7.324 No one receptor would experience a cumulative effect of the multiple developments proposed within relatively close vicinity of Site B, due to intervening vegetation screening the various sites. However, it would be possible to journey between the sites using local PROWs and roads, leading to the impression of an increasingly urbanised study area. This would not, however, lead to the recategorization of the effects incurred by any one route.

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8 ECOLOGY

Introduction

8.1 This Chapter of the ES evaluates the environmental effects of the proposed development on the ecology and biodiversity assets within the Sites and surrounding area.

8.2 This Chapter is not intended to be read as a standalone assessment and reference has been made to specific figures (*Figures 8.1 – 8.8*) and reports within the Appendices (*Appendices 8.1 – 8.9*), which provide a more detailed specific evaluation.

Potential Effects

8.3 This section summarises the likely potential effects of the proposed development on the environmental topic area.

8.4 The proposed development has the potential to have the following effects on Important Ecological Features (IEF):

- Direct loss of habitats and associated flora and fauna within Site boundaries;
- Decrease in the importance of ecological features through reduction in the structure and function of habitats and dependant fauna;
- Fragmentation of habitat connectivity;
- Indirect impacts on retained vegetation within and bordering both Sites, through increase in disturbance, such as local changes in the soil structure, nutrient status and / or hydrology;
- Disturbance causing displacement of protected or notable species from Sites and surrounding areas;
- Creation of new habitats; and
- Beneficial impacts arising because of the favourable long-term management of ecological features within Site.

Assessment Methodology

8.5 The section describes the methodology used to undertake the assessment within this Chapter.

8.6 The approach to assessment of the ecological impacts accords with current guidance and best practice. This includes baseline studies to establish the extent of IEF within or in proximity to both Sites (designated sites for conservation importance, flora and fauna), the classification of the importance of the identified ecological features, and an assessment of the potential effects of the proposed developments on the IEF. Measures to avoid, reduce and mitigate the impact along with any enhancements to the Sites are also described.

Study Area

8.7 Site A refers to all land within the red line boundary as shown in *Figure 8.1* and Site B refers to all land within the redline boundary shown in *Figure 8.5*.

8.8 A 15km search area for European designated sites; a 2km search of nationally designated sites and a 1km search for non-statutory designated sites and legally protected and notable species has been undertaken. While it was not possible to fully survey third party land immediately adjacent to the red line boundaries, these were considered when making any assessments, particularly in the functionality of corridors of movement for fauna.

Consultation

8.9 To compile existing baseline information, relevant ecological information was obtained from Sussex

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Biodiversity Record Centre (SBRC) and the Multi-Agency Geographic Information for the Countryside (MAGIC) online resource (www.magic.gov.uk).

Legislative / Planning Policy Context

8.10 The relevant legislation, policy and guidance are listed below, with details provided in *Appendix 8.1*.

Legislative Framework

8.11 The relevant legislative framework for ecological and biodiversity considerations comprises:

- The Habitat Directive 1992[15];
- The Conservation of Habitats and Species Regulations 2019 (Amendment) (EU Exit)[16];
- The Wildlife and Countryside Act (WCA) 1981 (as amended)[17];
- The Countryside and Rights of Way (CRoW) Act 2000 (as amended)[18];
- The Natural Environment and Rural Communities (NERC) Act 2006[19];
- The Protection of Badgers Act 1992[20];
- Environmental Act (2021)[21]; and
- The Hedgerow Regulations (REGS) 1997 (as amended)[22].

Planning Policy

8.12 The applicable planning policy is summarised as follows:

- The National Planning Policy Framework (NPPF) 2021[23]
- The National Planning Policy Guidance[24]
- Arun Local Plan 2011 – 2031 (July 2018)[25] (including the following policies: ENV SP1 Natural Environment, ENV DM1 Designated Sites of biodiversity or geological importance, ENV DM2 Pagham Harbour, ENV DM3 Biodiversity Opportunity Areas, ENV DM4 Protection of trees and ENV DM5 Development and biodiversity).
- Arun District Council Supplementary Planning Documents[26]
- Felpham and Yapton Neighbourhood Plan[27]

Assessment Process

8.13 This Assessment has been undertaken in accordance with the ecological impact assessment guidelines published by Chartered Institute of Ecological and Environmental Management's Guidelines for Ecological Impact Assessment (2018)[28].

8.14 All reference to 'the Site' refers to all land within the redline boundary identified for Site A and B, which are

[15] Act of Parliament. (1992). The Habitats Directive 1992, London: HMSO
[16] Act of Parliament, (2019). The Conservation of Habitats and Species Regulations (Amendment) (EU Exit) 2019, London: HMSO
[17] Act of Parliament, (1981). The Wildlife and Countryside Act 1981 (as amended). London: HMSO
[18] Act of Parliament, (2000). The Countryside and Rights of Way Act 2000, London: HMSO
[19] Act of Parliament, (2006). The Natural Environment and Rural Communities Act 2006. London: HMSO
[20] Act of Parliament, (1992). Protection of Badgers Act 1992. (c.51) London: HMSO
21 Act of Parliament , (2012) Environment Act. https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted
[22] DEFRA (1997). The Hedgerow Regulations. DEFRA
[23] Ministry of Housing Communities & Local Government (July 2021). National Planning Policy Framework.
[24] https://www.gov.uk/government/collections/planning-practice-guidance
[25] Adoption Arun Local Plan 2011 – 2031 (July 2018) Arun District Council
[26] Supplementary Planning Documents, Arun Council [ONLINE] Accessed at: https://www.arun.gov.uk/supplementary-planning-documents-spds
[27] Felpham Neighbourhood Plan (December 2013) [ONLINE] Accessed at: https://felphampc.gov.uk/media/6705/felpham-reg-19-post-examination-modifications.pdf
[28] Chartered Institute of Ecology and Environmental Management (CIEEM) (2018). Guideline for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal

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in Figures a *Figure 8.3* and *Figure 8.7*.

8.15 The activities associated with the construction and implementation of the Proposed Development are described in Chapter 3, together herewith the likely range within which their influence will be felt, given the nature of the habitat/area. The ecological features, which may be affected by such activities have been evaluated within a geographical framework, which is based on the ecological status of the features, but which also reflect a wide range of legislation and governmental guidance.

8.16 Field surveys and desk studies identify 'Important Ecological Features', which are further assessed within a geographical context of European/International, National, Regional, County and Local. To these has been added a Site level value which relates to a more restricted area of low importance. The geographical context used as a frame of reference when evaluating ecological features is outlined in *Table 8.1*

Table 8.1 Definitions of importance within geographical context for ecological features

Geographical Frame of Reference	Typical Descriptions
International	• High to very high importance • An internationally designated site or candidate site (SPA, pSPA, SAC, cSAC, pSAC, Ramsar site) • A viable area of a habitat type listed in Annex I of the Habitats Directive or smaller areas of such habitat which are essential to maintain the viability of a larger whole. • Any regularly occurring population of an internationally important species. • A regularly occurring, nationally significant population / number of any internationally important species.
National	• High importance • A nationally designated site (SSSI, NNR, Marine Nature Reserve) or a discrete area, which meets the published selection criteria for national designation (e.g. SSSI selection guidelines) irrespective of whether or not it has yet been notified. • A viable area of a priority habitat identified as qualifying as habitat of principal importance under the NERC Act 2006 or smaller areas of such habitat which are essential to maintain the viability of a larger whole. • Any regularly occurring population of a nationally important species which is threatened or rare in the region or county (local BAP). • A regularly occurring, regionally or county significant population / number of any nationally important species.
Regional	• Medium to High importance • Viable areas of key habitat identified in the Regional BAP or smaller areas of such habitat which are essential to maintain the viability of a larger whole. • Viable areas of key habitat identified as being of Regional value. • A regularly occurring, locally significant number of a regionally important species. • Sites which exceed the County-level designations but fall short of SSSI selection guidelines, where these occur.
County	• Medium importance • Semi-natural ancient woodland greater than 0.25 ha. • County sites and other sites which the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves selected on County ecological criteria (County sites will often have been identified in local plans). • A viable area of habitat identified in County BAP. • Any regularly occurring, locally significant population of a species which is listed in a County/Metropolitan "red data book" or BAP on account of its regional rarity or localisation. • A regularly occurring, locally significant number of a County important species.
Local	• Low importance

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Geographical Frame of Reference	Typical Descriptions
	• Areas of habitat considered to appreciably enrich the habitat resource within the context of the Parish or neighbourhood (e.g. species-rich hedgerows). • Local Nature Reserves (LNR) selected on Parish ecological criteria.
Site	• Very low importance • Habitats or species of value within the context of the site or lands immediately adjacent to the development.

Assessment Criteria

8.17 The assessment of the effects of the Proposed Development on the IEFs takes account of those that occur on-site, those that may occur adjacent and those more distant. Examples of potential impacts include, but are not restricted to: loss; damage; pollution, and severance of habitats; environmental changes (e.g. hydrology and air quality); and effects from those impacts may include isolation, disturbance and killing or injury of fauna. Impacts and their effects can be permanent or temporary.

8.18 If a potential effect resulting from or to the proposed development is classified as either moderate or major, it is considered a significant effect. As such mitigation and/or management measures are then prescribed to reduce/offset these to acceptable levels, ensuring that the proposed development meets national and local planning policy (by avoiding 'significant harm to biodiversity' and delivering a proportionate net biodiversity gain).

8.19 The criteria for assessing the environmental effects on IEFs are detailed within Chapter 4. The only difference is with regards to the duration which in this instance follows the CIEEM methodology:

- Short or long-term – CIEEM states that the duration should be defined in relation to the ecological characteristic, such as lifecycle or species, as well as human timeframe. For example, five years might be short term for long lived mammals such as humans, but this could be a number of generations for invertebrate species.

8.20 Once an effect is considered to be significant, the scale of the effect is assessed on a geographic scale (i.e. international, national, regional, county, local etc.). For example, an effect may not be significant at a county scale but significant at the local scale.

Sources on Information

8.21 Details of sources for information for flora and fauna are provided in specific reports in *Appendices 8.2 – 8.11*. This consists of consultations and field surveys.

8.22 Reference has also been made to Ecological Impact Assessments and other ecology reports prepared in conjunction with other development proposals in this location listed in Chapter 4, particularly those within close proximity.

Assumptions

8.23 The potential effects arising as a result of the Proposed Developments have been reviewed in order that, where possible, potential adverse effects upon IEFs can be avoided or minimised to the greatest extent. This has been achieved through a well-considered arrangement of Green Infrastructure (GI) within the Proposed Developments, which is particularly relevant for Site A, where residential dwellings are proposed. Site B differs slightly as development consists of a golf course with no residential development; providing additional opportunities for IEF to be retained, incorporated, enhanced and created. The assumption is that the development will be undertaken with these design principles as detailed within the parameters plan for each Site

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Limitations

8.24 Specific survey limitations are addressed in the associated survey reports. The existing data is sufficient to determine the potential effect on IEFs of the Proposed Developments. Species lists should not be regarded as exhaustive and the absence of evidence of species does not necessarily mean that it is not present within the Site. Sufficient information was obtained to determine broad habitat types present and their relative ecological value, and therefore this is not considered to be a limitation to the assessment.

8.25 The redline boundary for Site B was extended in November 2021 to include an arable field to the north-west of the Site; with the exception of wintering bird, badgers and phase one surveys; further protected/notable species surveys were absent. However, based on the habitat available and knowledge of the wider Site, evidence of existing baselines within the wider Site were used to assess the newly added north-western field's suitability to support IEFs.

Baseline Conditions

8.26 The section provides more detailed topic specific information to describe the character of Sites A and B and their environs. This describes the quality of the interests as they relate to this environmental topic and serves as a comparative measure against which changes arising from the construction and operational phases of the proposed development can be assessed or predicted. This identifies the sensitivity of environmental receptors.

Site A – Redevelopment of existing golf course

8.27 The following section provides the results of desk searches for sites of nature conservation interest and records of protected, rare or otherwise notable species, which can be seen in *Figure 8.1 and Figure 8.2*. The baseline also includes species specific surveys which are summarised here. The habitats identified can be seen in *Figure 8.2*.

Designated Sites of Nature Conservation Importance

8.28 There are eight statutory sites of international conservation importance located within a 15km radius of Site A; these are detailed within *Table 8.2* and *Figure 8.4* below. A number of these sites meet the criteria for multiple statutory designations including SACs, SPAs, and / or Ramsar sites. Relevant Statutory Instruments relating to these European designated sites have been transposed into legislation by the Conservation of Habitats and Species Regulations 2019 (Amendment) (EU Exit).

8.29 One nationally designated site of nature conservation importance is located within 2km of Site A, which comprised Felpham SSSI, located 1.4km south of the site and is designated for geological interest and is consequently not considered further within this assessment.

Table 8.2 Statutory sites of international conservation value within 15km of Site A

Site Name / Designation / Location from Site A	Reasons for Designation
Solent and Dorset Coast SPA 1.5km south	This covers areas of the sea that are important for supporting the foraging of common tern *Sterna hirundo*, sandwich tern *Sterna sandvicensis* and little tern *Sterna albifrons*.
Pagham Harbour Ramsar/SPA/SSSI 7.2km south-west	The site comprises an area of eustarine basin with extensive saltmarsh and intertidal mud-flats, surrounded by lagoons, reed swamp and wet grassland, which support rich invertebrate species. The SPA designation is due to the nationally and internationally important numbers of wintering and breeding waterbirds or waders, including dark-bellied brent goose Branta *bernicla bernicla,* little tern, common tern and wintering ruff *Philomachus pugnax*.
Chichester & Langstone Harbours Ramsar/SPA/SSSI 11km west	The site comprises a large estuarine basin with extensive mud and sandflats. It is designated primarily owing to the umbers of nationally and internationally important waterbirds which regularly exceed 20,000 individuals.

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Site Name / Designation / Location from Site A	Reasons for Designation
Solent Maritime SAC **11km west**	The site comprises a major estuarine system with a complex of marine and estuarine habitats including Annex 1 habitats (Estuaries, Spartine swards and Atlantic salt meadows) which are the primary reasons for designation. The Desmoulin's whorl snail *Vertigo moulinsiana is an* Annex II qualifying feature.
Duncton to Bignor SAC **11.6km north**	Asperulo-Fagetum beech forests, an Annex I habitat, is the primary for selection of this site, along with the rare plant communities.
Arun Valley Ramar SPA/SAC **12.1km north-east**	The site comprises an extensive area of grazing marsh dissected by drainage ditches which support a rich flora and a diverse community of breeding and wintering birds including Bewick's swan and regularly supports over 20,000 waterfowl. SAC designation due to presence of Annex II Ramshorn snail.
Singleton and Cocking Tunnels SAC / SSSI **14.2km north**	The tunnels constitute the most important site for hibernating bats in south east England with eight species recorded here including the Annex II qualifying species barbastelle *Barbastella barbastellus* and Bechstein's bat *Myotis bechsteinii.*
Kingley Vale SAC / SSSI **14.8km north-west**	The site is primarily designated for its yew *Taxus baccata* woodlands which is largest of its kind in Britain. It is also an important orchid site with semi-natural dry grasslands and scrubland facies on calcareous substrates *Festuco-Brometalia* present.

Non-Statutory Designated Sites

8.30 One non-statutory designated site, the Brooks LNR (also known as Bersted Brooks), is located 1km to the west of Site A. It is an area of floodplain meadow with recently planted wet woodlands with a network of ditches and ponds.

Protected Species Records

8.31 Records of protected and priority faunal species within 1km of Site A, derived from the desk study consultees, are summarised in *Table 8.3* (2021)[29];

Table 8.3 Desktop study results for protected species at Site A

Species	Most Recent Recorded Date	Conservation Status	Approx. Location Relative to Site A
Bats			
Bat species *Chiropter sp.*	2015	Hab Reg Sch2, WCA Sch5, NERC S41.	Single record, 922m South-West.
Brown Long- eared Bat *Plecotus auritus*	2014	Hab Reg Sch2, WCA Sch5, NERC S41.	Single record, 656m West.
Common pipistrelle (Pipistrellus pipistrellus)	2016	Hab Reg Sch2, NERC S41, WCA Sch5	Single record, 724m North-West.
Soprano pipistrelle *Pipistrellus pygmaeus*	2014	Hab Reg Sch2, WCA Sch5, NERC S41.	Single record, 986m West.
Whiskered bat *Myotis mystacinus*	2004	Hab Reg Sch2, WCA Sch5	Single record, 991m South-East.
Mammals (Excluding Bats)			
Brown Hare *Lepus europaeus*	2010	NERC S41, UK BAP Priority.	Single record, 603m North.

29 Act of Parliament , (2012) Environment Act. https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted

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Species	Most Recent Recorded Date	Conservation Status	Approx. Location Relative to Site A
European Water Vole *Arvicola amphibius*	2015	WCA Sch5, NERC S41.	Numerous records, ranging from 2003- 2015; the closest of which was within the site boundary.
West European Hedgehog *Erinaceus europaeus*	2020	NERC S41, UK BAP Priority, RedList GB post2001 VU.	Multiple records, the closest of which was 533m South-West of the site.
Birds			
Avocet *Recurvirostra avosetta*	2018	WCA Sch1 Pt1, BoCC4: Amber.	Single record, 836m North.
Bewick's Swan *Cygnus columbianus*	2011	WCA Sch1 Pt1, NERC S41, BoCC4: Amber.	Single record, 669m North.
Black-tailed Godwit *Limosa limosa*	2018	WCA Sch1 Pt1, BoCC4: Red, UK BAP Priority, RedList Global post2001 NT.	Single record, 836m North.
Cetts's Warbler *Cettia cetti*	2019	WCA Sch1 Pt1.	Multiple records, the closest of which was 42m West.
Common House Martin *Delichon urbicum*	2015	BoCC4: Amber.	Two records, the closest of which was 572m East of the site.
Common Reed Bunting *Emberiza schoeniclus*	2016	NERC S41, BoCC4: Amber, UK BAP Priority.	Three records, the closest of which was 359m South-West of the site.
Common Ringed Plover *Charadrius hiaticula*	2018	BoCC4: Red.	Single record, 836m North.
Corn Bunting *Emberiza calandra*	2014	NERC S41, BoCC4: Red, UK BAP Priority.	Single record, 758m North.
Eurasian Skylark *Alauda arvensis*	2019	NERC S41, BoCC4: Red, UK BAP Priority.	Single record, 636m North.
Grey partridge *Perdix perdix*	2019	NERC S41.	Four records, the closest of which was within the site boundary.
Kestrel *Falco tinnunculus*	2020	BoCC4: Amber.	Single record, 95m West.
Kingfisher *Alcedo atthis*	2018	WCA Sch1 Pt1, BoCC4: Amber.	Single record, 877m South.
Lapwing *Vanellus vanellus*	2019	NERC S41, BoCC4: Red, UK BAP Priority.	Four records, the closest of which is 465m North of the site boundary.
Mallard *Anas platyrhynchos*	2019	BoCC4: Amber.	Three records, the closest of which was within the site boundary.
Mute Swan *Cygnus olor*	2019	BoCC4: Amber.	Three records, the closest of which was within the site boundary.
Redshank *Tringa totanus*	2018	BoCC4: Amber.	Single record, 836m North.
Ruff *Calidris pugnax*	2018	WCA Sch1 Pt1, BoCC4: Red.	Single record, 836m North.

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Species	Most Recent Recorded Date	Conservation Status	Approx. Location Relative to Site A
Snipe *Gallinago gallinago*	2017	BoCC4: Amber.	Two records, the closest of which was 478m North of the site boundary.
Spoonbill *Platalea leucorodia*	2014	WCA Sch1 Pt1, BoCC4: Amber.	Single record, 836m North.
Swift *Apus apus*	2013	BoCC4: Amber.	Two records, the closest of which was 900m South of the site.
Tawny Owl *Strix aluco*	2012	BoCC4: Amber.	Single record, 907m North-East.
Western Barn Owl *Tyto alba*	2019	WCA Sch1 Pt1.	Single record, 862m North.
Western Yellow Wagtail *Motacilla flava*	2014	NERC S41, BoCC4: Red, UK BAP Priority.	Single record, 836m North.
Amphibians and Reptiles			
Common Lizard *Zootoca vivipara*	2019	WCA Sch5, NERC S41.	4 records, 233m North.
Grass Snake *Natrix helvetica*	2019	WCA Sch5, NERC S41.	Two records, the closest of which was 233m North of the site.
Great Crested Newt *Triturus cristatus*	2016	Hab Reg Sch2, WCA Sch5, NERC S41.	Single record, 534m East.
Slow-worm *Anguis fragilis*	2019	WCA Sch5, NERC S41.	Multiple records, the closest of which was, 233m North of the site.
Invasive and Non-Native			
American Mink *Neovison vison*	2021	WCA Sch 9 INNS.	Single record, 852m East.
Black Swan *Cygnus atratus*	2015	WCA Sch 9 INNS.	Single record, 701m North.
Harlequin Ladybird *Harmonia axyridis*	2019	Sussex INNS.	Single record, 989m South-West.
Pampas-grass *Cortaderia selloana*	2014	Sussex INNS.	Single record, 108m South.

Key: NERC S41 – Natural Environment & Rural Communities Act 2006 Section 41, Hab reg Sch2 – Conservation of Habitats & Species Regulations 2019 Schedule 2, WCA – Wildlife & Countryside Act 1981, Sussex INNS – Sussex Invasive non-native Species Inventory.

Field Survey – Habitat and Flora

8.32 The full results of the habitat survey are presented in *Appendix 8.2*, and the location of the habitats described below are illustrated on *Figure 8.3*.

Amenity Grassland

8.33 The predominant habitat within Site A comprises intensively managed amenity grassland, regularly mown to maintain fairways with a short sward height. Due to the intensity of management, this grassland is considered to be of **Negligible** importance.

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Semi-Improved Grassland

8.34 Areas of less managed semi-improved grassland were present in areas of 'rough' on the golf course, which occur in the peripheral areas and in central parts between fairways. These areas have a mosaic of taller and more diverse species assemblage. The semi-improved grassland is of **Site** importance.

Broadleaved and Mixed Plantation Woodland

8.35 There was a large resource of mature trees within Site A planted in groups/lines which separated the fairways and areas of 'rough', as well as around the periphery of the Site. Species recorded include pendunculate oak *Quercus robur*, horse chestnut *Aesculus hippocastanum*, ash *Fraxinus excelsior*, Scotts pine *Pinus sylvestris*, and willow species including crack, goat and grey *Salix fragilis, caprea* and *cinerea*.

8.36 The understory and ground flora beneath tree groups were generally sparse and species poor, due to management practices including mowing used to separate holes. In areas of 'rough' the understory has semi-improved grassland mosaics with ruderal species present. This habitat is of **Local** importance.

Hedgerows

8.37 Thirteen hedgerows are present on Site A, with the majority supporting a diverse range of native wood species, which has led to the majority qualifying as habitats of principal importance under the NERC Act (2006); the exception was H9 that largely supported non-native species.

8.38 Hedgerows H1, H2, H3, H4, H5, and H7 were considered 'important" under the Hedgerow Regulations (REGS). Under the HEGs criteria four hedgerows (H2, H3, H7 and H11) were assessed as having high to very high value (Grade 1) and two (H1 and H4) were assessed as having moderately high to high value (Grade 2), six (H5, H6, H8, H9, H10 & H13) as moderate (Grade 3) and one (H12) low (Grade 4). .

8.39 The hedgerow network within Site A is of **Local** importance.

Waterbodies and Riparian Habitats

8.40 The Site has a network of wet and dry ditches throughout. During periods of regular rainfall the majority held water, but were ephemerally wet, which was evident through the lack of aquatic vegetation in major ditches.

8.41 Three ponds are present within Site A, two of which (P2 and P3) are associated with the on-site ditches. P1 is a separated feature within the fairway. All of the ponds support aquatic / marginal plant species such as common reed *Phragmites sp*., yellow flag iris *Iris pseudacorus* and water mint *Mentha aquatica*. Pond P1, P3 and ditch 3a contain the Schedule 9 non-native invasive Parrot's feather *Myriophyllum aquaticum*.

8.42 The Lidsey Rife is classified as a Habitat of Principal Importance under S41 of the NERC act (2006), and is situated abutting the western boundary. It forms part of a Biodiversity Opportunity Area (BOA), that has been identified within Policy ENV DM3 of the Arun Local Plan, as well as a Local Green Space within Policy CLW6 of Felpham Neighbourhood Plan 2013-2029. It comprises a slow-flowing watercourse, which gently meanders south. Aquatic / marginal species present in the Lidsey Rifle include yellow flag Iris and starwort *Callitriche sp*. The banks and margins of the watercourse are heavily vegetated with common reed and these directly back onto the heavily managed fairways.

8.43 The ponds and ditch network are of **Local** importance and Lidsey Rife is of **County** importance.

Ruderal Vegetation

8.44 There are small discrete pockets of ruderal vegetation on Site A in areas of rough that are not subjected to intense management. Species present include common nettle *Urtica dioica*, prickly sow thistle *Sonchus asper*, greater burdock *Arctium lappa*, hemlock *Conium maculatum* and hogweed *Heracleum spondylium*. The ruderal vegetation is of limited coverage and diversity and has been assessed to be of **Negligible** importance.

Scattered Scrub

8.45 Individual specimens of scattered scrub were present around Site A which were represented by elder *Sambucus nigra* and buddleia *Buddleja davidii* with a small patch of snowberry *Symphoricarpos albus* present in the south

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east. Due to the limited coverage and species diversity this habitat is of **Negligible** importance.

Invasive Species

8.46 As well as the parrot's feather identified, there are also two stands of Japanese knotweed *Reynoutria japonica*. One stand it within an area of hard standing car park (*Target Note 1, Figure 8.3*) and the other is along ditch D5 in the north (*Target Note 2, Figure 8.3*). These have a detrimental effect biodiversity.

Field Surveys – Fauna

Badgers

8.47 No evidence of badger, such as the presence of setts, latrines, hairs, prints and snuffle holes were observed. Habitats within the Site can be considered of **Negligible** importance to this species.

Bats (*Appendix 8.3*)

Buildings

8.1 Of the buildings within Site A, one (B1) was classified as providing moderate potential to support roosting bats, due a few features but also no access into the internal structure, the remaining nine buildings were of negligible potential. No roosting bats were identified in building B1 during nocturnal surveys in 2016 and 2021.

Trees

8.2 A total of 97 trees were identified as having features suitable to support roosting bats. A bat box on a Corsican pine *Pinus nigra* tree (T96) supported a small summer Pipistrellus day roost with four individuals seen. The remaining trees comprised 35 trees with high potential, 41 trees of moderate potential and 20 trees of low potential to support roosting bats. The bat roost potential of the Application Site, provided by these trees, is considered to be of **Local** importance.

Activity

8.3 Bat activity surveys undertaken in 2021 (August & September) recorded a typical assemblage of foraging and commuting bats within the Site. The majority of activity on static units was associated with common and soprano pipistrelle (NERC S41), which comprised 69.58% and 15.54% of the activity recorded, respectively. Other species/species groups recorded in low numbers comprised *Myotis* species (8.51%), *Pipistrellus* species (1.64%), barbastelle (NERC S41, 1.40%), *Plecotus* species (1.22%), noctule (NERC S41, 1.05), *Nyctalus* species (0.82), Nathusius' pipistrelle (0.11%), serotine (0.11) and *Nyctalus/Eptesicus* species (0.02%). This level of activity is largely typical of the context of open habitats, with connections to farmland in the wider area.

8.4 Static/transect surveys undertaken in 2016/17 had recorded similar species diversity and registrations, with common pipistrelle the most frequently recorded species.

8.5 The majority of activity occurred along the southern boundary, adjacent to neighbouring residential buildings where 4080 registrations were recorded during static surveys, and adjacent to hedgerow H5 in the eastern extent of the site where 3144 registrations occurred.

8.6 The most notable species were barbastelle, which are an Annex II species under the Habitat Regulations. Barbastelle are more widespread with a range spanning most of southern Britain, but are extremely wide-ranging within the habitats they use. During the entire 2021 survey season only 176 registrations with barbastelles were recorded, with a peak of 88 registrations along hedgerow H5 to the east. Singleton and Cocking Tunnels SAC / SSSI is approximately 14km from Site. The Site therefore falls outside the 12km zone of influence and Core Sustenance Zones for barbastelle bats (7km).

8.7 The activity transects recorded a wider use of the Site, with the Lidsey Rife, hedgerows, ditches and tree groups forming the main foraging/commuting routes for bats.

8.8 It is concluded that the Site is of no more than **Local** importance for all bat common species recorded. Barbastelle bats were evaluated as being of **County** importance due to classification as an Annex II species, however it is also concluded that the habitats only function as a small proportion of the barbastelles range;

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whereby the number of registrations were low.

Breeding Birds (*Appendix 8.4*)

8.9 Three breeding bird surveys were undertaken during 2016/17, where a total of 55 bird species were recorded; of these 17 have some conservation status as either Wildlife and Countryside Act 1981 (as amended) Schedule 1 species, NERC S41 species and / or BoCC Red or Amber list species.

8.10 Eleven of the 18 notable species are considered to be of Local importance, which included mute swan *Cygnus olor*, marsh tit *Poecile palustris*, Cettis's warbler *Cettia cetti*, starling *Sturnus vulgaris*, song thrush *Turdus philomelos*, dunnock *Prunella modularis*, house sparrow *Passer domesticus*, bullfinch *Pyrrhula pyrrhula*, linnet *Carduelis cannabina*, yellowhammer *Emberiza citronella* and reed bunting *Emberiza schoeniclus*, as they are all fairly common in Sussex and the UK. One of the 18 notable species, gadwall Anas strepera, is considered to be of County importance, as it is a very scarce breeder in the county.

Great Crested Newts (*Appendix 8.5*)

8.11 There are three ponds within the Site and a network of wet/dry ditches that provide some suitable for breeding habitat for GCN (*Figure 8.4*). eDNA surveys were undertaken during 2017 on the on-site ponds, all of which returned a negative result. The only GCN record was that c.530m east, which is separated from the Site with no linkage habitats. Owing to the distance and lack of records, GCN are considered to be absent from Site A and are not considered further in this assessment.

Hazel Dormouse (*Appendix 8.6*)

8.12 No records for dormouse were returned within 1km of the Site, however, suitable habitat is present in the form of extensive hedgerow networks, tree groups and scattered mature trees. No evidence of dormouse presence was confirmed during completed 2016/17 surveys and those that have been completed to date in 2021. Therefore, this species is currently absent from the Site.

Reptiles (*Appendix 8.7*)

8.13 Surveys undertaken in September and October 2021 recorded a 'low population' of slow worm, grass snake and common lizard. These results are largely consistent with the 2016 surveys whereby a 'low population' of slow worm and grass snake were recorded. These populations were largely confined to the peripheries of the Site, predominantly along the western boundary adjacent to the Lidsey Rife, where habitats were less managed. Given the sparsity and isolation of suitable habitats within Site A, and the low number of individuals recorded, the populations within Site A are of no more than **Local** importance.

Riparian Mammals (*Appendix 8.8*)

8.14 During surveys in 2016/17, evidence of water vole was found within the Lidsey Rife; at locations D1, D2, D3 and D7 comprising of burrows, latrines and runs with some anecdotal sightings. One survey has been undertaken in September 2021 whereby one possible water vole burrow was recorded within D1 and feeding evidence in D3.

8.15 There are limited opportunities for the water vole population to expand because of the limited availability of habitats within Site A, and the restriction of onward connectivity due to the residential dwellings located to the south and east. Water voles are fully protected WCA species and NERC S41, and are declining in occurrence, however, consultations have recorded them in the wider area, particularly in Lidsey Rife. Although the habitats have no onward linkages, the Site could provide opportunities for refuge and foraging. Recent consultation data suggests that water voles are not reliant on these habitats in the Site and if they are present the population density will be low, however their presence is of **Local** importance.

Otters (*Appendix 8.8*)

8.16 No otters were recorded during the surveys undertaken on the ditches, and no consultation records were returned and are therefore excluded from any further assessment.

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Table 8.4 Summary of sensitivity of ecological receptors related to Site A

Ecological Feature		Importance	Sensitivity
Statutory Designated Sites			
Solent and Dorset Coast SPA		International	High
Pagham Harbour Ramsar/SPA			
Chichester and Langstone Harbours Ramsar/SPA			
Solent Maritime SAC			
Duncton to Bignor Escarpment SAC			
Arun Valley Ramsar/SPA/SAC			
Singleton and Cocking Tunnels SAC			
Kingley Vale SAC			
Felpham SSSI		National	High
Non-Statutory Designated Sites			
The Brooks LNR		Local	Low
Onsite Habitats			
Semi-improved Grassland		Site	Low
Mixed Plantation Woodland		Local	Low
Broadleaved Plantation Woodland		Local	Low
Hedgerows		Local	Low
Waterbodies and Riparian Habitats		Local	Low
Lidsey Rife		County	Moderate
Fauna			
Bats – Roosting Opportunities	Trees – roosting potential	Local	Low
Bats – Common Species	Foraging / Commuting	Local	Low
Bats – Barbastelle		County	Moderate
Breeding Birds	General Assemblage	Local	Low
	Gadwall	County	Moderate
Reptiles		Local	Low
Water Vole		Local	Low

Future Baseline Conditions - 'Do Nothing Scenario'

8.17 Should the development not take place and assuming the current management regime will continue; the intensity of grassland management would limit biodiversity value, essentially restricting habitats of ecological value to the boundaries and internal pockets of woodland.

8.18 The ditches throughout the Site are not currently managed for biodiversity. The central ditches will continue to support a low diversity, and vegetation build up would continue to become denser around the peripheral ditches. This will restrict the local water vole population from colonising any additional ditches and being able to increase population size. Biodiversity within the site will be lessened.

8.19 The Site will continue to be used by bat species as a potential linkage corridor, but the absence of habitat mosaics and connectivity, limits its value. The reptile population will remain as isolated peripheries features; where it is unlikely that population growth would occur, thus affecting their long-term Favourable Conservation Status (FCS).

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Site B – Relocation of Golf Course

Desk Study

8.20 The following section provides the results of desk searches for sites of nature conservation interest and records of protected, rare or otherwise notable species within Site B. These records can be seen on *Figure 8.5* and *Figure 8.6*.

Designated Sites of Nature Conservation Importance

8.21 There are six statutory sites of international importance located within a 15km radius of Site B. These sites include Solent and Dorset Coast SPA located 0.5km southwest, Pagham Harbour Ramsar/SPA/SSSI 10.6km southwest, Duncton to Bignor Escarpment SAC 11.5km north, Arun Valley Ramsar/SPA/SAC 12.2km north, Chichester and Langstone Harbours Ramsar/SPA/SSSI 14.5km north-west and Solent Maritime SAC 14.5km north-west. The reasons for these designations are listed in *Table 8.2* above.

8.22 No nationally designated statutory sites of nature conservation importance were located within the 1km search area.

Non-Statutory Designated Sites

8.23 There is one Local Wildlife Site (LWS), Elmer Rocks LWS, located 410m south within a 1km search radius of Site B. This site is designated for supporting vegetated shingle, an internationally rare habitat. The intertidal area supports a diverse community including intertidal sand and eight 'rock islands' constructed in the early 1990s in the mid-tide zone to form a coastal defence against the eroding coastline. The rock islands have provided a habitat type that is very rare, if not unique, in West Sussex.

Protected Species

8.24 Records of protected and priority faunal species within 1km, derived from the desk study consultees, are summarised in *Table 8.5* below and *Figure 8.6*.

Table 8.5 Desk study results for protected species at Site B

Species	Conservation Status	Approx. Location Relative to Site B
Bats		
Bat species	Hab Reg Sch2, WCA Sch5, NERC S41	One record 814m NW
Brown Long-eared Bat	Hab Reg Sch2, WCA Sch5, NERC S41	Two records, closest 45m S
Common Pipistrelle	Hab Reg Sch2, WCA Sch5, NERC S41	Multiple records, closest 45m S
Daubenton's Bat *Myotis daubentonii*	Hab Reg Sch2, WCA Sch5	Two records, closest 45m S
Long-eared bat Species *Plecotus sp.*	Hab Reg Sch2, WCA Sch5, NERC S41	One record 495m W
Myotis Species *Myotis sp.*	Hab Reg Sch2, WCA Sch5, NERC S41	Three records, closest 45m S
Natter's Bat *Myotis nattereri*	Hab Reg Sch2, WCA Sch5	Two records closest 45m S
Noctule *Nyctalus noctule*	Hab Reg Sch2, WCA Sch5, NERC S41	One record 45m S
Nyctalus Species *Nyctalus sp.*	Hab Reg Sch2, WCA Sch5, NERC S41	Two records, closest 45m S
Pipistrelle Species *Pipistrellus sp.*	Hab Reg Sch2, WCA Sch5, NERC S41	Two records closest 45m S

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Species	Conservation Status	Approx. Location Relative to Site B
Serotine *Eptesicus serotinus*	Hab Reg Sch2, WCA Sch5, NERC S41	Multiple records, closest 45m S
Soprano Pipistrelle	Hab Reg Sch2, WCA Sch5, NERC S41	Three records, closest 45m S
Western Barbastelle *Barbastella barbastellus*	Hab Reg Sch2, WCA Sch5, NERC S41	One record, 45m S
Whiskered Bat	Hab Reg Sch2, WCA Sch5	Two records, closest 45m S
Whiskered/Brant's *Myotis mystacinus/brandtii*	Hab Reg Sch2, WCA Sch5	One record, 669m NE
Mammals (Excluding Bats)		
European Water Vole *Arvicola amphibius*	WCA Sch5, NERC S41	One historical record (1997) adjacent to south-western site boundary
West European Hedgehog *Erinaceus europaeus*	NERC S41	Multiple records, closest 60m S
Birds		
Cuckoo *Cuculus canorus*	NERC S41	One record 400m SW
House Sparrow Passer domesticus	NERC S41	One record 254m W
Amphibians and Reptiles		
Common Frog *Rana temporaria*	WCA Sch5	One record 146m S
Slow-worm *Anguis fragilis*	WCA Sch5, NERC S41	Two records, closest 125m S
Palmate Newt *Lissotriton helveticus*	WCA Sch5	One record 146m S
Great Crested Newt *Triturus cristatus*	Hab Reg Sch2, WCA Sch5, NERC S41	Multiple records, closest 880m NE
Plants		
Jersey Cudweed *Gnaphalium luteoalbum*	WCA Sch8	One record 61m SW
Key: NERC S41 – Natural Environment & Rural Communities Act 2006 Section 41, Hab reg Sch2 – Conservation of Habitats & Species Regulations 2019 (Amended) (EU Exit) Schedule 2, WCA – Wildlife & Countryside Act 1981.		

Field Survey – Habitat and Flora

8.25 The full results of the habitat survey at Site B are presented in *Appendix 8.10*, and the location of the habitats described below are illustrated on *Figure 8.7*.

Arable

8.26 The site is divided by the Ryebank Rife, ditches, hedgerows and treelines into four field compartments. The three fields in the north were sown with oilseed rape *Brassica napus* whilst the southern field comprised recently harvested wheat. This was considered to be of **Negligible** importance.

Arable Field Margins

8.27 The arable margins varied in width (1m – 5m) and quality with some margins consisting of a few ruderal species compared with the eastern margins of the southern field which were species rich and classify as a Habitat of Principal Importance (HPI) under Section 41 of the NERC Act 2006. Habitats along the south of

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the southern field and the south of the north-eastern field were similarly HPIs, however, they comprise a mixture of tussocky and fine-leaved grasses rather than being species rich. The Site is under an agri-environmental scheme and so the arable fields margins had been sown with a species rich mix and were considered to be of no more than **Local** importance.

Woodland

8.28 The woodland along the eastern, southern and western boundaries of the southern field comprised lowland deciduous woodland which qualified as a HPI. The canopy was very tall in places, particularly the northern section. The ground layer consisted of a range of species and was dependent on light levels. A footpath ran through the centre of the woodland. The woodland is of **Local** importance.

Trees and scrub

8.29 Linear tree lines were present along the northern boundary, backing onto Gravatt's Lane. Further tree lines were present within hedgerow networks. In the main, tree and scrub habitats are limited to the peripheries of the Site, with similar habitats occurring in the wider landscape. A small linear block of scrub separated the two northern fields which comprises two planted lines of mixed scrub with an area of dense bramble scrub running through the centre. This habitat is of **Local** importance.

Hedgerows

8.30 Four hedgerows were present on Site, all supported more than 80% native species and so qualified as HPI. The northern boundary hedgerow (H4) of the north-western field qualified as a 'important' under the Hedgerow Regulations (REGS) as it comprised a diverse range of species (more than seven per m^2). None of the other hedgerows qualify as being important under REGS. Under HEGS assessment two hedgerows (H3 & H4) were of moderate high to high (Grade 2) and the remaining hedgerows (H1 & H2) were moderate value (Grade 3).. The hedgerow network within the Site is of **Local** importance.

Species-Poor Semi-Improved Grassland

8.31 A small compartment of species-poor semi-improved grassland is present in the north western corner of the north western field compartment. This was dominated by coarse species and is represented by an outgrown field corner alongside a planted hedgerow. This habitat is of limited coverage and diversity and so considered to be of **Negligible** importance.

Tall Ruderal

8.32 An area in the northeast corner of the southern field was fenced off and consisted of tall ruderal vegetation. Abundant species included broad-leaved dock *Rumex obtusifolius*, common nettle *Urtica dioica*, creeping cinquefoil *Potentilla reptans*, common knapweed *Cenaurea nigra*, teasel *Dipsacus fullonum* and *Buddleja sp.*

8.33 Along its southern extent, the banksides and tops of Ryebank Rife supported small patches of ruderal vegetation dominated by locally abundant great willowherb *Epilobium hirsutum* and common nettle with frequent cock's foot and false-oat grass *Arrhenatherum elatius*.

8.34 This habitat is of limited coverage and diversity and is considered to be of **Negligible** importance.

Ditches

8.35 The Ryebank Rife and four drainage ditches divided the field compartments and ran along the eastern and south-western boundaries. All of which were dominated by scrub and ruderal species, particularly bramble. All ditches were dry in places or held water in pools and were heavily shaded. Ryebank Rife had some water flow to it, but was dependent on the rainfall and vegetation density.

8.36 As ecological features, the ditches lack continuous water retention and a diverse marginal species, presently these are of no more than **Local** importance. The Ryebank Rife as a similar character but its linkages with surrounding ditches system gives it a **County** importance.

Field Surveys – Fauna

8.37 The following section evaluates the ecological importance of fauna within Site B. The full results of the

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protected species surveys are provided in *Appendix 8.10*.

Badgers

8.38 No evidence of badger, including the presence of setts, latrines, hairs, prints and snuffle holes were observed during surveys and there were no consultations of badgers within 1km. This species is considered to be absent and not considered further in this assessment.

Bats

Trees

8.39 A total of 37 trees were identified within the central fields, on the boundaries of the broadleaved woodland and within the hedgerows, as having some features suitable to support roosting bats. These comprised three trees with high potential (T15, T17, T21), 15 of moderate potential (T2-4, T6, T7, T9, T11, T12, T14, T19, T20, T22, T24, T28, T30) and 19 of low potential to support roosting bats. The bat roost potential of Site B, provided by these trees, is considered to be of **Local** importance.

Activity

8.40 Six static bat detectors have been deployed onsite to complement the bat activity transect, two during each survey. A total of eleven different species/species groups were recorded by the static detectors. The most frequently recorded bat species were common pipistrelle (NERC S41) species, which comprised 62.89% of the activity recorded. Other species/species groups recorded in low numbers comprised *Myotis sp* (13.33%), soprano pipistrelle (NERC S41, 12.92%), barbastelle *Barbestella barbestellus* (NERC S41/Annex II, 4.06%), noctule (NERC S41, 2.25%), serotine (NERC S41,1.39%), *Nyctalus* species (1.31%), *Plecotus* species (0.92%), Nathusius pipistrelle (0.48%), *Pipistrellus* species (0.43%) and *Nyctalus/Eptesicus* species (0.01%). The majority of activity occurred along the southern woodland boundary, where a total of 5338 registrations were recorded.

8.41 Barbastelle was the most notable species being an Annex II species under Habitat Regulations. Their occurrence is not uncommon in the south of Britain and due to the deciduous woodland and Ryebank Rife within and bordering the southern extent of the Site, such species would be expected and were recorded in low numbers.

8.42 The conclusions follow that for Site A, where Site B is of no more than **Local** importance for all bat common species recorded and **County** for barbastelle bats.

Breeding Birds

8.43 Habitats onsite were considered suitable to support a range of common and widespread species, with hedgerows and scrub providing suitable refuge, nesting and foraging opportunities for generalist species including the robin *Erithacus rubecula*, blackbird *Turdus merula,* as well as common and widespread tit/finch species recorded during the Phase 1 survey. The Site is considered to be of **Local** importance to breeding birds.

Wintering Birds

8.44 During the November 2021 survey the Site supported an assemblage largely comprising of common and widespread species typical of the habitats present. The interiors of arable fields support some suitability for foraging farmland birds but only small numbers of overwintering skylark *Alauda arvensis* (NERC S.41, BoCC red list), linnet *Linaria cannabina* (NERC S.41, BoCC red list) and meadow pipit *Anthus pratensis* (BoCC amber list) are present. Congregations of black-headed gull *Chroicocephalus ridibundus* (Amber list) and small numbers of herring gull *Larus argentatus* (NERC S.41, BoCC Red list) also make use of the open arable fields for foraging/roosting. Arable field interiors and margins also provide foraging opportunities for the kestrel *Falco tinnunculus* (BoCC amber list).

8.45 Woodland, hedgerow and scrub habitats support a generalist/woodland bird assemblage comprised of common and widespread species. Congregations of wintering thrushes have been identified onsite including fieldfare *Turdus pilaris* (WCA Sch1, BoCC red list), redwing *Turdus iliacus* (WCA Sch1, BoCC red list) and song thrush *Turdus philomelos* (NERC S.41, BoCC red list). Other notable species recorded in these habitats included dunnock *Prunella modularis* (NERC S.41, BoCC amber list).

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8.46 Other notable species recorded overflying the site only include starling *Sturnus vulgaris* (NERC S.41, BoCC red list) and grey wagtail *Motacilla cinerea* (BoCC red list).

8.47 The assemblage of winter birds present is considered to be typical of the habitats present onsite and no significant populations of notable species were recorded. The Site is considered to be of **Local** importance to wintering birds.

Great Crested Newt

8.48 There are no ponds onsite and due to the arable environs, suitable terrestrial habitat is limited to the field margins, hedgerows and woodland bases. The Ryebank Rife had a slow flowi and the remaining ditches were chocked with vegetation or had little water present, and were not considered to be suitable to support breeding great crested newts.

8.49 There are two offsite ponds within a 250m radius of the Site. P1 is present 25m south of the northern western field compartment, separated by scrub, tussock grassland and the Ryebank Rife. The second P2 is situated approximately 175m south within residential environs. There were no consultation records of GCN in either of these ponds, with the nearest record located 880m northeast from the eastern boundary (and 1.8km east from P1 and 2.1km north-east of P2). Therefore, based on the Site proximity and desk surveys this species is considered to be likely absent, and not considered further in this assessment.

Hazel Dormouse

8.50 The suitability of the habitats to support dormice are restricted to the boundary broadleaved woodland, which do link to offsite hedgerows and woodland beyond. No evidence of dormouse has been recorded during the autumn 2021 and no records for dormice were returned by the consultation data. The Site is considered to be of **Negligible** importance for hazel dormouse.

Reptiles

8.51 Surveys undertaken in September and October 2021 recorded a 'low population' of common lizards and slow worms, with a peak of three adults for both species. These populations were predominately along each field margins in the south and north, but also along the Ryebank Rife and adjoined ditch network.

8.52 Given the isolation of suitable habitats to arable field margins and the low populations/diversity the Site is of no more than **Local** importance.

Riparian Mammals

8.53 The consultation data returned a single historical (1997) record of water vole within the Rybank Rife in the north-western extent of the Site and no records of otters. No evidence of riparian mammals was recorded during the September 2021 survey. The Ryebank Rife and ditch network were heavily choked with vegetation, with no feeding signs of water voles seen. . The Site is considered to have **Negligible** importance for this species.

Table 8.6 Summary of sensitivity of ecological receptors at Site B

Ecological Feature	Importance	Sensitivity
Statutory Designated Sites		
Solent and Dorset SPA	International	High
Pagham Harbour Ramsar/SPA		
Duncton to Bignor Escarpment SAC		
Arun Valley Ramsar/SPA/SAC		
Chichester and Langstone Harbours Ramsar/SPA		
Solent Maritime SAC		
Non-Statutory Designated Sites		
Elmer Rocks LWS	Local	Low

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Ecological Feature		Importance	Sensitivity
Onsite Habitats			
Arable Field Margins		Local	Low
Woodland		Local	Low
Trees and scrub		Local	Low
Species-poor semi-improved grassland		Local	Low
Hedgerows		Local	Low
Ditches		Local	Low
Ryebank Rife		County	Moderate
Fauna			
Bats – Common Species	Foraging / Commuting	Local	Low
Bats – Barbstelle		County	Moderate
Breeding & Wintering Birds	General Assemblage	Local	Low
Reptiles		Local	Low

Future Baseline Conditions - 'Do Nothing Scenario'

8.54 The Site would most likely remain under arable use, with modern farming practices and nutrient input which are unlikely to improve the ecology of the site. Woodland habitats have not had much management and if this was to continue, it is likely that ground flora might suffer, and riparian habitats remain choked with vegetation, limiting opportunities for wildlife.

Inherent and Standard Mitigation

8.55 This section describes those 'inherent' and 'standard' mitigation measures which primarily address the scope to avoid, reduce or remedy adverse environmental impacts or enhance the beneficial aspects arising from the construction and operational periods of the proposed development.

Site A – Redevelopment of existing golf course

8.56 This section provides details of general habitat creation implemented through Green Infrastructure (GI) proposals which are proposed to meet national and local policies for increasing biodiversity, but also to ensure that measures are adopted to avoid impacts on the most of the ecologically important features present.

8.57 The following sections distinguish between measures proposed to mitigate the potential effects of the proposed development (e.g. retention and creation of IEF) and proposed enhancements to the nature conservation value of the site (e.g. improving the value of IEFs).

Inherent Mitigation Measures

Designated Sites of Nature Conservation Importance

8.58 Owing to the distance between Site A and the European designated sites and the large provision of GI, there will be no adverse recreational effects on these sites. Pagham Harbour SPA/SAC as a zone of influence of 5km, from which this Site is 7.2km from.

8.59 Site A falls within the nitrate vulnerability zone for surface water for Aldingbourne Rife, which joins the Lidsey Rife approximately 600m downstream of the Site and flows south before discharging into the sea into the Solent and Dorset SPA designation. It is anticipated that the use of land as a golf course would limit the amount of nutrient released as a baseline, and as a large degree of the proposed develop will consist of residential dwellings, this will limit any further accumulation.

8.60 During the construction phase, temporary drainage measures will be implemented to ensure sediment and increases in water levels do not increase pre-development rates. This will follow a Construction Environment Management Plan (CEMP) implementing the Guidance for Pollution Prevention (GPPS) and Pollution

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Prevention Guideline (PPG) as appropriate.

8.61 Chapter 9 goes into the detail about the water resources, whereby it has been confirmed that Lidsey Waste Water Treatment Work (WWTW) has capacity to deal with the sewage produced by this development. Alternatively, there is also option to connect to Ford WWTW which will ensure discharges meet Southern Water's permit to ensure no adverse environmental impacts. On site water quality will be managed with Sustainable Urban Drainage Systems (SuDS) and outfalls. The emitted nutrients from the Site will be lower than the current levels, and dispersal/dilution once it enters the sea will not be at levels that would effect the foraging resources for designated species at the SPA.

Non-Statutory Designated Sites

8.62 Habitat creation is central to the Site's GI, which will retain IEFs and create features that will promote biodiversity enhancements in the long-term, meeting national and local policies. A substantial area of GI will be created within the western and northern extents of Site, which will function as an extensive area for recreation and also opportunities for biodiversity. The recreational benefits of such areas will lessen any potential recreational impacts on the Brooks LNR.

Habitat Creation within the Green Infrastructure

8.63 Meadow grassland habitats will be created with additional general-purpose meadow mixture added to existing/retained areas and new areas to increase foraging resources for pollinators and provide an aesthetically pleasing area for residents to enjoy. A seed mix similar to that of Emorsgate EM1 meadow mixture will be used with additions and substitutions to provide more local species content with increased percentage of yellow rattle to limit grass growth; species to be included, but not restricted to:

- Black medick *Medicago lupulina*
- Common knapweed *Centaurea nigra*
- Common sorrel Rumex *acetosa*
- Common bent Agrostis *capillaris*
- Creeping buttercup *Ranunculus repens*
- Lady's bedstraw *Galium verum*
- Meadow buttercup *Ranunculus acris*
- Oxeye daisy *Leucanthemum vulgare*
- Red Campion *Silene dioica*
- Red clover *Trifolium pratense*
- Red fescue *Festuca rubra*
- Selfheal Prunella *vulgaris*
- Smaller cat's-tail *Phleum bertolonii*
- Wild carrot *Daucus carota*
- Yarrow *Achillea millefolium*
- Yellow rattle *Rhinanthus minor*

8.64 A minimum of a 50m buffer will be created along the Lidsey Rife in order to ensure the area is protected and buffered from the built environment. Within this buffer, habitats of ecological value will be created, including tussock grassland habitats nearer the banks that will progress into meadow grassland around informal paths with potential for amenity grassland areas that have a flowering content but can tolerate management. Three new large attenuation features are proposed to the west with GI, the northern basin will hold water with a third of its catchment area permanently throughout the year, this has opportunities to have additional aquatic and marginal species added. The central attenuation of the three, will be hold approximately 50% of its capacity year-round with similar enhancements to those mentioned above. The southern basin will hold no water permanently, only during storm or heavy rainfall and will have grassland habitat present. Any additional

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waterbodies will be created with ecological benefits. The ditch network will change as a result of the proposals with some lost and others retained with enhancements such as profiling and scrub removal; there will also be new networks linking up existing ditches and linking the new attenuation features and Lidsey Rife. These will benefit aquatic invertebrates, amphibians and water voles. Existing ditches will be reprofiled and scrub removed.

8.65 Natural colonisation of new water features will be encouraged; however, some parts will be planted with native species of local provenance to ensure good development of vegetation. Additional species such as fools watercress Apium nodiflorum, lesser water parsnip Berula erecta, marsh marigold Caltha palustris, purple loosestrife Lythrum salicaria, brooklime Veronica beccabunga and water mint Mentha aquatic will be planted. Where possible reedbed habitats will be created providing cover for wildlife within the northern and central attenuation features, however, this will require sensitive management to ensure they do not dominate.

8.66 Tussock forming grassland will be incorporated/managed around the banks of Lidsey Rife and any new waterbodies and.attenuation which will be of benefit to the local fauna including birds, small mammals and the reptile population. It is suggested that a mixture similar to Emorsgate EM10 tussock mixture is used, which has a high content species providing the structural diversity, which include, but not limited to:

- Cocksfoot *Dactylis glomerata*
- Crested dogstail *Cynosurus cristatus*
- Red fescue *Festuca rubra*
- Tall fescue *Schedonorus arundinaceus*

8.67 Fencing will be implemented around the waterbodies and attenuation to deter public access, which can be detrimental to their conservation value, these will be planted with climbing night scented species such as honeysuckle which attract invertebrates.

8.68 Amenity grassland areas will be incorporated within scheme, particularly around play areas. Although such areas may be subjected to more public traffic, opportunities for biodiversity can still be encouraged. In such areas a flowering lawn similar to Emorsgate EL1 will be planted that can tolerate regular cutting, but still produce for flowering resource, providing benefits to wildlife. Species include, but not restricted to:

- Common bent *Agrostis capillaris*
- Crested dogtail *Cynosurus cristatus*
- Red fescue *Festuca rubra*
- Lady's bedstraw *Galium verum*
- Oxeye daisy *Leucanthemum vulgare*
- Bird's-foot trefoil *Lotus corniculatus*

8.69 Flowering lawns will also be used along more formal paths and roadside verges which require regular management. However, in areas distinctly separated from publicly accessible places, wildflower mixes should be incorporated, these ideally should be native, however, some non-native species do have ecological benefits as they can flower for long periods, provided opportunities for native pollinators throughout the season.

8.70 New hedgerows and structural planting will be incorporated throughout the scheme adding to those linear tree groups that already exist, here native species that have fruiting bodies, seeds and nectar sources which will benefit wildlife. Species composition will consist of the following:

Tree Groups:
Pendunculate oak *Quercus robur*
Beech, *Fagus sylvatica*
Silver birch, *Betula pendula*
Whitebeam, *Sorbus aria*
Field maple *Acer campestre*
Wild cherry *Prunus avium*
Guelder rose *Viburnum opulus*

Hedgerows:
Common hawthorn *Crategus monogyna*
Hazel *Corylus avellana*
Guelder rose *Viburnum opulus*
Field rose *Rosa arvensis*
Blackthorn *Prunus spinosa*
Field maple *Acer campestre*
Crab apple *Malus sylvestris*

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Hazel *Corylus avellana*
Holly *Ilex aquifolium*
Dogwood *Cornus sanguinea*
Alder buckthorn *Rhamnus frangula*
Crab apple *Malus sylvestris*
Spindle *Euonymus europaeus*
Holly *Ilex aquifolium*
Honeysuckle *Lonicera periclymenum*

8.71 Existing and new hedgerows will be managed to increase their structural diversity. This will be achieved through traditional methods such as hedgerow laying, or where this cannot be undertaken, hedgerows will be 'topped out' to create structure.

Biodiversity Net Gain (BNG) (*Appendix 8.9*)

8.72 A BNG assessment has been carried out due to the Environment Act (2021), where the DEFRA 3.0 metric, was used to compare the habitats as they are currently and what habitats are lost and created as a result of the Proposed Development. The above habitat creation and enhancement measures have been used to make an initial assessment to quantify biodiversity, in terms of a positive gain or negative loss. The current indicative calculation based on the outline applications Green Infrastructure Parameter Plan *(Appendix 3.4)*, shows that there will be a 10.29% gain in habitats, 17.43% in hedgerows and 46.95% in rivers, which meets the requirement for 10% net gain identified in the Environment Act, with calculations and assessment comments available in *Appendix 8.9*.

Fauna

Bats

8.73 Some of the boundary features and tree groups that make up the areas of 'rough' through the golf course will be lost due to the occurrence of development, however, where these are to be retained and incorporated, they will be enhanced through additional planting creating structural diversity on the edges. Creation of new hedgerows, waterbodies/attenuation and woodland will provide additional navigational and foraging opportunities. Where such linkages are retained or formed, buffers will be created around Root Protection Areas (RPA) which will also incorporate dark corridors, which will especially benefit the light sensitive bats, such as barbastelle.

8.74 In the event that existing linear vegetation or stepping stone pockets of habitats are broken or interrupted, such as to incorporate proposed accesses or residential development, retained vegetation will be reinforced with native species planting to create 'hop-overs' to aid the crossing of these breaks for bats. These measures are detailed in Highways Agency Interim Advice Note Nature Conservation Advice in Relation to Bats[30] and are also recognised mitigation measures in accordance with Bat Conservation Trust (BCT)[31]. The approach to hop-overs involves maintaining or introducing increases in canopy height leading up to a road or gap, this naturally encourages commuting bats (and birds) to increase flight altitude so avoiding road collisions. The implementation of such 'hop-overs' will allow continued echolocation across the break thereby allowing continued usage of the vegetation as a foraging/commuting area.

8.75 Bat encounters were largely associated with the Lidsey Rife, hedgerows, ditches and tree groups. The Lidsey Rife will have a buffer to ensure that dark corridors are retained along this feature which is used as a navigational route into the wider area, and as the potential for foraging opportunities due to the invertebrate concentrations.

Breeding Birds

8.76 The majority of hedgerows and mature tree groups are to be retained and will be enhanced through the planting of additional native species. Preference will be given to indigenous species, in particular those that are seed and fruit bearing, which tend to support a greater diversity and number of invertebrate species for birds to feed on.

Gadwall

8.77 The pair of possible breeding gadwall were recorded in the southern extent of the Lidsey Rife which abuts

[30] Highway Agency (2019). Interim Advice Note Nature Conservation Advice in Relation to Bats
[31] Bat Conservation Trust, Roads [ONLINE] Accessed at: https://www.bats.org.uk/about-bats/threats-to-bats/roads

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the western boundary of the Site. A buffer will be created along the Lidsey Rife which will ensure that this species will not be impacted from disturbance during either the construction or operational phase of the development.

Reptiles

8.78 The GI proposed will have habitats created that will ensure reptiles can continue to use the Site, this will include appropriate tussocky grassland habitats with topographical features ideally creating south facing banks which will provide basking and unique micro-habitats which reptiles will utilise. Specific hibernculum and log piles will create refuge and hibernation opportunities. The retention, enhancement and creation of ditches and attenuation, will ensure that there are aquatic habitats that can be utilised by the low population of grass snakes recorded.

Water Voles

8.79 A new network of ditches is to be created, some connecting to new attenuation basins, within the western extent of the Site, which will provide alternative areas of refuge and foraging off the Lidsey Rife. New water features will have banks profiled and constructed out of material that will allow for burrowing and aquatic shelving to provide marginal vegetation establishment. The sections of existing ditch network that will be retained and enhanced (where feasible) through selected clearance of vegetation build up that is currently clogging the channels and reducing water retention. Removal of none beneficial species (and invasives) and the thinning of overshading vegetation will promote a greater variety of marginal and aquatic species that will ensure a food resource throughout the year.

Standard Mitigation Measures

Construction Phase

Construction Environmental Management Plan

8.80 A Construction Environmental Management Plan (CEMP) will be prepared to regulate construction activities and its effects on IEFs identified. The CEMP will protect environmental features from harmful effects that could otherwise arise during the construction phase by adopting best working practices and avoidance strategies.

8.81 The CEMP will apply the most recent ecological baseline to inform mitigation, the appropriate location and timing of works, the responsibilities of site workers, and the use of barriers or signage. Where required an Ecological Clerk of Works (ECoW) will be present onsite to give tool box talks and walk through the IEFs present and ensure that measures needed to avoid effects with regard to specific legislative and policy protection are adhered too.

8.82 The CEMP will detail amongst other things the following:

- Appropriate buffering locations/widths around key habitats;
- Location of fencing- hera and/or reptile with signage:
- Dust mitigation measures:
- Fuel and chemical spillages management, through Pollution Prevention Guidance
- Specific protected method statements for legally protected and notable species: Bats in trees, Reptiles, Nesting Birds, Other species – relevant NERC Section 41 species that may be encountered e.g., hedgehog & common toad.

8.83 As is commonplace the preparation and approval of the CEMP will be secured by Planning Condition.

Habitats

8.84 Mitigation measures will ensure that all retained habitats are afforded suitable protection throughout the construction period. Fencing will be positioned around all retained trees, hedgerows, retained ditches and

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the Lidsey Rife to ensure Root Protection Areas (RPA) are maintained and a safe distance is kept from sensitive habitats. Accidental damage via machinery access, storage of materials and site compound positioning, will be avoided. Invasive species such as Parrot's feather and Japanese knotweed will be removed by a licensed and accredited contractors, this will ensure that such species are not spread around the Site where they can have a detrimental affect on species diversity.

8.85 Where public footpaths and roads are to be constructed within RPAs, these will be constructed using a 'no dig method of construction' according to arboricultural best practice, utilising soft materials that will allow gaseous diffusion through root systems. Where such methods could not be used, load spreading and tree root friendly construction will be adopted.

Fauna

Bats

8.86 The confirmed bat roost within a bat box on T96 will be retained and adequately buffered within the GI of the Site, and the loss of mature trees across the Site will be minimal. There will be twelve trees identified as having some form of bat roosting potential; six high (T36, T71, T91, T93, T93, T94), four moderate (T32, T40, T72, T94) and two low (T69, T70) that will need to be removed; although these have been assessed previously and no roosts found updated bat surveys will be undertaken prior to construction, this is to ensure that any new features are assessed, and mitigation measure incorporated, as required, including Natural England licenses.

8.87 The location of site offices, construction compounds and storage will be sensibly chosen in areas away from habitats utilised by bats in order to mitigate for the potential disturbance effects of artificial construction lighting on bat behaviours. All construction activities will be undertaken during daylight hours to avoid the need for high intensity artificial lighting, therefore reducing the potential for disturbance. Where such work is required then lights will be positioned away from natural habitats and directional lighting used.

Breeding Birds

8.88 All construction activities requiring the removal of vegetation will occur outside of the bird breeding season (March to mid-August/September inclusive). Where this is not possible all vegetation should be checked by a qualified ecologist before any removal takes place. This is a statutory requirement owing to the protection of all birds on the nests under the Wildlife and Countryside Act 1981 (as amended). Retained habitats such as hedgerows and tree groups, will have protective fencing erected to ensure there is no accidental encroachment of machinery or materials takes place could disturb / damage nests.

Gadwall

8.89 Through provision of a CEMP, installation of hi-visibility fencing along the edge of the buffer to the Rife and a sensitive lighting scheme, any Gadwall present will be protected from disturbance, lighting, pollution and accidental encroachment from development.

Reptiles

8.90 Reptiles were found largely around the peripheries of Site where habitats were unmanaged. Many of these areas are to be retained within GI and existing RPA in the scheme, which along with the deployment of hi-visibility fencing around retained areas of suitable reptile habitat, will ensure that they are not affected by construction work.

8.91 Where losses are to take place of habitat used by reptiles, precautionary measures will be implemented to ensure that any individuals in such areas are not harmed. This will include passive displacement and, if required in some circumstances, a trapping and translocation exercise. Individuals will be passively displaced, or caught and relocated to areas of GI to the west that will comprise reptile suitable habitats, so ensuring a FCS in maintained.

Water Voles

8.92 Ditches D1, D2 and Lidsey Rife where evidence of water voles was identified, are to be retained and enhanced where they fall within the scheme; however ditch D3 and D12 will be lost to facilitate the development. If

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activity continues to be recorded during update surveys, then a Natural England license will be required for their removal prior to construction. Hi-visibility fencing will be positioned around the retained ditches approximately 7-10m from the banks to ensure accidental encroachment and destruction of burrows does not occur that could cause an offence through injury to or damage / disturb any water vole. Where bridges and/or culverts are needed an ecologist will need to survey these locations and appropriate mitigation and licenses will be applied, where needed.

General

8.93 The site manager and other contractors undertaking construction work will be briefed on the presence of reptiles and water voles, through a 'toolbox talk'. Staff will be provided with information relating to the legislation and briefed on the procedures to be implemented in the event such species are found during works.

Operational Phase

Landscape Ecology Management Plan

8.94 All areas of the GI will be managed in the long-term under an agreed Landscape and Ecological Management Plan (LEMP), which will maximise the biodiversity by detailing management prescriptions relative to habitat type, species requirements and specific mitigation measures. An LEMP will be produced pursuant to either a planning condition or planning obligation in the S106 agreement and will reflect the final detailed design. Below is a summary of the measure to be included in more details within the LEMP.

Habitats

8.95 The ineffective management of habitats could lead to a loss of biodiversity. This is particularly important for cutting regimes of established habitats, such as waterbodies, hedgerows and grasslands. In addition, habitats have the potential to be damaged by residents; this is particularly significant for linear features such as hedgerows that can take several years to mature. The LEMP will detail cutting regimes, removal of dense areas of marginal species, replacement of failed or damaged specimens, and a timetable of works ensuring that habitats are maintained and that biodiversity can be maximised.

Fauna

8.96 Reptiles require a mosaic of habitats with tussock grassland incorporated in order to provide cover and foraging opportunities for this species. Specific structures such as hibernaculum and log piles will also be provided to enable periods of refuge and hibernation. If management of these habitats and structures are not sensitively undertaken, then habitats could become sub-optimal and subject individuals to predation pressures. Cutting regimes within the different grassland habitats will be subjected to specific timed cutting, ensuring that no one grassland type is cut in totality, reducing functional habitats for reptiles and other species. These cutting regimes will be re-assessed to ensure that they are fulfilling the species requirements.

Water Vole

8.97 Ditches will be monitored for water vole occupation and vegetation growth. Management of the ditches will ensure that they remain functional for the local water vole population. This will include reducing organic build up within ditches, so to ensure that water is present and that densities of marginal and aquatic vegetation is managed, with species of lesser quality removed.

General

8.98 Homeowner information packs will be provided to each resident; this will detail the importance of the Site's and species which utilise them. This will include best practice behaviours to avoid damaging sensitive areas.

8.99 Dog and litter bins will be provided as part of the Proposed Development that will be regularly emptied. Areas for specific off lead exercise will be identified within the Site and monitored to ensure they are functional. Residents with cats will be encouraged to keep cats inside during the evenings and if they are released that cat collars with bells should worn.

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Site B – Relocation of Golf Course

Inherent Mitigation Measures

Designated Sites of Nature Conservation Importance

8.100 Owing to the recreation nature of the proposals and distance between Site B and the European designated sites, there will be no adverse recreational impacts on these designations.

8.101 Site B falls outside of the nitrate vulnerability zone for the area. The Ryebank Rife joins a ditch network that eventually discharges into the sea to the south of the Site. The outfall into the sea is approximately 650m east of the Solent and Dorset SPA designation. The existing land use of the Site is arable which is regularly ploughed exposing the earth, which aids in the rate of leaching into Rife. The golf course will provide large areas of permanent habitat coverage with grassland, scrub and tree planting, which will absorb and minimise runoff of water and nutrients; this will result in a betterment of the water quality in the Rife and at the point of discharge into the sea.

8.102 Due these measures mentioned above and the tidal action at the discharge point, which will reducing ingression into the SPA area, Site B will not have a detrimental effect on the foraging resources for the species for which the on Solent and Dorset SPA is designated.

Habitat Creation

8.103 As the majority of the Site is under arable use, remedial works are likely to be required, to allow for the successful establishment of the new golf greens and fairways. Habitat creation is essential for the golf course and will retain IEFs and create features that will promote biodiversity enhancements in the long-term, meeting national and local policies.

8.104 The Parameters Plan indicates that the larger field to the south of Ryebank Rife will retain the periphery HPI woodland to the east, south and west, which will be buffered with a variety of grassland habitats, with the majority consisting of 'rough' areas; such habitats are consistent around the entire development area and boundary features. The boundaries, woodland edges, waterbodies and banks of the ditch systems will have a tussocky grassland mosaic created, which will promote features that will benefit reptiles and small mammals. The species proposed are the same as those stated for Site A with a seed mix similar to Emorsgate EM10, as these will create the swards needed to function for species previously mentioned.

8.105 The Site will benefit from the creation of new connectivity for fauna and increases in biodiversity, whilst still maintaining the recreational functionality needed; this will compensate habitats lost. There will be a variety of 'roughs' comprising grassland created through the scheme, with the edges interfacing with the greens, although these areas will have some management they can provide some tussocky grasslands and/or a meadow grassland mix, that will be subjected to some intermittent cutting. Such roughs will be created intermittently, but provide stepping stones for invertebrates and particularly nectar feeding species, with a seed mix similar to those stated in paragraph 8.106, however it is proposed that a greater proportion of yellow rattle be added to managed the encroachment of grass species.

8.106 Hedgerow H2 that runs through the centre of the southern field will be completely lost, H1 near the Rife will be partially lost to facilitate the golf course and there will also be an approximate 70m loss H4 on the northern boundary to allow for a visual splay to be created, this hedgerow is of 'importance' under HEGS. All hedgerow losses will be compensated for by the substantial habitat creation throughout the golf course within the areas of 'rough', which will allow for more planting and to create stepping stones across the Site and enhancing existing lineages. Structural diversity with the addition of shrub, scrub and trees will create microclimate changes that some species require. Species used will function as a screen between greens and also as a resource for fauna, with a focus on species that have fruiting bodies, seeds and nectar sources; although a focus on native species, non-native species can be added that have an ecological benefit. Species should include but not limited to:

- Pendunculate oak *Quercus robur*
- Beech, *Fagus sylvatica*

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- Silver birch, *Betula pendula*
- Whitebeam, *Sorbus aria*
- Field maple *Acer campestre*
- Wild cherry *Prunus avium*
- Guelder rose *Viburnum opulus*
- Hazel *Corylus avellana*
- Holly *Ilex aquifolium*
- Hawthorn *Crataegus mongyna*
- Honeysuckle *Lonicera periclymenum*
- Dogwood *Cornus sanguinea*
- Alder buckthorn *Rhamnus frangula*
- Crab apple *Malus sylvestris*

8.107 Waterbodies will be integrated within the golf course and will be designed, where possible, with ecological benefits such as embankments, spits, varying water depths and areas of differing water retention areas, creating micro-climates for wildlife. These will be less landscaped along the bank tops and have mixes similar to Emorsgate EP1 pond edge mixture.

8.108 The existing ditch networks will be retained and enhanced through targeted remove of scrub; buffers will be widened along the banks. A new ditch network will be created to link up the waterbodies withn the Site. Natural colonisation will be encouraged in water features and ditches; however, specific mixes will be used to provide immediate coverage, this will use Emorsgate EP1 pond edge mixtures or similar.

8.109 Existing hedgerows will be enhanced with management to remove 'poor' and dominant species with new planting added to increase ecological function and fill in gaps that exist. Management will be achieved through traditional methods such as hedgerow laying, or where this cannot be undertaken, hedgerows will be 'topped out' at the appropriate time of the year.

Biodiversity Net Gain (BNG) (*Appendix 8.11*)

8.110 A BNG assessment has been carried out on the habitats created as part of the scheme using the DEFRA 3.0 metric, the details of which are covered in paragraph 8.072. The current indicative calculation (available in *Appendix 8.11*) based on the proposals indicate that for Habitats there will be a +41.79% gain, Hedgerows +14.45% gain and Rivers +23.93% gain, which exceed the Environment Act's 10%.

Fauna

Bats

8.111 The periphery woodland and riparian habitat will be retained and enhanced through additional planting, and new scrub and tree planting particularly in the new 'rough' areas, with diversity of planting which will provide new navigational and foraging opportunities with dark corridors created through the scheme.

8.112 The majority of periphery habitats are being retained, however, where gaps are required in the northern extent for access, these will be kept as small as possible and, if they exceed 7m, then 'hop-overs' will be created.

8.113 Bat encounters were largely associated with periphery woodland around the Site which will have structural planting and grassland habitats created around them as part of the golf course design, ensuring further linkages and foraging opportunities. Waterbodies will be created, which will aid in the supply of invertebrate prey items.

8.114 The majority of the trees with bat potential will be retained within boundary features, however there will be a potential loss of T32 (low) which is situated on the banks of Ryebank Rife where there will be access created for golfers and maintenance. A small footbridge is also to be created near T7 (moderate) and T8 (low) on the Rife, however the works proposed are unlikely to have an effect on the trees.

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Breeding & Wintering Birds

8.115 Existing woodland and tree lines are to be retained and strengthened. New planting associated with the areas of 'rough' will provide a foraging resource and in the long-term potential nesting opportunities.

Reptiles

8.116 The golf course will comprise areas of unmanaged tussock-forming grassland around the peripheries and through the scheme. The mosaics created within grasslands and the inclusion waterbodies will increase foraging opportunities for the low populations recorded. Specific hibernaculum and log piles will be created through the scheme to promote refuge and hibernation potential.

Standard Mitigation Measures

Non-Statutory Sites

8.117 Elmer Rocks LWS in situated approximately 400m south of the development and outside of the potential dust emissions radius. Recreational effects are unlikely to occur as the golf course in a destination for such activities, whereby it is unlikely that users would then visit the LWS. The onsite ditch network links to this designation, and the provision of a CEMP will prevent any adverse hydrological impacts to the LWS.

Construction Phase

Construction Environmental Management Plan (CEMP)

8.118 A CEMP will be prepared to regulate construction activities and its effects on IEFs identified. This will be produced as described for Site A at paragraph 8.123.

Habitats

8.119 Mitigation measures will ensure that all retained habitats are afforded suitable protection throughout the construction period. All construction works taking place in the vicinity of retained trees, woodland and hedgerows will have RPA enforced with fencing prior to site works; this will avoid accidental damage via machinery access or indirect damage through storage of materials and site compound positioning, which would affect the root systems and long-term health.

8.120 Where footpaths and roads are to be constructed within RPAs, these will be constructed using a 'no dig method of construction' according to arboricultural best practice, utilising soft materials that will allow gaseous diffusion through root systems. If such methods cannot be used, load spreading and tree root friendly construction will be adopted.

Fauna

Bats

8.121 The loss of mature trees across Site will be minimal and limited to the northern proposals where access is required. Should any tree which has potential to support roosting bats be proposed for removal, then further surveys will be undertaken to determine if a bat roost is present. In addition, updated bat surveys for potential roosting opportunities will be undertaken prior to construction, this is to ensure that any new features are assessed, and mitigation measure incorporated, if required.

8.122 In order to mitigate for the potential disturbance effects of artificial construction lighting on bat behaviours; the location of site offices, construction compounds and storage will be sensibly chosen in areas away from habitats utilised by bats. All construction activities will be undertaken during daylight hours to avoid the need for high intensity artificial lighting, therefore reducing the potential for disturbance. Where such work is required then lights will be positioned away from natural habitats and directional lighting used.

Breeding Birds

8.123 All construction activities requiring the removal of vegetation including arable crops will occur outside of the bird breeding season (March to mid-August/September inclusive). Where this is not possible all vegetation should be checked by a qualified ecologist before any removal takes place. This is a statutory requirement owing to the protection of all birds on the nests under the Wildlife and Countryside Act 1981 (as amended).

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Retained habitats will have protective fencing erected to ensure there is no accidental encroachment of machinery or materials takes place could disturb / damage nests.

Wintering Birds

8.124 The loss of arable fields will not be directly compensated for; however, the wider landscape is mainly arable and 'rough' areas of the golf course will continue to provide foraging and places of rest for farmland species.

8.125 The November 2021 survey found limited farmland birds using the Site, with the majority associated with boundary features that will be retained and strengthened. As a precautionary measure, if possible, wintering crops should be removed before that period to limit and disturbance. However, it is also important where habitats are not removed in the winter, that the breeding bird potential during spring is taken into consideration (as above).

8.126 **Reptiles**

8.127 Where losses of periphery habitats are to take place for the creation of new roads and greens, precautionary measures will be implemented to ensure that any reptile in such areas are not harmed which will include passive displacement techniques.

General

8.128 The site manager and other contractors undertaking construction work will be briefed on the presence of reptiles and possibility of water voles, through a 'toolbox talk'. Staff will be provided with information relating to the legislation and briefed on the procedures to be implemented in the event such species are found during works.

Operational Phase

Landscape and Ecological Management Plan (LEMP)

8.129 All areas of the proposed golf course with ecological function will be managed in the long-term under an agreed LEMP, which will maximise the biodiversity by detailing management prescriptions relative to habitat type, species requirements and specific mitigation measures; this will include:

- Reptile habitat compensation, enhancement and management details
- Disturbance avoidance along ditches and Ryebank Rife
- Enhancement and management on ditches
- Management regimes for different habitats – cutting periods
- Location of bat / bird boxes – Monitoring

Habitats

8.130 There is potential for habitats to be ineffectively managed once they have established, this is particularly important concerning cutting regimes on hedgerow and grassland habitats. The ineffective management of habitats could lead to a loss of biodiversity, which is contrary to local and national policies. The LEMP will detail cutting regimes and a timetable of works ensuring that biodiversity can be maximised.

Fauna

Bats

8.131 The proposed golf course will not be lit at night and so will not cause direct or indirect impact to the roosting, commuting and foraging behaviours of bats utilising the Site. Where lighting is required around car parks and the club house, these will be positioned away from natural habitats and directional focused . Ideally, timers will be used to ensure that there are periods of dark to facilitate passage of bats around these areas.

Reptiles

8.132 Reptiles utilise the varied structural diversity that a tussock grassland can provide, as it aids in refuge and foraging opportunities. Specific structures such as hibernaculum and log piles will be provided to enable

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periods of refuge and hibernation. If management of these habitats are not sensitively undertaken, then habitats could become sub-optimal and subject individuals to predation pressures. The cutting regimes within the different grassland habitats will be subjected to specific timed cutting, ensuring that no one grassland type is cut in totality, reducing functional habitats for reptiles. These cutting regimes will be re-assessed to ensure that they are fulfilling the species requirements.

Assessment of Environmental Impacts

8.133 This section provides an assessment of the nature, extent, magnitude of change that the proposed development will have on individual receptors identified in the baseline section. By employing the sensitivity of the receptor and magnitude of change, the significance of environmental effects which arise as a result of the construction and operational periods of the proposed development will be determined.

Site A – Redevelopment of existing golf course

8.134 The following section evaluates the impacts of the development on designated sites and the IEFs identified in the baseline description of Site A. Where relevant this considers both construction and / or operational phases.

Statutory and Non-Statutory Designated Sites

Operational

8.135 Owing to the intervening distance involved, it is considered that increased recreational pressure, effects from lighting and noise during the operational stage will have no effect on the seven statutory sites of international conservation importance.

8.136 The Brooks LNR lies approximately 1km to the west of Site as the crow flies. However, there are no direct footpaths to access this LNR, and residents would have to cross the A29 and walk c. 1.5km (one way) to the edge of the LNR. There is public access to this LNR with an existing pathway around the perimeter of the Site which 'Friends of Bersted Brooks' volunteer group hope to extend and make wheelchair friendly to encourage more visitors. In addition, a large expanse of GI is to be incorporated into the scheme which will encourage residents to remain in the confines of the development for recreational purposes. It is therefore considered that impacts on the LNR during the operational stage will be **Negligible**.

Habitats

Operational

8.137 The removal of intensively managed amenity grassland and ponds P1 & P2 will create an opportunity to increase the number of beneficial habitats, which will include a variety of grassland types, waterbodies/attenuation, tree planting, new hedgerows and a new ditch network. This removal of amenity grassland and creation of new connecting habitats of great value, especially within the western extent, will have a **minor beneficial permanent long-term direct effect at a Local level**.

8.138 The on-site ditches have not been managed for biodiversity and as a result water retention is limited in large extents of the network, with some the channels heavily vegetated with non-target species. In addition, aquatic and marginal species have limited diversity. The potential enhancements such as removal of vegetation from the channel and surrounding will allow for marginal species to colonise, promoting more diversity of habitats. There are also a number of and invasive species such as Parrot's feather and Japanese knotweed, which will be removed, benefiting biodiversity. The enhancement works will lead to a **minor beneficial permanent long-term direct effect at Local level.**

8.139 If habitats are not appropriately managed to maintain their biodiversity value and functionality to support species in the long-term, it would result in **a moderate adverse temporary long-term effect at Site level**.

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Fauna

Bats

Construction

8.140 There are twelve trees with varying degrees of bat potential that will be lost to the development proposals, although none were confirmed with roosts during earlier surveys, they will need to be resurveyed prior to removal, this could result in **minor adverse permanent long term direct effect at Site level**. Construction activities have the potential to cause disturbance to the bat roost identified within a bat box on T96 owing to the proximity of the roost and the proposed housing. Lighting, noise and vibrations from the initial groundworks and construction could all result in the roost becoming unsuitable resulting in a **minor adverse temporary short term direct effect at a Local level**

8.141 Bat behaviours can be affected by lighting, dependent on the species and extent of the lighting, although most of the construction activity will occur in daylight hours reducing effects. Where daylight hours are reduced during the autumn/winter months, bats will be starting to go into hibernation; however there is potential during the intermittent period that if construction lighting is needed this could affect foraging and navigational routes. This would have a **minor adverse temporary short term direct effect at Site level**.

