Gatwick Airport Northern Runway Project

Environmental Statement
Chapter 11: Water Environment

Book 5

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11 Water Environment

11.1 Introduction

11.1.1 This chapter of the Environmental Statement (ES) presents the findings of the Environmental Impact Assessment (EIA) concerning the potential effects of the proposal to make best use of London Gatwick Airport's existing runways and infrastructure (referred to within this report as 'the Project') on the water environment. For the purposes of this assessment, the water environment constitutes:

- surface water (comprising geomorphology and water quality);
- groundwater;
- flood risk (including surface water drainage); and
- water infrastructure (comprising wastewater and water supply).

11.1.2 The assessment of geomorphology, water quality and groundwater impacts and effects has been informed by the completion of a **Water Framework Directive (WFD) Compliance Assessment** included in **ES Appendix 11.9.2** (Doc Ref 5.3).

11.1.3 The water environment also interfaces with other environmental disciplines, whose chapters should be read in conjunction with this, in particular **ES Chapter 9: Ecology and Nature Conservation** (Doc Ref. 5.1) (which includes aquatic habitats and ecology) and **ES Chapter 10: Geology and Ground Conditions** (Doc Ref. 5.1) (which includes groundwater quality).

11.1.4 In particular, this ES chapter:

- sets out the existing and future environmental baseline conditions, established from desk studies, surveys and consultation to date;
- presents the potential environmental effects on the water environment arising from the Project, based on the information gathered and the analysis and assessments undertaken to date which takes embedded mitigation measures into account;
- identifies any assumptions and limitations encountered in compiling the environmental information;
- highlights any necessary monitoring and embedded mitigation measures that could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process; and
- identifies further mitigation that would be required to address residual effects following the consideration of embedded mitigation measures.

11.1.5 The following appendices provide the technical detail supporting the assessment of likely significant effects reported in this chapter:

- Summary of Local Planning Policy - Water Environment (**ES Appendix 11.2.1** (Doc Ref 5.3));
- Summary of Stakeholder Scoping Responses – Water Environment (**ES Appendix 11.3.1** (Doc Ref 5.3));
- Geomorphology Assessment (**ES Appendix 11.9.1** (Doc Ref 5.3));
- Water Framework Directive Compliance Assessment (**ES Appendix 11.9.2** (Doc Ref 5.3));
- Water Quality HEWRAT Assessment (**ES Appendix 11.9.3** (Doc Ref 5.3));

- Water Quality De-Icer Impact Assessment (**ES Appendix 11.9.4** (Doc Ref 5.3));
- Groundwater Assessment (**ES Appendix 11.9.5** (Doc Ref 5.3));
- Flood Risk Assessment (**ES Appendix 11.9.6** (Doc Ref 5.3));
- Wastewater Assessment (**ES Appendix 11.9.7** (Doc Ref 5.3)); and
- Water Supply Assessment (**ES Appendix 11.9.8** (Doc Ref 5.3)).

11.1.6 This chapter is supported by the following figures:

- **ES Figure 11.4.1** (Doc Ref 5.2): Water Environment Study Area;
- **ES Figure 11.6.1** (Doc Ref 5.2): General Water Features;
- **ES Figure 11.6.2** (Doc Ref 5.2): Contaminated Water Path – Existing;
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- **ES Figure 11.9.2** (Doc Ref 5.2): Upper Mole Hydraulic Model 1% + 20% CC AEP Event Depth Difference to Baseline (With-Project, With-Mitigation Scenario); and

11.1.7 The Preliminary Environmental Information Report (PEIR) chapter identified Next Steps and these have been addressed in this chapter as follows.

- The design of the highways improvement element of the Project has evolved (including the highway drainage strategy), with additional design information available to inform the EIA.
- Further development of a detailed surface water drainage hydraulic model and an integrated surface water drainage and fluvial hydraulic model was undertaken which have informed the EIA via the **Flood Risk Assessment (FRA)**, see **ES Appendix 11.9.6** (Doc Ref. 5.3).
- Updates to the Upper Mole hydraulic model as reported in the **Flood Risk Assessment** in **ES Appendix 11.9.6** (Doc Ref. 5.3).
- Further analysis has been undertaken to assess the hydromorphological effects of the Project, and particularly the River Mole realignment and the connection of Floodplain Compensation Areas (FCA), to the River Mole.
- In terms of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (WFD Regulations), further ecological surveys (Phase 1, NVC) have been undertaken and have been used to inform the assessment (See Chapter 9: Ecology and Nature Conservation).
- A hydraulic model has been constructed of the water quality management system at London Gatwick Airport (Gatwick) to quantitatively assess the Project's impact upon the water quality of receiving watercourses (see **ES Appendix 11.9.4 Water Quality** (Doc Ref. 5.3)).