Operational

8.142 The western areas of the development will be retained as natural areas, however the eastern areas will be developed resulting in the loss of habitats and an increase in interactions with the urban environment. The positioning of houses and street lighting could have an impact where they illuminate linear features and natural habitats, thereby affecting navigational and foraging routes along with roosting sites. If lighting or structural blockages occur along linear features and known commuting/foraging routes and roosting sites, this could disrupt the local bat populations usual behaviour, resulting in a **minor adverse permanent medium term indirect/direct effect at a Local level**.

Breeding Birds

Construction

8.143 Construction activities have the potential to cause disturbance to the local bird population through visual and aural stimuli created by the initial groundworks, vegetation clearance and related activities which result in noise and vibration. This is unlikely to cause long-term impacts however, as the local bird assemblage is likely to return post-construction which is predicted to be broadly similar to the pre-existing assemblage, and of at least similar nature conservation value. The effects of construction will have a **minor adverse temporary short term direct impact at a Local level.**

Operational

8.144 New hedgerow networks will create more foraging resources and the inclusion of gardens will also provide opportunities for birds to utilise food resources during the winter, that are high in fats increasing potential survival rates. Urban gardens can also provide additional nesting opportunities, as well as those proposed as part of construction of dwellings. The additional foraging resources provide a **minor beneficial permanent long-term direct effect at a Site level**.

Reptiles

Construction

8.145 It is possible that working areas might need to be extended, whereby hedgerows, ditch margins and/or unmanaged peripheral habitats will be removed or impacted by construction practices. As these habitats, particularly around the peripheries, support a reptile population this could cause an offence under the Schedule 5 of the Wildlife & Countryside Act, whereby individuals are injured or killed. This would result in a **moderate adverse permanent long-term direct impact at Local level**.

Operational

8.146 The existing reptile population has the potential to be impacted during the operation phase from disturbance

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from cats, inappropriate management and general human disturbance. As habitats have been reduced during the construction phase, effects on existing/created habitats might be greater, this could result in a **moderate adverse long-term direct impact at Local level**.

Water Vole

Operational

8.147 The creation of a new purpose-built ditch network and attenuation basins with connections to the Lidsey Rife will provide optimal habitat for water vole with a rich food supply and ample opportunities for refuge and burrowing. This will result in a **moderate beneficial permanent long-term direct impact at Local level**.

Table 8.7 Summary of magnitude of change to ecological receptors at Site A

Receptor/Resources	Summary of Change to Receptor / Resource	Summary Reason
Statutory Designated Sites	Negligible	There will be no impacts on any statutory designated site from the proposed Development due to the intervening distance.
Non-Statutory Designated Site	Negligible	Due to the intervening distance, large expanse of GI incorporated within the scheme, and the LNR able to handle increased public footfall.
Semi-Improved Grassland	Minor	There will be some loss of the semi-improved grassland which make up the 'rough' areas of the golf course. Creation of new species-rich grassland habitats within the GI will compensate for this loss, resulting in a long-term beneficial impact for this habitat.
Trees (Grouped and Scattered)	Minor	Some tree loss is proposed in order to facilitate the Proposed Development. Additional tree planting will compensate for this loss, however, the new planting will take time to mature, resulting in a minor temporary impact on this habitat.
Hedgerows	Minor	Some hedgerow loss is proposed in order to facilitate the Proposed Development. Additional hedgerow planting will compensate for this loss, however, the new planting will take time to mature, resulting in a minor temporary impact on this habitat.
Waterbodies and Riparian Habitats	Minor	Some loss of ditches and waterbodies are proposed to facilitate the Proposed Development, however, creation of a new network of ditches and attenuation, enhancement of existing will result in a long-term benefit.
The Lidsey Rife	Negligible	The Lidsey Rife will be buffered within GI and the implementation of a CEMP and following best practice guidelines will ensure this habitat is protected from pollution, dust and accidental encroachment.
Bats – Buildings (roosting potential)	Negligible	B1 is the only building on site with potential to support roosting bats and this building is due to be retained resulting in a negligible impact.
Bats – Trees (roosting potential)	Minor	Twelve trees with varying roosting potential will be lost, none confirmed as having roosts on previous surveys.
Bats – Pipistrelle Roost in Tree T96	Minor	Retained within the GI, however in close proximity to proposed development which could increase lighting.
Bats – Foraging and Commuting – Common Species	Minor	There will be some loss of foraging/commuting habitat during construction and operational phase of the development, however dark buffers incorporated into

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Receptor/Resources	Summary of Change to Receptor / Resource	Summary Reason
		the GI will ensure that commuting corridors are still available to the west of the development.
Bats – Foraging and Commuting – Barbastelle	Minor	As above. Limited use of the Site by these Annex II species, effects are adverse but limited as not reliant on the habitats.
Breeding Birds	Minor	There will be some short-term disturbance to the local bird population, and loss of nesting/foraging habitat and disturbance during construction phase. However, habitats to be created will likely provide a betterment for bird species present in the long-term.
Gadwall	Negligible	Creation of a buffer along the length of the Lidsey Rife, along with provision of a CEMP, fencing and best practice will ensure that this species is protected from disturbance, pollution, lighting and accidental encroachment from development.
Reptiles	Minor	There is a potential risk of killing or injury to individuals during the construction works. In addition, there will be small losses of suitable habitat during the construction works, however habitats to be created will provide a betterment for this species in the long-term.
Water Voles	Moderate	There is a potential risk of killing or injury to individuals during the construction works. In addition, there will be small losses of suitable habitat during the construction works, however habitats to be created will provide a betterment, this will also include enhancements of existing ditches, providing benefits for this species in the long-term.

Site B – Relocation of Golf Course

8.148 The following section evaluates the impacts of the development on designated sites and the IEFs identified in the baseline description of Site B. Where relevant this considers both construction and / or operational phases.

Statutory and Non-Statutory Designated Sites

Operational

8.149 Owing to the intervening distance involved and as the development is solely for recreational purposes, it is considered that increased recreational pressure, effects from lighting and noise during the operational stage will be **Negligible**.

Habitats

Operational

8.150 The removal of arable land, although this will include the limited areas of species-rich arable margins, will create a significant opportunity to increase the number of beneficial habitats, which will include a variety of grassland types, waterbodies, woodland and new hedgerows. The change from intensively managed arable habitats will therefore have a **moderate beneficial permanent long-term direct effect at a Local level**.

8.151 Total loss of hedgerow H2, partial loss of H1 and H4, be compensated for by species-rich linear planting up and new areas of shrub, scrub and tree planting and other linear features incorporated within the 'rough' habitats through the Site, increasing connectivity which is currently limited to the peripheries. This will result in a **moderate beneficial permanent long-term direct effect at Local level**.

8.152 The trees and scrub are largely restricted to the peripheries, the creation of new stepping stone habitats will

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enable a more diverse range of species across the central regions of the Site, resulting in **a minor beneficial permanent long-term direct effect at Local level**.

8.153 The on-site ditches have not been managed for biodiversity and as a result water retention is limited in large extents of the network, with some the channels heavily vegetated with non-target species. In addition, aquatic and marginal species have limited diversity. The potential enhancements such as removal of vegetation from and surrounding the channel will allow for marginal species to colonise, promoting more diversity of habitats. The enhancement works will lead to a **minor beneficial permanent long-term direct effect at Local level**.

Fauna

Bats

Construction

8.154 As stated for Site A, paragraph 1.182 inappropriate construction lighting will lead to **minor adverse temporary short term direct impact at Site level.** There is a loss of one tree T32 with low roosting potential, the effects **are negligible.**

Operational

8.155 Neither the golf course nor the driving range will be lit. Lighting will be restricted to the club house and car park which are located near linear features in the north. The positioning of this lighting could have an impact where they illuminate linear features and natural habitats, thereby affecting navigational and foraging routes. If lighting or structural blockages occur along linear features and known commuting/foraging routes, this could disrupt the local bat populations usual behaviour, resulting in a **minor adverse temporary short term direct effect at a Site level**, this is particularly important to barbastelles which are more light sensitive.

Breeding Birds

Construction

8.156 Habitats onsite were considered suitable to support a range of common and widespread species, with woodland, hedgerows and scrub providing suitable breeding and foraging for generalist species. The loss of arable environs will have a **minor adverse permanent short term direct effect at a Site level.**

Wintering Birds

Construction

8.157 The majority of the existing population will benefit from the large extent of additional habitats created that will benefit the bird species identified that utilise edge habitats, with large areas of connecting 'roughs' that provide foraging and structural maturity over time that will creating nesting opportunities.

8.158 There will be a large variety and extent of habitat creation which will increase foraging and refuge opportunities for wintering bird assemblage resulting in a **minor beneficial permanent long-term effect at Local level**.

Reptiles

Operational

8.159 It is considered that the significant increases in habitats would lead to a **minor beneficial permanent long-term direct effect at Local level**.

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Table 8.8 Summary of magnitude of change to ecological receptors at Site B

Receptor/Resources	Summary of Change to Receptor / Resource	Summary Reason
Statutory Designated Sites	Negligible	Due to intervening distances and the recreational purpose of the proposed golf course, there will be no impact on statutory designated sites.
Non-Statutory Designated Site	Negligible	There will be no impact on the LWS due to the recreational nature of the proposed golf course.
Arable Field Margins	Moderate	The species-rich arable margins will be lost to facilitate the proposed golf course. This will be compensated for by additional species-rich grassland planting.
Woodland	Negligible	The woodland will be retained and buffered due to the nature of the proposals.
Trees and Scrub	Moderate	Limited tree and scrub loss will occur to facilitate the proposed golf course. This will be compensated for by substantial planting within the roughs of the golf course.
Hedgerows	Minor	Small hedgerow losses will be compensated for by new hedgerows being created and similar habitat types within the 'roughs' of the golf course. .
Ditches	Negligible	The Ryebank Rife and ditches onsite will be retained, enhanced through vegetation removal and buffered.
Bats – Trees (roosting potential)	Minor	Only one tree will be lost with low bat potential (T32), this is to facilitate access to the green from the club house.
Bats – Foraging and Commuting – Common Species	Moderate	Limited loss of foraging and commuting resources, and effect from lighting largely redundant due to nature of development. Substantial habitats will be created that will benefit bat populations in the long-term
Bats – Foraging and Commuting – Barbastelle	Minor	As above. Barbastelle in low number not reliant on habitats, but enhancement will encourage future use.
Bats– Operational lighting Sources - Barbastelle	Minor	Lighting will be increased in the northern areas of the Site. Although large areas will be retained as dark habitats
Birds - Breeding	Minor	Limited loss of features used by breeding birds. Substantial structural planting throughout site increase breeding opportunities.
Birds – Wintering	Minor	Low number of skylarks will be displaced but the remaining bird assemblage will benefit from habitat creation and enhancement.
Reptiles	Moderate	Boundary features used by reptile will be retained. Favourable habitats created, with connectivity through Site. Suitable refuge and foraging habitats created, benefiting these species.

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Site A – Redevelopment of existing golf course

8.160 Table 8.9 below shows the significance of the impact derived from sensitivity and magnitude of change.

Table 8.9 Significance of environmental effect for ecological receptors at Site A

Receptor/Resources	Sensitivity	Magnitude of Change	Significance of Effect
Statutory Designated Sites	High	Negligible	Negligible
Non-Statutory Designated Site	Low	Negligible	Negligible
Semi-Improved Grassland	Low	Minor	Minor beneficial permanent direct long-term – negligible effect
Trees (Grouped and Scattered)	Low	Minor	Minor beneficial permanent direct long-term – negligible effect
Hedgerows	Low	Minor	Minor beneficial permanent direct long-term – negligible effect
Waterbodies and Riparian Habitats	Low	Minor	Minor beneficial permanent direct long-term
The Lidsey Rife	Moderate	Negligible	Negligible
Bats – Confirmed Pipistrelle Tree Roost in T96	Low	Minor	Minor adverse indirect short term – negligible effect
Bats – Trees (roosting potential)	Low	Minor	Minor adverse permanent direct long term
Bats – Foraging and Commuting – Common Species – Construction	Low	Minor	Minor adverse temporary direct short term
Bats – Foraging and Commuting – Barbastelle – Construction	Moderate	Minor	Minor adverse temporary direct short term
Bats – Operational lighting Sources - Common Species	Low	Minor	Minor adverse permanent direct/indirect medium term
Bats– Operational lighting Sources - Barbastelle	Moderate	Minor	Minor adverse permanent direct/indirect medium term effect
Breeding Birds – Construction	Low	Minor	Minor adverse temporary direct short term effect
Breeding Birds – Operational	Low	Minor	Minor beneficial direct long-term
Gadwall	Moderate	Negligible	Negligible
Reptiles - Construction	Low	Minor	Moderate adverse permanent direct long-term
Reptiles – Operational	Low	Minor	Moderate adverse permanent direct long-term
Water Voles	Low	Minor	Minor beneficial permanent direct long-term effect

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Site B – Relocation of Golf Course

8.161 Table 8.10 below shows the significance of the impact derived from sensitivity and magnitude of change.

Table 8.10 Significance of environmental effect for ecological receptors at Site B

Receptor/Resources	Sensitivity	Magnitude of Change	Significance of Effect
Statutory Designated Sites	High	Negligible	Negligible
Non-Statutory Designated Site	Low	Negligible	Negligible
Arable field margins	Low	Moderate	Minor beneficial permanent direct long-term effect
Woodland	Low	Negligible	Negligible
Trees and scrub	Low	Minor	Minor beneficial permanent direct long-term Negligible effect -
Hedgerows	Low	Minor	Minor beneficial permanent direct long-term effect - Negligible
Ditches	Low	Negligible	Negligible
Ryebank Rife	Moderate	Negligible	Negligible
Bats – T32 Trees (low Roosting potential)	Low	Negligible	Negligible
Bats – Foraging and Commuting – Common Species	Low	Minor	Minor beneficial permanent direct long-term effect - Negligible
Bats – Foraging and Commuting – Barbastelle	Moderate	Minor	Minor beneficial permanent indirect long-term effect
Bats– Operational lighting Sources - Barbastelle	Moderate	Minor	Minor adverse temporary indirect short term effect
Birds - Breeding	Low	Minor	Minor beneficial permanent direct long-term effect -Negligible
Birds - Wintering	Low	Minor	Minor beneficial permanent direct long-term effect -Negligible
Reptiles	Low	Moderate	Minor beneficial permanent direct long-term effect

Actionable Mitigation

8.162 This section describes actionable mitigation to be employed to reduce the negative effects of the proposed development.

Site A – Redevelopment of existing golf course

Habitats

Monitoring

8.163 The inclusion of the western areas backing onto the Lidsey Rife as areas of GI will incorporate existing features that will be enhanced, but will also include the creation of new linkage habitats through the scheme which include significant waterbodies/attenuation and ditches created. It is important that all ecological features/habitats, particularly waterbodies are managed to ensure that they do not get engulfed with vegetation and reduce biodiversity and function for key fauna species. It is also important that management is responsive to any pressures from the residential use of the GI, this will include that grassland habitats are suitably managed, litter is removed and more litter bin provisions in key areas are provided if required, and

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where habitats/specimens are in poor health that they are replaced on a like-for-like basis or adjusted to accommodate the pressure. The key to the monitoring is that it is adaptive to ensure long-term sustainability, viability and that they remain suitable for the intended purpose.

8.164 A LEMP will detail ecological works and standardise management practices such as rotational strimming and monitoring. Such documents will be prepared pursuant to either a planning condition or planning obligation.

Fauna

Bats

8.165 The bat box on tree T96 will be retained within the existing GI, with some additional planting taking place; owing to the surrounding habitats it is likely that any roosting bats will not be adversely effected from lighting, however if a reserve matters plans change and the roost is likely to be disturbed, then a Natural England licence will be required to legitimise the relocation of the bat box into a nearby suitable area within the GI, if the bat is still present, and this will need to be monitored.

8.166 The lighting and layout of the Proposed Development will be designed to minimise light-spill onto habitats that are used by the local bat population foraging or commuting. This will be achieved by the creation of dark corridors throughout the site. In particular the western boundary adjacent to the Lidsey Rife and the new waterbodies/attenuation, but also the northern extent of Site A where development is largely absent.

8.167 A lighting scheme would be designed with regard to current guidance provided by the Bat Conservation Trust and the Institution of Lighting Professionals[32] and adopt the following principles:

- The avoidance of direct lighting of existing trees, hedgerows, scrub, woodland, or proposed areas of habitat creation / landscape planting;
- The GI buffers around the Lidsey Rife and those corridors linking between such areas and residential areas should not to be illuminated;
- Hedgerows and buffers will be kept dark (where possible), which will maintain corridors of movement of bats, but particularly barbastelles that may occur;
- Low pressure sodium lighting or similar to be used, as they emit at one wavelength so attracting less invertebrates;
- Directional lighting and avoidance of upward lighting and / or light spillage;
- Lighting columns to be as short as possible, although in some locations taller columns would allow reduced horizontal spill; and
- Security lighting on residential properties and the care home near areas of GI will be low wattage LED, which will be installed at construction stage to forestall any future homeowner installing unsuitable lighting, which could impact on wildlife such as bats and birds.

8.168 Roosting opportunities will be enhanced through the installation of bat boxes on retained trees and incorporated onto selected new buildings. These could include Ibstock bat bricks or Schwegler 1FR bat tubes and Schwegler 1F and 2FN bat boxes for trees. The provision of such features would be in accordance with national and local planning policy helping to enhance biodiversity. These will also be monitored and checked by a licensed bat worker, and where required they will be replaced if damaged or lost; ideally with records submitted the local record center.

Breeding Birds

8.169 Nesting opportunities for breeding birds will be enhanced through the installation of bird boxes. The provision of such enhancements would be in accordance with local and national planning policy. The following provides details of suitable nest box types to be included within the scheme:

- A mixture of small hole (26mm and 32mm) boxes placed throughout the Site on suitable trees and

[32] Institute of Lighting Professionals. (2018). Bats and Artificial lighting in the UK.

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buildings will provide nesting opportunities for blue tit *Cyanistes caeruleus* and great tit *Parus major*. These boxes generally have a high uptake rate;

- Larger nest boxes with a 45mm hole should be placed under the eaves of buildings, or approximately 2.5m above ground in trees in order to provide nesting opportunities for starling; and larger terraced style or multiple single holed 32mm nest boxes should be placed on buildings to attract house sparrows;
- Small open fronted nest boxes again should be placed throughout the Site especially on trees which support a climber such as ivy *Hedera helix* which provides a degree of concealment. These boxes typically attract robin *Erithacus rubecula*, blackbird *Turdus merula* and spotted flycatcher *Muscicapa striata*; and
- A mixture of more specialised nest boxes should be placed on retained trees and new buildings and should include boxes for stock dove *Columba oenas*, kestrel *Falco tinnunculus*, swallow *Hirundo rustica*, house sparrow and swift *Apus apus*.
- The condition of the boxes should also be monitored, and where they are starting to fail they are replaced prior to the breeding season.

Reptiles

8.170 Habitats will be maintained and monitored to ensure they function as foraging and refuge potential. Population size assessments will ensure that the population remains viable and management adjustment made based on these surveys.

Site B – Relocation of Golf Course

Habitats

Monitoring

8.171 There will need to be a balance between the functionality of the golf course and the Site's biodiversity interests. The new habitats created within the areas of rough and the existing peripheries will be subject to long-term monitoring to ensure future sustainability, viability and that they remain suitable for the intended purpose (when provided as specific mitigation measure for fauna). Non-viable or failed specimens/habitats will be replaced on a like for like basis or similar. Cutting regimes, timings and specific management required will be detailed within LEMP.

Fauna

Bats

Construction

8.172 Roosting opportunities will be enhanced through the installation of bat boxes on retained trees. These could include Ibstock bat bricks or Schwegler 1FR bat tubes within the club house and Schwegler 1F and 2FN bat boxes for trees. The provision of such features would be in accordance with National and Local Planning Policy helping to enhance biodiversity. These will also be monitored and checked by a licensed bat work, where required they will be replaced if damaged or lost; with records submitted the local record centre.

8.173 The proposed golf course will not be lit at night. Where outside lighting is required around the car park and club house buildings, this will be on a timer and designed to minimise light-spill onto habitats used by the local bat population for foraging or commuting. The design of lighting will be based upon guidelines presented by the Bat Conservation Trust & Institute of Lighting Engineers 'Bats and Lighting in the UK', with the following principals. Therefore, the lighting scheme will include the following:

- The strategic use of landscaping and planting to avoid light spill on sensitive habitats, including the retained scrub areas. The site boundaries will be buffered with additional planting to prevent light spill which will encourage use by bats. Additional LUX levels should be no greater than 1LUX for this habitat area.
- The avoidance of direct lighting of existing trees, scrub, woodland, or proposed areas of habitat creation

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/ landscape planting. This is particularly important for this site due to the presence of light sensitive barbastelle bats. Any lighting will be directed away from retained or created habitats.

- Unnecessary light spill will be controlled through a combination of directional lighting, low level lighting columns, hooded / shielded luminaires and strategic planting.
- All new column mounted luminaires will be fitted with flat glass where appropriate to aid 0% upward light discharge which will reduce light pollution for larger bat species found foraging over the site such as noctule and serotine.
- Where located adjacent to green corridors and retained habitats, lights will be installed facing away from the habitats and will be fitted with rear light baffles or cowls to prevent light spill behind them.

Birds

Construction

8.174 Nesting opportunities will be enhanced through the installation of bird boxes. The provision of such enhancements would be in accordance with national planning policies. The following provides details of suitable nest box types to be included within the scheme:

- A mixture of small hole (26mm and 32mm) boxes placed on suitable trees will provide nesting opportunities for blue tit *Cyanistes caeruleus* and great tit *Parus major*.
- Larger nest boxes with a 45mm hole should be placed in trees in order to provide nesting opportunities for starlings *Sturnus vulgaris*;
- Small open fronted nest boxes again should be installed on trees which support a climber such as ivy which provides a degree of concealment. These boxes typically attract robin *Erithacus rubecula*, blackbird *Turdus merula* and sand potted flycatcher *Muscicapa striata*.

Reptiles

8.175 Habitats will be maintained and monitored to ensure they function as foraging and refuge potential. Population size assessments will ensure that the population remains viable and management adjustment made based on these surveys.

Residual Impact Assessment

8.176 This section identifies residual effects and their significance.

Site A – Redevelopment of existing golf course

8.177 These are the residual impacts that remain after inherent, standard and actionable mitigation measures are applied.

Habitats

Construction

8.178 The CEMP and proposed mitigation measures will reduce potential effects from habitat loss, incidental damage, pollution, and disturbance, such that those effects on retained, enhanced and created habitats will be **Negligible**. Creation of new habitats which were previously absent from Site A will provide diversity within the scheme providing a **minor beneficial permanent direct long-term effect at a Local level.**

Operational

8.179 The establishment of a variety of new habitats and the successful maturity will be dependent on a number of factors including weather, management and utilisation by the public/new residents. The LEMP will ensure that the habitats created and enhanced, do establish successfully, and remain viable for the foreseeable future. These measures will ensure that there is a **minor beneficial permanent direct long-term effect at a Local**

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level.

Fauna

Birds

8.180 The creation of new habitats and provision of nest boxes strategically located throughout the site, will increase the overall nesting resources within Site A resulting in a **minor beneficial permanent long-term effect at a Site level.**

8.181 Creation of a buffer along the length of the Lidsey Rife, along with provision of a CEMP, fencing and best practice will ensure that any Gadwall present within the Lidsey Rife are protected from disturbance, pollution, lighting and accidental encroachment from development, resulting in a **Negligible impact**.

Bats

8.182 The production of a sensitive lighting strategy, along with newly created dark corridors, will ensure that habitats currently utilised by common bat species within the local population, will remain viable and will maintain connectivity around the Site and into the wider environment. The lighting strategy and the general retention of dark corridors to the west will also ensure the light sensitive barbastelles can continue to utilise the corridors within which they were found. The incorporation of bat boxes throughout the Site will increase the roosting habitat available to the local bat population. These measures will ensure that there is a **minor beneficial permanent long-term effect at a Local level.**

Reptiles

8.183 A passive displacement exercise (or trapping and translocation if deemed necessary) will be undertaken prior to any construction works to ensure that the FCS of the reptiles present within the Site will be maintained. This, along with retention of suitable reptile habitat and the creation of additional suitable habitat which will be managed to ensure optimal conditions, will ensure that there is a **minor beneficial permanent direct long-term effect at a Site level.**

Water Voles

8.184 Prior to commencement of construction works additional surveys will confirm the presence or likely absence of water voles, and appropriate mitigation measures taken including a NE licence to displace or trap individuals. The existing and newly created ditches will be under a management regime to increase their value as a foraging and refuge resource for the local population that are using the Lidsay Rife. These mitigation measures will result in a **minor beneficial permanent direct long-term effect at a Local level.**

Table 8.11 Residual ecological effects at Site A

Receptor/Resources	Significance of Effect	Mitigation (Actionable)	Residual Effect
Habitats - Woodlands, grasslands, waterbodies and Hedgerows	Minor beneficial - Negligible	Long-term monitoring newly planted habitats to ensure establishment and long-term viability of specimens.	Minor beneficial permanent long-term effort at local level
Bats - Tree roosts – Common Species	Minor adverse-Negligible	A sensitive lighting scheme will be designed in order to reduce light spill onto sensitive habitats utilised by bats. Tree roosts will be compensated / supplemented by bat boxes on trees and/or on buildings	Minor beneficial permanent long-term effect at Local level
Bat – Foraging and Commuting / Lighting – Common Species	Minor adverse		
Bat - Foraging and Commuting / Lighting – Barbastelle	Minor adverse / Minor adverse – Negligible		
Breeding Birds	Minor beneficial – Negligible	Provision of nest boxes to increase suitable breeding habitat within the Site	Minor beneficial permanent long-term effect at Site level
Reptiles	Minor beneficial – Negligible	Retention of most habitats, where loss is likely a passive	Minor beneficial permanent long-term effect at Site level

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Receptor/Resources	Significance of Effect	Mitigation (Actionable)	Residual Effect
		displacement exercise, or a trapping and translocation exercise. Habitats will be managed to ensure they are suitable for reptiles, this includes monitoring hibernaculum and log piles. Population assessment undertaken.	
Water Vole	Minor beneficial	Long-term habitat quality will be ensured by monitoring and management.	Minor beneficial permanent long-term at local level

Site B – Relocation of Golf Course

8.185 These are the residual impacts that remain after inherent, standard and actionable mitigation measures are applied.

Habitats

Construction

8.186 The proposals will retain the IEF and lose those which are of limited value (arable). There will be substantial habitats created, which will favour biodiversity gains and ecological function, especially compare that previous represented. Enhancements will be made to linear features, and a CEMP will ensure these are protected during development. The combination of new and existing habitats will result in a **moderate beneficial permanent direct long-term effect at a Local level.**

Operational

8.187 The LEMP will ensure that habitats are monitored and adaptive management measures can be implemented in response to any pressures/changes/impacts, ensuring their viability into the future. These measures will ensure that there is a **moderate beneficial permanent direct long-term effect at a Local level**.

Fauna

Bats

8.188 The production of a sensitive lighting strategy for the small areas that may require temporary lighting, along with continued and newly created dark corridors, will ensure continued use by species recorded during the surveys. The creation of a greater diversity of habitats including waterbodies, scrub and grassland will provide foraging opportunities that were previously absent and attract bat species that were poorly represented because of the limited habitats. The incorporation of bat boxes throughout the scheme will increase the roosting habitat available to the local bat population. These measures will ensure that there is a **moderate beneficial permanent long-term effect at a Local level**.

Birds

8.189 The mitigation measures in place with reduce the potential impacts to negligible. The creation of new habitats and provision of nest boxes strategically located throughout the site, will increase the overall nesting resources within Site resulting in a **minor beneficial permanent long-term effect at a Local level**.

Reptiles

8.190 It is likely that there will be no habitat losses that will affect the reptile populations, however if this is needed passive displacement will be undertaken. It is important that monitoring of that habitats for reptiles are undertaken, and the LEMP will ensure that optimal habitats are created through the scheme at will function in the long-term. The size, quality and long-term assurances will ensure that there is a **moderate beneficial permanent direct long-term effect at a Local level**.

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Table 8.12 Residual ecological effects at Site B

Receptor/Resources	Significance of Effect	Mitigation (Actionable)	Residual Effect
Habitats – retained/created	Minor / Minor – Negligible / Negligible	Monitoring and adaptive management through an LEMP will ensure biodiversity and ecological gains	Moderate beneficial permanent effect in the long-term at Local level
Bats – Trees (Roosting potential)	Minor beneficial	New bat roosting opportunities on trees and monitored	Minor beneficial permanent effect in the long-term at Local level.
Bats – Foraging and Commuting – Common Species / barbastelle	Minor beneficial – Negligible / Minor beneficial	A sensitive lighting will be designed in order to reduce light spill onto sensitive habitats utilised by bats. Habitat managed to ensure foraging opportunities. .	Moderate beneficial permanent effect in the long-term at Local level.
Bats – Operational Lighting Sources – barabstelle	Minor adverse		
Birds - Breeding	Minor beneficial - Negligible	Provision of nest boxes to increase suitable breeding habitat.	Minor beneficial permanent effect in the long-term at Local level.
Birds - Wintering	Minor beneficial - Negligible	Areas of suitable bird habitat will be monitored and management adjusted accordingly.	Minor beneficial permanent effect in the long-term at Local level
Reptiles	Minor beneficial	Areas of suitable reptile habitat will be monitored and management adjusted accordingly. Populations will be monitored.	Minor beneficial permanent effect in the long-term at Local level.

NB: Inherent/ Standard Mitigation is included in determining the Magnitude of Change in Tables 5 and 6. Only Actionable Mitigation is employed in Tables 7 and 8 to arrive at Residual Effect.

Cumulative Effects

8.191 This Section identifies and assesses the nature, extent, magnitude and significance of inter-project effects (i.e., effects from other development in combination with those from the proposed development).

8.192 The sites identified in Chapter 4 have been considered for their cumulative effects on biodiversity and designated sites.

Site A – Redevelopment of existing Golf Course

Construction Phase

Designated Sites of Nature Conservation Importance

8.193 There will be no direct loss of habitat on any statutory sites of nature conservation interest as a result of the development at Site A, there are no cumulative effects with other developments identified above.

8.194 Site A has not been found to provide supporting habitat for any species for which designated sites have been identified, so there are no effects alone or in combination.

8.195 It has been concluded that the intervening distance between the International designated sites and the Site is far enough to ensure there will be no construction effects from the proposals alone, and thus cumulative effects will not occur. Regarding those sites above, which are in proximity to European Designated Sites would have to follow local policies ENV SP1 Natural Environment and ENV DM1 Designated Sites of

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biodiversity or geological importance in the Arun District Council Local Plan.

Habitats

8.196 All proposed developments will adhere to NPPF, Environmental Act and local policies ENV SP1 and ENV DM5, whereby habitats of importance are retained and enhanced, with additional habitat created to ensure increases in biodiversity. Each site will need to result in positive and negligible enhancements, which will vary in value. It is anticipated that disturbance of retained habitats during construction will be minimised through best practice, including the use of fenced buffer zones, protection of tree roots through RPA, drainage strategies and the control of dust and accidental pollution events. These measures will ensure that the cumulative impact of disturbance to habitats during construction is **Negligible**.

Fauna

8.197 It is considered that the mitigation included for each of the applications is sufficient to ensure that there will be no cumulative impacts to badgers, bats, amphibians, reptiles or birds during the construction phase.

Operational Phase

International Designated Sites of Nature Conservation Importance

8.198 The Site is outside of the 5km ZoI for Pagham Harbour SPA/Ramsar, and therefore there will be no effects on the integrity of this European Designated site as stated with policy ENV DM1 of the local plan. As Site A will not have a detrimental effect on Pagham Harbour SPA/Ramsar, there cannot be a cumulative effect with other Applications. Regardless those sites within 5km of Pagham Harbour SPA/Ramsar will have to make contributions to the Solent Recreation Mitigation Strategy (SRMS).

Nationally Designated and Non-Statutory Sites

8.199 It is considered that the mitigation described for Site A and each Application considered, include the implementation of public open space including circular walks and areas for off-lead dog activity, which is sufficient to ensure any cumulative effects from increased recreational pressures upon any SSSI or LNR within the ZoI are predicted to be **Negligible.**

Habitats

8.200 Following the implementation of mitigation measures and GI requirements, beneficial effects are predicted for the majority of Applications listed ensuring there are biodiversity gains, so they are policy compliant. The extent of losses proposed are considered to be **Negligible**, ensuring the cumulative impact during operation is also **Negligible**.

Fauna

8.201 It is considered that the mitigation described for each of the applications is sufficient to ensure that there will be no cumulative impacts or an offence under legislation to badgers, bats, birds, dormice, GCN, reptiles or water vole during the operational phase.

Site B – Relocation of Golf Course

8.202 Due to the recreational nature of the proposed golf course and intervening distances, there will be no alone or in combination effect on statutory and non-statutory designated sites.

8.203 All the above Applications that have been granted planning permission will have to adhere to the national and local policies, particularly Policy ENV DM5 regarding Development and Biodiversity, which identifies that development should seek to achieve a net gain in biodiversity and facilitate the emergence of new habitats through creation of links between habitat areas to allow species movement. It also states for the provision of bat and bird boxes. The proposed golf course will provide new connectivity, foraging and refuge habitats for wildlife; and the mitigation to be implemented on the above Applications will also provide such opportunities to ensure their compliance with policies.

8.204 Those Applications that have been either refused, appealed or have yet to be submitted or determined, will also have to adhere to these measures and so there will be **Negligible** adverse effect to wildlife with the

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opportunity for **minor/moderate beneficial effect at a Local level**.

Summary

Site A – Redevelopment of existing golf course

8.205 An assessment has been undertaken to establish the likely significant effects of the Site in terms of ecology and biodiversity. The assessment has been informed by a comprehensive desk study and suite of ecological surveys.

8.206 The intervening distance between the internationally designated sites and Site A will result in a **Negligible** effect on the designated sites. This will also ensure that in combination effects are **Negligible**. The large expanse of on-site GI will provide new residents with areas for recreation ensuring that impacts to the Brooks LNR will be also be **Negligible**.

8.207 The intensively managed amenity grassland of the golf course is of **Negligible** ecological value, of which the majority to the east will be lost to facilitate residential development. Habitats of higher ecological value such as the woodlands, ditches and small areas of the golf course 'roughs' where management was less intense will largely be retained. Where these habitats will be lost, compensatory planting of habitats of high ecological value, such as woodland, species-rich grassland and wildflower meadow, and creation of a new waterbodies and extensive ditch network are proposed, which increase biodiversity and provide opportunities for the local fauna.

8.208 A CEMP will ensure retained habitats are protected during the construction phase and the LEMP will ensure that all habitats sustain their optimal condition in perpetuity, so to ensure that biodiversity benefits meet local and national policies. These will also ensure that any invasive species removed do not reoccur and if they do, they are quickly treated/removed.

8.209 The retention, enhancement and creation of habitats throughout Site A will benefit a number of fauna species. The local bat population will benefit from increases in commuting, foraging and roosting resources, and the local bird population will benefit from increases in nesting opportunities. Reptiles and water vole will both benefit from enhancement and creation of new optimal habitat with the GI. These habitats will be specifically managed to meet the function requirements for these and other species, which will be detailed in a LEMP.

8.210 The BNG work done on the indicative layout, as calculated that there will 10.29% gain in habitats. At this outline stage this exceeds the 10% requirement under the current Environmental Act, these habitats will also benefit a number of protected and notable species, for which specific mitigation measures have been adopted where needed. This calculation may change at reserve matters depending on the scheme design. These measures will result in an overall **minor beneficial direct effect in the long-term at a Local level.**

Site B – Relocation of Golf Course

8.211 An assessment, based on ecological surveys and a comprehensive desk study, has been undertaken to determine the likely significant effects of the proposed golf course on ecology and biodiversity.

8.212 There will be a **Negligible** impact on international statutory designated sites and the non-statutory site, due to the recreational nature of the proposals, intervening distances and best practice measures incorporated. This will also ensure that in combination effects are **Negligible.**

8.213 The woodland bordering the eastern, southern and western boundaries of the southern field is classified as a habitat of principal importance under NERC Act. It has been assessed as being of local level conservation value, and will be integrated within the GI during construction and operation phases. The RPA will be protected by high-visibility fencing. These measures will ensure that impacts are negligible.

8.214 The four hedgerows onsite all classified habitats of principal importance under NERC and are of local value. One hedgerow (H4) qualified as 'important' under REGS. Hedgerow H2 will be lost to facilitate the proposed golf course. However, there will be extensive compensatory planting of native species rich scrub and trees, which will increase biodiversity and provide opportunities for the local fauna.

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8.215 The arable fields are of **Negligible** ecological value, with exception to limited areas of diverse arable field margins which are of local value, both of these areas will be lost to facilitate the development. The GI within the proposed golf course will create a number of habitats which are currently absent or poorly represented, including waterbodies, additional woodland planting, diverse hedgerow networks, and diverse grassland areas. This is considered to provide an overall benefit to wildlife and compensate for the areas of habitat to be lost.

8.216 A CEMP will ensure retained habitats are protected during the construction phase and the LEMP will ensure that all habitats sustain their optimal condition in perpetuity, so to ensure that biodiversity benefits meet local and national policies.

8.217 Improvements to the habitat diversity within the Site will benefit a number of fauna species. The local bat populations will benefit from the increases if foraging and navigational opportunities, increased foraging and nesting opportunities for birds and reptiles will have large areas to colonise. These habitats will be specifically managed to meet the function requirements for these and other species, which will be detailed in a LEMP.

8.218 The habitats created achieve 41.79% BNG, which exceeds the 10% requirement under the current Environmental Act, these habitats will also benefit a number of protected and notable species, for which specific mitigation measures have been adopted where needed. These measures will lead to an overall **moderate beneficial direct effect in the long-term at a Local level.**

8.219 The cumulative effect of the Project is **minor-moderate beneficial direct long-term at a Local Level**.

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9 WATER RESOURCES

Introduction

9.1 This Chapter of the ES assesses the likely significant effects of the proposed developments at Bognor Regis on the water environment in the context of the baseline conditions at and within the vicinity of the Site. Where appropriate it also identifies proposed mitigation measures to prevent, minimise or control likely negative (adverse) effects in terms of water resources, flood risk and drainage arising from the proposed development and the subsequent anticipated residual effects.

9.2 This chapter should be read together with Chapter 9' Biodiversity' and Chapter 13 'Ground Conditions' and the following technical appendices:

- Appendix 9.1 Flood Risk Assessment (FRA) for Site A;
- Appendix 9.2 Surface Water Drainage Strategy (SWDS) for Site A; and
- Appendix 9.3 Flood Risk Assessment for Site B.

Potential Effects

9.3 This section summarises the likely potential effects of the proposed development on the environmental topic area.

Site A – Redevelopment of existing golf course

Construction Phase

9.4 The following possible significant effects on water resources and flood risk that could occur during the construction phase have been identified:

- Changes in the risk of flooding at the site and their effects on potential receptors (i.e., construction workers);
- Changes in the risk of flooding on the surrounding areas and their effects on potential receptors (i.e., residents and users); and
- Changes to the quality (i.e., physical & chemical contamination) of surface water discharged to the water environment.

Operational Phase

9.5 The following possible significant effects that could occur during the operational phase of the development have been identified:

- Changes in the risk of flooding at the site and their effects on potential receptors (i.e., residents and users);
- Changes in the risk of flooding on the surrounding areas and their effects on potential receptors (i.e., residents and users);
- Changes to the drainage regime – quantity and quality of surface water discharged to the water environment; and
- Impact of the proposed development on water supply and availability.

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Site B – Relocation of golf course

Construction Phase

9.6 The following possible significant effects on water resources and flood risk that could occur during the construction phase have been identified:

- Changes in the risk of flooding at the site and their effects on potential receptors (i.e., construction workers);
- Changes in the risk of flooding on the surrounding areas and their effects on potential receptors (i.e., residents and users); and
- Changes to the quality (i.e., physical & chemical contamination) of surface water discharged to the water environment

Operational Phase

9.7 The following possible significant effects that could occur during the operational phase of the development have been identified:

- Changes in the risk of flooding at the site and their effects on potential receptors (i.e., users);
- Changes in the risk of flooding on the surrounding areas and their effects on potential receptors (i.e., residents and users);
- Changes to the drainage regime – quantity and quality of surface water discharged to the water environment; and
- Impact of the proposed development on water quantity / supply and availability.

Assessment Methodology

9.8 The section describes the methodology used to undertake the assessment within this Chapter.

Study Area

9.9 The study area considered for the purpose of this assessment will comprise the proposed development sites and their immediate surrounding area within 250m. This distance has been used based on professional judgement in general practice and it is considered that within this radius the surrounding area may be affected by or may affect the Sites.

Consultation

9.10 Consultation was undertaken with the Environment Agency in January 2020 to understand the baseline flood risk data and determine the scope and methodology for the site specific hydraulic modelling. Further information is provided within the Flood Risk Assessment (*Appendix 9.1*).

Legislative / Planning Policy Context

Legislative Context

9.12 The applicable legislative framework is summarised as follows:

- The Environmental Protection Act 1990;
- The Water Industry Act 1991;
- Water Resources Act 1991;
- Land Drainage Act 1991;

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- Land Drainage Act 1994;
- The Environment Act 1995;
- The Anti-Pollution Works Regulations 1999;
- The Water Industry Act 1999;
- The Water Act 2003;
- The Water Environment (Water Framework Directive) (WFD) (England and Wales) Regulations, 2003 (WFD) (2000/60/EC);
- The Floods Directive (2007/60/EC);
- The Flood Risk Regulations 2009;
- The Water Resources Act (Amendment) 2009;
- The Environmental Permitting (England and Wales) Regulations 2010;
- The Flood and Water Management Act 2010;
- The Water Act 2014;
- Environmental Damage (Prevention and Remediation) (England) Regulations 2015;
- The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations 2017; and
- Environmental Permitting (England and Wales) (Amendment) (No. 110) Regulations 2018.

Planning Policy Context

9.13 Section 14 of the NPPF sets out the Government's national policies for flood risk management in a land use planning context within England, stating that *"Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere"*.

9.14 Section 15 of the NPPF outlines that planning policies and decisions should contribute to and enhance the natural and local environment by: "*Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air,* ***water*** *or noise* ***pollution*** *or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and* ***water quality****, taking into account relevant information such as river basin management plans*".

National Planning Practice Guidance (NPPG)

- Flood Risk and Coastal Change;
- Water Supply, Wastewater and Water Quality;
- Climate Change; and
- Natural Environment.

Arun Local Plan 2011-2031, adopted July 2018

- Policy W DM1: Water Supply and quality;
- Policy W DM2: Flood Risk; and
- Policy W DM3: Sustainable Urban Drainage Systems.

Assessment Process

9.15 All aspects of the Proposed Development are relevant to this section as the proposals will entail an increase in the number of users of both sites which may affect flood risk, water supply quantity and discharged water

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quality and quantity from the sites.

9.16 This assessment has been undertaken through a combination of consultation / meetings (see section 9.10), hydraulic modelling, site visits and desk based assessments Full details are provided in the relevant appendices and summarised in the Baseline Conditions section of this chapter (section 9.39).

9.17 Possible significant effects on the quality of surface water and groundwater bodies within the Study Area have been identified, as well as possible changes in flood risk at the site and downstream as a result of the development. The impacts of the development on groundwater in terms of potential for contamination are addressed within Chapter 13 - Ground Conditions with the potential impacts on / from groundwater as a result of water supply and flood risk discussed within this chapter.

Assessment Criteria

9.18 The significance level attributed to each effect has been assessed based on the magnitude of change caused by the Proposed Development and the sensitivity of the affected receptor are outlined in more detail in Chapter 4 – Methodology.

9.19 The sensitivity of the affected receptor is assessed on a scale of High, Moderate, and Low, whilst the magnitude of change is assessed on a scale of Major, Moderate, Minor, and Negligible.

9.20 Magnitude of change and the sensitivity of the affected receptor/receiving environment have been assessed by adapting the relevant tables within the following documents:

- Design Manual for Roads and Bridges (DMRB) Road Drainage and the Water Environment (LA 113 Revision 1)[33]. The DMRB provides guidance for appraising significance on potential effects that road projects may have on the water environment; and
- TAG Unit A3 Environmental Impact Appraisal[34] – Chapter 10 Impacts on the Water Environment.

9.21 Although the above two documents were developed to provide guidance for assessing potential effects that road projects may have on the water environment, they provide a general framework which can be used to provide a consistent assessment of the effects of development proposals on the water environment.

9.22 For the purposes of this Chapter, the term 'sensitivity' has been used rather than value or importance of receptor as outlined in the DMRB guidance.

9.23 Table 9.1 outlines the criteria used to assess the sensitivity of receptors as part of this assessment.

[33] DMRB, Road Drainage and the Water Environment, LA 113, Revision 1, March 2020, Highways England
[34] TAG Unit A3, Environment Impact Appraisal, July 2021, Department for Transport

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Table 9.1 Sensitivity of environmental receptors with regards to the water environment

Sensitivity	Criteria	Examples
High	An attribute with high quality and rarity, regional or national scale and limited potential for substitution.	• Principal Aquifer providing potable water to a large population (groundwater). • Water Framework Directive (WFD) 'High' status water body or acting as a potable water supply. • Human health receptors (including construction workers and future Site users). • Existing water supply or wastewater network with no availability/ capacity. • Designated site or species protected under EU or UK habitat legislation, such as Sites of Special Scientific Interest ('SSSI'), Special Areas of Conservation ('SAC'), and Special Protection Areas ('SPA'), hydrologically linked to the Site
Moderate	An attribute with Moderate quality and rarity, regional or national scale and limited potential for substitution.	• WFD 'Good' status water body. • Aquifer providing abstraction water for agricultural or industrial use (ground water). • Existing water supply or wastewater network with limited availability/ capacity. • Locally designated site (Local Nature Reserve) considered to be directly supporting or maintaining water conditions hydrologically linked to the Site
Low	An attribute with low quality and rarity, regional or national scale and limited potential for substitution.	• WFD less than 'Good' status water body. • Unproductive strata (ground water). • Heavily managed river and floodplain. • Existing water supply or wastewater network with availability/ capacity.

9.24 The criteria for determining the magnitude of change / effect are detailed in Table 9.2.

9.25 For flood risk in relation to construction workers and future users / residents of the development, magnitude of effect rather than change is considered as those receptors are currently not affected and therefore 'change' is not applicable.

Table 9.2 Criteria for determining magnitude of change / impact on water receptors

Magnitude	Criteria
Major	• Results in a loss or major improvement of feature. • Significant fluvial flooding affecting offsite receptors caused or severely exacerbated by the Proposed Development has a high probability of occurring (i.e. exceeding 1% annual probability) with potential high depth / velocity of water and risk to life and/or major financial effect. Vice-versa the Proposed Development might significantly reduce or eliminate flooding for events with a high probability of occurring. • Significant flooding which could potentially cause detrimental consequences at the Site including the loss of life and that has a high probability of occurring (i.e. exceeding 1% annual probability). • Significant increase / reduction in the flow entering controlled systems causing a major change in the probability/magnitude of flooding. • Change in WFD classification of river reach. • Impact capable of causing extensive changes to local hydrography and flow paths. • Impact capable of causing a major reduction in sewerage/public water supply network capacity.

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Magnitude	Criteria
Moderate	• Results in a Moderate change on the integrity or improvement of a feature or loss or gain of part of a feature. • Flooding which could potentially cause financial effect and disruption offsite, caused or exacerbated by the Proposed Development, has a high probability of occurring (i.e. exceeding 1% annual probability). • Flooding of the site which could cause financial effect and disruption (but no loss of life) has a high probability of occurring (i.e. exceeding 1% annual probability). • Increase / reduction of amount of flow entering controlled systems (Sufficient enough to cause a noticeable change in the probability / magnitude of flooding). • Impact capable of causing limited and, localised change in local hydrography and flow paths. • Impact capable of causing some contribution or reduction of pollution entering feature, but insufficient to change WFD classification;
Minor	• Results in a minimal change in the integrity of the feature or loss of part of a feature. • Small increase / decrease in the likelihood of flooding as a consequence of the Proposed Development. • Limited increase in sediment entering controlled water systems. • Limited increase / reduction of amount of flow entering controlled systems which would cause a small / barely noticeable change in the likelihood of flooding. • Impact capable of causing a localised and minor change in local hydrography and flow paths.
Negligible	• Results in a change but the change is marginal and is unlikely to be noticeable. • The Proposed Development is unlikely to affect the integrity of the water environment and / or change the risk of flooding.
No Change	• No loss or alteration of characteristics, features, or elements; no observable impact in either direction.

9.26 Both sensitivity of the receptors value and magnitude of change must be considered when determining the significance of effect. In the same manner as the assessment of the magnitude of change and the sensitivity of the affected receptor/receiving environment; the significance of effect has been assessed by adapting the relevant table within the following documents:

- DMRB Environmental Assessment and Monitoring (LA 104 Revision 1)[35]. This chapter of the DMRB provides guidance for undertaking environmental assessments for road projects; and
- TAG Unit A3 Environmental Impact Appraisal[2] – Impacts on the Water Environment chapter.

9.27 A summary of the significance matrix can be found in Table 9.3.

Table 9.3 Significance Matrix for determining significance of effects on receptors related to water

Sensitivity	Magnitude of impact / change				
	No Change	Negligible	Minor	Moderate	Major
Low	Neutral	Negligible	Minor-Negligible	Minor	Moderate-Minor
Moderate	Neutral	Negligible	Minor	Moderate-Minor	Major-Moderate
High	Neutral	Negligible	Moderate-Minor	Major	Major

[35] DMRB. Sustainability and Environment Appraisal. LA104 Environmental assessment and monitoring, Revision 1, August 2020, Highways England

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9.28 Effects/changes that are described as 'major', or 'moderate' are determined to be significant; and effects that are described as 'minor', 'negligible' or 'neutral' are determined to be not significant.

9.29 Effects may be classified as either beneficial or adverse.

Sources on Information

9.30 The information presented in this Chapter has been informed by the following methods:

Desk Study

9.31 The following sources of information have been reviewed as part of the desk study:

- The Environment Agency's Long-Term Flood Risk Maps[36];
- The Environment Agency's Flood Map for Planning[37];
- The Environment Agency's Catchment Data Explorer[38];
- British Geological Survey (BGS) geological mapping[39];
- National Soil Maps[40];
- Natural England designated sites database[41];
- Magic Maps natural environment database & mapping[42];
- Arun District Council (ADC) Level 1 and Level 2 Strategic Flood Risk Assessment[43];
- Topographical survey of the sites; and
- All relevant legislation noted in Section L.2.

Site Visit / Other Assessments

9.32 A WSP Water specialist undertook a site visit for both Site A and Site B in September 2021.

9.33 The WSP reports provided as Appendix 9.1 to 9.3 (Volume 2 of this ES) have been prepared for the proposed development and used to inform this assessment.

9.34 In addition, the following Third Party Report has been considered: Groundsure Reports (ref: GS-8275626 and Ref GS-8275705), 2021.

Assumptions

9.35 Impacts on groundwater bodies in terms of the potential for contamination have been assessed in Chapter 13 'Ground Conditions' with the potential impacts on / from groundwater as a result of water supply and flood risk discussed within this chapter.

9.36 The following impacts have not been included in the scope of this assessment:

- Neither site A nor Site B nor their immediate surrounds are located within a groundwater source protection zone. As such, no significant effects on the quality of public drinking water supplies are anticipated and will not be considered further within the ES.

Limitations

9.37 This assessment is limited to available desk-based information, with no Ground Investigation specific to

[36] Long Term Flood Risk Maps, Environment Agency, 2021, available online [https://www.gov.uk/check-long-term-flood-risk]
[37] Flood Map for Planning, Environment Agency, 2021, available online [https://flood-map-for-planning.service.gov.uk/]
[38] Catchment Date Explorer, Environment Agency, 2021, available online [https://environment.data.gov.uk/catchment-planning/]
[39] GeoIndex Onshore Geological Mapping, British Geological Survey, 2021, available online [https://mapapps2.bgs.ac.uk/geoindex/home.html]
[40] UK Soil Observatory, British Geological Survey, 2021, available online [http://mapapps2.bgs.ac.uk/ukso/home.html]
[41] Designated sites viewer, Natural England, 2021, available online [https://designatedsites.naturalengland.org.uk/]
[42] MAGIC Interactive Maps, DEFRA and Natural England, 2021, available online [https://magic.defra.gov.uk/MagicMap.aspx]
[43] *Level 1 and Level 2 Strategic Flood Risk Assessment (Final Report), September 2016, Arun District Council*

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either of the Sites having been undertaken to date.

Baseline Conditions

9.38 The section provides more detailed topic specific information to describe the character of Sites A and B and their environs. This describes the quality of the interests as they relate to this environmental topic and serves as a comparative measure against which changes arising from the construction and operational phases of the proposed development can be assessed or predicted. This identifies the sensitivity of environmental receptors.

Site A – Redevelopment of existing golf course

Surface Water Bodies

9.39 Several surface water features are located within or in proximity to Site A, the locations of which are shown in Figure 9.1 and discussed further below.

Lidsey Rife

9.40 The Lidsey Rife rises near Glatting Beacon, approximately 10km north of the proposed development. The Rife flows south, through largely rural areas before passing under the Arundel bypass (A27) and flowing through the settlements of Eastergate, Woodgate and Lidsey.

9.41 In its reaches past the site, the Lidsey Rife forms the western boundary of the site, continuing to flow south towards Bognor Regis, where it joins the Aldingbourne Rife, approximately 500m downstream of the site and around 1.5km further downstream the Aldingbourne Rife discharges into the sea via a flapped outfall or a pumping station, dependent upon tidal conditions.

9.42 The Lidsey Rife is classified as a Main River in its reaches past the site and therefore the associated flood risk management is overseen by the Environment Agency. There are no Environment Agency gauging stations on the Lidsey Rife.

9.43 The Environment Agency's Catchment Data Explorer shows the current ecological status of the Lidsey Rife (GB107041012010) to be moderate, whilst the current chemical status of Rife is also assessed to be Failing. The Lidsey Rife is not designated as an artificial or heavily modified waterbody.

Field Drains

9.44 Within the existing Bognor Golf Course site there are several field drains / ditches which are classified as Ordinary Watercourses. These drains / ditches all discharge into the Lidsey Rife and fall within the Lidsey Rife WFD catchment.

Aldingbourne Rife

9.45 The Aldingbourne Rife does not flow through the site boundary but it located within close proximity downstream of the site so has been considered as a potential receptor.

9.46 In its reaches downstream of the site the Aldingbourne is also classified as a Main River and therefore its associated flood risk management is overseen by the Environment Agency. There are no Environment Agency gauging stations on the Aldingbourne Rife.

9.47 The Environment Agency's Catchment Data Explorer shows the current ecological status of the Aldingbourne Rife (GB107041011980) to be moderate, whilst the current chemical status of Rife is also assessed to be Failing. The Aldingbourne Rife is designated as a heavily modified waterbody in its reaches downstream of the site.

WFD Classification

9.48 Table 9.4 displays the classifications of the Water Framework Directive (WFD) features under cycle 2 (2019).

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Table 9.4 Water Framework Directive classifications of surface waterbodies at Site A

Surface Water Feature	Approx. Distance	Flow Direction	WFD RBMP Chemical Classification	WFD RBMP Ecological Classification	Overall Water Body Status
Lidsey Rife	Western site boundary	North to south	Fail	Moderate	Moderate
Aldingbourne Rife	500m south of site	North to south	Fail	Moderate	Moderate

Groundwater

9.49 The geology underlying the site is presented in Chapter 13 'Ground Conditions' of the Environmental Statement. The underlying solid geology comprises the White Chalk Subgroup (formerly the Upper Chalk Formation), specifically the Spetisbury and Tarrant chalk members in the south and north of the Site respectively.

9.50 Superficial River Terrace Deposits consisting of sand silt and clay and raised marine deposits consisting of clay, silt, sand, and gravel are found across the site. Both deposits overlay approximately half of the site with the River Terrace deposit located on the east of the site and raised marine deposits on the west of the site.

9.51 Of relevance to groundwater, the bedrock underlying the site is categorised as a Primary aquifer. Primary aquifers are defined as layers of rock or drift deposits that have high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage. The superficial deposits overlaying the site is categorised as a Secondary A aquifer. Secondary A aquifers are defined as permeable layers capable of supporting water supplies at a local rather than strategic scale, in some cases forming an important source of base flow to rivers.

9.52 The site is situated within a WFD designated groundwater catchment, Littlehampton Anticline West (GB40701G504900). This groundwater body has a good chemical status and a good quantitative status.

9.53 The site is not situated within a groundwater Source Protection Zone (SPZ) as defined by the Environment Agency.

Tidal and Fluvial Flood Risk

9.54 With respect to fluvial flooding, the Environment Agency's Flood Map for Planning shows the majority of the site to be within Flood Zone 3 (Figure 9.2). Small portions of the site are located in Flood Zone 2, whilst a small area of land in the southeast of the site is shown to be within Flood Zone 1.

9.55 Flood Zone 3 is defined as land having a greater than 1 in 100 annual probability of fluvial flooding and / or a greater than 1 in 200 annual probability of tidal flooding. Whilst Flood Zone 2 is defined as land having between a 1 in 1000 and a 1 in 100 annual probability of fluvial flooding. Flood Zone 1 corresponds with a less than 1 in 1000 annual probability of fluvial flooding.

9.56 It is not possible to distinguish between fluvial and tidal flooding on the Environment Agency's Flood Map for Planning, however, site specific modelling has been undertaken as detailed in Section 9.61.

Surface Water Flood Risk

9.57 The Environment Agency's Risk of Flooding from Surface Water Map (Figure 9.3) indicates that significant portions of the site are at low risk of surface water flooding, with small areas at Moderate and High risk.

9.58 Low risk denotes an area that has between a 1 in 1,000 (0.1% AEP) and 1 in 100 (1% AEP) annual probability of flooding. Moderate risk denotes an area that has between a 1 in 100 (1.0% AEP) and 1 in 30 (3.3% AEP) probability of surface water flooding. Whilst high risk refers to areas that have greater than a 1 in 30 annual probability (3.3% AEP) of surface water flooding.

9.59 The areas at high risk of surface water flooding are located near the southeast and southwest corners of the site, near existing field drains and the depths in the high risk event (1 in 30 years) are predicted to be mostly

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below 300mm. In the Moderate risk event (1 in 100 years) surface water flood depths are also largely predicted to be below 300mm.

9.60 In the north of the site there is a large area at low risk of surface water flooding, where depths of between 300mm and 900mm are predicted to pond in the low risk (1 in 1000 years) event.

Site Specific Fluvial, Surface Water and Tidal Flood Risk Assessment

9.61 WSP have undertaken hydraulic modelling of the Lidsey Rife (as detailed in the FRA, Appendix 9.1) to refine the modelling undertaken by the Environment Agency as a part of 2015 Aldingbourne Flood Risk Mapping Study. This model is a direct rainfall model covering the entire catchment; therefore, it assesses the fluvial flood risk (from the rainfall generated over the wider upstream catchment), the surface water flood risk (from the smaller upstream catchments, which flow over / through the site on their way to the Lidsey Rife) and tidal flood risk (as it includes the tidal boundary).

9.62 Baseline hydraulic modelling has been undertaken to refine the Environment Agency's flood extents for the site. This involved some small updates to the 2015 Aldingbourne direct rainfall ICM model, to make it suitable for the purposes of a site-specific assessment of flood risk. The main focus of the modelling was to refine the understanding of the flood regime for the 1 in 100 year event and the 1 in 100 year event with an allowance for climate change (+25%).

9.63 The 1 in 100 year showed flooding in the northern section of the site, however the majority of the lower section only showed flooding within the existing ditches. There are isolated low points of the site that do also show some ponding of water but generally these areas are less than 300mm in depth. This confirms that when flood defences are taken into account the majority of the Site is not at risk of fluvial or surface water flooding in the present day scenario.

9.64 The 1 in 100 year plus climate change (25%) also shows the majority of the flood risk is in the northern section of the site, with increased depths and extent over what is shown for the current day 1 in 100 year event. The existing ditches in the south of the Site are also more pronounced, along with more connectivity between the areas of localised ponding. However, in general the majority of the southern part of the Site is still shown not to be at risk in the 1 in 100 year event including climate change.

Existing Drainage Infrastructure

9.65 Foul water services at the site and in the surrounding area are provided by Southern Water (SW).

9.66 In 2017 a Memorandum of Understanding (MoU) was issued between SW and ADC, relating to sewerage capacity and treatment.

9.67 In the MoU it is stated that sufficient capacity can be delivered in the overall sewerage network in line with the intended phasing of the strategic Barnham/Eastergate/Westergate (BEW) sites. It also outlines that SW's preferred option is for a new pipeline to connect the BEW development to the Ford Waste Water Treatment Works (WWTW). Noting that construction of the BEW sites has yet to commence.

9.68 At the time of the MoU it was understood that the Lidsey WWTW has some headroom to the capacity of the existing permit as construction has yet to commence at the BEW sites there may be sufficient capacity at Lidsey WWTW / combined with the time elapsed since the preparation of the MoU upgrade works to Lidsey WWTW may not be feasible to facilitate a connection for the development proposed at Site A. Alternatively, Site A will connect to the Ford WWTW, which is a matter for agreement during detailed design and the ongoing consultation with SW. In either scenario appropriate treatment will be undertaken by SW to ensure that the discharge meets their permit requirements, this will make sure that there are no adverse environmental impacts.

Potable Water Supply

9.69 The existing Bognor Regis golf club is supplied with potable water by Portsmouth Water (PW).

9.70 The 2021 PW Water Resources Management Plan (WRMP) outlines that there is a deficit in their baseline supply-demand balance, reported to be 26.68 Ml/d in 2019/20. This indicates that options need to be developed to meet PW's customer requirements and bulk supply agreements. The options proposed in the

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WRMP include:

- Demand side options such as a revised household water efficiency programme;
- Implementing a deployable output recovery scheme at sources O, H and C, to better utilise the existing assets, with a revised yield benefit to be determined following a sustainability review;
- Increasing the maximum abstraction amount from drought permit Source S, to provide 8.5 Ml/d benefit to the average and critical period scenarios in droughts equivalent to, or worse than, a 1 in 125 year drought event;
- Increasing deployable output at Source J (increased abstraction capability) to provide an annual average benefit of 3.1 Ml/d and 12.5 Ml/d critical period by 2024-25; and
- Construction of the Havant Thicket Winter Storage Reservoir, with the benefit of this option estimated to be 21 Ml/d average and 25 Ml/d critical period up to the 1 in 200 year drought condition, to be implemented in 2029-2030.

9.71 The WRMP states that between 2021 and 2032-2033 PW are not expecting to meet their target headroom in the 1 in 200 year annual average scenario. However, beyond 2033 the headroom targets for the 1 in 200 year annual average scenario are expected to be met.

9.72 Despite the findings of the WRMP, PW have confirmed that they have the capacity to supply Site A with potable water and only minor infrastructure upgrades will be required as reinforcement works in the area are being undertaken prior to March 2023, after which point it is envisaged that there will be more than adequate capacity in the network to accommodate the development.

Abstractions

9.73 Three active surface water abstractions have been identified within 1 km of Site A, used for irrigation. The nearest of these is situated on the western bank of the Lidsey Rife (i.e. on the opposite side of the Rife from the boundary of Site A).

Designated sites

9.74 There are no designated sites within the immediate vicinity of Site A, with the closest designated site, Felpham SSSI, located approximately 1.4km south of the site. Felpham SSSI is beyond the study area and is designated for geological interest and is consequently not considered further within this assessment of the water environment.

Receptors

9.75 Identified receptors and their importance have been classified in accordance with the criteria in Table 9.1 and summarised in Table 9.5 below.

Table 9.5 Summary of sensitivity of water related receptors at Site A

Feature	Receptor	Location	Sensitivity or Importance	Summary Reason
Surface Water Quality	Lidsey Rife	Flows from south to north along western boundary of the site	Low in relation to surface water quality	This waterbody has a 'Fail' WFD RBMP Chemical Classification, a Moderate RBMP Ecological Classification and an overall status of Moderate.
	Aldingbourne Rife	Downstream of the site (500m south)	Low in relation to surface water quality	This waterbody has a 'Fail' WFD RBMP Chemical Classification, a Moderate RBMP Ecological Classification and an overall status of Moderate.

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Feature	Receptor	Location	Sensitivity or Importance	Summary Reason
Groundwater quality	Littlehampton Anticline West groundwater body	Underlying the site and the surrounding area	Moderate in relation to water quality	The WFD waterbody has a 'Good' overall status
Flood Risk	Ground workers and construction workers	Onsite	Moderate	Flooding may affect Construction workers, but their sensitivity is lowered as a result of a level of competence attained by construction workers through measures such as Health and Safety training and presence only during working hours in teams and the deployment of safe working practises.
	Future populations onsite and users of the site	Onsite	High	Future Site users could be affected by flooding once the site is operational; sensitivity of future residents is the highest among future users of the Site due to their presence overnight (sleeping accommodation).
	Third parties offsite including offsite residents down gradient from the Proposed Development	Onsite	High	Residents/users of the surrounding areas might have limited or no awareness of flood risk; sensitivity of residents is the highest due to their presence overnight (sleeping accommodation).
Water Infrastructure	Sewage network and local sewage treatment works	Onsite and offsite	High	The MoU identifies that there is limited capacity within Lidsey WWTW and a connection to Ford WWTW may be required.
	Potable water supply	Onsite and offsite	High	PW have confirmed that they have capacity to supply Site A.

Site B – Relocation of golf course

Surface Waterbodies

9.76 Several surface water features are located within or in proximity to Site B, the locations of which are shown in Figure 9.4.

Ryebank Rife

9.77 Ordinance Survey (OS) mapping shows the Ryebank Rife to be connected to both the Lidsey Rife (around 900m upstream of Site A) and River Arun (at Littlehampton Marina), i.e. bi-directional flow possible). Under normal circumstances it will not flow in both an easterly and westerly direction. The direction in which it flows is dependent upon either or both the tidal and fluvial conditions. The normal catchment divide is a highpoint (as observed in the Environment Agency's LiDAR based Digital Terrain Model (DTM)) to the east of the site towards Climping. Under normal conditions the flows in the Rife adjacent to Site B would

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flow in a westly direction towards the Lidsey Rife and Site A. This was the case at the time of the site visit and is replicated in the Environment Agency's and the site specific hydraulic model.

9.78 The Ryebank Rife flows through the north of the site, separating the two parcels of land that form the site. In its reaches past the site the Ryebank Rife is classified as a Main River and therefore its associated flood risk management is overseen by the Environment Agency.

9.79 The Environment Agency's Catchment Data Explorer shows the current ecological status of the Ryebank Rife (GB107041006620) to be moderate, whilst the current chemical status of Rife is also assessed to be Failing. The Ryebank Rife is not designated as an artificial or heavily modified waterbody.

Elmer Rife

9.80 The Elmer Rife flows along the eastern boundary of the site and along this reach is classified as a Main River Main River and therefore its associated flood risk management is overseen by the Environment Agency. The Elmer Rife, dependent upon tidal conditions, is either a tributary of Ryebank Rife or discharges into the English Channel (bi-directional flow possible), via a flapped outfall. The watercourse flows to the north and east of Elmer.

9.81 The Elmer Rife is not a designated waterbody under the WFD and falls within the Ryebank Rife WFD Catchment (GB107041006620).

Field Drains

9.82 Within the site there are several field drains / ditches which are classified as Ordinary Watercourses. These drains / ditches all discharge into either the Elmer Rife or the Ryebank Rife and fall within the Ryebank Rife WFD catchment.

WFD Classification

9.83 Table 9.6 displayed the classifications of the Ryebank Rife catchment (which includes the Elmer Rife and the field drains) under cycle 2 (2019).

Table 9.6 Water Framework Directive classification of surface waterbodies at Site B

Surface Water Feature	Approx. Distance	Direction	WFD RBMP Chemical Classification	WFD RBMP Ecological Classification	Overall Water Body Status
Ryebank Rife	Through Site	West to east	Fail	Moderate	Moderate

Groundwater

9.84 The geology underlying the site is presented in Chapter 13 'Ground Conditions' of the Environmental Statement. The bedrock underlying the site is Chalk from the Lewes Nodular, Seaford, Newhaven, Culver and Portsdown chalk formation.

9.85 Superficial River Terrace Deposits consisting of sand silt and clay are present across the majority of the site. In the southeast of the site there is an area overlain with raised beach deposits, comprising sand and gravel.

9.86 Of relevance to groundwater, the bedrock underlying the site is categorised as a Primary aquifer. Primary aquifers are defined as layers of rock or drift deposits that have high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage. The superficial deposits overlaying the site is categorised as a Secondary A aquifer. Secondary A aquifers are defined as permeable layers capable of supporting water supplies at a local rather than strategic scale, in some cases forming an important source of base flow to rivers.

9.87 The site is situated within a WFD designated groundwater catchment, Littlehampton Anticline West (GB40701G504900). This groundwater body has a good chemical status and a good quantitative status.

9.88 The site is not situated within a groundwater Source Protection Zone (SPZ) as defined by the Environment

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Agency.

Tidal and Fluvial Flood Risk

9.89 With respect to fluvial flooding, the Environment Agency's Flood Map for Planning shows the majority of the site to be within Flood Zone and 3 (Figure 9.5). Small areas in the northwest and southwest corners of the site are located in Flood Zones 2 and 1.

9.90 Flood Zone 3 is defined as land having a greater than 1 in 100 annual probability of fluvial flooding and/or a greater than 1 in 200 annual probability of tidal flooding. Whilst Flood Zone 2 is defined as land having between a 1 in 1000 and a 1 in 100 annual probability of fluvial flooding. Flood Zone 1 corresponds with a less than 1 in 1000 annual probability of fluvial flooding.

Surface Water Flood Risk

9.91 Surface water flood risk has been assessed using the Environment Agency's Risk of Flooding from Surface Water Mapping, shown in Figure 9.6.

9.92 This mapping shows that the majority of the site is at very low risk of surface water flooding, which corresponds with an annual probability of less than 1 in ,000.

9.93 Adjacent to the Ryebank Rife and Elmer Rife there are areas shown to be at low risk of surface water flooding, which means that these areas have an annual probability of flooding of between 1 in 1000 and 1 in 100. There is also an area at low risk of surface water pooling in the centre of the southern portion of the site. Surface water flood depths are predicted to be between 300mm and 900mm adjacent to the Rifes, with the depths in the low risk area in the centre of the site predicted to be below 300mm.

Site Specific Hydraulic Model – Fluvial, Surface Water and Tidal Flood Risk

9.94 The site specific hydraulic model developed by WSP, as detailed in Site A - Section 9.61, also covers Site B. In relation to Site B the hydraulic model demonstrates that the majority of the site is situated outside of the 1 in 100 year plus 25% climate change flood extents, with the majority of onsite flooding predicted to occur adjacent to the eastern boundary of the site by the Elmer Rife.

Existing Drainage Infrastructure

9.95 Foul water services at the site and in the surrounding area are provided by Southern Water (SW).

9.96 In 2017 a Memorandum of Understanding (MoU) was issues between SW and ADC, relating to sewerage capacity and treatment, detail on the content of the MoU and the potential drainage options is provided in Paragraph 9.67.

Potable Water Supply

9.97 Site B currently consists of agricultural uses and as such there are no potable water connections currently in place with PW.

9.98 The 2021 PW Water Resources Management Plan (WRMP) outlines that there is a deficit in their baseline supply-demand balance, reported to be 26.68 Ml/d in 2019/20. This indicates that options need to be developed to meet PW's customer requirements and bulk supply agreements.

9.99 Details of the proposed options in the WRMP are outlined in section 9.70.

Water Abstractions

9.100 BGS records show no groundwater abstractions identified within Site B, however one is present approximately 110 m to the north, used for general farming and domestic supply. The study area is not situated within a groundwater SPZ.

9.101 Three surface water abstraction licences are allocated to the site; abstracting water for irrigation purposes from the Elmer Rife and Ryebank Rife.

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Designated Sites

9.102 Site B falls within a nitrate vulnerable zone, which indicates that this area is designated as being at risk from agricultural nitrate pollution.

Receptors

9.103 Identified receptors and their importance have been classified in accordance with the criteria in Table 9.1 and summarised in Table 9.7.

Table 9.7 Summary of sensitivity of water related receptors at Site B

Feature	Receptor	Location	Sensitivity / Importance	Summary Reason
Surface Water Quality	Ryebank Rife and Elmer Rife	Flows from west to east through the north of the site	Low in relation to surface water quality	This waterbody has a 'Fail' WFD RBMP Chemical Classification, a Moderate RBMP Ecological Classification and an overall status of Moderate.
Flood Risk	Ground workers and construction workers	Onsite	Moderate	Flooding may affect Construction workers, but their sensitivity is lowered as a result of a level of competence attained by construction workers through measures such as Health and Safety training and presence only during working hours in teams and safe working practises.
	Future users of the site	Onsite	High	Future Site users could be affected by flooding and are assessed to have a high sensitivity as they may have limited or no awareness of flood risk but their presence on site would be managed through the operating procedures of the Golf Club (i.e. restricted during times of flood).
	Third parties offsite including offsite residents down gradient from the Proposed Development	Onsite	High	Residents/users of the surrounding areas might have limited or no awareness of flood risk; sensitivity of residents is the highest due to their presence overnight (sleeping accommodation).
Water Infrastructure	Sewage network and local sewage treatment works	Onsite and offsite	High	The MoU identifies that there is limited capacity within Lidsey WWTW and a connection to Ford WWTW may be required.
	Potable water supply	Onsite and offsite	High	The WRMP outlines that there is a deficit in PW's baseline supply-demand balance.

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Inherent and Standard Mitigation

9.104 This section describes those 'inherent' and 'standard' mitigation measures which primarily address the scope to avoid, reduce or remedy adverse environmental impacts or enhance the beneficial aspects arising from the construction and operational periods of the proposed development.

Site A – Redevelopment of existing golf course.

Construction Phase

Flood Risk

9.105 A temporary drainage solution will be implemented for each phase of the construction programme and will ensure the management of surface water runoff in terms of both quantity and quality on site until the permanent surface water drainage solutions are incorporated.

9.106 The temporary drainage solution will include local flood prevention measures, in line with best practice and policy to mitigate the additional runoff (which could lead to an increase in flood risk). This will ensure any increase in surface water run-off above pre-development rates is managed and attenuated on-site. Therefore there will be no increases in surface water runoff to off-site areas during the construction stage.

9.107 The proposed temporary drainage solution for the construction phase will be developed by the contractor prior to enabling works and approved by ADC.

9.108 A Construction Environmental Management Plan (CEMP) will ensure that there is no storage (e.g., soils, materials or vehicles) within the open floodplain and that the contractor has an emergency flood management plan for any works that are to be undertaken within the open floodplain (such as the watercourse crossings and works to the public open space.

Water quality

9.109 The temporary drainage strategy will include sediment control measures to prevent sediments from being washed off site during heavy rainfall events, this will be complemented by the working practices which will ensure that the areas of open / cleared ground are minimised and once cleared re-vegetated at the earliest opportunity, this will be secured through the CEMP.

9.110 A CEMP will include measures to prevent physical and chemical pollutants entering the drainage system. It is anticipated that the CEMP would detail the controls and measures to be adopted during construction (such as managing any accidental spillages, ensuring parking of machinery and stockpiles are outside of the floodplain). The CEMP would be agreed with ADC and demonstrate compliance with the Guidance for Pollution Prevention (GPPS) and Pollution Prevention Guidelines (PPGs)[44].

9.111 In addition, the construction works would be managed in accordance with CIRIA guidance 'C532 - Control of Pollution from Construction Sites'[45] to help ensure a well-managed operation which minimises potential environmental risks.

Operational Phase

Flood Risk

9.112 Regarding flood risk, the inherent and standard mitigation is detailed in the FRA (*Appendix 9.1*), and primarily relates to the sequential steering of the masterplan through locating the most vulnerable parts of the development to areas outside of the floodplain. The site-specific hydraulic modelling demonstrates that the development parcels and associated dwellings will be safe for flooding from events up to and including the 1 in 100 year plus climate change event. The FRA details the inclusion of the following mitigation measures:

- The land drains which are present under the golf course will be maintained as far as possible;

[44] Guidance for Pollution Prevention (GPPS) and Pollution Prevention Guidance, NetRegs, 2021, available online [https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/]
[45] C532 Control of water pollution from construction sites: guidance for consultants and contractors, 2001. CIRIA

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- The network of surface water channels across the site will be increased and enhanced;
- The development platforms will be raised above existing ground levels;
- Demountable defences are to be installed on the retained club house with electrical sockets set at a minimum of 600mm above the FFL. The inclusion of additional measures will be considered at detailed design;
- A ditch/swale is to be incorporated to channel exceedance overland flows from Shirley Drive to the Lidsey Rife;
- The FFL's for the properties will be raised 300mm above the platform levels; and
- Installing a flood berm that separates the area to the north that is at risk of fluvial flooding from the rest of the Site.

9.113 The SWDS (Appendix 9.2) demonstrates that the surface water runoff from the impermeable areas of the development will be restricted the equivalent greenfield runoff rate to ensure that there is no increase in flood risk downstream. A network of new/improved ditches/swales are to be incorporated across the development to ensure that the surface water flows are attenuated and conveyed to the attenuation ponds adjacent to the Lidsey Rife, into which they will discharge at a controlled rate via an existing outfall.

9.114 As with changes in on site flood risk, the risk of changes in flood risk on the areas surrounding the site has been mitigated as detailed in the FRA. This includes:

- A new ditch/swale to convey overland flows from Shirley Drive through the development and into the Lidsey Rife; and
- Demonstration within the FRA that the site specific model shows that there will be no adverse impacts elsewhere as a result of the development.

Water quality

9.115 Embedded mitigation within the design of Sustainable Urban Drainage Systems (SuDS) and outfalls from the proposed highways network will ensure the appropriate water quality standards are achieved.

Water supply and availability

9.116 Although PW have confirmed that they have the capacity to supply Site A with potable water, to reduce the impact of the proposed development on the local potable water supply network, several demand management measures will be incorporated into the development to ensure that the development aims for the highest levels of water efficiency. The starting point is that the demand will be in line with (or lower than) the local plan policy and optional Buildings Regulation standard of 110 litres per person per day. Liaison is continuing with PW to demonstrate the most appropriate approach for the supply of potable water to Site A.

9.117 No detrimental impact on the local water features (streams, ponds, lakes, ditches or drains) are foreseen as a result of this development as a result of any licenced or unlicensed abstractions.

Site B – Relocation of golf course

Construction Phase

Flood Risk

9.118 A temporary drainage solution will be implemented for each phase of the construction programme and will ensure the management of surface water runoff on site until the permanent surface water drainage solutions are incorporated.

9.119 The temporary drainage solution will include local flood prevention measures, in line with best practice and policy to mitigate both flood risk and sediment loading and will ensure any increase in surface water run-off above pre-development rates are managed and attenuated on-site.

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9.120 The temporary drainage solution will ensure any increase in surface water run-off above pre-development rates are managed and attenuated on-site, therefore there will be no increases in surface water runoff to off-site areas during the construction stage

9.121 The proposed temporary drainage solution for the construction phase will be developed by the contractor prior to enabling works and approved by ADC.

9.122 A Construction Environmental Management Plan (CEMP) will ensure that there is no construction storage within the open floodplain and that the contractor has an emergency flood management plan for any works that are to be undertaken within the open floodplain (such as the river crossings and works to the linear park).

9.123 During construction, the potential receptors of changes in flood risk at the site are the construction workers.

Water Quality

9.124 The temporary drainage strategy will include sediment control measures to prevent sediments from being washed off site during heavy rainfall events, this will be complemented by the working practices which will ensure that the areas of open / cleared ground are minimised and one cleared re-vegetated at the earliest opportunity, this will be secured through the CEMP.

9.125 A CEMP will be adopted during the construction phase to prevent physical and chemical pollutants entering the drainage system. It is anticipated that the CEMP would detail the controls and measures to be adopted during construction (such as managing any accidental spillages, ensuring parking of machinery and stockpiles are outside of the floodplain). The CEMP would be agreed with ADC and demonstrate compliance with the Guidance for Pollution Prevention (GPPS) and Pollution Prevention Guidelines (PPGs)[46].

9.126 In addition, the construction works would be managed in accordance with CIRIA guidance 'C532 - Control of Pollution from Construction Sites'[47] to help ensure a well-managed operation which minimises potential environmental risks.

Operational Phase

Flood Risk

9.127 As with changes in on site flood risk, the risk of changes in flood risk on the areas surrounding the site has been mitigated (as outlined in the FRA, *Appendix 9.3*) by:

- Ensuring that there is no loss of floodplain for the 1 in 100 year plus 25% climate change event;
- Implementation of a SWDS;
- Appropriate setting of the FFL of both the Club House and the Maintenance Depot; and
- Ensuring appropriate maintenance requirements and regimes are in place for the watercourses within the boundary.

Water Quality

9.128 To ensure that there are no adverse impacts on water quality as a result of the operation of the Golf Course the following measures will be implemented, noting that these measures are in accordance with best practice (CIRIA SuDS Manual, GPPS and the International Voluntary Sustainability Standard (VSS) for Sustainable Golf Development and GEO Certified® Developments[48]):

- Collection and reuse of surface water runoff (from as much of the course as practical subject to detailed design), thus preventing discharge to the water environment;

[46] Guidance for Pollution Prevention (GPPS) and Pollution Prevention Guidance, NetRegs, 2021, available online [https://www.netregs.org.uk/environmental-topics/guidance-for-pollution-prevention-gpp-documents/guidance-for-pollution-prevention-gpps-full-list/]
[47] C532 Control of water pollution from construction sites: guidance for consultants and contractors, 2001. CIRIA
[48] Sustainable Golf, 2021 available online *https://sustainable.golf/about/credibility/standards/development-standard/*

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- Inclusion of an appropriate level of SuDS treatment trains or hydrocarbon interceptors from the carparking and maintenance areas;
- Inclusion of a closed loop wash rack system that captures, cleans and reuses the water from the wash down facility in the maintenance area;
- Safe storage on hardstanding with appropriate bunding (which is independently /appropriately drained and filtered) for the storage of:
    - Oil
    - Fuel
    - Other hydrocarbon products
    - Detergents
    - Herbicides
    - Insecticides
    - Pesticides
    - Fertilizers
    - Grass clippings
- Equipment washdown area will be bunded and drained appropriately (SuDS, proprietary filter, closed loop reuse system or drained to the foul sewer);
- Fertilisers to be applied in accordance with the 'Using nitrogen fertilisers in nitrate vulnerable zones guidance'[49].

9.129 The proposed development at Site B includes a maintenance area which is understood to include a refuelling area. To reduce the risk of fuel spillages impacting the nearby waterbodies, integrally bunded containers should be designed.

Water supply and availability

9.130 The Golf Course in its current location / arrangement already uses potable water for both domestic (club house) and irrigation purposes. The relocation of the Golf Course provides the opportunity to implement measures to reduce the potable water demand for 'domestic' and irrigation purposes to ensure that the new the Golf Club does not result in an additional potable water demand.

9.131 The impact the proposed development will have on water supply and availability will be mitigated by sourcing irrigation water through the following hierarchy (ensuring that the constraints imposed by the required abstraction permits are complied with to prevent adverse environmental impacts, these permits will be sought at the detailed design phase):

- Rainwater harvesting, water to be sourced from:
- Golf course;
- Car parking areas;
- Maintenance area;
- Clubhouse greywater reuse (subject to detailed design);
- Surface water abstraction;
- Groundwater abstraction; and
- Potable water.

[49] Using nitrogen fertilisers in nitrate vulnerable zones, Environment Agency / Defra 2018 available online https://www.gov.uk/guidance/using-nitrogen-fertilisers-in-nitrate-vulnerable-zones

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9.132 In addition to the hierarchy above a recycling water from the vehicle wash down area will be implemented, this will either be a close loop wash rack system that captures, cleans and reuses water or a system that cleans and directs used water to the rainwater harvesting reservoir, this would help to reduce water consumption in the vehicle washdown area. A further benefit of this would be to reduce the risk of contaminants from the washdown water entering the drainage ditches.

9.133 The irrigation system will be highly efficient and targeted to the specific areas which require irrigation. The system will be tightly controlled with every head having its own individual control to enable the daily requirements based upon the current evapotranspiration rates. It is envisaged that the irrigation period will be April to September, with the system drained down between October and March in normal years.

9.134 The irrigation water will be stored within the onsite reservoirs, which will be designed to fill over the winter period and topped up with any summer time rainfall. This approach will minimise the requirements for abstraction / potable water supply during the summer months thus minimising the environmental impacts.

Assessment of Environmental Impacts

9.135 This section provides an assessment of the nature, extent, magnitude of change that the proposed development will have on individual receptors identified in the baseline section. By employing the sensitivity of the receptor and magnitude of change, the significance of environmental effects which arise as a result of the construction and operational periods of the proposed development will be determined.

Site A – Redevelopment of existing golf course.

Construction Phase

Changes in the risk of flooding at the site and their effects on potential receptors (i.e. construction workers)

9.136 Surface water and fluvial flooding, especially after extreme rainfall events, has the potential to harm workers onsite if it is received in large volumes, particularly if they are working in the floodplain or in excavations, which have the potential to fill with water. In addition, construction of the proposed development will lead to the introduction of impervious surfaces and a potential reduction in permeable area through the temporary siting of the contractor's compound and storage areas. This would temporarily reduce infiltration, increase surface water runoff, and potentially increase flood risk across the development site and in the surrounding area

9.137 The topography of the site will change during site preparation, earthworks, and construction. The re-profiling of the land has the potential to change the rate and direction of surface water flows within the study area. Existing overland flowpaths could be diverted, terminated and new flowpaths could be created during construction. The placement/stockpiling of materials may also influence where surface water collects and flows. This has the potential to alter the rate and volume of water entering local watercourses and surface water features on and offsite, as well as the volume of water infiltrating through the soils into the underlying aquifer systems.

9.138 During construction, the potential receptors of changes in surface water and fluvial flood risk at the site are the construction workers

9.139 The sensitivity of construction workers is considered to be moderate, and the magnitude of change/effect prior to actionable mitigation, is considered to be moderate. Therefore there will be a **short term, minor adverse effect** on the construction workers.

9.140 **Changes in the risk of flooding on the surrounding areas and their effects on potential receptors (i.e. residents and users)**

9.141 Existing overland flowpaths could be diverted, terminated and new flowpaths could be created during construction. The placement/stockpiling of materials may also influence where surface water collects and flows. This has the potential to alter the rate and volume of water entering local watercourses and surface water features offsite.

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9.142 The residents and users of the surrounding areas are further away from the Site than the construction workers and would therefore experience a lesser magnitude of change/effect compared to the construction workers.

9.143 The sensitivity of the residents and users of the surrounding areas is considered to be high, and the magnitude of change prior to actionable mitigation, is considered to be minor.

9.144 Therefore, the significance of the effect on changes to flood risk during the construction stage for residents and users of the areas surrounding the proposed development is considered to be **negligible**.

Changes to the quality (i.e. physical and chemical contamination) of surface water discharged to the water environment

9.145 There will be a number of activities during the construction phase that will disturb the ground and potentially result in increased sediment and pollutants in surface water runoff and subsequently the water environment.

9.146 These activities include:

- Movement and use of static and mobile plant/construction vehicles such as excavators. Dumper trucks, hydraulic breakers, and haulage trucks;
- Materials handling, storage, stockpiling, spillage, and disposal;
- Bulk earthworks to ground formation levels;
- Construction of drainage features, and
- Installation of infrastructure, roads, and haul routes.

9.147 These construction activities, in particular vehicle movements within the site, will lead to the disturbance and mobilisation of physical contaminants, which may result in increased suspended sediment loads in surface waters, especially during periods of heavy rainfall. On the other hand, during periods of dry, windy weather, wind-blown dusts generated by ground excavation and earthworks may indirectly enter surface water bodies on and offsite. Elevated suspended sediment loads in surface waters could potentially lead to effects, such as increased turbidity and a reduction in dissolved oxygen, and subsequently a degradation in water quality.

9.148 Additionally, surface water runoff from the construction site could potentially carry elevated concentrations of soluble contaminants and any accidental spillage of fuel, cement products or chemicals could enter surface waters within the study area. Soils associated with floodplains within the site are identified to be naturally wet with a high water table. The shallow depth to groundwater means that the water resource is vulnerable to pollution from nutrients and wastes applied to the land.

9.149 The standard and inherent mitigation such as the CEMP and temporary drainage solution which will be implemented during the construction phase will reduce the risk of contaminants being discharged to the water environment. Therefore the magnitude of change is considered to be minor.

9.150 The sensitivity of the Lidsey Rife, Aldingbourne Rife and the drainage ditches to changes in water quality is assessed to be Low.

9.151 Therefore there will be a **short-term minor-negligible adverse impact** on the water quality discharged to the water environment during the construction phase.

Operational Phase

Changes in the risk of flooding at the site and their effects on potential receptors (i.e. residents and users)

9.152 As outlined in the FRA, several aspects of the proposed development have the potential to impact on site flood risk, such as the increase in impermeable areas and proposed earthworks which could alter existing drainage patterns.

9.153 Post-development hydraulic modelling has been carried out, incorporating key scheme components as detailed in the FRA this demonstrates that the dwellings will not be at risk of flooding during the 1 in 100 year plus 25% climate change event and there will be no adverse impacts off site.

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9.154 To ensure that the future residents and users of the development are not at risk of fluvial flooding, each of the development parcels are to be raised above the 1 in 100 year plus 25% climate change flood level with the Finished Floor Level (FFL) or each property set 300mm above this.

9.155 Where 'hard' surfaces are proposed as part of the development, there will be in an increase in impermeable areas and therefore associated surface water runoff, compared with the existing, undeveloped situation. Without mitigation, this would increase peak surface water discharge to the onsite watercourses, as well as increasing volumetric runoff.

9.156 To mitigate the risk of increased surface water flooding the SWDS, which forms part of the inherent development design, has been designed to reduce the probability of surface water flooding at the Site and in the surroundings and ensure that there are no detrimental effects to surface water flooding in the receiving drainage systems.

9.157 The SWDS will restrict peak flows from the impermeable areas to the equivalent greenfield runoff rate via a series of ditches/swales/raingardens which discharge into attenuation ponds and then into the Lidsey Rife.

9.158 The sensitivity of the future residents and users of the proposed development to flood risk is considered to be high.

9.159 Considering the inherent and standard mitigation as detailed within the FRA and drainage strategy, the magnitude of change / effect prior to actionable mitigation is considered to be Minor. Were a flood to occur, the rate of inundation would be such that there would be minimal risk to human life.

9.160 Therefore, there will be a **long term -minor adverse impact** on the future residents and users of the development.

Changes in the risk of flooding on the surrounding areas and their effects on potential receptors (i.e. residents and users)

9.161 As detailed in the section regarding changes in the risk of surface water and fluvial flooding at the site, there are several components of the development which have the potential to impact the local flood regime.

9.162 However, the post-development model demonstrates that there are no substantial changes to the flood regime of the Lidsey Rife as a result of the proposed development.

9.163 A comparison of the baseline and post-development modelled flood extents for the Lidsey Rife shows that there are no impacts on third party land.

9.164 Considering the inherent and standard mitigation as detailed within the FRA and SWDS, the magnitude of change / effect prior to mitigation is considered to be Negligible.

9.165 The sensitivity of residents and users of the surrounding area to changes in flood risk is considered to be high.

9.166 Therefore, there will be a **negligible impact** on the residents and users of the surrounding area.

Changes to the drainage regime – quantity and quality of surface water discharged to the water environment

9.167 **As** detailed in the section regarding changes in the risk of flooding, the SWDS will restrict flows from the impermeable area of the development to the equivalent greenfield flow rates. Therefore there is not expected to be an increase in the quantity of surface water discharged as a result of the development.

9.168 Regarding water quality, it is not envisaged that the development would cause a deterioration in the status/potential of the Lidsey Rife or Aldingbourne Rife waterbodies for biological water quality elements. There will be a 9m buffer strip along the Lidsey Rife to meet the Environment Agency's byelaw requirement, the surface water systems from the development platforms will discharge into the existing drainage channels, thus minimising any new connections to the Lidsey Rife.

9.169 The proposed development is to be provided with vehicular access via Golf Links Road, at the south of the site, with a small network of secondary roads and access roads across the development. Runoff from the

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roads could impact the Physio-Chemical water quality of the Lidsey Rife and there is also the potential for an increase in ammonia and nitrates entering the Lidsey Rife as a result of increased road run-off.

9.170 Inherent mitigation within the design of Sustainable Urban Drainage Systems (SuDS) and outfalls would ensure that the required water quality standards are achieved.

9.171 A detailed assessment of how runoff from the proposed road network could impact water quality will be undertaken as required at the detailed design stage.

9.172 The sensitivity of the Lidsey Rife and Aldingbourne Rife to changes in water quantity and quality are assessed to be low. Considering the inherent mitigation within the SWDS and the SuDS design, the magnitude of change is considered Minor. Therefore, there will be a **long term minor-negligible adverse impact** on the quantity and quality of surface water discharged to the water environment.

Impact of the proposed development on water supply and availability

9.173 Consultation has been undertaken with PW to understand the capacity within their local network to serve the development proposals, this has concluded that they have sufficient capacity to supply Site A..

9.174 WSP have estimated that the proposed development will impose a diversified peak load of approximately Peak demand of 7.17l/s on the existing Water network. The impact on the potable water infrastructure and the wider environment is minimised by reducing potable water demand to 110 litres per person per day or less.

9.175 The sensitivity of the existing PW network is assessed to be low and the magnitude of change considering the inherent mitigation is assessed to be low. Therefore, there will be a minor adverse effect on the existing water supply network.

Summary of potential effects at Site A

9.176 Table 9.8 summarises the potential environmental effects that may impact Site A and their significance.

Table 9.8 Significance of water related effects associated with development at Site A

Description of Effects	Receptor(s)	Sensitivity	Magnitude of Change	Significance of Effect
Construction Phase				
Changes in on site flood risk	Construction Workers	Moderate	Minor	Minor, short term, adverse
Changes in flood risk in the areas surrounding the site	Residents and users of the surrounding area	High	Negligible	Negligible
Changes to the quality of surface water discharged to the water environment	Lidsey Rife and Aldingbourne Rife Waterbodies	Low	Minor	Minor-Negligible, short term, adverse
Operational Phase				
Changes in on site flood risk	Residents and users of the development	High	Minor - were a flood to occur, the rate of inundation would be such that there would be minimal risk to human life	Minor, long term, adverse
Changes in flood risk in the areas surrounding the site	Residents and users of the surrounding area	High	Negligible	Negligible

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Changes to the drainage regime, quantity and quality of water discharged to the water environment	Lidsey Rife and Aldingbourne Rife Waterbodies	Low	Minor	Minor-Negligible, long term, adverse
Impact of the proposed development on water supply and availability.	Existing water supply network (Portsmouth Water)	Low	Minor	Minor, long term adverse

Site B – Relocation of golf course

Construction Phase

Changes in the risk of flooding at the site and their effects on potential receptors (i.e. construction workers)

9.177 Surface water and fluvial flooding, especially after extreme rainfall events, has the potential to harm workers onsite if it is received in large volumes, particularly if they are working in the floodplain or in excavations, which have the potential to fill with water. In addition, construction of the proposed development will lead to the introduction of impervious surfaces and a potential reduction in permeable area through the temporary siting of the contractor's compound and storage areas. This would temporarily reduce infiltration, increase surface water runoff, and potentially increase flood risk across the development site and in the surrounding area

9.178 The topography of the site will change during site preparation, earthworks, and construction. The re-profiling of the land has the potential to change the rate and direction of surface water flows within the study area. Existing overland flowpaths could be diverted, terminated and new flowpaths could be created during construction. The placement/stockpiling of materials may also influence where surface water collects and flows. This has the potential to alter the rate and volume of water entering local watercourses and surface water features on and offsite, as well as the volume of water infiltrating through the soils into the underlying aquifer systems.

9.179 During construction, the potential receptors of changes in surface water and fluvial flood risk at the site are the construction workers

9.180 The sensitivity of construction workers is considered to be moderate, and the magnitude of change/effect considering the inherent and standard mitigation (temporary drainage solution and CEMP), is considered to be minor. Therefore, there will be a **short term minor adverse effect** on the construction workers.

Changes in the risk of flooding on the surrounding areas and their effects on potential receptors (i.e. residents and users)

9.181 Existing overland flowpaths could be diverted, terminated and new flowpaths could be created during construction. The placement/stockpiling of materials may also influence where surface water collects and flows. This has the potential to alter the rate and volume of water entering local watercourses and surface water features offsite.

9.182 The residents and users of the surrounding areas are further away from the Site than the construction workers and would therefore experience a lesser magnitude of change/effect compared to the construction workers.

9.183 The sensitivity of the residents and users of the surrounding areas is considered to be high, and the magnitude of change considering the inherent and standard mitigation (e.g. the CEMP), is considered to be negligible. Therefore, the significance of the effect on changes to flood risk for residents and users of the areas surrounding the proposed development is considered to be **negligible.**

Changes to the quality (i.e. physical and chemical contamination) of surface water discharged to the water environment

9.184 As with Site A, there are a number of activities during the construction phase at Site B that will disturb the ground and potentially result in increased sediment and pollutants in surface water runoff and subsequently

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the water environment.

9.185 These construction activities will lead to the disturbance and mobilisation of physical contaminants, which may result in increased suspended sediment loads in surface waters, especially during periods of heavy rainfall. On the other hand, during periods of dry, windy weather, wind-blown dusts generated by ground excavation and earthworks may indirectly enter surface water bodies on and offsite. Elevated suspended sediment loads in surface waters could potentially lead to effects, such as increased turbidity and a reduction in dissolved oxygen, and subsequently a degradation in water quality.

9.186 Additionally, surface water runoff from the construction site could potentially carry elevated concentrations of soluble contaminants and any accidental spillage of fuel, cement products or chemicals could enter surface waters within the study area.

9.187 The sensitivity of the Ryebank Rife, and the drainage ditches with discharge into the Rife, to changes in water quality is assessed to be Low.

9.188 The standard and inherent mitigation such as the CEMP and temporary drainage solution which will be implemented during the construction phase will reduce the risk of contaminants being discharged to the water environment. Therefore, the magnitude of change is considered to be minor.

9.189 Therefore, there will be **a short term minor-negligible adverse effect** on the quality of the surface water discharged to the water environment during construction.

Operational Phase

Changes in the risk of flooding at the site their effects on potential receptors (i.e. users)

9.190 Several aspects of the proposed development have the potential to impact the flood regime of the Ryebank Rife, such as the proposed bridge crossings of the Ryebank Rife, along with the proposed culverts on the drainage ditches and the proposed reprofiling of the site.

9.191 The two proposed bridge crossings of the Ryebank Rife are to be clear-span structures to avoid disturbance to the bed of the Rife.

9.192 Where 'hard' surfaces are proposed as part of the development, there will be in an increase in impermeable areas and therefore associated surface water runoff, compared with the existing, undeveloped situation. Without mitigation, this would increase peak surface water discharge to the onsite watercourses, as well as increasing volumetric runoff.

9.193 To mitigate the risk of increased surface water flooding the SWDS, which forms part of the inherent development design, has been designed to reduce the probability of surface water flooding at the Site and in the surroundings and ensure that there are no detrimental effects to surface water flooding in the receiving drainage systems.

9.194 The SWDS will restrict peak flows from the impermeable areas to the equivalent greenfield runoff rate.

9.195 The FRA demonstrates that there will be no loss of floodplain for the 1 in 100 year plus 25% climate change event as a result of the reprofiling works to create the golf course.

9.196 Considering the inherent and standard mitigation in the SWDS and FRA, the magnitude of impact is considered to be Minor.

9.197 Were a flood to occur, the rate of inundation would be such that there would be minimal risk to human life.

9.198 The sensitivity of the future users of the proposed development to flood risk is considered to be high.

9.199 Therefore, there will be **a long term minor adverse effect** on the users of the proposed development.

Changes in the risk of flooding on the surrounding areas and their effects on potential receptors (i.e. residents and users)

9.200 There will be no loss of floodplain storage on the site, with a view to increase floodplain storage on the site which be assessed during the detailed design stage. As a result of this there will not be any increase in flood

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risk to downstream communities, with the magnitude of effect considered to be negligible.

9.201 The sensitivity of the residents and users of the areas surrounding the proposed development to flood risk is considered to be high.

Therefore, the significance of the effect on changes to flood risk for residents and users of the areas surrounding the proposed development is considered to be **negligible**.

Changes to the drainage regime – quantity and quality of surface water discharged to the water environment

9.202 As detailed in the section regarding changes in the risk of flooding, the SWDS will restrict flows from the impermeable area of the development to the equivalent greenfield flow rates. Therefore, there is not expected to be an increase in the quantity of surface water discharged as result of the development.

9.203 Regarding water quality, the proposed development is to incorporate a maintenance area in the north of the site, which is located in close proximity to a drainage ditch. There is a risk that runoff from this maintenance area containing fuel and pollutants could impact the water quality of this discharge and the Ryebank Rife (which it discharges into).

9.204 To reduce the risk of pollutants entering the drainage ditches and Rife, the refuelling area and vehicle washdown areas should be impermeable and bunded with a low lip surround to contain water. There should be outlets to allow for the controlled collection of waste water with this waste water then discharged to the foul sewerage system.

9.205 Considering the inherent and standard mitigation, the magnitude of change is assessed to be minor.

9.206 The sensitivity of the Ryebank Rife and its tributaries to changes in the quantity and quality of water discharged to the water environment is assessed to be low.

9.207 Therefore, there will be a long-term minor-negligible adverse effect on the – quantity and quality of surface water discharged to the water environment.

Changes to the land-use regime – quantity and quality of surface water discharged to the water environment

9.208 The change from agricultural land to a golf course will change the approach and types of fertilisers and herbicides applied to the land, However, especially since the site is within a nitrate vulnerability zone care will be undertaken with how nitrates are applied, with this in accordance with the Environment Agency / Defra guidance. As the golf course will have more limited areas and increased maintenance teams the fertilisers and herbicides will be able to be applied in a more targeted manner than currently, which is expected to reduce the impact with the water environment.

Impact of the proposed development on water supply and availability

9.209 Due to its nature and scale. the proposed development is estimated have a small impact on potable water supply, WSP have predicted a diversified peak load of approximately Peak demand of 1.34l/s on the existing Water network. Should the irrigation hierarchy require potable water, then this water would be obtained during the night, not at peak times, and directed to the reservoir, for future use. Given the irrigation hierarchy the volumes of potable water required for this purpose are minimized. The magnitude of impact is assessed to be Minor.

9.210 The sensitivity of the PW network is assessed to be low.

9.211 Therefore, there is expected to be **minor long term adverse effect** on the water supply network.

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Table 9.9 Significance of water related effects associated with development at Site B

Description of Effects	Receptor(s)	Sensitivity	Magnitude of Change	Significance of Effect
Construction Phase				
Changes in on site flood risk	Construction Workers	Moderate	Minor	Minor, short term, adverse
Changes in flood risk in the areas surrounding the site	Residents and users of the surrounding area	High	Negligible	Negligible
Changes to the quality of surface water discharged to the water environment	Lidsey Rife and Aldingbourne Rife Waterbodies	Low	Minor	Minor-Negligible, short term, adverse
Operational Phase				
Changes in on site flood risk	Users of the development	High	Minor. Were a flood to occur, the rate of inundation would be such that there would be minimal risk to human life	Minor, long term, adverse
Changes in flood risk in the areas surrounding the site	Residents and users of the surrounding area	High	Negligible	Negligible. There will be no change to flood risk in the surrounding area.
Changes to the drainage regime, quantity and quality of water discharged to the water environment	Lidsey Rife and Aldingbourne Rife Waterbodies	Low	Minor	Minor-Negligible, long term, adverse
Impact of the proposed development on water supply and availability.	Existing water supply network (Portsmouth Water)	Low	Minor	Minor, long term, adverse

Actionable Mitigation

9.212 This section describes actionable mitigation to be employed to reduce the negative effects of the proposed development.

Site A – Redevelopment of existing golf course

9.213 No further mitigation is required, subject to the conclusion of the ongoing discussions with PW and SWS, in relation to the potable and foul water respectively.

Site B – Relocation of golf course

9.214 No further mitigation is required, subject to the conclusion of the ongoing discussions with the Environment Agency, PW and SWS, in relation to the irrigation, potable and foul water respectively.

Residual Impact Assessment

9.215 This section identifies residual effects and their significance.

Site A – Redevelopment of existing golf course

9.216 The residual effects/impacts of the environmental effects at Site A are presented in Table 9.10.

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Table 9.10 Residual effects on water related receptors at Site A

Receptor/Resources	Significance of Effect	Mitigation (Actionable)	Residual Effect
Construction Workers	Minor in relation to changes in flood risk	No Mitigation required	Minor adverse
Residents and users of the surrounding area	Negligible in relation to flood risk.		Negligible
Lidsey Rife and Aldingbourne Rife Waterbodies	Minor-Negligible in relation to changes in quantity and quality of water		Minor adverse-Negligible
Residents and users of the development	Minor in relation to changes in flood risk. Were a flood to occur, the rate of inundation would be such that there would be minimal risk to human life.		Minor adverse
Existing water supply network (Portsmouth Water)	Minor in relation to impacts on the water supply network		Minor adverse

Site B – Relocation of golf course

9.217 The residual effects/impacts of the environmental effects at Site B are presented in Table 9.11.

Table 9.11 Residual effects on water related receptors at Site B

Receptor/Resources	Significance of Effect	Mitigation (Actionable)	Residual Effect
Construction Workers	Minor in relation to changes in flood risk	No mitigation required	Minor adverse
Residents and users of the surrounding area	Negligible in relation to changes in flood risk		Negligible
Ryebank Rife and tributaries	Minor-Negligible in relation to changes in quantity and quality of water		Minor adverse-Negligible
Users of the development	Minor in relation to changes in flood risk. Were a flood to occur, the rate of inundation would be such that there would be minimal risk to human life.		Minor adverse
Existing water supply network (Portsmouth Water	Minor in relation to impacts on the water supply network		Minor adverse

NB: Inherent/Standard Mitigation is included in determining the Magnitude of Change in Tables 5 and 6. Only Actionable Mitigation is employed in Tables 7 and 8 to arrive at Residual Effect.

Cumulative Effects

9.218 This Section identifies and assesses the nature, extent, magnitude and significance of inter-project effects (i.e., effects from other development in combination with those from the proposed development).

9.219 Given that within NPPF that there is to be no increase in risk to third parties as a result of any Scheme, no other developments in isolation or cumulative should change the baseline conditions in relation to flood risk.

9.220 It is anticipated that the relocation of the Golf Course Site B will result in a negligible to minor improvement on the surface water environment as a result of the change in fertiliser and herbicide practices.

9.221 The irrigation hierarchy means that the cumulative development of Sites A and B in addition to other Schemes is minimised in terms of the overall potable water demand, particularly in the medium term until Havant Thicket Winter Storage Reservoir is operational in 2032-2033.

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Summary

Site A

9.222 For Site A, a range of potential effects on the water environment have been considered, including changes in flood risk (on site and off-site), changes in the quantity and quality of water discharged from the site and the impact of the development on the local water supply network.

9.223 Considering inherent and standard mitigation included in the FRA and SWDS there will be no increases in flood risk at the site or in the surrounding area and there will be no increase in the quantity of water discharged from the site. There will also be no adverse change in the quality of the water discharged from the site to the water environment.

9.224 PW have confirmed that they have the capacity to supply the site with potable water.

9.225 Overall, the proposed development will have a **minor adverse effect.**

Site B

9.226 For site B, the same range of potential effects/impacts were identified as at site A, i.e. changes in flood risk, changes in the quantity and quality of water discharged and impacts on the water supply network.

9.227 As with Site A, considering the inherent and standard mitigation, there will be no adverse impacts on flood risk, or the quantity and quality of water discharged as a result of the development.

9.228 Given the nature and scale of the development at Site B, there is not expected to be a significant impact on the water supply network, given the irrigation hierarchy in place to obtain the water in the most sustainable manner.

9.229 Overall, the proposed development will have a **minor adverse effect.**

Cumulative Assessment

Considering the two sites together, the most important cumulative impact of the project is the impact on the local water supply network, however, this is reduced through the irrigation hierarchy.

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10 TRAFFIC AND TRANSPORT

Introduction

10.1 This Chapter of the ES reports the outcome of the assessment of the likely significant environmental effects arising from the proposed development in relation to road traffic that will be generated. This Chapter, and its associated Figure 10.1, is be read in conjunction with the Transport Assessment at *Appendix 10.1*.

Potential Effects

10.2 This section summarises the likely potential effects of the proposed development on the environmental topic area.

10.3 The proposed development will give rise to an increase in traffic on the local highway network both during the construction phase and once they are operational that could have the following effects: severance between existing communities, driver delay, pedestrian delay, impacts on pedestrian amenity, fear and intimidation and effects on road safety.

10.4 The potential effect 'Hazardous Loads' is not being assessed as part of this ES Chapter as Hazardous Loads/ Dangerous loads are not generally associated with the construction of residential developments or new golf courses as movements are primarily non-hazardous HGV's and LGV's/ MGV's. Should there be a requirement of any such loads requiring access to the Sites a methodology statement will be included within the CEMP to be presented and agreed with the local Highway Authority and Health and Safety Executive where appropriate. A Construction Environmental Management Plan (CEMP) would be secured as a planning condition and this would include information to control construction traffic.

10.5 For Site B, the construction phase is not considered in detail as part of this chapter as the movements associated with this phase of works will be minimal, although the potential effects and mitigation are reviewed. Construction machinery is expected to be transported to site by loader HGV's where they will remain for the duration of the works. Other works relating to the club house will be minimal over a 24hour period.

10.6 The impact of traffic movements is also considered cumulatively as one site will not come forward without the other, although works on the new Golf Course will commence prior to the work for the residential site.

Assessment Methodology

10.7 The section describes the methodology used to undertake the assessment within this Chapter.

10.8 This assessment has been undertaken in accordance with guidance given in the following documents: IEMA Guidance for the Environmental Assessment of Road Traffic; and DMRB, LA 104, Environmental Assessment and Monitoring.

10.9 The methodology for calculating trip generation, distribution and assignment of traffic generated by the Proposed Schemes is outlined in Section 6 of the Transport Assessment.

Assessment Scenarios

10.10 This Chapter assesses the construction phase traffic effects for Site A based on a single assessment scenario (i.e., yr. 2026). This is considered to provide a representative year to enable the identification and assessment of likely significant effects during the construction phase.

10.11 The construction of the Proposed Golf Course (site B) is considered to commence in 2023 and completed by 2026.

10.12 The assessment Scenarios considered in this Chapter are as follows:

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- 2026 – Construction Phase of Site A
- 2026 – Full operation of Site B
- 2031 – Full Occupation/operation of Site A & Site B

10.13 For the construction phase scenario (2026) the baseline flows include background growth as well as the following applications:

- App Ref: Y/91/17/OUT - Bilsham Road, Yapton
- App Ref: AL/87/21/PL - Oldlands Farm, Bognor Regos
- App Ref: Y/92/17/OUT - Main Road, Yapton
- App Ref: F/4/20/OUT - Ford Airfield (50% Occupation)

10.14 Information about these is set out in *Appendix 4.1*.

10.15 The 2031 scenario includes background growth, 100% occupation of Ford Airfield and the two strategic development areas West of Bersted and at the three villages Barnham, Eastergate and Westergate.

10.16 Any other sites identified in this cumulative development table are not considered to have a material impact on the local road network and any trips that may affect the roads assessed would be included the background growth which is also applied.

Study Area

10.17 The IEMA Guidance identifies that traffic flow increases of 30% represent a reasonable threshold for inclusion of highway links within the assessment process, although a lower threshold may be appropriate where there are higher HGV flows. It also suggests that other 'sensitive areas' should be included where traffic flows increase by 10% or more. Such 'sensitive areas' may include accident black spots or links with high pedestrian flows.

10.18 For the purposes of this assessment, the effects of the Proposed Development have been considered for receptors on the following links and junctions and the effects of the changes in traffic composition and volume have been assessed. The extent of the study area is that assessed and discussed as part of Transport Assessment.

10.19 These links and junctions are identified in Figure 10.1 and comprise:

- Shripney Road (A29) (south of A259)
- Shripney Road (A29) (North of A259)
- Felpham Relief Road (A259) (Near junction with A29)
- Felpham Relief Road (A259) (Near junction with B2259)
- Felpham Lane (B2259)
- Firs Lane
- Felpham Way (B2259)
- Downview Road
- Outerwyke Road
- Felpham Way (B2259) east of Arun Leisure Centre
- Felpham Way (B2259) South of Arun Leisure Centre
- A259 Grevatt's Lane
- B2259 upper Bognor Road (East of High Street)
- High Street

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10.20 The Junctions within the study area comprise the following:

- A259/ A29
- B2259/ A259
- B2132/ B2259
- Summerley Lane/ B2259
- Felpham Road/ Downview Road/ B2259
- Drygrounds Close/ B2259
- Upper Bognor Road/ B2259
- B2259/ High Street
- High Street/ Gloucester Road

10.21 Beyond the road links and junctions identified above the impact of the development traffic from Sites A and B will be less than 3% of the total flows over a 24hour period and as such the impact will be negligible. Therefore, no likely significant effects are anticipated to occur beyond this study area.

Consultation

10.22 The scope of the Transport Assessment was discussed with West Sussex County Council as the local highway authority during September and October 2021. The matters discussed and agreed are included in the Transport Assessment and therefore this assessment

Legislative / Planning Policy Context

10.23 There is no legislation relevant to the assessment reported in this Chapter.

10.24 In terms of Planning Policy the National Planning Policy Framework (NPPF) states at para 104;

"Transport issues should be considered from the earliest stages of plan-making and development proposals so that the environmental impacts of traffic and transportation infrastructure can be identified, assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains..".

Assessment Process

10.25 The assessment of likely significant environmental effects as a result of the Proposed Development has taken into account both the construction and operations phases.

10.26 The duration of the effect has been assessed as either 'short-term', 'medium-term' or 'long-term'. Short-term is considered to be up to 5-year, medium-term is considered to be between 5 to 15 years and long-term is considered to be greater than 15 years.

10.27 The IEMA Guidance makes it clear that a "...critical feature of Environmental Assessment is determining whether a given impact is significant." Further "for many effects there are no simple rules or formulae which define thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor backed up by data or quantified information whenever possible. Such judgements will include the assessment of the numbers of people experiencing a change in environmental impact..."

Assessment Criteria

10.28 The assessment of environmental effect considers the receptors at identified links and junctions and the level of change that the increase in proposed development traffic will have on the receptors. The identification of receptors has been drawn from the principles set out in the IEMA Guidance and includes the following:

- The need to identify particularly groups or locations which may be sensitive to changes in traffic conditions (e.g., children attending school on foot or cycle);
- The list of affected groups and special interests set out in the IEMA Guidance which include;

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- People at home
- People in work places
- Sensitive groups including children, elderly and disabled;
- Sensitive locations, e.g. hospitals, churches, schools, historical buildings
- People walking
- People cycling
- Open spaces, recreational sites, shopping areas;
- Sites of ecological / nature conservation value;
- Sites of tourist/ visitor attraction

- The identification of links or locations where it is felt that specific environmental problems may occur - this would relate to accident blackspots, Conservation Areas, hospitals, links with high pedestrian flows.

10.29 The above have been used to outline in broad terms the susceptibility of receptors to traffic for the categories of impact assessed, enabling an identification of the road links to be considered in detail within the assessment (see 'Sensitive Receptors' section below).

10.30 The key receptors are identified as high, moderate or low in sensitivity.

10.31 In terms of the assessment of transport related effects, high sensitivity receptors include residents, pedestrians and cyclists. Low sensitivity receptors comprise of road users.

Determining the Magnitude of Change

10.32 The magnitude of change has been considered as the change experienced from the baseline conditions at the sensitive receptors and has been considered on a scale of Large, Moderate, Small and Negligible.

10.33 Drawing on the IEMA Guidance, which sets out the broad principles of how to determine the magnitude of change, the approach / criteria are for each effect is summarised below:

10.34 **Severance**: The IEMA Guidance states that: 'severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery.' Further: 'Changes in traffic flow of 30%, 60% and 90% are regarded as producing small, 'moderate' and 'large' changes in severance respectively.' However, the IEMA Guidance acknowledges that the measurement and prediction of severance is extremely difficult. Where the change is less than 30%, the level of severance is considered as 'negligible'. The assignment of magnitude of change is based on the two-way daily level of traffic movements. To assist in informing the outcome of this, the locality, nature of local area and location of facilities has also been taken into consideration.

10.35 **Driver delay**: For the construction phase, the magnitude of change has been based on factors including the volume of traffic generated by the Proposed Development and activities that could disrupt traffic flows on the local road network alongside professional judgement. For the operational phase, this has been established at key junctions using conventional modelling techniques identifying the average delay in seconds. However, the IEMA Guidance identifies that such delays: '… are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system.' The assignment of magnitude of change has been based on the level of delay identified from the junction modelling output and reviewing the changes as a result of the 'with development' scenarios compared to the future. In general, a delay of less than 30 seconds per vehicle is considered to be negligible in terms of magnitude, an increase of 30 seconds to 1 minute is considered to be small, an increase of 1 minutes to 2 minutes is considered to be moderate and an increase greater than 2 minutes per vehicle is considered to be large. Professional judgement is also applied in determining magnitude of change.

10.36 **Pedestrian delay:** The IEMA Guidance notes that this refers to 'changes in the volume, composition or speed of traffic [that] may affect the ability of people to crossroads.' As part of this assessment the Department for Transport's Local Transport Note 1/95 'The Assessment of Pedestrian Crossings' has been used. This Note reviews the average time it takes for a person to cross a road and this provides an indication of the level of gap needed between vehicles for people to cross a road easily (in terms of seconds). A gap of

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4-6 seconds may be considered acceptable by the majority of able-bodied individuals at normal urban traffic speeds, and shorter gaps where traffic is slower. Other groups (e.g., older individuals, disabled persons) may require larger gaps of 10-12 seconds or longer. Where the level of gap is less than this measures to assist pedestrians across the road are identified. Professional judgement is also used alongside these measures to determine magnitude of change. For the construction phase, the magnitude of change also accounts for activities that could disrupt pedestrian movements around the local area, such as temporary footway closures/ diversions etc.

10.37 **Pedestrian amenity**: Broadly defined as the relative pleasantness of a journey, amenity is affected by traffic flow, traffic composition and pavement width / separation from traffic. The IEMA Guidance suggests a tentative threshold for judging the magnitude of change in respect to pedestrian amenity, where traffic flow (or its lorry component) is halved or doubled. The assessment in terms of magnitude is based on professional judgement and is also determined by change in traffic levels (i.e., negligible where there is a limited change, small where the level of traffic increases is less than 30% of the existing levels, medium where the increases are 30% to 60% against existing traffic flows and large where the increases are greater than 60%). For the construction phase, the magnitude of change also accounts for activities that could disrupt pedestrian movements around the local area and proximity to construction works.

10.38 **Fear and intimidation**: The magnitude of change is dependent upon the volume of traffic, its HGV composition, proximity to people or the lack of protection caused by such factors as narrow pavement widths. The IEMA Guidance states that there are no commonly agreed thresholds for estimating this from known traffic and physical conditions, but it does nevertheless suggest some thresholds, based on previous research, which have been used in conjunction with the factors noted above and professional judgement. These thresholds are noted in Table 10.1.

Table 10.1 Fear and intimidation threshold from increase in traffic

Degree of Hazard	Average Traffic Flow over 18 hr day – Vehicles / Hour 2-way	Total 18-hour HGV Flow	Average Vehicle Speed over 18-hour Day - mph
Large	+1800	+3000	+20
Moderate	1200-1800	2000 - 3000	15-20
Small	600-1200	1000 - 2000	10-15

Note: although no category is given in the guidance for flows less than the above thresholds, for the purposes of this assessment any flows below the thresholds have been categorised as 'negligible'

10.39 **Accidents and Safety:** The IEMA Guidance states that: 'Professional judgement will be needed to assess the implications of local circumstances, or factors, which may elevate or lessen risks of accidents, e.g., junction conflicts'. The magnitude of change is determined based on professional judgement and a review of accident data (e.g., the type / severity of accidents that have occurred and the number if there is a cluster of incidents) and the percentage increase of traffic generated by the Proposed Development.

10.40 The level of effect attributed has been based on the magnitude of change due to the proposed development and the evaluation of the sensitivity of the affected receptor, as well as a number of other factors that are outlined in more detail in Assessment Criteria. The level of effect has been based on professional judgement and Table 10.2 has been used as a tool to assist with this process.

10.41 Whilst Table 10.2 provides ranges, the level of effect is confirmed as a single level and not a range informed by professional judgement. A statement is also made as to whether the level of effect (for residual effects) is 'Significant' or 'Not Significant', again based on professional judgment.

10.42 The following terms have been used to define the level of effect identified and these can be 'beneficial' or 'adverse':

Major effect: where the Proposed Scheme is likely to cause a considerable change from the baseline conditions and the receptor has limited adaptability, tolerance or recoverability or is of the highest sensitivity. This effect is considered to be 'Significant';

Moderate effect: where the Proposed Scheme is likely to cause either a considerable change from the

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baseline conditions at a receptor which has a degree of adaptability, tolerance or recoverability or a less than considerable change at a receptor that has limited adaptability, tolerance or recoverability. This effect is considered more likely to be 'Significant' but will be subject to professional judgement;

Minor effect: where the Proposed Scheme is likely to cause a small, but noticeable change from the baseline conditions on a receptor which has limited adaptability, tolerance or recoverability or is of the highest sensitivity; or where the Proposed Scheme is likely to cause a considerable change from the baseline conditions at a receptor which can adapt, is tolerant of the change and / or can recover from the change. This effect is considered less likely to be 'Significant' but will be subject to professional judgement; and

10.43 **Negligible**: where the Proposed Scheme is unlikely to cause a noticeable change at a receptor, despite its level of sensitivity or there is a considerable change at a receptor which is not considered sensitive to a change. This effect is 'Not Significant'.

Table 10.2 Matrix to determine significance of transport related effects

Magnitude of Change	Sensitivity			
	High	Moderate	Low	Negligible
Large	Major	Moderate to Major	Minor to Moderate	Negligible
Moderate	Moderate to Major	Moderate	Minor	Negligible
Small	Minor to Moderate	Minor	Negligible to Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Sources of Information

10.44 The traffic data used in the assessment is based on survey data collected in 2021 data which has been extrapolated and modelled with background growth and committed developments added to provide the 2026 and 2031 baseline conditions.

10.45 The background studies that have informed this assessment are outlined in Table 10.3 below.

Table 10.3 Transport background studies

Survey	Overview	Date of Completion
Traffic Surveys	Base Traffic Surveys at the following junctions: • A259/A29 • Bognor Regis Golf Course Access/ Downview Road • A259/B2259 • B2259/B2132 • Firs Avenue. B2259/Summerley Lane • Downview Road/ Felpham Way • B2259/ Drygrounds Close • B2259/Upper Bognor Rd **Automatic Traffic Counters** A259 Felpham Relief Road Downview Road Grevatt's Lane Outerwyke Road x 2 Firs Avenue	Tuesday 14th September 2021 14th to 20th September 2021 5th to 11th October 2021

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10.46 These flows have been compared to pre-covid traffic data (2018/2019) obtained from West Sussex County Council's website and, as discussed in the TA, the 2021 flows + growth provide a suitably robust basis.

Assumptions

10.47 In undertaking the analysis within this Chapter, the following assumptions have been made

- The Housing Scheme at Site A will be operational, and the site will be fully occupied by 2031
- The committed developments included as part OF THE 2026 assessment year include APP Ref: Y/91/17/OUT – Proposed 250 Dwellings – Full Occupation; App Ref: AL/87/21/PL – Proposed employment use 11,412sqm – Fully operational; App Ref: Y/92/17/OUT – Proposed 300 Dwellings – Full Occupation; App Ref: F/4/20/OUT – Proposed 1,200 dwellings & Care Home inc. school – Assumed 50% occupation
- The Future Year assessment of 2031 includes the above and the following committed/allocated developments:
- App Ref: F/4/20/OUT – Proposed 1,200 dwellings & Care Home etc – Full Occupation
- Land at Barnham, Eastergate & Westergate – 3,200 Dwellings – Full Occupation
- Land West of Bersted – 2,500 Dwellings – Full Occupation

10.48 For the construction Phase of the Residential Development (Site A), it is assumed that construction will commence in 2026 and the construction will be completed within a 5-6 year period.

10.49 The TA has assessed up to 500 new homes at Site A; this is greater than the 480 new homes for which planning permission is sought and is therefore a worst-case scenario.

Limitations

10.50 Existing WSCC Modelling data that includes detail of the local area was not available at the time of writing this report, however, the Transport Assessment is considered to be sufficiently robust.

Baseline Conditions

10.51 The section provides more detailed topic specific information to describe the character of Sites A and B and their environs. This describes the quality of the interests as they relate to this environmental topic and serves as a comparative measure against which changes arising from the construction and operational phases of the proposed development can be assessed or predicted. This identifies the sensitivity of environmental receptors.

Site A – Redevelopment of existing golf course

Existing Pedestrian/ Cycle Route

10.52 PROW 153 crosses through the site. This route extends from Drygrounds, a road just north of Felpham Way, to join with routes 146 & 147 to the north east side of A259 Felpham Relief Road. Route 153 also connects with route 152 via a footbridge that crosses the Lidsey Rife to the northern edge of the site. Figure 10.2 shows the existing PROW routes within the local area.

10.53 The public footpath is currently a track that provides a direct link to Downview Primary School and Felpham College / Arun Leisure Centre.

10.54 To the southeast of the site, PROW route 154 extends from Shirley Drive and continues on a north easterly direction through the newly constructed residential development east of the site and then continues northward across the A259 Charles Purley Way. This route is predominantly a surfaced route changing to a track to the north side of the A259.

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10.55 The local area includes an extensive network of footways of varying width. The footway along Downview Road is provided along both sides of the road and is separated from the road by a verge. This road and many of the surrounding roads have street lighting providing safe routes for pedestrians during the hours of darkness.

10.56 To the south east of the site, Shirley Drive is not a publicly adopted road and does not include any footway or street lighting provision; although the PROW route 154 links to Shirley Drive providing a surfaced route northward.

10.57 Local roads are lightly trafficked and vehicle speeds are kept low through the provision of traffic calming in the form of speed cushions. This allows pedestrians to safely crossroads without the need for controlled measures. Local roads are also suitable for on road cycling.

10.58 Downview Road joins B2259 Felpham Road via a signal-controlled junction. At this junction there are controlled crossing facilities for pedestrians.

10.59 There is an existing signed cycle route along the southern side of B2259 which continues from Felpham Road into Bognor Town Centre.

10.60 In addition, there is the Sustrans National Cycle Route No. 2 which continues along A259 and B2259 Flansham Lane. This route then continues southwest via King George V Recreation Ground to Felpham Beach.

10.61 To the north of the site there is an existing footway/cycleway route that continues along the A29 and the A259 Felpham Relief Road.

Existing Road Network

10.62 The site abuts Golf Links Road to the south with an access serving the existing golf course named as Gareth Road. Golf Links Road is a residential road approximately 5.5m wide with footways on both sides. Golf Links Road joins Shirley Drive to the east of the existing Golf Course access.

10.63 Downview Road is a residential road and leads from Golf Links Road via a simple priority junction arrangement. Downview Road continues south from the site on a straight alignment to join B2259 Felpham Road. Downview Road is approximately 6m wide with footways either side and has traffic calming in the form of speed cushions along its full length.

10.64 Leading off from Downview Road are a number of residential roads, including Wroxham Way which leads to Downview Primary School and Outerwyke Road which continues eastward to join Firs Avenue which in turn joins B2259. Outerwyke Road also has traffic calming along its full length in the form of speed cushions.

10.65 To the south of the site, the B2259 is the primary route into Bognor Town Centre and also joins A259 to the north east. The junction of B2259 and Downview Road is signalised although the majority of junctions along the B2259 are either in the form of roundabouts or priority junctions.

10.66 The A259 north of the site joins the A29 via the Felpham Relief Road north west of the site and continues eastward to Littlehampton and Goring-by-Sea.

10.67 The A29 continues from the centre of Bognor northwards to join with the A27 and further north to join the A24.

Public Transport

10.68 The site is situated within a 5min walk of bus service route 67 which provides a service between Felpham and Bognor Town Centre, this service runs Monday to Saturday providing a 2hourly service. Four additional bus services are provided on B2259 approximately a 10min walk from the site providing a high frequency service of buses every 20-30mins serving Chichester, Bognor, Portsmouth and the surrounding areas. Further details of the existing bus services are provided in Section 2 of the Transport Assessment.

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Accidents and Safety

10.69 Personal Injury Accident (PIA) data has been obtained from Sussex Police for the latest five-year period from August 2016 to July 2021.

10.70 During the latest five-year period a total of 97 injury were recorded within the study area, 20 of which were serious, one was fatal, and the rest were slight.

10.71 A detailed review of the accident data is included in Section 2 of the Transport Assessment, although it is concluded that there are no accident patterns occurring that could be attributed to the existing highway layout and design.

Future Baseline

10.72 The baseline is likely to remain unchanged for the foreseeable future in the absence of development, as the current Golf Course use would continue under such a future scenario.

Sensitive Receptors

10.73 Table 10.4 presents the sensitive receptors that have been identified for this assessment. The receptors have been identified because of their susceptibility to changes in traffic flows caused by the proposed developments and it is identified if they are susceptible to change due to the presence of pedestrian footways/ cycleways and residential properties/ schools.

Table 10.4 Summary of sensitivity of transport related receptors associated with Site A

Link Ref	Highway Link	Sensitivity	Summary Reason
1	Shripney Road (A29) South	Moderate	There is an existing footway/cycleway along one side of the road, although the level of use is considered lower than built up areas and therefore the sensitivity is considered to be Moderate.
2	Shripney Road (A29) North	Moderate	There is an existing footway/cycleway along one side of the road, although the level of use is considered lower than built up areas and therefore the sensitivity is considered to be Moderate.
3	Felpham Relief Road (A259)	Moderate	There is an existing footway/cycleway along one side of the road, although the level of use is considered lower than built up areas and therefore the sensitivity is considered to be Moderate.
4	Charles Purley Way (A259)	Moderate	There is an existing footway/cycleway along one side of the road, although the level of use is considered lower than built up areas and therefore the sensitivity is considered to be Moderate.
5	Flansham Lane (B2259)	High	This road is bound by residential development and has footways on both sides of the carriageway.
6	Felpham Way (B2259) (East of Downview Road)	High	This road is bound by residential development and has footways on both sides of the carriageway. This also serves recreational areas.
7	Felpham Way (B2259) (West of Downview Road)	Moderate	This section of B2259 has limited residential access and footway provision is on one side set back from the road.

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Link Ref	Highway Link	Sensitivity	Summary Reason
8	Downview Road	High	This is an existing residential road with footways on both sides separated from the road by a verge. Downview Primary School is also located close to Downview Road.

10.74 The key routes for traffic to and from the existing site is along Downview Road and on the B2259 Felpham Way, with some traffic also using the A259 although beyond these areas the impact will be negligible.

Site B – Relocation of golf course

10.75 The existing site for the new golf course is currently agricultural land and therefore has limited activity in terms of vehicular movements. Table 10.5 identifies the road links that are considered susceptible to change.

Table 10.5 Summary of sensitivity of transport related receptors associated with Site B

Link	Receptor/Resources	Sensitivity	Summary Reason
5	Flansham Lane (B2259)	High	This road is bounded by residential development and has footways on both sides of the carriageway.
6	Felpham Way (B2259) (East of Downview Road)	High	This road is bounded by residential development and has footways on both sides of the carriageway. This also serves recreational areas.
7	Felpham Way (B2259) (West of Downview Road)	Moderate	This section of B2259 has limited residential access and footway provision is on one side set back from the road.
8	Downview Road	High	This is an existing residential road with footways on both sides separated from the road by a verge. Downview Primary School is also located close to Downview Road.
9	Grevatt's Lane (A259) West of B2233	Moderate	There is an existing footway/cycleway along one side of the road, although the level of use is considered lower than built up areas and therefore the sensitivity is considered to be Moderate.

Inherent and Standard Mitigation

10.76 This section describes those 'inherent' and 'standard' mitigation measures which primarily address the scope to avoid, reduce or remedy adverse environmental impacts or enhance the beneficial aspects arising from the construction and operational periods of the proposed development.

Site A – Redevelopment of existing golf course.

10.77 The proposed access arrangement will see the realignment of Downview Road into the site; this road will form a crossroad arrangement with Golf links Road and Shirley Drive with a table-top ramp to slow vehicle speeds as vehicles enter the site and assist in maintaining the existing 20mph speed limit in this area and provide a continuation of the traffic calming features. The 20mph speed limit will continue into the site controlled through design and if required traffic calming features.

10.78 The development proposal will also look to upgrade existing PROW routes from the site to provide off road routes to Downview Primary School, suitable for walking and cycling as well as potential improvements to link with the A259 north of the site. Improvements to local bus stops will be provided to make the use of bus travel more attractive.

10.79 Further details of these measures are provided in Section 5 of the Transport Assessment. The use of non-car modes and reduction of single occupancy car use will be encouraged through the provision of a Travel

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Plan which will be conditioned as part of a S106 agreement.

Assessment of Environmental Impacts

10.80 This section provides an assessment of the nature, extent, magnitude of change that the proposed development will have on individual receptors identified in the baseline section. By employing the sensitivity of the receptor and magnitude of change, the significance of environmental effects which arise as a result of the construction and operational periods of the proposed development will be determined.

10.81 The identification and assessment of the change that the proposed development will have on individual receptors is based on the sensitivity of the receptor and magnitude of change. This informs significance of environmental effects (including any, direct or indirect effects) that arise as a result of the construction and operational periods of the proposed development. This assessment will consider inherent and standard mitigation (e.g., highway improvements that are part of the proposed development).

Site A – Redevelopment of existing golf course

10.82 Table 10.6 below identifies the Magnitude of change with the proposed redevelopment of the existing golf course site for residential use, based on the increase in traffic movements and the level of Sensitivity identified in Table 10.4.

Table 10.6 Summary of magnitude of change to transport related receptors associated with Site A

Link ID	Receptor/Resources	Summary of Potential Change to Receptor/Resource	Summary Reason
1	Shripney Road (A29) South	Negligible	The assignment of traffic shows that no traffic from the development is likely to use this route in the peak hours, therefore the effect is not significant.
2	Shripney Road (A29) North	Negligible	The assignment of traffic shows that, whilst there will be a slight increase in traffic associated with the development, the change will be Minor and therefore the effect is not likely to be significant.
3	Felpham Relief Road (A259)	Negligible	The assignment of traffic shows that, whilst there will be a slight increase in traffic associated with the development, the change will be Minor and therefore the effect is not likely to be significant.
4	Charles Purley Way (A259)	Negligible	The assignment of traffic shows that, whilst there will be a slight increase in traffic associated with the development, the change will be Minor and therefore the effect is not likely to be significant.
5	Flansham Lane (B2259)	Negligible to Minor	The assignment of traffic shows that there will be a small increase in traffic associated with the development; the change will be Minor to Negligible and therefore the effect is not likely to be significant.
6	Felpham Way (B2259) (East of Downview Road)	Negligible to Minor	The assignment of traffic shows that there will be an increase in traffic associated with the development; the change will be Minor to Negligible and therefore the effect is not likely to be significant.

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Link ID	Receptor/Resources	Summary of Potential Change to Receptor/Resource	Summary Reason
7	Felpham Way (B2259) (West of Downview Road)	Negligible to Minor	The assignment of traffic shows that there will be an increase in traffic associated with the development; the change will be Minor to Negligible and therefore the effect is not likely to be significant.
8	Downview Road	Moderate	The assignment of traffic shows that there will be a moderate increase in traffic associated with the development, although this is due to the existing low traffic movements; in real terms the impact is considered to be Minor. The change is therefore considered to be will be Minor although the effect is not considered to be significant.

Site B – Relocation of golf course

10.83 Table 10.7 below identifies the Magnitude of change with the proposed development of the new golf course south of Grevatt's Lane. The traffic movements are predominately already on the local road network although will be re-assigned as a result of the re location of the Golf Course.

Table 10.7 Summary of magnitude of change to transport related receptors associated with Site B

Link Ref	Receptor/Resources	Summary of Potential Change to Receptor/Resource	Summary Reason
5	Flansham Lane (B2259)	Negligible	The assignment of traffic shows that, whilst there will be a change in direction of travel associated with the development, the change will be Low and therefore the effect is not likely to be significant.
6	Felpham Way (B2259) (East of Downview Road)	Negligible	The assignment of traffic shows that, whilst there will be a change in direction of travel associated with the development, the change will be Low and therefore the effect is not likely to be significant.
8	Downview Road	Negligible	The change in location of the Golf Course will see a reduction in traffic flows on this link, although the traffic movements are currently low and therefore the effect is not likely to be significant.
9	Grevatt's Lane (A259) West of B2233	Negligible	The assignment of traffic shows that, whilst there will be a slight increase in traffic associated with the development, the change will be Negligible and therefore the effect is not likely to be significant .

10.84 The above tables provide the potential change that the development proposals at Site A and Site B are considered to have on the links identified within this assessment. The level of change is used as part of the following assessment process where professional judgement is required in determining the overall magnitude of change.

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Site A – Redevelopment of existing golf course.

10.85 The redevelopment of the existing golf course has been reviewed to determine the environmental impact of traffic flows during the construction phase and also during the fully operational phase.

Construction Phase

10.86 The potential construction trips are derived from previous experience of such projects. The details of the predicted vehicle movements to the Proposed Scheme include the likely HGV movements and staff movements.

Severance

10.87 During the construction phase, there will be additional vehicles traveling to / from the Site associated with delivery of materials and deployment of the construction workforce which could create a perception of severance.

10.88 **Table 10.8** provides the predicted two-way daily movements associated with the construction phase (based on an assessment year of 2026).

Table 10.8 Hourly and Daily traffic movements associated with the construction phase

	HGVs	Light Good Vehicles (LGVs) / Cars
Movements per day (Average)	8	40
Movements per hour (Average)	1	5

10.89 The predicted construction traffic percentage change on the identified road links in the study area are presented in **Table 10.9** The distribution of HGV traffic movements will be via Downview Road, B2295 and A259. It is assumed at this stage that 100% of HGV's will travel via Downview Road (Road Link 8) and then east onto the B2295 (road links 5 & 6) and then 50/50 on the A259 (Links 3,4 & 9) and onto the A29 North (Link 2). As the direction of construction traffic is not yet known, it has been assumed within the information presented in **Table 10.12** that 100% in both directions on the A259 for robust analysis. For employee traffic movements, the direction of travel has been assigned based on existing traffic flow patterns.

Table 10.9 Predicted construction traffic percentage change over a 24-hour weekday period at 2026

Highway Link		Flows (Vehicles / HGV's)								Change in severance
		Base 2026		construction traffic 2026		Total (with construction traffic)		% Increase		
Ref No.	Link	Car / LGV	HGV	Car / LGV	HGV	Car/ LGV	HGV	Car / LGV	HGV	
2	Shripney Road (A29) North	17538	711	5	8	17546	719	0%	1.1%	Negligible
3	Felpham Relief Road (A259)	24014	2724	5	8	24019	2732	0%	2.9%	Negligible
4	Charles Purley Way (A259)	26218	1088	5	8	26223	1096	0%	0.7%	Negligible
5	Flansham Lane (B2259)	20926	392	12	8	20938	400	0%	2.0%	Negligible
6	Felpham Way (B2259) (East of Downview Road)	22511	203	14	8	22525	211	0%	3.9%	Negligible

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Highway Link		Flows (Vehicles / HGV's)								Change in severance
		Base 2026		construction traffic 2026		Total (with construction traffic)		% Increase		
Ref No.	Link	Car / LGV	HGV	Car / LGV	HGV	Car/ LGV	HGV	Car / LGV	HGV	
7	Felpham Way (B2259) (West of Downview Road)	21951	203	26	0	21977	203	0.1%	0%	Negligible
8	Downview Road	3420	167	40	8	3460	175	1.1%	4.7%	Negligible
9	Grevatt's Lane (A259)	26485	5049	7	8	26492	5057	0%	0.1%	Negligible

10.90 Table 10.09 shows that the level of increase in traffic and the magnitude of change associated with the construction phase will be low and therefore the change in severance is considered negligible.

Driver Delay

10.91 During the construction phase, there will additional vehicles travelling to and from the site associated with delivery of materials and deployment of the construction workforce which has the potential to result in driver delay for other road users.

10.92 The predicted number of movements associated with the construction phase is identified in Table 10.8 which shows a maximum number of vehicle movements of 6 two-way per hour of which 1 will be HGV movements. The base line analysis of the existing Downview Road/B2259 junction shows that this junction will operate within its design capacity, and beyond this junction, junctions are operating well and the addition of 6 two-way movements over a one-hour period will not have a material effect on the operation of the junctions within the study area.

10.93 The implementation of the vehicular access on Golf Links Road is unlikely to cause any significant disruption to traffic or delay due to the location being in a lightly trafficked area. The offsite highway improvements as identified in the Transport Assessment has the potential to cause disruption and increase delay on the local road network. However, such disruption is anticipated to be short-term and temporary in nature. In addition, appropriate traffic management controls (such as appropriate signage/temporary traffic lights) will be implemented as part of a CEMP.

10.94 The sensitivity of the road users on all road links during the construction phase in respect of driver delay is considered to be low. The magnitude of change is considered to be negligible. Therefore, there is likely to be a direct, temporary, short-term, adverse effect which is considered to be negligible.

Pedestrian Delay as a result of increase traffic movements

10.95 During the construction phase, there will be additional vehicles travelling to and from the Site associated with the delivery of materials and deployment of the construction workforce which has the potential to result in pedestrian delay.

10.96 There are no formal crossings on Downview Road expect at its junction with B2259 where there are signal controlled crossings on all arms of the junction. There are further controlled crossings on B2559 to the west of Downview Road junction and also a mix of controlled and uncontrolled crossings to the east on B2259. The number of vehicle movements associated with the construction phase will not be significant and the provision of controlled crossings will enable pedestrians to cross the local roads safely.

10.97 The road that will see the greatest impact will be Downview Road (Link 8). Apart from at the junction with B2259, this road has no formal crossings as it is a residential access road. This road also provides access to Downview Primary School, therefore, an assessment of the pedestrian delay has been carried out for this link.

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10.98 The assessment of pedestrian delay is based on the gap in traffic flow which is available/acceptable to pedestrians; the less gap available the greater delay to pedestrians. The gap is based on the level of traffic that a pedestrian has to negotiate from kerb to kerb or kerb to refuge and will vary from person to person.

10.99 Table 10.10 identifies the predicted vehicle movements in 2026 on Downview Road (Link 8). The network morning (AM) peak period has been used as part of this assessment as this will be the period whereby the traffic movements are at their highest and also where there are likely to be a greater number of pedestrians especially associated with the local primary school.

10.100 Table 10.10 identifies the level of gap achievable, although this is a worst-case scenario as it assumes that the vehicle movements are equal and does not account for vehicles travelling along the links in close proximity which would result in longer gap periods. In addition, the traffic movements are taken at the junction with B2259 whereas they reduce further north as traffic disperses.

Table 10.10 Pedestrian delay analysis at Downview Road during the construction phase

Highway Link		Average Pedestrian Delay (08:00 – 09:00)			
Ref No	Link	Maximum Vehicle Flow (Base 2026)	Gap available (Seconds)	With Construction Traffic (2026)	Gap available (Seconds)
8	Downview Road	306	11.8	312	11.5

10.101 Table 10.10 shows that there will be no change to pedestrian delay caused by the construction traffic along Downview Road. Therefore, the magnitude of change is considered to be negligible. Beyond Downview Road there are controlled crossing facilities, and the quantum of traffic is greater therefore the change with the construction traffic will not be perceptible and therefore also considered to be negligible.

10.102 Where PROW153 dissects the site, this route will be retained within the proposed scheme, albeit it is anticipated to be subject to temporary closure/ diversion for health and safety purposes during the construction period. Such disruption is anticipated to be short-term and temporary in nature. In addition, appropriate management controls (such as appropriate signage for alternative routes) will be implemented as part of a CEMP.

10.103 As such the magnitude of change for pedestrian delay is considered to be negligible.

10.104 The Sensitivity of pedestrians during the construction period is considered to be high. The magnitude of change is considered to be negligible. Therefore, there is likely to be a **direct, temporary, medium term, negligible effect**.

Changes in Pedestrian Amenity as a result of increase traffic movements

10.105 There is a good network of footways throughout the local area and along Downview Road the footways are separated from the road by a verge of varying width. The footways throughout the local area are of varying width although are predominately 2m in width. There are also a number of controlled crossing facilities on the B2259.

10.106 During the construction phase there will be additional vehicles travelling to and from the Site associated with delivery of materials and deployment of the construction workforce which has the potential to result in a reduction of amenity. However, during the construction phase the increase in vehicles including HGV movements will be limited (see Table 10. 9) and much lower than 50% of the existing traffic movements.

10.107 In addition, where PROW 153 dissects the site, this route will be retained within the proposed scheme albeit it is anticipated to be subject to closure/ diversion for health and safety purposes during the construction period. However, such disruption is anticipated to be short-term and temporary in nature. In addition, appropriate management controls (such as appropriate signage for alternative routes) will be implemented as part of a CEMP.

10.108 Overall, it is considered as part of the construction phase, the magnitude of change in respect to pedestrian

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amenity is small.

10.109 The Sensitivity of pedestrians during the construction period is considered to be high. The magnitude of change is considered to be small. Therefore, there is likely to be a **direct, temporary, medium term, negligible adverse effect**.

Changes in Fear and intimidation as a result of increased HGV movements

10.110 During the construction phase, there will be additional vehicles (including HGV's) travelling to and from the Site associated with the delivery of materials and deployment of the construction workforce which has the potential to result in a change (i.e., Increase) in fear and intimidation.

10.111 Table 10.11 identifies the degree of hazard during the construction phase (during 2026) based on the IEMA guidance set out in Table 10.2.

Table 10.11 Degree of hazard during the construction phase

Highway Link[1]		Degree of Hazard (Base 2026)		Degree of Hazard (With Construction Traffic 2026)		Average Speed over 18hr day (Mph)
Ref No.	Link	Average Traffic Flows 18hr day (Veh/hr)	Total 18hr HGV flow	Average Traffic Flows 18hr day (Veh/hr)	Total 18hr HGV flow	
2	Shripney Road (A29) North	998	819	1002	827	40
	Degree of Hazard	Small	Negligible	Small	Negligible	Large
3	Felpham Relief Road (A259)	1366	3139	1370	3924	40
	Degree of Hazard	Moderate	Large	Moderate	Large	Large
4	Charles Purley Way (A259	1492	1254	1492	1262	40
	Degree of Hazard	Moderate	Small	Moderate	Small	Large
5	Flansham Lane (B2259)	1191	452	1192	460	30
	Degree of Hazard	Small	Negligible	Small	Negligible	Large
6	Felpham Way (B2259) (East of Downview Road)	1281	234	1282	242	40
	Degree of Hazard	Moderate	Negligible	Moderate	Negligible	Large
7	Felpham Way (B2259) (West of Downview Road)	1249	192	1250	192	40
	Degree of Hazard	Moderate	Negligible	Moderate	Negligible	Large
8	Downview Road	190	192	192	200	23
	Degree of Hazard	Negligible	Negligible	Negligible	Negligible	Large
9	Grevatt's Lane (A259)	1510	4335	1510	4343	40
	Degree of Hazard	Moderate	Large	Moderate	Large	Large

10.112 As identified in Table 10.11 during the construction phase, the degree of hazard relating to Fear and Intimidation is identified as Large to Negligible on the roads assessed. The increase in traffic movements including HGV movements does not change the degree of hazard from the forecast baseline. Given this and

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the volume of traffic, its HGV composition and the presence of footways with appropriate widths, the magnitude of change in respect to Fear and Intimidation during the construction phase is considered to be negligible.

10.113 The sensitivity of pedestrians is considered to be high. The magnitude of change is considered to be negligible. Therefore, there is likely to be a **direct, temporary, medium-term, adverse negligible effect**.

Changes in Accidents and Safety as a result of increased traffic movements and increased pedestrian/ cycle activity.

10.114 During the construction phase, there will be additional vehicles (including HGV's) travelling to and from the Site associated with the delivery of materials and deployment of the construction workforce which has the potential to result in a change in accidents (i.e., increase) and safety (i.e., a reduction).

10.115 Personal Injury accident data has been obtained from WSCC for the most recent five-year period between August 2016 and July 2021. A copy of the accident data is contained in the Transport Assessment appendices.

10.116 During the latest fiver-year period a total of 97injury accidents were recorded within the study area, 20 of which were serious. It is concluded that based on the descriptions of the accidents that have occurred there are no accident patterns occurring that could be attributed to the existing highway layout and design and they are primarily down to driver error or pedestrian error (see the Transport Assessment for further details).

10.117 The increase in traffic movements associated with the construction phase will be low (see Table 10.2) with movements less than the existing variation in traffic flows and as the incidents that have occurred are not attributable to the highway layout, it is considered that the construction traffic will have a limited impact on the level of incidents that occur in the local area.

10.118 The sensitivity of road users and pedestrians is considered to be low and high respectively. The magnitude of change is considered to be small. Therefore, there is likely to be an **indirect, temporary medium-term, negligible to minor adverse effect**.

Operational Phase

Severance

10.119 During the operational phase, there will be additional vehicles travelling to and from the Site associated with residents travelling to and from the proposed residential units. This has the potential to create severance (i.e., a perceived division within the local community).

10.120 There are a number of community facilities within the study area including local schools. Table 10.12 provides the predicted two-way daily movements associated with the full development in 2031 (up to 500 dwellings & committed developments).

10.121 The proposed future total traffic movements provided in the tables below include the new residential trips and the removal of the existing golf course trips.

Table 10.12 Hourly and daily traffic movements (two-way) associated with the operational phase

	All Vehicles
Movements per day (Average)	2755
Movements per hour (Average)	115
Peak Hour Movements	258 (AM Peak) 254 (PM Peak)

10.122 Table 10.13 provides the predicted traffic percentage change over 24hr weekday period for the 2031 scenario which includes all Local Plan allocations identified earlier in this chapter.

10.123 Table 10.13 shows that in 2031 (Proposed Development up to 500 Dwellings + Committed + Site

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Allocations) the percentage increase is negligible expect for Downview Road (Link 8) where the change in severance is again considered to be Moderate. The existing vehicle movements on Downview Road are currently low and as such the above results show that will the development traffic there will be a moderate increase in terms of percentage change, however the overall levels of traffic will remain low in absolute terms.

10.124 For the 2031 full occupation scenario, the sensitivity of the local community and pedestrians is considered to be high. The magnitude of change is considered to be Negligible to Moderate. Therefore, there is likely to be an indirect, permeant, long-term negligible adverse effect.

Table 10.13 Predicted traffic percentage change over a 24-hour weekday period at 2031

Highway Link		Flows (Vehicles / HGV's)								Change in severance
		Base 2031 (including committed & allocated Developments)		Development Trips (500 Dwellings)		Total (with Development traffic)		% Increase		
Ref No.	Link	Car / LGV	HGV	Car / LGV	HGV	Car/ LGV	HGV	Car / LGV	HGV	
2	Shripney Road (A29) North	31603	711	468	0	32091	711	1.5%	0%	Negligible
3	Felpham Relief Road (A259)	31221	2724	468	0	31731	2724	1.6%	0%	Negligible
4	Charles Purley Way (A259)	33556	1088	468	0	34085	1088	1.6%	0%	Negligible
5	Flansham Lane (B2259)	22661	392	1044	0	23949	392	5.7%	0%	Negligible
6	Felpham Way (B2259) (East of Downview Road)	25373	203	1487	0	26891	203	5.9%	0%	Negligible
7	Felpham Way (B2259) (West of Downview Road)	24739	167	1212	0	25864	167	4.5%	0%	Negligible
8	Downview Road	3467	167	2755	0	6044	167	74.3%	0%	Moderate
9	Grevatt's Lane (A259)	33448	5049	716	0	34376	5049	2.7%	0%	Negligible

Diver Delay as a result of increased traffic movements

10.125 During the operational phase, there will be additional vehicles travelling to and from the Site associated with residents travelling to and from the proposed residential units which have the potential to create driver delay.

10.126 The average delay is calculated in terms of minutes based on the IEMA guidance and has been extracted from the industry standard modelling software for roundabout or priority junctions 'Junctions 9' and 'LINSIG' for signalised junctions. Table 10.14 shows the average delay in minutes per vehicle at the key junctions assessed during the AM and PM Peak hour periods for the 2031 with and without Full Development.

10.127 The location of these junctions is shown in Figure 10.1.

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Table 10.14 Driver delay at 2031

No.	Junction	Average Vehicle Dealy per junction (Mins/ Veh)			
		Base 2031		2031 (With Development)	
		AM	PM	AM	PM
A	A29/ A259 Felpham Relief Road	1min 34sec	2min 22sec	1min 48sec	2min 33sec
B	A259/ B2259/ Hoe Lane	0min 28sec	2min 11sec	0min 52sec	2min 48sec
C	B2259 Flansham lane/ Felpham Way/ Middleton Road (B2132)	3min 49sec	3min 06sec	6min 06sec	4min 51sec
D	B2259 Felpham Way/ Summerley Lane	1min 15sec	0min 22sec	1min 53sec	0min 41sec
E	Downview Road/ B2259*	1min 19sec	1min 26sec	2min 21sec	1min 29sec
F	B2259 Felpham Way/ Drygrounds Close	0min 4sec	0min 3sec	0min 4sec	0min 3sec
G	B2259/ Upper Bognor Road/ Ocean Hotel Road	0min 9sec	0min 6sec	0min 10sec	0min 7sec
H	B2259/ High Street	0min 6sec	0min 6sec	0min 8sec	0min 6sec
I	High Street/ Gloucester Road	0min 7sec	0min 7sec	0min 7sec	0min 7sec

** The Cycle time in the 2026 Scenarios is 120seconds, the cycle time in the 2031 scenarios is 169seconds which is the maximum observed on site.*

10.128 The results for the 2031 scenario identifies that junction 1, 5-9 will have an increase of less than 30seconds delay with the development proposal, junctions B & D will have an increase of greater than 30seconds but less than 1min and junction 3 is predicted to see an increase of more than 2min in the AM Peak and less than 2min in the PM Peak, but greater than 1min. The delay at junctions A, E-I is considered negligible, at junctions B & D the driver delay is considered small and at junction C the increase in driver delay is considered to be Large.

10.129 For the 2031 scenarios, the sensitivity of local road users is considered to be low. The magnitude of change is considered to be Moderate at junction C but Small to negligible at all other junctions. Therefore, there is likely to be a **direct, permeant, long-term, minor adverse effect**.

Secondary Mitigation or Enhancement

10.130 The Proposed Scheme will include improvements to the existing Downview Road/ B2259 junction and improvements to the B2259 Flansham Lane/ Felpham Way/ Middleton Road (B2132) junction. The impact of development traffic on the Downview Road/ B2259 is not considered to be large in terms of driver delay, however, to improve the junction's operation and avoid any potential rat-running traffic, improvements are proposed. Details of the improvements are presented in the Transport Assessment. The results of the mitigation ae provided in Table 10.15 below.

Table 10.15 Driver delay at 2031 with mitigation

No.	Junction	Average Vehicle Dealy per junction (Mins/ Veh)	
		Base 2031(With Development)	
		AM	PM
3	B2259 Flansham lane/ Felpham Way/ Middleton Road (B2132)	3 minutes 13 seconds	2 minutes 5 seconds
5	Downview Road/ B2259*	56 seconds	1 minute 8 seconds

10.131 The results in Table 10.15 show that the delay is significantly reduced with the mitigation proposals in place. Details of queues and capacity are included as part of the TA.

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10.132 The sensitivity of local road users is considered Low. The magnitude of change following secondary mitigation is considered to be Negligible. Therefore there is likely to be a **direct permanent long term negligible adverse effect**

Pedestrian Delay as a result of increased traffic movements

10.133 During the operational phase, there will be additional vehicles traveling to and from the Site associated with residents travelling to and from the proposed residential units and education uses which have the potential to create pedestrian delay.

10.134 The roads local to the site are considered to be sufficiently lightly trafficked to enable pedestrians to easily cross without any significant delay. The routes with higher traffic volumes are along the B2259 where controlled and uncontrolled crossing facilities are provided. All links below have some form of controlled or uncontrolled crossing provision.

10.135 Table 10.16 identifies the existing vehicle flow on the links considered to be sensitive to change and also the forecast volume of traffic using these routes in 2031. The network morning peak period is used as part of this assessment as this will be the period whereby the traffic movements are at their highest. Table 10.16 also identifies the level of gap achievable although this is a worst-case scenario as it assumes that the vehicle movements are equal and does not account for vehicles travelling along the links in close proximity which would result in longer gap periods.

Table 10.16 Pedestrian delay at 2031

Highway Link		Average Pedestrian Delay (08:00 – 09:00)			
Ref No	Link	Maximum Vehicle Flow (Base 2031)	Gap available (Seconds)	Maximum Vehicle Flow (With development 2031)	Gap available (Seconds)
2	Shripney Road (A29) North	2212	1.6	2259	1.5
3	Felpham Relief Road (A259)	2363	1.5	2418	1.5
4	Charles Purley Way (A259)	2226	1.6	2282	1.6
5	Flansham Lane (B2259)	1597	2.2	1721	2.0
6	Felpham Way (B2259) (East of Downview Road)	1746	2.0	1890	1.9
7	Felpham Way (B2259) (West of Downview Road)	1865	1.9	1971	1.8
8	Downview Road	684	5.2	917	3.9
9	Grevatt's Lane (A259)	2486	1.4	2577	1.4

10.136 Table 10.16 shows that in 2031 all roads except Downview Road have gaps below that considered sufficient for a pedestrian to cross kerb to kerb. However, there are refuge islands available and/ or signal controlled crossings to assist pedestrians at key locations. The change in level of gap is less than 1sec in all scenarios with the proposed development, therefore there will be no material change to the ability for pedestrians to cross these roads.

10.137 Downview Road at its junction with B2259 is shown to have suitable gaps for able bodied persons without and with the development although there are also existing controlled crossing facilities available at the junction to assist pedestrians across the road. The traffic volumes further north on Downview Road towards the site, decrease providing longer gaps for all pedestrians to cross the road safely.

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10.138 The sensitivity of pedestrians is considered to be high. The magnitude of change is considered to be negligible. Therefore, there is likely to be a **direct, permanent, long-term, negligible effect**.

Change in Pedestrian Amenity as a result of increased traffic movements

10.139 The term pedestrian amenity is broadly defined as the relative pleasantness of a journey within the IEMA Guidance and is considered to be affected by traffic flow, traffic composition and pavement width / separation from traffic.

10.140 There is a good network of footways throughout the local area and along Downview Road the footways are separated from the road by a verge of varying width. The footways throughout the local area are of varying width although are predominately 2m in width. There are also a number of controlled crossing facilities on the B2259.

10.141 During the operational phase there will be additional vehicles travelling to and from the Site associated with proposed residential use which has the potential to result in a reduction of amenity.

10.142 In addition, where PROW153 dissects the site, this route will be retained within the proposed scheme albeit it is anticipated to be subject to slight diversions as it is incorporated through the Site.

10.143 The greatest increase in traffic movements will be along Downview Road where the increase over a 24hour period is 77% of the existing levels of traffic (Table 10.16). However, the background traffic flows are low and therefore any increase in traffic movements will result in a high percentage increase although the actual increase is considered to be small. The footways along Downview Road are around 1.5-2m in width with a verge separating them from the road, in addition there is traffic calming along Downview Road in the form of speed cushions to maintain low vehicle speeds.

10.144 Overall, it is considered as part of the operational phase, the magnitude of change in respect to pedestrian amenity is considered to be small.

10.145 The Sensitivity of pedestrians during the operational phase is considered to be high. The magnitude of change is considered to be small. Therefore, there is likely to be a **direct, temporary, medium term, minor effect**.

Secondary Mitigation or Enhancement

10.146 The greatest level of change in amenity will be along Downview Road, the proposal is to potentially improve the PROW 153 between the site and Downview Primary School which will link with the improvements that WSCC are proposing between Downview Road and Drygrounds Lane providing a surfaced off-road route that pedestrians could also use improving the amenity for pedestrians.

Residual Effect

10.147 The sensitivity of pedestrians is considered to be high. The magnitude of change following secondary mitigation, is considered to be negligible. Therefore, there is likely to be an **in direct, permeant, long-term, beneficial negligible effect**.

Changes in Fear and Intimidation as a result of increased Vehicle movements

10.148 During the operational phase, there will be additional vehicles (including HGVs) traveling to / from the Site associated with the proposed residential and other uses, which has the potential to result in a change (i.e., increase) in fear and intimidation. The increase in vehicle movements will be primarily cars/ LGV's rather than HGV's, the most frequent HGV movement will be a refuse vehicle which will already be on the local road network.

10.149 Table 10.17 identifies the degree of hazard at 2031 with and without the proposed development traffic. The degree of hazard is as set out in Table 10.2.

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Table 10.17 Degree of hazard during the future operational phase

Highway Link		Degree of Hazard (Base 2031)		Degree of Hazard (With Development Traffic 2031)		Average Speed over 18hr day (Mph)
Ref No.	Link	Average Traffic Flows 18hr day (Veh/hr)	Total 18hr HGV flow	Average Traffic Flows 18hr day (Veh/hr)	Total 18hr HGV flow	
2	Shripney Road (A29) North	1798	819	1825	819	40
	Degree of Hazard	*Moderate*	*Negligible*	*Large*	*Negligible*	*Large*
3	Felpham Relief Road (A259)	1776	3139	1805	3139	40
	Degree of Hazard	*Moderate*	*Large*	*Large*	*Large*	*Large*
4	Charles Purley Way (A259	1742	1254	1939	1254	40
	Degree of Hazard	*Moderate*	*Small*	*Large*	*Small*	*Large*
5	Flansham Lane (B2259)	1289	452	1361	452	30
	Degree of Hazard	*Moderate*	*Negligible*	*Moderate*	*Negligible*	*Large*
6	Felpham Way (B2259) (East of Downview Road)	1444	234	1529	234	40
	Degree of Hazard	*Moderate*	*Negligible*	*Moderate*	*Negligible*	*Large*
7	Felpham Way (B2259) (West of Downview Road)	1408	192	1470	192	40
	Degree of Hazard	*Moderate*	*Negligible*	*Moderate*	*Negligible*	*Large*
8	Downview Road	197	192	341	192	23
	Degree of Hazard	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Large*
9	Grevatt's Lane (A259)	1898	4335	1950	4335	40
	Degree of Hazard	*Moderate*	*Large*	*Large*	*Large*	*Large*

10.150 Table 10.17 shows the degree of hazard relating to fear and intimidation in 2031 as Large (HGV's) to Negligible on the road links within the study area. With the proposed development traffic there is a slight change on links 2, 3,4 & 9 where the degree of hazard changes from Medium to Large (based on vehicle movements). The routes affected by the change have very few pedestrian/ cycle movements and as such the impact associated with the development traffic is considered to be negligible.

10.151 Table 10.17 also shows the speeds above 20mph and therefore are identified as a large degree of Hazard, there will be no material change to the vehicle speeds as part of this application and therefore no change to this degree of Hazard. There is a good network of footways within the local area, many of which are 2m or more in width and some are separated from the road by a verge (Downview Road), the effect is therefore considered to be negligible.

10.152 The sensitivity of pedestrians is considered to be high. The magnitude of change is considered to be negligible. Therefore, there is likely to be a **direct, permanent, long-term, negligible adverse**.

Secondary Mitigation or Enhancement

10.153 The Proposed Scheme includes for off road footways through the potential upgrading of the existing PROW as well as providing wide footways and cycleways within the development. In addition, the proposal is to provide improved crossing facilities at the Downview Road/ B2259 junction.

Residual Effect

10.154 The sensitivity of pedestrians is considered to be high. The magnitude of change following secondary

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mitigation is considered to be negligible in 2031. Therefore, there is likely to be a direct, permeant, long-term, adverse effect which is considered to be negligible.

Changes in Accidents and Safety as a result of increased traffic movements and increased pedestrian and cycle activity

10.155 During the operational phase, there will be additional vehicles and pedestrian and cycle activity traveling to and from the Site associated with the proposed residential uses which has the potential to result a change in accidents (i.e., an increase) and safety (i.e., a reduction). This effect considers the 2031 scenarios.

10.156 Personal injury accident data has been obtained from WSCC for the most recent five-year period between 2016 and 2021 A copy of the accident data is contained in the Transport Assessment.

10.157 During the latest five-year period a total of 97 injury accidents were recorded within the study area, 20 of which were serious. It is concluded that there are no accident patterns occurring that could be attributed to the existing highway layout and design and the accidents are primarily down to driver or pedestrian error (see the Transport Assessment for further details). Therefore, the increase in traffic movements associated with the operational phase is considered likely to have a negligible impact on the level of incidents that occur in the study area.

10.158 The sensitivity of pedestrians / cyclists and road users are considered to be high and low (respectively). The magnitude of change is considered to be small. Therefore, there is likely to be an indirect, permanent, long-term, adverse effect which is considered to be negligible to minor.

Residual Effect

10.159 The sensitivity of pedestrians / cyclists and road users is considered to be high and low (respectively). The magnitude of change, following inherent mitigation, is considered to be negligible. Therefore, there is likely to be direct, permanent, long-term, residual effect which is considered to be negligible.

Summary

10.160 Table 10.18 provides a summary of the sensitivity of receptors, the magnitude of change they will experience and the significance of the effects.

Table 10.18 Summary of significance of effect on transport related receptors associated with Site A

Effect	Receptor/ Resources	Sensitivity	Magnitude of Change	Significance of Effect
Construction Phase				
Driver delay as a result of increased traffic movements	Road Users	Low	Negligible	Negligible
Pedestrian delay as a result of increased traffic movements	Pedestrians	High	Negligible	Negligible
Change in Pedestrian Amenity as a result of increased traffic movements	Pedestrians	High	Negligible	Negligible
Changes in Fear and Intimidation as a result of increased HGV movements	Pedestrians/ Cyclists	High (Pedestrians) Low (Cyclists)	Negligible	Negligible
Changes in Accidents and Safety as a result of increased traffic	Local Road Users, Pedestrians and Cyclists	Low (Road users) High (Pedestrians) Low (Cyclists)	Negligible	Negligible

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Effect	Receptor/ Resources	Sensitivity	Magnitude of Change	Significance of Effect
movements and increased pedestrian / cycle activity				
Operation Phase 2031				
Driver delay as a result of increased traffic movements	Road Users	Low	Minor	Minor - Negligible
Pedestrian delay as a result of increased traffic movements	Pedestrians	High	Negligible	Negligible
Change in Pedestrian Amenity as a result of increased traffic movements	Pedestrians	High	Minor Minor	Minor – Negligible Minor – Negligible
Changes in Fear and Intimidation as a result of increased Vehicle movements	Pedestrians/ Cyclists	High/ Low	Negligible Negligible	Negligible Negligible
Changes in Accidents and Safety as a result of increased traffic movements and increased pedestrian / cycle activity	All Road Users/ Pedestrians & Cyclists	Low – Road Users, High Pedestrians & Low - Cyclists	Negligible Moderate - Negligible	Negligible Negligible

Site B – Relocation of golf course.

10.161 The Relocation of the proposed Golf Course has been assessed in isolation in 2026 without the proposed residential development. The potential trips associated with the new Golf Course are based on the trips currently using the Golf course and for the 24hour information based on similar sites from the TRICS database. The trips will be primarily existing trips on the local highway network re-assigned to the new Golf Course site. Details of the Trip assignment, distribution and impact are included as part of the Transport Assessment included in Appendix 10.2.

10.162 Table 10.19 provide the predicted two-way daily movements associated with the New Golf Course Site.

Table 10.19 Proposed golf course traffic movements (two-way)

	HGV's	LGV's (Light Goods)/ Cars
Movements per day (Average)	2	248
Movements Per Hour (Average)	0	10
Movements during the AM Peak	0	30
Construction Vehicles Per Hour (Average)	1	5

10.163 The above traffic movements (excluding Construction Trips) are trips already on the local highway network that are associated with the existing Golf Course Site at Site A. The proposed location of the Golf Course will see a re-distribution of trips. Table 10.20 below identifies the changes in traffic movements over a 24hour period on the extent of the study area being assessed.

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Table 10.20 Change in golf course trips – 24hour AADT

Highway Link		Existing Golf Course Trips		Proposed Golf Course Trips		Change	
		All Vehicles	HGV	All Vehicles	HGV	All Vehicles	HGV
Ref No.	Link						
1	Shripney Road (A29) South	0	0	28	0	+28	-
2	Shripney Road (A29) North	0	0	19	0	+19	-
3	Felpham Relief Road (A259)	0	0	19	0	+19	-
4	Charles Purley Way (A259)	0	0	61	0	+61	-
5	Flansham Lane (B2259)	35	0	139	1	+104	+1
6	Felpham Way (B2259) (East of Downview Road)	63	1	92	0	+29	-1
7	Felpham Way (B2259) (West of Downview Road)	134	1	48	0	-86	-1
8	Downview Road	250	2		0	-250	-2
9	Grevatt's Lane (A259)	35	0	248	2	+213	+2

10.164 Table 10.20 shows that there will be a moderate to small change in traffic movements on Charles Purley Way (Link 4), Flansham Lane (Link 5), Felpham Way (west of Downview Road) (Link 7), Downview Road (Link 8) and Grevatt's Lane (Link 9).

Severance

10.165 During the operational phase of the new golf course, there will be additional vehicles traveling to / from the Site associated with site which locally to the Site could create a perception of severance.

10.166 The predicted traffic movements associated with the new Golf Course will see a change in traffic movements on the local road network although many will already be on the local road network as identified in Table 10.28.

10.167 The distribution of trips associated with the new Golf Course has been based on post code information obtained from the members of the existing golf course site.

Table 10.21 Predicted golf course traffic percentage change over a 24-hour weekday period at 2026

Highway Link[4]		Flows (Vehicles / HGV's)						Change in severance
		Base 2026 (including committed & allocated Developments) Including Existing Golf Course Trips		Base 2026 (including committed & allocated Developments) Excluding Existing Golf Course including New Golf Course		% Increase		
Ref No	Link	Car / LGV	HGV	Car / LGV	HGV	Car / LGV	HGV	
4	Charles Purley Way (A259)	26218	1088	26279	1088	0.2%	0%	Negligible
5	Flansham Lane (B2259)	20926	392	21030	393	0.5%	0.2%	Negligible

Highway Link[4]		Flows (Vehicles / HGV's)						Change in severance
		Base 2026 (including committed & allocated Developments) Including Existing Golf Course Trips		Base 2026 (including committed & allocated Developments) Excluding Existing Golf Course including New Golf Course		% Increase		
7	Felpham Way (B2259) (West of Downview Road)	21951	216	21864	215	-0.03%	-0.4%	Negligible
8	Downview Road	3331	167	3056	165	-8.9%	-1.2%	Negligible
9	Grevatt's Lane (A259)	26485	5049	26698	5051	0.8%	0%	Negligible

10.168 Table 10.21 shows that the level of change in vehicle movements associated with the new Golf Course will result in no material change in severance and the magnitude of change overall is considered to be negligible in respect of the road links assessed.

10.169 The sensitivity of the residents and pedestrians is considered to be high. The magnitude of change is identified as being negligible. Therefore, there is likely to be an **indirect, temporary, medium-term, adverse effect**.

Driver Delay as a result of increased traffic movements

10.170 The change in traffic movements is not considered to materially affect the operation of junctions local to the Site, given that the level of hourly traffic movements associated with the Golf Course is not new to the network and simply re-assigned and will result in no more than 28 two-way movements during the network peak periods. Therefore, there will not be a material effect on the operation of the junctions within the study area.

10.171 The construction of the vehicular Site access on Grevatt's Lane and the pedestrian / cycle crossing proposed has the potential to cause disruption and increase delay on this road. However, such disruption is anticipated to be short-term and temporary in nature. In addition, appropriate traffic management controls (such as appropriate signage) will be implemented as part of a CEMP.

10.172 The sensitivity of road users on all road links during the construction phase of the new Golf Course and opening of the golf course in respect of driver delay is considered to be low. The magnitude of change is considered to be negligible. Therefore, there is likely to be a **direct, temporary, medium-term, negligible adverse effect**.

Pedestrian Delay as a result of increased traffic movements

10.173 During the operational phase of the new golf course there will be a re-assignment of existing traffic movements on the local highway network seeing a reduction in traffic movements on some links and slight increase on other links.

10.174 The assessment in terms of pedestrian delay is based on the number of gaps in traffic flow that enable a pedestrian to cross a road kerb to kerb or kerb to refuge island. The period over which this assessment is made is the busiest AM peak period. The change in traffic movements during the AM Peak will be negligible as identified in Table 10.19 there will be around 30 two-way trips associated with the new golf course, many of which will already be on the local road network. this level of change will not make any material difference to the gaps for pedestrians to cross.

10.175 The sensitivity of pedestrians during the construction of the new golf course and operational period is considered to be high. The magnitude of change is considered to be negligible. Therefore, there is likely to be a **direct, permanent, long-term, negligible adverse effect**.

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Changes in Pedestrian Amenity as a result of increase traffic movements

10.176 The proposed Golf Course has access to a single footway/cycleway along the northern side which connects with Flansham & Felpham to the west and Littlehampton the east. There are currently limited residential properties in the vicinity of the site and Grevatt's Lane is subject to a 60mph speed limit.

10.177 The proposed access to the Golf Course will be alongside the existing PROW165 which currently starts from the extent of public highway south of Grevatt's Lane to join with Sunnymead Close at Middleton-on-Sea. The PROW continues on the northern side of Grevatt's Lane approximately 100m west of the proposed access. The proposed access arrangement into the site will not affect the route of the PROW but will see an enhancement through the provision of a surface footway on the south side of Grevatt's Lane into the site and pedestrian refuge island on Grevatt's Lane.

10.178 Within the development area, the proposed arrangement will see access to the car park being formed across the PROW. Appropriate measures to reduce vehicle speeds and ensure suitable levels of visibility will be provided, details of which are included in the TA.

10.179 Overall, it is considered as part of the construction and operational phase of the new Golf Course, the magnitude of change in respect to pedestrian amenity is small as the number of pedestrians likely to access the site in this location will be low. The management of pedestrian routes will be included as part of the CEMP.

10.180 The Sensitivity of pedestrians during the operational periods is considered to be high. The magnitude of change is considered to be small. Therefore, there is likely to be a **direct, permanent, long term, minor adverse effect** which is considered to be minor.

Changes in Fear and intimidation as a result of increased HGV movements

10.181 During the construction phase, there will be additional vehicles (including HGV's) travelling to and from the Site associated with the delivery of materials and deployment of the construction workforce which has the potential to result in a change (i.e., increase) in fear and intimidation.

10.182 Table 10.19 identifies that the number of additional movements associated with the construction of the golf course will be small including the number of HGV's and this will be significantly lower than the existing level of vehicle movements on Grevatt's Lane. It is therefore considered that the impact of the construction traffic movements in terms of Fear and Intimidation will be small and the magnitude in change during the construction phase will be negligible.

10.183 Table 10.19 also identifies the number of movements associated with the operation of the new golf course, which will be primarily existing vehicle movements re-assigned and as such the impact of development traffic movements in terms of Fear and Intimidation will be small and the magnitude in change during the operational phase will be **negligible**.

Changes in Accidents and Safety as result of increased traffic movements and increased pedestrian / cycle activity

10.184 During the construction phase, there will be additional vehicles (including HGVs) traveling to / from the Site associated with delivery of materials and deployment of the construction workforce which has the potential to result an increase in accidents and reduced safety

10.185 During the operational phase of the new golf course there will be a re-assignment of traffic movements on the local road network, which also has the potential to result in an increase in accidents and reduction in road safety.

10.186 Personal injury accident data has been obtained from WSCC for the most recent five-year period between 2016 – 2021. A copy of the accident data is contained in the Transport Assessment.

10.187 During the latest five-year period a total of 21 injury accidents were recorded within the study area, one of which was serious. It is concluded that based on the descriptions of the accidents that have occurred, there are no accident patterns occurring that could be attributed to the existing highway layout and design and they are primarily down to driver or pedestrian error.

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10.188 The increase in traffic movements associated with the operational phase of the site will also be low and not perceptible to local road users as many of the trips will be already on the local road network. The proposed access arrangement to the site has been designed to conform to the appropriate design standards ensuring sufficient visibility is provided.

10.189 The sensitivity of road users and pedestrians is considered to be low and high respectively. The magnitude of change is considered to be small. Therefore, there is likely to be an **indirect, temporary long-term, adverse negligible to minor effect**.

Secondary Mitigation or Enhancement

10.190 The proposed access arrangement has been reviewed by an independent Stage 1 Road Safety Audit. Details of which are included in Appendix 8 of the TA.

Table 10.22 Significance of effects on transport related receptors associated with Site B

Effect	Receptor/ Resources	Sensitivity	Magnitude of Change	Significance of Effect
Construction Phase				
Driver delay as a result of increased traffic movements	Road Users	Low	Negligible	Negligible
Pedestrian delay as a result of increased traffic movements	Pedestrians	High	Negligible	Negligible
Change in Pedestrian Amenity as a result of increased traffic movements	Pedestrians	High	Negligible	Negligible
Changes in Fear and Intimidation as a result of increased HGV movements	Pedestrians/ Cyclists	High/ Low	Negligible	Negligible
Changes in Accidents and Safety as a result of increased traffic movements and increased pedestrian / cycle activity	Local Road Users, Pedestrians and Cyclists	Low – Road Users Pedestrians – High Cyclists - Low	Small	Negligible to Minor
Operational Phase				
Driver delay as a result of increased traffic movements	Road Users	Low	Negligible	Negligible
Pedestrian delay as a result of increased traffic movements	Pedestrians	High	Negligible	Negligible
Change in Pedestrian Amenity as a result of increased traffic movements	Pedestrians	High	Negligible	Negligible
Changes in Fear and Intimidation as a result of increased HGV movements	Pedestrians/ Cyclists	High/ Low	Negligible	Negligible
Changes in Accidents and Safety as a result of increased traffic movements and increased pedestrian / cycle activity	Local Road Users, Pedestrians and Cyclists	Low – Road Users Pedestrians – High Cyclists - Low	Negligible	Negligible

Actionable Mitigation

10.191 In this assessment, secondary mitigation or enhancement has been included to determine the impacts of the proposed development in the first instance. No additional mitigation is proposed.

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Residual Impact Assessment

10.192 This section identifies residual effects and their significance.

Site A – Redevelopment of existing golf course

10.193 Table 10.25 provides a summary of the receptors and residual effects following the mitigation detailed in Table 10.23 for the proposed residential development at Site A.

Table 10.23 Residual effects on transport related receptor at Site A

Receptor/Resources	Residual Effect
Pedestrians & Cyclists	Negligible adverse effect
Road Users	Minor - Negligible adverse effect

Site B – Relocation of golf course

10.194 Table 10.26 provides a summary of the receptors and residual effects following the mitigation detailed in Table 10.24 for the proposed Golf Course at Site B.

Table 10.24 Residual effects on transport related receptor at Site B

Receptor/Resources	Residual Effect
Pedestrians & Cyclists	Negligible adverse effect
Road Users	Minor - Negligible adverse effect

Cumulative Effects

10.195 This Section identifies and assesses the nature, extent, magnitude and significance of inter-project effects (i.e., effects from other development in combination with those from the proposed development).

10.196 The assessment of Site A showed that the effects of this development are on links closest to the Site namely B2259 & Downview Road (links 5,6, 7 & 8). The Magnitude of change identified for the various receptors as Medium to Negligible. Following mitigation as detailed in Table 10.25, the Magnitude of change is reduced to Minor to Negligible. Therefore, there is likely to be a direct, permanent, long-term, adverse residual effect which is considered to be Minor – Negligible.

10.197 The assessment of Site B showed that the effects of this development would be local to the site on Grevatt's Lane (Link 9) but also on Downview Road (Link 8). The magnitude of change for all users would be a Minor to Negligible although there would be a short-term beneficial impact on Downview Road. Following mitigation as identified in Table 10.26, the magnitude of change is reduced to Negligible. Therefore, there is likely to be a **direct, permanent, long-term negligible adverse residual effect**.

10.198 Site B will see no material change to the effect on receptors and the benefit on Downview Road will be offset with the traffic movements associated with Site A. Therefore, the magnitude of change cumulatively with both site A and Site B will be Medium to Negligible. Following mitigation this is reduced to Minor to Negligible. Therefore, there is likely to be a **direct, permanent, long-term, negligible adverse residual effect**.

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Summary

10.199 The Proposed Development associated with both Site A, the redevelopment of the existing golf course, and Site B, the relocation of the Golf Course, will result in an increase traffic on the local highway network associated with vehicular trips to and from the development. To determine the effect of this a full audit of the highway network surrounding the site has been undertaken as part of a comprehensive Transport Assessment. As part of this work, the assessment of the distributed traffic has ensured locations that may be considered sensitive receptors are identified.

10.200 The transport assessment in the ES considers specific parameters that are set out within the IEMA Guidelines to determine the effects on road users, pedestrians, cyclists and local residents and other sensitive locations such as schools, open spaces, historical buildings etc.

10.201 Both sites have been assessed in isolation and also on a cumulative basis.

10.202 In the context of Site A, the key elements reviewed include severance, driver and pedestrian delay and pedestrian/cycle amenity. The assessment under these criteria shows that in terms of severance, there will be moderate impacts on Downview Road, with all other impacts being **negligible** on all other routes

10.203 For Site A, there will be some increase in delays at the junctions assessed for vehicular traffic, but the impact on pedestrian delay and amenity is considered to be **negligible**.

10.204 To address the effects of the development, mitigation is proposed in the form of improvements to offsite junctions which will improve capacity and consequently will reduce journey times. Furthermore, the measures will also improve pedestrian crossing facilities.

10.205 Other measures include the upgrading of existing PROW routes to provide easy off-road walking and cycling access to local facilities. Hence, the overall conclusion is that the effect of both the construction traffic and traffic associated with the development of Site A is **minor-negligible adverse** and not significant.

10.206 Turning to Site B, again the key elements reviewed include severance, driver and pedestrian delay, and pedestrian and cycle amenity.

10.207 The assessment of Site B showed that the effects of this development would be local to the site, i.e. on Grevatt's Lane (Link 9). The magnitude of change for all users would be a Minor to Negligible. However, there would be a short-term beneficial impact on Downview Road through the removal of the existing Golf Club traffic. Following mitigation the magnitude of change is reduced to **negligible**.

10.208 The effect of severance associated with Site B is also demonstrated to be **negligible**.

10.209 Hence, the overall conclusion is that the effect of both the construction traffic and traffic associated with the development of Site A is **negligible**.

10.210 When considering the combine effects of both sites, the overall the cumulative impacts have been assessed as part of the ES.

10.211 As has been demonstrated, Site B will see no material change to the effect on receptors and the benefit on Downview Road will be offset with the traffic movements associated with Site A. Therefore, the magnitude of change cumulatively with both site A and Site B will be moderate to negligible.

10.212 Following mitigation this is reduced to minor to negligible. Therefore, the long term direct, permanent effect of the cumulative impacts is considered to be a **negligible** residual effect.

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11 AIR QUALITY

Introduction

11.1 This chapter details the air quality assessment undertaken for the Proposed Developments. It provides an evaluation of the temporary effects from fugitive construction dust and construction-vehicle exhaust emissions and an evaluation of the operational phase in terms of the impacts arising from development related traffic on the local and, for the future residents of Site A, their potential exposure to the prevailing levels of air pollution, which can be a factor in the suitability of the site for its proposed uses.

11.2 There are currently no designated Air Quality Management Areas (AQMAs) within Arun District, indicating that air quality in the area is generally good.

Potential Effects

11.3 This section summarises the likely potential effects of the proposed development on the environmental topic area.

11.4 The proposed development could have the following potential impacts on local air quality:

- Impacts upon sensitive receptors from dust and emissions generated during the proposed construction activities;
- Temporary increases in traffic-generated emissions associated with construction related vehicles operating on the site and/or on the local road network;
- Long-term changes in local air quality due to emissions from vehicles associated with the operation of the completed development; and
- Effects of air quality upon the occupants of the proposed residential units of the development (i.e. establishment of the suitability of the site for residential uses).

Assessment Methodology

11.5 The section describes the methodology used to undertake the assessment within this Chapter.

Study Area

11.6 The study area in the air quality assessment differs for each type of emission. The study area in each case is described in detail within the methodology that follows, referencing the relevant guidance documents.

11.7 In general, the study area for the risk assessment of dust impacts is up to 350 metres from the application site boundary and 500 metres along roads from the site entrance. For vehicle emissions, representative receptors have been selected within 200 m of roads used by vehicles accessing the site.

Consultation

11.8 The Environmental Health Department at Arun District Council was consulted as to the scope and methodology for this assessment. The scope and methodology were agreed on the 9th November 2021.

Legislative / Planning Policy Context

Air Quality Standards Regulations

11.9 The Air Quality Standards Regulations 2010[50] sets legally binding limit values for ambient air concentrations for the main air pollutants: particulate matter (PM_{10} and $PM_{2.5}$), nitrogen dioxide (NO_2), sulphur dioxide

[50] Defra (2010) The Air Quality Standards Regulations.

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(SO_2), ozone (O_3), carbon monoxide (CO), lead (Pb) and benzene, certain toxic heavy metals (arsenic, cadmium and nickel) and polycyclic aromatic hydrocarbons (PAHs). . Various national ambient air quality monitoring networks to measure compliance and develop plans to meet the limit values.

UK Air Quality Strategy

11.10 The Environment Act 1995 established the requirement for a National Air Quality Strategy (AQS) to improve ambient air quality; the latest was published in 2007[51]. The National Air Quality Strategy sets UK air quality standards*1 and objectives*2 for the pollutants in the Air Quality Standards Regulations (plus 1,3-butadiene) and recognises that action at national, regional and local level may be needed, depending on the scale and nature of the air quality problem. There is no legal requirement to meet objectives set within the UK AQS except where equivalent limit values are set within the Air Quality Standards Regulations.

11.11 The limit values and objectives relevant to this assessment are summarised in Table 11.1. Although the limit values and the AQS objectives are numerically equal, there are some differences in where they apply and who is responsible for their achievement.

Table 11.1 Summary of relevant air quality limit values and objectives

Pollutant	Averaging Period	Objectives/ Limit Values	Not to be Exceeded More Than
Nitrogen Dioxide (NO_2)	1 hour	200 µg.m^{-3}	18 times per calendar year
	Annual	40 µg.m^{-3}	-
Particulate Matter (PM_{10})	24 Hour	50 µg.m^{-3}	35 times per calendar year
	Annual	40 µg.m^{-3}	-
Particulate Matter ($PM_{2.5}$)	Annual	25 µg.m^{-3}	-

11.12 Defra published the *'Clean Air Strategy 2019'* which sets out actions that the Government intends to take to reduce emissions from transport, in the home, from farming and from industry.

Planning Policy

National Planning Policy Framework

11.13 The NPPF[52] sets out three overarching objectives to achieve sustainable development. The relevant objective in the context of this air quality assessment is:

"**an environmental objective** – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution and mitigating and adapting to climate change, including moving to a low carbon economy" (Paragraph 8c)

11.14 Under the heading 'Conserving and Enhancing the Natural Environment', the NPPF states:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

…

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of ….air,….. Development should, wherever possible, help to improve local environmental conditions such as air … quality….; …" (Paragraph 174)

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and

[51] Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland.

*1 Standards are concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. Standards, as the benchmarks for setting objectives, are set purely with regard to scientific evidence and medical evidence on the effects of the particular pollutant on health, or on the wider environment, as minimum or zero risk levels.

*2 Objectives are policy targets expressed as a concentration that should be achieved, all the time or for a percentage of time, by a certain date

[52] Communities and Local Government, (July 2021), National Planning Policy Framework

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Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan." (Paragraph 186)

National Planning Practice Guidance

11.15 The Air Quality section of the National Planning Practice Guidance (NPPG) describes the circumstances when air quality, odour and dust can be a planning concern, requiring assessment.

11.16 The NPPG advises that whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity. The NPPG states that when deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

"Lead to changes (including any potential reductions) in vehicle-related emissions in the immediate vicinity of the proposed development or further afield. This could be through the provision of electric vehicle charging infrastructure; altering the level of traffic congestion; significantly changing traffic volumes, vehicle speeds or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; could add to turnover in a large car park; or involve construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;

Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; biomass boilers or biomass-fuelled Combined Heat and Power plant; centralised boilers or plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area; or extraction systems (including chimneys) which require approval or permits under pollution control legislation;

Expose people to harmful concentrations of air pollutants, including dust. This could be by building new homes, schools, workplaces or other development in places with poor air quality;

Give rise to potentially unacceptable impacts (such as dust) during construction for nearby sensitive locations;

Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value."

11.17 The NPPG provides advice on how air quality impacts can be mitigated and notes "Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met."

Arun Local Plan

11.18 The Arun Local Plan contains one policy relevant to this assessment.

'Policy QE DM3

Air Pollution

All major development proposals will be required to assess the likely impacts of the development on air quality and mitigate any negative impacts by:

- Ensuring the development is located within easy reach of established public transport services;
- Maximising provision for cycling and pedestrian facilities;
- Encouraging the use of cleaner transport fuels on site, through the inclusion of electric car charging points; and

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- Contributing towards the improvement of the highway network where the development is predicted to result in increased congestion on the highway network…'

Assessment Process

11.19 Neither the NPPF nor the NPPG is prescriptive on the methodology for assessing air quality effects or describing significance; practitioners continue to use guidance provided by Defra and non-governmental organisations, including Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM). However, the NPPG does advise that *"Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific. The scope and content of supporting information is best discussed and agreed between the local planning authority and applicant before it is commissioned." It lists a number of areas that might be usefully agreed at the outset.*

11.20 This air quality assessment covers the elements recommended in the NPPG. The approach is consistent with the EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document[53], the IAQM Guidance on the assessment of dust from demolition and construction[54] and, where relevant, Defra's Local Air Quality Management Technical Guidance: LAQM.TG16[55]. It includes the key elements listed below:

- assessment of the existing air quality in the study area (existing baseline) and prediction of the future air quality without the development in place (future baseline), using official government estimates from Defra, publicly available air quality monitoring data for the area, and relevant Air Quality Review and Assessment (R&A) documents;
- a qualitative assessment of likely construction-phase impacts with mitigation and controls in place; and
- a quantitative prediction of the future operational-phase air quality impact with the development in place (with any necessary mitigation), encompassing:
  - the impacts of the development traffic on the local area
  - the impacts on future occupants of the development at Site A from their exposure to the prevailing levels of air pollution, which can be a factor in the suitability of the site for its proposed uses.

11.21 Air quality guidance advises that the organisation engaged in assessing the overall risks should hold relevant qualifications and/or extensive experience in undertaking air quality assessments.

Summary of Key Pollutants Considered

11.22 For the operational phase of the Proposed Development, the main pollutants from road traffic with potential for local air quality impacts are nitrogen oxides (NO_x) and particulate matter (PM_{10}). Emissions of total NO_x from combustion sources comprise nitric oxide (NO) and NO_2. The NO oxidises in the atmosphere to form NO_2. The assessment of operational impacts therefore focuses on changes in NO_2 and PM_{10} concentrations. The impact from fine particulate matter, known as $PM_{2.5}$ (a subset of PM_{10}) concentrations has also been considered.

11.23 For the construction phase of the Proposed Development the key pollutant is dust, covering both the PM_{10} fraction that is suspended in the air that can be breathed, and the deposited dust that has fallen out of the air onto surfaces and which can potentially cause temporary annoyance effects.

Construction Phase – Methodology

11.24 The detail of the dust assessment methodology is provided in *Appendix 11.1*.

11.25 The dust risk categories that have been determined for each of the four activities (demolition, earthworks, construction and trackout) have been used to define the appropriate site-specific mitigation measures based on those described in the IAQM dust guidance. The guidance states that provided the mitigation measures

[53] EPUK & IAQM (January 2017) Land-use Planning & Development Control: Planning For Air Quality
[54] IAQM (2014) Guidance on the assessment of dust from demolition and construction
[55] Defra (February 2018) Local Air Quality Management Technical Guidance, 2016 (LAQM.TG16)

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are successfully implemented the resultant effects of the dust exposure will normally be "not significant".

11.26 The available evidence set out in Chapter 13 concerning ground conditions does not suggest any incidence of contamination and therefore the air quality impacts of dust from any contaminated land or buildings has not been considered.

Operational Vehicle Emissions -Methodology

Traffic-Related Emissions Modelling

11.27 The ADMS-Roads model has been used in this assessment to predict the air quality impacts from changes in traffic on the local road network. This is a version of the Atmospheric Dispersion Modelling System (ADMS), a formally validated model developed in the UK by Cambridge Environmental Research Consultants Ltd (CERC) and widely used in the UK and internationally for regulatory purposes.

Modelled Scenarios

11.28 The following scenarios were modelled:

- Without Development – without the Proposed Developments in the first year that the development is expected to be fully operational, 2031; and
- With Development – with the Proposed Developments in the first year that the development is expected to be fully operational, 2031.

Model Inputs

Traffic Flow Data

11.29 Traffic data used in the assessment have been provided by the proposed development's transport consultants, RPS. The traffic flow data provided for this assessment are summarised in Table 11.2. The modelled road links are illustrated in Figure 11-1.

The traffic data is inclusive of the relocated golf course.

Table 11.2 Traffic data used within the air quality assessment

Road Link ID	Road Link Name	Speed (km.hr^{-1})	Daily Two-Way Vehicle Flow			
			Without Development		With Development	
			LDV	HDV	LDV	HDV
1	Shripney Rd S (A29)	64	54300	1581	54328	1581
2	Shripney Rd N (A29)	64	30892	711	31380	711
3	Felpham Relief Rd (A259)	64	28497	2724	29008	2724
4	Felpham Relief Rd (A259)	64	32468	1088	32997	1088
5	Flansham Lane (B2259)	48	22269	392	23558	392
6	Firs Avenue	26	2950	246	2950	246
7	Felpham Way (B2259)	48	25170	203	26688	203
8	Downview Rd	37	3300	167	5877	167
9	Outerwyke Rd	30	3379	158	3379	158
10	Felpham Way	64	24572	167	25697	167

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Road Link ID	Road Link Name	Speed (km.hr^{-1})	Daily Two-Way Vehicle Flow			
			Without Development		With Development	
			LDV	HDV	LDV	HDV
	(B2259)					
11	Felpham Way S (B2259)	64	26065	167	27190	167
12	Grevatts Lane (A259)	97	28399	5049	29327	5049

Notes
(km.hr^{-1}) = kilometres per hour
HDV = Heavy Duty Vehicle - vehicles greater than 3.5 t gross vehicle weight including buses
LDV = Light Duty Vehicle

11.30 The average speed on each road has been reduced by 10 km.hr-1 to take into account the possibility of slow-moving traffic near junctions and at roundabouts in accordance with LAQM.TG16.

Vehicle Emissions Factors

11.31 The modelling has been undertaken using Defra's 2021 emission factor toolkit (version 11.0) which draws on emissions generated by the European Environment Agency (EEA) COPERT 5.3 emission calculation tool.

Meteorological Data

11.32 ADMS-Roads requires detailed meteorological data as an input. The most representative observing station for the region of the study area that supplies all the data in the required format is Shoreham Airport approximately 25 km east of Site A and Site B. Meteorological data from that station for 2020 have been used within the dispersion model.

Receptors

11.33 The air quality assessment predicts the impacts at locations that could be sensitive to any changes. For assessing human-health impacts, such sensitive receptors should be selected where the public is regularly present and likely to be exposed over the averaging period of the objective. LAQM.TG16[56] provides examples of exposure locations and these are summarised in Table 11.3.

Table 11.3 Examples of where air quality objectives apply

Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Annual-mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes.	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's façades), or any other location where public exposure is expected to be short-term.
Daily-mean	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's façade), or any other location where public exposure is expected to be short-term.

[56] Defra, (February 2018,) Local Air Quality Management Technical Guidance, 2016 (LAQM.TG16)

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Averaging Period	Objectives should apply at:	Objectives should generally not apply at:
Hourly-mean	All locations where the annual and 24 hour mean would apply. Kerbside sites (e.g., 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 to which the public might reasonably be expected to spend 1-hour or longer.	Kerbside sites where the public would not be expected to have regular access.

11.34 Representative sensitive receptors for this assessment have been selected at properties where pollutant concentrations and/or changes in pollutant concentrations are anticipated to be greatest, as listed in Table 11.4. All receptors are highly sensitive to air quality.

Table 11.4 Modelled receptors sensitive to changes in air quality

ID	Description	x	y
1	Residential Property at Blackthorn Avenue	496161	100932
2	Residential Property at Flansham Lane 1	496320	101015
3	Residential Property at Flansham Lane/Flansham Park	496306	100930
4	Residential Property at Flansham Lane 2	496210	100478
5	Residential Property at First Avenue/Felpham Way	495692	100205
6	Residential Property at First Avenue	495703	100303
7	Residential Property at Downview Road/Felpham Way	495125	100086
8	Residential Property at Downview Road/Whitelands	495182	100668
9	Residential Property at Rife Way	494591	99938
10	Residential Property at Downview Road/Outerwyke Road	495167	100545
11	Residential Property at Shripney Road	493879	101922
12	Residential Property at Apple Burn Cottage	499590	101636
13	Proposed Receptor 1	494882	101825
14	Proposed Receptor 2	495180	101621
15	Proposed Receptor 3	495208	101277
16	Proposed Receptor 4	495148	100800
17	Proposed Receptor 5	494760	100757

11.35 The annual, daily and hourly-mean AQS objectives apply at the front and rear façades of all residential properties. The approaches used to predict the concentrations for these different averaging periods are described below.

Long-Term Pollutant Predictions

11.36 Annual-mean NO_x and PM_{10} concentrations have been predicted at representative sensitive receptors using ADMS-Roads, then added to relevant background concentrations. Primary NO in the NO_X emissions is converted to NO_2 to a degree determined by the availability of atmospheric oxidants locally and the strength of sunlight. For road traffic sources, annual-mean NO2 concentrations have been derived from the modelled

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road-related annual-mean NOx concentration using Defra's calculator[57].

Short-Term Pollutant Predictions

11.37 Research undertaken in support of LAQM.TG16 has indicated that the hourly-mean limit value and objective for NO_2 is unlikely to be exceeded at a roadside location where the annual-mean NO_2 concentration is less than 60 $\mu g.m^{-3}$ The threshold of 60 $\mu g.m^{-3}$ NO_2 has been used as the guideline for considering a likely exceedance of the hourly-mean nitrogen dioxide objective.

Daily-Mean AQS Objective for PM_{10}

11.38 The number of exceedances of the daily-mean AQS objective for PM_{10} of 50 $\mu g.m^{-3}$ may be estimated using the relationship set out in LAQM.TG16:

Number of Exceedances of Daily Mean of 50 μg.m-3 = -18.5 + 0.00145 * (Predicted Annual-mean PM10)3 + 206 / (Predicted Annual-mean PM_{10} Concentration)

11.39 This relationship indicates that the daily-mean AQS objective for PM_{10} is likely to be met if the predicted annual-mean PM_{10} concentration is 31.8 $\mu g.m^{-3}$ or less.

11.40 The daily mean objective is therefore not considered further within this assessment if the annual-mean PM_{10} concentration is predicted to be less than 31.5 $\mu g.m^{-3}$.

Fugitive PM_{10} Emissions

11.41 Transport PM_{10} emissions arise from both the tailpipe exhausts and from fugitive sources such as brake and tyre wear and re-suspended road dust. Improvements in vehicle technologies are reducing PM_{10} exhaust emissions; therefore, the relative importance of fugitive PM_{10} emissions is increasing. Current official vehicle emission factors for particulate matter include brake dust and tyre wear which studies suggest may account for approximately one-third of the total particulate emissions from road transport; but not re-suspended road dust (which remains unquantified.)

Assessment Criteria and Assignment of Significance

11.42 Exhaust emissions from construction-related vehicles (contractors' vehicles and Heavy Goods Vehicles (HGVs), diggers, and other diesel-powered vehicles), these are unlikely to have a significant impact on local air quality[58] except for large, long-term construction sites: the EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document[59] indicates that air quality assessments should include developments increasing annual average daily Heavy Duty Vehicle (HDV) traffic flows by more than 25 within or adjacent to an AQMA and more than 100 elsewhere. The maximum predicted annual average daily number of HGVs generated during the construction of Sites A and B is 8 for each site. These traffic flows are below the indicative criteria. The EPUK & IAQM guidance continues by stating that "*If none of the criteria are met, then there should be no requirement to carry out an air quality assessment… and the impacts can be considered as having an insignificant effect".* As the EPUK & IAQM thresholds are not expected to be exceeded during the construction phase of the proposed development, no further assessment is proposed and the air quality effects from construction vehicle exhaust emissions are not considered significant.

11.43 Dust is the generic term used to describe particulate matter in the size range 1-75 μm in diameter[60]. Particles greater than 75 μm in diameter are termed grit rather than dust. Dusts can contain a wide range of particles of different sizes. The normal fate of suspended (i.e. airborne) dust is deposition. The rate of deposition depends largely on the size of the particle and its density; together these influence the aerodynamic and gravitational effects that determine the distance it travels and how long it stays suspended in the air before it settles out onto a surface. In addition, some particles may agglomerate to become fewer, larger particles; whilst others react chemically.

[57] http://laqm.defra.gov.uk/review-and-assessment/tools/tools.html
[58] IAQM (2014) Guidance on the assessment of dust from demolition and construction
[59] EPUK & IAQM (January 2017) Land-use Planning & Development Control: Planning for Air Quality
[60] British Standard Institute (1983) Characterization of air quality. Glossary

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11.44 The effects of dust are linked to particle size and two main categories are usually considered:

- PM_{10} particles, those up to 10 μm in diameter, remain suspended in the air for long periods and are small enough to be breathed in and so can potentially impact on health; and
- Dust, generally considered to be particles larger than 10 μm which fall out of the air quite quickly and can soil surfaces (e.g., a car, window sill, laundry). Additionally, dust can potentially have adverse effects on vegetation and fauna at sensitive habitat sites.

11.45 The IAQM Guidance on the assessment of dust from demolition and construction sets out 350 m as the distance from the site boundary and 50 m from the site traffic route(s) up to 500 m of the entrance, within which there could potentially be nuisance dust and PM_{10} effects on human receptors. For sensitive ecological receptors, the corresponding distances are 50 m in both cases. (At both sites, there are no sensitive ecological receptors within the distances and ecological effects have been scoped out). These distances are set to be deliberately conservative.

11.46 Concentration-based limit values and objectives have been set for the PM_{10} suspended particle fraction, but no statutory or official numerical air quality criterion for dust annoyance has been set at a UK, European or World Health Organisation (WHO) level. Construction dust assessments have tended to be risk based, focusing on the appropriate measures to be used to keep dust impacts at an acceptable level.

11.47 The IAQM dust guidance aims to estimate the impacts of both PM_{10} and dust through a risk-based assessment procedure. The IAQM dust guidance document states that: "*The impacts depend on the mitigation measures adopted. Therefore the emphasis in this document is on classifying the risk of dust impacts from a site, which will then allow mitigation measures commensurate with that risk to be identified.*"

11.48 The IAQM dust guidance provides a methodological framework, but notes that professional judgement is required to assess effects: "*This is necessary, because the diverse range of projects that are likely to be subject to dust impact assessment means that it is not possible to be prescriptive as to how to assess the impacts. Also a wide range of factors affect the amount of dust that may arise, and these are not readily quantified.*"

11.49 Consistent with the recommendations in the IAQM dust guidance, a risk-based assessment has been undertaken for the development, using the well-established source-pathway-receptor approach. The dust impact (the change in dust levels attributable to the development activity) at a particular receptor will depend on the magnitude of the dust source and the effectiveness of the pathway (i.e., the route through the air) from source to receptor.

11.50 The effects of the dust are the results of these changes in dust levels on the exposed receptors, for example annoyance or adverse health effects. The effect experienced for a given exposure depends on the sensitivity of the particular receptor to dust. An assessment of the overall dust effect for the area as a whole has been made using professional judgement, taking into account both the change in dust levels (as indicated by the Dust Impact Risk for individual receptors) and the absolute dust levels, together with the sensitivities of local receptors and other relevant factors for the area.

11.51 The EPUK & IAQM Land-Use Planning & Development Control: Planning For Air Quality document (EPUK & IAQM, 2017) advises that:

"The significance of the effects arising from the impacts on air quality will depend on a number of factors and will need to be considered alongside the benefits of the development in question. Development under current planning policy is required to be sustainable and the definition of this includes social and economic dimensions, as well as environmental. Development brings opportunities for reducing emissions at a wider level through the use of more efficient technologies and better designed buildings, which could well displace emissions elsewhere, even if they increase at the development site. Conversely, development can also have adverse consequences for air quality at a wider level through its effects on trip generation."

11.52 When describing the air quality impact at a sensitive receptor, the change in magnitude of the concentration should be considered in the context of the absolute concentration at the sensitive receptor. Table 11.5 provides the EPUK & IAQM approach for describing the long-term air quality impacts at sensitive human health receptors in the surrounding area.

11.53 The human-health impact descriptors above apply at individual receptors. The EPUK & IAQM guidance

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states that the impact descriptors "are not, of themselves, a clear and unambiguous guide to reaching a conclusion on significance. These impact descriptors are intended for application at a series of individual receptors. Whilst it maybe that there are 'slight', 'moderate' or 'substantial' impacts at one or more receptors, the overall effect may not necessarily be judged as being significant in some circumstances".

11.54 Professional judgement is required to establish the significance associated with the consequence of the impacts. This judgement is likely to take into account the extent of the current and future population exposure to the impacts and the influence and/or validity of any assumptions adopted during the assessment process.

11.55 The EPUK & IAQM guidance considers an exceedance of an air quality objective at a building façade to be significant adverse effect unless provision is made to reduce the resident's or occupant's exposure by some means.

Table 11.5 Impact descriptors for individual sensitive air quality receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	**2–5**	**6–10**	**>10**
75 % or less of AQAL	Negligible	Negligible	Slight	Moderate
76 –94 % of AQAL	Negligible	Slight	Moderate	Moderate
95 – 102 % of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109 % of AQAL	Moderate	Moderate	Substantial	Substantial
110 % or more than AQAL	Moderate	Substantial	Substantial	Substantial

Notes
1. AQAL = Air Quality Assessment Level, which may be an air quality objective, limit value, or an Environment Agency 'Environmental Assessment Level (EAL)'.
2. The table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which then makes it clearer which cell the impact falls within. The user is encouraged to treat the numbers with recognition of their likely accuracy and not assume a false level of precision. Changes of 0%, i.e. less than 0.5% will be described as negligible.
3. The table is only designed to be used with annual mean concentrations.
4. Descriptors for individual receptors only; the overall significance is determined using professional judgement. For example, a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect. Other factors need to be considered.
5. When defining the concentration as a percentage of the AQAL, use the 'without scheme' concentration where there is a decrease in pollutant concentration and the 'with scheme;' concentration for an increase.
6. The total concentration categories reflect the degree of potential harm by reference to the AQAL value. At exposure less than 75% of this value, i.e. well below, the degree of harm is likely to be small. As the exposure approaches and exceeds the AQAL, the degree of harm increases. This change naturally becomes more important when the result is an exposure that is approximately equal to, or greater than the AQAL.
7. It is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the AQAL. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the AQAL, rather than being exactly equal to it.

Sources on Information

11.56 The sources of information are listed under their relevant sections. The main data required for the air quality assessment has been supplied by the project's traffic consultant.

Assumptions

11.57 Any assumptions made have been listed in Table 11.6.

Limitations

11.58 All air quality assessment tools, whether models or monitoring measurements, have a degree of uncertainty associated with the results. The choices that the practitioner makes in setting-up the model, choosing the input data, and selecting the baseline monitoring data will decide whether the final predicted impact should be considered a central estimate, or an estimate tending towards the upper bounds of the uncertainty range (i.e. tending towards worst-case).

11.59 The atmospheric dispersion model itself contributes some of this uncertainty, due to it being a simplified

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version of the real situation: it uses a sophisticated set of mathematical equations to approximate the complex physical and chemical atmospheric processes taking place as a pollutant is released and as it travels to a receptor. The predictive ability of even the best model is limited by how well the turbulent nature of the atmosphere can be represented.

11.60 Each of the data inputs for the models will also have some uncertainty associated with them. Where it has been necessary to make assumptions, these have mainly been made towards the upper end of the uncertainty range informed by an analysis of relevant, available data.

11.61 The atmospheric dispersion models used for this assessment, ADMS Roads and ADMS, have been validated by their supplier and are widely used by professionals in the UK and overseas.

11.62 For roads modelling, a site-specific verification (calibration) provides additional certainty and is particularly important when air quality levels are close to exceeding the objectives/limit values. LAQM.TG16 requires that local authorities verify the results of any detailed modelling undertaken for the purposes of fulfilling their Review and Assessment (R&A) duties. Model verification refers to the checks that are carried out on model performance at a local level. Modelled concentrations are compared with the results of monitoring. Where there is a disparity between modelled and monitored concentrations, the first step is to review the appropriateness of the data inputs to determine whether the performance of the model can be improved. Once reasonable efforts have been made to reduce the uncertainties in the data inputs, an adjustment may be established and applied to reduce any remaining disparity between modelled and monitored concentrations. No adjustment factor is deemed necessary where the modelled concentrations are within 25% of the monitored concentrations.

11.63 For the verification and adjustment of NO_x/NO_2 concentrations for R&A purposes, it is recommended that the comparison involves a combination of automatic and diffusion monitoring, rather than a single automatic monitor. This is to ensure any adjustment factor derived is representative of all locations modelled and not unduly weighted towards the characteristics at a single site. Where only diffusion tubes are used for the model verification, the study should consider a broad spread of monitoring locations across the study area to provide sufficient information relating to the spatial variation in pollutant concentrations.

11.64 Local Authorities generally implement a broad spread of monitoring, particularly in areas that are known to be sensitive to changes in air quality. Consequently, Local Authorities are usually able to verify the models they use for R&A purposes; however, for individual developments, there is less likely to be a broad range of monitoring locations within the relevant study area. Notwithstanding this, a small number of monitoring locations have been identified within the study area and a model verification study has been undertaken for the proposed development and is included in Appendix 11.4.

11.65 The main components of uncertainty in the total predicted concentrations include those summarised in Table 11.6.

11.66 The analysis of the component uncertainties indicates that, overall, the predicted total concentration is likely to be towards the top of the uncertainty range rather than being a central estimate. The actual concentrations that will be found when the development is operational are unlikely to be higher than those presented within this report and are more likely to be lower.

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Table 11.6 Approaches to dealing with uncertainty used within the air quality assessment

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
Background Concentration	Characterisation of future baseline air quality (i.e. the air quality conditions in the future assuming that the development does not proceed)	The future background concentration used in the assessment is the same as the current background concentration and no reduction has been assumed. This is a conservative assumption as background concentrations are likely to reduce over time as cleaner vehicle technologies form an increasing proportion of the fleet.	The background concentration is the major proportion of the total predicted concentration. This conservative assumption should ensure that the background concentration used within the model contributes to the result being towards the top of the uncertainty range, rather than a central estimate.
Fraction from Modelled Sources	Traffic flow estimates	High growth assumptions have been used to develop the traffic dataset used within the model.	The modelled fraction is a minor proportion of the total predicted concentration. The modelled fraction is likely to contribute to the result being between a central estimate and the top of the uncertainty range.
	Traffic speed estimates	The average speed has been reduced in congested areas to take account of slow-moving and queuing traffic.	
	Road-related emission factors – projection to future years	The most recently published emission factors have been used within the modelling and these are based on the current and best understanding of the variation in emission factors in future years.	
	Meteorological Data	Uncertainties arise from any differences between the conditions at the met station and the development site, and between the historical met years and the future years. These have been minimised by using meteorological data collated at a representative measuring site. The model has been run for a full year of meteorological conditions. This means that the conditions in 8,760 hours have been considered in the assessment of road traffic emissions. Over 43,800 hours have been considered in the odour modelling. The maximum predicted concentrations are presented in the report.	
	Receptors	Receptor locations have been identified where	

Concentration	Source of Uncertainty	Approach to Dealing with Uncertainty	Comments
		concentrations are highest or where the greatest changes are expected.	
	Dispersion Modelling	The model predictions have been compared with monitored concentrations. The model outputs have been adjusted accordingly. The fractional bias indicates that the model is performing well.	

Baseline Conditions

11.67 The section provides more detailed topic specific information to describe the character of Sites A and B and their environs. This describes the quality of the interests as they relate to this environmental topic and serves as a comparative measure against which changes arising from the construction and operational phases of the proposed development can be assessed or predicted. This identifies the sensitivity of environmental receptors.

Review and Assessment Process

11.68 Arun District Council has not designated any Air Quality Management Areas (AQMAs) within the District, indicating that air quality in the area is generally good.

Local Urban Background Monitoring

11.69 Monitors at urban background locations measure concentrations away from the local influence of emission sources and are therefore broadly representative of residential areas within large conurbations. Monitoring at local urban background locations is considered an appropriate source of data for the purposes of describing baseline air quality for the Proposed Development sites.

11.70 There are no local monitoring stations where urban background concentrations are measured using continuous automatic instruments.

11.71 However, Arun District Council manually monitors NO_2 concentrations at several urban background locations using passive diffusion tubes and the most recently measured annual-mean concentrations are presented in Table 11.7.

Table 11.7 Passively monitored urban background annual-mean NO_2 concentrations

Site Name	Approximate Distance from Site A (km)	Approximate Distance from Site B (km)	Concentration (µg.m^{-3})	
			2015	2016
Litt03	8.0	4.2	12.9	12.9
Arun07	8.9	6.6	12.7	13.7
Bog11	1.6	5.4	15.4	15.1

Defra Mapped Concentration Estimates

11.72 Defra's total annual-mean NO_2 concentration estimates have been collected for the 1 km grid squares of the monitoring sites and the Proposed Development and are summarised in Table 11.8.

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Table 11.8 Defra mapped annual-mean background NO_2 concentration estimates

Site Name	Approximate Distance from Site A (km)	Approximate Distance from Site B (km)	Concentration (µg.m^{-3})	
			Range of Monitored	Estimated Defra Mapped
Litt03	8.0	4.2	12.9 - 12.9	11.7
Arun07	8.9	6.6	12.7 - 13.7	9.5
Bog11	1.6	5.4	15.1 - 15.4	11.6
Site A	-	-	-	11.1
Site B	-	-	-	8.4

Appropriate Background Concentrations for the Development Sites

11.73 For NO_2, the Defra mapped background concentration estimates are generally smaller than the range of the results from monitoring and the use of these data would not be conservative. The Bog11 monitor is the closest monitoring location to Site A. Passively monitored annual-mean NO2 concentrations at the Bog11 monitor range from 15.1 to 15.4 µg.m^{-3}. To ensure the assessment is conservative for both existing receptors and receptors introduced at Site A, the background annual-mean NO2 concentration has been derived from the 15.4 µg.m^{-3}, monitored at Bog11. Although Litt03 is located closer to Site B, it would be more conservative to use the 15.4 µg.m^{-3} measured at Bog11.

11.74 In the absence of PM_{10} and $PM_{2.5}$ monitoring, the background annual-mean concentration at the Application Sites has been derived from the Defra mapped background concentration estimate.

11.75 Historically the view has been that background traffic-related NO_2 concentrations in the UK would reduce over time, due to the progressive introduction of improved vehicle technologies and increasingly stringent limits on emissions. After a prolonged period through the last decade where background annual-mean NO_2 concentrations did not generally decrease in line with expectations, the most recent monitoring studies indicate ambient traffic-related NO_2 concentrations are now falling. To ensure that the assessment presents conservative results, no reduction in the background has been applied for future years.

11.76 Table 11.9 summarises the annual-mean background concentrations for NO_2, PM_{10} and $PM_{2.5}$ used in this assessment for both Site A and B.

Table 11.9 Summary of background annual-mean (long-term) concentrations

Pollutant	Data Source	Concentration (µg.m^{-3})
NO_2	Bog11 (2015)	15.4
PM_{10}	Defra (2018)	14.3
$PM_{2.5}$	Defra (2018)	9.5

Inherent and Standard Mitigation

11.77 This section describes those 'inherent' and 'standard' mitigation measures which primarily address the scope to avoid, reduce or remedy adverse environmental impacts or enhance the beneficial aspects arising from the construction and operational periods of the proposed development.

Construction

11.78 The IAQM dust guidance lists mitigation measures for low, medium and high dust risks. The risk of dust impacts during construction is assessed below. Without mitigation, the risk is considered high for both Site A and Site B (see Table 11.2.4 and Table 11.3.4).

11.79 The measures below are based on the IAQM general site measures described as 'highly recommended' for

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High risks.

Communications

- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
- Display the head or regional office contact information.

Dust Management

- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real-time PM10 continuous monitoring and/or visual inspections.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to ADC when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.

Monitoring

- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of the site boundary, with cleaning to be provided if necessary.
- Carry out dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. Use screening intelligently where possible – e.g.,, locating site offices between potentially dusty activities and the receptors.
- Erect solid screens or barriers around the construction site boundary.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extended period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.

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- Cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- Ensure all vehicles switch off engines when stationary – no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g.,, suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible.
- Use enclosed chutes, conveyors and covered skips, where practicable.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste management

- Bonfires and burning of waste materials will be prohibited.

High Risk Measures Specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces.
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil.
- Only remove secure covers in small areas during work and not all at once.

Operational Phase

11.80 The "*Air quality and emissions mitigation guidance for Sussex (2021)"* also lists standard mitigation that all major residential developments must follow:

- All gas fired boilers to meet a minimum standard of <40mgNOx/kWh. Consideration should be given to renewable sources of energy, e.g., air source heat pumps
- Meet the electric vehicle charging point guidance set out in West Sussex County Council Guidance on Parking at New Developments (September 2020).

11.81 The West Sussex County Council Guidance on Parking at New Developments (September 2020) states that "As the demand for electric vehicle charging points is expected to change rapidly over time, any standard for electric vehicle charging points is likely to become quickly out of date. Therefore, there is no specific standard for electric vehicle charging points …"

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Site A – Redevelopment of existing golf course.

11.82 Site A is classified as medium risk for construction and low risk for trackout. The measures below are specific to medium risk construction sites. There are no specific measures for low risk trackout sites.

Medium Risk Measures Specific to Construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.

Site B – Relocation of golf course.

11.83 Site B is classified as low risk for construction and medium risk for trackout. The measures below are specific to medium risk trackout sites. There are no specific measures for low risk construction sites.

Medium Risk Measures Specific to Trackout

- Regularly use a water-assisted dust sweeper on the access and local roads, as necessary, to remove any material tracked out of the site.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems and regularly cleaned.
- Inspect haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10m from receptors where possible.

Assessment of Environmental Impacts

11.84 This section provides an assessment of the nature, extent, magnitude of change that the proposed development will have on individual receptors identified in the baseline section. By employing the sensitivity of the receptor and magnitude of change, the significance of environmental effects which arise as a result of the construction and operational periods of the proposed development will be determined.

Site A – Redevelopment of existing golf course.

Construction Dust

11.85 The assessment of construction effects for Site A are presented in Appendix 11.2. With the implementation of the highly recommended mitigation measures listed above the impacts are considered to be not significant.

Vehicle Emissions

Nitrogen Dioxide (NO_2)

11.86 Table 11.10 presents the annual-mean NO_2 concentrations predicted at the façades of existing receptors.

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Table 11.10 Predicted annual mean NO_2 impacts at existing receptors

Receptor ID	Concentration (µg.m^{-3})		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	**With Development**		
1	17.2	17.2	0	Negligible
2	17.5	17.5	0	Negligible
3	18.6	18.7	0	Negligible
4	19.4	19.6	1	Negligible
5	17.4	17.5	0	Negligible
6	16.2	16.2	0	Negligible
7	17.8	18.2	1	Negligible
8	16.0	16.2	1	Negligible
9	18.7	18.9	0	Negligible
10	16.3	16.5	1	Negligible
11	18.6	18.6	0	Negligible
12	20.1	20.2	0	Negligible
Maximum	**20.1**	**20.2**	**1**	**-**
Minimum	**16.0**	**16.2**	**0**	**-**

11.87 Predicted annual-mean NO_2 concentrations in the opening year at the façades of the existing receptors are below the AQS objective for NO_2. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is 'negligible'.

11.88 As all predicted annual-mean NO_2 concentrations are below 60 µg.m^{-3}, the hourly-mean objective for NO2 is likely to be met at all receptors. The short-term NO_2 impact can be considered 'negligible' and is not considered further within this assessment.

11.89 Overall, the impact on the surrounding area from NO_2 is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Particulate Matter (PM_{10})

11.90 Table 11.11 presents the annual-mean PM_{10} concentrations predicted at the façades of existing receptors.

Table 11.11 Predicted annual mean PM_{10} impacts at existing receptors

Receptor ID	Concentration (µg.m^{-3})		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
1	15.5	15.6	0	Negligible
2	15.5	15.6	0	Negligible
3	16.3	16.3	0	Negligible
4	16.7	16.8	0	Negligible
5	15.5	15.5	0	Negligible
6	14.7	14.7	0	Negligible
7	15.7	16.0	1	Negligible

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Receptor ID	Concentration (µg.m^{-3})		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
8	14.6	14.8	0	Negligible
9	16.5	16.6	0	Negligible
10	14.8	15.0	0	Negligible
11	16.4	16.5	0	Negligible
12	18.1	18.2	0	Negligible
Maximum	**18.1**	**18.2**	**1**	**-**
Minimum	**14.6**	**14.7**	**0**	**-**

11.91 Predicted annual-mean PM_{10} concentrations in the opening year at the façades of the existing receptors are well below the AQS objective for PM_{10} . When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

11.92 As all predicted annual mean PM_{10} concentrations are below 31.5 µg.m^{-3}, the daily-mean PM_{10} objective is expected to be met at all receptors and the short-term PM_{10} impact is not considered further within this assessment.

11.93 Overall, the impact on the surrounding area from PM_{10} is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

Particulate Matter ($PM_{2.5}$)

11.94 Table 11.12 presents the annual-mean $PM_{2.5}$ concentrations predicted at the façades of existing receptors.

Table 11.12 Predicted annual mean $PM_{2.5}$ impacts at existing receptors

Receptor ID	Concentration (µg.m^{-3})		With - Without Dev as % of the AQS Objective	Impact Descriptor
	Without Development	With Development		
1	10.1	10.1	0	Negligible
2	10.1	10.1	0	Negligible
3	10.5	10.6	0	Negligible
4	10.8	10.8	0	Negligible
5	10.1	10.1	0	Negligible
6	9.7	9.7	0	Negligible
7	10.2	10.3	0	Negligible
8	9.6	9.7	0	Negligible
9	10.6	10.7	0	Negligible
10	9.7	9.8	0	Negligible
11	10.6	10.6	0	Negligible
12	11.5	11.5	0	Negligible
Maximum	**11.5**	**11.5**	**0**	**-**
Minimum	**9.6**	**9.7**	**0**	**-**

11.95 Predicted annual-mean $PM_{2.5}$ concentrations in the opening year at the façades of the existing receptors are

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below the AQS objective for $PM_{2.5}$ at all receptors. When the magnitude of change is considered in the context of the absolute concentrations, the impact descriptor is categorised as 'negligible' at all receptors.

11.96 Overall, the impact on the surrounding area from $PM_{2.5}$ is considered to be 'negligible', using the criteria adopted for this assessment and based on professional judgement.

11.97 Figure 11-1 shows the modelled sensitive receptors and road links.

Assessment of New Population Exposure (Site Suitability)

11.98 This section of the chapter summarises the operational-phase air quality impacts on future occupants of the development from their exposure to the prevailing levels of air pollution, which can be a factor in the suitability of the site for its proposed uses.

11.99 Table 11.13 presents the annual-mean NO_2, PM_{10} and $PM_{2.5}$ concentrations predicted at the façades of proposed receptors.

Table 11.13 Predicted annual-mean NO_2, PM_{10} and $PM_{2.5}$ concentrations ($\mu g.m^{-3}$) at receptor locations

Receptor ID	Receptor Name	NO_2	PM_{10}	$PM_{2.5}$
13	Proposed Receptor 1	15.9	14.7	9.6
14	Proposed Receptor 2	15.9	14.7	9.6
15	Proposed Receptor 3	15.6	14.5	9.5
16	Proposed Receptor 4	15.6	14.5	9.5
17	Proposed Receptor 5	15.5	14.4	9.5
Maximum	**-**	**15.9**	**14.7**	**9.6**
Minimum	**-**	**15.5**	**14.4**	**9.5**

11.100 The long-term and short-term objectives apply at the Proposed Development.

11.101 The predicted annual-mean NO_2 concentrations range between 15.5 and 15.9$\mu g.m^{-3}$, well below the annual-mean AQS objective of 40 $\mu g.m^{-3}$ at all receptors. Furthermore, as the annual-mean NO_2 concentration is predicted to be less than 60 $\mu g.m^{-3}$, the hourly-mean AQS objective is expected to be met.

11.102 6The predicted annual-mean PM_{10} concentrations range between 14.4 and 14.7 $\mu g.m^{-3}$, well below the annual-mean AQS objective of 40 $\mu g.m^{-3}$ at all receptors. Furthermore, as the annual-mean PM_{10} concentration is predicted to be less than 31.5 $\mu g.m^{-3}$, the daily-mean AQS objective for this

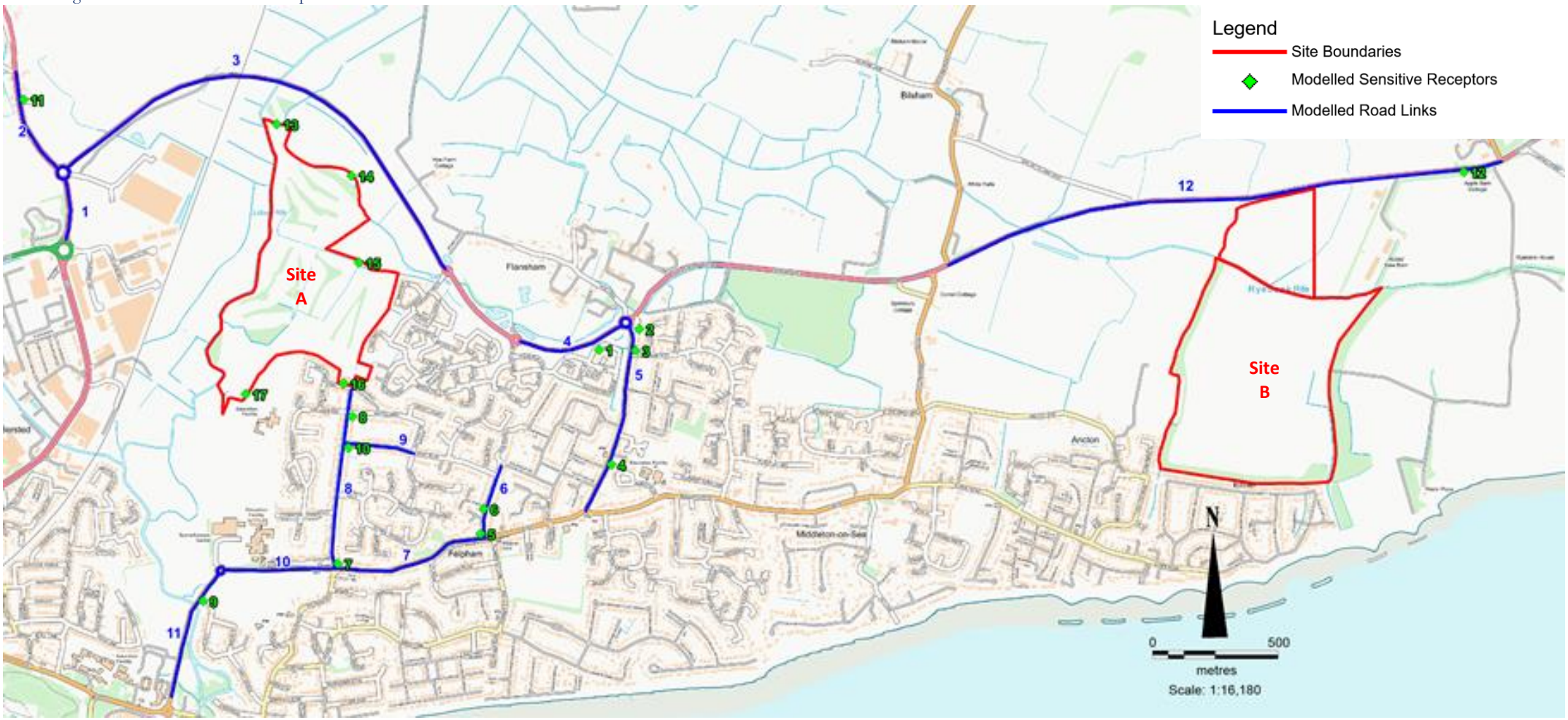
11.103 Predicted annual-mean $PM_{2.5}$ concentrations range between 9.5 and 9.6 $\mu g.m^{-3}$. Predicted concentrations at all receptors are below the annual-mean AQS objective of 25 $\mu g.m^{-3}$.

Table 11.14 Summary of magnitude of change to air quality receptors from development at Site A

Receptor/Resources	Summary of Change to Receptor/Resource	Summary Reason
Receptors within 350 m of site boundary	Increase in suspended particulate matter concentrations and deposited dust - High	Emissions during construction phase
Residential Receptors	Change in NO_2, PM_{10} and $PM_{2.5}$ concentrations – Low.	Emissions from vehicles

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Figure 11-1 Modelled sensitive receptors and road links



Site B – Relocation of golf course.

Construction Dust

11.104 The assessment of construction effects for Site B are presented in Appendix 11.3. With the implementation of the highly recommended mitigation measures listed above the impacts are considered to be not significant.

Vehicle Emissions

11.105 Due to the nature of the development, Site B cannot be assessed independently from Site A in terms of vehicle emissions. Site B will not proceed without Site A. Site B only introduces one new road link with one nearby sensitive receptor (see road link 12, Figure 11-1). Site B itself does not introduce any new sensitive receptors.

Table 11.15 Summary of magnitude of change to air quality receptors from development at Site B

Receptor/Resources	Summary of Change to Receptor/Resource	Summary Reason
Receptors within 350 m of site boundary	Increase in suspended particulate matter concentrations and deposited dust – High.	Emissions during construction phase
Residential Receptors	Change in NO_2, PM_{10} and $PM_{2.5}$ concentrations – Low.	Emissions from vehicles

Site A – Redevelopment of existing golf course.

11.106 The results of the modelling presented in this chapter of this ES, indicate that with the project, the predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations at modelled receptors are below the relevant long and short term AQS objectives. When the magnitude of change in annual-mean NO_2, PM_{10} and $PM_{2.5}$ concentrations is considered in the context of the absolute predictions, the air quality impacts of the development on receptors are categorised as 'negligible'. Taking into account the geographical extent of the impacts predicted in this study, the overall impact of the development on the surrounding area as a whole is considered to be 'negligible', using the descriptors adopted for this assessment.

11.107 Using professional judgement, the resulting air quality effect is considered to be **negligible**, which would not be significant as summarised in Table 11.16.

Table 11.16 Significance of effect on air quality receptors associated with Site A

Receptor/Resources	Sensitivity	Magnitude of Change	Significance of Effect
Receptors within 350 m of site boundary	Receptors considered range from low to high sensitivity	Negligible	Negligible
Residential Receptors	High	Negligible	Negligible

Site B – Relocation of golf course.

11.108 The results of the modelling presented in this chapter of this ES, indicate that with the project, the predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations at modelled receptors are below the relevant long and short term AQS objectives. When the magnitude of change in annual-mean NO_2, PM_{10} and $PM_{2.5}$ concentrations is considered in the context of the absolute predictions, the air quality impacts of the development on receptors are categorised as negligible. Taking into account the geographical extent of the impacts predicted in this study, the overall impact of the development on the surrounding area as a whole is considered to be negligible, using the descriptors adopted for this assessment.

11.109 Using professional judgement, the resulting air quality effect is considered to be **negligible**, which would not

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be significant as summarised in Table 11.17.

Table 11.17 Significance of effect on air quality receptors associated with Site B

Receptor/Resources	Sensitivity	Magnitude of Change	Significance of Effect
Receptors within 350 m of site boundary	Receptors considered range from low to high sensitivity	Negligible	Negligible
Residential Receptors	High	Negligible	Negligible

Actionable Mitigation

11.110 This section describes actionable mitigation to be employed to reduce the negative effects of the proposed development.

Site B – Relocation of golf course.

11.111 With the IAQM recommended dust controls in place, the effects are not considered significant and further mitigation is not required.

Residual Impact Assessment

11.112 This section identifies residual effects and their significance.

Sites A and B

11.113 As no further mitigation is recommended, the residual effects would remain as **negligible** and 'not significant' individually or cumulatively.

Cumulative Effects

11.114 This Section identifies and assesses the nature, extent, magnitude and significance of inter-project effects (i.e., effects from other development in combination with those from the proposed development).

11.115 In addition, it is necessary to consider the potential cumulative effect of the proposed development along with other developments listed in *Appendix 4.1*.

11.116 During the construction phase, cumulative dust effects may occur if there are other proposed and potential developments within 700 metres of the project site and construction activities occur at the same time as the project. Assuming that mitigation and control measures that are proportionate to risk of a dust impact are identified and implemented at those sites, the cumulative effect should not be significant.

11.117 During the operational phase, cumulative effects have been taken into account to the extent that the traffic from other developments has been included in the traffic data provided for this assessment. The other developments included within the traffic data provided are given in Chapter 10 (Transport and Access) of this ES. No further cumulative effects are considered likely.

Summary

11.118 This assessment has considered dust effects during the construction phase and the air quality impacts during the operational phase of the developments.

11.119 Impacts during construction at each site, such as dust generation and plant vehicle emissions, are predicted to be short-term and only relevant during the construction phase (temporary). The results of the risk assessment of construction dust impacts undertaken using the IAQM dust guidance, indicates that before the implementation of mitigation and controls, the risk of dust impacts will be high. Implementation of the highly-recommended mitigation measures described in the IAQM construction dust guidance should reduce the residual dust effects to a level categorised as **negligible.**

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11.120 For the operational phase, arrivals at and departures from both sites may change the number, type and speed of vehicles using the local road network. Changes in road vehicle emissions are an important consideration during this phase of the project. Detailed atmospheric dispersion modelling has been undertaken for the first year in which the developments at both sites are expected to be fully operational, 2031. Using the criteria adopted for this assessment together with professional judgement, the operational air quality effects are considered to be **negligible** and no additional mitigation is considered necessary.

11.121 Pollutant concentrations at the façades of the residential properties within Site A are predicted to be well within the relevant health-based air quality objectives and the site is considered to be suitable for its proposed use in the context of air quality.

11.122 Using professional judgement, the resulting air quality effect of the developments is considered to be 'not significant' overall. The project does not, in air quality terms, conflict with national or local policies. There are, therefore, no constraints to the project in the context of air quality.

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12 NOISE

Introduction

12.1 This chapter of the Environmental Statement (ES) provides an assessment of the likely noise and vibration effects associated with the proposed development on existing and future noise and vibration sensitive receptors (NSRs).

Potential Effects

12.2 This section summarises the likely potential effects of the proposed development on the environmental topic area.

Site A – Redevelopment of existing golf course

12.3 The likely potential noise and vibration effects of the proposed development on existing and future NSRs include:

- Construction effects: Noise and vibration from plant, activities and traffic associated with the construction phase of the proposed development; and
- Operational effects: Noise and vibration from the operation of the proposed development associated with the operation of any new plant / equipment / servicing activities and changes in traffic flow characteristics on the local road network.

Site B – Relocation of Golf Course

12.4 The likely potential noise and vibration effects of the proposed development on existing NSRs include:

- Construction effects: Noise and vibration from plant, activities and traffic associated with the construction phase of the proposed development; and
- Operational effects: Noise and vibration from the operation of the proposed development associated with the operation of any new plant / equipment / servicing activities and changes in traffic flow characteristics on the local road network.

Assessment Methodology

12.5 The section describes the methodology used to undertake the assessment within this Chapter.

Study Area

12.6 There are no nationally adopted standards or guidance documents that define the study area for the assessment of likely potential noise and vibration effects for developments of this type. Therefore, the study areas for this proposed development are based on professional judgment.

12.7 The study area for the assessment of construction noise includes the nearest NSRs and extends approximately 300 metres (m) from the site boundary, in accordance with guidance contained in British Standard (BS) 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Noise'[61]. Beyond this distance, noise levels from typical construction activities are unlikely to give rise to significant effects.

12.8 The study area for the assessment of construction vibration includes the nearest NSRs and extends approximately 50 m from the site boundary in accordance with BS 5228-2:2009+A1:2014 'Code of practice for

[61] BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Noise', (2014), The British Standards Institution (BSI).

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noise and vibration control on construction and open sites – Vibration'[62]. Beyond this distance, vibration levels from typical construction activities are unlikely to give rise to significant effects.

12.9 The study area for the assessment of road traffic noise during the operation of the proposed development is determined from the roads on which there is an anticipated increase in traffic flow of a sufficient magnitude to result in a potentially significant noise effect. On this basis, the study area includes a subset of the road links that are the subject of the Transport Assessment (TA) (Chapter 10 of this ES).

12.10 The assessment of noise from new operational plant, equipment and servicing activities associated with the development will be assessed at the nearest identified noise sensitive receptors (refer to paragraph 12.41 and 12.41).

12.11 Whilst the above study areas have been considered, the assessment of noise impact is generally undertaken at the nearest NSRs. It is considered that, if the noise effects are acceptable at the nearest NSRs of a given sensitivity, then the noise effects would be acceptable at NSRs of equal or lower sensitivity within the study areas above.

Consultation

12.12 Consultation with the Environmental Health Department (EHD) from Arun District Council was undertaken in October 2021 concerning the scope of the noise monitoring and survey locations. A copy of the e-mail correspondence is provided in *Appendix 12.1*.

Legislative / Planning Policy Context

12.13 Relevant legislation, policy, British Standards (BS) and guidance documents are list below, with further information provided in *Appendix 12.2*.

- Control of Pollution Act 1974 (CoPA)[63];
- The Environmental Protection Act 1990 (EPA)[64];
- Noise Policy Statement for England (NPSE)[65];
- National Planning Policy Framework (NPPF)[66];
- Planning Practice Guidance on Noise (PPG-N)[67];
- Arun District Council Local Plan[68];
- BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Part 1: Noise'[69];
- BS 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration'[70];
- BS 7445-2:1991 'Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use'[71];
- BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'[72];
- Design Manual for Roads and Bridges (DMRB) LA 111 - Noise and Vibration[73]; and

[62] BS 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Vibration', (2014), BSI.
[63] Control of Pollution Act, (1974), Her Majesty's Stationary Office (HMSO).
[64] Environmental Protection Act, (1990), HMSO.
[65] Noise Policy Statement for England, (2010), HMSO.
[66] National Planning Policy Framework, (2021), HMSO.
[67] Planning Practice Guidance on Noise, (2019), HMSO.
[68] Adoption Arun Local Plan 2011-2031 (July 2018), (2018), Arun District Council.
[69] BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Noise', (2014), BSI.
[70] BS 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Vibration', (2014), BSI.
[71] BS 7445-2:1991 'Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use', (1991), BSI.
[72] BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound', (2019), BSI.
[73] Design Manual for Roads and Bridges, LA 111 – Noise and Vibration, (2020), Highways England.

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- Calculation of Road Traffic Noise (CRTN)[74].

Assessment Process

12.14 Table 12.1 summarises the likely potential noise and vibration effects and the assessment approach for each.

Table 12.1 Approach to assessment of noise and vibration

Noise and Vibration Effect	Approach
Construction noise	A qualitative assessment has been carried out due to no detailed information being available at this stage in relation to the likely construction techniques / activities required. This is considered standard practice, especially for low rise residential development that is unlikely to require specialist construction techniques. Construction noise and vibration can be controlled through a Construction Code of Practice (CCoP) and/or a Construction Environmental Management Plan (CEMP). Construction hours, limits and routes are likely to be conditioned.
Construction vibration	Scoped Out - Vibration from construction vibration is likely to be negligible beyond the site boundary unless piling is required. Assuming that no piling is taking place, no significant vibration effects are considered likely.
Construction road traffic noise	A quantitative assessment has been carried out based on traffic data for the development.
Construction road traffic vibration	Scoped Out - Provided that roads are well maintained, vibration from construction traffic is likely to be negligible beyond the highway. As such, no significant traffic vibration effects are considered likely.
Operational plant, equipment and servicing noise	A qualitative assessment has been carried out due to insufficient information being available at this stage in the planning process to carry out a detailed assessment. Plant noise limits are likely to be conditioned.
Operational plant, equipment and servicing vibration	Scoped Out – vibration effects are considered very unlikely for this type of development and can be controlled through suitably worded planning conditions.
Operational road traffic noise	A quantitative assessment has been carried out based on traffic data for the development.
Operational road traffic vibration	Scoped Out - Provided that roads are well maintained, vibration from operational traffic is likely to be negligible beyond the highway. As such, no significant traffic vibration effects are considered likely.

Assessment Criteria

Receptor Sensitivity

12.15 There is no national guidance on how the sensitivity of a NSR should be determined for the assessment of noise effects. For this assessment, the sensitivity of NSRs to noise has been based on the use of the receptor (i.e. the extent to which intruding noise may be expected to interfere with the expected activities therein).

12.16 The semantic scale for determining the sensitivity of NSRs for this assessment has been based on professional judgment and is summarised in Table 12.2 below. Residential properties have been considered as being of medium sensitivity in accordance with EIA best practice.

[74] Calculation of Road Traffic Noise, (1974), HMSO.

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Table 12.2 Sensitivity of receptor to noise and vibration effects

Sensitivity	Receptor
High	Residential properties, hotels, schools, hospitals, nursing homes, care homes, places of worship.
Moderate	Area used primarily for leisure activities, including Public Rights of Way (PROW), sports facilities and sites of historic or cultural importance, offices and retail businesses.
Negligible	All other areas such as those used primarily for industrial or agricultural purposes.

Construction Noise Criteria

12.17 The criteria for assessing the magnitude of impact from construction noise is based on guidance provided in Annex E of BS 5228-1:2009+A1:2014, which states that:

"Noise levels generated by site activities are deemed to be potentially significant if the total noise (pre-construction ambient plus site noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB $L_{Aeq,Period}$, from site noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant effect."

12.18 Table 12.4 summarises the criteria that have been used for the assessment of construction noise effects for residential dwellings and other NSRs of medium sensitivity. The guidance in BS 5228-1:2009+A1:2014 applies to residential dwellings only (deemed to be of medium sensitivity); therefore, for NSRs that have low or high sensitivity, professional judgement has been applied to determine the overall significance of effect.

Table 12.3 Construction noise impact criteria

Assessment category and threshold value period	Magnitude of Impact / Threshold Value (L_{Aeq} dB)			
	Negligible	**Minor**	**Moderate**	**Major**
Night-time (23:00 to 07:00 hours)	<40 or <1 dB above baseline ambient noise level	>40-<45 or <5 dB above baseline ambient noise level	≥45-<55	≥55
Evenings (19:00 to 23:00 hours weekdays). Weekends (13:00 to 23:00 hours Saturdays and 07:00 to 23:00 hours Sundays)	<50 or <1 dB above baseline ambient noise level	>50-<55 or <5 dB above baseline ambient noise level	≥55-<65	≥65
Daytime (07:00 to 19:00 hours) weekdays and Saturdays (07:00 to 13:00 hours)	<60 or <1 dB above baseline ambient noise level	>60-<65 or <5 dB above baseline ambient noise level	≥65-<75	≥75
Note: Subject to duration criteria (i.e. typically a minimum duration of one month) and where ambient noise levels are low (as they are on both sites A and B, as described in the baseline data section)				

12.19 Where predicted construction noise levels are up to 5 dB below the lower cut-off values stated within BS-5228 1:2009+A1:2014 or of short duration (less than 1 month), this is considered to be a negligible magnitude of impact. For works of significant duration (of one month or more) where levels are between 5 dB below and equal to the thresholds above, this is considered to be a low impact; where the thresholds are exceeded by up to 10 dB, this is considered to be a moderate impact. Noise levels greater than 10 dB above the thresholds (median line of 45, 55 and 65 dB for night, evening and day) are considered to result in a major adverse impact depending on the context and duration of the works.

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Plant Noise Criteria

12.20 The criteria for assessing the magnitude of impact from operation plant noise is in accordance with BS-4142:2014+A1:2019. The Standard primarily provides a methodology to determine the significance of sound of an industrial nature (i.e. the 'specific sound' from the proposed development) at NSRs.

12.21 Whilst there is a relationship between the significance of impacts determined by the method contained within BS 4142:2014+A1:2019 and the significance of effects described in the PPGN, there is not a direct link. When assessing potential commercial / industrial sound impact in accordance with BS 4142:2014+A1:2019 it is necessary to consider all pertinent factors, including:

- absolute level of the sound;
- character and level of the residual sound compared to the character and level of the specific sound; and
- sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as facade insulation treatment; and ventilation and/or cooling systems that will reduce the need to have windows open for thermal comfort.

12.22 Table 12.5 summarises the criteria, based on BS 4142:2015+A1:2019, that have been used for the assessment of operational plant / equipment noise impacts.

Table 12.4 Operational plant and equipment noise impact criteria

Difference Between the Rating Level and Representative Background Level (dB)	Magnitude of Impact
-10.0 or more	No change
-10.0 to 0.0	Negligible
0.0 to 4.9	Minor
5.0 to 9.9	Moderate
10.0 or more	Major

Road Traffic Noise Criteria

12.23 For road traffic noise, the change in the $L_{A10,18hr}$ noise level of as a result of the proposed development has been used to define the magnitude of impact. The method is based on guidance detailed in DMRB LA 111. The changes in noise level have been calculated based on the CRTN methodology but only consider the noise change from changes in number of vehicles for operational traffic. The classification of magnitude of impacts to be used for traffic noise from the base year is provided in Table 12.6 for long-term effects.

12.24 The semantic scales for the magnitude of impact of the noise change have been adopted from the DMRB LA 111. However, DMRB LA 111 is primarily for the construction and use of trunk roads (usually where a new road is introduced onto an environment or significantly altered) and hence the application and the semantic scale for the magnitude of impact has been varied slightly for this application.

Table 12.5 Road traffic noise impact criteria

Noise Change ($L_{A10,18hr}$ dB)	Magnitude of Impact
0	No change
0.1 to 2.9	Negligible
3.0 to 4.9	Minor
5.0 to 9.9	Moderate
10 or more	Major

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Type of Effects

12.25 Due to the nature of the NSRs for this development, the main effects of noise and vibration will be those on people (mainly occupants of residential type properties or pupils at the school).

12.26 Therefore, the likely adverse effects that could occur on people include the following (this is discussed in more detail in Appendix 12.1 Policy):

- Annoyance
- Task disturbance
- Speech interference
- Sleep disturbance

Significance of Effects

12.27 The assessment of significance of effects is based on the matrix provided in Table 12.7 below.

Table 12.6 Matrix of significance for noise effects

Magnitude of Impact	Sensitivity to Receptor		
	High	Moderate	Low
Major	Major	Major to Moderate	Moderate to Minor
Moderate	Major	Moderate to Minor	Minor
Minor	Moderate to Minor	Minor	Minor to Negligible
Negligible	Negligible	Negligible	Negligible

12.28 The definitions of the sensitivity terms, as described in Table 12.7, relate to the NPPG as follows:

- Effects of major significance are equivalent to the Unacceptable Adverse Effect Level (UAEL) set out in the NPPG. Such effects should be prevented and require mitigation. These effects are likely to be material in the decision-making process.
- Effects of moderate significance are equivalent to the Significant Observed Adverse Effect Level (SOAEL) set out in the NPPG. Professional judgement should be used to determine whether impacts are considered to be significant or not in EIA terms.
- Effects of minor significance are equivalent to the Lowest Observed Adverse Effect Level (LOAEL) set out in the NPPG. Such effects should be mitigated and reduced to a minimum as far as reasonably practicable but taking account of the economic and social benefits being derived from the activity causing the noise. These effects are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the proposed development.
- Effects of negligible significance are below the LOAEL set out in the NPPG and do not require mitigation.

12.29 For the purposes of this assessment, effects of moderate and above are considered significant in EIA terms.

Sources of Information

12.30 Baseline conditions have been identified by undertaking:

- a desktop review of the available project information (e.g. mapping, project description, etc.);
- a desktop review of the available internet information (e.g. google maps, street view, etc.);
- a site visit (to view the site and surrounding area); and
- a baseline sound survey (to establish the baseline sound levels in and around the vicinity of the site).

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12.31 The assessment has been undertaken based upon information on the proposed development provided by the project team.

Assumptions

12.32 The assessment has been undertaken based upon a number of assumptions, which are detailed in the relevant sections of this chapter.

Limitations

12.33 In all assessments it is good practice to consider uncertainty, which can arise from a number of different aspects of an assessment. There is a degree of uncertainty associated with: the instrumentation used in the baseline monitoring itself; the survey methodology; the sound propagation model; the source terms used; and the subjective response of residents to the sound sources.

12.34 Uncertainty due to instrumentation error has been reduced with the use of modern instrumentation and by ensuring that all instrumentation is field calibrated before/after each measurement period and is annually/biannually calibrated by an accredited laboratory.

12.35 Every effort has been made to reduce the uncertainty of the baseline sound level measurements. Uncertainty in the baseline data has been reduced significantly by using good practice measurement techniques and carrying out the baseline sound level survey over a period of seven days, allowing analysis of how representative the baseline data are, given the naturally varying sound level at the site and reducing the likelihood of atypical weather / site conditions distorting the baseline noise data.

12.36 If the baseline sound surveys were repeated, it is possible that the averages of the ambient and background sound levels would be slightly different; this would be due to seasonal variations and variations in repeatability/reproducibility. However, this limitation has been managed by adopting a 'representative' background sound level, using professional judgement. This is a standard approach and is considered to be an acceptable and robust method.

12.37 There are uncertainties in any sound propagation prediction methodology. International Organization Standardization (ISO) 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation'[75] is applicable in practice to a great variety of noise sources and environments and the approach has been used in the noise modelling undertaken for the assessment. The estimated accuracy for values of an A weighted sound level down-wind L_{AT} (D_W) is stated as ± 3 dB for a mean source/receptor height of up to 5 m and a source/propagation separation distance of up to 1 kilometre (km). For a mean source height between 5 and 30 m, the estimated accuracy is given as ± 1 dB for a source/propagation separation distance of 0 to 100 m and ± 3 dB for a source/propagation separation distance of more than 100 m. This is a standard approach and is considered to be an acceptable and robust prediction methodology.

12.38 With regard to subjective response, the standards and guidance adopted for the assessment are based on the subjective response of the majority of the population. This is considered to be the best that can be achieved in a population of varying subjective responses, which are dependent upon a wide range of factors.

12.39 On the basis of the above, measurements have been taken to minimise uncertainty in accordance with best practice. The information used to inform this chapter is therefore considered to provide an acceptable and robust basis for the assessment.

Baseline Conditions

12.40 The section provides more detailed topic specific information to describe the character of Sites A and B and their environs. This describes the quality of the interests as they relate to this environmental topic and serves as a comparative measure against which changes arising from the construction and operational phases of the

[75] . ISO 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation', (1996) ISO.

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proposed development can be assessed or predicted. This identifies the sensitivity of environmental receptors.

Site A – Redevelopment of existing golf course

12.41 For the purposes of this assessment, the nearest NSRs are identified as:

- Residential properties to the east of the site, on Bridger Close and Wellers Close;
- Residential properties to the south of the site, on Golf Links Road, Stanham Way and Wroxham Way; and
- Downview Primary School, to the south of the site off Wroxham Way.

12.42 A summary of the sensitivity of the NSRs identified is provided in Table 12.8 below. The locations of the NSRs are shown in the figures provided in Appendix 12.4. There are also PROWs that cross the site.

Table 12.7 Summary of noise sensitive receptors associated with Site A

Receptor/Resources	Sensitivity	Summary Reason
Residential	High	Residential properties have been considered as being of high sensitivity in accordance with EIA best practice (refer to Table 12.3) and professional judgement.
School	High	Educational facilities have been considered as being of high sensitivity in accordance with EIA best practice (refer to Table 12.3) and professional judgement.
PROW	Moderate	PROWs have been considered as being of moderate sensitivity in accordance with EIA best practice (refer to Table 12.3) and professional judgement, for the construction phase only. Users are only transitory as they move through the area over a relatively short period of time.

12.43 Baseline sound levels for the site were recorded during a survey undertaken in October 2021. A summary of the results of the baseline noise surveys are provided in Table 12.9 below, with further information in relation to the collection of baseline data provided in Appendix 12.4 of this chapter. The measured noise levels take into account noise from the local road network, railway line and the airfield.

Table 12.8 Baseline noise survey summary at Site A

Location	Representative Measurement Location	Daytime (07:00 to 23:00 hours)		Night (23:00 to 07:00 hours)	
		$L_{Aeq,16hr}$ dB	$L_{A90,16hr}$ dB	$L_{Aeq,8hr}$ dB	$L_{A90,16hr}$ dB
Residential properties on Bridger Close and Wellers Close	LT3	49	43	40	34
Residential properties to on Golf Links Road, Stanham Way and Wroxham Way	LT2	51	40	44	35
Downview Primary School	LT2	51	40	44	35

Site B – Relocation of Golf Course

12.44 This section describes those 'inherent' and 'standard' mitigation measures which primarily address the scope to avoid, reduce or remedy adverse environmental impacts or enhance the beneficial aspects arising from the construction and operational periods of the proposed development

12.45 For the purposes of this assessment, the nearest NSRs are identified as:

- Residential properties to the south of the site, on The Hard, Ancton Way, Alleyne Way, Elm Drive,

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Arundel Way and Lane End Road;

- Residential properties to the west of the site, on Sunnymead Close and Kingsmead Road; and
- Land End Farm Caravan Site, to the west of the site off Ancton Lane.

12.46 A summary of the sensitivity of the NSRs identified is provided in Table 12.10 below. The locations of the NSRs are shown in the figures provided in Appendix 12.4.

Table 12.9 Summary of sensitivity environmental receptors at Site B

Receptor/Resources	Sensitivity	Summary Reason
Residential	High	Residential properties have been considered as being of high sensitivity in accordance with EIA best practice (refer to Table 12.3) and professional judgement.
Caravan Site	High	The caravan site could be classed as temporary holiday accommodation or a permeant residence, it has therefore been considered as being of high sensitivity in accordance with EIA best practice (refer to Table 12.3) and professional judgement.

12.47 Baseline sound levels for the site were recorded during a survey undertaken in October 2021. A summary of the results of the baseline noise surveys are provided in Table 12.11 below, with further information describing the collection of baseline data provided in Appendix 12.4 of this chapter. The measured noise levels take into account noise from the local road network.

Table 12.10 Baseline noise survey summary at Site B

Location	Representative Measurement Location	Daytime (07:00 to 23:00 hours)		Night (23:00 to 07:00 hours)	
		$L_{Aeq,16hr}$ dB	$L_{A90,16hr}$ dB	$L_{Aeq,8hr}$ dB	$L_{A90,16hr}$ dB
Residential properties on The Hard, Ancton Way, Alleyne Way, Elm Drive, Arundel Way and Lane End Road	LT5	49	39	44	35
Residential properties on Sunnymead Close and Kingsmead Road	LT6	45	38	41	33
Land End Farm Caravan Site	LT6	45	38	41	33

Future Baseline Conditions

12.48 The dominant source of noise affecting both sites is road traffic noise.

12.49 Predictions based on the traffic flow data provided for the existing Base Year (2021) and the Opening Year (2031), indicate that the baseline $L_{A10,18hr}$ sound levels associated with road traffic movements only, are likely to increase on all the 12 road links assessed (Appendix 12.5, Table 12.5 a). The greatest increase, of up to 1.3 dB will occur on Outerwyke Road (link 9). The noise change is associated with the natural increase in road traffic movements on the road links identified.

12.50 Predictions based on the traffic flow data provided for the existing Base Year (2021) and the Future Year (2046), indicate that the baseline $L_{A10,18hr}$ sound levels associated with road traffic movements only, are likely to increase on all the 12 road links assessed (Appendix 12.5, Table 12.5 b). The greatest increase, of up to 1.6 dB will occur on Outerwyke Road (link 9). The noise change is associated with the natural increase in road traffic movements on the road links identified.

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12.51 Predictions based on the traffic flow data provided for the existing Base Year (2021) and the Opening Year (2031) with other committed development, indicate that the baseline $L_{A10,18hr}$ sound levels associated with road traffic movements only, are likely to increase on all the 12 road links assessed (Appendix 12.5, Table 12.5 d). The greatest increase, of up to 2.2 dB will occur on Shripney Road (A29) (link 2). The noise change is associated with the natural increase in road traffic movements on the road links identified, plus vehicle movements associated with other committed development.

12.52 Predictions based on the traffic flow data provided for the existing Base Year (2021) and the Future Year (2046) with other committed development, indicate that the baseline $L_{A10,18hr}$ sound levels associated with road traffic movements only, are likely to increase on all 12 road links (Appendix 12.5, Table 12.5 e). The greatest increase, of up to 2.4 dB will occur on Shripney Road (A29) (link 2). The noise change is associated with the natural increase in road traffic movements on the road links identified, plus vehicle movements associated with other committed development.

12.53 It has been shown that changes in future baseline noise levels are unlikely to be significant in the context of this assessment. In addition, the slight increases in baseline noise levels predicted above are likely to reduce any noise impacts, when compared to the current baseline, as background noise levels at receptors may also be slightly increased. Therefore, it is considered appropriate to use the measured existing baseline noise levels in the assessment as this represents a slight worse case assumption.

12.54 Road traffic data and road traffic noise change calculations are provided in Appendix 12.5.

Inherent and Standard Mitigation

12.55 This section describes those 'inherent' and 'standard' mitigation measures which primarily address the scope to avoid, reduce or remedy adverse environmental impacts or enhance the beneficial aspects arising from the construction and operational periods of the proposed development.

12.56 A CCoP/CEMP would be prepared post consent that would set out the measures and procedures that would be implemented to mitigate the environmental impacts during the construction phase. The CCoP/CEMP would be agreed with Arun District Council prior to the commencement of construction.

12.57 The CCoP/CEMP would stipulate that construction works, would be carried out in accordance with 'best practicable means' (BPM) of Section 72 of the CoPA to minimise noise effects. Measures within the CCoP/CEMP relating to noise would follow guidance provided in BS 5228-1:2009+A1:2014 for noise and would include:

- Appointment of a Construction Liaison Officer to act as the first point of contact on environmental matters for Arun District Council, other external bodies and the general public.
- Construction activities would be undertaken during typical construction working hours (i.e. 07:00 to 19:00 hours Monday to Friday, 07:00 to 13:00 hours Saturdays, with no working on Sundays or Bank/Public holidays). Activities would therefore be limited to weekday daytimes and Saturday mornings. Any working outside these hours would only take place with prior agreement with Arun District Council (i.e. via the Section 61 process of the CoPA).
- Agreeing access routes for construction traffic with the local highway authority (i.e. construction traffic will be routed away from existing NSRs, where reasonably practicable).
- Use of quieter alternative methods, plant and equipment, where reasonably practicable.
- Siting the construction compounds, in particular plant, equipment, site offices, storage areas and worksites, away from existing NSRs, where reasonably practicable.
- Use of hoardings or portable acoustic enclosures/screens, where practicable.
- Maintaining and operating all vehicles, plant and equipment in an appropriate manner, to ensure that noise is kept to a minimum.
- Details of any proposed construction noise monitoring should be agreed with Arun District Council (e.g.

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for any unusual or particularly loud activities).

12.58 Mechanical plant / equipment / servicing activities associated with the proposed development can be specified, designed and operated in such a manner so as not to exceed 'negligible' impact, as outlined in Table 12.5, when assessed in accordance with BS4142:2014+A1:2019.

12.59 It is very unlikely that the development would contain any significant vibration generating plant or equipment. However, any plant / equipment or activities likely to give rise to appreciable vibration can be controlled / designed / mitigated so that they do not adversely impact on the proposed new dwellings themselves. This will ensure that vibration does also not result in adverse impacts at the more distant NSRs.

Assessment of Environmental Impacts

12.60 This section provides an assessment of the nature, extent, magnitude of change that the proposed development will have on individual receptors identified in the baseline section. By employing the sensitivity of the receptor and magnitude of change, the significance of environmental effects which arise as a result of the construction and operational periods of the proposed development will be determined.

Site A – Redevelopment of existing golf course

Construction Noise

12.61 During the construction phase, on-site plant would be likely to comprise various diesel mechanised construction plant including excavators (with various tool attachments depending upon the task being undertaken), dump trucks, concrete wagons and pumps or an on-site batching plant, mobile cranes, delivery lorries and fork-lift trucks.

12.62 Construction noise emissions would vary spatially throughout the programme as work is undertaken in different areas. Noise levels at the identified receptors will be highest when work was being undertaken in close proximity to them but will reduce when work is carried out in more distant locations.

12.63 In general, construction noise emissions would be highest during initial site clearance and earthworks and decrease as the buildings are constructed. Noise emissions during the fit-out as buildings are completed would be very low, as work would be undertaken mostly with hand-tools within the completed structures.

12.64 Therefore, with reference to Table 12.4, the magnitude of impact is likely to be negligible to minor, although there may be occasions when the impact is moderate for limited periods of time if / when construction work occurs near to the site boundary in close proximity to the identified receptors (as identified in paragraph 12.41).

Construction Road Traffic Noise

12.65 Predictions based on the traffic flow data provided for the Construction Year (2026) and the Construction Year (2026) plus other committed development and the proposed development (Site A and Site B), indicate that the $L_{A10,18hr}$ sound levels are likely to increase on all the 12 road links assessed (Appendix 12.5, Table 12.5 m to r). The noise increase is less than 0.5 dB on 11 road links assessed but up to 1.6 dB on Downview Road (link 8). Overall, a noise increase of less than 3 dB is considered to be a **negligible** impact in accordance with Table 12.6.

12.66 Road traffic data and road traffic noise change calculations are provided in Appendix 12.5.

Operational Plant / Equipment / Servicing Noise

12.67 At this stage in the design process, the type, number and location of mechanical plant associated with the proposed development is not known. Therefore, a detailed assessment of operational plant noise cannot be undertaken.

12.68 However, mechanical plant associated with the proposed development will be specified, designed and operated in such a manner so as not to exceed 'negligible' impact, as outlined in Table 12.5, when assessed in accordance with BS4142:2014+A1:2019.

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12.69 Therefore, with reference to Table 12.5, the magnitude of impact is likely to be **negligible.**

Operational Road Traffic Noise

12.70 Predictions based on the traffic flow data provided for the Opening Year (2031) and the Opening Year (2031) plus other committed development and the proposed development (Site A and Site B), indicate that the LA10,18hr sound levels are likely to increase on the 12 road links assessed (Appendix 12.5, Table 12.5 g to i). The greatest increase, of up to 2.1 dB will occur on Shripney Road (A29) (link 2); however, the proposed development is only likely to contribute up to 0.1 dB to the predicted noise change, which is negligible in accordance with Table 12.6. The second greatest increase, of up to 1.6 dB will occur on Downview Road (link 8) and the proposed development is likely to contribute up to 1.5 dB to the predicted noise change, which is negligible in accordance with Table 12.6. Overall, a noise increase of less than 3 dB is considered to be a negligible impact in accordance with Table 12.6.

12.71 Predictions based on the traffic flow data provided for the Future Year (2046) and the Future Year (2046) plus other committed development and the proposed development (Site A and Site B), indicate that the LA10,18hr sound levels are likely to increase on the 12 road links assessed (Appendix 12.5, Table 12.5 j to l). The greatest increase, of up to 2.0 dB will occur on Shripney Road (A29) (link 2); however, the proposed development is only likely to contribute up to 0.1 dB to the predicted noise change, which is negligible in accordance with Table 12.6. The second greatest increase, of up to 1.5 dB will occur on Downview Road (link 8) and the proposed development is likely to contribute up to 1.5 dB to the predicted noise change, which is negligible in accordance with Table 12.6. Overall, a noise increase of less than 3 dB is considered to be a negligible impact in accordance with Table 12.6.

12.72 Road traffic data and road traffic noise change calculations are provided in Appendix 12.5.

Table 12.11 Summary of magnitude of change on noise sensitive receptors at Site A

Receptor	Summary of Change to Receptor/Resource	Summary Reason
Construction Noise		
Residential (as identified in paragraph 12.38)	Negligible to Minor Moderate on occasion	Construction noise and vibration can be controlled through a CCoP and/or a CEMP. Construction hours, limits and routes are likely to be conditioned.
School (as identified in paragraph 12.38)		
PROW		
Construction Road Traffic Noise		
Residential (as identified in paragraph 12.41	Negligible	Predicted noise increase of less than 3 dB due to the proposed development.
School (as identified in paragraph 12.41)		
Operational Plant / Equipment / Servicing Noise		
Residential (as identified in paragraph 12.38)	Negligible	The scheme will be designed so that adverse effects are negligible (or less). This can be secured by condition if required
School (as identified in paragraph 12.38)		

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Receptor	Summary of Change to Receptor/Resource	Summary Reason
Operational Road Traffic Noise		
Residential (as identified in paragraph 12.38)	Negligible	Predicted noise increase of less than 3 dB due to the proposed development.
School (as identified in paragraph 12.38)		

Residential Suitability

12.73 Further information is provided in Appendix 12.6 of this chapter. In summary it has been found that the site is suitable for residential development and significant adverse impacts are unlikely to occur.

Site B – Relocation of Golf Course

Construction Noise

12.74 During the construction phase, on-site plant would be likely to comprise various diesel mechanised construction plant including excavators (with various tool attachments depending upon the task being undertaken), dump trucks, concrete wagons and pumps or an on-site batching plant, mobile cranes, delivery lorries and fork-lift trucks.

12.75 Construction noise emissions would vary spatially throughout the programme as work is undertaken in different areas. Noise levels at the identified receptors will be highest when work was being undertaken in close proximity to them but will reduce when work is carried out in more distant locations.

12.76 In general, construction noise emissions would be highest during initial site clearance and earthworks and decrease as the buildings associated with the golf club are constructed. Noise emissions during the fit-out as buildings are completed would be very low, as work would be undertaken mostly with hand-tools within the completed structures.

12.77 With the implementation of the mitigation measures outlined in Section 12.55 and 12.57, in particular the commitment that only daytime working will be carried out, it is considered unlikely that noise levels would exceed the low impact criteria at the identified receptors for the majority of the works.

12.78 Therefore, with reference to Table 12.4, the magnitude of impact is likely to be negligible to minor, although there may be occasions when the impact is increased for limited periods of time if / when construction work occurs in close proximity to the identified receptors (as identified in paragraph 12.38).

Construction Road Traffic Noise

12.79 Predictions based on the traffic flow data provided for the Construction Year (2026) and the Construction Year (2026) plus other committed development and the proposed development (Site A and Site B), indicate that the $L_{A10,18hr}$ sound levels are likely to increase on all the 12 road links assessed (Appendix 12.5, Table 12.5 m to r). The noise increase is less than 0.5 dB on 11 road links assessed but up to 1.6 dB on Downview Road (link 8). Overall, a noise increase of less than 3 dB is **negligible** in accordance with Table 12.6.

12.80 Road traffic data and road traffic noise change calculations are provided in Appendix 12.5.

Operational Plant / Equipment / Servicing Noise

12.81 The main source of operational noise that could potentially result in adverse impacts at existing NSRs (if it is not appropriately accounted for in the design and necessary mitigated) is servicing activities such as lawn mowing, noise from service yards or grounds maintenance etc. It is considered that other noise sources generated by the operation of the golf course (e.g. users of the course talking, noise generated by golf shots or sound from golf buggies) is unlikely to result in adverse effects at existing NSRs.

12.82 At this stage in the design process, the type, number and location of mechanical plant and noise generating activities associated with the proposed development is not known. Therefore, a detailed assessment of

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operational noise cannot be undertaken.

12.83 However, mechanical plant associated with the proposed development and servicing activities will be planned, specified, designed and operated in such a manner so as not to exceed 'negligible' impact, as outlined in Table 12.5, when assessed in accordance with BS4142:2014+A1:2019.

12.84 Therefore, with reference to Table 12.5, the magnitude of impact is likely to be **negligible.**

Operational Road Traffic Noise

12.85 Predictions based on the traffic flow data provided for the Opening Year (2031) and the Opening Year (2031) plus other committed development and the proposed development (Site A and Site B), indicate that the $L_{A10,18hr}$ sound levels are likely to increase on the 12 road links assessed (Appendix 12.5, Table 12.5 g to i). The greatest increase, of up to 2.1 dB will occur on Shripney Road (A29) (link 2); however, the proposed development is only likely to contribute up to 0.1 dB to the predicted noise change, which is **negligible** in accordance with Table 12.6. The second greatest increase, of up to 1.6 dB will occur on Downview Road (link 8) and the proposed development is likely to contribute up to 1.5 dB to the predicted noise change, which is **negligible** in accordance with Table 12.6. Overall, a noise increase of less than 3 dB is considered to be a **negligible** impact in accordance with Table 12.6.

12.86 Predictions based on the traffic flow data provided for the Future Year (2046) and the Future Year (2046) plus other committed development and the proposed development (Site A and Site B), indicate that the $L_{A10,18hr}$ sound levels are likely to increase on the 12 road links assessed (Appendix 12.5, Table 12.5 j to l). The greatest increase, of up to 2.0 dB will occur on Shripney Road (A29) (link 2); however, the proposed development is only likely to contribute up to 0.1 dB to the predicted noise change, which is **negligible** in accordance with Table 12.6. The second greatest increase, of up to 1.5 dB will occur on Downview Road (link 8) and the proposed development is likely to contribute up to 1.5 dB to the predicted noise change, which is **negligible** in accordance with Table 12.6. Overall, a noise increase of less than 3 dB is considered to be a **negligible impact** in accordance with Table 12.6.

12.87 Road traffic data and road traffic noise change calculations are provided in Appendix 12.5.

Table 12.12 Summary of magnitude of change on noise sensitive receptors at Site A

Receptor	Summary of Change to Receptor/Resource	Summary Reason
Construction Noise		
Residential (as identified in paragraph 12.41)	Negligible to Minor Moderate on occasion	Construction noise and vibration can be controlled through a CCoP and/or a CEMP. Construction hours, limits and routes are likely to be conditioned.
Caravan Site (as identified in paragraph 12.41)		
Construction Road Traffic Noise		
Residential (as identified in paragraph 12.41)	Negligible	Construction noise and vibration can be controlled through a CCoP and/or a CEMP. Construction hours, limits and routes are likely to be conditioned.
Caravan Site (as identified in paragraph 12.41)		
Operational Plant / Equipment / Servicing Noise		
Residential (as identified in paragraph 12.41)	Negligible	The scheme will be designed so that adverse effects are negligible (or less). This can be secured by condition if required.
Caravan Site		

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Receptor	Summary of Change to Receptor/Resource	Summary Reason
(as identified in paragraph 12.41)		
Operational Road Traffic Noise		
Residential (as identified in paragraph 12.41)	Negligible	Predicted noise increase of less than 3 dB due to the proposed development, therefore negligible impact.
Caravan Site (as identified in paragraph 12.41)		

Identification of effects

Site A – Redevelopment of existing golf course

Construction Noise

12.88 With reference to Table 12.3 the sensitivity of the residential NSRs identified are high, the sensitivity of the school is high and the sensitivity of the PROW is moderate. With reference to Table 12.4, the magnitude of impact is likely to be negligible to minor. With reference to Table 12.7, the noise effects would be negligible to minor adverse for most of the time, although there may be occasions when the significance is moderate at the residential / school receptors. Minor effects are not significant in EIA terms. The effect would be **temporary, short to medium term and direct**.

12.89 Any moderate effects, should they occur, are only likely to be short term i.e. when construction activities are in close proximity to receptors.

12.90 With reference to the PPGN, effects are likely to vary from below the LOAEL to the SOAEL but below the UAEL. This is the expected outcome for a phased construction site of this size; effects are likely to occur for only a proportion of the temporary works, affecting any individual NSRs for only a relatively small portion of the construction process. In addition, best practicable means will be used to reduce the magnitude and duration of any adverse noise effects.

Construction Road Traffic Noise

12.91 With reference to Table 12.3, the sensitivity of the NSRs identified are high. With reference to Table 12.6, the magnitude of impact is likely to be negligible. With reference to Table 12.7, the noise effects would be negligible. Negligible effects are not significant in EIA terms.

12.92 With reference to the PPGN, effects are likely to be considered to fall below the LOAEL.

Operational Plant / Equipment / Servicing Noise

12.93 With reference to Table 12.3, the sensitivity of the NSRs identified are high. With reference to Table 12.5, the magnitude of impact is likely to be negligible. With reference to Table 12.7, the noise effects would be negligible and therefore not significant in EIA terms.

12.94 With reference to the PPGN, effects are likely to be considered to fall below the LOAEL.

Operational Road Traffic Noise

12.95 With reference to Table 12.3, the sensitivity of the NSRs identified are high. With reference to Table 12.6, the magnitude of impact is likely to be negligible. With reference to Table 12.7, the noise effects would be negligible. Negligible effects are not significant in EIA terms.

12.96 With reference to the PPGN, effects are likely to be considered to fall below the LOAEL.

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Table 12.13 Significance of effects on noise sensitive receptors at Site A

Receptor	Sensitivity	Magnitude of Change	Significance of Effect
Construction Noise			
Residential	High	Negligible to Minor Moderate on occasion	Negligible to Minor Adverse Moderate Adverse (significant) on occasion Temporary Short to medium term Direct
School	High		
PROW	Moderate		
Construction Road Traffic Noise			
Residential	High	Negligible	Negligible
School	High		
Operational Plant / Equipment / Servicing Noise			
Residential	High	Negligible	Negligible
School	High		
Operational Road Traffic Noise			
Residential	High	Negligible	Negligible

Site B – Relocation of Golf Course

Construction Noise

12.97 With reference to Table 12.3, the sensitivity of the NSRs identified are high. With reference to Table 12.4, the magnitude of impact is likely to be negligible to minor. With reference to Table 12.7, the noise effects would be negligible to minor adverse for most of the time, although there may be occasions when the significance is moderate. Minor effects are not significant in EIA terms. The effects would be **temporary, short to medium term and direct.**

12.98 Any moderate effects, should they occur, are only likely to be short term (i.e. when construction activities are in close proximity to receptors.)

12.99 With reference to the PPGN, effects are likely to vary between the NOEL and SOAEL but below the UAEL. This is the expected outcome for a phased construction site of this size; effects are likely to occur for only a portion of the temporary works, affecting any individual NSRs for only a relatively small period of the construction process.

Construction Road Traffic Noise

12.100 With reference to Table 12.3, the sensitivity of the NSRs identified are high. With reference to Table 12.6, the magnitude of impact is likely to be negligible. With reference to Table 12.7, the noise effects would be negligible. Negligible effects are not significant in EIA terms.

12.101 With reference to the PPGN, effects are likely to be considered to fall below the LOAEL.

Operational Plant / Equipment / Servicing Noise

12.102 With reference to Table 12.3, the sensitivity of the NSRs identified are high. With reference to Table 12.5, the magnitude of impact is likely to be negligible. With reference to Table 12.7, the noise effects would be negligible and therefore not significant in EIA terms.

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12.103 With reference to the PPGN, effects are likely to be considered to fall below the LOAEL.

Operational Road Traffic Noise

12.104 With reference to Table 12.3, the sensitivity of the NSRs identified are high. With reference to Table 12.6, the magnitude of impact is likely to be negligible. With reference to Table 12.7, the noise effects would be negligible. Negligible effects are not significant in EIA terms.

12.105 With reference to the PPGN, effects are likely to be considered to fall below the LOAEL.

Table 12.14 Significance of effects on noise sensitive receptors at Site B

Receptor/Resources	Sensitivity	Magnitude of Change	Significance of Effect
Construction Noise			
Residential	High	Negligible to Minor	Negligible to Minor Adverse Moderate Adverse (significant) on occasion Temporary Short to medium term Direct
Caravan Site	High		
Construction Road Traffic Noise			
Residential	High	Negligible	Negligible
Caravan Site	High		
Operational Plant / Equipment / Servicing Noise			
Residential	High	Negligible	Negligible
Caravan Site	High		
Operational Road Traffic Noise			
Residential	High	Negligible	Negligible

Actionable Mitigation

12.106 With standard mitigation measures implemented, no additional mitigation is proposed for either Site A or Site B.

Residual Impact Assessment

12.107 This section identifies residual effects and their significance.

Site A – Redevelopment of existing golf course

12.108 With standard mitigation measures implemented, some residual impacts have been identified during the construction phase when construction works are close to neighbouring NSRs but the effect will only be temporary and short to medium term (moderate effects are only likely to be short term), as detailed in Table 12.15 below.

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Table 12.15 Residual effects on noise sensitive receptors at Site A

Receptor	Significance of Effect	Mitigation (Actionable)	Residual Effect
Construction Noise			
Residential	Negligible to Minor Adverse Moderate Adverse (significant) on occasion	Construction noise and vibration can be controlled through a CCoP and/or a CEMP. Construction hours, limits and routes are likely to be conditioned.	Negligible to Minor Adverse Moderate Adverse (significant) on occasion Temporary Short to medium term Direct
School			
PROW	Negligible to Minor Adverse		
Operation Plant / Equipment / Servicing Noise			
Residential	N/A	N/A	N/A
School	N/A	N/A	N/A
Construction Road Traffic Noise			
Residential	Residential	Residential	Residential
School	School	School	School
Operational Road Traffic Noise			
Residential	N/A	N/A	N/A
School	N/A	N/A	N/A

Site B – Relocation of Golf Course

12.109 With standard mitigation measures implemented, some residual impacts have been identified during the construction phase when construction works are close to neighbouring NSRs but the effect will only be temporary and short term (moderate effects are only likely to be short term), as detailed in Table 12.16 below.

Table 12.16 Residual effects on noise sensitive receptors at Site B

Receptor/Resources	Significance of Effect	Mitigation (Actionable)	Residual Effect
Construction Noise			
Residential	Negligible to Minor Adverse Moderate Adverse (significant) on occasion	Construction noise and vibration can be controlled through a CCoP and/or a CEMP. Construction hours, limits and routes are likely to be conditioned.	Negligible to Minor Adverse Moderate Adverse (significant) on occasion Temporary, Short to medium term, Direct
Caravan Site			
Operational Plant Noise & Vibration			
Residential	N/A	N/A	N/A
Caravan Site	N/A	N/A	N/A
Operational Road Traffic Noise			
Residential	N/A	N/A	N/A
Caravan Site	N/A	N/A	N/A

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Cumulative Effects

12.110 This Section identifies and assesses the nature, extent, magnitude and significance of inter-project effects (i.e., effects from other development in combination with those from the proposed development).

Inter-relationships

12.111 This chapter only considers the effects on human receptors.

12.112 This chapter is based upon the traffic data provided within the TA which accompanies Chapter 10 of this ES at *Appendix 10.1*.

Construction Noise

12.113 Cumulative effects are unlikely to occur as construction hours and limits for other committed development and the proposed development are likely to be controlled through appropriate planning conditions.

12.114 In addition, due to the size of the site and location of the receptors, it is very unlikely other construction activities could occur at committed developments that would result in increases in overall construction noise levels, and therefore cumulative effects, at NSRs.

12.115 Due to the distance between Site A and Site B, it is very unlikely that there will be any combined construction noise and vibration related effects, even if construction activities occur at the same time.

Operational Plant Noise

12.116 Cumulative effects are unlikely to occur as plant noise limits for other committed development and the proposed development are likely to be controlled through appropriate planning conditions.

12.117 In addition, due to the size of the site and location of the receptors, it is very unlikely that plant / equipment / commercial type noise from other committed development could occur that would result in increased operational noise levels, and therefore cumulative effects, at the NSRs.

Operational Road Traffic Noise

12.118 Predictions based on the traffic flow data provided for the Opening Year (2031) and the Opening Year (2031) plus other committed development and the proposed development (Site A and Site B), indicate that the $L_{A10,18hr}$ sound levels are likely to increase on the 12 road links assessed (Appendix 12.5, Table 12.5 g to i). The greatest increase, of up to 2.1 dB will occur on Shripney Road (A29) (link 2); however, the proposed development is only likely to contribute up to 0.1 dB to the predicted noise change, which is **negligible** in accordance with Table 12.6. The second greatest increase, of up to 1.6 dB will occur on Downview Road (link 8) and the proposed development is likely to contribute up to 1.5 dB to the predicted noise change, which is **negligible** in accordance with Table 12.6. Overall, a noise increase of less than 3 dB is **negligible** in accordance with Table 12.6.

12.119 Predictions based on the traffic flow data provided for the Future Year (2046) and the Future Year (2046) plus other committed development and the proposed development (Site A and Site B), indicate that the $L_{A10,18hr}$ sound levels are likely to increase on the 12 road links assessed (Appendix 12.5, Table 12.5 j to l). The greatest increase, of up to 2.0 dB will occur on Shripney Road (A29) (link 2); however, the proposed development is only likely to contribute up to 0.1 dB to the predicted noise change, which is **negligible** in accordance with Table 12.6. The second greatest increase, of up to 1.5 dB will occur on Downview Road (link 8) and the proposed development is likely to contribute up to 1.5 dB to the predicted noise change, which is **negligible** in accordance with Table 12.6. Overall, a noise increase of less than 3 dB is **negligible** in accordance with Table 12.6.

12.120 Road traffic data and road traffic noise change calculations are provided in Appendix 12.5.

12.121 Based on the impact criteria in Table 12.6, it can be seen that cumulative changes in road traffic noise are likely to have negligible impact at the NSRs. Therefore, any cumulative effects will also be negligible.

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Summary

12.122 Due to the distance between the two sites it is very unlikely that there will be any combined construction noise and vibration related effects (even if construction activities occur at the same time).

12.123 Similarly, due to the distance between the two sites it is very unlikely that there will be any cumulative effects as a result of operational noise (plant / equipment / servicing activities).

12.124 Paragraphs 12.1260 to 12.1284 discuss the cumulative impact of operational traffic on both sites and it has been found that effects are likely to be negligible.

12.125 Therefore, no cumulative effects are expected as a result of construction and operation Site A and B.

Summary

12.126 A noise and vibration impact assessment has been carried as part of the EIA for the Bognor Regis Golf Course development.

12.127 It has been found that adverse effects as a result of the operation of the proposed developments (Site A and B) are unlikely to occur.

12.128 During the construction phase it has been identified that temporary adverse noise effects may occur at the nearest NSRs and for short periods of time there could be some moderate (significant) effects. However, the inherent mitigation includes the use of best practicable means to control noise from construction and wherever practicable these effects will be mitigated and minimised.

12.129 A summary of the likely residual noise and vibration effects is provided in Tables 12.15 (Site A) and 12.16 (Site B).

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13 GROUND CONDITIONS

Introduction

13.1 This chapter assesses the impacts associated with ground conditions and the Proposed Development, and identifies the likely significance of effects with the implementation of standard mitigation. It describes the baseline ground conditions of the study areas and considers the potential for land to be affected by contamination.

13.2 This chapter includes:

- Relevant, legislation, policy and guidance;
- Potential effects of the construction phase;
- Potential effects of the operational phase; and
- Potential cumulative effects.

13.3 This chapter should be read in conjunction with the other relevant chapters within this Environmental Statement, particularly agricultural land and soils and farm holdings Chapter 14), population and human health (Chapter 6), water resources (Chapter 9) and waste and materials (Chapter 16).

Potential Effects

13.4 This section summarises the likely potential effects of the proposed development on the environmental topic area.

13.5 The Proposed Development could potentially effect/ be affected by ground conditions:

- Pathways can be created between potentially existing contamination and receptors such as human health, property, ecological receptors and controlled waters;
- Sterilisation or loss of resources and/or geological features of importance;
- Unsuitable physical ground conditions (such as compressible ground or ground dissolution of soluble rocks) can impact the Proposed Development and the surrounding built environment; and
- New sources of contamination could be introduced during construction and operation of the Proposed Development. This is discussed in water resources (Chapter 9).

Assessment Methodology

13.6 The section describes the methodology used to undertake the assessment within this Chapter.

13.7 The general methodology used for the assessment of impacts is outlined in Chapter 4; Methodology. Topic specific methodology is described below.

Study Area

13.8 Site A is currently a golf course, proposed for residential development. Site B is currently agricultural land, proposed for development as a new golf course.

13.9 The study areas (shown on figures provided in Appendices A of *Appendix 13.1* and *Appendix 13.2*) have been selected to encompass the Proposed Development (the Site (A or B)), and each site's vicinity, as follows:

- The Proposed Developments (Site A and Site B) and up to 250 m radius for potential human health receptors or potentially contaminating off-site activities. This distance is referenced in best practice

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documents[76] and is typical at the hazard identification stage of an assessment; and

- Up to 1 km radius from the Proposed Development[77] is considered appropriate for identifying sensitive controlled water receptors such as groundwater abstraction wells, Principal Aquifers and groundwater Source Protection Zones (SPZ).

13.10 If there is considered to be relevant features outside of the 250 m human health and potentially contaminating off-site activities study area, then these have been included and described in the assessment. Relevant guidance for impact assessment[78] does not specify a minimum study area distance for the assessment of impacts to geology and soils / ground conditions, therefore professional judgement has been applied.

Consultation

13.11 No consultation has been undertaken to date.

Legislative / Planning Policy Context

13.12 The assessment has been undertaken with reference to the following list of legislation and policies.

Legislation

- Part 2A of the Environmental Protection Act, 1990;
- Environment Act, 1995;
- Control of Substances Hazardous to Human Health, 2002;
- Dangerous Substances Directive 2006/11/EC;
- Groundwater Directive 2006/118/EC;
- Control of Asbestos Regulations, 2012;
- Contaminated Land (England) Regulations, 2006;
- Construction (Design & Management) Regulations, 2015;
- Environmental Damage (Prevention and Remediation) Regulations, 2015;
- The Environmental Permitting (England and Wales) Regulations, 2016 and
- The Water Environment (Water Framework Directive) (WFD) (England and Wales) Regulations, 2017.

Planning Policy

- National Planning Policy Framework, Department for Levelling Up, Housing and Communities, July 2021.
- Arun District Council, Local Plan 2011-2031, Adopted January 2018.

Guidance

- DMRB LA104 Environmental Assessment and Monitoring[79], LA108 Biodiversity[80], LA109 Geology and Soils, LA110 Materials Asset and Waste[81] and LA113 Road Drainage and the Water Environment;
- Planning Practice Guidance, Land affected by contamination[82];
- Guidance for the Safe Development of Housing on Land Affected by Contamination;

[76] National House Building Council (NHBC), (2008), Guidance for the Safe Development of Housing on Land Affected by Contamination. R&D Publication 66, Volume 1
[77] Design Manual for Roads and Bridges (DMRB). Sustainability and Environment Appraisal. LA113 Road drainage and the water environment, Revision 1, (2019), Highways England
[78] DMRB. Sustainability and Environment Appraisal. LA109 Geology and soils, Revision 0, (2019), Highways England
[79] DMRB. Sustainability and Environment Appraisal. LA104 Environmental assessment and monitoring, Revision 1, (2019), Highways England
[80] DMRB. Sustainability and Environment Appraisal. LA108 Biodiversity, Revision 1, (2019), Highways England
[81] DMRB. Sustainability and Environment Appraisal. LA110 Material assets and waste, Revision 0, (2019), Highways England
[82] Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government, (2019). Land Affected by Contamination.

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- Contaminated Land Statutory Guidance83;
- Land Contamination: Risk Management (LC:RM)84 superseding Model Procedures for the Management of Land Contamination (CLR11)85;
- Contaminated Land: Applications in Real Environments, The Definition of Waste: Development Industry Code of Practice (DoW CoP)86;
- Investigation of Potentially Contaminated Sites - Code of Practice87;
- Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings88;
- Asbestos in Soil and Made Ground; A Guide to Understanding and Managing Risk89; and
- Contaminated Land Risk Assessment: A Guide to Good Practice90.

Assessment Process

13.13 The assessment has been undertaken as outlined within Chapter 4. Receptors relevant to ground conditions are identified and the 'change' or 'impacts' to these receptors are assessed and an overall 'significance of effect' has been determined.

13.14 In order to assign sensitivity with regards to potential contamination, a preliminary risk assessment (PRA) has been completed and is set out in Appendices H of *Appendix 13.1 and Appendix 13.2*. In accordance with current UK Government guidance, qualitative risks from potential contaminated soils are assessed using the 'Source-Pathway-Receptor' approach, where the following definitions apply:

- Source: a substance or situation which has the potential to cause harm or pollution;
- Pathway: means by which a source/hazard can reach and impact upon a receptor; and
- Receptor: that which may be adversely affected by the presence of the source/hazard.

13.15 Such an approach recognises that risks relating to land contamination can only exist where all three components are present, constituting a complete contaminant linkage. The level of risk has been evaluated in accordance with the methodology set out in CIRIA C552. This involves classification of the consequence and probability associated with each potential complete contaminant linkage and thereby the corresponding level of risk (risk category).

13.16 Using DMRB and C552, the following attributes and receptors are considered relevant for consideration within this chapter:

- Geology, geomorphology and soil;
- Controlled waters, including groundwater and surface water;
- Existing and proposed infrastructure and property;
- Designated areas of ecological interest; and
- Current and future land users.

[83] Contaminated Land Statutory Guidance, (2012), DEFRA
[84] Land contamination risk management, (2021), EA
[85] Model Procedures for the Management of Land Contamination (2019) DEFRA and EA
[86] The Definition of Waste: Development Industry Code of Practice, (2011), CL:AIRE
[87] British Standards (BS)10175 (2011+A2:2017), Investigation of Potentially Contaminated Sites - Code of Practice (2017), British Standards Institute
[88] BS8485 (2015+A1:2019), Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings, (2019), British Standards Institute
[89] C733: Asbestos in Soil and Made Ground; A Guide to Understanding and Managing Risk, (2014), Construction Industry Research and Information Association (CIRIA)
[90] C552: Contaminated Land Risk Assessment: A Guide to Good Practice, (2001), CIRIA,

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Assessment Criteria

13.17 CIRIA C552, along with professional judgement, has been used to assign sensitivity (Table 13.1) and magnitude of impacts (Table 13.2) associated with contaminated land, for subsequent use in the DMRB methodology. The assessment methodology is the same for both the construction and operational phases. The method used in CIRIA C552 is provided in Appendices H of Appendix 13.1 and 13.2.

Table 13.1 Sensitivity of receptor associated with ground conditions

Sensitivity	Receptor
High	**Geology**: rare/very rare and of national or international importance with little or no potential for replacement (e.g., UNESCO World Heritage Sites, Geological Conservation Review (GCR), geological Site of Special Scientific Interest (SSSI), Area of Special Scientific Interest (ASSI), National Nature Reserve (NNR)). Geology meeting national or international designation citation criteria which is not designated as such. **Soils**: soils directly supporting a European Union (EU) (e.g., Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar) or UK designated site (e.g., SSSI). **Contamination**: 1) human health: high/very high sensitivity such as residents, allotment users or users of public open space; 2) surface water: high and very high sensitivity criteria in LA 113 (Table 3.70); 3) groundwater: high and very high sensitivity criteria in LA 113; and 4) ecology: EU (e.g., SAC, SPA, Ramsar) or UK designated site (e.g., SSSI).
Moderate	**Geology**: of regional importance with limited potential for replacement (e.g., RIGS). Geology meeting regional designation citation criteria which is not designated as such. **Soils**: soils supporting non-statutory designated sites (e.g., Local Nature Reserve (LNR), Local Geological Site (LGS), Site of Nature Conservation Interest (SNCIs)). **Contamination**: 1) human health: medium sensitivity such as commercial or industrial workers; 2) surface water: 'medium' sensitivity criteria in LA 113; 3) groundwater: 'medium' sensitivity criteria in LA 113; and 4) ecology: non-statutory designated sites (e.g., LNR, SNCIs).
Low	**Geology**: of local importance / interest with potential for replacement (e.g., non designated geological exposures, former quarry's / mining sites). **Soils**: soils supporting non-designated notable or priority habitats. **Contamination**: 1) human health: low and very low sensitivity such as inaccessible areas/ areas of limited exposure such as highways and railway; 2) surface water: 'low' sensitivity criteria in LA 113; 3) groundwater: 'low' sensitivity criteria in LA 113; 4) ecology: non-designated notable or priority habitats.

*sensitivity criteria in DMRB have been adapted to meet the prescribed site-specific methodology; 'high' and 'very high' and 'low' and 'very low' criteria have been merged.

13.18 Property receptors cannot easily be merged into DMRB guidance for assessing impacts from CIRIA C552, as it is the consequence of the risk occurring to any property which is classified as high, medium, low (i.e. high is catastrophic damage to buildings such as an explosion and low is easily repairable effects of damage to buildings) and therefore these scenarios are more comparable to magnitude of impact. Property and infrastructure are present on the sites and study areas. Potential impacts to property have been assessed in a qualitative manner in this chapter.

13.19 The magnitude of impact has been assigned in accordance with the principles established in DMRB guidance (LA108, LA109, LA110, LA113) and are defined in Table 13.2 It is assumed that mitigation (see 13.87, 'Standard Mitigation' section) will be implemented during the construction and operation of the Proposed Development and have therefore been considered when assigning magnitude of impact. When assigning magnitude, the scale, duration, timing and extent of impacts, as well as the degree of certainty in the prediction

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of impacts and the likelihood of irreversible changes occurring have all been considered.

Table 13.2 Magnitude of change (impact) associated with ground condition receptors

Magnitude of impact	Criteria for Assessing Impact
Major	• Loss of geological feature / designation and / or quality and integrity, severe damage to key characteristic, features or elements; • Significant contamination identified above screening criteria; • Contamination restricts future use of land; • Project sterilises ≥1 Mineral Safeguard Area (MSA) and / or peat resource; • Loss of regionally important public water supply; • Catastrophic damage to buildings/property (i.e. from explosion); • Reduction in water body WFD classification; and • Physical removal or permanent sealing of soil resource.
Moderate	• Partial loss of geological feature / designation, potentially affecting its integrity; • Significant contamination can be present, but control / remediation measures required to reduce risks to human health / make land suitable for intended use; • Degradation of regionally import public water supply or loss of significant commercial / industrial / agricultural supplies; • Damage to buildings / property; • Contribution to reduction in water body WFD classification; and • Permanent loss / reduction of one or more soil function(s) and restriction to current or approved future use (e.g through degradation, compaction, erosion of soil resource.)
Minor	• Minor measurable change in geological feature / designation; • Contaminant concentrations below screening criteria, significant contamination unlikely with a low risk to human health; • Easily reparable damage to buildings / property; • Best practice measures to minimise risks to human health; • Minor impact on an aquifer or abstractions; and • Temporary loss / reduction of one or more soil function(s) and restriction to current or approved future use (e.g through degradation, compaction, erosion of soil resource.)
Negligible	• Very minor loss or detrimental alteration to one or more characteristics, features or elements of geological designation; • Contaminant concentrations substantially below screening criteria and no requirement for control measures to reduce risks to human health; • No damage to buildings / property; • No measurable impact upon controlled water receptors; and • No discernible loss / reduction of soil function(s) that restrict current or approved future use.

13.20 The significance level attributed to each effect has been assessed based on the sensitivity/value of the affected receptor(s) and the magnitude of change arising from the Proposed Development, as outlined in Chapter 4. The matrix to determine significance of effects is provided in Table 4.4. Effects can be adverse or beneficial.

Sources of Information

13.21 The following sources of information have been used in this assessment:

Public information

- Map no. 317/332 (Chichester and Bognor) Solid and Drift (1:50,000 Series), (1996), British Geological Survey (BGS);
- GeoIndex Onshore, (2021), BGS, available [https://mapapps2.bgs.ac.uk/geoindex/home.html], accessed 20th October 2021;
- Lexicon of Named Rock Units, (2021), BGS, available [https://www.bgs.ac.uk/technologies/the-bgs-lexicon-of-named-rock-units/], accessed 20th October 2021;

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- The Coal Authority Interactive Map Viewer, (2021), the Coal Authority, available [https://mapapps2.bgs.ac.uk/coalauthority/home.html], accessed 20th October 2021;
- Catchment Data Explorer, (2021), EA, available [https://environment.data.gov.uk/catchment-planning/], accessed 20th October 2021;
- Main River Map, (2021), EA, available [https://www.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386], accessed 15th September 2021;
- MAGIC Interactive Maps, (2021), DEFRA and Natural England, available [https://magic.defra.gov.uk/MagicMap.aspx], accessed 20th October 2021;
- UK Flood Risk Maps for Planning, (2021), EA, available [https://flood-map-for-planning.service.gov.uk/confirm-location?easting=495157&northing=100813&placeOrPostcode=PO22%208JD], accessed 20th October 2021;
- UXB Risk Maps, (2021), Zetica, available [https://zeticauxo.com/downloads-and-resources/risk-maps/], accessed 20th October 2021;
- Minerals and Waste Safeguarding Guidance West Sussex Joint Minerals Local Plan (2020), West Sussex County Council, available [https://www.westsussex.gov.uk/media/13437/mw_safeguarding_guidance.pdf] accessed 5th November 2021; and
- Soils and their use in South East England. 250k, (1983), Soil Survey of England and Wales.
- Third Party Reports
- Groundsure Report (ref: GS-8275626), 2021.

*A request for further information of the waste and historical landfills is currently being processed by the Environment Agency.

Assumptions

13.22 It is assumed that any material moved within the boundary of the Proposed Development and any imported material during the construction phase (e.g., to achieve an engineered development platform or desired landscaping) will have been subject to appropriate chemical and geotechnical testing and will therefore, not present a risk to receptors. It is assumed construction will be undertaken in accordance with the CL:AIRE, 2011, DoW CoP and informed by a Ground Investigation (GInv) and subsequent monitoring where necessary, based on the design of the Proposed Development. It is assumed that if any contamination is identified during GI, monitoring, remediation or suitable management will be implemented. Likewise detailed design of substructures (i.e., foundations and below ground services) will consider findings of geotechnical assessment. These are standard mitigation requirements.

13.23 Construction work will be carried out using best practice under a site-specific Construction Environmental Management Plan (CEMP). This is also a standard mitigation measure.

13.24 It has been assumed that the information provided and reviewed in the Phase 1 PRA are representative of existing ground conditions. A degree of professional judgement has been used in the interpretation of this information and in its application to determining environmental sensitivity and magnitude of impact.

Limitations

13.25 The assessment is limited to available, desk-based information, with no GInv specific to the Proposed Development having been undertaken to date.

Baseline Conditions

13.26 The section provides more detailed topic specific information to describe the character of Sites A and B and their environs. This describes the quality of the interests as they relate to this environmental topic and serves

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as a comparative measure against which changes arising from the construction and operational phases of the proposed development can be assessed or predicted. This identifies the sensitivity of environmental receptors.

13.27 The conditions refer to the present time and with no significant change predicted during the interim period before construction works are programmed to commence. The baseline conditions are summarised below with the detail provided in *Appendix 13.1* and *Appendix 13.2*.

Site A – Redevelopment of existing golf course

Current Land Use

13.28 The current use of Site A is as a golf club with associated club house and maintenance facilities/storage yard. Site A is generally flat and level, ranging from 0 m AOD (metres above ordnance datum) to 3 m AOD.

13.29 To the east of Site A are residential properties; to the north are agricultural fields; to the west is the Lidsey Rife, beyond which is an airfield, beyond which is a railway line, fuel station and a trading estate. The land use to the south of Site A comprises agricultural land, public open space, residential properties and a school.

Agriculture and Soil

13.30 Site A is provisionally Grade 3 agricultural land, surrounded by provisional Grade 1 and 2 Best and Most Versatile (BMV) land. However, the site is not in agricultural use and would be 'other land' under the Ministry of Agriculture, Fisheries and Food (MAFF) Agricultural Land Classification (ALC) guidance.

13.31 The Soil Survey of England and Wales 250k mapping shows Newchurch 1 Association across Site A; Deep stoneless calcareous clayey and fine silty soils. Groundwater levels are known to be controlled by ditches and pumps within this association. Present on flat land with low ridges, giving a complex soil pattern and is developed on marine alluvium. Hamble 2 Association is mapped on the eastern extent of Site A; Deep stoneless well drained silty soils and similar soils affected by groundwater, over gravel locally, usually flat land and developed on aeolian silty drift. This is small scale mapping and is for indicative purposes only.

Geology

13.32 Site A is underlain by superficial Quaternary River Terrace Deposits (RTD). Raised Marine Deposits (RMD) are also present across the western extent. The underlying solid geology comprises the White Chalk Subgroup (formerly the Upper Chalk Formation), specifically the Spetisbury and Tarrant chalk members in the south and north of the Site respectively.

13.33 There are no known nationally or internationally important geological or geomorphological features (SSSIs or RIGS), or local geological sites within the study area (Felpham SSSI is designated due to its geological features, however, it is located 1.4km south of the site and consequently not considered further within this assessment). Site A is not within an MSA and no significant peat or peaty soils are anticipated to be present. The nearest designated site is located 800m to the west of the site – The Brooks Local Nature Reserve – but this is not designated for geological reasons.

Radon

13.34 UK Radon data indicates that Site A is located in an area where less than 1% of properties are expected to have radon levels above the action level for radon, with the exception of the southernmost portion of the Site where 1 to 3% of properties are expected to experience greater than the action level for radon gas. In either case, it is expected that no radon protection measures will be required.

UXO Risk

13.35 The unexploded ordnance (UXO) risk in regional mapping for Bognor provided by Zetica is 'moderate', whilst the majority of the site is within a 'low' risk area across the centre and north. It is acknowledged that the regional mapping provided by Zetica is of insufficient scale to assess individual sites and is intended as first point of reference only, therefore further assessment is required (detailed UXO desk study). This will be obtained prior to breaking ground during the GI.

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Natural Geological Hazards

13.36 A summary of the geological hazards has been presented in Table 13.3.

Table 13.3 Potential ground stability hazards at Site A

Potential Hazards	BGS Risk Rating
Shrink Swell Clays	Low
Running Sands	Low
Compressible Deposits	Negligible
Collapsible Deposits	Low
Landslides	Very Low
Ground Dissolution of Soluble Rocks	Very Low

Hydrogeology and Hydrology

13.37 The RTD and RMD are both designated as Secondary A aquifers, defined by the EA as "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".

13.38 The White Chalk Subgroup is designated as a Principal aquifer, defined by the EA as "geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale".

13.39 BGS records show only one groundwater abstraction point within 1 km of Site A. The site and study area are not within a SPZ.

13.40 Historical borehole records available from the BGS, indicate that resting groundwater level within Site A varies from 1 m below ground level (bgl) to 2.5 m bgl.

13.41 Land drains are present under the golf course as the site would otherwise be naturally affected by shallow groundwater. These land drains are expected to be connected to the Lidsey Rife, located on the western boundary of Site A. Surface drains are present across the centre of Site A and along the northern boundary. One small pond is present on the golf course.

13.42 Under the WFD, three water features (water bodies, water body catchments, and groundwater bodies) have been identified within the study area, these are:

- Lidsey Rife River Waterbody Catchment area;
- Lidsey Rife River; and,
- Littlehampton Anticline West groundwater body.

13.43 Five surface water abstractions have been identified within 1 km of Site A, used for irrigation and dust suppression. The nearest of these is situated on the northernmost boundary of Site A.

13.44 A review of the flood risk map for planning indicates that the majority of Site A lies within a Flood Zone 3 (High Risk) area, indicating that it has a greater than 1 in 100 chance of annual flooding from rivers (see water resources Chapter 9 for further information on flood risk). Additionally, the site is considered to be at high risk from groundwater flooding.

Designated Sites

13.45 There are no designated sites of ecological interest located within Site A or within the study area based on publicly available information. Ecology Surveys were completed on Site A to inform the ecology assessment (see Chapter 8), from which the findings have identified the following:

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- Semi improved grassland of site importance;
- Broadleaved and mixed plantation woodland local importance;
- Hedgerows local importance; and
- pond and ditch network of local and county importance (these receptors are considered in the assessment of controlled waters).

13.46 In relation to the ground conditions assessment, these habitats are not considered to be directly supported by unique features of the soil present on site and are therefore not considered as a soil receptor.

Historical Land Use

13.47 Historical land use of Site A has been reviewed with reference to published historical mapping and is summarised in Table 13.4.

Table 13.4 Summary of historical land use at Site A

Historical Map Source	Historical Land use
County Series, 1876 (1:10,560)	The Site comprises undeveloped land, covered with a network of tree lines, drainage ditches, and pathways. On the east of the Site, in the same location as the present club house, is a building labelled the Clap Barn.
County Series, 1896 (1:10,560)	Establishment of some footpaths, on the western portion of the Site, and on the northern portion of the Site.
County Series, 1910 (1:10,560)	No significant changes are shown on the Site.
County Series, 1934 (1:10,560)	The Site is now marked as a Golf Links, indicating a use change since the previous map. However, other sources of information indicate the golf course was established in 1906.
County Series, 1961 (1:10,560)	Approximately 50 trees are now marked in the southern most portion of the Site.
County Series, 1967 to 2021 (1:10,560)	No significant change except for the establishment of more trees across the Site.

Landfill and Waste

13.48 Historical landfilling is known to have taken place 100 m northwest, and 110 m and 230 m to the west of Site A. Material includes liquid sludge, inert waste and industrial waste. A historical refuse heap was also present 240 m to the west of Site A. Storage waste exemptions are associated with operations 50m and 160 m northeast (for sludge).

Potential Sources of Contamination

13.49 Off-site sources of potential contamination identified are as follows: the adjacent airfield, an historical electricity substation (95 m southwest of Site A), unspecified tanks, pumping station, railway line (with associated building and sidings), sludge storage, the trading estate, historical landfilling and refuse heap. With regards to on-site, the maintenance facilities/storage yard is a potential source of contamination, and due to the age of the golf course, areas of localised unknown made ground to raise levels may be present, along with the longstanding use of chemicals to achieve the required soft landscaping.

13.50 Gas works and water treatment works were also identified in the PRA, however, due to the distance from the site (beyond 400m) and on the western side of the Rife, these are not considered as sources of potential contamination which may affect Site A.

13.51 The sources of potential contamination give rise to the following possible contaminants of concern: fuel and lubricating oils, herbicides, fungicides and pesticides, asbestos containing materials (ACMs), metals, polyaromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPHs), ethylene glycol, creosote, ferrous residues, ash, sulphates, polychlorinated biphenols (PCBs) and ground gases.

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Pathways

13.52 The pathways in which the potential sources of contamination can affect the receptors are:

- Surface runoff;
- Vertical migration of contaminants to Principal and Secondary A aquifers;
- Migration of contaminants in RTD to surface waters;
- Vertical migration of leachable contaminants to Principal and Secondary A aquifers;
- Dermal contact, ingestion, inhalation of contaminated soil, windblown dusts and fibres;
- Chemical attack of underground services and foundations; and
- Vertical migration and accumulation of ground gases.

13.53 A preliminary conceptual site model (CSM) is included in *Appendix 13.1*.

Receptors

13.54 Identified receptors and their importance have been classified in accordance with the criteria in Table 13.1 and summarised in Table 13.5 below.

Table 13.5 Sensitivity of environmental receptors related to ground conditions at Site A

Receptor/Resources	Sensitivity	Summary Reason
Geology, Geomorphology and Soils	Not present	There are no designated nationally important geological or geomorphological features (SSSIs or RIGS) within the study area. Soils present do not support designated, notable or priority habitats.
Groundwater	High	The study area is underlain by superficial deposits classified as a Secondary A aquifer and bedrock classified as a Principal aquifer, likely to be hydraulically connected and providing locally important resource and/or supporting a river ecosystem with one groundwater abstraction licence in the study area.
Surface Water	High	Site A is situated within the WFD designated Lidsey Rife River catchment area and the Lidsey Rife River is adjacent to the west of the site. Surface water abstractions are present within the study area, used for irrigation.
Human Health; Current and neighbouring land users	High	The current land users are predominantly users of the existing golf course and users of the existing public rights of way. Residents, industrial/commercial land use and members of the public are present within the study area.
Human Health: Future users on site and neighbouring land users	High	The proposed future land use will be predominantly primarily residential and users of public rights of way. Residents, industrial/commercial land use and members of the public will be present within the study area.
Ecology	Not present	No designated, notable or priority habitats are present within the study area with regards to contaminated land assessment. The soils on site are not considered unique in supporting the locally important/site importance habitats.
Property/infrastructure	Moderate	Buildings, existing underground services (including potable water supplies) are present within the site and study area. The residential properties are likely to require further below ground services. These have been assigned as moderate utilising the classification of consequence of the pollutant linkage occurring (Appendix 13.1).

13.55 Construction and maintenance workers are not included in DMRB guidance. Construction and maintenance workers may be exposed to contamination during works, if it is present. However, earthworks are considered limited and health and safety protocols will be followed to best practice standards such as:

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- Protection of Workers and the General Public during the Development of Contaminated Land[91];
- A Guide to Safe Working on Contaminated Sites[92];
- Construction (Design & Management) Regulations, 2015; and
- wearing appropriate Personal Protective Equipment (PPE).

Site B – Relocation of golf course

Current Land Use

13.56 Site B of the Proposed Development is in agricultural use. Site B is generally level, ranging from 1 m AOD to 3 m AOD.

13.57 To the south and southwest of Site B lies residential housing; to the northeast lies an industrial estate (Hobbs Barn Farm). A caravan site is present to the west and a paintball centre is present to the east of the site. The remaining surrounding land is in agricultural use.

Agriculture and soil

13.58 Historical ALC survey data were available for approximately two thirds of Site B on the south. Approximately 14 ha of this surveyed area is BMV agricultural land (Subgrade 3a) and the remaining 30 ha of this surveyed land is Subgrade 3b (non-BMV). In addition, an ALC survey was carried out in October 2021 to inform the EIA for the Proposed Development (see Chapter 14; Agriculture and Soils) which confirmed BMV land (Grade 2 and Subgrade 3a) on the north of the site, as well as some Subgrade 3b.

13.59 The Soil Survey of England and Wales 250k mapping shows Park Gate Association across the north of Site B; Deep stoneless silty soils variably affected by groundwater. The south of site B is mapped as Efford 1 Association; Well drained fine loamy soils often over gravel associated with similar permeable soils, variably affected by groundwater.

Geology

13.60 Site B is underlain by superficial Quaternary RTD, with RMD also present beneath the south. The underlying solid geology comprises the White Chalk Subgroup, specifically the Newhaven Chalk Member.

13.61 Chalk has been encountered at depths between 2.60 to 11.60 m bgl, as described in available sources.

13.62 There are no known nationally important geological or geomorphological features (SSSIs or RIGS), or local geological sites within the study area. Site B is not within a MSA and no significant peat or peaty soils are anticipated to be present.

Radon

13.63 Less than 1% of properties are expected to exceed the action levels for Radon on the western section of Site B. The eastern section has comparatively elevated levels of Radon, where 1 to 3% of properties are expected to exceed the action level for Radon. In either case, it is expected that no radon protection measures will be required.

UXO Risk

13.64 The unexploded bomb risk in regional mapping for Bognor provided by Zetica is considered to be 'low'.

Natural Geological Hazards

13.65 A summary of the geological hazards has been presented in Table 13.6.

[91] Protection of Workers and the General Public during the Development of Contaminated Land, (1991), Health and Safety Executive
[92] A Guide to Safe Working on Contaminated Sites, R132, (1996), CIRIA

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Table 13.6 Potential ground stability hazards at Site B

Potential Hazards	BGS Risk Rating
Shrink Swell Clays	Low
Running Sands	Low
Compressible Deposits	Negligible
Collapsible Deposits	Low
Landslides	Very Low
Ground Dissolution of Soluble Rocks	Very Low

Hydrogeology and Hydrology

13.66 The superficial deposits are classified as Secondary A aquifers, defined by the EA as a series of *"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"*.

13.67 The White Chalk Subgroup is classified as a Principal aquifer, defined by the EA as having *"high intergranular and/or fracture permeability, usually providing a high level of groundwater storage and may support water supply/river base flow on a strategic scale"*. This aquifer is rated as having a Medium vulnerability to pollution.

13.68 BGS records show no groundwater abstractions identified within Site B. However one is present approximately 110 m to the north, used for general farming and domestic supply. The study area is not situated within a groundwater SPZ.

13.69 Historical borehole records available from the BGS indicate that groundwater with Site B varies from 1.8 to 6.0 m bgl.

13.70 50 surface water network features are present in the study area. Of these, 21 are on-site.

13.71 Under the WFD, two water features have been identified onsite:

- Ryebank Rife River Waterbody Catchment; and
- Ryebank Rife River which runs through Site B west-east, with various field drains/streams connected to it, including alongside the eastern boundary of the site and through the northern section of the site north-south.

13.72 Three surface water abstraction licences are allocated to the site; abstracting water for irrigation purposes from the Elmer Rife and Ryebank Rife.

13.73 A review of the flood risk map for planning published by the UK Government indicates that the Site majority of the Site lies within a Flood Zone 3 (High Risk) area, indicating that it has a greater than 1 in 100 chance of annual flooding from rivers (see water resources Chapter 9 for further detail on flood risks).

Designated Sites

13.74 There are no designated sites of ecological interest located within Site B or the study area.

Historical Land Use

13.75 Historical land use with the study area has been reviewed with reference to published historical mapping and summarised in Table 13.7.

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Table 13.7 Summary of historical land use at Site B

Historical Map	Historical Land Use
County Series, 1878 (1:10,560)	The site comprises undeveloped agricultural land, with land boundaries consistent with modern day field boundaries. A barn complex (North Barn) is present in the centre of the site. The Ryebank Rife bisects the site.
County Series, 1896 (1:10,560)	An area of marshland is shown on the southern extent of the site and a pond is present.
County Series, 1910	The area of marshland is no longer shown.
County Series, 1932 (1:10,560)	The North Barn is removed, and a wooded border has been planted around the site boundary.
County Series, 1940	An area of woodland is present on the centre of the site.
County Series, 1981	The woodland is no longer present.
County Series, 1992 to	No significant change.

Landfill and Waste

13.76 There are no historical or active landfill sites known to be on Site B or within the study area. However, waste was used in construction 30 m north and 100 m north of the site. The nature of the waste is not known. There is a permit exemption for activities on site, which allows the storage of sludge. There is a licenced waste site immediately north-east of Site B, at Hobbs New Barn. Ponds were once present on the Site. It is not known whether these were backfilled and if so, what material was utilised.

Potential Sources of Contamination

13.77 An electricity substation was present on site between 1970 and 1982 (two other electricity substations have been present within 250m of Site B, both to the south). North Barn once on the centre of Site B is considered to be a source of potential contamination (made ground), as well as the storage of sludge onsite and potential longstanding use of chemicals for agriculture. Ponds were once present onsite and may have been infilled with unknown materials.

13.78 Offsite sources of potential contamination include waste businesses (transfer and treatment), haulage company, manufacturers, vehicle repair and a concrete products company operating at Hobb's New Barn industrial estate adjacent to the north-east of the site, an historical nursery to the west (now the site of the caravan park), paintball area, engineering garage 200 m south, an historical coastguard station 250 m south and the two sites to the north where waste was known to have been used in construction.

13.79 An aerodrome and industrial land uses are present beyond 400m to the north of Site B, however, due to the distance, these are not considered as sources of potential contamination which may affect Site B.

13.80 The sources of potential contamination give rise to the following possible contaminants of concern: fuel and lubricating oils, herbicides and pesticides, ACMs, metals, PAHs, TPHs, ethylene glycol, creosote, ferrous residues, ash, sulphates, PCBs and ground gases.

Pathways

13.81 The pathways in which the potential sources of contamination can affect the receptors are:

- Surface runoff;
- Migration of contaminants in RTD to surface waters;
- Vertical migration of contaminants to Principal and Secondary A aquifers;
- Vertical migration of leachable contaminants to Principal and Secondary A aquifers;
- Dermal contact, ingestion, inhalation of contaminated soil, windblown dusts and fibres;
- Chemical attack of underground services and foundations; and

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- Vertical migration and accumulation of ground gases.

13.82 A preliminary CSM is included in *Appendix 13.2*.

Receptors

13.83 Receptors and attributes identified within Site B and the study area that have the potential to be adversely affected by the Proposed Development have been identified and discussed in Table 13.8.

Table 13.8 Sensitivity of environmental receptors associated with ground conditions at Site B

Receptor/Resources	Sensitivity	Summary Reason
Geology, Geomorphology and Soils	Not present	There are no designated nationally important geological or geomorphological features (SSSIs or RIGs) within the study area. Soils present do not support designated, notable or priority habitats
Groundwater	High	The study area is underlain by superficial deposits classified as a Secondary A Aquifer, and bedrock strata which is classified as a Principal Aquifers.
Surface Waters- Ryebank Rife	High	The site is present within the the WFD Ryebank Rife River waterbody catchment area and the Ryebank Rife River crosses Site B. Surface water abstractions are present within the study area, used for irrigation.
Human Health; Current and Neighbouring land users	High	Current site users are predominantly farm workers and possibly members of the public. Residents, industrial/commercial land use and members of the public are present within the study area.
Human Health: Future users on site	High	Future site users will be members of the public visiting the golf course. Residents, industrial/commercial land use and members of the public will be present within the study area.
Ecology	Not present	No designated, notable or priority habitats are present within the study area with regards to ground conditions assessment. The soils on site area not considered unique in supporting the locally important/site importance habitats.
Property/infrastructure	Moderate	Buildings, existing underground services (including potable water supplies) are present within the site and study area. Proposed Development is a golf course, with a club house and underground services likely to be required. These have been assigned as moderate utilising the classification of consequence of the pollutant linkage occurring (Appendix 13.2).

13.84 Construction and maintenance workers are not included in DMRB guidance. Construction and maintenance workers may be exposed to contamination during works, if it is present. However, earthworks are considered limited and health and safety protocols will be followed to best practice standards such as:

- Protection of Workers and the General Public during the Development of Contaminated Land;
- A Guide to Safe Working on Contaminated Sites;
- Construction (Design & Management) Regulations, 2015; and
- wearing appropriate PPE.

Inherent and Standard Mitigation

13.85 This section describes those 'inherent' and 'standard' mitigation measures which primarily address the scope to avoid, reduce or remedy adverse environmental impacts or enhance the beneficial aspects arising from the construction and operational periods of the proposed development.

13.86 There is no inherent mitigation designed into the proposed development.

13.87 Standard mitigation considered for this ground conditions chapter include carrying out a GInv and subsequent monitoring. This will inform geotechnical requirements for construction and investigate the presence of/risk from any existing contamination from the identified sources of contamination.

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13.88 The scope of the geo-environmental investigation will be underpinned by the CSM presented in the PRA. The analytical data will be screened for risks to human health and controlled waters and the results used to refine the contaminant linkages identified. The soils will also be analysed for the purposes of waste classification and to determine suitability for re-use.

13.89 The GInv would also confirm preliminary hydrogeological conditions and will obtain information associated with ground aggressivity, including sulphates, sulphides (especially in pyritic ground), water-soluble magnesium and acids (indicators are pH, chloride and nitrate ions). The results will be used to determine an appropriate concrete specification for the design stage.

13.90 The GInv will be undertaken in accordance with the following:

- BS10175 Investigation of Potentially Contaminated Sites. Code of Practice; and
- LC:RM.

13.91 The results of the GInv and subsequent monitoring will be interpreted and assessed within a Generic Quantitative Risk Assessment (GQRA) which will be provided for regulatory approval. If the GInv identifies contaminant linkages a Remediation Strategy would be produced which would specify protective measures during construction which would be agreed with the regulators prior to implementation. Any remediation undertaken would be validated and report on within a Verification Report to provide confidence that it has been undertaken with the agreed strategy. This would be provided to the local planning authority and statutory consultees for review.

13.92 If required, based on detailed design and findings of the GInv, a Piling Risk Assessment would be produced to outline measures to protect the underlying aquifers during Construction and mitigate risk of creating preferential pathways for potential contamination.

13.93 In order to reduce impacts during construction which may lead to pollution, a CEMP will be produced and followed. A CEMP helps to ensure that construction work considers aspects of environmental protection within the context of compliance with local legislation and minimization of the impacts on humans and the environment.

13.94 The CEMP should include the following:

- General good construction working practices such as dust suppression, including potentially contaminated dust, (damping down), windbreak netting around excavations and/or perimeter fencing, covering stockpiles with tarpaulins, wheel washing and road sweeping to prevent local residents and employees in the vicinity of the earthworks from being exposed to windblown dusts, vapours and asbestos fibres.
- Appropriate stockpile segregation, locations and containment measures to minimise the exposure of surface water and groundwater from contaminated run-off and local neighbours from windblown dusts, vapours and asbestos fibres.
- A protocol for managing unexpected ground contamination that may be encountered during construction. This may require additional investigations, sampling, risk assessment and remediation to ensure the protection of the possible receptors.
- Construction workers would be required to wear Personal Protection Equipment (PPE) such as gloves and face masks (where appropriate) to prevent dermal contact and inhalation or ingestion. Appropriate site hygiene facilities will be put in place and the presence of contaminants and the associated risks will be explained to ground workers before they begin work.
- Fuel storage on-site to be carried out under best practice i.e. integrally bunded containers. Plant refuelling to be carried out using best practice techniques and any spills to be controlled with spill kit.
- Management of water that collects on Site or within excavations.
- Management of polluting substances that are being brought on Site and used as part of the construction process.

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- Management of sediments in surface water runoff generated in construction area and laydowns.
- Management of accidental leakage and / or spillage incidents of oils/hazardous substances.
- Incorporate hydrocarbon interceptors into the Site drainage system at high risk areas, such as parking, unloading and refuelling areas, to remove hydrocarbons and oils from surface water prior to discharge.

13.95 In addition, the geochemical and geotechnical suitability of soils for re-use should be assessed prior to and during construction. A Materials Management Plan (MMP) should be produced and implemented by the Principal Contractor in order to undertake earthworks on the construction site, if the reuse of material on site is considered suitable. With an MMP, the Proposed Development would be part of a circular economy, becoming more sustainable and producing less waste soils and therefore, reducing environmental impacts and consumption of materials requiring importation to the site.

Assessment of Environmental Impacts

13.96 This section provides an assessment of the nature, extent, magnitude of change that the proposed development will have on individual receptors identified in the baseline section. By employing the sensitivity of the receptor and magnitude of change, the significance of environmental effects which arise as a result of the construction and operational periods of the proposed development will be determined.

Site A – Redevelopment of existing golf course

13.97 The following section evaluates the impacts of the Proposed Development on the receptors identified in Table 13.8.

13.98 Geology, geomorphology, soils and ecology receptors with regards to potential contamination were not identified to be present in Site A or study area.

Construction Phase

Groundwater

13.99 The superficial deposits are designated as Secondary A aquifers, with the bedrock geology of the White Chalk Subgroup designated as a Principal aquifer. There is one groundwater abstraction point within the study area, located 750 m from Site A which is used for farming and domestic uses. Therefore, groundwater is considered to have **high** sensitivity.

13.100 Sources of potential contamination have been identified and new sources of contamination could be introduced during construction as well as contamination pathways, however, no significant sources of potential contamination have been identified on-site. As part of the standard mitigation, a GInv will be carried out and a CEMP will be in place. Any unacceptable levels of legacy contamination identified during the GInv would be remediated suitably. It is considered that the potential magnitude of change would be **negligible** and therefore the significance of the effect will be **negligible.**

Surface Water

13.101 Site A is situated within the WFD designated Lidsey Rife River catchment area and the Lidsey Rife River is adjacent to the west of the site. Surface water abstractions are present within the study area, used for irrigation. Therefore, surface water is considered to have **high** sensitivity.

13.102 Sources of potential contamination have been identified and new sources of contamination could be introduced during construction as well as contamination pathways, however, no significant sources of potential contamination have been identified on-site. As part of the standard mitigation, a GInv will be carried out and a CEMP will be in place. Any unacceptable levels of legacy contamination identified during the GInv would be remediated suitably. It is considered that the potential magnitude of change would be **negligible** and therefore the significance of the effect will be **negligible**.

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Human Health

13.103 The current and neighbouring site users are users of the existing golf club, residents, members of the public and workers, and are therefore considered to have **high** sensitivity.

13.104 Sources of potential contamination have been identified and new sources of contamination could be introduced during construction as well as contamination pathways, however, no significant sources of potential contamination have been identified on-site. As part of the standard mitigation, a GInv will be carried out and a CEMP will be in place. Any unacceptable levels of legacy contamination identified during the GInv would be remediated suitably. It is considered that the potential magnitude of change would be **negligible** and therefore the significance of the effect will be **negligible**.

Property and infrastructure

13.105 Underground services and foundations of existing buildings are present on site and within the study area, which are considered to be of **moderate** sensitivity. UXO risk will be further investigated prior to any construction works commencing. No significant geological hazards were identified. Chemicals that are destructive to concrete have the potential to effect existing underground infrastructure. The chemicals most likely to attack concrete are sulphates and acids. Appropriate chemical testing for sulphates and acids will be undertaken as part of the GInv and the concrete design classifications adopted within the design of the residential development. No significant sources of ground gas were identified in the PRA. However, following the GInv, ground gas monitoring may be advised, which will inform any design requirements for ground gas mitigation. Therefore, the magnitude of change during construction is considered **negligible** resulting in a **negligible** effect.

Operational Phase

Groundwater

13.106 During the operational phase of the Proposed Development, it is considered that any legacy contamination if identified on site during the GInv will have been removed/remediated, and that no new sources of contamination are likely to be introduced in its end use as residential properties. Groundwater has a **high** sensitivity. It is considered that the potential magnitude of change would be **negligible** and therefore the effect will be **negligible**.

Surface Water

13.107 During the operational phase of the Proposed Development, it is considered that any legacy contamination if identified on site during the GInv will have been removed/remediated, and that no new sources of contamination are likely to be introduced in its end use as residential properties. Surface water has a **high** sensitivity. It is considered that the potential magnitude of change would be **negligible** and therefore the effect will be **negligible**.

Human Health

13.108 During the operational phase of the Proposed Development, it is considered that any legacy contamination if identified on site during the GInv will be removed/remediated, and that no new sources of contamination are likely to be introduced in its end use as residential properties. Buildings will be built and regulated to mitigate any risks from ground gas and volatile accumulation. Residents and members of the public are of **high** sensitivity. It is considered that the potential magnitude of change would be **negligible** and therefore the effect will be **negligible**

Property and infrastructure

13.109 Underground services and foundations of existing buildings are present on site and within the study area, which are considered to be of **moderate** sensitivity. Chemicals that are destructive to concrete have the potential to effect existing underground infrastructure. The chemicals most likely to attack concrete are sulphates and acids. Appropriate chemical testing for sulphates and acids will be undertaken as part of the GIs and the concrete design classifications adopted within the design of the residential development. No significant sources of ground gas were identified in the PRA and none are considered to be introduced during construction of

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residential properties. Following GI, and if deemed necessary ground gas monitoring may be conducted which will inform any design requirements for ground gas mitigation. Therefore, the magnitude of change during operation is considered **negligible** resulting in a **negligible** significance of effect.

Site B – Relocation of Golf Course

13.110 The following section evaluates the impacts of the Proposed Development on the receptors identified in Table 13.8.

13.111 Geology, geomorphology, soils and ecology receptors with regards to potential contamination were not identified to be present in Site B or study area.

Construction Phase

Groundwater

13.112 The superficial deposits are designated as Secondary A aquifers, with the bedrock geology of the White Chalk Subgroup designated as a Principal aquifer. There is one groundwater abstraction point located within the study area (107 m from the Site B) and is used for farming and domestic uses. Therefore, groundwater is considered to have **high** sensitivity.

13.113 Sources of potential contamination have been identified and new sources of contamination could be introduced during construction as well as contamination pathways. As part of the standard mitigation, a GInv will be carried out and a CEMP will be in place. Any unacceptable levels of legacy contamination identified during the GInv would be remediated suitably. It is considered that the potential magnitude of change would be **negligible** and therefore the significance of the effect will be **negligible**.

Surface Water

13.114 The site is present within the WFD Ryebank Rife River waterbody catchment area and the Ryebank Rife River crosses Site B. Surface water abstractions are present within the study area, used for irrigation. Therefore, surface water is considered to have **high** sensitivity.

13.115 Sources of potential contamination have been identified and new sources of contamination could be introduced during construction as well as contamination pathways. As part of the standard mitigation, a GInv will be carried out and a CEMP will be in place. Any unacceptable levels of legacy contamination identified during the GInv would be remediated suitably. It is considered that the potential magnitude of change would be **negligible** and therefore the significance of the effect will be **negligible**.

Human Health

13.116 The current and neighbouring site users are users of Site B are farm workers, industrial/ commercial site workers, residents and members of the public, and are therefore considered to have **high** sensitivity.

13.117 Sources of potential contamination have been identified and new sources of contamination could be introduced during construction as well as contamination pathways. As part of the standard mitigation, a GInv will be carried out and a CEMP will be in place. Any unacceptable levels of legacy contamination identified during the GInv would be remediated suitably. It is considered that the potential magnitude of change would be **negligible** and therefore the effect will be **negligible**

Property and infrastructure

13.118 Underground services and foundations of existing buildings are present within the study area, which are considered to be of **moderate** sensitivity. No significant geological hazards were identified. Chemicals that are destructive to concrete have the potential to effect existing underground infrastructure. The chemicals most likely to attack concrete are sulphates and acids. Appropriate chemical testing for sulphates and acids will be undertaken as part of the GIs and the concrete design classifications adopted within the design of any building associated with the new golf course. Ground gas monitoring may be advised based on the findings of the GInv, which will inform any design requirements for ground gas mitigation of any building associated with the new golf course. Therefore, the magnitude of change during construction is considered **negligible** resulting in a

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negligible significance of effect.

Operational Phase

Groundwater

13.119 During the operational phase of the Proposed Development, it is considered that any legacy contamination if identified on site during the GI will have been removed/remediated. Groundwater has a **high** sensitivity. It is considered that the potential magnitude of change would be **negligible** and therefore the significance of the effect will be **negligible**.

Surface Water

13.120 During the operational phase of the Proposed Development, it is considered that any legacy contamination if identified on site during the GInv will have been removed/remediated. Surface water has a **high** sensitivity. It is considered that the potential magnitude of change would be **negligible** and therefore the significance of the effect will be **negligible**.

Human Health

13.121 During the operational phase of the Proposed Development, it is considered that any legacy contamination if identified on site during the GInv will be removed/remediated. Buildings will be built and regulated to mitigate any risks from ground gas and volatile accumulation. Nearby residents and members of the public are of **high** sensitivity. It is considered that the potential magnitude of change would be **negligible** and therefore the significance of the effect will be **negligible**

Property and infrastructure

13.122 Underground services and foundations of existing buildings are present within the study area, which are considered to be of **moderate** sensitivity. Chemicals that are destructive to concrete have the potential to effect existing underground infrastructure. The chemicals most likely to attack concrete are sulphates and acids. Appropriate chemical testing for sulphates and acids will be undertaken as part of the GInv and the concrete design classifications adopted within the design of any building associated with the new golf course. Ground gas monitoring may be advised based on the findings of the GInv, which will inform any design requirements for ground gas mitigation of any building associated with the new golf course. Therefore, the magnitude of change during operation is considered **negligible** resulting in a **negligible** significance of effect.

Actionable Mitigation

13.123 No additional mitigation measures beyond standard mitigation have been noted at this stage.

Residual Impact Assessment

13.124 This section identifies residual effects and their significance.

13.125 Assuming the implementation of the outlined standard mitigation measures to mitigate the magnitude of impacts, there will be **no residual effects** with regards to the receptors identified within Table 13.8 for Site A and Site B and associated study areas.

Cumulative Effects

13.126 This Section identifies and assesses the nature, extent, magnitude and significance of inter-project effects (i.e., effects from other development in combination with those from the proposed development).

13.127 The Proposed Development could occur simultaneously with other developments in the vicinity as set out in *Appendix 4.1*. Each of these sites is considered too far from either Site A or Site B from the perspective of ground conditions to give rise to create cumulative effects. Any new development proposals not showing on the portal which may arise between baseline and construction of the Proposed Development, are anticipated to be subject to the same standards as the Proposed Development, and where any contamination may be

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present, remediation would be implemented.

Summary

13.128 A review of the ground conditions was undertaken to establish baseline conditions within the Site A and Site B and associated study areas, in order to assess potential impacts and identify significance of effects from the potential impacts (relevant to construction and operational phases of the Proposed Development).

13.129 A preliminary CSM was produced which highlighted potential risks to identified receptors using CIRIA C552. The risks ranged from 'very low' to 'moderate'. Findings of the preliminary CSM was used to assign sensitivity to receptors using DMRB guidance.

13.130 Mitigation measures (which were used in assigning magnitude of impact) include the requirement for GInv and subsequent monitoring, to characterize ground conditions both geotechnically and geo-environmentally. The geo-environmental characterization will be in relation to potential sources of contamination and facilitate determination of the waste classification and the re-use potential of soils for input within the site's MMP. A CEMP is also a requirement to outline management procedures during construction to prevent environmental pollution. Following these mitigation measures, the potential impacts to the identified receptors associated with ground conditions at Site A and Site B and their associated study areas, are considered to have negligible effects and therefore considered not significant.

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14 AGRICULTURE AND SOILS

Introduction

14.1 This chapter of the ES assesses the likely significant effects of the development proposals in terms of agricultural land and soils.

14.2 Site A is a golf course and accordingly is "non-agricultural land" in the Agricultural Land Classification (MAFF 1988). Therefore, there will be no loss of agricultural land on that part of the site, although there will be a loss of soil resource. Site B, where both agricultural land and soil resources are affected extends to 77.6 hectares (ha) of mostly agricultural land in agricultural production, where both agricultural land and soil resources are affected.

14.3 The assessment considers the soil and agricultural land resource, the occupying farm business and any wider implications that there may be for surrounding land. Hence whilst the assessment is largely focused on Site B itself, consideration has been given to adjacent land. In terms of the assessment of significance the land quality of the wider area has also been considered.

Potential Effects

14.4 This section summarises the likely potential effects of the proposed development on the environmental topic area.

Site A – Relocation of golf course

14.5 The existing golf course is classified as "non-agricultural land" in the Agricultural Land Classification (ALC). There is no requirement for an ALC assessment therefore, and no agricultural land will be lost. The soil resource is, however, considered.

Site B – Relocation of Golf Course

14.6 A large extent of Site B has been the subject of detailed Agricultural Land Classification surveys and found to comprise a mixture of land quality grades. The majority of the agricultural land within the Site is Subgrade 3b, although there is Subgrade 3a and a small area of Grade 2, plus woodland and non-agricultural land. Therefore, in total 22.8 ha of "best and most versatile agricultural land" (BMV) is known to be affected. In addition, 11.9 ha has not been the subject of field survey, but is assumed to be "best and most versatile agricultural land".

14.7 The loss of agricultural land cannot be mitigated. Therefore, there is the potential for a significant adverse effect as a result of the loss of land that is defined as BMV agricultural quality. In this area, BMV land is widespread, and the significance of the effect is considered in that wider context.

14.8 The land is part of a farm business. This chapter assesses the implications of the loss of land to this business.

Assessment Methodology

14.9 The section describes the methodology used to undertake the assessment within this Chapter.

Study Area

14.10 The study area is the 77.6 ha of Site B. This is mostly agricultural land in agricultural use, but includes 9.8 ha of woodland and non-agricultural land.

Consultation

14.11 No consultation with Statutory Consultees (Natural England) has taken place.

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Legislative / Planning Policy Context

14.12 The assessment has been undertaken in the context of the following legislation and planning policy, which provide relevant the thresholds.

14.13 The Town and Country Planning (Development Management Procedure) (England) Order 2015 sets out the requirements for consultation with Natural England where development involves agricultural land. The threshold is where development of agricultural land that is not in accordance with the provisions of a development plan will lead to the loss of 20 ha or more of the best and most versatile agricultural land. This sets a context for defining the magnitude of impacts in EIA terms.

14.14 The National Planning Policy Framework (2021) (NPPF) Annex 2 defines the "best and most versatile agricultural land" (hereafter referred to as BMV agricultural land) as that falling within Grades 1, 2 and 3a of the Agricultural Land Classification (MAFF, 1988) [93].

14.15 Paragraph 174 of the NPPF states that "planning policies and decisions should contribute to and enhance the natural and local environment" by, *inter alia*, recognising "the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land".

14.16 Paragraph 175 is set in the context of plan making. It is noted that plans should allocate land with the least environmental value. Footnote 58 states that "where significant development of agricultural land is demonstrated to be necessary, areas of poorer quality land should be preferred to those of a higher quality".

14.17 The Planning Practice Guidance sets out guidance in Paragraph 8-001-20190721 that refers to the consultation thresholds with Natural England. This notes the importance of soil as an essential natural capital asset and refers to Defra's Code of Practice for the Sustainable Use of Soils on Construction Sites (2009).

14.18 The Arun Local Plan 2011 – 2031 (2018) recognises at paragraph 11.1.4 that most of the undeveloped coastal plain comprises high grade agricultural land. Paragraph 11.1.3 recognises the potential to preserve soils through careful construction methodologies and paragraph 11.1.6 requires a soil plan in some instances. Policy SO DM1 accordingly seeks to protect BMV land unless the need for development outweighs the need to protect such land and the lowest grade land is used where possible.

Assessment Process

14.19 The methodology for the assessment of agricultural land quality involved an initial desk-top study followed by a detailed Agricultural Land Classification field survey of the land where it had not already been surveyed.

14.20 The assessment of the effect on farm businesses involved a telephone discussion and over-the-fence field survey.

Assessment Criteria

14.21 The assessment of the effects on agricultural land and farm businesses has been carried out in three stages. First the sensitivity of the receptor is considered, followed by the magnitude of change. This then enables the significance of the impact or effect to be determined.

14.22 The methodology for determining the sensitivity of the receptors - agricultural land and farm businesses - is set out in Table 14.1. The sensitivity of these receptors is defined by the quality of the agricultural land and the scale of the farm business. BMV agricultural land is of national importance and accordingly of high significance, whilst poorer quality agricultural land (non-BMV) and farm businesses are of local importance and accordingly of medium or low sensitivity.

[93] Agricultural Land Classification: revised guidelines and criteria for grading the quality of agricultural land, MAFF, October 1988

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Table 14.1 Methodology for determining sensitivity of agriculture and soils related receptors

Sensitivity	Receptors
High	Land resources are matters of potentially national importance. National planning policy towards the development and protection of agricultural land is contained in paragraphs 174 and 175 of the NPPF. The effect on land resources is a combination of the quantum and quality of agricultural land affected, relative to both the national resource and the relative availability of land of that quality locally. Land resources that are of the best and most versatile quality should therefore be classified as being of high environmental value (sensitivity).
Moderate	Land that is of poorer quality, Grades 3b, 4 and 5, is of lower sensitivity and is afforded no special protection in the NPPF. It is nevertheless a finite resource of local importance and so is regarded as of moderate sensitivity. Full-time farm businesses are of medium sensitivity, as the way that farms are operated will vary over time according to ownership, security of tenure and local and international economic factors. Farm businesses are tolerant of some change without detriment to their character. Farms outwith the site boundary, if affected, are considered to be of medium sensitivity.
Low	Part-time farm businesses are of low sensitivity. The way that farms are operated will vary over time according to ownership, security of tenure and local and international economic factors. Farm businesses are tolerant of some change without detriment to their character.

14.23 The magnitude of change is then assessed against the criteria in Table 14.2 below.

Table 14.2 Methodology for determining magnitude of change to agriculture and soils receptors

Magnitude of Effect	Definition	
	Effects on Agricultural Land (soils)	**Effects on Farm Businesses (agricultural businesses)**
Major	The proposed development would directly lead to the loss of over 50 hectares of "**best and most versatile agricultural land**" (Grades 1, 2 and 3a) soil resources.	The impact of the development would render a full-time agricultural business non-viable.
Moderate	The proposed development would directly lead to the loss of between 20 and 50 hectares of "best and most versatile agricultural land" (Grades 1, 2 and 3a) soil resources.	The impact of the development would require significant changes in the day-to-day management of a full-time agricultural business, or closure of a part-time agricultural business. Loss of buildings or impacts on drainage or water supplies affecting the potential for at least 5 ha of adjacent land to be farmed fully.
Minor	The proposed development would directly lead to the loss of less than 20 hectares of "best and most versatile agricultural land" (Grades 1, 2 and 3a) soil resources or would directly lead to the loss of 5 ha or more of poorer quality agricultural land (Grades 3b, 4 or 5) and soil resources.	Land take would require only minor changes in the day-to-day management / structure of a full-time agricultural business or land take would have a significant effect on a part-time business. Minor effects, direct or indirect, on surrounding land beyond the boundaries of the site.
Negligible	The proposed development would directly lead to the loss of less than 5	Land take would require only negligible changes in the day-to-day management of a

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Magnitude of Effect	Definition	
	hectares of poorer quality agricultural land and soil resources.	full-time agricultural business or land take would require only minor changes to a part-time farm business.

14.24 The significance of the effects of the development will then be determined by the interaction of the magnitude of the impact and the sensitivity of the receptor, as set out in the matrix at Table 14.3.

Table 14.3 Methodology for determining sensitivity related to agriculture and soils

Magnitude of Impact	Sensitivity/Importance of Receptor		
	High	**Moderate**	**Low**
Major	Major	Moderate	Moderate-Minor
Moderate	Moderate	Moderate-Minor	Minor
Minor	Moderate-Minor	Minor	Minor - Negligible
Negligible	Negligible	Negligible	Negligible

Sources on Information

14.25 This assessment relies upon the published sources of information referred to, including historic agricultural land classification results, and the results of new field survey.

Assumptions

14.26 As part of the assessment, an area of land has been assumed to be of BMV quality, as no detailed field survey data exists.

Limitations

14.27 Part of the site has not been surveyed.

Baseline Conditions

14.28 The section provides more detailed topic specific information to describe the character of Sites A and B and their environs. This describes the quality of the interests as they relate to this environmental topic and serves as a comparative measure against which changes arising from the construction and operational phases of the proposed development can be assessed or predicted. This identifies the sensitivity of environmental receptors.

Agricultural Land Quality

14.29 The Agricultural Land Classification (ALC) system provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. The ALC system divides agricultural land into five grades. Grade 1 of the ALC is described as being of excellent quality and Grade 5, at the other end of the scale, is described as being of very poor quality. The current guidelines and criteria for ALC were published by MAFF in 1988.

Site A – Redevelopment of existing golf course

14.30 The golf course falls within the description of "non-agricultural" land in the ALC methodology, (MAFF, 1988). This describes such land as "*soft* uses where most of the land could be returned relatively easily to agriculture, including golf courses". This also includes mineral workings and refuse tips where restoration to soft uses may apply.

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Site B – Relocation of Golf Course

14.31 Some 49.1 ha of the site, being the larger southern parcel, was surveyed by ADAS Reading on behalf of MAFF in January 1993. That survey was under the current ALC methodology and remains valid. That survey identified that most of the site, 29.4 ha or 60%, was Subgrade 3b. Through the centre of the site was a band of Subgrade 3a, amounting to 14.9 ha (30%), and non-agricultural and woodland covered the rest of the site. This is set out in *Appendix 14.1 (Insert 5)*.

14.32 The land to the north had not been surveyed previously and therefore we carried out a detailed ALC survey in October 2021. This identified that 11.6 ha to comprise a complex mix of Grades 2, 3a and 3b (see *Appendix 14.1*, *Insert 6*).

14.33 Land to the northwest, amounting to 11.9 ha, has not been surveyed. As set out in *Appendix 14.1*, that area is shown as Grade 2 on the "provisional" ALC maps and falls within the high probability of BMV on the "predictive BMV" maps. It is assumed that this is BMV land for the purposes of this assessment.

14.34 To the east of the area surveyed by ADAS an area of woodland has been included in the Site and is included in the overall grading.

14.35 The combined ALC results for the two sites are set out as follows.

Table 14.4 Agricultural land classification results for Site B

Grade	Description	Area (ha)	Proportion (%)
2	Very good	1.7	2.2
3a	Good	21.1	27.2
3b	Moderate	33.1	42.6
	Woodland	8.7	11.2
NA	Non-Agricultural	1.1	1.4
N/S	Not surveyed	11.9	15.4
Total		**77.6**	**100**

14.36 The site comprises arable land forming part of a substantial farm unit, which is mostly arable. There are no farm buildings within the site, nor adjacent, and no farmland will be severed by the proposals.

14.37 The sensitivity of the environmental resources is Table 14.5.

Table 14.5 Summary of sensitivity of agricultural and soils receptors

Receptor/Resources	Sensitivity	Summary Reason
Land known to be of BMV quality (22.8 ha) and land assumed to be of BMV quality (11.9 ha)	High	This is the best quality land as defined in planning policy
Land of poorer quality (33.1 ha)	Moderate	This land is not provided with special protection but is nevertheless a finite resource
Full-time farm business	Moderate	Farms are affected by many factors and are usually able to tolerate some change

Note: the area of Woodland and Non-agricultural land measures 9.8 ha as set out in Table 14.4

Inherent and Standard Mitigation

14.38 This section describes those 'inherent' and 'standard' mitigation measures which primarily address the scope to avoid, reduce or remedy adverse environmental impacts or enhance the beneficial aspects arising from the construction and operational periods of the proposed development.

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Inherent Mitigation Measures

14.39 There are no effective measures to mitigate the loss of agricultural land as it is not possible to effectively translocate best and most versatile agricultural land to another location, nor elevate land quality elsewhere to compensate (e.g., turn subgrade 3b land to subgrade 3a by adding soil).

Standard Mitigation Measures

14.40 Soils have a number of important functions beyond the support and growth of plants. These include improved drainage and maintaining solution pathways, supporting ecosystems and providing green areas for communities to use and enjoy. In order to sustain these basic functions, it is important that appropriate consideration is given to the soil resource on any development site, as if it is not managed carefully during construction and ground preparation, these functions can be lost.

14.41 The "Construction Code of Practice for the Sustainable Use of Soils on Construction Sites" (Defra, 2009) is a practical guide to assist managers of construction sites to protect the soil resources that they work with. The Code is not legally binding but, by using it, the soil resource at a site may be enhanced and wider environmental benefits may be achieved. For example, careful movement of soil during ground preparation, including the timing of land work and the storage of soils for after use, will provide materials in better condition for landscaping and will also help natural site drainage. A Soils Management Plan is a requirement of the Local Plan and can be addressed by planning condition.

14.42 There are no effective measures to mitigate the loss of farmland for the occupying farm business. Careful design can minimise impacts of severance, but there are no such impacts involved in this case.

14.43 **Actionable Mitigation Measures**. Effects on agricultural land and soils, and farm businesses, occur at the construction phase. There are no additional effects during the operational phase, and no actionable mitigation measures are required.

Assessment of Environmental Impacts

14.44 This section provides an assessment of the nature, extent, magnitude of change that the proposed development will have on individual receptors identified in the baseline section. By employing the sensitivity of the receptor and magnitude of change, the significance of environmental effects which arise as a result of the construction and operational periods of the proposed development will be determined.

Site B – Relocation of Golf Course

14.45 This section considers the likely direct and indirect effects on agricultural land, soil resources and farm businesses, and whether any effects are permanent or temporary, positive or adverse.

Construction Phase

14.46 The effect on soil and agricultural land resources commences during the construction phase, as soon as the land has ceased to be used for agricultural purposes and the stripping of soil begins.

14.47 These effects on agricultural land are usually permanent. Accordingly, effects that take place at the construction phase typically continue throughout the operational phase, as they are permanent. These effects are also usually adverse. It may be that parts of the golf course could be returned to agricultural use in the future, if required, and that the impact is reversible. This can be covered in a soils Management Plan.

14.48 Whilst the Proposed Development involves the use of BMV land, the soil and inherent land quality is not significantly adversely affected. Golf courses tend to result in the loss, in practical terms, of BMV land, but the soil resource is not lost. Indeed, the soil resource is a key factor to the construction and successful use of a golf course.

14.49 The adverse effects on agricultural businesses commences at the start of the construction phase. In this case the effect is limited. The land is farmed by a local farming business and represents a small part of the overall farm business. The impact is adverse and permanent, and the receptor is a full-time farm business of medium sensitivity. The loss of approximately 68ha of agricultural land will have an adverse impact on the business, but

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given the scale of the overall farm business the proposed development will not have a significant effect on the day-to-day management or structure of the farm business.

Table 14.6 Summary of magnitude of change to agriculture and soils receptors at Site B

Receptor/Resources	Summary of Change to Receptor/Resource	Summary Reason
Loss of BMV agricultural land	Loss/reduced utility of up to 34.7 ha (22.8 ha known and 11.9 ha assumed) ha of BMV agricultural land	Moderate adverse
Loss of lower quality agricultural land	Loss of poorer quality land	Minor adverse
Effect on farm business	Minor day-to-day effects on full-time farm businesses	Minor adverse

14.50 The significance of this is shown in Table 14.7.

Table 14.7 Significance of environmental effect on agriculture and soil receptors at Site B

Receptor/Resources	Sensitivity	Magnitude of Change	Significance of Effect
BMV agricultural land	High	Moderate adverse	Moderate adverse, direct and permanent
Poorer quality agricultural land	Moderate	Minor adverse	Minor adverse, direct and permanent
Effect on full-time farm business	Moderate	Minor adverse	Minor adverse, direct and permanent

Operational Phase

14.51 The adverse impacts occur at the construction phase and are permanent. There are no additional operational phase impacts.

Actionable Mitigation

14.52 This section describes actionable mitigation to be employed to reduce the negative effects of the proposed development.

14.53 The soil resource within the golf course will be retained within the golf course so far as possible. A Soils Management Plan will be provided pursuant to a planning condition. Parts of the site are expected to be capable of return to agricultural use, if ever required. These will retain as much as possible of the soil resource, but will not prevent the loss of BMV agricultural land to agricultural use.

Residual Impact Assessment

14.54 This section identifies residual effects and their significance.

14.55 The Proposed Development will result in the permanent loss of 22.8 ha of Grades 2 and mostly Subgrade 3a agricultural land and an assumed 11.9 ha of BMV land. This is a moderate adverse significance effect. The area around Bognor Regis is all predicted to be mostly of BMV quality. In the local context this loss of good quality land is of reduced significance as a consequence.

14.56 As set out in *Appendix 14.1 (Insets 3 and 4)*, the land around Bognor Regis is generally high quality. The predictive BMV maps show most of the periphery as falling into the "high probability of BMV" except for much of this site which is shown as of "moderate probability (20 – 60% area BMV)", in accordance with the survey results.

14.57 Accordingly in policy terms and in respect of minimising the loss of BMV land, this is some of the poorest

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quality land available.

14.58 There is a small localised effect on the farming business that carries out the farming operations. The overall effect is a minor adverse effect.

Table 14.8 Residual effect on agriculture and soils receptors at Site B

Receptor/Resources	Significance of Effect	Mitigation (Actionable)	Residual Effect
Loss of BMV agricultural land	Major adverse	Minimise loss of soil resource	Moderate adverse
Loss of poorer quality agricultural land	Minor adverse	Minimise loss of soil resource	Minor adverse
Effect on full-time farm business	Minor adverse	None	Minor adverse

Cumulative Effects

14.59 This Section identifies and assesses the nature, extent, magnitude and significance of inter-project effects (i.e., effects from other development in combination with those from the proposed development).

14.60 Any adverse effects on agricultural land and occupying farm businesses are specific to, and limited to, Site B. Whilst other development identified in *Appendix 4.1* may affecting agricultural land, those effects are not directly related to the agricultural effects of the Proposed Development.

Summary

14.61 Site A is "non-agricultural land" in the ALC methodology and no agricultural land is lost as a consequence. The soils resource will be retained for reuse within the site as far as possible.

14.62 Site B is mostly agricultural land, with 9.8 ha of woodland and non-agricultural land within the study area. Of the agricultural land involved, 1.7 ha is classified as Grade 2 and 21.1 ha is classified as Subgrade 3a. A further 11.9 ha has not been surveyed but is assumed to be of BMV quality.

14.63 Due to the loss to agricultural use of up to 34.7 ha of BMV land this is a **permanent moderate adverse effect**. The land around Bognor Regis is generally of high quality and the majority of this site is the poorest quality available on the predictive ALC maps except for the areas generally affected by flooding.

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15 CLIMATE CHANGE (GREENHOUSE GASES)

Introduction

15.1 This Chapter of the ES provides an assessment of likely significant effects arising from the proposed development upon greenhouse gas (GHG) emissions arising from activities and traffic associated with both the construction and operational phases.

15.2 This chapter is concerned with the identification, management, and reduction of GHG emissions throughout the proposed development's lifecycle. GHG emissions are assessed and reported in EIAs to identify potential sources of emissions, enable an early and informed understanding of the proposed development's impacts, and ensure that the complexity and detail of assessment is proportionate to its size and nature.

15.3 GHG emissions have been calculated throughout the Project Reference Lifespan (2031-2090) over the operational phases. Where relevant data is available, a quantitative assessment has been completed, however, a qualitative assessment has been completed where there is an absence of data presently.

15.4 For the purposes of this Chapter, carbon dioxide is taken to be equivalent to the common greenhouse gases, as defined in the 1997 Kyoto Protocol.[94]

Potential Effects

15.5 This section summarises the likely potential effects of the proposed development on the environmental topic area.

Both Site A and Site B

15.6 The potential sources of GHG emissions associated with the Proposed Development are identified in Table 15.1. These are derived from the PAS20220 lifecycle stages[95]

Table 15.1 Potential sources of greenhouse gas emissions

Lifecycle scope	Phase	Justification
Product stage (manufacture and transport of raw materials to suppliers) A1-3	Construction	Embodied emissions associated with extraction and manufacturing of the required raw materials.
Transport of materials to site A4	Construction	Emissions from fuel and electricity used in vehicles transporting materials to site
Plant and equipment use during construction A5	Construction	Emissions from fuel and electricity used in plant and equipment on site
Transport of waste A5	Construction	Emissions from fuel and electricity used in vehicles transporting materials away from site
Disposal of waste A5	Construction	Emissions from the final disposal of waste materials.
Land use, land use change and forestry A5	Construction	Change in emissions associated with the clearance and disposal of biomass (cleared vegetation) due to the construction of scheme

[94] UNFCCC (1997) Kyoto Protocol
[95] PAS2080:2016 Carbon Management in Infrastructure

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Lifecycle scope	Phase	Justification
Maintenance, repair, replacement, refurbishment B2-5	Operation	Embodied emissions, and emissions from transport and plant associated with maintenance, repair, replacement, and refurbishment.
Operational energy use B6	Operation	Energy used for the operation of the Proposed Development (e.g. lighting)
Operational water use B7	Operation	Emissions associated with water use in the Proposed Development
Land use, land use change and forestry B8	Operation	Change in emissions associated with the existence of the scheme hindering or promoting the sequestration of carbon dioxide into biomass (for example through decrease or increase in the number of trees).
End-user emissions (regional traffic flows) - traffic B9/D	Operation	Vehicles using highways infrastructure constructed as part of the scheme
Decommissioning process C1	End of Life	Emissions from decommissioning work (i.e. fuel/electricity)
Transport and disposal of materials C2-4	End of Life	Emissions sources as fuel/energy consumption from the transport of materials to disposal sites or recovery.

Assessment Methodology

15.7 The section describes the methodology used to undertake the assessment within this Chapter.

Study Area

15.8 The GHG assessment is not restricted by geographical area but instead includes any increase or decrease in emissions as a result of the proposed development, wherever they occur. This includes:

- Construction emissions - from the Proposed Development footprint, but also related to the transport of materials to and from the Site and their manufacture (this may be distant from the Proposed Development location, for example emissions from the manufacture of steel); and
- Operational emissions - (increase or reduction) which result from the end-use of the Proposed Development. Such emissions include those for traffic using the Proposed Development as well as the surrounding regional road network to gain access, and the energy and water use of the buildings.

Consultation

15.9 No consultation was undertaken as part of this assessment.

Legislative / Planning Policy Context

15.10 The applicable legislative framework is summarised as follows:

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United Nations Framework Convention on Climate Change

15.11 The UK is a member of the United Nations Framework Convention on Climate Change (UNFCCC) [96] which drives international action on climate change. The UK has pledged to reduce emissions under the Paris Agreement97, as a part of a joint pledge by members of the European Union (EU). This provides an overarching commitment by the UK.

Glasgow Climate Pact (2021)

15.12 One of the outcomes of the Conference of the Parties (COP26) was the Glasgow Climate Pact.[98] This highlighted the impacts of human activities on the climate, and "stresses the urgency of enhancing ambition and action in relation to mitigation, adaptation and finance in this critical decade". The report also states that to keep global warming within 1.5 °C above pre-industrial levels there will need to be "rapid, deep and sustained reductions in global greenhouse gas emissions", including a phasedown of coal use.

Directive 2014/52/EU on Assessment of The Effects of Certain Public and Private Projects on The Environment (The EIA Directive)

15.13 The EIA Directive[99] provides the overarching legislative framework for assessing the significance of impacts and effects from schemes on the environment. The Directive requires EIA to identify, describe and assess the direct and indirect significant effects of a project on the climate (Article 3). It also stipulates that the information to be included within the EIA report should include the 'impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change'.

The Climate Change Act 2008 (2050 Target Amendment)

15.14 The 2019 amendment to the Climate Change Act 2008[100] established a legal requirement for reaching net zero GHG emissions in the UK economy by 2050. This is reflected in the UK Net Zero Strategy[101]. The 2008 Act also created the Committee on Climate Change[102], with a responsibility for: Setting five-year carbon budgets, advising and scrutinising the UK Government's associated climate change adaptation programmes and producing a national adaptation plan for the UK Government to implement.

15.15 Key provisions of the Act in respect of climate change mitigation include the requirement for the government to set legally binding carbon budgets capping the amount of GHG emitted in the UK over a 5-year period, as set out in Table 15.2.

Table 15.2 National carbon budgets set by the UK Government (MtCO2e)

Carbon Budget Period[103]	UK Carbon Budget
Third: 2018-2022	2,544 MtCO2e
Fourth: 2023-2027	1,950 MtCO2e
Fifth: 2028-2032	1,725 MtCO2e

[96] United Nations Framework Convention on Climate Change. Available at https://unfccc.int/
[97] United Nations (2015) Paris Agreement. Available at: https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf
[98] UNFCCC (2021) Glasgow Climate Pact. Available at: https://unfccc.int/sites/default/files/resource/cma2021_L16E.pdf
[99] Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effect of certain public and private projects on the environment (2014). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0052&from=EN
[100] Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effect of certain public and private projects on the environment (2014). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0052&from=EN
[101] Department for Business, Energy & Industrial Strategy (2021) Net Zero Strategy: Build Back Greener. Available at: https://www.gov.uk/government/publications/net-zero-strategy
[102] Committee on Climate Change. Available at: https://www.theccc.org.uk/
[103] Department of Business, Energy & Industrial Strategy (2021) Carbon Budgets. Available at: https://www.gov.uk/guidance/carbon-budgets#setting-of-the-sixth-carbon-budget-2033-2037

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Carbon Budget Period[103]	UK Carbon Budget
Sixth: 2033-2037	965 MtCO2e

Infrastructure Carbon Review

15.16 In 2013, the UK Government published the Infrastructure Carbon Review[104]*, aiming to "release the value of lower carbon solutions and to make carbon reduction part of the DNA of infrastructure in the UK." Major infrastructure owners, operators and developers were invited to endorse, become signatories and make commitments under the review.*

15.17 The review provided increased emphas*is on 'capital carbon' (GHG emissions associated with raw materials, activities and transport for construction, repairs, replacement, refurbishment and de-construction of infrastructure) while acknowledging that 'operational carbon' (associated with energy consumption for the operation and use of infrastructure) will continue to dominate overall emissions to 2050 and beyond.*

15.18 The Infrastructure Carbon Review *highlighted the importance of assessing GHG emissions early in the lifecycle of an infrastructure scheme when there is the greatest carbon reduction potential. The assessment presented in this chapter provides an assessment of the Proposed Development early in its lifecycle.*

National Planning Policy Framework and Future Homes Standard

15.19 The National Planning Policy Framework (NPPF)7 sets out the core planning principle of supporting "the transition to a low carbon future in a changing climate…":

15.20 Chapter 9: Promoting Sustainable Transport - considers how people should be offered a choice of transportation modes, encouraging a movement away from the use of single private vehicles, the latter being understood to contribute to a significant proportion of total UK carbon emissions. For example, between 1990 and 2007, domestic transport comprised 24% of total UK emissions; the largest share was from road passenger cars at 86%8. In 2013, domestic and international transport accounted for 26% of all UK greenhouse gas emissions.

15.21 Chapter 14 of the NPPF concerns planning for climate change. New development should be planned in ways that can help reduce greenhouse gas emissions, sic as through its location, orientation and design. Local requirements for the sustainable of buildings should reflect the Government's policy for national technical standards. The Government is preparing a Future Homes Standard which has been the subject of public consultation. In 2021, the Government indicates that it would revise the Building Regulations in 2022 to improve energy efficiency and reduce carbon emissions. This will be followed by the introduction of the Future Homes Standards in 2025 intending to achieve further reductions in emissions in anticipation of the decarbonization of the electricity grid.[105]

Arun Local Plan

15.22 Arun District Council has two documents to inform the design of developments; Adopted Arun Local Plan (2018), and the Arun District Design Guide Supplementary Planning Document (SPD, 2021). The following policies are particularly relevant to this chapter:

15.23 Local Plan Policy ECC SP2: Energy and climate change mitigation encourages all new residential development to be energy efficient and incorporate measures such as renewable and low carbon energy. Major development should produce 10% of the total predicated energy requirements from such sources.

15.24 The Design Code includes the following principles:

- E.01 Using the Site's Features & Natural Resources: Consider passive solar design, renewable energy generation or rainwater collection (SPD, pg. 46).
- I.02 Electric Vehicles: Provide designated parking bays and charging points for ultra-low emission vehicles

104 UK Government (2013) Infrastructure Carbon Review
[105] Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (2021) The Future Buildings Standard

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to promote and support their uptake. (SPD, pg.80).

- K.01 Energy & Carbon: Maximise energy efficiency and minimise whole life carbon. Approaches to design must demonstrate that each step of the energy hierarchy … has been followed (SPD, pg.100).

Guidance

15.25 The following guidance documents have been used during the preparation of this chapter:

- IEMA's (2017) Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance[106]
- Highways England (2019) Design Manual for Roads and Bridges (DMRB) LA114 Climate[107]
- TAG Unit A3 Environmental Impact Appraisal - Chapter 4 Greenhouse Gases108
- PAS2080:2016 Carbon Management in Infrastructure [95]
- RICS Whole Life Carbon Assessment for the Built Environment[109]
- RIBA Embodied and Whole Life Carbon Assessment for Architects[110]

Assessment Process

Scoping of the assessment

15.26 Based on the emissions sources identified in Table 15.1 and using IEMA guidance, professional judgement has been used to determine which sources to consider in the ES.

15.27 The effect of the PAS 2080[95] lifecycles scoped into the assessment on climate and their study areas are explored in Table 15.3.

Table 15.3 Lifecycle stages within the scope of assessment

Lifecycle scope	Phase	Justification
Product stage (manufacture and transport of raw materials to suppliers) A1-3	Construction	Raw materials required for the Proposed Development will result in embodied emissions and have the potential to be large.
Transport of materials to site A4	Construction	Construction stage emissions from fuel / energy consumption due to the delivery of material to site have the potential to be large.
Plant and equipment used during construction A5	Construction	Fuel / energy consumption of plant and equipment used during construction would generate GHG emissions.
Transport of waste A5	Construction	Emissions from fuel / energy consumption due to the transport of waste materials, particularly fill, have the potential to be large.
Maintenance B2	Operation	The Proposed Development may require maintenance activities which would release emissions.

[106] IEMA's (2017) Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance
[107] Design Manual for Roads and Bridges (DMRB), Sustainability & Environment Appraisal, LA114 Climate, Revision 0, October 2019. Published by Highways England.
[108] UK Government (2021) TAG unit A3 environmental impact appraisal
[109] RICS (2017) Whole life carbon assessment for the built environment
[110] RIBA (2019) Whole life carbon assessment for architects

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Lifecycle scope	Phase	Justification
Replacement B4	Operation	The replacement of the Proposed Development (such as resurfacing) would release emissions.
B6 Operational energy use	Operation	Emissions from operational energy use within the Proposed Development have the potential to be large, for activities such as: Heating (Residential) Lighting (Residential) EV charge point infrastructure Lighting (Road)
Operational water use B7	Operation	Emissions from operational water use in the Proposed Development have the potential to be large, due to the quantity of water which could be used in the residential development, and golf course irrigation.
End-user emissions (regional traffic flows) - traffic B9/D	Operation	Changes to regional traffic flows are expected and this has the potential to result in a large change in GHG emissions.

15.28 The effect of the PAS 2080[95] lifecycles scoped out of the assessment on climate and their study areas are explored in Table 15.4.

Table 15.4 Lifecycle stages outside of the scope of assessment

Lifecycle scope	Phase	Justification
Disposal of waste A5	Construction	Emissions from the disposal of waste are unlikely to be large, as the waste types are likely to be inert.
Land use, land use change and forestry A5	Construction	Emissions from the disposal of biomass are not expected to be large, as the Scheme aims to use felled timber on site.
Repair and Refurbishment B3, B5	Operation	Schemes do not typically design for repair and refurbishment, therefore these activities are unlikely to take place.
Land use, land use change and forestry B8	Operation	The change in carbon sequestration due to the Proposed Scheme is not considered to be large, as there are not expected to be large numbers of trees, or mudflats/bogs affected by the Proposed Development.
Decommissioning process C1	End of life	Expected timescales for decommissioning are so far into the future that there is insufficient certainty about the likelihood, type or scale of emissions activity to determine their likely magnitude, even if they take place at all. As such these emissions sources will not be considered.
Transport and disposal of materials C2-4	End of life	

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Method of Baseline Data Collation

15.29 For the baseline scenario (Do Minimum) there will be no construction emissions, so no assessment is needed.

15.30 The GHG assessment for end-user traffic emissions has been undertaken through a desk study using baseline traffic data using the methodology outlined below.

Assessment Methodology

Construction Phase

15.31 Due to lack of available data at this early design stage, a qualitative appraisal of the likely construction emissions sources from the proposed development has been undertaken informed by PAS2080 guidance[95], consideration of DMRB LA114[107], and IEMA guidance [95], along with professional judgement and experience of similar projects.

Operational Phase

15.32 End-user vehicle emissions were calculated in accordance with DMRB Volume 11, Section 3, Part 14 Climate; LA114[107]. Emissions were quantified using WebTAG data from the Department of Transport[111]. This took into account the proportions of the vehicle types, fuel type, forecast fuel consumption parameters and emission factors. From this, emissions were quantified for each year over the lifetime of the proposed development (2031-2090).

15.33 The likely operational emissions from other sources (e.g., building operational emissions) have been assessed qualitatively due to a lack of quantitative data at this design stage.

Assessment Criteria

15.34 The significance of GHG impacts has been assessed in line with IEMA best practice guidance and through comparing estimated GHG emissions arising from the Proposed Development and the respective UK carbon budgets covering 2018 to 2037 (Table 15.2). The budgets are expressed in millions of tonnes of carbon dioxide equivalents (MtCO2e). As such the magnitude of emissions, in conjunction with guidance from IEMA's *Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance* and knowledge of similar schemes have been used to inform the professional judgement of significance.

Assumptions and Limitations

15.35 The following assumptions and limitations exist in preparing this assessment.

- In EIA, there is currently no specific carbon *emissions threshold, which, if exceeded, is considered significant. Professional judgement and current guidance have been used to derive findings in this assessment.*
- The opening year for the Proposed Development has been modelled from the year 2031.
- This assessment has been completed based on cur*rent available information regarding the scale and nature of the Proposed Development.*
- Due to design stage of the project a full bill of quantities and other data on the construction and operation activities is not currently available therefore a qualitati*ve assessment has been undertaken for these elements.*
- The 'do minimum' scenario for the traffic emissions was taken to include "baseline + committed planning" as this reflects the most likely 'do minimum' scenario for the Proposed Development, however this means there is some uncertainty dependent on the progression of the committed developments.
- There will be some uncertainty regarding traffic data as the model is based on traffic assumptions that project into the future.
- The assessment considers both sites A and B for the end-user traffic emissions calculations, and the for the qualitative assessment of the rest of the scheme.

[111] Department for Transport (2021) TAG Data Book

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- The design life of the Proposed Development is assumed to be 60 years.

Baseline Conditions

15.36 The section provides more detailed topic specific information to describe the character of Sites A and B and their environs. This describes the quality of the interests as they relate to this environmental topic and serves as a comparative measure against which changes arising from the construction and operational phases of the proposed development can be assessed or predicted. This identifies the sensitivity of environmental receptors.

Both Sites

15.37 In the baseline (Do Minimum) scenario, GHG emissions occur constantly and widely as a result of human and natural activity including energy consumption (fuel, power), industrial processes, land use and land use change. The GHG assessment only considers instances in which the Scheme results in additional or avoided emissions in comparison to the baseline scenario and its assumed evolution. The baseline conditions therefore focus on those emissions sources subject to change between the baseline scenario and the Scheme. However, transport emissions from 2019 within West Sussex, and Nationally are presented in Table 15.5 for context.[112]

Table 15.5 Transport emissions for West Sussex and nationally

Category	West Sussex	% of national emissions	National (ktCO2)
I. Road Transport (A roads)	748.5	1.5%	49,580.9
J. Road Transport (Motorways)	80.3	0.3%	27,602.4
K. Road Transport (Minor roads)	593.7	1.4%	42,886.2
L. Diesel Railways	11.9	0.7%	1,794.2
M. Transport Other	78.0	3.2%	2,439.8
Transport Total	1,512.2	1.2%	124,303.4

15.38 Without the Proposed Development, construction would not take place, and as such there are no baseline emissions. The future baseline scenario involves no construction activities and therefore the future construction baseline is also zero emissions.

15.39 The operation and management of the existing assets on Site A under the baseline scenario are likely to require a small number of components, and small amounts of bulk materials for minor works and repairs to the golf course. These materials would have embodied emissions associated with them, and the installation of these materials would result in emissions due to the transport of these materials, and plant use. These baseline emissions are expected to be small, and as such have not been quantified. On Site B, which is currently agricultural land, the operational emissions are also expected to be negligible.

15.40 The baseline for operational end users' emissions from the Proposed Development comprises the 'Do Minimum' scenario, and so the baseline reflects the existing (+committed) conditions. The future baseline is where the Proposed Development is not constructed, and emissions are generated by end users under the existing (+committed) conditions.

15.41 The total baseline end-user emissions are presented in Table 15.6 for the year 2031 (the first operational year of the Proposed Development) and the future modelled years 2036 and 2046. In addition, the average annual and total GHG emissions from 2031 to 2090 are presented for comparison with the 60-year operational period of the Proposed Development.

[112] Department for Business, Energy & Industrial Strategy (2021) UK local authority and regional carbon dioxide emissions national statistics: 2005 to 2019. Available at: https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-to-2019

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Table 15.6 Baseline operational stage emissions

Scenario		Total GHG emissions for traffic in the strategic and local road network (tCO_2e)			
	2031 (operational year)	2036 (future year)	2046 (future year)	Average per year (2031-2090)	Total (2031-2090)
Baseline ('Do Minimum')	11,527	10,021	8,421	8,776	526,566

Inherent and Standard Mitigation

15.42 This section describes those 'inherent' and 'standard' mitigation measures which primarily address the scope to avoid, reduce or remedy adverse environmental impacts or enhance the beneficial aspects arising from the construction and operational periods of the proposed development.

Site A – Redevelopment of existing golf course

15.43 The proposed development will be required to meet the standards in Building Regulations at the time of implementation, which is expected to include Future Homes Standard.

15.44 There is the potential for some on site renewables as part of the residential development and will be designed to enable the future integration of low carbon technologies.

15.45 There will be provision for EV parking, in line with local policy.

Site B – Relocation of Golf Course

15.46 No confirmed mitigation measures for the Golf Course.

Assessment of Environmental Impacts

15.47 This section provides an assessment of the nature, extent, magnitude of change that the proposed development will have on individual receptors identified in the baseline section. By employing the sensitivity of the receptor and magnitude of change, the significance of environmental effects which arise as a result of the construction and operational periods of the proposed development will be determined.

Both Site A and Site B

Construction Phase

15.48 The likely sources of GHG emissions arising from the construction phase are material use, transport of materials to site, plant and equipment use, and transport of waste from site. Without data it is not possible to quantify the GHG emissions associated with this phase at the present time, however, based on professional judgement, experience of projects of a similar nature and referring to guidance from IEMA it is anticipated that this will lead to minor significant emissions.

Operation phase

15.49 The total anticipated traffic GHG emissions are presented in Table 15.7 for the year 2031 (the first year of operation for the Proposed Development) and the years 2036 and 2046 (the future modelled year). In addition, the average annual and total GHG emissions based on a 60-year operational period of 2031 to 2090 are presented. The baseline figures (without the Proposed Development) are included for comparison.

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Table 15.7 Operational emissions arising from traffic

Scenario	Total GHG Emissions for Traffic in the Strategic and Local Road Network (tCO_2e)				
	2031 (operational year)	2036 (future year)	2046 (future year)	Average per year (2031-2090)	Total (2031-2090)
Baseline Traffic Emissions ('Do Minimum')	11,527	10,021	8,421	8,776	526,566
Proposed Development ('Do Something')	11,827	10,266	8,607	8,975	538,523
Difference	300	245	186	199	11,957

15.50 The total traffic GHG emissions for the operational lifespan of the Proposed Development are 11,957 tCO_2e more (>2.4%) than the baseline scenario.

15.51 The additional likely emissions sources for the operational phase:

- The maintenance and replacement of the assets on both sites, including maintenance of the built assets and resurfacing of the roads.
- Operational energy use, including energy use within the residential buildings and the golf course buildings (including EV charging), and road lighting.
- Operational water use within the built assets and for irrigation of the golf course.

15.52 Emissions will occur during the operational phase from the embodied carbon of materials used in maintenance and replacement of the assets on both sites, and the transport of these materials to site. Based on professional judgement, experience of projects of a similar nature and referring to guidance from IEMA, it is anticipated that this will lead to minor significant emissions.

15.53 Emissions will occur during the operational phase from operational energy use. Based on professional judgement, experience of projects of a similar nature and referring to guidance from IEMA, it is anticipated that this will lead to minor significant emissions.

15.54 Emissions will occur during the operational phase from operational water use. Based on professional judgement, experience of projects of a similar nature and referring to guidance from IEMA, it is anticipated that this will lead to minor significant emissions.

15.55 The effect of the proposed development on greenhouse gas emissions is therefore considered to **minor direct, permanent, long term and adverse (negative)**

Actionable Mitigation

15.56 This section describes actionable mitigation to be employed to reduce the negative effects of the proposed development.

15.57 The identification of actionable mitigation employed where applicable to reduce the GHG emissions of the proposed development are outlined in Table 15.8.

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Residual Impact Assessment

15.58 This section identifies residual effects and their significance.

Both Sites.

Table 15.8: Assessment of residual effects on greenhouse gas emissions

Receptor/ Resources	Significance of Effect	Mitigation (Actionable)	Residual Effect
Climate (construction)	Minor (significant)	The following mitigation measures are recommended during construction: • Design optimisation to reflect the carbon reduction hierarchy (detailed below and found in clause 6.1.4 of PAS:2080:2016): • Reduce the number of construction elements required for the Proposed Development; and • Reduce the quantity of construction materials and excavation. • Substitute construction elements for lower-carbon alternatives (e.g. specifying concrete with a higher portion of ground-granulated blast-furnace slag (GGBS) content); • Using more efficient construction plant and delivery vehicles, and/or those powered by electricity from alternative/lower carbon fuels; contractor to ensure high performance of plant and equipment through strong record of, and ability to ensure correct maintenance and servicing of vehicle fleet to avoid polluting emissions; • Minimise embodied carbon in supply chain by specifying materials and products with reduced embodied GHG emissions. This would include through material substitution, recycled or secondary content and from renewable sources; • Select and engage with material suppliers and construction contractors considering their policies and commitments to reduction of GHG emissions, including actions to reduce embodied emission in materials; • Maximise the local sourcing of materials and local waste management facilities; • The contractor having policies and management protocols in place to avoid idling of engines, spills of fuels (e.g. when refuelling) and safe/environmentally sensitive driving techniques to maximise fuel saving; and • Designing, specifying and constructing the Proposed Development with a view to maximising the potential for reuse and recycling of materials / elements at the end-of-life stage.	Whilst the application of the mitigation measures outlined would reduce GHG emissions it is not expected to alter the significance of effects, noting that IEMA guidance states that all GHG emissions are significant. Therefore, with the application of these mitigation measures, the residual effect of GHG emissions during the construction phase would remain Minor Adverse.
Climate (operation)	Minor (significant)	The following mitigation measures are recommended during operation: • Opportunities to sequester carbon through increased tree planting. • Use low carbon road surface options, informed using the carbon reduction hierarchy. • Use LED fittings in the buildings • Install water limitation fittings	Whilst the application of the mitigation measures outlined would reduce GHG emissions it is not expected to alter the significance of effects, noting that IEMA guidance states that all GHG emissions are significant. Therefore, with the

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Receptor/ Resources	Significance of Effect	Mitigation (Actionable)	Residual Effect
		• Employ circular economy principles to waste management • Continue to investigate the feasibility of installing renewable energy fittings on-site e.g. PV	application of these mitigation measures, the residual effect of GHG emissions during the operation phase would remain Minor Adverse.

Cumulative Effects

15.59 This Section identifies and assesses the nature, extent, magnitude and significance of inter-project effects (i.e., effects from other development in combination with those from the proposed development).

15.60 The impacts of greenhouse gases (GHG) emissions, in terms of their contribution to climate change, are global and cumulative in nature, with every tonne contributing to impacts on natural and human systems.

15.61 There is an overwhelming scientific consensus that the major increase in the atmospheric concentration of GHGs since the industrial revolution, is contributing to climate change. It is the increase in concentrations of GHGs in the global atmosphere due to all GHG causing human activities that cause climate change. As such it is the cumulative effect of all GHG-emitting human activities that cause climate change, and therefore the assessment of the GHGs due to the Scheme implicitly assesses the cumulative effect of GHG emissions.

15.62 Therefore, the quantification of emissions from the Scheme in the assessment of significance or effects inherently assesses the combined and cumulative impacts.

Summary

15.63 IEMA guidance suggests that all GHG emissions are significant in the absence of any significance criteria or defined threshold.

15.64 Based on professional judgement, the overall GHG emissions generated during the construction phase of the Proposed Development across both sites are anticipated to have a minor significant effect. Emissions during the operation across both sites of the Proposed Development are anticipated to have a minor significant effect.

15.65 The mitigation outlined in Table 15.8 is expected to reduce GHG emissions due to construction and operation of the Proposed Development. Whilst the application of the mitigation measures would reduce GHG emissions it would not alter the significance of effects, noting that IEMA guidance states that all GHG emissions are significant. Therefore, with the application of the above mitigation measures, the residual effect of GHG emissions from the combined Proposed Development during both construction and operation would remain **minor adverse**.

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16 CLIMATE RESILIENCE

Introduction

16.1 This Chapter of the ES reports the outcome of the assessment of likely significant effects of climate change on the proposed development.

16.2 Climate resilience is different to most other environmental disciplines, including the assessment of GHG emissions, in that it is the potential effects of the environment (future climatic conditions) on the proposed development that is being assessed, i.e., rather than the effects of the proposed development on the environment. In the case of climate resilience, climate is part of the context in which the proposed development exists, rather than a receptor. The proposed development and its components are the receptor as it is affected by climate.

Potential Effects

16.3 This section summarises the likely potential effects of the proposed development on the environmental topic area.

16.4 Potential effects to the construction and operation stage of the proposed development as a result of climate change are summarized in Table 16.1. The significance of these effects are assessed further into this chapter.

Table 16.1 Potential effects from climate change that could impact on the proposed developments

Climate Variable	Potential Effect
Construction	
Extreme Precipitation including snow and ice	• Flooding and damage to materials and equipment on site. Impacting construction and delaying the timeline of the development. • Overwhelming of site drainage • Disruption to site access due to flooding • Snow and ice presenting hazardous conditions for workforce
Extreme Temperature	• Risk of overheating and damage to equipment and materials. • Heatstroke risk to workforce from high temperatures.
Wind and Storms	• Damage to materials and equipment caused from high winds. • Risk presented to construction works working at high elevations above ground level.
Operation	
Extreme Precipitation and sea level rise	• Drainage infrastructure overwhelmed, leading to surface water flooding and scour of buildings • Water ingress into electronic components • Water ingress into materials, deteriorating their structure and composition. • Waterlogging of green infrastructure, resulting in vegetation and ground/soil failure.
Extreme Temperature	• Overheating and uncomfortable conditions within buildings • Death of vegetation and landscaped areas through scorching
Wind And Storms	• Damage to infrastructure and planting from high winds requiring restoration works.

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Assessment Methodology

16.5 The section describes the methodology used to undertake the assessment within this Chapter.

Study Area and Project Receptors

16.6 The study area for the assessment is the application boundary of both Sites A and B. The assessment has therefore been undertaken for the following receptors that are part of the proposed development:

Construction (Site A & Site B)

- Materials, including their storage
- Workforce
- Site compounds, including site access road and temporary drainage
- Plant and equipment.

Operation (Residential Scheme - Site A)

- **Buildings:** 480 new residential dwellings and the re-purposing of the existing golf club house as a community hub facility
- **Green infrastructure:** Proposed open space and green infrastructure - to feature trees, woodland, hedgerows, growing areas, play areas and SUDs
- **Road and access:** The road network within the Proposed development, the dedicated emergency vehicle access route and car parks on the site, including the retention of existing public rights of way
- **Site wide drainage:** Existing ditch and drainage networks[113]
- **Electric vehicle (EV) infrastructure**.

Operation (Golf Course Scheme - Site B)

- **Green infrastructure:** The new golf course and associated landscaping and natural drainage
- **Buildings:** The club house, and maintenance and practice facilities.

16.7 The assessment for Site A and Site B will, hereafter, be combined within the following receptor groups:

- Buildings (Site A and Site B);
- Green infrastructure (Site A and Site B);
- Road and access (Site A only);
- Site wide drainage (Site A only); and
- EV infrastructure (Site A only).

Consultation

16.8 No consultation was undertaken as part of this assessment.

Legislative / Planning Policy Context

16.9 The applicable legislative framework is summarised as follows:

[113] Whilst the existing ditch and drainage networks on Site A are not 'new' aspects of the Proposed development, they are considered of high importance to the operation of the development and have the potential to be vulnerable to climate change. These assets are therefore are included in this assessment.

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UK Climate Change Act 2008 (2050 Target Amendment) Order 2019

16.10 In addition to the emissions targets (as highlighted in the GHG chapter), The Climate Change Act 2008 created the Committee on Climate Change, with a responsibility for:

- Advising and scrutinising the UK Government's associated climate change adaptation programmes; and
- Producing a national adaptation plan for the UK Government to implement.

National Planning Policy Framework

16.11 Chapter 14: Meeting the challenge of climate change, flooding and coastal change establishes that Local Planning Authorities "should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures"..

Adopted Arun Local Plan (2018)

16.12 The Arun Local Plan 2011-2031 sets out the vision for the future of Arun, which will protect those aspects of the District which are important by virtue of heritage, culture or otherwise valued by local people. The Plan will also facilitate future growth to meet local need and address wider issues of sustainable development, including the challenges presented by climate change.

16.13 Policies of relevance to this assessment include :

- Policy ECC SP1: 'Adapting to climate change', which states a priority to the support of development which is located and appropriately designed to adapt to impacts arising from climate change. Focal issues of the policy include location, water efficiency, shade/cooling/ventilation/solar gain, connectivity to green infrastructure, layout and massing, resilience of buildings and building materials to extreme weather and capacity of drainage systems.

2018 Arun District Design Guide Supplementary Planning Document[114]

16.14 In response to the Adopted Arun Local Plan (2018), the Arun District Design Guide has been prepared as part of the Council's commitment to secure the highest quality new development within the District. Guidance of relevance to this assessment includes:

- Policy ECC SP1: 'Adapting to climate change'
- Policy K.03 Climate Change & Sustainability: Adapting to Climate Change – focussing on designing for resilience and adaptability to climate change to ensure the future-proofing of developments

Guidance

16.15 The following guidance documents have been used during the preparation of this chapter:

- IEMA Environmental Impact Assessment guide to Climate Change Resilience and Adaptation;
- European Commission (2016) Climate change and major projects;
- European Commission Non-paper Guidelines for Project Managers: Making vulnerable investments climate resilient; and
- Design Manual for Roads and Bridges (DRMB) LA 114 Climate.

Assessment Process

16.16 The assessment process comprises the identification of the sensitivity of magnitude of climate hazards on the

114 Arun District SPD (2018). Available at: Supplementary planning information | Arun District Council

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Proposed development receptors.

16.17 As stated in IEMA's EIA guidance, an assessment of the impact on the Proposed development relies on the interaction between:

- The sensitivity of the environmental receptor; and
- The magnitude of change to that environmental receptor.

16.18 The sensitivity of receptors is analysed with respect to collated baseline information and is classified in a table using criteria set out in Table 16.2.

Table 16.2 Criteria for determining sensitivity of receptors to climate change effects

Sensitivity	Descriptor
High	The receptor has little ability to absorb change without fundamentally altering its present character, or is of international or national importance
Moderate	The receptor has moderate capacity to absorb change without significantly altering its present character, or is of high importance
Low	The receptor is tolerant of change without detriment to its character, is of low or local performance

16.19 Magnitude of change is the extent to which environmental receptors on the Proposed development will alter as a result of impacts from climate.

16.20 When assessing the magnitude of change, the scale, duration, timing and extent of effects, as well as the degree of certainty in the prediction of impacts and the likelihood of irreversible changes occurring have all been considered.

16.21 The magnitude descriptors in Table 16.3 have been prepared in line with the DMRB and the IEMA EIA guidance on Climate Change Resilience and Adaptation.

Table 16.3 Criteria for determining magnitude of change to receptors sensitive to climate change effects

Magnitude of Change	Criteria for Assessing Impact
Major	Permanent damage. Damage to structures or resources, access obstruction or disruption lasting more than ten days. Early renewal of >90% infrastructure. Severe health effects and/or fatalities. Significant repair costs.
Moderate	Extensive damage. Damage to structures or resources, access obstruction or disruption lasting more than three, but less than ten, days. Early renewal of 50-90% of infrastructure and related features. Severe health effects. Effect on the environment, requiring remediation. Significant repair costs.
Minor	Limited damage to structures or resources, access obstruction or disruption damage with damage recoverable by maintenance or minor repair. Lasting more than one, but less than three, days. Adverse effects on health and/or the environment. Moderate repair costs.
Negligible	Localised disruption, damage to structures or resources, access obstruction or disruption. No permanent damage, though minor restoration work required: disruption lasting less than one day. Slight adverse health or environmental effects. Minor repair costs.

Assessment Criteria

16.22 The determination of significant effects is undertaken by comparing an assessment of receptor sensitivity (Table 16.2) and the magnitude of change (Table 16.3), by using the significance of effects thresholds information in Table 1616.416.4.

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Table 1616.4 Matrix to determine significance of effect

Magnitude of Change	Sensitivity of Receptor/Resource		
	High	Moderate	Low
Major	Major	Major-Moderate	Moderate-Minor
Moderate	Major-Moderate	Moderate-Minor	Minor
Minor	Moderate-Minor	Minor	Minor-Negligible
Negligible	Negligible	Negligible	Negligible

16.23 Effects considered to be **Moderate-Minor, Major-Moderate and Major** are considered **significant** for Climate Resilience. Conversely, effects identified as **Minor, Minor-Negligible or Negligible** are considered **not significant**.

Sources of Information

16.24 The baseline data collected and presented in this chapter were obtained by desk study, from a combination of publicly and privately available data sources, as follows:

- State of the UK Climate (2021)[115] (existing baseline);
- Climate of the UK: observed trends[116] (existing baseline);
- Met Office Regional Climate Profile for the South East of England[117] (existing baseline); and
- UK Climate Projections 2018 (UKCP18)[118] (future baseline).

Assumptions & Limitations

16.25 To ensure transparency within the EIA process, the following assumptions and limitations have been identified:

- UKCP18 projections have been used to infer future changes in a range of climate variables that may affect the resilience of the Proposed development to climate change. At the time of writing, these represent the most up-to-date representation of future climate in the UK. However, the UKCP18 data currently available does not provide data for drought, snow and ice, or wind.
- In general, there are inherent uncertainties associated with climate projections and they are not absolute predictions of the future. It is possible that future climate will differ from the future baseline climate against which the resilience of the Proposed development has been assessed, depending on global emissions over the next century. A 'high' emissions scenario (RCP 8.5) using the 2080s time slice (2070 – 2099 - the longest temporal scale available through UKCP18) has been used to develop the baseline against which resilience has been assessed. This is consistent with the precautionary principle i.e. 'worst case' scenario.
- Any further research, analysis or decision-making on the Proposed development should take account of the accuracies and uncertainties associated with climate projections. It is also important to note that the analysis is based on selected observational data, the results of climate model, and a selected range of existing climate change research and literature available at the time of the assessment. Any future decision-making based on this analysis should consider the range of literature, evidence and research available at that time and any changes therein.

[115] Kendon, M., McCarthy, M., Jevrejeva, S., Matthews, A., Sparks, T., & Garforth, J. (2021). State of the UK Climate 2020. International Journal of Climatology, 41, 1-76..
[116] Met Office UK (2019) UK Climate maps and data. Available at: https://www.metoffice.gov.uk/research/climate/maps-and-data
[117] Met Office (2018) Midlands: Climate. Available at: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/regional-climates/midlands_-climate---met-office.pdf
[118] Met Office (2018) UK Climate Projections 2018. Available at: https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index

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Baseline Conditions

16.26 The section provides more detailed topic specific information to describe the character of Sites A and B and their environs. This describes the quality of the interests as they relate to this environmental topic and serves as a comparative measure against which changes arising from the construction and operational phases of the proposed development can be assessed or predicted. This identifies the sensitivity of environmental receptors.

16.27 Due to the relative proximity of both Site A and Site B (at a regional scale), the baseline conditions identified in this section of the chapter apply equally to both.

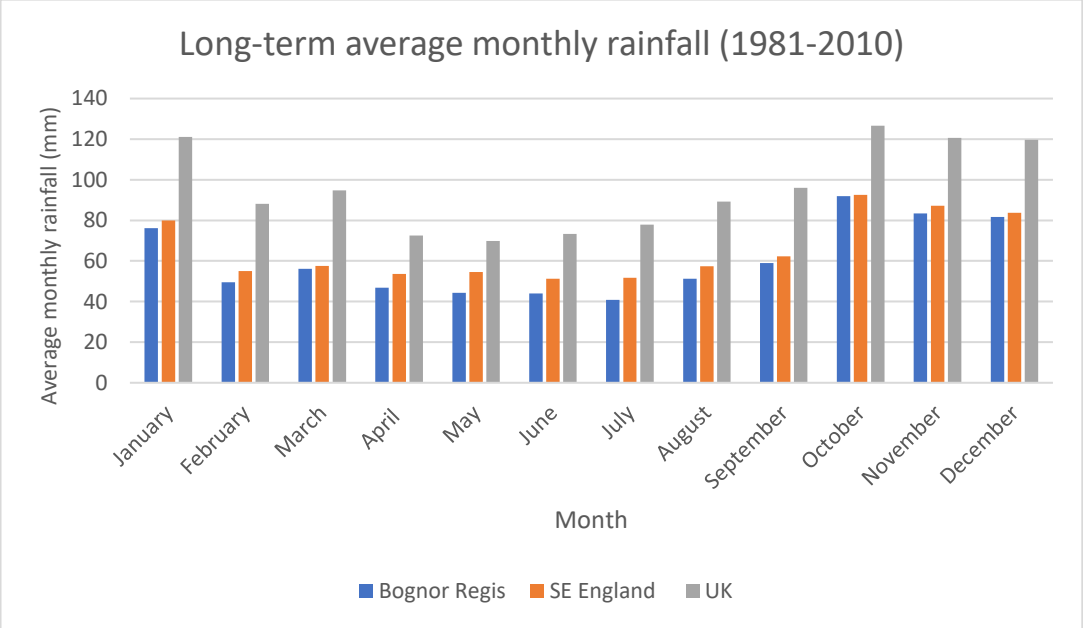
Existing Baseline

Precipitation

16.28 The Proposed development is located within the Met Office climate profile of South East (SE) England, which has a climate described as relatively quiescent, due to the region being the furthest from the paths of Atlantic depressions that carry wind, cloud and rain.

16.29 Average monthly rainfall at Bognor Regis weather station, the SE England and the UK for the period 1981-2010 is summarised in Figure 16.1. This shows that on average, the region experiences lower levels of rainfall than the rest of the UK and the SE England region.[119]

Figure 16-1 Long-term average monthly rainfall in areas of Bognor Regis, SE England and the UK within the period of 1981-2010)



Extreme precipitation

16.30 The latest UK State of the Climate report120 shows that the UK's climate is becoming wetter. The most recent decade (2011–2020) has been on average 4% wetter than 1981–2010 and 9% wetter than 1961–1990 for the UK overall. With UK summers being on average 15% wetter than 1981–2010 and 17% wetter than 1961–1990 and UK winters being 11%/19% wetter. However, such changes are experienced less intensely in most areas of the SE England region. 121

[119] Bognor Regis (West Sussex) UK climate averages - Met Office
[120] State of the UK Climate 2020 - Kendon - 2021 - International Journal of Climatology - Wiley Online Library
[121] UK extreme events - Heavy rainfall and floods - Met Office

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16.31 Table 16.5 shows the average number of days in summer and winter in the SE England region (in the period 1981 – 2010) where rainfall exceeded 1mm per day.

Table 16.5 Long-term average of total number of days where rainfall exceeded 1mm in baseline period

Period	Average number of days rainfall > 1mm (1981-2010)
Summer	8
Winter	12
Annual	110

16.32 Although precipitation in Bognor Regis and the wider SE England region is lower than the national average, these areas can still be subject to extreme precipitation events. Examples of recent extreme precipitation within this area include:

- February 2020 – Storm Dennis brought heavy and persistent rain and strong winds across much of the UK;
- Storm Ciara - February 2020 also saw Storm Ciara bringing heavy rain and strong winds of 70 – 80 mph even in less exposed, inland sites, with a band of rain bringing some intense thundery downpours, and strong, squally winds; [122] and
- Storm Gareth - affected the UK and Ireland on 12-13 March 2019.

16.33 Persistent, heavy rain in south east England 10-11 June 2012 caused the West Sussex area significant flooding issues after 70mm of rain fell within a 16-hour period. The monthly average for this region is typically around 60mm. [123]

Snow and ice

16.34 Snowfall for the Bognor Regis region is typically confined to months between November and April, with an average of 12-15 days of snowfall in lower lying areas. However, upland areas may experience an average of 20 days of snowfall a year, extended from October to May. Areas along the English Channel experience lower levels, with less than 10 days on average[124].

16.35 For the period 1981-2010, Bognor Regis and the surrounding area experienced an average of <10 days of annual snowfall, compared to the UK average of 23.7 days within this period. The region experienced snow events in:

- February to March 2018 - the most significant spell of snow and low temperatures for the UK overall since December 2010;[125]
- March 2013 – unseasonably high levels of snow and low temperatures across the UK, causing March to become the coldest month of the 'extended winter' in almost 40 years; [126] and
- December 2010 – two spells of snowfall lasting around a month.[127]

Temperature

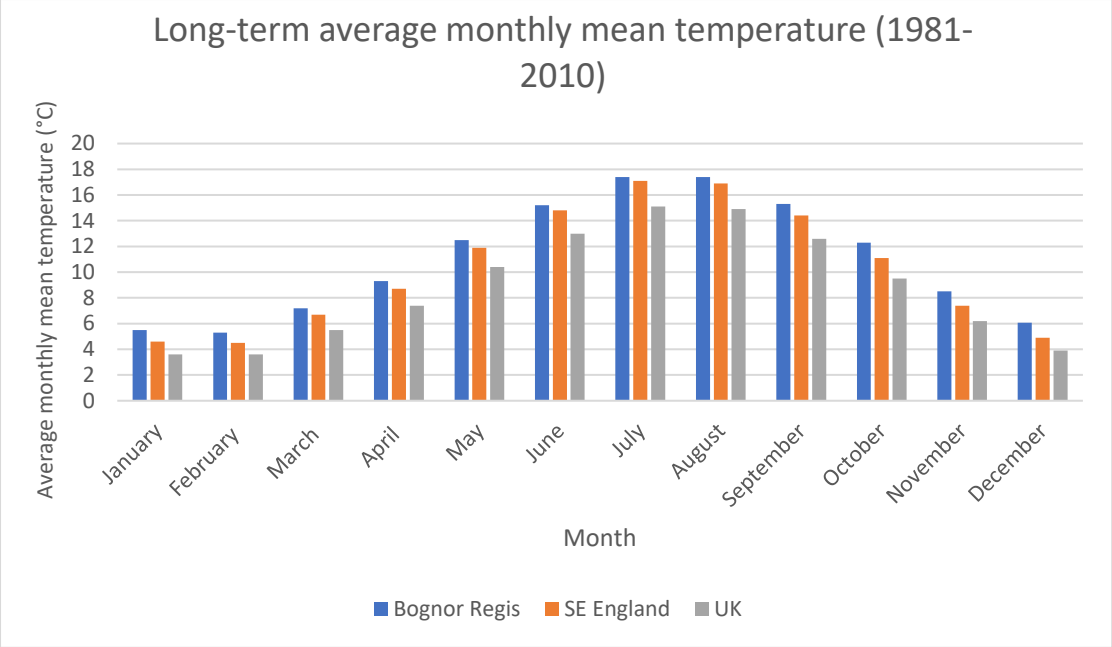
16.36 Figure 16.2 shows the long-term average mean monthly temperature for the SE England region and Bognor Regis Weather Station, between 1981 and 2010. It shows that the weather station and region is, on average,

[122] i] Met Office (2020) Storm Ciara. Available at: https://www.metoffice.gov.uk/weather/warnings-and-advice/uk-storm-centre/storm-ciara (Last accessed 21 June 2020).
[123] *mo_ofcom_report.pdf
[124] southern-england_-climate---met-office.pdf (metoffice.gov.uk)
[125] https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/interesting/2018/snow-and-low-temperatures-february-to-march-2018---met-office.pdf
[126] snow-and-low-temperatures-late-march-2013---met-office.pdf (metoffice.gov.uk)
[127] https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/interesting/2010/snow-and-low-temperatures-december-2010---met-office.pdf

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lower than the UK's average temperatures.

Figure 16-2 Long-term average mean monthly temperature for SE England region and Bognor Regis weather station, by comparison with the UK. Source: Bognor Regis (West Sussex) UK climate averages - Met Office



Extreme temperature

16.37 Table 16.6 shows the average minimum and maximum temperatures for the summer (June-August) and winter (December-February) months, recorded between 1981 and 2010 for Bognor Regis.

Table 16.6 Long-term average of mean maximum temperature (°C) for Bognor Regis weather station

Period	Mean Maximum Temperature (°C) (1981-2010)	Mean Minimum Temperature (°C) (1981-2010)
Summer	20.14	13.18
Winter	8.09	3.14

Source: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcp8bswvw

Wind and storms

16.38 SE England is amongst the more sheltered regions of the UK, with areas of low pressure that reduce the frequency and strength of winds occurring from December to February; within this period, mean speeds and gusts are at their strongest. Yearly average wind at 10 minutes in the period from 1981-2010 for the SE England was 7.62kn; this was lower than the UK average of 9.27kn for this same period.

16.39 Thunderstorms are most likely to occur from May to September, reaching their peak in July and August. The heaviest rainfall events in the UK are often associated with these summer thunderstorms.

16.40 A 'day of gale' is defined as a day on which the wind speed attains a mean value of 34kn or more over any period of 10 minutes. Notable gales affecting SE England include:

- 'Storm Ciara': Beginning on the 9 February, storm Ciara was the third named storm of the 2019/2020

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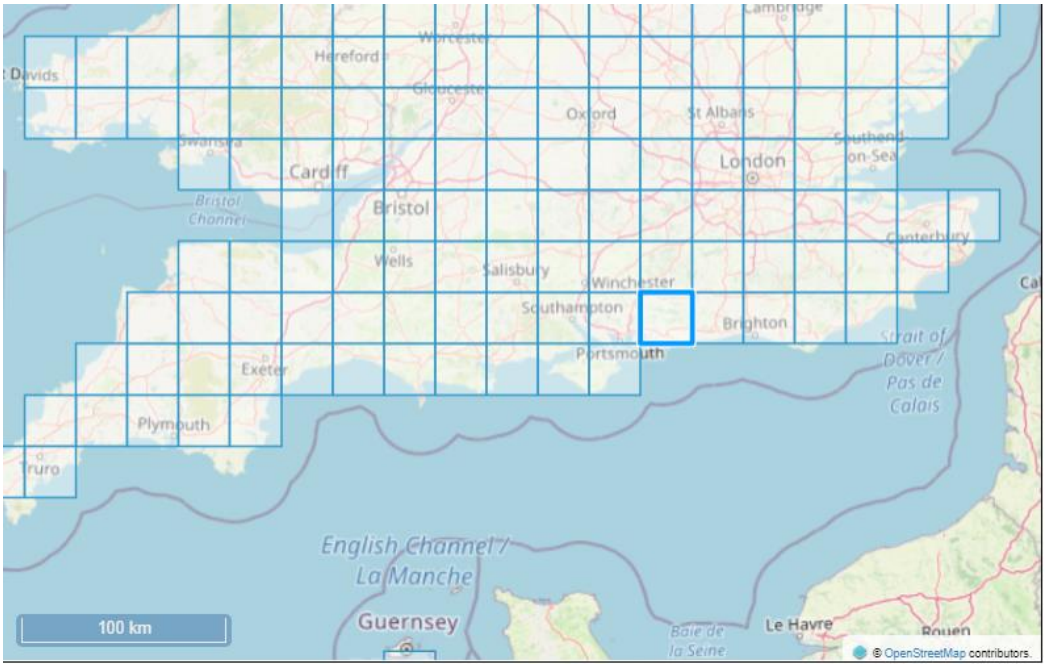
season, with amber warnings issued for both strong winds and heavy rain. Winds gusted at over 60Kt widely across England, with much of the SE England region recording gusts of 48 to 84Kt. [128]

- 'Storm Gareth': From 12-13 March, Strom Gareth swept the UK as the seventh named storm of the 2018/2019 winter. Much of the southern half of the UK recorded gusts of 40 to 50Kt (46 to 58mph), with 50 to 60Kt (58 to 69mph) in exposed coastal locations. A gust of 61Kt (70mph) was recorded at Isle of Portland, West Dorset. [129]

Future Baseline

16.41 UKCP18 provides data on projected change in climate variables for the UK. Figure 16.3 shows the 25km^2 grid square (reference 487500.00, 112500.00) of the Proposed development; the image has been extracted from UKCP18's probabilistic projections [130] and has been used in this assessment to cover the Proposed development's location.

Figure 16-3 25km Grid Square used for Probabilistic Projections



16.42 UKCP18 provides the most up-to-date projections of climate change for the UK, providing projections until the end of the twenty-first century. UKCP18 includes probabilistic projections of a range of climate variables for different emissions scenarios, termed representative concentration pathways (RCP) and for a range of time slices to the end of the 21st century. The probabilistic projections provide a range of outcomes based on an 'ensemble' of multiple climate model runs; this better represents the uncertainty of climate projections. To help demonstrate consideration of uncertainty inherent within climate modelling, projections for the 10th, 50th (central) and 90th percentiles are stated, where possible.

16.43 Climate projections are provided for the emissions scenario RCP8.5. This is a high emissions scenario which combines assumptions about high population and relatively slow income growth with modest rates of technological change and energy intensity improvements, leading (in the long-term) to high energy demand and GHG emissions in absence of climate change policies. This scenario has been used in this chapter as, for

[128] 2020_02_storm_ciara.pdf (metoffice.gov.uk)
[129] Microsoft Word - 2019_004_storm_gareth.docx (metoffice.gov.uk)
[130] Met Office (2019) UKCP18 Land Projections: Science Report Available at: https://www.metoffice.gov.uk/pub/data/weather/uk/ukcp18/science-reports/UKCP18-Land-report.pdf Last Accessed: 13/10/2021

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climate change, EIA good practice relies on the assessment of a worst-case scenario.

16.44 The future baseline has been presented for the 2020s (2010-2039), 2060s (2050-2079) and 2080s (2070-2099) to identify the anticipated climate conditions over the anticipated lifespan of the Proposed development's key assets and features.

Precipitation

16.45 Climate change is projected to lead to wetter winters and drier summers, although natural variation, including extreme events such as storms and heatwaves, will continue to punctuate these trends. The projected changes to average summer and winter rainfall for the 2020s, 2060s and 2080s compared to 1981-2010, under RCP8.5, are summarised in Table 16.7.

Table 16.7 Projected change in mean precipitation for the 2060s and 2080s, RCP8.5

Season	Percentile	Time slice / % change in mean precipitation		
		2020s	2060s	2080s
Winter	10	-5.95	-2.88	1.1
	50	7.5	18.67	26.76
	90	21.32	42.33	56.17
Summer	10	-26.7	-57.96	-70.55
	50	-7.6	-28.55	-38.92
	90	11	1.23	-4.23

16.46 The central estimate (50th percentile) projects a decrease in summer rainfall, while winter precipitation is projected to increase.

Extreme Precipitation

16.47 The probability that precipitation events will occur is often expressed as a return period. Table 16.8 provides a summary of the 1 in 20-year return periods for 1-day total events. Results are expressed in absolute future values for RCP8.5 and are bias corrected to the reference period 1981-2000. The results are given for the average summer and winter rainfall extremes for short term and long-term events.

Table 16.8 1:20 year 1-day total precipitation events, for 2020 and 2080 under RCP8.5.

Season	Percentile	Time slice / Number of 1-day precipitation events	
		2020	2080
Winter	10	35.5	38
	50	39.5	44.5
	90	44.16	52.57
Summer	10	42.06	37.4
	50	48.15	47.96
	90	55.13	61.28

Snow and ice

16.48 Between 2061-2080, under RCP8.5, UKCP18 projects a decrease in both falling and lying snow across the UK. The decrease is smaller in mountainous regions than in those that are low-lying[131].

[131] UKCP18 Factsheet Snow - https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-factsheet-snow.pdf last accessed: 19/10/2021

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Temperature

16.49 In general, UKCP18 forecasts that climate change is projected to lead to hotter summers and warmer winters. Table 16.9 summarises the UKCP18 projections for changes in mean temperature in the 2060s and 2080s compared to 1981-2010, under RCP 8.5.

Table 16.9 Projected change in mean temperature for the 2020s, 2060s and 2080s, RCP8.5.

Season	Percentile	Time slice / ºC change in temperature		
		2020s	2060s	2080s
Winter	10	-0.05	0.73	1.16
	50	0.69	2.15	3.13
	90	1.46	3.67	5.18
Summer	10	0.33	1.35	2.4
	50	1	3.4	5.15
	90	1.82	5.58	8.19

16.50 The central estimate (50th percentile) projects an increase in summer temperature by approximately 1°C for the short term, 3.4°C in the medium term (2060s) and a further increase to 5°C in the long term (2080s). Winter temperature is also projected to increase, by approximately 0.7°C for the short term, 2°C in the medium term (2060s) and a further increase to 3°C in the long term (2080s).

Extreme Temperature

16.51 Table 16.10 provides a summary of the 1 in 20-year return periods[132] for maximum air temperature (°C). Results are expressed in absolute future values for RCP8.5 and are bias corrected to the reference period 1981-2000. The results are given for the average summer and winter temperature extremes for short term and long-term events. There is a 5% probability that in any given year there will be an increase in the extreme temperatures for both summer and winter months. Note: the values here represent average maximum temperature extremes, individual days may exceed these values.

Table 16.10 1:20 year maximum temperature (°C) event, for 2020 and 2080 under RCP8.5.

Season	Percentile	Time slice / maximum temperature (ºC) events	
		2020	2080
Winter	10	15.59	17.25
	50	16.16	18.65
	90	16.82	20.3
Summer	10	32.98	33.51
	50	33.94	37.66
	90	35.16	42.56

Humidity

16.52 Projections for humidity show that overall, winter humidity is projected to increase by 22.4%, and summer humidity by 17.6%, by the 2080s, when compared to 1981-2010.

Wind and Storms

16.53 UKCP18 depicts a wide spread of future changes in mean surface wind speed, however, there is large

132 A 1 in 20-year return period can be expressed as a probability of occurring being 1/20, or 5% in any one year. This does not mean that if an event with such a time-period occurs one year then the next event will happen again in 20 years' time. Instead it means that in any given year there is a 5% chance that the event will happen, regardless of when the last similar event occurred.

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uncertainty in projected changes in circulation over the UK, caused by natural variations in climate and conditions[133]. It is therefore not possible to currently accurately forecast regional wind extreme winds and gusts within regional climate models[134].

16.54 Within the 12km grid spatial resolution, projected central estimate for the 2060s range from minus 1.3 to +1.9 ms-1 during winter and minus 0.5 to +2.7ms-1 during summer.

16.55 A wind speed of 0.2ms-1 (approximately 0.4 knots) is small compared with the typical magnitude of summer mean wind speed of about 3.6–5.1ms-1 (7 – 10 knots) over much of England[135]. Seasonal changes at individual locations across the UK lie within the range of minus 15% to +10%.

16.56 In terms of storms, the analysis presented here is a summary of expected changes in storm patterns under a changing climate. A storm is defined by the Met Office as a wind event measuring 10 or higher on the Beaufort scale (equivalent to a wind speed of 24.5m/s or 55mph)[136].

16.57 Studies relating to future projections of storms[137,138] suggest that climate-driven storm changes are less distinct in the northern hemisphere, by comparison to the south. However, such is the wide range of inter-model variation, robust projections of changes in storm tracking are not yet possible and hence there is low confidence in the direction of future changes in the frequency, duration or intensity of storms affecting the UK.

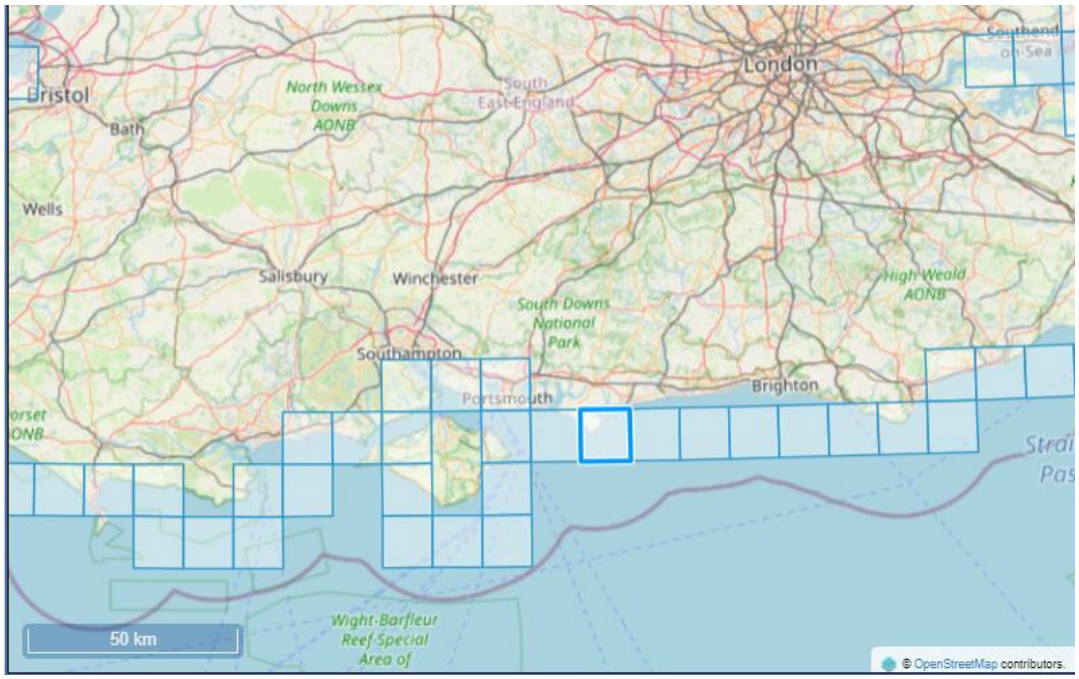
Sea level rise

16.58 Projections for sea level rise have been ascertained using UKCP18 marine projections. The 25km grid square closest to the Proposed development (cell reference 50.72, -0.75) has been used, as presented Figure 4**.**

[133] Brown, S., Boorman, P., McDonald, R., and Murphy. J. (2012) Interpretation for use of surface wind speed projections from the 11-member Met Office Regional Climate Model ensemble. Post-launch technical documentation for UKCP09. Met Office Hadley Centre, Exeter, UK. Crown copyright.
[134] Bengtsson, L., K. Hodges, and E. Roeckner, 2006: Storm tracks and climate change. Journal of Climate, 19, 3518-3543.
[135] Jenkins, G.J., Perry, M.C., and Prior, M.J. (2008). The climate of the United Kingdom and recent trends. Met Office Hadley Centre, Exeter, UK.
[136] Met Office Beaufort wind force scale https://www.metoffice.gov.uk/weather/guides/coast-and-sea/beaufort-scale. [Accessed 01/06/2020].
[137] Slingo, J., Belcher, S., Scaife, A., McCarthy, M., Saulter, A., McBeath, K., Jenkins, A., Huntingford, C., Marsh, T., Hannaford, J. and Parry, S. (2014) The recent storms and floods in the UK, Met Office, Exeter, 29pp.
[138] Bengtsson, Lennart & Hodges, Kevin & Roeckner, Erich. (2006). Storm Tracks and Climate Change. Journal of Climate. 19. 10.1175/JCLI3815.1.

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Figure 16-4 Grid Square used for Marine Projections



16.59 As identified in Table 16.11, by 2060, the area could experience sea level rise in the region of 0.37cm, posing flood risk to the Proposed development. Flood Zone 3 is described as land assessed as having a 1 in 100 or greater annual probability of flooding from rivers, or a 1 in 200 or greater annual probability of flooding from the sea in any year. Site A of the Proposed development is located within an area that is classified as Flood Zone 3. Note that flood modelling for the Proposed development considered a 1 in 100 year flood event with an allowance for climate change (+25%) and found the majority of the flood risk to be in the northern section of the site (with the southern part of the Site still shown to not be at risk). This is further discussed in Chapter 9 : Water Resources and Flood Risk.

Table 16.11 Projected Change in Sea Level Rise (m) for 2020, 2060 and 2080 RCP8.5 (50th percentile)

	Time slice / sea level rise (m)		
	2020	2060	2080
Sea level Increase (m)	0.1	0.37	0.57

Sensitivity of site receptors

16.60 The sensitivity of identified receptors during the construction and operation for both Sites A and B, is summarised in Tables 16.11 and 16.12, respectively. These sensitivity ratings have been developed using the climate hazards identified during the baseline assessment.

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Table 16.12 Sensitivity of environmental receptors to changes in climate in the construction phase

Receptor	Climate variable and description, if available		Sensitivity	Summary Reason
Construction				
Construction site and Materials This includes: Materials, including their storage Site compounds, including site access road and temporary drainage Plant and equipment	**Precipitation**	**Changes in annual average**	**Low**	Changes in annual average precipitation are unlikely to pose adverse risks to this receptor
		Extreme precipitation	Moderate	Extreme rainfall in the form of flash/prolonged flooding has the potential to render this receptor sensitive to change, however the receptor has moderate capacity to be resilient to these changes.
		Snow and ice	**Moderate**	Snow and ice conditions have the potential to render this receptor sensitive to change, however the receptor has moderate capacity to be resilient to these changes.
	Temperature	Changes in annual average	Low	Changes in annual average temperatures are unlikely to pose adverse risks to this receptor
		Extreme temperature	**Low**	Extreme temperature events are unlikely to pose adverse risks to the construction site.
		Humidity	Low	Changes in humidity are unlikely to pose adverse risks to the construction site.
	Wind and storms		**Moderate**	Wind and storms are likely to render this receptor sensitive to change, however the receptor has moderate capacity to be resilient to these changes.
	Sea level rise		Low	The short construction programme and minimal sea level rise experienced during this time is unlikely to render this receptor sensitive to change.
Workforce	**Precipitation**	**Changes in annual average**	**Low**	Changes in annual average precipitation are unlikely to pose adverse risks to construction workers.
		Extreme precipitation	Low	Extreme precipitation events are unlikely to pose adverse risks to construction workers.
		Snow and ice	Moderate	Snow and ice conditions have the potential to render this receptor sensitive, due to health and safety risks (e.g. trips and falls)
	Temperature	Changes in annual average	Low	Changes in annual average temperatures are unlikely to pose adverse risks to construction workers.

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Receptor	Climate variable and description, if available		Sensitivity	Summary Reason
		Extreme temperature	Moderate	Extreme temperature is likely to a pose threat to construction workers (e.g. heatstroke, dehydration)
		Humidity	Low	Changes in humidity are unlikely to pose adverse risks to construction workers
	Wind and storms		Moderate	Wind and storm events are likely to pose threat to construction workers (e.g. risk of being hit by falling objects)
	Sea level rise		Low	The short construction process and the mimimal sea level rise experienced during this time is unlikely to render this receptor sensitive to change.

Table 16.13 Sensitivity of environmental receptors to changes in climate in the operational phase

Receptor	Climate variable and description, if available		Sensitivity	Summary Reason
Operation				
Buildings (Sites A and B)	Precipitation	Changes in annual average	Low	Changes in annual average precipitation are unlikely to pose adverse risks to this receptor
		Extreme precipitation	High	Extreme rainfall in the form of flash/prolonged flooding is highly likely to pose risk to the receptor in the form of altering its present characteristics.
		Snow and ice	Moderate	Snow and ice are unlikely to significantly alter the receptor's current characteristics.
	Temperature	Changes in annual average	Moderate	The receptors are likely to be able to tolerate changes in annual average temperatures, however may be altered to some extent
		Extreme temperature	High	The receptor and the end users are highly likely to be sensitive to the effects of extreme temperatures.
		Humidity	Moderate	The receptor is likely to be altered by some extent by changes in humidity (e.g. impacting thermal comfort of end users, damage to building due to condensation/mold growth)
	Wind and storms		Moderate	The receptor is likely to be altered by wind and storm events, but should have the capacity to be resilient to some of these effects.
	Sea level rise		High	The receptor is highly likely to be sensitive to the effects of sea level rise, due to the location of the scheme to the coast.

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Receptor	Climate variable and description, if available		Sensitivity	Summary Reason
Green infrastructure (Site A and Site B)	Precipitation	Changes in annual average	Low	Changes in annual average precipitation are unlikely to pose adverse risks to this receptor
		Extreme precipitation	High	Extreme rainfall in the form of flash/prolonged flooding is highly likely to pose risk to the receptor in the form of altering its present characteristics.
		Snow and ice	Moderate	The receptor is likely to have the capacity to tolerate the impact of snow and ice without being fully altered.
	Temperature	Changes in annual average	Moderate	The receptor is likely to be able to tolerate changes in annual average temperatures, however may be altered to some extent
		Extreme temperature	High	The receptor is highly susceptible to being altered by extreme temperatures.
		Humidity	Low	Humidity is unlikely to pose adverse risks to this receptor, as green infrastructure can help stabilise humidity conditions.
	Wind and storms		High	The receptor is highly susceptible to alteration by wind and storm events.
	Sea level rise		High	The receptor is highly likely to be sensitive to the effects of sea level rise, due to the proximity of the Proposed Scheme to the coast.
Road and access (Site A only)	Precipitation	Changes in annual average	Low	Changes in annual average precipitation are unlikely to pose adverse risks to this receptor
		Extreme precipitation	High	Extreme rainfall in the form of flash/prolonged flooding is highly likely to pose risk to the receptor in the form of altering its present characteristics.
		Snow and ice	Moderate	Snow and ice are unlikely to significantly alter the receptors current characteristics.
	Temperature	Changes in annual average	Moderate	The receptor is likely to be able to tolerate changes in annual average temperatures, however may be altered to some extent
		Extreme temperature	High	The receptor is highly likely to be altered by extreme temperatures (e.g. cracking of surfaces)
		Humidity	Low	Humidity is unlikely to pose adverse risks to this receptor
	Wind and storms		Moderate	The receptor and its end users are likely to be altered by wind and storm events.

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Receptor	Climate variable and description, if available		Sensitivity	Summary Reason
	Sea level rise		High	The receptor is highly likely to be sensitive to the effects of sea level rise, due to the location of the scheme to the coast.
Existing drainage (Site A only)	Precipitation	Changes in annual average	Low	Changes in annual average precipitation are unlikely to pose adverse risks to this receptor
		Extreme precipitation	High	Extreme rainfall resulting in flash/prolonged flooding is highly likely to overwhelm the receptor.
		Snow and ice	Moderate	Snow and ice are unlikely to significantly alter the receptor's current characteristics.
	Temperature	Changes in annual average	Moderate	The receptor is likely to be able to tolerate changes in annual average temperatures, however may be altered to some extent
		Extreme temperature	Moderate	The receptor is likely to be able to tolerate changes in annual average temperatures, however may be altered to some extent
		Humidity	Low	Humidity is unlikely to pose adverse risks to this receptor
	Wind and storms		High	The receptor is highly susceptible to be altered by wind and storm events, due to clogging from debris.
	Sea level rise		High	The receptor is highly likely to be sensitive to the effects of sea level rise, due to the location of the scheme to the coast.
EV infrastructure (Site A only)	Precipitation	Changes in annual average	Low	Changes in annual average precipitation are unlikely to pose adverse risks to this receptor.
		Extreme precipitation	High	Extreme rainfall resulting in flash/prolonged flooding is highly likely to overwhelm the receptor.
		Snow and ice	Moderate	Snow and ice are unlikely to significantly alter the receptors current characteristics.
	Temperature	Changes in annual average	Moderate	The receptor is likely to be able to tolerate changes in annual average temperatures, however may be altered to some extent
		Extreme temperature	High	The receptor is highly likely to be sensitive to the effects of extreme temperatures due to deterioration of electronic equipment.
		Humidity	Moderate	The receptor is likely to be altered by humidity as moisture control may be altered.
	Wind and storms		Moderate	The receptor and its end users are likely to be altered by wind and storm events.

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Receptor	Climate variable and description, if available	Sensitivity	Summary Reason
	Sea level rise	High	The receptor is highly likely to be sensitive to the effects of sea level rise, due to the proximity of the Proposed Scheme to the coast.

Inherent and Standard Mitigation

16.61 This section describes those 'inherent' and 'standard' mitigation measures which primarily address the scope to avoid, reduce or remedy adverse environmental impacts or enhance the beneficial aspects arising from the construction and operational periods of the proposed development.

Construction

16.62 It is considered standard mitigation that a Construction Environmental Management Plan (CEMP) is produced as part of the planning application. It is considered good practice to include measures within the CEMP to avoid any potential effects during the construction phase which extreme weather and climate may pose. Good practice measures are identified in Table 16.14.

Table 16.14 Standard climate resilience measures to be included within the CEMP

Climate variable	Mitigation to be included within the CEMP
Extreme precipitation	• Ensure site and compound drainage infrastructure has sufficient capacity to withstand extreme rainfall events. • Ensure that site drainage and any access roads used during construction are monitored during periods of heavy rainfall. • Ensure appropriate traffic management measures are put in place to avoid areas of potential flooding. • Cover materials piles with waterproof materials and where possible, store outside areas at high risk of flooding. • Ensure emergency response procedures are active on site to, in the event of flooding, minimise disruption and damage. • Ensure there is a process for the monitoring of weather and issuing weather warnings to staff where appropriate.
Snow and ice	• Ensure emergency response procedures are active on site to, in the event of snow and ice, ensure that roads and surfaces are gritted and cleared of snow. • As above for precipitation
Extreme temperature	• Ensure welfare facilities are in place and sufficiently cooled. • Periodic rest breaks to be taken during the hottest part of the day. • Provide shade for workers in exposed areas. • Ensure workers use personal protective equipment to reduce exposure to UV radiation – light coloured, long-sleeved clothing, sun cream, sun hats.
Wind and storms	• Reviewing wind speed before commencing any work at height and ceasing work at height during storms. • Ensure all temporary infrastructure such as lighting and fencing are secured.

Operation

16.63 Table 16.14 sets out the inherent mitigation measures adopted in the design of both Sites A and B, which address risks from climate change. The details of the inherent mitigation have been obtained through a desk based review of the Proposed development description and of the Lidsey Green Sustainability Statement (Site A).

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Table 16.15 Inherent mitigation within the design of Sites A & B contributing to climate resilience

Climate variable		Potential Impact	Receptor Affected	Embedded Mitigation	Evidence of Commitment
Precipitation	Extreme precipitation	Drainage infrastructure overwhelmed, leading to surface water flooding and scour of buildings	Buildings Green infrastructure Road and access Drainage	Enhancement of the existing drainage network to the requisite standard plus a minimum 36% climate allowance. The drainage design includes enhancements of existing attenuation capacity via swales and Sustainable Drainage Systems (SuDS) for attenuating the surface water runoff.	As outlined within the Sustainability Statement. A Flood Risk Assessment (FRA) is to be produced for the sites. The design will be informed by an ongoing climate change adaptation strategy appraisal, which responds to criteria set out in BREEAM 2018 (WST05 Adaptation to Climate Change).
		Water ingress into electronic components	EV infrastructure	It is assumed that all EV infrastructure will be appropriately designed and built to avoid water ingress.	As outlined within the Sustainability Statement.
		Water ingress into materials, deteriorating their structure and composition.	Buildings Road and access	The Sustainability Statement identifies that within the Proposed Scheme design, material selection will be conducted with considerations for projected climate change139.	As outlined within the Sustainability Statement.
		Waterlogging of green infrastructure, resulting in vegetation and ground/soil failure.	Green infrastructure	Tree planting is to be deployed extensively throughout site, as well as retaining many existing trees and vegetation. This will support natural ground permeability.	A green infrastructure plan and a tree removal plan has been produced at this stage. Further details are to be provided as the design progresses.

[139] Detail on the specifics of material choice will be made post outline planning application.

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Climate variable		Potential Impact	Receptor Affected	Embedded Mitigation	Evidence of Commitment
Temperature	Changes in annual average Extreme temperatures Humidity	Overheating and uncomfortable conditions	Buildings	All buildings will contain cooling with good use of thermal mass and natural ventilation. Tree planting deployed extensively throughout the Proposed Scheme will provide screening and shading for properties and buildings.	As outlined within the Sustainability Statement. The design will be informed by an ongoing climate change adaptation strategy appraisal, which responds (for example) best practice to criteria set out in BREEAM 2018 (WST05 Adaptation to Climate Change).
	Changes in annual average Extreme temperatures	Death of vegetation and landscaped areas through scorching	Green infrastructure	Planting will be specified in later design stages however it will incorporate a mix of native and non-native species, selected with the changing climate in mind.	As outlined within the Sustainability Statement.
Wind and Storms		Damage and destabilisation from high winds	Buildings	Buildings have been designed to current standards for wind loading.	Refer to The Design and Access Statement (DAS). The design will be informed by an ongoing climate change adaptation strategy appraisal, which responds to for example) best criteria set out in BREEAM 2018 (WST05 Adaptation to Climate Change).
Sea level rise		As identified for precipitation-related flooding impacts			

Table 166-15 Inherent mitigation within the design of Sites A & B contributing to climate resilience

Climate variable		Potential Impact	Receptor Affected	Embedded Mitigation	Evidence of Commitment
Precipitation	Extreme precipitation	Drainage infrastructure overwhelmed, leading to surface water flooding and scour of buildings	Buildings Green infrastructure Road and access Drainage	Enhancement of the existing drainage network to the requisite standard plus a minimum 36% climate allowance. The drainage design includes enhancements of existing attenuation capacity via swales and Sustainable Drainage Systems (SuDS) for attenuating the surface water runoff.	As outlined within the Sustainability Statement. A Flood Risk Assessment (FRA) is to be produced for the sites. The design will be informed by an ongoing climate change adaptation strategy appraisal, which responds to (for example) best practice criteria set out in BREEAM 2018 (WST05 Adaptation to Climate Change).
		Water ingress into electronic components	EV infrastructure	EV infrastructure will be appropriately designed and built to avoid water ingress.	As outlined within the Sustainability Statement
		Water ingress into materials, deteriorating their structure and composition.	Buildings Road and access	The Sustainability Statement identifies that within the Proposed development design, material selection will be conducted with considerations for projected climate change140.	As outlined within the Sustainability Statement.

[140] Detail on the specifics of material choice will be made post outline planning application.

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Climate variable		Potential Impact	Receptor Affected	Embedded Mitigation	Evidence of Commitment
		Waterlogging of green infrastructure, resulting in vegetation and ground/soil failure.	Green infrastructure	The Sustainability Statement identifies that within the Proposed development design, material selection will be conducted with considerations for projected climate change. The details of the materials to be used within the design should be confirmed within the detailed design141.	A green infrastructure plan and a tree removal plan has been produced at this stage. Further details are to be provided as the design progresses.
Temperature	Changes in annual average Extreme temperatures Humidity	Overheating and uncomfortable conditions	Buildings	All buildings will contain cooling with good use of thermal mass and natural ventilation. Tree planting deployed extensively throughout the Proposed development will provide screening and shading for properties and buildings.	As outlined within the Sustainability Statement. The design will be informed by an ongoing climate change adaptation strategy appraisal, which responds to (for example) best practice criteria set out in BREEAM 2018 (WST05 Adaptation to Climate Change).
	Changes in annual average Extreme temperatures	Death of vegetation and landscaped areas through scorching	Green infrastructure	Planting will be specified in later design stages however it will incorporate a mix of native and non-native species, selected with the changing climate in mind.	As outlined within the Sustainability Statement.
Wind and Storms		Damage and destabilisation from high winds	Buildings	Buildings have been designed to current standards for wind loading.	Refer to The Design and Access Statement (DAS). The design will be informed by an ongoing climate change adaptation strategy appraisal, which responds to (for example) best practice criteria set out in BREEAM 2018 (WST05 Adaptation to Climate Change).
Sea level rise		As identified for precipitation-related flooding impacts			

[141] Detail on the specifics of material choice will be made post outline planning application.

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Assessment of Environmental Impacts

16.64 This section provides an assessment of the nature, extent, magnitude of change that the proposed development will have on individual receptors identified in the baseline section. By employing the sensitivity of the receptor and magnitude of change, the significance of environmental effects which arise as a result of the construction and operational periods of the proposed development will be determined.

16.65 By comparing the sensitivity of receptors and the potential magnitude of change imparted on them by long-term changes to the climate, the **significance of environmental effects** (including any, direct or indirect effects), which arise during the construction and operational periods of the Proposed development have been determined. The assessment takes into consideration inherent and standard mitigation (e.g. strategic landscaping, habitat creation etc) that is part of the Proposed development.

16.66 For the purpose of this assessment and in line with the drive towards EIA proportionality, the receptors and climate variables which have been deemed low sensitivity have been omitted from further assessment.

Magnitude

16.67 Tables 16.15 and 16.16 identify the magnitude of change in line with the descriptors presented in Table 16.3.

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Table 16.16 Summary of magnitude of change in the construction phase

Receptor		Climate Variable	Magnitude of change	Summary Reason
Construction				
Construction site and Materials This includes: • Materials, including their storage • Site compounds, including site access road and temporary drainage • Plant and equipment	Precipitation	Extreme precipitation	Minor	Limited damage to receptor due to mitigation measures within CEMP.
		Snow and ice	Minor	Limited damage to receptor due to mitigation measures within CEMP.
	Wind and storms		Minor	Limited damage to receptor due to mitigation measures within CEMP.
Workforce	Precipitation	Snow and ice	Minor	Limited damage to receptor due to mitigation measures within CEMP.
	Temperature	Extreme temperature	Minor	Limited damage to receptor due to mitigation measures within CEMP.
	Wind and storms		Minor	Limited damage to receptor due to mitigation measures within CEMP.

Table 16.17 Summary of magnitude of change in the operational phase

Receptor	Climate Variable		Magnitude of change	Summary Reason
Operation				
Buildings (Site A and Site B)	Precipitation	Extreme precipitation	Moderate	Extensive damage due to extreme rainfall resulting in water ingress into materials, surface water flooding and deterioration to structures and scour of buildings. Detail on materials used and methods of reducing this impact are not yet available.
		Snow and ice	Minor	There are no embedded mitigation measures which account for the impact of snow and ice; this can result in damage to structures and adverse health effects in the form of slippery surfaces resulting in falls.
	Temperature	Changes in annual average	Negligible	Measures adopted through planting in place to reduce risk of localised disruption.
		Extreme temperature	Minor	Buildings will contain cooling systems and natural ventilation, and vegetation shading which in turn will limit impacts on proposed structures and human health
		Humidity	Minor	Buildings will contain cooling systems and natural ventilation which in turn will limit impacts on proposed structures and human health
	Wind and storms		Minor	Damage by wind will be localised; minor restoration work may be required
	Sea level rise		Moderate	Extensive damage due sea level rise (flooding) resulting in water ingress into materials, surface water flooding and deterioration to structures and scour of buildings. Detail on materials used and methods of reducing this impact are not available at this stage, but are likely to be forthcoming post outline planning.
Green infrastructure (Site A and Site B)	Precipitation	Extreme precipitation	Negligible	Tree planting will provide natural ground permeability
		Snow and ice	Minor	There are no embedded mitigation measures which account for the impact of snow and ice, the impacts of which can result in limited damage to receptors; recovery can be achieved through minor maintenance and repair activities.
	Temperature	Changes in annual average	Minor	The use of a mix of species selected with changing climate in mind will reduce the risk of death and damage to vegetation.
		Extreme temperature	Moderate	The use of a mix of species selected with changing climate in mind will reduce the risk of death and damage to vegetation. Additional measures should be considered in terms of irrigation and monitoring of vegetation condition.
	Wind and storms		Major	Vegetation is at major risk of extreme wind and storm events. There are no embedded mitigation measures which would imply that this risk is reduced.

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Receptor	Climate Variable		Magnitude of change	Summary Reason
	Sea level rise		Minor	Tree planting will increase natural ground permeability. Enhancement of drainage network and the inclusion of Sustainable Drainage Systems (SuDS) will also reduce the risk of flooding. Sea level rise may still pose a threat.
Road and access (Site A only)	Precipitation	Extreme precipitation	Moderate	Extensive potential damage due to extreme rainfall (resulting in surface water flooding), causing access disruption and damage. Details on materials to be used and methods of reducing this impact are not available at this time.
		Snow and ice	Negligible	Snow and ice is likely to result in localised disruption with impacts lasting less than 3 days.
	Temperature	Changes in annual average	Negligible	The receptor is likely to be able to tolerate changes in annual average temperatures, however it may be altered to some extent. Impact will be localised.
		Extreme temperature	Moderate	The receptor is highly likely to be altered by extreme temperatures (e.g. cracking/melting of surfaces), no measures (other than DMRB compliant highway designs) have been provided to reduce this risk. This could result in extensive damage to the receptor.
	Wind and storms		Moderate	The receptor and its end users are likely to be altered by wind and storm events. No mitigation or other measures have been implemented to respond to this risk.
	Sea level rise		Moderate	Extensive damage due sea level rise (flooding) resulting in water ingress into materials, and surface water flooding. Detail on materials used and methods of reducing this impact have not been provided.
Existing drainage (Site A only)	Precipitation	Extreme precipitation	Minor	Extreme rainfall resulting in flash/prolonged flooding is highly likely to overwhelm the receptor. Drainage systems are being enhanced with swales and SuDS, and a minimum 36% climate allowance have been modelled.
		Snow and ice	Minor	There are no embedded mitigation measures which account for the impact of snow and ice; damage due to snow and ice is recoverable through minor maintenance activities.
	Temperature	Changes in annual average	Negligible	Damage to the asset is expected to be extremely limited and localised
		Extreme temperature	Negligible	Damage to the asset is expected to be extremely limited and localised
	Wind and storms		Moderate	High winds can result in clogging of drainage infrastructure from debris
	Sea level rise		Minor	The drainage system is being enhanced with swales and SuDS, and a minimum 36% climate allowance have been modelled. Sea level rise may result in minor flooding of area and clogging of infrastructure from debris, as well as abrasion by salt water.

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Receptor	Climate Variable		Magnitude of change	Summary Reason
EV infrastructure (Site A only)	Precipitation	Extreme precipitation	Negligible	Damage to this receptor could be localised, but EV infrastructure will be designed to avoid water ingress by locating charging points well above the ground surface.
		Snow and ice	Negligible	Damage to this receptor could be localised, but EV infrastructure will be designed to avoid water ingress by locating charging points well above the ground surface.
	Temperature	Changes in annual average	Negligible	Damage to the asset is expected to be extremely limited and localised
		Extreme temperature	Negligible	Damage to the asset is expected to be extremely limited and localised
		Moderate	Negligible	Damage to the asset is expected to be extremely limited and localised
	Wind and storms		Negligible	Limited damage to structures or resources expected. Access obstruction or disruption is also assessed to limited. Any damage is recoverable though minor maintenance or repair activities.
	Sea level rise		Negligible	Damage to this receptor will be localised, but EV infrastructure will be designed to avoid water ingress by locating charging points well above the ground surface.

Table 16.18 Significance of effects associated with climate change during the construction phase

Receptor	Climate Variable	Sensitivity	Magnitude of Change	Significance of Effect
Construction site and Materials This includes: • Materials, including their storage • Site compounds, including site access road and temporary drainage • Plant and equipment	Extreme precipitation	Moderate	Minor	Minor Direct/Temporary/Short/Negative
	Snow and ice	Moderate	Minor	Minor Direct/Temporary/Short/Negative
	Wind and storms	Moderate	Minor	Minor Direct/Temporary/Short/Negative
Workforce	Snow and ice	Moderate	Minor	Minor Direct/Temporary/Short/Negative
	Extreme temperature	Moderate	Minor	Minor Direct/Temporary/Short/Negative
	Wind and storms	Moderate	Minor	Minor Direct/Temporary/Short/Negative

Table 16.19 Significance of effects associated with climate change during the operational phase

Receptor	Climate Variable	Sensitivity	Magnitude of Change	Significance of Effect
Buildings (Site A and Site B)	Extreme precipitation	High	Moderate	Moderate-Minor Direct/Temporary/long-term/Negative
	Snow and ice	Moderate	Minor	Minor Direct/Temporary/long-term/Negative
	Changes in annual average temperature	Moderate	Negligible	Negligible Direct/Temporary/long-term/Negative
	Extreme temperature	High	Minor	Moderate-Minor Direct/Temporary/long-term/Negative
	Humidity	Moderate	Minor	Minor Direct/Temporary/long-term/Negative
	Wind and storms	Moderate	Minor	Minor Direct/Temporary/long-term/Negative
	Sea level rise	High	Moderate	Moderate-Minor Direct/Permanent/long-term/Negative
Green infrastructure (Site A and Site B)	Extreme precipitation	High	Negligible	Negligible Direct/Temporary/long-term/Positive
	Snow and ice	Moderate	Minor	Minor Direct/Temporary/long-term/Negative
	Changes in annual average temperature	Moderate	Minor	Minor Direct/Temporary/long-term/Negative
	Extreme temperature	High	Moderate	Moderate-Minor Direct/Permanent/long-term/Negative
	Wind and storms	High	Major	Major Direct/Permanent/long-term/Negative
	Sea level rise	High	Minor	Moderate-Minor Direct/Permanent/long-term/Negative
Road and access (Site A only)	Extreme precipitation	High	Moderate	Moderate-Minor Direct/Temporary/long-term/Negative
	Snow and ice	Moderate	Negligible	Negligible Direct/Temporary/short-term/Negative
	Changes in annual average temperature	Moderate	Minor	Minor Direct/Temporary/long-term/Negative
	Extreme temperature	High	Major	Major Direct/Temporary/long-term/Negative
	Wind and storms	Moderate	Moderate	Minor Direct/Temporary/long-term/Negative
	Sea level rise	High	Moderate	Moderate-Minor Direct/Permanent/long-term/Negative
Existing drainage (Site A only)	Extreme precipitation	High	Minor	Minor Direct/Temporary/long-term/Negative
	Snow and ice	Moderate	Minor	Minor Direct/Temporary/long-term/Negative
	Changes in annual average temperature	Moderate	Negligible	Negligible Direct/Temporary/long-term/Negative
	Extreme temperature	Moderate	Negligible	Negligible Direct/Temporary/long-term/Negative

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Receptor	Climate Variable	Sensitivity	Magnitude of Change	Significance of Effect
	Wind and storms	High	Moderate	Moderate-Minor In-direct/Temporary/long-term/Negative
	Sea level rise	High	Minor	Minor Direct/Permanent/long-term/Negative
EV infrastructure (Site A only)	Extreme precipitation	High	Negligible	Negligible Direct/Temporary/ medium-term/Negative
	Snow and ice	Moderate	Negligible	Negligible Direct/Temporary/short-term/Negative
	Changes in annual average temperature	Moderate	Negligible	Negligible Direct/Temporary/ medium-term/Negative
	Extreme temperature	High	Negligible	Negligible Direct/Temporary/ medium-term/Negative
	Humidity	Moderate	Negligible	Negligible Direct/Temporary/ medium-term/Negative
	Wind and storms	Moderate	Negligible	Minor Direct/Temporary/medium-term/Negative
	Sea level rise	High	Negligible	Negligible Direct/Permanent/long-term/Negative

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Significance

16.68 Taking into account the sensitivity and magnitude identified in Tables 16-12 and 16-16, in addition to the standard measures to be included within the CEMP (Table 16-14), the significance of effect of climate on the construction process is detailed in Table 15-18.

16.69 Taking into account the sensitivity and magnitude identified in Tables 16.13 and 16.17, in addition to the inherent measures within the design (Table 16-15), the significance of the operation of the Proposed Scheme is detailed in Table 16.18.

Actionable Mitigation

16.70 This section describes actionable mitigation to be employed to reduce the negative effects of the proposed development.

16.71 No actionable mitigation is required for the construction phase.

16.72 In order to **reduce the potentially significant adverse effects** on the operation of the Proposed development, actionable mitigation is detailed in Table 16.20.

Table 16.20 Operational actionable mitigation

Receptor	Climate Variable	Potential impact	Mitigation (Actionable)
Buildings (Site A and Site B)	Extreme precipitation and Sea level rise	Damage due to extreme rainfall and sea level rise (flooding) resulting in water ingress into materials, surface water flooding and deterioration to structures and scour of buildings.	Confirmation at detailed design stage of materials used in the design which will avoid or substantially reduce potential impacts.
	Extreme temperature	Overheating and impacts to wellbeing of occupants	Confirmation at detailed design stage of the ventilation and heating systems incorporated in the design and their ability to operate and provide cooling to all residential buildings in extreme temperatures/heatwave conditions.
Green infrastructure (Site A and Site B)	Extreme temperature	Risk of death and damage to vegetation from scorching	The use of a mix of species selected with changing climate in mind will reduce the risk of death and damage to vegetation. Additional measures should be considered in terms of irrigation and monitoring of vegetation. Confirmation required at detailed design stage on the monitoring of green infrastructure and maintenance regime.
	Wind and storms	Risk of death and damage to vegetation	Confirmation at detailed design stage of design and other measures adopted to reduce the impact so effects are not significant
	Sea level rise	Risk of death and damage to vegetation from inundation	Confirmation at detailed design stage of design and other measures adopted to reduce the impact so effects are not significant

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Receptor	Climate Variable	Potential impact	Mitigation (Actionable)
Road and access (Site A only)	Extreme precipitation and Sea level rise	Extensive damage due to extreme rainfall resulting in surface water flooding, resulting in access disruption and damage.	Confirmation at detailed design stage of materials used in the design which will avoid or substantially reduce potential impacts.
	Extreme temperature	Damage due to cracking/melting of surfaces	Confirmation at detailed design stage that materials selection will avoid the potential impacts of cracking and melting.
Existing drainage (Site A only)	Wind and storms	Clogging of drainage infrastructure from debris	Confirmation at detailed design stage of the maintenance and monitoring regime for avoiding the potential clogging of drainage.

Residual Impact Assessment

16.73 Table 16.21 summarise the residual environmental effects associated with the Proposed Scheme, in relation to climate resilience, for construction and operation respectively. The findings of this section have been carried out using professional judgement based on the assessment conducted and on the working presumption that the actionable mitigation listed in Table 16.21 is fully implemented.

16.74 No actionable mitigation is considered necessary for the construction phase.

Site B – Relocation of Golf Course

Table 16.21 Mitigation for effects relating to climate resilience during operation.

Receptor/Resources	Significance of Effect	Mitigation (Actionable)	Residual Effect
Buildings (Site A and Site B)	As per Table 16.18	Confirmation of materials used to avoid or substantially reduce potential resiliency impacts Confirmation of ventilation and heating systems to be used and their ability to operate and provide cooling to all residential buildings in extreme temperature events	Not significant
Green infrastructure (Site A and Site B)		Use of a mix of plant species selected with the changing climate in mind Measures adopted to ensure effective irrigation for vegetation Monitoring and maintenance regime for green infrastructure health	Not significant
Road and access (Site A only)		Confirmation of materials used to avoid or substantially reduce potential resiliency impacts	Not significant

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Receptor/Resources	Significance of Effect	Mitigation (Actionable)	Residual Effect
		Selection of materials to avoid the potential impacts of cracking and melting in surface treatments	
Existing drainage (Site A only)		A maintenance and monitoring regime is implemented to avoid the potential clogging of drainage systems	Not significant

Cumulative Effects

16.75 This Section identifies and assesses the nature, extent, magnitude and significance of inter-project effects (i.e., effects from other development in combination with those from the proposed development).

16.76 The effect of other Proposed developments in the vicinity of the Proposed development in relation to flood risk have been assessed within Chapter 9: Water Resources and Flood Risk.

16.77 No other cumulative effects on the proposed development have been identified.

Summary

16.78 This chapter has presented the future baseline (climate projections) for the proposed development location. Climate projections indicate wetter winters with greater levels of rainfall annually and drier summer conditions with increasing levels of drought conditions. Mean annual temperatures across the region are projected to increase leading to increasing temperatures in both winter and summer ranging from 1-3°C across winter and summer seasons. Extreme precipitation and temperatures are projected to increase in severity and frequency with a greater number of days of high rainfall measured throughout the year. Equally, the frequency of drought and heatwaves are projected to increase with higher annual temperatures. Future climate conditions will present increasing frequency and severity of storms and winds caused by strong Atlantic depressions.

16.79 No significant effects have been identified in relation to the construction process following mitigation measures implemented within the CEMP.

16.80 For the operation phase, significant effects have been identified relating to increases in precipitation, extreme temperatures, sea level rise and wind and storm events. Actions have been identified to reduce such risks including:

- Extreme Precipitation: Confirmation within the detailed design of materials used in the design which will avoid or substantially reduce potential impacts from extreme precipitation.
- Extreme temperature: Confirmation within the detailed design of the ventilation and heating systems incorporated in the design and their ability to operate and provide cooling to all residential buildings in extreme temperatures/heatwave conditions.
- Green infrastructure: Mitigation actions suggested to include mix of species selected with changing climate in mind to reduce the risk of death and damage to vegetation. Confirmation required within the detailed design on the monitoring of green infrastructure and maintenance regime.
- Sea Level Rise: Confirmation within the detailed design to include and adopt further measures to mitigate the effects of sea level rise.
- Wind and Storms: Confirmation within the detailed design for a regime of maintenance of infrastructure and monitoring for avoiding the potential clogging of drainage and damage to infrastructure from such events.

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16.81 Following confirmation of the above identified measures, no residual significant effects are anticipated. No cumulative impacts are anticipated for climate resilience.

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17 MATERIAL ASSETS AND WASTE

Introduction

17.1 The scope of this chapter is to assess the impacts and effects from the consumption of material resources, and the generation and disposal of waste, across the in-scope lifecycle phases of Site A (Lidsey Green Residential Development) and Site B (Golf Course Relocation) – herein, 'the Proposed Schemes'.

Potential Effects

17.2 This section summarises the likely potential effects of the proposed development on the environmental topic area.

17.3 The nature of the potential impacts and effects arising from the two schemes relate to the following sensitive receptors:

- Availability of construction materials – consumption of resources (both renewable and non-renewable) impacts on the immediate and long-term availability of material assets, resulting in the temporary and permanent depletion of natural and other stocks.
- Availability of landfill void capacity – reductions in the capacity of regional and (where appropriate) national infrastructure has the potential to result in unsustainable use or loss of resources and temporary or permanent degradation of the natural environment.

17.4 Table 17.1 summarises the impacts and effects associated with materials consumption, and waste generation and disposal.

Table 17.1 Potential significant environmental impacts and effects associated with materials and waste

Element	Direct impacts	Direct effects	Indirect impacts
Materials	• consumption of natural and non-renewable resources	• depletion of natural and non-renewable resources; and • degradation of the natural environment	• release of greenhouse gas emissions; • water consumption and scarcity; and • nuisance to communities (visual, noise, human health)
Waste	• generation and disposal of waste	• reduction in landfill capacity; and • degradation of the natural environment	• release of greenhouse gas emissions; and • nuisance to communities (visual, noise, human health)

17.5 *Appendix 17.1* provides a summary of the anticipated materials and waste for the Proposed Scheme at each site, and which have the potential to generate significant adverse environmental effects. Specific quantities and types of materials imported, arisings generated for reuse or recovery, and waste for disposal to landfill, are not available at this early design stage; quantified information in this context will be identified and refined as the design progresses.

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Assessment Methodology

17.6 The section describes the methodology used to undertake the assessment within this Chapter.

17.7 The Institute of Environmental Management and Assessment (IEMA) Guide to Materials and Waste in Environmental Impact Assessment (April 2020)[142], herein referred to as 'the IEMA Guide' has been used to assess the potential combined impacts and effects from the two proposed development sites, using the process and significance criteria it sets out. Method W1 (Void Capacity, as detailed in the IEMA Guide) has been used to best reflect the scale and nature of the Proposed Scheme.

Study Area

17.8 The study areas for this assessment (as defined in the IEMA Guide) are:

- The development study areas comprise the extent of the Proposed Scheme footprints and any areas required for temporary access, site compounds, working platforms and other enabling activities.
- The expansive study area extends to the availability of construction materials and the capacity of waste management facilities within the South East of England region and – where necessary or especially where regional data are unavailable - the UK. This is based on Environment Agency (EA) data set out against former planning regions and sub-regions, including: Berkshire, Buckinghamshire, East Sussex, Hampshire, Isle of Wight, Kent, Oxfordshire, Surrey and West Sussex).

Consultation

17.9 To date, no statutory consultation has been undertaken for material assets and waste.

17.10 The EA has been previously consulted, on other schemes, regarding the availability of data for regional Construction, Demolition and Excavation (CDE) arisings nationally. These data are presented in the baseline section of this assessment.

Legislative / Planning Policy Context

17.11 In considering impacts and effects from materials and waste, international and national legislation, as well as national and local policy, are substantive considerations for the assessment process. Appendix 17-2 describes the legislation and policy that informs this assessment.

Assessment Process

17.12 In accordance with the IEMA Guide, environmental assessment is a quantitative exercise that aims to identify the following:

- The type and volume of materials to be consumed by the Proposed Scheme, including details of any recycled materials content.
- The type and volume of waste to be generated by the Proposed Scheme, with details of planned recovery and / or disposal method (for example on-site reuse, off-site recycling, disposal to landfill).
- The cut and fill balance.
- Details of any materials to be specified, where sustainability credentials (particularly those that improve resource efficiency) afford performance beyond expected industry standards.

17.13 The sensitivity of materials relates to the regional (and where justified, national) availability and type of resources to be consumed by the Proposed Scheme. The sensitivity of waste relates to the availability of regional (and where appropriate, national) landfill void capacity, in the absence of the Proposed Scheme and future provision.

[142] IEMA (2020) Materials and Waste in Environmental Impact Assessment

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17.14 The magnitude of impacts from the Proposed Scheme, as considered in this assessment, include:

- Anticipated reductions in availability (stocks, production and/or sales) of materials regionally and (where appropriate) nationally; and
- Anticipated reductions in the landfill void capacity of regional and national infrastructure.

17.15 The **likely types and estimated quantities of the main construction material resources required** (including site arisings generated) for the Proposed Scheme have been assessed. Impacts and effects have been evaluated against data for the regional and national materials markets, where information is available.

17.16 The **likely types and estimated quantities of waste to be generated** by the Proposed Scheme have been assessed. Impacts are evaluated against the capacity of regional (or where justified, national) waste management infrastructure.

Assessment Criteria

17.17 Table 17.2 sets out the criteria for assessing the potential magnitude of impact from materials and waste. For the purposes of the assessment, Method W1 (void capacity) as set out in the IEMA Guide, has been used.

Table 17.2 Criteria for determining magnitude of change to waste resources

Magnitude	Materials criteria The assessment of the Project is made by determining whether the consumption of…	Inert and non-hazardous waste criteria The percentage depletion of remaining landfill void capacity	Hazardous waste criteria The percentage depletion of remaining landfill void capacity
No Change	...no materials are required.	Zero waste generation and disposal from the development.	Zero waste generation and disposal from development.
Negligible	...no individual material type is equal to or greater than 1% by volume of the regional* baseline availability.	Waste generated by the development will reduce regional* landfill void capacity baseline$ by <1%.	Waste generated by the development will reduce national landfill void capacity baseline$ by <0.1%.
Minor	...one or more materials is between 1-5% by volume of the regional* baseline availability; and/or the development has the potential to adversely and substantially# impact access to one or more allocated mineral site (in their entirety), placing their future use at risk.	Waste generated by the development will reduce regional* landfill void capacity baseline$ by 1-5%.	Waste generated by the development will reduce national landfill void capacity baseline$ by <0.1-0.5%.
Moderate	...one or more materials is between 6-10% by volume of the regional* baseline availability; and/or one allocated mineral site is substantially# sterilised by the development rendering it inaccessible for future use.	Waste generated by the development will reduce regional* landfill void capacity baseline$ by 6-10%.	Waste generated by the development will reduce national landfill void capacity baseline$ by <0.5-1%.

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Magnitude	Materials criteria The assessment of the Project is made by determining whether the consumption of…	Inert and non-hazardous waste criteria The percentage depletion of remaining landfill void capacity	Hazardous waste criteria The percentage depletion of remaining landfill void capacity
Major	...one or more materials is >10% by volume of the regional* baseline availability; and/or more than one allocated mineral site is substantially# sterilised by the development rendering it inaccessible for future use.	Waste generated by the development will reduce regional* landfill void capacity baseline$ by >10%.	Waste generated by the development will reduce national landfill void capacity baseline$ by >1%.

Note: * or where justified, national. # justified using professional judgement, based on the scale and nature of the allocated mineral site being assessed. $ forecast as the worst-case scenario, during a defined construction phase.

17.18 The criteria for assessing sensitivity of materials and waste are set out in Table 17.3.

Table 17.3 Criteria for determining sensitivity of waste resources

Sensitivity	Materials criteria On balance, the key materials required for the construction of the Project…	Inert and non-hazardous waste criteria Landfill void capacity is expected to…	Hazardous waste criteria Landfill void capacity is expected to…
Negligible	Are forecast (through trend analysis and other information) to be free from known issues regarding supply and stock; and/or Are available comprising a very high proportion of sustainable features and benefits compared to industry-standard materials*	...remain unchanged, or is expected to increase through a committed change in capacity.	...remain unchanged, or is expected to increase through a committed change in capacity.
Low	Are forecast (through trend analysis and other information) to be generally free from known issues regarding supply and stock; and/or Are available comprising a high proportion of sustainable features and benefits compared to industry-standard materials.	...reduce minimally: by <1% as a result of wastes forecast.	...reduce minimally: by <0.1% as a result of wastes forecast.
Medium	Are forecast (through trend analysis and other information) to suffer from some potential issues regarding supply and stock; and/or Are available comprising some sustainable features and benefits compared to industry-standard materials.	...reduce noticeably: by 1-5% as a result of wastes forecast.	...reduce noticeably: by 0.1-0.5% as a result of wastes forecast.

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Sensitivity	Materials criteria On balance, the key materials required for the construction of the Project…	Inert and non-hazardous waste criteria Landfill void capacity is expected to…	Hazardous waste criteria Landfill void capacity is expected to…
High	Are forecast (through trend analysis and other information) to suffer from known issues regarding supply and stock; and/or Comprise little or no sustainable features and benefits compared to industry-standard materials.	...reduce considerably: by 6-10% as a result of wastes forecast.	...reduce considerably: by 0.5-1% as a result of wastes forecast.
Very High	Are known to be insufficient in terms of production, supply and/or stock; and/or Comprise no sustainable features and benefits compared to industry-standard materials.	... reduce very considerably (by>10%); end during construction or operation; is already known to be unavailable; or, would require new capacity or infrastructure to be put in place to meet forecast demand.	... reduce very considerably (by >1%); end during construction or operation; is already known to be unavailable; or, would require new capacity or infrastructure to be put in place to meet forecast demand.

* Subject to supporting evidence, sustainable features and benefits could include, for example, materials or products that: comprise reused, secondary or recycled content (including excavated and other arisings); support the drive to a circular economy; or in some other way reduce lifetime environmental impacts.

17.19 Following an assessment of sensitivity and magnitude, a determination of the significance of effects can be undertaken using the information in Table 17.4, which is taken from the IEMA Guide.

Table 17.4 Matrix to determine significance of effects thresholds for waste resources

		Magnitude of impact				
		No change	Negligible	Minor	Moderate	Major
Sensitivity of receptor	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

17.20 Effect thresholds for significance classified as moderate, large or very large are considered significant, for both materials and waste. Effects classified as slight or neutral are considered not significant in either case.

Sources on Information

17.21 The baseline data collected and presented in this chapter were obtained by desk study, from publicly available data sources, as follows:

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- Department for Business, Energy and Industrial Strategy, Monthly Bulletin of Building Materials and Components
- South East Aggregates Working Party Annual Aggregates Monitoring Report 2020
- Mineral Products Association, Profile of the UK Mineral Products Industry, 2020 Edition
- United Kingdom Steel Production I 1969-2020 Data I 2021-2022 Forecast I Historical (online)
- West Sussex Minerals Joint Plan (Adopted July 2018)
- West Sussex Waste Local Plan (Adopted April 2014
- Natural England MAGIC mapping website (online
- Department for Environment, Food and Rural Affairs (DEFRA), Basis of the UK BAP target for the reduction in use of peat in horticulture – SP0573 (2009)
- Defra (July 2021) UK Statistics on Waste
- Directive 2008/98/EC of the European parliament and of the council of 19 November 2008 on waste and repealing certain directives. The European Parliament and the Council of the European Union (2008)
- Environment Agency, Waste Data Interrogator (2021) Waste Summary Tables for England – Version 3: South East
- Environment Agency (2021) Remaining landfill capacity: England as at end 2020 Version 1.

Assumptions

17.22 A lifecycle assessment (including embodied carbon and water) of materials and waste has not been included, as the effort and resources required to complete such an exercise are deemed disproportionate to the benefit they would offer the assessment of significance of effects.

Limitations

17.23 The assessment of materials is based upon the validity of the collated information, regarding the resources that are expected to be consumed during the 'in scope' lifecycle phases of the Proposed Scheme.

17.24 The assessment of impacts and effects on landfill void capacity will be based upon the validity of the collated information, regarding the waste generated and disposed of by the Proposed Scheme during 'in scope' phases of the development.

17.25 The assessment baseline uses the most recent available data, which is up to and including 2020 (unless stated otherwise).

17.26 Landfill operators can claim commercial confidentiality for their data at time of submission; data for sites with a commercial confidentiality agreement in place are therefore unavailable for the analyses presented in this chapter.

Baseline Conditions

17.27 The section provides more detailed topic specific information to describe the character of Sites A and B and their environs. This describes the quality of the interests as they relate to this environmental topic and serves as a comparative measure against which changes arising from the construction and operational phases of the proposed development can be assessed or predicted. This identifies the sensitivity of environmental receptors.

17.28 It describes baseline material consumption and waste disposal for the current land use and provides regional / national information and data in the context of which environmental assessment can be undertaken. The content of this section does this by identifying the sensitivity of environmental receptors (i.e. very high, high, medium, low or negligible), against which the magnitude of impacts (taking into account any confirmed primary, tertiary or mitigation measures) can be compared.

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Materials currently required

17.29 The operation and maintenance of the current assets within the Proposed Scheme boundary of Site A will require a number of minor products e.g. lighting, paint, fencing, as well as the intermittent use of bulk products for routine works and repairs of the existing buildings, ancillary infrastructure, car parks and the access road (concrete, masonry, aggregate and asphalt for minor re-surfacing).

17.30 Site B comprises 3 large agricultural (arable) fields bound by hedgerows, woodland, trees and drainage ditches feeding into Ryebank Rife stream. The operation and maintenance of these current assets would be limited to agricultural products.

17.31 Although no specific data are available on materials currently required, professional judgement can be used to assert that by comparison with regional and national availability of resources, consumption of construction and other routine materials by the Proposed Scheme is minimal.

Availability of construction materials

17.32 Table 17.5 provides a summary of the availability of the main construction materials in the South East of England region and the UK, as required to deliver buildings, plant and highways. To ensure proportionality, the overview excludes technological products but provides a context in which the assessment of impacts and significant effects from bulk material consumption from the Proposed Scheme can be undertaken.

Table 17.5 Bulk construction materials availability in south east of England and the UK

Material Type	South East	UK
Sand and gravel *	16.1 million tonnes (Mt)	59.1 Mt (GB)
Permitted crushed rock *	0.0 Mt	116.5 Mt (GB)
Concrete blocks #	1.2 million square metres (Mm2) (Southern) (2020)	6 Mm2 (GB) (2020)
Primary aggregate *	16.1 Mt	198.8 Mt
Recycled and secondary	4.4 Mt (2018)	71.0 Mt
Ready-mix concrete *	2.4 million cubic metres (Mm3)	24.7 Mm3
Steel +	(no data)	7.2 Mt
Asphalt *	1.9Mt	27.4 Mt

Note # stocks + production * sales; Data availability: 2019 unless otherwise stated; GB: Great Britain (England, Wales and Scotland) figures used where UK figures (including Northern Ireland) are unavailable

17.33 Based on publicly available data, across the UK, the availability of the main construction materials typically required for residential and commercial development schemes, indicates that stocks / production / sales remain buoyant. Whilst it is recognised that COVID-19 continues to adversely impact construction supply chain security, no definitive data in this context is available for this report.

17.34 For the purposes of this assessment, any interruptions to the supply chain due to COVID-19 are considered temporary and it is likely that these will have been resolved prior to the year of commencement of construction of Site B (from 2024 onwards).

17.35 Where data are available, the South East region of England has, in general a 'higher than average' availability of some construction materials by comparison with other UK regions. For example, sales of sand and gravel and primary aggregate are amongst the highest of all UK regions. Sales of recycled and secondary aggregate, ready-mix concrete and asphalt are comparable; however, stocks of concrete blocks and sales of crushed rock are lower than the UK average.

17.36 There are no known Mineral Safeguarding Areas (MSA), peat resources or active peat extractions within or adjacent to the development study area for either Site A or Site B.

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Site Arisings

17.37 The current land use within the development study areas is expected to generate minimal volumes waste arising from site activities (site arisings), limited to surplus materials generated during minor repair works to the buildings, golf course, car parks and access road (Site A) and potential earthworks on agricultural land (Site B).

17.38 Although no data exists, it is anticipated that the current generation of site arisings is minimal in the context of material recovery facilities and regional waste management infrastructure; professional judgement indicates that the volumes of such arisings would therefore be extremely limited.

Existing waste transfer, recovery and recycling management facilities

17.39 Waste recovery facilities within the region have been assessed to identify the availability of infrastructure and capacity for the transfer and recovery of Construction, Demolition and Excavation (CDE) wastes from the Proposed Scheme. The availability of such infrastructure encourages the diversion of waste from landfill.

17.40 Defra data (Table 17.6) show that within England, the recovery rate for non-hazardous construction and demolition wastes has remained above 90% between 2010 and 2018. This exceeds the EU target of 70% (by weight), which the UK was required to meet by 2020[143]. Note that the 70% target excludes naturally occurring materials (specifically, category 17 05 04 in the List of Wastes, which is defined as non-hazardous soils and stones)[144].

Table 17.6 Non-hazardous construction and demolition waste recovery in England

Year	Generation (Mt)	Recovery (Mt)	Recovery rate (%)
2010	53.6	49.4	92.2%
2011	54.9	50.8	92.5%
2012	50.5	46.4	92.0%
2013	51.7	47.6	92.0%
2014	55.9	51.7	92.4%
2015	57.7	53.3	92.3%
2016	59.6	55.0	92.1%
2017	62.2	57.9	93.1%
2018	61.4	57.5	93.8%

Note: Defra's 2021 update of this table does not extend the data range beyond 2018

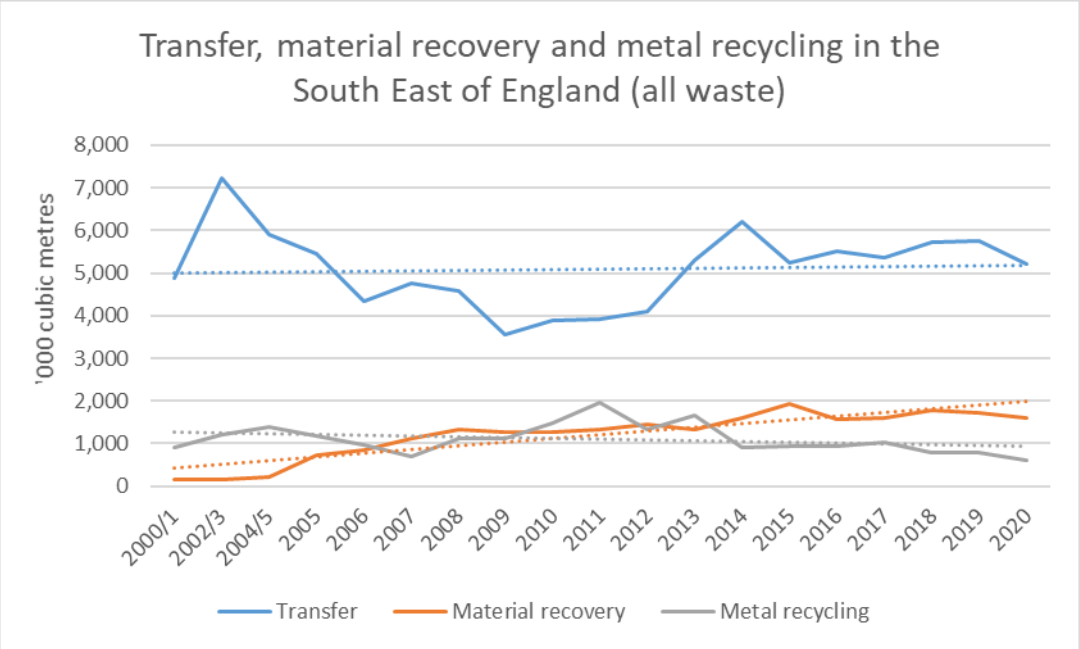
17.41 Data in Figure 17.1 has been collated to show that trends for waste recovery in the region have risen steadily over the past 20 years. Data are provided for all waste types in the South East and hence will include, but are not specific to, CDE wastes.

[143] Defra (2021) UK Statistics on Waste [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1002246/UK_stats_on_waste_statistical_notice_July2021_accessible_FINAL.pdf

[144] Directive 2008/98/EC of the European parliament and of the council of 19 November 2008 on waste and repealing certain directives. The European Parliament and the Council of the European Union (2008). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0098

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Figure 17-1 Transfer, materials recovery and recycling in the South East of England region (2000/1 – 2020)



17.42 Linear trends (shown as dashed lines on the graph) for transfer, recovery and metal recycling in the South East indicate that regional infrastructure and capacity for managing CDE wastes from the Proposed Scheme is likely to remain viable; data provided in Table 17.7 reinforces this assertion.

Table 17.7 Permitted waste recovery sites in the south east of England region (2020)

Waste recovery facility type	Number of sites
Incineration	29
Transfer	393
Treatment	424
Metal recovery	188
Use of waste	1
Total	1,035

17.43 Regional data for construction and demolition waste is presented in Figure 17-2, which is based on analysis of publicly available information in the EA Waste Data Interrogator.

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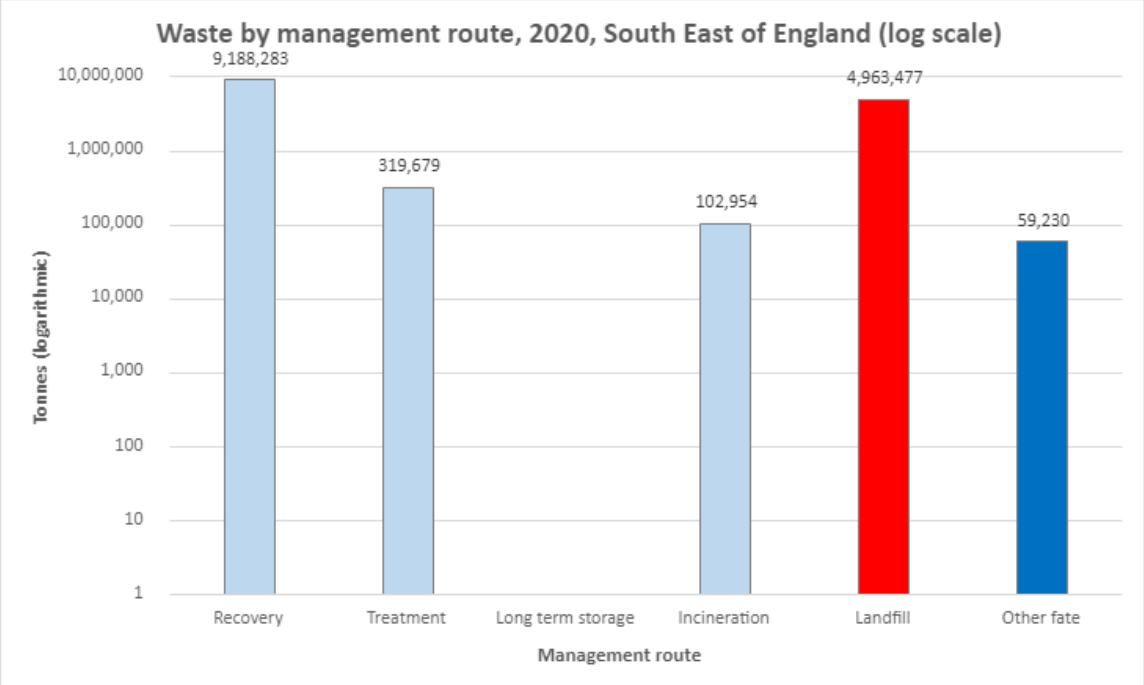


Figure 17-2 Construction and demolition waste management by route for the region

17.44 Figure 17-2 shows that, in 2020, the volume of waste recovered, including treatment and incineration, was almost double the volume of waste sent to landfill in the region. This is confirmed by data in Table 17.8 which show that 66% of waste received in the region was diverted from landfill through waste management and recovery methods. Data include the total waste received by the East of England, both within the South East region and from other regions in the UK.

Table 17.8 Waste management routes for waste received in the south east of England (2020)

Waste Management Route	Inert and non-hazardous waste (tonnes)	Hazardous waste (tonnes)	Total waste (tonnes)	Percentage
Recovery	9,499,588	111,328	9,610,916	66%
Landfill	4,914,230	49,247	4,963,477	34%
Other fate	59,230	-	59,230	0%
Totals	14,473,048	160,575	14,633,623	100%

17.45 The charts and data presented in this section confirm the availability of waste management facilities in the region that are expected – subject to data provision - to enable suitable recovery of site arisings generated by the Proposed Scheme.

17.46 The West Sussex Waste Local Plan also indicates that there is sufficient spare capacity for recycling CDE waste. There is an aspiration to achieve 'zero waste to landfill' by 2031 – defined in the plan as '*the disposal to land (via landfill or land raise) of less than 3% of the waste arising in the County*.'

17.47 The availability of materials recovery infrastructure in the South East and across England (mindful of the financial and environmental benefits that can be achieved by applying the Proximity Principle) suggests that there is strong potential to divert from landfill site arisings generated by the Proposed Scheme. The importance of this infrastructure indicates there is a strong potential to maximise the reuse / recycling value of site arisings.

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Recovering arisings and diverting them from landfill has the potential to materially influence the findings of the assessment of impacts and effects from materials and waste.

Waste currently generated and disposed of

17.48 Waste generated for disposal to landfill from activities undertaken on the current land uses is expected to comprise non-recoverable from routine maintenance and infrequent repair of the existing buildings, golf course, car park and access road (Site A) and farming practices (Site B). Although no waste data exists, it can be asserted (using professional judgement) that even in the worst-case scenario, the current waste generation and disposal is minimal in the context of available regional capacity.

Regional Perspective: Remaining Landfill Capacity

17.49 EA data confirm that at the end of 2020, 59 landfill sites in the South East of England region were recorded as having 63.2 million cubic meters (Mm^3) of remaining capacity. Data in Table 17.9 summarise this information by landfill type; the change in capacity from 2019 to 2020 is also shown.

Table 17.9 Remaining landfill capacity in the south east of England (2019-2020)

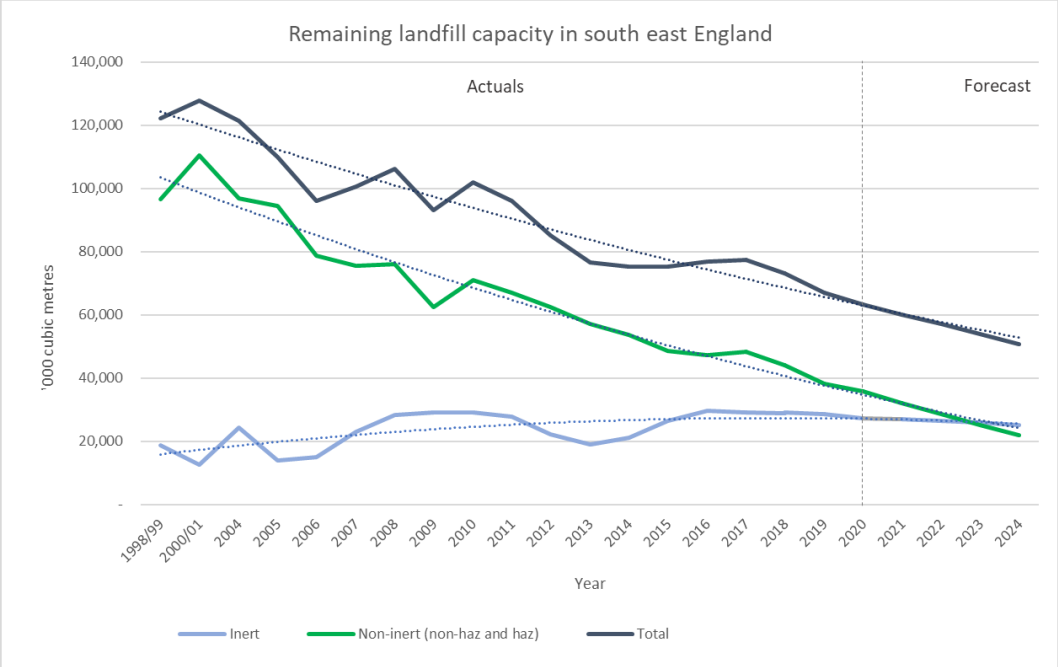
Landfill type	Remaining capacity in 2019 (m3)	Remaining capacity in 2020 (m3)	2019 to 2020 change in capacity Mm3 (%)
Hazardous (merchant)	181,315	146,325	0.0 (-19.3%)
Hazardous (restricted*)	139,809	117,042	0.0 (-16.3%)
Inert	38,142,030	27,174,453	-11.0 (-28.8%)
Non-hazardous (including stable hazardous waste cells)	28,525,357	35,752,782	7.2 (25.3%)
Total	66,988,511	63,190,602	-3.8 (-5.7%)
Notes	*Restricted landfill sites only accept waste from restricted sources and producers, e.g. site operator / managing site.		

17.50 The West Sussex Waste Local Plan determines that there is a theoretical shortfall in new inert landfill void capacity for inert waste over the plan period (2031), although large amounts of inert waste is used for beneficial purposes, such as quarry restoration and landscape projects. Therefore, recovery through accommodating inert fill to committed and allocated mineral extraction sites allows sufficient space for future inert waste arisings. Therefore, there is no requirement for additional landfill or recovery void space over the plan period.

17.51 Baseline regional landfill capacity is detailed in Figure 17.3. Simple statistical forecasting (using the Microsoft Excel forecasting function) has been used to demonstrate long-term void capacity to the year of planned Proposed Scheme completion (currently anticipated to be 2024) in the absence of future provision.

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Figure 17-3 Remaining landfill capacity in South East of England



17.52 Baseline data indicates that in the absence of future provision, inert, non-inert and total landfill capacity is likely to become an increasingly sensitive receptor throughout the duration of the construction phase and in operation. Figure 17.3 shows that in the absence of future provision, waste capacity in the South East of England region is forecast to reduce from 2020 to 2024 by as much as:

- Inert waste - 7% to 25.2 Mm3;
- Non-inert waste – 39% to 21.9 Mm3; and
- Total waste - 20% to 50.9 Mm3.

Future Baseline

17.53 In the future baseline (a scenario in which the Proposed Scheme is absent), it is considered that the current land use within the development study area would remain the same. Given the scale of the current infrastructure within the site boundaries for both Site A and Site B, the consumption of materials resources and the recovery of site arisings is considered to remain minimal. Similarly, the potential for waste generation to landfill in the future baseline is also anticipated to remain minimal.

Sensitivity of Environmental Receptors - Site A

17.54 Baseline receptors within the Study Area are listed alongside an assessment of their sensitivity. The sensitivity of receptors has been determined following the IEMA guidance.

Table 17.10 Summary of sensitivity of waste resources related to Site A

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Receptor/Resources	Sensitivity	Summary Reason
Availability of construction materials	Low	Overall, the baseline sensitivity of material assets is determined to be low due to: - the generally buoyant availability of bulk material resources within the south east of England region and nationally which, the time of writing, indicates that there are currently no significant issues regarding supply and stock; and - materials are available comprising some sustainable features and benefits compared to industry-standard materials.
Availability of landfill capacity	Very high	- Overall, the baseline sensitivity of total waste is determined to be very high due to an expected reduction of regional landfill void capacity (in the absence of any future provision) of 20%

Sensitivity of Environmental Receptors - Site B

17.55 Baseline receptors within the Study Area are listed alongside an assessment of their sensitivity. The sensitivity of receptors has been determined following the IEMA guidance.

Table 17.11 Summary of sensitivity of waste resources related to Site B

Receptor/Resources	Sensitivity	Summary Reason
Availability of construction materials	Low	Overall, the baseline sensitivity of material assets is determined to be low due to: - the generally buoyant availability of bulk material resources within the south east of England region and nationally which, the time of writing, indicates that there are currently no significant issues regarding supply and stock; and - these materials are available comprising some sustainable features and benefits compared to industry-standard materials.
Availability of landfill capacity	Very high	Overall, the baseline sensitivity of total waste is determined to be very high due to an expected reduction of regional landfill void capacity (in the absence of any future provision) of 20%

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Inherent and Standard Mitigation

17.56 This section describes those 'inherent' and 'standard' mitigation measures which primarily address the scope to avoid, reduce or remedy adverse environmental impacts or enhance the beneficial aspects arising from the construction and operational periods of the proposed development.

Site A – Redevelopment of existing golf course

17.57 The design of Site A will follow the principles of the Waste Hierarchy, seeking to prevent the generation and disposal of waste as a first principle. For example, the existing clubhouse building, located to the south of the existing site, will be retained for reuse as a community hub. This will prevent demolition waste being generated and disposed to landfill.

Site B – Relocation of Golf Course

17.58 The design of Site B will follow the principles of the Waste Hierarchy, seeking to prevent the generation and disposal of waste as a first principle.

Assessment of Environmental Effects

17.59 This section provides an assessment of the nature, extent, magnitude of change that the proposed development will have on individual receptors identified in the baseline section. By employing the sensitivity of the receptor and magnitude of change, the significance of environmental effects which arise as a result of the construction and operational periods of the proposed development will be determined.

17.60 At outline planning stage, there is no available information on the types and quantities of construction materials required, or site arisings and waste likely to be generated, for the Proposed Scheme; this applies to both Site A and Site B.

17.61 In order to determine the likely magnitude of impact of the Proposed Scheme, the magnitude thresholds for materials consumption are provided in Table 17.12 based on current available data.

Table 17.12 Magnitude thresholds for determining waste resource availability

Material	Production / sales data for the region* (Million tonnes – unless otherwise stated)	1% threshold (tonnes – unless otherwise stated)	5% threshold (tonnes – unless otherwise stated)
Sand and gravel	16.1	161,000	805,000
Permitted crushed	116.5	1,165,000	5,825,000
Concrete blocks	1.2M m2	12,000m2	60,000m2
Recycled and	4.4	44,000	220,000
Ready-mix	2.4M m3	24,000m3	120,000m3
Asphalt	1.9	19,000	95,000
Steel	7.2*	72,000	360,000
*nationally where regional data unavailable			

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Site A – Redevelopment of existing golf course

Table 17.13 Magnitude of change to waste related receptors arising from development at Site A

Receptor/Resources	Summary of Change to Receptor/Resource	Summary Reason
Availability of construction materials	It is likely that the potential for consumption of one or more materials (e.g. concrete blocks) is between 1-5% by volume of regional baseline availability.	Based on the criteria set out in Table 17.2, and the baseline data provided, it is possible to use professional judgement on the scale and nature of Site A (which - in the absence of available data, requires adoption of a proportionate worst case scenario) - the magnitude for material resources consumption is considered Minor.
Availability of landfill capacity	It is not likely that waste generated by Site A will reduce total regional landfill void capacity by more than 1%, (632,000m3).	Based on the criteria set out in Table 17.2 and the baseline data provided, it is possible to use professional judgement on the scale and nature of Site A (which - in the absence of available data, requires adoption of a proportionate worst case scenario) - the magnitude for waste generation is considered Negligible.

Site B – Relocation of Golf Course

Table 17.14 Magnitude of change to waste related receptors arising from development at Site B

Receptor/Resources	Summary of Change to Receptor/Resource	Summary Reason
Availability of construction materials	It is unlikely that the consumption of any individual material type is equal to or greater than 1% by volume of regional (or national) baseline availability.	Based on the criteria set out in Table 17.2, and the baseline data provided, it is possible to use professional judgement on the scale and nature of Site B (which - in the absence of available data, requires adoption of a proportionate worst case scenario) - the magnitude for material resources consumption is considered Negligible.
Availability of landfill capacity	It is not likely that waste generated by Site B will reduce total regional landfill void capacity by more than 1%, (632,000m3).	Based on the criteria set out in Table 17.2 and the baseline data provided, it is possible to use professional judgement on the scale and nature of Site B (which - in the absence of available data, requires adoption of a proportionate worst case scenario) - the magnitude for waste generation is considered Negligible.

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Site A – Redevelopment of existing golf course

17.62 Based on the information provided in Table 17.15, the overall effect of material consumption for, and waste generation disposal from, Site A are both considered ***not significant***.

Table 17.15 Significance of effects on waste related receptors associated with development at Site A

Receptor/Resources	Sensitivity	Magnitude of Change	Significance of Effect
Availability of construction materials	Low	Minor	Neutral or Slight
Landfill capacity	Very high	Negligible	Slight

Site B – Relocation of Golf Course

17.63 Based on the information provided in Table 17.16, the overall effect of material consumption for, and waste generation disposal from, Site B are both considered ***not significant***.

Table 17.16 Significance of effects on waste related receptors associated with development at Site A

Receptor/Resources	Sensitivity	Magnitude of Change	Significance of Effect
Availability of construction materials	Low	Negligible	Neutral or Slight
Landfill capacity	Very high	Negligible	Slight

Actionable Mitigation

17.64 This section describes actionable mitigation to be employed to reduce the negative effects of the proposed development.

17.65 This section describes the identification of actionable mitigation that shall be employed to reduce the magnitude of adverse impacts from the Proposed Scheme. Where significant adverse effects have been identified, actionable mitigation shall be deployed and secured through planning, to reduce impacts such that associated effects are no longer significant.

17.66 It is noted that while the pre-mitigation assessment (Section 13.6) has identified that effects from material consumption, and from waste generation and disposal, are *not* significant, the following measures will either be adopted by the applicant outside of Section 106 or Reserved Matters (or similar) conditions, to demonstrate a commitment to good practice, or are expected as a natural course of constructing the sites. These measures are not *necessarily* actionable, therefore, rather a statement of intent on sustainable resource and waste management.

Proposed Scheme (Site A and Site B)

17.67 As the Proposed Scheme designs advance, the following measures will be explored to maximise material resource efficiency:

- Specifying recycled and secondary content in imported materials (such as aggregate, concrete and asphalt).
- Maximising the use of off-site construction and pre-fabrication methods to encourage a process of assembly rather than construction.

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- Capturing and communicating actions within the design that facilitate deconstruction and disassembly, to encourage reuse and recycling at assets' end of life.
- Specifying materials and products that afford higher sustainability performance than typical industry standards e.g. closed loop plasticised cable ducting; low carbon materials (timber), or technology that is powered through renewable energy sources.
- Identifying how to suitably locate and manage stockpiles to maximise reuse from site arisings. Stockpiles will be designed to minimise quality degradation, damage and loss of resource. The following considerations will be taken into account: the stockpile location, the underlying soil type and condition, methods for prevention of erosion and leachate generation, and use of appropriate signage; these considerations will be described in more detail in the CEMP.

17.68 A CEMP is expected to be required as a condition for the to-be-commissioned site developer; this is expected to include a Site Waste Management Plan (SWMP), which should commit to achieving less than 10% waste to landfill. A SWMP would be used to demonstrate a good practice approach to resource efficiency during construction, and to capture the benefits of (*inter alia*):

- Managing arisings as part of the ground preparation and excavations to achieve the design ambition for a balanced cut and fill. For example, the applicant has noted that soil arisings from the excavations for substructures and surface water storage will (as applicable to each site) be reused in the planned works. Additionally, the applicant will identify opportunities to incorporate felled timber to produce street furniture, and to use this resource in other high value uses e.g. play areas, insect homes, and as part of future art strategies, wherever practicable.
- Achieving a neutral cut and fill balance across both sites (either individually or in unison), with the target of achieving 'self-containment'.

17.69 The material palette for the buildings and landscapes across both sites will also be reviewed as the design advances, to ensure resources that maximise sustainability credentials are used, and are mindful of safety, quality and cost.

Site A specific measures

17.70 To support a low waste approach in operation, and in accordance with good practice approaches (for example BREEAM 2018 WST03 Operational Waste), the applicant will engineer in space provision for source-segregated waste collection bins and sorting equipment within the units. The potential for a community recycling space, in a central location for collection of household recyclates, will also be investigated.

Site B specific measures

17.71 The design will also seek to reuse inert construction site arisings from other local projects sites (if available and practicable), to minimise primary imports for (for example) greens, tees, and drainage construction.

17.72 The design will consider how to establish an onsite 'green waste' composting facility, that will compost 100% of the operational landscape green waste, generated through typical maintenance practices of the golf course and surrounding landscape.

17.73 Materials needed for the golf course construction i.e. sands, gravels, will be sourced (where practicable) from local suppliers within 150km of the site.

17.74 Alignment to the voluntary GEO Certified® Development Scheme[145] which contains a number of requirements on materials and waste, will also be pursued for the construction process.

[145] International Voluntary Sustainability Standard for Golf Construction [https://sustainable.golf/assets/media/development_vss_2nd-editon_web.pdf]

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Residual Impact Assessment

17.75 This section identifies residual effects and their significance.

17.76 Tables 17.17 and 17.18 summarise the residual environmental effects associated with the Proposed Scheme. At the time of writing, and the design is still in development, no materials or waste data was available to validate this assessment; the findings of this section have therefore been carried out using professional judgement based on knowledge of schemes of a similar scale and nature.

Site A – Redevelopment of existing golf course

Table 17.17 Mitigation to reduce waste related effects at Site A

Receptor/Resources	Significance of Effect	Mitigation (Actionable)	Residual Effect
Availability of construction materials	Neutral or Slight (Not Significant)	No mitigation required	Not significant
Availability of landfill capacity	Slight (Not Significant)	No mitigation required	Not significant

Site B – Relocation of Golf Course

Table 17.18 Mitigation to reduce waste related effects at Site B

Receptor/Resources	Significance of Effect	Mitigation (Actionable)	Residual Effect
Availability of construction materials	Neutral or Slight (Not Significant)	No mitigation required	Not Significant
Availability of landfill capacity	Neutral or Slight (Not Significant)	No mitigation required	Not Significant

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Cumulative Effects

17.77 This Section identifies and assesses the nature, extent, magnitude and significance of inter-project effects (i.e., effects from other development in combination with those from the proposed development).

17.78 An initial review of the committed developments identified in Chapter 4 has identified a number that have the potential to generate significant inter-project cumulative effects due to the requirement for construction materials and the management of waste generated during construction of the Proposed Scheme:

17.79 Without materials and waste data from the Proposed Scheme, to assess alongside the combined impacts and effects from the respective sites, it has not been possible to *quantifiably* assess the potential cumulative effects.

17.80 At the outline planning stage, however, it is reasonable to assert – using professional judgement, and considering assessed absence of significance adverse effects from both sites within the Proposed Scheme - that the potential for cumulative effects is limited. This assertion would be strengthened through:

- the provision of materials and waste data for the Proposed Scheme;
- the provision of materials and waste data for those developments which will be constructed and operated in the same timeframes as the Proposed Scheme; and
- information on good and best practice measures adopted by cumulative developments in the region.

Summary

17.81 The impacts and effects of consuming materials, and generating and disposing of waste to landfill, from Site A and Site B have been assessed. The assessment process used complies with the industry best practice document 'IEMA Guide to Materials & Waste EIA', and was conducted in accordance with professional judgement in the absence of quantitative data.

17.82 The construction stage is the only phase of the Proposed Scheme that has been scoped into the assessment, as it has been possible to qualify that no significant effects are expected during 'operation' or 'end of life'.

17.83 For Site A and Site B, the potential for adverse effects from materials consumed, and waste disposed of, was assessed to be **not significant**.

17.84 Whilst a quantitative assessment of cumulative effects has not been possible, it is reasonable to assert – using professional judgement, and considering assessed absence of significance adverse effects from both sites within the Proposed Scheme - that the potential for cumulative effects is limited.

17.85 If further iterations of this chapter are required at full planning stage, it will be necessary that the assertions in this chapter are revisited, especially where materials and waste data are made available.

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18 CULTURAL HERITAGE

Introduction

18.1 This Chapter of the ES presents the findings of the assessment of likely significant effects of the construction and operational phases of the proposed developments in terms of archaeology and cultural heritage. It incorporates the results of a heritage desk-based assessments (DBA) and a geoarchaeological desk-based assessments which are at *Appendices 18.1 – 18.2*. A geophysical survey for Site B is included at *Appendix 18.3*.

Potential Effects

18.2 This section summarises the likely potential effects of the proposed development on the environmental topic area.

18.3 The historic environment includes a wide range of features resulting from human intervention in the landscape, varying in scope from buried archaeological remains, to late 20th century industrial and military structures. It can be broadly divided into the following categories:

- Archaeology - which comprises Scheduled Monument (SMs) and non-designated archaeological heritage assets; and
- Built Heritage - which comprises listed buildings, non-designated buildings of heritage interest, registered parks and gardens, conservation areas, historic battlefields and World Heritage Sites (WHS).

18.4 The assessment has identified the following potential effects on Cultural Heritage in relation to the redevelopment of Site A.

- Potential direct effects from construction on non-designated geoarchaeological and paleoenvironmental evidence;
- Potential direct effects from construction on non-designated buried archaeological remains; and
- Potential indirect effects from construction and operation on built heritage receptors in the vicinity of the development.

Assessment Methodology

18.5 The section describes the methodology used to undertake the assessment within this Chapter.

Study Area

18.6 There are no strict parameters for the setting of study areas, therefore the following study areas have been chosen for this assessment using professional judgement, and experience of potential significant direct and indirect effects likely to arise from the Proposed Development:

- Archaeological study area: a radius of 1km from the edge of the Site to identify designated and non-designated archaeological assets which might be directly or indirectly impacted by the Proposed Development and inform the potential for previously unrecorded archaeological remains.

18.7 Again, there are no fixed parameters for establishing the study areas for a settings assessment. The following study areas were defined based on professional judgement and experience of potential likely significant indirect effects to arise from the Proposed Development:

- Settings assessment study area - A radius of 1 km from the edge of the Site has been used to identify

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designated or non-designated built heritage assets which might be indirectly impacted by the Proposed Development.

Consultation

18.8 The Desk Based Assessments were provided to the Archaeological Advisor to Arun District Council (ADC) in November 2021. At the time of writing no comments have been received.

Legislative / Planning Policy Context

18.9 The following legislation has informed the assessment of effects within this Chapter, and is detailed further in *Appendix 18.1* and *18.2*:

- Ancient Monuments & Archaeological Areas Act 1979[146]
- Planning (Listed Building and Conservation Areas) Act 1990[147]

18.10 The following policy has informed the assessment of effects within this Chapter, and is detailed further in *Appendix 18.1* and *18.2*:

- National Planning Policy Framework (NPPF)[148]
- National Planning Practice Guidance (NPPG)[149]
- Arun Local Plan 2011-2031: Policy HER DM1 Listed Buildings; Policy HER DM3 Conservation Areas; Policy HER DM6 Sites of Archaeological Interest[150]
- Felpham Neighbourhood Plan (2013-2029): Policy ESD7: Felpham conservation area; Policy ESD8: Building design[151]

18.11 The following guidance has informed the assessment of effects within this Chapter, and is detailed further in *Appendix 18.1* and *18.2*:

- National Planning Practice Guidance (NPPG)[152];
- Historic Environment Good Practice Advice In Planning Note 2: Managing Significance in Decision-Taking in the Historic Environment[153]
- Historic Environment Good Practice Advice In Planning Note 3: The Setting of Heritage Assets[154]

Assessment Process

18.12 The assessment process has involved the production of a Heritage DBA contained within *Appendix 18.1 (which includes a geoarchaeological assessment*) for Site A. For Site B, the assessment process involved the production of a heritage DBA, contained within *Appendix 18.2 (which includes a geoarchaeological assessment)* and a geophysical survey contained in *Appendix 18.3*.

18.13 The first step in the assessment process is the identification of known and potential cultural heritage receptors that may be affected by the proposed development. Heritage receptors are either designated (Scheduled Monuments, Conservation Area, Listed Buildings, Registered Parks and Gardens or Registered Battlefields) which are identified on the National Heritage List for England (NHLE) or areas of importance identified in

[146] Ancient Monuments & Archaeological Areas Act, (1979)
[147] Planning (Listed Building and Conservation Areas) Act, (1990)
[148] National Planning Policy Framework (NPPF), (2021), Ministry, Housing, Communities & Local Government
[149] National Planning Practice Guidance (NPPG), (2019), Ministry, Housing, Communities & Local Government
[150] Arun Local Plan 2011-2031, (July 2018), Arun District Council
[151] Felpham Neighbourhood Plan, (2013-2029), Felpham Parish Council
[152] National Planning Practice Guidance (NPPG), (July 2019), Ministry, Housing, Communities & Local Government
[153] Historic Environment Good Practice Advice In Planning Note 2: Managing Significance in Decision-Taking in the Historic Environment, (2015), Historic England
[154] Historic Environment Good Practice Advice In Planning Note 3: The Setting of Heritage Assets, (2017), Historic England

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local planning policy, or non-designated heritage assets.

18.14 As defined in the PPG "Non-designated heritage assets are buildings, monuments, sites, places, areas or landscapes identified by plan-making bodies as having a degree of heritage significance meriting consideration in planning decisions, but which do not meet the criteria for designated heritage assets."

18.15 Non-designated heritage assets can comprise identified heritage receptors, for example finds or features recorded in the Historic Environment Record or locally listed buildings recorded in local planning policy. The potential for previously unrecorded heritage assets is also considered, for example previously unrecorded archaeological remains or previously un-assessed built heritage asset.

18.16 Not all features recorded on Historic Environment Records are non-designated assets. As outlined in *Managing Significance in Decision-Taking in the Historic Environment*[155] Historic Environment Records includes "assets that are known to have been demolished or destroyed or known only from antiquarian sources"; they are no longer physically present. Similarly, there is potential for non-designated heritage assets that are not recorded on the Historic Environment Record or recorded in local planning policy to be present. Such remains may include previous unrecorded sub-surface remains, landscape features or buildings identified through an appraisal of sources or identification through a site visit.

18.17 In terms of non-designated assets, the PPG states that there are two categories of non-designated sites of archaeological interest:

"(1) Those that are demonstrably of equivalent significance to scheduled monuments and are therefore considered subject to the same policies as those for designated heritage assets...

(2) Other non-designated heritage assets of archaeological interest"

18.18 The value / significance of a non-designated heritage asset may change following assessment and evaluation prior to a planning decision and move from the second to the first category.

18.19 The PPG states that applicants should, if required, submit an appropriate DBA and, where necessary, a field evaluation.

Assessment Criteria

Assessing Heritage Significance and Sensitivity

18.20 The significance of a heritage asset is defined in the NPPF as "The value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting." In the case of many heritage assets their importance has already been established through the designation (i.e., scheduling, listing and register) processes applied by Historic England (HistE).

18.21 In order to assess the heritage significance of previously unrecorded or non-designated heritage assets, the criteria set out by the Department of Culture, Media, and Sports publication, '*Principles for Selection of Listed Buildings*'[156] and the *Scheduled Monuments Policy Statements*[157], are used. The criteria for establishing significance of heritage assets for this assessment are presented in Table 18.1 below.

[155] Historic Environment Good Practice Advice In Planning Note 2: Managing Significance in Decision-Taking in the Historic Environment, (2015), Historic England
[156] Principles for Selection of Listed Buildings, (2010), Department of Culture, Media, and Sports
[157] Scheduled Monuments Policy Statements (2013), Department of Culture, Media, and Sports

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Table 18.1. Criteria for determining the significance of heritage assets

Significance	Description
International	Archaeological sites or monuments of international importance, including World Heritage Sites. Structures and buildings inscribed as of universal importance as World Heritage Sites. Other buildings or structures of recognised international importance.
National	Monuments scheduled under the Ancient Monuments and Archaeological Areas Act 1979, or archaeological sites and remains of comparable quality, assessed with reference to the DCMS's principles of selection for scheduled monuments (DCMS 2013). Listed Buildings. Conservation Areas. Non-designated built assets of national importance, assessed with reference to the Secretary of State's published Principles of Selection for Listing Buildings[158].
Regional/County	Archaeological sites and remains which, while not of national importance, score well against most of the DCMS's principles of selection for scheduled monuments[159].
Local	Archaeological sites that score less well against the DCMS's principles of selection for scheduled monuments[160]. Historic buildings on a 'local list'. Non-designated built assets of local significance.
None	Areas in which investigative techniques have produced negligible or only minimal evidence for archaeological remains, or where previous large-scale disturbance or removal of deposits can be demonstrated.

18.22 Significance has been assigned to effects relative to the heritage significance, its sensitivity to change and the magnitude of impact in accordance with best practice.

18.23 The sensitivity of a heritage receptor / resource is determined by evaluating a receptors susceptibility to change and heritage significance. For direct physical impacts to below ground archaeological remains or built heritage assets, this is assessed in terms of potential reduction of heritage significance through the physical impact of a monument or building.

18.24 For indirect impacts to the setting of heritage assets, the heritage significance of an asset is not the same as its sensitivity to change[161]. Thus, in determining effects upon the setting of assets by a proposed development, both heritage significance and sensitivity to changes to setting need to be considered. Factors considered when assessing sensitivity to indirect change include, but are not limited to, heritage significance, condition, type and period of asset and landscape positioning. The assessment of settings impact following the methodology set out in the Historic Environment Good Practice Advice in Planning Note 3, *The Setting of Heritage Assets.*[162]

18.25 The criteria for assessing sensitivity to change is set out in Table 18.2 below.

Table 18.2 Sensitivity of heritage receptors / resources

Sensitivity	Receptor
High	The receptor/resource has little ability to absorb change without fundamentally altering its present international or national heritage significance; or The Application Site(s) make a high contribution to the setting / heritage significance of a designated heritage asset.

[158] Scheduled Monuments. Identifying, protecting, conserving and investigating nationally important archaeological sites under the Ancient Monuments and Archaeological Areas Act 1979, (2010), Department of Culture, Media, and Sports
[159] Scheduled Monuments Policy Statements, (2013), Department of Culture, Media, and Sports
[160] Scheduled Monuments Policy Statements, (2013), Department of Culture, Media, and Sports
[161] Historic Environment Good Practice Advice In Planning Note 3: The Setting of Heritage Assets, (2017), Historic England
[162] Historic Environment Good Practice Advice In Planning Note 3: The Setting of Heritage Assets, (2017), Historic England

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Sensitivity	Receptor
Moderate	The receptor/resource has moderate capacity to absorb change without significantly altering its present regional heritage significance; or The Application Site(s) make a moderate contribution to the setting / heritage significance of a designated heritage asset.
Low	The receptor/resource is tolerant of change without detriment to its heritage significance, is of low or local heritage significance; or The study site makes a minor contribution to the setting of a designated heritage asset.

Assessing Magnitude of Impact

18.26 The nature and likelihood of the impacts of the Proposed Development is assessed in both the short, medium and long, on archaeological and heritage features against clearly defined criteria.

18.27 Significance has been assigned to effects relative to the heritage significance, its sensitivity to change and the magnitude of impact in accordance with best practice.

18.28 Archaeological and built heritage resources are susceptible to a range of direct impacts during site preparation as well as construction related activities, including:

- Site clearance / site preparation activities that disturb archaeological remains;
- Demolition or alteration of designated and non-designated built cultural heritage assets;
- Excavation that extends into archaeological sequences, for example remediation excavations, deep foundations, basements or re-landscaping (for example attenuation ponds) resulting in the removal of the resource;
- Piling activities resulting in disturbance and fragmentation of the archaeological resource; and
- Dewatering activities resulting in desiccation of waterlogged remains and deposits.

18.29 Indirect impacts to heritage receptors primarily relate to changes to the setting of a Listed Building / Conservation Areas / Scheduled Monument / non-designated heritage asset.

18.30 The magnitude of the impact is a product of the extent of development impact on an asset. Impacts are rated as High, Medium, Low and Negligible/Neutral. Impacts can be direct or indirect, adverse or beneficial. The criteria for assessing the magnitude of impact are set out in Table 18.3 below.

Table 18.3 Magnitude of impact on heritage assets

Magnitude	Direct Impacts	Indirect Impacts
Major Adverse	Demolition of built heritage assets or demolition within a Conservation Area. Complete removal of an archaeological site.	Radical transformation of the setting of an archaeological monument. Substantially harmful change to the significance of a built heritage asset or Conservation Area due to a change in setting.
Moderate Adverse	Harmful alteration (but not demolition) of a built heritage asset or alterations to a building in a Conservation Area. Removal of a major part of an archaeological site and loss of research potential / significance.	Less than substantial harm to the significance of a built heritage asset or Conservation Area due to a change in setting. Partial transformation of the significance of an archaeological site e.g., the introduction of significant noise or vibration levels to an archaeological monument leading to changes to amenity use, accessibility or appreciation of an archaeological site.

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Magnitude	Direct Impacts	Indirect Impacts
Minor Adverse	Alterations to a built heritage asset or Conservation Area resulting in minor harm. Removal of an archaeological site where a minor part of its total area is removed but the site retains significant future research potential.	Minor harm to the significance of an archaeological monument or built heritage asset or Conservation Area due to a change in setting.
Negligible/ Neutral	Negligible impact from changes in use, amenity or access. Negligible direct impact to the built heritage asset or Conservation Area.	Negligible perceptible change to the significance of a building, archaeological site or Conservation Area due to a change in setting.
Minor Beneficial	Alterations to a built heritage asset or Conservation Area resulting in minor beneficial impacts. Land use change resulting in improved conditions for the protection of archaeological remains.	Minor enhancement to the setting of a built heritage asset or Conservation Area. Decrease in visual or noise intrusion on the setting of a building, archaeological site or monument.
Moderate Beneficial	Alterations to a built heritage asset or Conservation Area resulting in moderate beneficial impacts. Land use change resulting in improved conditions for the protection of archaeological remains plus interpretation measures (heritage trails, etc.)	Significant reduction or removal of visual or noise intrusion on the setting of a building, archaeological site or monument. Improvement of the wider landscape setting of a built heritage asset, Conservation Area, archaeological site or monument. Improvement of the cultural heritage amenity, access or use of a built heritage asset, archaeological site or monument. Moderate enhancement to the setting of the built heritage asset and Conservation Area.
Major Beneficial	Arrest of physical damage or decay to a built heritage asset or structure. Alteration to a built heritage asset or Conservation Area resulting in significant beneficial impact.	Significant enhancement to the setting of a built heritage asset. Conservation Area or archaeological site, its cultural heritage amenity and access or use.

18.31 The above primarily deals with visual factors affecting setting. Whilst the importance of visual elements of settings, e.g., views, intervisibility, prominence etc., are clear, it is also acknowledged that there are other non-visual factors which could potentially result in impacts to setting. Such factors could be other sensory factors, e.g., noise or odour, or could be associative. In coming to a conclusion about magnitude of change upon setting, this assessment makes reference to traffic, noise, air quality, and townscape and visual assessments, reported in the ES, as appropriate.

Significance of Effect

18.32 The significance of the impact of the proposed development on archaeological and heritage assets is determined by the heritage significance of the asset and the magnitude of impact to the asset. Table 18.5 presents a matrix that demonstrates how the significance of effect is established.

18.33 Effects of moderate or above are considered 'significant', unless otherwise stated. However, professional judgement is also used in considering the significance of effects.

18.34 The judgement of the significance of effects takes into consideration the impact on the heritage asset's heritage significance (as defined in Annex 2 of the NPPF). As part of this assessment, the impact on the contribution that the setting of a heritage asset makes to its significance is also considered. The nature of the contribution that the setting of an asset makes to its heritage significance varies from asset to asset (i.e., the setting of some assets have a greater contribution to the significance and vice versa). Consequently, where there are effects from a development on the setting of an asset that has only a limited contribution to the significance of that asset, the effect on the significance of the asset itself may be very limited or even potentially non-existent. Where a heritage asset has a setting that has a large contribution to the significance of that asset, effects on the

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significance of the asset itself will be greater.

Table 18.4 Matrix for determining significance of effects on heritage assets

		Magnitude of Impact			
		Major	Moderate	Minor	Negligible
Sensitivity of Heritage Asset	High	Major	Major	Moderate - Minor	Negligible
	Moderate	Major - Moderate	Moderate - Minor	Minor	Negligible
	Low	Moderate - Minor	Minor	Minor-Negligible	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Sources on Information

18.35 The following data sources were used in the compilation of the baseline data:

- West Sussex Historic Environment Record (WSHER) Data
- The National Heritage List for England (NHLE) held by Historic England
- The National Archives (TNA)
- The British Library (BL)
- Historic England Archive
- Pastscape
- Areas of importance identified in local planning policy (conservation areas, archaeological priority areas)
- Local studies and record office research
- Map regression exercise
- Archaeology and built heritage site inspection.

18.36 The geoarchaeological DBA was undertaken by QUEST (University of Reading) with the aim of assessing the geoarchaeological and paleoenvironmental significance and potential of the site, and to determine whether there are justifications for further work on the site based on current knowledge; and to outline a preliminary strategy for on-site investigation (if needed). These are included within each Desk Based Assessment for each site (Appendix 18.1 and 18.2).

18.37 The results of a geophysical survey of Site B within *Appendix 18.3*. The geophysical survey was undertaken in accordance with the CIfA's Standards and Guidelines for archaeological geophysical survey[163]. Archaeological geophysical survey uses non-intrusive and non-destructive techniques to determine the presence or absence of anomalies likely to be caused by archaeological features, structures or deposits, as far as reasonably possible, within a specified area or site on land, in the inter-tidal zone or underwater. Geophysical survey determines the presence of anomalies of archaeological potential through measurement of one or more physical properties of the subsurface. Geophysical survey of Site A was not possible due to the continuous use of the existing golf course and moreover due to the modern, recreational use of the site, a geophysical survey is unlikely to have good quality survey results.

Assumptions

18.38 The magnitude of impact is based on an assumption on average foundation depths being in the region of 1m. It is noted that the site specific condition on the Site may require raising of areas across the Site which may

[163] Standards and Guidelines for Historic Environment Desk Based Assessments, (2014), CIFA

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serve to reduce physical impact to potential below ground archaeological remains. The assessment is based on construction from existing ground levels and therefore provides a worst case assessment of potential impacts and effects.

Limitations

18.39 This assessment is based upon data obtained from publicly accessible archives as described in paragraph 17.34. Data was received from West Sussex Historic Environment Record in September 2021 and downloaded from the HistE website in September 2021.

Baseline Conditions

18.40 The section provides more detailed topic specific information to describe the character of Sites A and B and their environs. This describes the quality of the interests as they relate to this environmental topic and serves as a comparative measure against which changes arising from the construction and operational phases of the proposed development can be assessed or predicted. This identifies the sensitivity of environmental receptors.

18.41 The following section outlines the Baseline Conditions for both Site A and B. The baseline considers first archaeology and then built heritage separately. The location of heritage assets referred to are shown on Figures 18.1 – 18.6.

Site A – Redevelopment of existing golf course

Archaeology

18.42 As outlined in the geoarchaeological assessment of the Site by QUEST, *Appendix 18.1,* the Site is located on a complex of raised beaches that form the West Sussex Coastal Plain. Most of the sand and gravel resting on bedrock beneath the lower coastal plain, including deposits beneath the Golf Course site can be regarded as remnants of the Pagham Formation (Pagham Raised Beach), the lowest of the Sussex raised beaches. Judging by the Optically Stimulated Luminescence (OSL) dates reported by Bates et al (2007), this beach is of Last Interglacial (Ipswichian) age. Evidence from other sites on the lower coastal plain indicate a low probability that Palaeolithic artefacts and/or palaeoenvironmental remains may be present in any of these deposits. However, the underlying gravels have the potential to contain geoarchaeological remains, which have the potential to increase the knowledge and understanding of the early environmental history of the Site.

18.43 The silty and clayey deposits ('brickearth') overlying the raised beach sediments are therefore likely to be of Devensian age. The geoarchaeological assessment concluded that it is likely that the western half of the golf course site is underlain by the estuarine alluvium of the Lidsey Rife. If present, such alluvial deposits have the potential for peat layers and other organic units.

18.44 The potential alluvial and brickearth deposits lain in the Holocene within the site have the potential to build a detailed understanding of the former landscapes and environmental changes. The potential for Mesolithic, Neolithic or Bronze Age occupation evidence from these deposits cannot be entirely discounted at this stage. The southern part of the Site is covered by an Archaeological Notification Area due to the potential in this area for evidence of prehistoric flint working.

18.45 Excavations to the east, north and west have all revealed evidence attesting to transient activity in the Mesolithic and Early Neolithic periods and land management practices dating from the Mid-Bronze Age onwards; alongside funerary activity and potential occupation evidence. This suggests a heavily exploited environment next to the former estuary or embayment of the Lidsey and Aldingbourne Rifes in the prehistoric period.

18.46 Archaeological investigations in the vicinity of the Site recorded continued occupation into the Roman period. The investigations to the north and east of the Site suggested small-scale occupation and farming and a probable circular enclosure (WHER MWS12237). Features representative of Roman field systems were also found at excavations at Oldlands Farm c.300m west of the Site, alongside a circular enclosure in use in the Roman period (WHER MWS12157).

18.47 The name Bognor is derived from the Old English personal female name 'Bucge' with the second element Ora

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meaning bank[164].

18.48 The lower part of the Aldingbourne Rife was known as 'bynes fleot' in 680 and 953 and by the latter date it bounded the Anglo-Saxon estate of Felpham. This estate had been devised by King Alfred to Osferth, a relative and in 953 King Eadred seems to have granted it to his mother Eadgifu. From description of the bounds it was likely as large as the ancient parish[165].

18.49 Settlement is recorded at Bilsham and Middleton in Domesday. Both were in the ownership of Earl Roger of Shrewsbury in 1086 with a population of 14 and 16 households respectively. Felpham was a larger settlement at that date with a population of 73 households, making it among the 20% of the largest settlements recorded. It was land of Shaftesbury Abbey at that time and remained so until the dissolution[166].

18.50 The Site appears to have been part of the rural hinterland surrounding settlement in the Saxon and early medieval period, with the evidence suggesting nearest occupation was taking place at Felpham by the end of the period.

18.51 Bognor was a minor beach-based landing place from at least the 16th century onwards but possibly also in the Medieval period. It had a chapel dedicated to St Bartholemew, described in the Taxatio Ecclisiastica of Pope Nicholas IV in 1291 as dependant on the church at Pagham[167]. The Site remained part of the rural agricultural hinterland during this period.

18.52 There is one historic environment record of post-medieval date within the Site. This refers to the site of Clap Barn, a 19th century outfarm or field barn lying at the southern boundary of the study site in the area of the present golf club house (WHER MWS9815). The Site remained agricultural in character until the construction of the golf course in the 20th century. The 18-hole golf course was opened in 1922, utilising existing trees, bushes and ditches, complemented by new planting and landscaping. The club had 600 playing members in 1978[168].

18.53 In summary, there are no known archaeological remains within the Site. There is, however, a moderate general theoretical potential for buried geoarchaeological and archaeological evidence of prehistoric to Romano-British date. It is anticipated that some degree of truncation / disturbance of the potential archaeological horizon will have resulted from historic ploughing and the construction of the current golf course. Such remains are considered likely to be fragmentary and of local to regional significance. The sensitivity of the potential archaeological remains is considered low – moderate based on anticipated condition and heritage significance.

Built Heritage

18.54 As outlined in Section 5 of the Historic Environment Desk Based Assessment *Appendix 18.1*, the Application Site does not fall within or near a Conservation Area; Felpham Conservation Area lies approximately 750m to the south of the study site and is not considered sensitive to change by the proposed development. Within the 1km study area 19 Grade II Listed Buildings and one Grade II* Listed Buildings are recorded. These lie between 570m – 1km from the Site.

18.55 A site visit was undertaken on 27th September 2021 to assess the setting of nearby designated heritage assets. The conditions were sunny with good visibility. Additional desk-based assessment using Google Earth and maps was also utilised. Due to a combination of topography, distance from the site and the built-up nature within which they are located, none of these are considered sensitive to change by the proposed development. Therefore, Built Heritage is not considered further in this assessment.

18.56 The current golf club house comprises a complex of single and two-storey structures, some of clear modern construction, with some elements potentially of more historic origin (for example sections of the western and

[164] Bognor, Historic Character Assessment Report. Sussex Extensive Urban Survey, (2009), Harris. R. B.

[165] 'Middleton-on-Sea', in A History of the County of Sussex: Volume 5 Part 1, Arundel Rape: South-Western Part, Including Arundel, (1997), Hudson T. P. (ed)

[166] Opendomesday Accessed at: https://opendomesday.org/

[167] Bognor, Historic Character Assessment Report. Sussex Extensive Urban Survey, (2009), Harris. R. B.

[168] 'Middleton-on-Sea', in A History of the County of Sussex: Volume 5 Part 1, Arundel Rape: South-Western Part, Including Arundel, (1997), Hudson T. P. (ed)

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central bays). A review of historic mapping indicate that these are located on the approximate location of 19th century 'Clap Barn'. It is noted that the WSHER description states that the barn has been demolished or lost. It is noted that the existing club house is to be retained and re-purposed as a community facility.

Table 18.5 Summary of sensitivity of heritage receptors / resources associated with Site A

Receptor/Resources	Sensitivity	Summary Reason
Potential non-designated below ground geoarchaeological deposits	Low	The underlying Quaternary deposits have the potential to hold environmental evidence which may increase the knowledge and understanding of the environmental history of the Site. The heritage significance of the underlying sequence is considered local. It is noted that the western part of the site, which will be retained as open space has higher potential for alluvial deposits. Taking this into consideration and the anticipated heritage significance, the sensitivity of the resource is considered low.
Potential non-designated below ground prehistoric and Romano-British archaeological remains	Low - moderate	The sensitivity of the potential archaeological remains is considered low – moderate based on anticipated condition and heritage significance.

Site B – Relocation of Golf Course

Archaeology

18.57 As outlined in the geoarchaeological assessment of the Site by QUEST at *Appendix 18.4*, the majority of the Site is located on bedrock of chalk overlain by River Terrace Gravels (as mapped by the British Geological Society (BGS)). In the south-east of the Site, including the lowest ground at or close to 0.0m OD, BGS maps Raised Beach Deposits (Sand and Gravel), and straddling the eastern boundary of the site maps Raised Marine Deposits (Clay, Silt, Sand and Gravel). These Raised Marine Deposits were previously mapped as 'Tidal River Deposits'[169] and are evidently associated with the water course which here forms the boundary of the Site. Although BGS mapping distinguishes in these superficial deposits between River Terrace Deposits and Raised Beach Deposits, they are not readily distinguishable in borehole records and most authorities regard all such deposits underlying the West Sussex Coastal Plain as part of a complex of raised beaches widely recognised between Chichester and Brighton. [170,171,172,173]

18.58 The sand and gravel resting on bedrock beneath the lower coastal plain, including deposits beneath Site B can be regarded as remnants of the Pagham Formation (Pagham Raised Beach), the lowest of the Sussex raised beaches. Judging by the OSL dates reported by Bates et al,[174] this beach is of Last Interglacial (Ipswichian) age. The silty and clayey deposits ('brickearth') overlying the raised beach sediments are therefore likely to be of Devensian age.

18.59 QUEST note that no river deposits are now mapped as such in association with the small stream that forms the eastern boundary of the site. There is good reason however to assume that the so-called Raised Marine Deposits, formerly mapped as Tidal River Deposits, are in fact estuarine alluvium. If present, such alluvial deposits have the potential for peat layers and other organic units.

18.60 The potential for Lower or Middle Palaeolithic remains at the present site is considered low. No evidence of

[169] Chichester and Bognor, British Geological Society Sheet317/332, 1:50,000, (1996), BGS
[170] The Chronology, palaeogeography and archaeological significance of the marine Quaternary record of the West Sussex Coastal Plain, Southern England, U.K. Quaternary Science Reviews, 16, (1997), Bates, M.R., Parfitt, S.A. & Roberts, M.B.
[171] Late Middle Pleistocene deposits at Norton Farm on the West Sussex Coastal Plain, southern England. Journal of Quaternary Science, 15, (2000), Bates, M., Bates, C.R., Gibbard, P.L., Owen, F.J., Parfitt, S.Q., Preece, R.C., Roberts, M.B., Robinson, J.E., Whittaker, J.E. & Wilkinson, K.E.
[172] The Palaeolithic Archaeology of the Sussex/Hampshire Coastal Corridor, (2008), Bates, M., Wenban-Smith, F., Briant, R. & Bates, R.
[173] Quaternary sediments of the Sussex/Hampshire Coastal Corridor: a brief review. In: Briant, R.M., Bates, M.R., Hosfield, R.T. and Wenban-Smith, F. (eds) The Quaternary of the Solent Basin and West Sussex raised beaches, (2009), Bates, M.R. & Briant, R.M.
[174] The Palaeolithic Archaeology of the Sussex/Hampshire Coastal Corridor, (2008), Bates, M., Wenban-Smith, F., Briant, R. & Bates, R.

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Upper Palaeolithic occupation has ever been identified on the Sussex Coastal Plain, although the valleys of the main rivers would seem to represent attractive environments for hunter-gatherer groups and Upper Palaeolithic occupation is known from the site at Beedings on the Lower Greensand to the north of the Chalk escarpment[175]. Even in the absence of artefact remains, the Pleistocene sediments and their contained biological remains can be significant as they enable the reconstruction of landforms, climatic conditions and environments occupied by Palaeolithic communities.

18.61 Similarly, the potential alluvial and head deposits lain in the Holocene within the site have the potential to build a detailed understanding of the former landscapes and environmental changes. The potential for Mesolithic material culture from the brickearth can not be entirely discounted at this stage.

18.62 The Application Site does not fall within an Archaeological Notification Area and is distinct from the area immediately south-west of the Site which is covered by an Archaeological Notification Area for the historic settlement of Ancton as detailed on the Yeakell and Gardner Sussex map of 1778-1783 (WHER DWS8466).

18.63 The WSHER records no archaeological investigations within the Site. However, extensive areas of prehistoric and Romano-British settlement have been detected in many of the archaeological investigations within the study area, revealing dense, multi-phase occupation. Of particular note are the archaeological works associated with the excavation of the Bognor Regis to Littlehampton pipeline and archaeological investigations by Archaeology South-East at the Oystercatchers Public House c. 350m north-east of the study site.

18.64 As such, the Site is located within a landscape which has general theoretic potential for transient occupation evidence from the Mesolithic and Early Neolithic periods and land management practices dating from the mid-Bronze Age onwards; alongside funerary activity and potential occupation evidence.

18.65 There are no Historic Environment Records of Romano-British date identified within the study site. The study site lies away from major Roman Roads in the area which ran through Chichester to the west[176].

18.66 A Roman occupation site was discovered at Bilsham corner in 1963 during extensive road works c.990m to the west of the study site (WHER MWS2407). These consisted of traces of a ditch, flint walling and rubbish pits containing 1st to 3rd century pottery. Roman occupation has also been detected at The Oystercatcher Public House where a possible Romano British field boundary/ditch was excavated (WHER MWS7709). Roman pottery and coin hoards have also been discovered in proximity. This indicates a moderate potential for the presence of Romano-British period archaeological finds or features within the study site.

18.67 Middleton is recorded in Domesday in the ownership of Earl Roger (of Shrewsbury), with a population of 12 villagers and 4 cottagers. Bilsham was under the same ownership with a population of 14 villagers[177]. The configuration of the western and northern boundaries suggests that the parish of Middleton was once part of Felpham. The position of the manor of Middleton centrally, between Felpham and either Elmer or Cudlow in Climping may have influenced the name of the parish and settlement. Elmer pool or 'eel pool' is first mentioned in 953 and by 1310 this feature and a ditch formed the eastern boundary of the parish[178].

18.68 Evidence of early medieval domestic occupation has been excavated at the Oystercatchers Public House to the north east of the study site and a Saxon Grave has been found at Nalgo Lodge to the west of the study site. Therefore it is considered that there is a a low potential for early Medieval occupation features or finds within the study site based on proximity to known activity.

18.69 The chief centres of Medieval settlement at Middleton were around the old church, in existence from 1086, and at Elmer. There was apparently an area of occupation around Sea Lane in an area now lost to the sea. Three wells were exposed during high tide here in 1923 approximately 270m to the south of the study site (WHER MWS7002). One of these contained fragments of medieval jugs but no archaeological features were noted in

[175] At the headwaters of the English Channel river: considering Late Neanderthal archaeology in the Sussex Weald. In: Ashton, N. & Harris, C. (eds) No Stone Unturned: Papers in Honour of Roger Jacobi. Lithic Studies Society, (2015), Pope, M., Blundell, L., Cutler, H. & Scott, B.
[176] The Rural Settlement of Roman Britain, (2016), Brindle, T., Smith, A. T., Allen, M. G. and Fulford, M.
[177] Opendomesday Accessed at: https://opendomesday.org/
[178] 'Middleton-on-Sea', in A History of the County of Sussex: Volume 5 Part 1, Arundel Rape: South-Western Part, Including Arundel, (1997), Hudson T. P. (ed)

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excavations in the vicinity. A wattle-lined well was also revealed nearby in 1976, potentially also of medieval date (WHER MWS2413).

18.70 Although settlement is attested at Bailffscourt, Middleton and Bilsham in the medieval period the study site appears to have occupied the rural hinterland away from areas of known occupation. Evidence of farming practices that may have a medieval origin could therefore be detectable within the site but there is considered to be only a low potential for the presence of significant medieval archaeological remains.

18.71 The WSHER contains one record within the Site, the site of 19th century North Barn in the centre of the study site. It is indicated on the Ordnance Survey 2nd edition map of 1895 but has been totally demolished since (WSHER MWS12607). A review of historic mapping indicates that the Site formed part of the rural hinterland of settlement throughout the post-medieval period to date. With the exception of minor changes to field boundaries and the aforementioned North Barn, there is considered low potential for significant archaeological remains from this period.

18.72 Recent geophysical survey (SUMO 2021) has revealed three areas of archaeological interest. In the centre of the study site geophysical survey identified a circular ditch with a smaller circular response in the centre of it (Figure 18.4; Orion 3). The form of this anomaly is suggestive of a prehistoric, possibly Bronze Age date. Evidence for prehistoric occupation have been detected during excavations of the Bognor Regis to Littlehampton pipeline to the north-west of the site and land utilisation from the Bronze Age onwards is indicated in many of the excavations within the study area. Based on available evidence the significance of this feature is considered likely to be of local to regional heritage significance. The sensitivity of the asset is considered moderate.

18.73 Geophysical survey (SUMO 2021) also recorded two areas of rectilinear anomalies in the north-west (Figure 18.4; Orion 1) and north (Figure 18.4; Orion 2) of the study site. None of these features correspond to known structures on historic mapping. The form of the rectilinear enclosures is suggestive of a Roman to medieval date. In the case of Orion 2 it is noted that the anomalies generally respect the alignment of surrounding ridge and furrow which may strengthen the argument for a medieval date for these anomalies. It is noted that archaeological investigations have recorded Romano-British field systems and fragmentary occupation evidence throughout the study site. Domestic occupation of Saxon and early Medieval date has been found at the Oystercatchers Public House to the north east of the study site. Based on available evidence, the significance of these features are considered likely to be of local to regional heritage significance, depending on date and condition. The sensitivity of these asset is considered moderate.

Built Heritage

18.74 Site B does not fall within or near a Conservation Area. Within the 1km study area 13 Grade II Listed Buildings and three Grade II* Listed Buildings are recorded. The majority of these lie c. 950m to 1km from the Application Site. Three listed buildings lie within 500m: Grade II Listed Manor Farmhouse, Acton (NHLE 1276185); Grade II House Hotel (NHLE 1353901) and Grade II Listed High Kettle Cottage (NHLE 1274458).

18.75 As for Site A, the site visit undertaken on 27th September 2021 assessed the setting of nearby designated heritage assets. Due to a combination of topography, dense vegetation around the Application Site, distance and the built-up nature within these heritage assets are located, none are considered sensitive to change by the proposed development. Therefore, Built Heritage is not considered further in this assessment.

Table 18.6 Summary of sensitivity of heritage receptors/resources associated with Site B

Receptor/Resources	Sensitivity	Summary Reason
Potential non-designated below ground geoarchaeological deposits	Low	The underlying Quaternary deposits have the potential to hold environmental evidence which may increase the knowledge and understanding of the environmental history of the Site. The heritage significance of the underlying sequence is considered local. It is noted that the eastern part of the site has higher potential for alluvial deposits. Taking into

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Receptor/Resources	Sensitivity	Summary Reason
		consideration the anticipated heritage significance, the sensitivity of the resource is considered low.
Potential non-designated below ground prehistoric (Mesolithic, Neolithic, Bronze Age, Iron Age) and Romano-British archaeological remains	Moderate	The sensitivity of the potential archaeological remains is considered moderate based on anticipated condition and heritage significance.

Inherent and Standard Mitigation

18.76 No inherent and standard mitigation in relation to cultural heritage is proposed for either Site A or Site B.

Assessment of Environmental Impacts

18.77 This section provides an assessment of the nature, extent, magnitude of change that the proposed development will have on individual receptors identified in the baseline section. By employing the sensitivity of the receptor and magnitude of change, the significance of environmental effects which arise as a result of the construction and operational periods of the proposed development will be determined.

Site A – Redevelopment of existing golf course

Construction

18.78 Site preparation of the existing golf course and construction of the proposed residential development has the potential to impact buried geoarchaeological and archaeological deposits within the Site.

18.79 The underlying Quaternary sequence is considered to survive at depth across the Site. It is noted that construction impacts in the western part of the site are restricted to the construction of attenuation ponds and that due to topography and flood considerations ground works are likely to be relatively superficial (c. 500mm). As such these are unlikely to impact the buried geoarchaeological sequence. Potential impact to the below ground geoarchaeological resource in the eastern part of the site is likely to occur by the construction of foundations and drainage for the proposed development. Such impacts are likely to be relatively superficial and localised; the overall anticipated impact is considered low adverse.

18.80 Potential impact to the below ground archaeological resource is likely to occur by the construction of foundations, drainage, roads and potentially from re-landscaping. Although the anticipated archaeological horizon may be fragmentary due to past impacts, it may also survive at relatively shallow depths. On balance the anticipated magnitude of impact is considered low – moderate adverse.

Operation

18.81 No operational effects to cultural heritage have been identified for Site A.

Table 18.7 Summary of magnitude of change to heritage assets associated with development at Site A

Receptor/Resources	Summary of Change to Receptor/Resource	Summary Reason
Potential non-designated below ground geoarchaeological deposits	Minor adverse impact	As the underlying sequence will be retained in large parts of the site the overall anticipated impact is considered low adverse.
Potential non-designated below ground prehistoric (Mesolithic, Neolithic, Bronze Age, Iron Age) and Romano-British archaeological remains	Minor - Moderate adverse impact	The anticipated archaeological horizon may survive at relatively shallow depth, however, is likely to be fragmentary due to past impacts. On balance the anticipated

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Receptor/Resources	Summary of Change to Receptor/Resource	Summary Reason
		magnitude of impact is considered low – moderate adverse.

18.82 *Appendix 18.1* concludes that the archaeological potential for Site A is high for geoarchaeological evidence. As the resource is considered of local heritage significance, the sensitivity of the resource is considered low. The Magnitude of Change is considered Minor adverse in line with the criteria set out in Table 18.3: *Removal of an archaeological site where a minor part of its total area is removed but the site retains significant future research potential.* The significance of this effect is considered **direct, permanent, minor adverse – negligible** in line with the criteria set out in Table 18.4.

18.83 In relation to in situ occupation evidence, *Appendix 18.1* concluded a moderate potential for previously unrecorded prehistoric – Romano-British evidence. The sensitivity of the potential archaeological remains is considered low – moderate based on anticipated condition and heritage significance. The Magnitude of Change is considered Minor-Moderate adverse in line with the criteria set out in Table 18.4: *Removal of an archaeological site where a minor - major part of its total area is removed and loss of future research potential / significance*. The significance of this effect is considered **direct, permanent, adverse minor – moderate** in line with the criteria set out in Table 18.4.

18.84 No indirect effects to cultural heritage, for example the impacts of construction of the proposed development on surrounding cultural heritage assets, have been identified for Site A.

Table 18.8 Significance of heritage effects associated with development at Site A

Receptor/Resources	Sensitivity	Magnitude of Change	Significance of Effect
Potential non-designated below ground geoarchaeological deposits	Low	Minor adverse impact	Direct, permanent, negative, Minor - Negligible effect
Potential non-designated below ground prehistoric and Romano-British archaeological remains	Low – moderate	Minor - Moderate adverse impact	Direct, permanent, negative Minor – Moderate effect

Site B – Relocation of Golf Course

Construction

18.85 Construction of the proposed golf course and associated infrastructure has the potential to impact buried geoarchaeological and archaeological deposits within Site B.

18.86 The underlying Quaternary sequence is considered to survive at depth across the Site. Potential impact to the below ground geoarchaeological resource is likely to occur by the construction of deep attenuation ponds and areas of deep re-landscaping for the proposed development. As the underlying sequence will be retained in large parts of the site, the overall anticipated impact is considered low adverse.

18.87 Recent geophysical survey (SUMO 2021) has revealed three areas of archaeological interest. In the centre of the study site geophysical survey identified a circular ditch with a smaller circular response in the centre of it (Figure 2; Orion 3). The form of this anomaly is suggestive of a prehistoric, possibly Bronze Age date. Geophysical survey (SUMO 2021) also recorded two areas of rectilinear anomalies in the north-west (Figure 2; Orion 1) and north (Figure 2; Orion 2) of the study site. The form of the rectilinear enclosures is suggestive of a Roman to medieval date. Based on available evidence the significance of these features are considered likely to be of local to regional heritage significance. The sensitivity of these assets is considered moderate.

18.88 Potential impact to the below ground archaeological resource is likely to occur by the construction activity associated with the proposed club house, maintenance facility, access and re-landscaping associated with the proposed golf course. It is noted that re-landscaping will also require the fill of parts of the site which will serve

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to preserve below ground archaeological remains, if surviving. Groundworks associated with the excavation of the clubhouse, ponds and re-modelling for the golf course are likely to have a low - moderate magnitude of impact on these archaeological assets. This would result in a low - moderate adverse effect.

Operation

18.89 No operational effects to cultural heritage have been identified for Site B.

Table 18.9 Summary of magnitude of change to heritage assets with development at Site B

Receptor/Resources	Summary of Change to Receptor/Resource	Summary Reason
Potential non-designated below ground geoarchaeological deposits	Minor adverse impact	As the underlying sequence will be retained in large parts of the site the overall anticipated impact is considered low adverse.
Potential non-designated below ground prehistoric (Mesolithic, Neolithic, Bronze Age, Iron Age) and Romano-British - medieval archaeological remains	Minor - Moderate adverse impact	Taking into considered the development will require both cut and fill across the Site, on balance the anticipated magnitude of impact is considered low – moderate adverse.

18.90 *Appendix 18.2* concludes that the archaeological potential for Site B is high for geoarchaeological evidence. As the resource is considered of local heritage significance, the sensitivity of the resource is considered low. The Magnitude of Change is considered Minor adverse in line with the criteria set out in *Table 18.3: Removal of an archaeological site where a minor part of its total area is removed but the site retains significant future research potential.* The significance of this effect is considered **direct, permanent, minor adverse – negligible** in line with the criteria set out in Table 18.4.

18.91 In relation to in situ occupation evidence, *Appendix 18.1* concluded a high potential for previously unrecorded prehistoric and Romano-British - medieval evidence. The sensitivity of the potential archaeological remains is considered low – moderate based on anticipated condition and heritage significance. The Magnitude of Change is considered Minor-Moderate adverse in line with the criteria set out in Table 18.3: *Removal of an archaeological site where a minor - major part of its total area is removed and loss of future research potential / significance*. The significance of this effect is considered **direct, permanent, Minor-Moderate adverse** in line with the criteria set out in Table 18.4.

18.92 No indirect effects to cultural heritage, for example the impacts of construction of the proposed development on surrounding cultural heritage assets, have been identified for Site B.

Table 18.10 Significance of heritage effects associated with development at Site B

Receptor/Resources	Sensitivity	Magnitude of Change	Significance of Effect
Potential non-designated below ground geoarchaeological deposits	Low	Minor adverse impact	Direct, permanent, negative, Minor - Negligible effect
Potential non-designated below ground prehistoric and Romano-British archaeological remains	Low - moderate	Minor - Moderate adverse impact	Direct, permanent, negative Minor – Moderate effect

Actionable Mitigation

18.93 This section describes actionable mitigation to be employed to reduce the negative effects of the proposed development.

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18.94 The implementation of a staged programme of archaeological works for both Sites A and B will allow the identification of archaeological assets within the Site and a suitable mitigation strategy to be developed and agreed with Arun District Council (ADC) and their archaeological advisors. The archaeological interest of the Site can be secured by excavation and analysis of archaeological assets, i.e., preservation by record.

Residual Impact Assessment

18.95 This section identifies residual effects and their significance.

Site A – Redevelopment of existing golf course

18.96 The implementation of the programme of archaeological work at Site A will result in the preservation by record of archaeological deposits impacted by the proposed development. The resulting research will contribute to the increased knowledge and understanding of the landscape and settlement evolution of the wider area. This is considered to slightly reduce the overall effects on archaeology to Minor Adverse, not significant in EIA terms.

Table 18.11 Residual effects on heritage assets associated with Site A

Receptor/Resources	Significance of Effect	Mitigation (Actionable)	Residual Effect
Potential non-designated below ground geoarchaeological deposits	Direct, permanent, negative Minor -Negligible effect	A staged programme of archaeological works	Direct, permanent, negative Negligible effect
Non-designated below ground prehistoric and Romano-British archaeological remains	Direct, permanent, negative Minor-Moderate effect	A staged programme of archaeological works	Direct, permanent, negative Minor effect

Site B – Relocation of Golf Course

18.97 The implementation of the programme of archaeological work at Site B will result in the preservation by record of archaeological deposits impacted by the proposed development. The resulting research will contribute to the increased knowledge and understanding of the landscape and settlement evolution of the wider area. This is considered to slightly reduce the overall effects on archaeology to Minor Adverse, not significant in EIA terms.

Table 18.12 Residual effects on heritage assets associated with Site B

Receptor/Resources	Significance of Effect	Mitigation (Actionable)	Residual Effect
Potential non-designated below ground geoarchaeological deposits	Direct, permanent, negative Minor -Negligible effect	A staged programme of archaeological works	Direct, permanent, negative Negligible effect
Non-designated below ground prehistoric and Romano-British – medieval archaeological remains	Direct, permanent, negative Minor-Moderate effect	A staged programme of archaeological works	Direct, permanent, negative Minor effect

Cumulative Effects

18.98 This Section identifies and assesses the nature, extent, magnitude and significance of inter-project effects (i.e., effects from other development in combination with those from the proposed development).

18.99 Potential cumulative effects considered include the potential effects of the two proposed development as a single project. The construction of the two proposed development could also occur simultaneously with other projects located in the vicinity of the Application Site. The 'other development' with the most potential for

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simultaneous construction or operation effects are identified in Chapter 4 and *Appendix 4.1*.

18.100 The 'other development' with the most potential for simultaneous construction or operation effects have been reviewed. Due to distance between these, cumulative effects from these are not considered likely and no further assessment is required. The cumulative effect of the two proposed developments is considered below.

18.101 There are no strict guidelines for assessing cumulative effects. In terms of direct cumulative effects, due to the physical localised character of sub-surface archaeological remains, construction of 'other developments' will generally not result in cumulative direct impacts on designated or non-designated archaeological assets. The exception to this is archaeological deposits which extend beyond the development site which would be impacted by removal of contemporary deposits by development in the immediate vicinity. The following archaeological receptors are identified as being sensitive to cumulative impact as they physically extend beyond the limits of the Proposed Development: there are no designated heritage assets within the Application Sites. As such no designated assets will be directly impacted by the proposed development.

- Underlying geoarchaeological deposits;
- Potential non-designated below ground prehistoric (Mesolithic, Neolithic, Bronze Age, Iron Age) and Romano-British archaeological remains

18.102 The criteria for the assessment of significance, magnitude of impact and significance of effect presented in the methodology section are used to assess cumulative effects on identified historic environment receptors.

18.103 The Application Sites are underlain by a Quaternary sequence of geoarchaeological interest which extends beyond the study site, with potential for geoarchaeological remains extending across large areas of Bognor Regis. Whilst it is recognised that there is potential for both developments to physically impact the same general Quaternary sequence, the extent of the area of interest, depth of the deposits and type of development impacts, the significance of the resource will remain largely unchanged. Cumulative effects are assessed as being **Negligible**.

18.104 The potential for contemporary below ground archaeological remains to be located on both sites cannot be ruled out entirely. However, due to the c. 3km between the two sites the potential for highly related and contemporary material on both sites is relatively low. The staged phase of works on both sites has the potential to provide a synthesised, landscape approach which has the potential to contribute to the increased knowledge and understanding of the interactions between relative sea level, human activity, vegetation succession and climate in this area throughout Palaeolithic and early Holocene and settlement evolution through the prehistoric and Romano-British periods. While this does not reduce the overall cumulative effect, it offsets the negative effect for both sites; the cumulative effect for both Site A and B is considered to be **direct, permanent minor adverse**.

Summary

18.105 This chapter presents the findings of the assessment of likely significant effects of the construction and operational phases of the proposed developments at Site A and Site B in terms of archaeology and cultural heritage. It also includes an assessment of the potential cumulative effects of both developments together. It incorporates the results of a heritage desk-based assessments (geoarchaeological DBAs and a geophysical survey for Site B).

18.106 A review of the National Heritage List for England confirmed that there are no designated heritage assets within the Application Sites. As such no designated assets will be directly impacted by the proposed development.

18.107 The assessment has identified and assessed the effects of the proposed developments on the following receptors on both Application Sites: potential geoarchaeological and paleoenvironmental evidence of Local Significance and low sensitivity and potential in situ prehistoric to Romano-British - medieval occupation evidence of Local – Regional Significance and low – moderate sensitivity.

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18.108 Site preparation of the existing golf course and construction of the proposed residential development at Site A and construction of the proposed golf course at Site B has the potential to impact buried geoarchaeological and archaeological deposits within the Sites. The Magnitude of impact in relation to Palaeolithic geoarchaeology and paleoenvironmental evidence is considered Minor; the significance of this effect is considered Minor – Negligible Adverse for both Sites. The Magnitude of impact in relation to prehistoric – Romano-British - medieval occupation evidence is considered Minor – Moderate adverse; the significance of effect is considered Minor – Moderate Adverse.

18.109 The cumulative effect of the two developments has been assessed. The Application Sites are underlain by a Quaternary sequence of geoarchaeological interest which extends beyond the study site, with potential for geoarchaeological remains extending across large areas of Bognor Regis. Whilst it is recognised that there is potential for both developments to physically impact the same general Quaternary sequence, the extent of the area of interest, depth of the deposits and type of development impacts, the significance of the resource will remain largely unchanged. Cumulative effects are assessed as being Negligible, Not Significant in relation to the potential effect to geoarchaeological and paleoenvironmental evidence.

18.110 The potential for contemporary below ground archaeological remains to be located on both sites cannot be ruled out entirely. However, due to the c. 3km between the two sites the potential for highly related and contemporary material on both sites is relatively low. The staged phase of works on both sites has the potential to provide a synthesised, landscape approach which has the potential to contribute to the increased knowledge and understanding of the interactions between relative sea level, human activity, vegetation succession and climate in this area throughout Palaeolithic and early Holocene and settlement evolution through the prehistoric and Romano-British periods. While this does not reduce the overall cumulative effect, it offsets the negative effect for both sites; the cumulative effect for both Site and B is considered Minor Adverse (direct and permanent).

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19 CUMULATIVE EFFECTS

19.1 The EIA Regulations require an ES to describe the likely effects of development on the environment when taken cumulatively with other environmental effects and any current or prospective development in the vicinity.

19.2 Whilst there is no formal definition within legislation or the NPPG of what constitutes a 'cumulative effect' and no prescribed methodology on how to assess such interactions between environmental receptors or other development sites, for this purpose the following has been considered to represent a cumulative impact: "Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project."

19.3 In this regard, there are two types of cumulative effect, which are commonly known as 'Type 1' and 'Type 2' effects, respectively. These are generally defined as follows:

- Type 1 Cumulative Effects: The combined effects of individual effects resultant from the development upon a set of defined sensitive receptors, for example noise, dust and visual effects; and
- Type 2 Cumulative Effects: The combined effects arising from another development site or sites, which individually might be insignificant, but when considered together could create a significant cumulative effect.

19.4 Type 2 effects have been considered in each of the Topic Chapters with reference to the in-combination effects of the proposed development at Site A and Site B together and with other potential development locations local to Bognor as set out in *Appendix 4.1*.

19.5 Table 19.1 considers the combined residual effects on individual environmental receptors - Type 1 effects – and illustrates that none of the combined environmental effects on individual receptors are materially different. This does not highlight a receptor that will be subject to a significant adverse environmental effect as a consequence of the combined effect.

Table 19.1 Combined residual effects on individual sensitive receptors

Environmental Receptor	Nature of Effect	Comments
Human Beings	Temporary adverse construction phase effects (dust, noise construction traffic).	The construction phase effects are temporary effects only and will not continue into the operation phase. With the implementation of the CEMP, the effects are considered to be of negligible significance. Community infrastructure is to be funded either by the Community Infrastructure Levy of through planning obligations and any short term minor adverse effects associated with an absence of community infrastructure during the construction stage are unlikely to last into period once the development is complete. The change in character is a permanent change but both in respect of the housing and golf course. This change has a major, moderate and minor adverse effects on users of the Public Right of Way at certain locations. Lastly, the risk of harm to human beings from flooding is considered to be low because of the likely speed of inundation. Taken together, the accumulation of these effects is not considered to give rise a greater (i.e., more adverse) effect.
	Short term effects as houses are occupied during the construction phase ahead of community infrastructure provision.	
	As visual receptors, residents close to the site and pedestrians on local rods and users of the Public Right of Way will experience a change in views of the character of the sites are altered	
	Users of the areas of public open space and the golf course in the even of an extreme storm event and the land is subject to flooding.	

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Environmental Receptor	Nature of Effect	Comments
Landscape features	Loss of or change to landscape features around and within the sites' boundaries will contribute to the change in views and landscape character.	Whilst the loss of some vegetation is necessary to create development areas for the housing at Site A and to form access to and lay out the new golf course at Site B. The landscape character effect is minor adverse whereas the ecological measures proposed for both developments contribute to a beneficial and positive effect in terms of ecology.
	These landscape features also contribute important ecological features which could be subject to adverse impacts.	
Watercourses	Watercourses within and adjacent to the Sites could be subject to pollution during the construction phase and could be subject to increased volume of surface water run-off and therefore out-of-bank flows and incidence of flooding.	Both Site A and Site B have watercourses within and adjacent to their boundaries. Measures in the CEMPs will safeguard against pollution incidents and temporary surface water drainage measures will be designed to avoid increased run-off and flood risks. These measures will safeguard the hydrological function of these watercourses and their ecological value. Neither the the Lidsey Rife and the Ryebank Rife are directly affected by the proposed developments and their role as landscape features are retained. The sustainable drainage system will include measures to improve water quality discharges from the Sites into the receiving watercourses. New watercourses that are to be provided as part of the surface water drainage strategy will have a number of positive effects on ecological, landscape and water resources. Any abstraction of water from the Ryebank Rife will need to adhere to permitted licenses.
	The watercourses serve as ecological habitats and connect to a wider network.	
	They are also elements of the landscape fabric in the locality.	
	Extraction of water from Ryebank Rife for irrigation of the golf course at Site B	
Pedestrians and cyclists and road users	Such receptors (human beings) will experience slight changes in the noise environment, exposure to air pollution and the adverse effects in increases in traffic.	These are effects that are generated from increased traffic arising from the proposed development. Individually, and with the respective mitigation measures, these effects have been assessed as negligible or minor adverse. In combination therefore, receptors might experience a slight adverse effect as a result of increased noise, increased air pollution and increased traffic. But these effects are not uniform and are not concentrated in one location or one group of receptors. For example, a driver experiencing delay on the highway network will not experience the increase in noise or air pollution. These effects are more likely to be experienced by pedestrians or cyclists who already experience minor adverse effects but not at a level that exceeds an objective standard or objective.

19.6 The above illustrates that whilst individual receptors in some instances are subject to more than one environmental effect, when these cumulative effects are taken together, the accumulation is not considered to give rise a greater (i.e., more adverse) effect.

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20 SUMMARY AND CONCLUSION

20.1 Hallam Land Management Limited (the Applicant) will be submitting two planning applications; the first for the construction of up to 480 new houses and associated open space on land at Bognor Regis Golf Course and a second for the construction of a new golf course at land south of Grevatt's Lane (A259).

20.2 The proposed developments is considered to constitute Schedule 2 development under the Town and Country Planning (Environmental Impact Assessment) Regulations 2017.

20.3 The Applicant has undertaken an Environmental Impact Assessment (EIA) and has prepared this Environmental Statement (ES) to accompany these planning applications, in accordance with the Regulations.

The Proposed Developments

20.4 Planning permission is sought for the following two proposed developments which together comprise one project:

A. The construction of a new golf course and facilities on land south of Grevatt's Lane (A259) (Site B) to enable the relocation of Bognor Regis Golf Club

B. Redevelopment of the current Bognor Regis Golf Club (Site A) for new housing and open space.

20.5 Parameter Plans have been prepared for each scheme that provide pictorial illustrations of the proposed development and serve as the basis for the Environmental Impact Assessment that has been undertaken.

20.6 The Proposed Development will see the existing agricultural land being developed to form new golfing facilities followed by the existing golf course developed as new housing and open space.

20.7 The new golf course will change the character of Site B from undeveloped agricultural land to formal recreational space with a small number of buildings and associated spaces, fairways and practice facilities and new water bodies. Earthworks will be required to form the golf course along with new planting.

20.8 The introduction of new housing at the existing golf course will also change the character of Site A – the built-up area of Felpham will extend further west. A significant extent of green infrastructure is going to be laid out to enclose the development; this will provide informal recreational space with public access, surface water drainage and habitat creation.

20.9 Development at both sites could have an effect on environmental receptors, such as habitats and protected species, trees and hedgerows and water courses. Construction activity could also give rise to increased risk of pollution such as noise, air quality, watercourses and groundwater.

20.10 Once the development is occupied, the new houses will provide accommodation for the identified population and household growth in Arun at one of its main towns. The new resident population will give rise to an increase in demand for local services and facilities. The operational effect of the development will also see increases in the traffic and associated changes in noise and air quality environments. The surface water and foul water drainage regimes will also change. Views of the Sites will also be different as built development is enclosed by a maturing landscape.

20.11 Each of the topic chapters within the ES has considered the potential significant effects of the proposed development which are summarised in the following paragraphs and highlighting the significance of residual effects.

Population and Human Health

20.12 The population and human health impacts arising from the overall project considers the following receptors: population, housing, economy, healthcare, education, community facilities and open space and are generally

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beneficial in nature.

Site A – Redevelopment of the existing golf course

20.13 The development at Site A will provide new housing to meet forecast growth in the local population and to meet the identified housing need. Overall, it is considered the impact on population is a **direct, permanent**, **long-term, major beneficial effect.**

20.14 The additional housing on Site A will give rise to a higher demand on the local healthcare facilities capacity. When including financial contributions, if sought by the Arun CCG, there will be an overall **negligible effect**. The relocation of the golf course is not expected to give rise to any healthcare demands. However, there will be a beneficial impact on the development of the new golf course in promoting well-being and healthy lifestyles.

20.15 There will be an increased demand on education facilities from the new resident population at Site A. There is existing capacity in nurseries, primary and secondary schools in the local area. Should there be a need to improve the local education facilities to accommodate the delivery of the housing scheme then CIL monies are intended to fund education projects. The overall impact on educational facilities is **negligible**.

20.16 The existing clubhouse is being retained with the intention it will be repurposed for use as a community facility. This is a potential indirect benefit of the proposed development. Site B will host a new club house and associated facilities which would be available for community use. The increase in population from the development of Site A will lead to an increased expenditure and use of local services and facilities. Overall, there will be a **negligible effect.**

20.17 There are limited opportunities for public access to Site A, restricted only to the use of the Public Right of Way. Site B currently comprises two agricultural fields equally with no public access. The relocation of the golf course and redevelopment of Site A will provide a substantial enhancement to the public open space in this area. This will be in line with policy requirements. This will be a **direct, permanent, long-term, major beneficial effect.**

20.18 The proposed development will result in an increase in new housing which will have a **major beneficial** effect on meeting the identified housing need of the District. During the construction stage the economic effects are **moderately beneficial** and on occupation of the development there will be increased expenditure in the local area with a **moderate beneficial effect**. There is also **major beneficial** effect from the delivery of public open space on Site A. There will be **negligible effects** on education, healthcare, emergency services and local community facilities as part of the overall project.

Site B – Relocation of golf course

20.19 The employment of staff at the golf club will be transferred from Site A to B but is forecast to be greater than at present. During construction there will be employment on site, which is predicted at 25-30 FTE construction workers for the golf course with more workers constructing the golf club house, through a variety of skill levels. The increased population will provide additional expenditure in the local area. Overall, there will be a **direct, temporary and permanent**, **long-term, major beneficial impact**.

The Combined Project

20.20 Taken together, the combined project is considered to have a **major beneficial impact**.

Landscape and Visual

20.21 A Landscape and Visual Assessment has been prepared to assess the effects of the proposed development upon landscape features, landscape character, and visual amenity within the context of the Sites.

Site A – Redevelopment of existing golf course

Impact on Landscape

20.22 The development would result in minimal manipulation of levels and the effect on landform is considered to

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be neutral. Through the introduction of SuDS the development would realise a slight beneficial effect on drainage.

20.23 Existing vegetation within the site includes belts of trees and shrubs along stretches of the site boundary and strong avenues of trees and shrubs characterise the site interior. Vegetation would be predominantly retained, with improved management and supplemented with areas of new planting to add screening and define areas of public open space. The maturation of the proposed vegetation associated with gardens, public open space and field boundaries, in conjunction with the retention and enhancement of retained structural planting would result in a **minor beneficial** effect on vegetation.

20.24 The development would result in a total change of land use from recreational golf course to a mix of residential use and public open space. The amount of built form on site would increase and become a prominent feature within the site realising a **moderate adverse and moderate-minor adverse** effect on land use and built form respectively.

20.25 The creation of proposed footpaths and roads within the site will significantly increase the amount of formal circulation, realising a negligible effect. In addition, the implementation of infrastructure such as utilities and services associated with the introduction of dwellings to the site would result in a **moderate-minor adverse** effect.

20.26 The existing sense of scale and enclosure is defined by the rows of mature trees and hedgerows along the site boundary and within the site interior. The majority of vegetation would be retained and the addition of new planting and development will strengthen the existing sense of enclosure and long internal views in the west and north of the site. Additionally, this will impact on local visual connections into the site, where the extent of visibility into the site as a setting for adjacent land will be reduced. The change to scale, enclosure and visual connection is considered to be **minor adverse**.

20.27 At a site level the whole landscape is being developed and would largely change in character. The development would result in a change from the recreational landscape of the golf course to a mix of residential and public open space, expanding the existing character to the south and east of the site. Aspects of the site character such as the clumps of mature vegetation will be retained and strengthened through the development, whilst some openness would be lost. At a site level, the effects of the development are considered to be **moderate-minor adverse**.

20.28 The site represents a small area of local landscape character type SC9: Chichester to Yapton Coastal Plain and therefore has little influence over the overall character of the area. Impacts on the local landscape character area are considered to be **minor adverse**.

20.29 The site represents a small area of NCA 126 South Coast Plain and therefore has little influence over the overall character of the area. Impacts on the National Character Area are considered to be **negligible**.

Impact on Visual Amenity

20.30 The site has a visual envelope, predominantly shaped by the existing urban edge of Felpham and South Bersted, the bridge associated with Felpham Relief Road and the substantial structural vegetation found within the site and the local context. Views experiencing the site and change are limited to receptors within the site and the vicinity of. These include houses defining the south and east site boundaries, PROW running through and within close range of the site and the Felpham Relief Road, travelling parallel to the east.

20.31 A number of residents of Sutton Close, Golf Links Road, Mid Acre Close, Red Bar Crescent, Wellers Close and Bridger Close would experience major-moderate adverse effects, as housing is introduced to the rear of properties, replacing views of the golf club. A small number of residents on Downview Road may appreciate a moderate-minor adverse impact as a consequence of the development to the main access. This would diminish to a negligible impact by year 15. The remaining residential receptors would receive no more than a **negligible impact** from the development.

20.32 A small number of roads would experience a minor adverse impact, resulting from the introduction of additional housing into the scene, including Downview Road, Stalham Way, Golf Links Way, Wellers Close,

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Bridger Close and Felpham Relief Road. Receptors on Downview Road would experience negligible change by year 15. Users of Whitfield Close and Marylands Crescent would appreciate negligible impact and the remaining roads within the study area would see **no change** from the development.

20.33 At implementation there is one **major adverse impact**, experienced by users of the PROW FEL/153/6, running through the centre of the site. Users of this route will see the golf course setting replaced with a new residential extension. The connecting section of PROW, YAP/153/4 would experience a **major-moderate adverse** impact, as a single side of the route is substituted in the same fashion. Three PROWs beyond the fringe of the site, BET/152/2, ALD/152/3 and FEL/154/2 would see moderate-minor adverse impact, with the introduction of housing into the scene, at mid distance and filtered. The impacts for each would reduce to **negligible, negligible and minor adverse**, respectively, by year 15 with the maturing of intervening vegetation. The remaining PROW receptors would experience no more than minor adverse impacts, with the majority of routes within the study area seeing either **negligible effect** or no change from the baseline.

Site B – Relocation of Golf Course

Impact on Landscape

20.34 The development would result in minimal manipulation of levels and the effect on landform is considered to be neutral. Through the introduction of SuDS the development would realise a **slight beneficial** effect on drainage.

20.35 Existing vegetation within the site consists of dense belts of native dense belts of mature native trees and shrubs along its boundaries, between field parcels and along Ryebank Rife. Existing vegetation will be retained with improved management and supplemented with extensive areas of new planting to add screening and define the structure of fairways within the development. The maturation of this vegetation in conjunction with the retention and enhancement of retained structural planting would result in a **moderate-minor beneficial** effect on vegetation.

20.36 The development would result in a total change to land use, substituting agricultural land for a recreational and sporting use. The change in land use is considered to be **a moderate-minor adverse** effect.

20.37 Presently, there is no built form or infrastructure on the site and therefore both landscape features will increase as a result of the proposed development. Three buildings will be created to support the function of the development as a golf course and vehicular access and car parking will be constructed to provide access. New built form will be designed to match the vernacular style of existing settlements. The anticipated effect is considered to be **moderate-minor adverse**.

20.38 The existing site is open and expansive internally, with strong belts of mature vegetation along the boundary lines. The open character of the site, characteristic of the local area, will change due to the introduction of various belts of vegetation to define the golf course structure within the site interior. The addition of new vegetation will alter the visual connection and experience of the site from the neighbouring landscape, particularly from the north, changing the shared agricultural character. The anticipated effect on scale and enclosure is considered to be moderate-minor adverse and the effect on visual connection is considered to be **negligible**.

20.39 At a site level the whole landscape is being developed and would largely change in character. The development would result in complete change from an agricultural, rural landscape to a recreational and sporting landscape, disconnecting the site from its shared character with land to the east, west and north. Aspects of the site character such as the belts of mature vegetation and Ryebank Rife will be retained and strengthened through the development. At a site level, the effects of the development are considered to be **minor adverse**.

20.40 The site represents a small area of local landscape character type SC9: Chichester to Yapton Coastal Plain and therefore has little influence over the overall character of the area. Impacts on the local landscape character area are considered to be **minor adverse**.

20.41 The site represents a small area of NCA 126 South Coast Plain and therefore has little influence over the overall character of the area. Impacts on the National Character Area are considered to be **negligible**.

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Impact on Visual Amenity

20.42 The site has a visual envelope, predominantly shaped by the existing urban edge of Elmer and substantial belts of tree and structural planting, within the site, framing it, and within the local context. Views experiencing the site and change are limited to receptors within the site and the vicinity of. These include houses defining the southern boundary, PROW running through and within close range of the site and Grevatt's Road travelling parallel to the north.

20.43 No residential receptor within the study area would experience more than a negligible effect from the development, including those aligning the southern boundary of the site upon Sunnymede Close and Acton Way, owing to the dense boundary vegetation defining the site.

20.44 Users of Grevatt's Lane would see a minor adverse impact from the development, resulting from the reconfiguration of the access road to the site and the framing of introduced elements within the interior. Users of Sunnymede Close, Ancton Way, The Layne, Arundel Way, Elm Drive, Alleyne Way, The Hard and Yapton Road would experience **no change** from the development. No additional receptor within the study area would be impacted.

20.45 Users of PROW MOS/165/3 and MOS/165/1 would both experience minor adverse impacts from the development from the introduction of the clubhouse, which may be perceptible from the route. YAP/165/2 would see major-moderate adverse impact owing to the proximity of the clubhouse and the addition of associated golf facilities within a former agricultural setting.

20.46 CLI/1666/4 would initially experience a moderate adverse impact from the development, as views from the route allowed appreciation of the built form and infrastructure proposed to the site, alongside a diminishment to the planted boundary. Once the planted boundary has matured, the site will be screened in the main, reducing the impact of the development to **minor adverse**. There are no other PROW receptors within the study area that would experience adverse impacts.

The Combined Project

20.47 Both proposed developments will change the character of their individual sites. Together there will be minor urbanising effect in the landscape as a whole mitigated by the new planting associated with both schemes. The combined effect on the landscape is therefore **minor adverse**. There is no inter- or intra-visibility between Sites A and B, therefore there would not be a cumulative visual impact.

Ecology

20.48 An assessment has been undertaken to establish the likely significant effects of the Site in terms of ecology and biodiversity. The assessment has been informed by a comprehensive desk study and suite of ecological surveys.

Site A – Redevelopment of existing golf course

20.49 The intervening distance between the internationally designated sites and the Site will result in a **negligible** effect on the designated sites. This will also ensure that in combination effects are negligible. The large expanse of on-site GI will provide new residents with areas for recreation ensuring that impacts to the Brooks LNR will be also be **negligible**.

20.50 The intensively managed amenity grassland of the golf course is of negligible ecological value, of which the majority to the east will be lost to facilitate residential development. Habitats of higher ecological value such as the woodlands, ditches and small areas of the golf course 'roughs' where management was less intense will largely be retained. Where these habitats will be lost, compensatory planting of habitats of high ecological value, such as woodland, species-rich grassland and wildflower meadow, and creation of a new ditch network are proposed, which increase biodiversity and provide opportunities for the local fauna.

20.51 A CEMP will ensure retained habitats are protected during the construction phase and the LEMP will ensure

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that all habitats sustain their optimal condition in perpetuity, so to ensure that biodiversity benefits meet local and national policies.

20.52 The retention, enhancement and creation of habitats throughout Site A will benefit a number of fauna species. The local bat population will benefit from increases in commuting, foraging and roosting resources, and the local bird population will benefit from increases in nesting opportunities. Reptiles and water vole will both benefit from enhancement and creation of new optimal habitat with the GI. These habitats will be specifically managed to meet the function requirements for these and other species, which will be detailed in a LEMP.

20.53 The habitats created will achieve a BNG that exceeds the 10% requirement under the current Environmental Act, these habitats will also benefit a number of protected and notable species, for which specific mitigation measures have been adopted where needed. These measures will result in an overall **minor beneficial direct effect** in the long-term at a Local level**.**

Site B – Relocation of Golf Course

20.54 There will be a negligible impact on international statutory designated sites and the non-statutory site, due to the recreational nature of the proposals, intervening distances and best practice measures incorporated. This will also ensure that in combination effects are **negligible**.

20.55 The woodland bordering the eastern, southern and western boundaries of the southern field is classified as a habitat of principal importance under NERC Act. It has been assessed as being of local level conservation value, and will be integrated within the GI during construction and operation phases. The root protection area will be protected by high-visibility fencing. These measures will ensure that impacts are **negligible**.

20.56 The four hedgerows onsite all classified habitats of principal importance under NERC and are of local value. One hedgerow (H4) qualified as 'important' under REGS. Hedgerow H2 will be lost to facilitate the proposed golf course. However, there will be extensive compensatory planting of native species rich scrub and trees which will increase biodiversity and provide opportunities for the local fauna.

20.57 The arable fields are of negligible ecological value, with exception to limited areas of diverse arable field margins which are of local value, both of these areas will be lost to facilitate the development. The GI within the proposed golf course will create a number of habitats which are currently absent or poorly represented, including waterbodies, additional woodland planting, diverse hedgerow networks, meadow grassland and wildflower margins. This is considered to provide an overall benefit to wildlife and compensate for the areas of habitat to be lost.

20.58 A CEMP will ensure retained habitats are protected during the construction phase and the LEMP will ensure that all habitats sustain their optimal condition in perpetuity, so to ensure that biodiversity benefits meet local and national policies.

20.59 Improvements to the habitat diversity within the Site will benefit a number of fauna species. The local bat populations will benefit from the increases if foraging and navigational opportunities, increased foraging and nesting opportunities for birds and reptiles will have large areas to colonise. These habitats will be specifically managed to meet the function requirements for these and other species, which will be detailed in a LEMP.

20.60 The habitats created exceeds the 10% requirement under the current Environmental Act; this will also benefit a number of protected and notable species, for which specific mitigation measures have been adopted where needed. These measures will lead to an overall **moderate beneficial direct effect in the long-term at a Local level.**

The Combined Project

20.61 Derived from the assessment of the effects arising at Site A and B, the cumulative effect of the project is **minor-moderate beneficial** direct long-term at a Local Level.

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Water Resources

Site A – Redevelopment of existing golf course

20.62 For Site A, a range of potential effects on the water environment have been considered, including changes in flood risk (on site and off-site), changes in the quantity and quality of water discharged from the site and the impact of the development on the local water supply network.

20.63 Considering inherent and standard mitigation included in the FRA and SWDS there will be no increases in flood risk at the site or in the surrounding area and there will be no increase in the quantity of water discharged from the site. There will also be no adverse change in the quality of the water discharged from the site to the water environment.

20.64 PW have confirmed that they have the capacity to supply the site with potable water.

20.65 Overall, the proposed development will have a **minor adverse effect.**

Site B – Relocation of Golf Course

20.66 For site B, the same range of potential effects/impacts were identified as at site A, i.e. changes in flood risk, changes in the quantity and quality of water discharged and impacts on the water supply network.

20.67 As with Site A, considering the inherent and standard mitigation, there will be no adverse impacts on flood risk, or the quantity and quality of water discharged as a result of the development.

20.68 Given the nature and scale of the development at Site B, there is not expected to be a significant impact on the water supply network, given the irrigation hierarchy in place to obtain the water in the most sustainable manner.

20.69 Overall, the proposed development will have a **minor adverse effect.**

The Combined Project

Considering the two sites together, the most important cumulative impact of the project is the impact on the local water supply network, however, this is reduced through the irrigation hierarchy.

Transport

20.70 The Proposed Development will increase traffic on the local highway network associated with vehicular trips to and from the development. To determine the effect of this a full audit of the highway network surrounding the site has been undertaken as part of a comprehensive Transport Assessment. As part of this work, the assessment of the distributed traffic has ensured locations that may be considered sensitive receptors are identified.

20.71 The assessment in the ES considers specific parameters that are set out within the IEMA Guidelines to determine the effects on road users, pedestrians, cyclists and local residents and other sensitive locations such as schools, open spaces, historical buildings etc.

Site A - Redevelopment of existing golf course

20.72 The key elements reviewed include severance, driver and pedestrian delay and pedestrian/cycle amenity. The assessment under these criteria shows that in terms of severance, there will be **moderate adverse** impacts on Downview Road, with all other impacts being **negligible** on all other routes

20.73 For Site A, there will be some increase in delays at the junctions assessed for vehicular traffic, but the impact on pedestrian delay and amenity is considered to be **negligible**.

20.74 To address the effects of the development, mitigation is proposed in the form of improvements to offsite junctions which will improve capacity and consequently will reduce journey times. Furthermore, the measures will also improve pedestrian crossing facilities.

20.75 Other measures include the upgrading of existing PROW routes to provide easy off-road walking and cycling

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access to local facilities. Hence, the overall conclusion is that the effect of both the construction traffic and traffic associated with the development of Site A is **minor-negligible adverse** and not significant

Site B – Relocation of Golf Course

20.76 The key elements reviewed include severance, driver and pedestrian delay, and pedestrian and cycle amenity.

20.77 The assessment of Site B showed that the effects of this development would be local to the site, i.e. on Grevatt's Lane (Link 9). The magnitude of change for all users would be Minor to Negligible. However, there would be a short-term beneficial impact on Downview Road through the removal of the existing Golf Club traffic. Following mitigation the magnitude of change is reduced to **negligible**.

20.78 The effect of severance associated with Site B is also demonstrated to be **negligible**.

20.79 Hence, the overall conclusion is that the effect of both the construction traffic and traffic associated with the development of Site A is **negligible**.

The Combined Project

20.80 As has been demonstrated, Site B will see no material change to the effect on receptors and the benefit on Downview Road will be offset with the traffic movements associated with Site A. Therefore, the magnitude of change cumulatively with both Site A and Site B will be **moderate to negligible**.

20.81 Following mitigation this is reduced to minor to negligible. Therefore, the long term direct, permanent effect of the cumulative impacts is considered to be a **negligible** residual effect.

Air Quality

20.82 An air quality impact assessment has been carried out to assess both construction and operational impacts of the proposed development.

Site A - Redevelopment of existing golf course

20.83 Impacts during construction, such as dust generation and plant vehicle emissions, are predicted to be short-term and only relevant during the construction phase (temporary). The results of the risk assessment of construction dust impacts undertaken using the IAQM dust guidance, indicates that before the implementation of mitigation and controls, the risk of dust impacts will be high. Implementation of the highly-recommended mitigation measures described in the IAQM construction dust guidance should reduce the residual dust effects to a level categorised as **negligible.**

20.84 For the operational phase, arrivals at and departures may change the number, type and speed of vehicles using the local road network. Changes in road vehicle emissions are an important consideration during this phase of the project. Detailed atmospheric dispersion modelling has been undertaken for the first year in which the developments at both sites are expected to be fully operational, 2031. Using the criteria adopted for this assessment together with professional judgement, the operational air quality effects are considered to be **negligible** and no additional mitigation is considered necessary.

20.85 Pollutant concentrations at the façades of the residential properties within Site A are predicted to be well within the relevant health-based air quality objectives and the site is considered to be suitable for its proposed use in the context of air quality.

Site B – Relocation of Golf Course

20.86 Impacts during construction, such as dust generation and plant vehicle emissions, are predicted to be short-term and only relevant during the construction phase (temporary). The results of the risk assessment of construction dust impacts undertaken using the IAQM dust guidance, indicates that before the implementation of mitigation and controls, the risk of dust impacts will be high. Implementation of the highly-recommended mitigation measures described in the IAQM construction dust guidance should reduce the residual dust effects to a level categorised as **negligible.**

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20.87 For the operational phase, arrivals at and departures may change the number, type and speed of vehicles using the local road network. Changes in road vehicle emissions are an important consideration during this phase of the project. Detailed atmospheric dispersion modelling has been undertaken for the first year in which the developments at both sites are expected to be fully operational, 2031. Using the criteria adopted for this assessment together with professional judgement, the operational air quality effects are considered to be **negligible** and no additional mitigation is considered necessary.

The Combined Project

20.88 Using professional judgement, the resulting air quality effect of the developments is considered to be 'not significant' overall.

Noise

20.89 The proposed development has the potential to change the Site's noise environment because of construction activities during that phase, activities within the Site and changes in traffic levels.

Site A - Redevelopment of existing golf course

20.90 The Noise Sensitive Receptors associated with Site A comprise residential properties, Downview School and uses of the Public Rights of Way. Sources of noise that could change the noise environment comprise construction activities, traffic and plant and in the operational phase increase in road traffic. The predicted changes in the noise environment range between Lowest Observed Adverse Effect Level (LOAEL) and Significant Observed Adverse Effect Level.

20.91 During the construction phase it has been identified that **temporary adverse** noise effects may occur at the nearest NSRs and for short periods of time there could be some moderate (significant) effects. However, the inherent mitigation includes the use of best practicable means to control noise from construction and wherever practicable these effects will be mitigated and minimised.

20.92 In the operational phase, the level of change in road traffic results in only a **negligible** change in the noise environment.

Site B – Relocation of Golf Course

20.93 The Noise Sensitive Receptors associated with Site B comprise residential properties and the caravan site. Sources of noise that could change the noise environment comprise construction activities, traffic and plant and in the operational phase increase in road traffic. The predicted changes in the noise environment range between No Observed Effect Level (LOAEL) and Significant Observed Adverse Effect Level.

20.94 During the construction phase it has been identified that **temporary adverse** noise effects may occur at the nearest NSRs and for short periods of time there could be some moderate (significant) effects. However, the inherent mitigation includes the use of best practicable means to control noise from construction and wherever practicable these effects will be mitigated and minimised.

20.95 In the operational phase, the level of change in road traffic results in only a **negligible** change in the noise environment.

The Combined Project

20.96 The assessment has determined that adverse effects as a result of the operation of the proposed developments are unlikely to occur.

Ground Conditions

20.97 A review of the ground conditions has been undertaken to establish baseline conditions at the Sites and associated study areas, in order to assess potential impacts and identify significance of effects from the potential impacts.

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Site A - Redevelopment of existing golf course

20.98 A preliminary Conceptual Site Modal has been produced which highlighted potential risks to identified receptors using CIRIA C552. The risks ranged from 'very low' to 'moderate'. Findings of the preliminary CSM was used to assign sensitivity to receptors using DMRB guidance.

20.99 Mitigation measures include the requirement for GInv and subsequent monitoring, to characterize ground conditions both geotechnically and geo-environmentally. The geo-environmental characterization will be in relation to potential sources of contamination and facilitate determination of the waste classification and the re-use potential of soils for input within the site's MMP. A CEMP is also a requirement to outline management procedures during construction to prevent environmental pollution. Following these mitigation measures, the potential impacts to the identified receptors associated with ground conditions at Site A and its associated study areas, are considered to have **negligible** effects.

Site B – Relocation of Golf Course

20.100 A preliminary Conceptual Site Modal has been produced which highlighted potential risks to identified receptors using CIRIA C552. The risks ranged from 'very low' to 'moderate'. Findings of the preliminary CSM was used to assign sensitivity to receptors using DMRB guidance.

20.101 Mitigation measures include the requirement for GInv and subsequent monitoring, to characterize ground conditions both geotechnically and geo-environmentally. The geo-environmental characterization will be in relation to potential sources of contamination and facilitate determination of the waste classification and the re-use potential of soils for input within the site's MMP. A CEMP is also a requirement to outline management procedures during construction to prevent environmental pollution. Following these mitigation measures, the potential impacts to the identified receptors associated with ground conditions at Site B and its associated study areas, are considered to have **negligible** effects.

The Combined Project

20.102 With this mitigation measures identified, the potential impacts to the identified receptors associated with ground conditions at Site A and Site B and their associated study areas are considered to have **negligible** effects.

Agriculture and Soils

20.103 An assessment of the likely significant effects of the Proposed Development on agricultural land, soil resources and farming circumstances has been undertaken. This has been informed by a detailed soil and Agricultural Land Classification Survey and discussions with the landowner and farmer.

Site A - Redevelopment of existing golf course

20.104 Site A is "non-agricultural land" in the ALC methodology and no agricultural land is lost as a consequence. The soils resource will be retained for reuse within the site as far as possible.

Site B – Relocation of Golf Course

20.105 Site B is mostly agricultural land, with 9.8 ha of woodland and non-agricultural land within the study area. Of the agricultural land involved, 1.7 ha is classified as Grade 2 and 21.1 ha is classified as Subgrade 3a. A further 11.9 ha has not been surveyed but is assumed to be of BMV quality.

20.106 Due to the loss to agricultural use of up to 34.7 ha of BMV land this is a permanent **moderate adverse effect**. The land around Bognor Regis is generally of high quality and the majority of this site is the poorest quality available on the predictive ALC maps except for the areas generally affected by flooding.

The Combined Project

20.107 The loss to agricultural use arises at Site B only and therefor the effect of the Combined Project is permanent **moderate adverse** effect.

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Climate Change (Greenhouse Gases)

20.108 IEMA guidance suggests that all GHG emissions are significant in the absence of any significance criteria or defined threshold.

20.109 Based on professional judgement, the overall GHG emissions generated during the construction phase of the Proposed Development across both sites are anticipated to have a minor significant effect. Emissions during the operation across both sites of the Proposed Development are anticipated to have a minor significant effect.

20.110 The identified mitigation is expected to reduce GHG emissions due to construction and operation of the Proposed Development. Whilst the application of the mitigation measures would reduce GHG emissions it would not alter the significance of effects, noting that IEMA guidance states that all GHG emissions are significant. Therefore, with the application of the above mitigation measures, the residual effect of GHG emissions from the combined Proposed Development during both construction and operation would remain **minor adverse**.

Climate Change (Resilience)

20.111 Climate projections indicate wetter winters with greater levels of rainfall annually and drier summer conditions with increasing levels of drought conditions. Mean annual temperatures across the region are projected to increase leading to increasing temperatures in both winter and summer ranging from 1-3°C across winter and summer seasons. Extreme precipitation and temperatures are projected to increase in severity and frequency with a greater number of days of high rainfall measured throughout the year. Equally, the frequency of drought and heatwaves are projected to increase with higher annual temperatures. Future climate conditions will present increasing frequency and severity of storms and winds caused by strong Atlantic depressions.

20.112 No significant effects have been identified in relation to the construction process following mitigation measures implemented within the CEMP.

20.113 For the operation phase, significant effects at both Site A and Site B have been identified relating to increases in precipitation, extreme temperatures, sea level rise and wind and storm events. Actions have been identified to reduce such risks including:

- Extreme Precipitation: Confirmation within the detailed design of materials used in the design which will avoid or substantially reduce potential impacts from extreme precipitation.
- Extreme temperature: Confirmation within the detailed design of the ventilation and heating systems incorporated in the design and their ability to operate and provide cooling to all residential buildings in extreme temperatures/heatwave conditions.
- Green infrastructure: Mitigation actions suggested to include mix of species selected with changing climate in mind to reduce the risk of death and damage to vegetation. Confirmation required within the detailed design on the monitoring of green infrastructure and maintenance regime.
- Sea Level Rise: Confirmation within the detailed design to include and adopt further measures to mitigate the effects of sea level rise.
- Wind and Storms: Confirmation within the detailed design for a regime of maintenance of infrastructure and monitoring for avoiding the potential clogging of drainage and damage to infrastructure from such events.

20.114 Following confirmation of the above identified measures, no residual significant effects are anticipated. No cumulative impacts are anticipated for climate resilience.

Material Assets and Waste

20.115 The impacts and effects of consuming materials, and generating and disposing of waste to landfill, from Site A and Site B have been assessed. The assessment process used complies with the industry best practice document 'IEMA Guide to Materials & Waste EIA' and was conducted in accordance with professional judgement in the

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absence of quantitative data.

20.116 The construction stage is the only phase of the Proposed Scheme that has been scoped into the assessment, as it has been possible to qualify that no significant effects are expected during 'operation' or 'end of life'.

Site A - Redevelopment of existing golf course

20.117 For Site A the potential for adverse effects from materials consumed, and waste disposed of, was assessed to be **not significant**.

Site B – Relocation of Golf Course

20.118 For Site B the potential for adverse effects from materials consumed, and waste disposed of, was assessed to be **not significant**.

The Combined Project

20.119 Whilst a quantitative assessment of cumulative effects has not been possible, it is reasonable to assert – using professional judgement, and considering assessed absence of significance adverse effects from both sites within the Proposed Scheme - that the potential for cumulative effects is limited.

Archaeology and Cultural Heritage

20.120 An assessment has been undertaken to establish the likely significant effects of the proposed development in relation to the historic environment, which includes below ground archaeology and designated cultural heritage assets.

20.121 A review of the National Heritage List for England confirmed that there are no designated heritage assets within the Application Sites. As such no designated assets will be directly impacted by the proposed development.

20.122 The assessment has identified and assessed the effects of the proposed developments on the following receptors on both Application Sites: potential geoarchaeological and paleoenvironmental evidence of Local Significance and low sensitivity and potential in situ prehistoric to Romano-British occupation evidence of Local – Regional Significance and low – moderate sensitivity.

Site A - Redevelopment of existing golf course

20.123 Site preparation of the existing golf course and construction of the proposed residential development at Site A has the potential to impact buried geoarchaeological and archaeological deposits within the Site. The Magnitude of impact in relation to *Palaeolithic geoarchaeology* and paleoenvironmental evidence is considered Minor; the significance of this effect is considered **Minor – Negligible Adverse**. The Magnitude of impact in relation to *prehistoric – Romano-British* occupation evidence is considered Minor – Moderate adverse; the significance of effect is considered **Minor – Moderate Adverse**.

Site B – Relocation of Golf Course

20.124 Construction of the proposed golf course at Site B has the potential to impact buried geoarchaeological and archaeological deposits within the Site. The Magnitude of impact in relation to *Palaeolithic geoarchaeology* and paleoenvironmental evidence is considered Minor; the significance of this effect is considered **Minor – Negligible Adverse**. The Magnitude of impact in relation to *prehistoric – Romano-British* occupation evidence is considered Minor – Moderate adverse; the significance of effect is considered **Minor – Moderate Adverse**.

The Combined Project

20.125 The cumulative effect of the two developments has been assessed. The Application Sites are underlain by a Quaternary sequence of geoarchaeological interest which extends beyond the study site, with potential for geoarchaeological remains extending across large areas of Bognor Regis. Whilst it is recognised that there is potential for both developments to physically impact the same general Quaternary sequence, the extent of the

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area of interest, depth of the deposits and type of development impacts, the significance of the resource will remain largely unchanged. Cumulative effects are assessed as being Negligible, Not Significant in relation to the potential effect to geoarchaeological and paleoenvironmental evidence.

20.126 The potential for contemporary below ground archaeological remains to be located on both sites cannot be ruled out entirely. However, due to the c. 3km between the two sites the potential for highly related and contemporary material on both sites is relatively low. The staged phase of works on both sites has the potential to provide a synthesised, landscape approach which has the potential to contribute to the increased knowledge and understanding of the interactions between relative sea level, human activity, vegetation succession and climate in this area throughout Palaeolithic and early Holocene and settlement evolution through the prehistoric and Romano-British periods. While this does not reduce the overall cumulative effect, it offsets the negative effect for both sites; the cumulative effect for both Site A and B is considered **Minor Adverse**.

Conclusion

20.127 The assessment of the potential environmental effects of the proposed development has identified major beneficial effects from providing new housing to meet identified need. In a great many instances, the predicted environmental effects are negligible. There are a number of minor and moderate adverse effects on certain environmental receptors. Only in a small number of instances is the predicted effect considered to be major adverse. This demonstrates that development can proceed without causing an unacceptable impact on either the local or wider environments.

20.128 Through appropriate mitigation measures which are either inherent within the proposed development and shown on the parameter plans, or standard measures identified in the ES to be secured as part of the planning permission by means of planning condition or planning obligation, or actionable mitigation to be secured by the applicant in conjunction with others, the environmental effects of the proposed development at both Site A and Site B are minimised.

20.129 When considered alongside other existing or approved development, such is the relationship between the application sites and those others, and the nature of the receiving environments, the overall cumulative effects on identified environmental receptors or resources are not considered to be any greater.

20.130 For these reasons, the Environmental Statement concludes that the measured environmental consequences of the proposed development support the granting of outline permission.

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