- A quantitative approach has been undertaken to assess the water quality impacts of the highways improvement and car parking elements of the Project on receiving watercourses (see **ES Appendix 11.9.3: Water Quality HEWRAT Assessment** (Doc Ref. 5.3)).
- Two project-specific ground investigations have been undertaken which have informed the groundwater assessment – see Section 11.4.
- Further assessment of the potential effects of infiltration from the surface water drainage to groundwater has been provided as part of **ES Appendix 11.9.3: Water Quality HEWRAT Assessment** (Doc Ref. 5.3). The design currently assumes all new attenuation ponds associated with the highways improvements are to be lined and therefore no additional assessment is required for these Project elements.
- Liaison continues with Thames Water regarding their own assessment of the impact of the Project and wider development in the local area to their Horley and Crawley treatment works.
- Liaison continues with Sutton and East Surrey Water (SESW) regarding the Project's effects on water resources, but it is understood that current water sources are sufficient to maintain supply to Gatwick even with forecast increases and proposed external development.

11.2 Legislation and Policy

Legislation

11.2.1 A summary of key legislation of relevance to the water environment and taken into account for this assessment is included in Table 11.2.1.

Table 11.2.1: Summary of Legislation Relevant to the Water Environment

Legislation	Description and Relevance
Reservoirs Act 1975	This legislation was enacted to protect against escapes of water from large reservoirs or from artificially created or enlarged lakes. It essentially provides regulation for assessing risk of escape of water and ensuring that reservoirs are regularly monitored and their asset status (integrity) is regularly assessed.
Environmental Protection Act 1990	This defines the fundamental structure for waste management and control of emissions, including contaminated land.
Land Drainage Act 1991	This requires that a watercourse be maintained by its owner in such a condition that the free flow of water is not impeded. The riparian owner must accept the natural flow from upstream but need not carry out work to cater for increased flows resulting from some types of works carried out upstream.
Water Industry Act 1991	The act regulates water and sewerage industries and lays out the legislative provisions in relation to discharge consents to sewers.
Water Resources Act 1991	This legislation regulates water resources, water quality, water pollution, flood defence, and provides for the general management of water resources, the standards expected for controlled waters, and mitigation through flood defence.
Environment Act 1995	This legislation set the standard for environmental management and made provision for the establishment of the Environment Agency. The Environment Agency is a key consultee for water environment elements of the Project.

Legislation	Description and Relevance
Water Act 2003	This act amends the Water Resources Act 1991 to improve long-term water resource management. The four broad aims of the act are as follows: ▪ The sustainable use of water resources ▪ Strengthening the voice of consumers ▪ A measured increase in competition ▪ The promotion of water conservation
Climate Change Act 2008	This legislation requires that emissions of carbon dioxide and other greenhouse gases are reduced and that climate change risks are prepared for.
Flood and Water Management Act 2010	This Act established Lead Local Flood Authorities (LLFA) with responsibilities to manage local sources of flooding. East Sussex and Surrey County Councils are statutory consultees for the Project as LLFAs.
Water Act 2014	This legislation governs public water supply, water companies and provides greater protection to consumers. It sets out the main powers for water companies and provides a framework for licensing and permitting.
Environment Act 2021	The Act does not revoke or replace the Environment Act 1995, but it does make amendments to strengthen and enforce adoption of the environmental provisions. The Act includes targets of relevance to water to increase species abundance and reduce the use of public water supplies.
Urban Waste Water Treatment (England and Wales) Regulations 1994	These Regulations implemented, as respects England and Wales, the Urban Waste Water Treatment Directive (91/271/EEC), the objective of which is to protect the environment from the adverse effects of urban wastewater discharges and discharges from certain industrial sectors, and concerns the collection, treatment and discharge of domestic wastewater; mixture of wastewater and wastewater from certain industrial sectors. It aims to protect the environment from the adverse effects of the collection, treatment and discharge of urban wastewater.
Flood Risk Regulations 2009	These Regulations transposed the Floods Directive (2007/60/EC) on the assessment and management of flood risks for England and Wales. The Regulations impose duties on the Environment Agency and local authorities to identify areas at significant risk of flooding and to prepare flood risk maps, flood hazard maps and flood risk management plan for those areas.
Control of Pollution (Oil Storage) (England) Regulations 2001	These Regulations provide legislation to prevent pollution of the water environment, by minimising and/or preventing future contamination of controlled water by oil.
Private Water Supplies (England) Regulations 2016	This legislation sets out standards for private water supplies including wells and boreholes. It establishes a framework for monitoring and ensuring water quality standards.
Water Supply (Water Quality) Regulations 2016	These Regulations transposed the requirements of Directive 98/83/EC on the quality of water intended for human consumption in England. They aim to prevent contamination of water supply and ensure standards for water quality are met. They

Legislation	Description and Relevance
	require water undertakers to identify water supply zones and for the monitoring of water supplies.
Environmental Permitting (England and Wales) Regulations 2016	These Regulations provide a consolidated system of environmental permitting in England and Wales. They are relevant to, for example, works in rivers, dewatering, and discharges to water bodies.
The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017	The WFD Regulations transposed for England and Wales the Water Framework Directive (2000/60/EC) and aspects of the Groundwater Directive (2006/118/EC) and of the Environmental Quality Standards Directive (2008/105/EC). The WFD Regulations require that environmental objectives are set for all surface and groundwater bodies to have regard for water quality standards and betterment wherever possible. The WFD Regulations compliance need to be taken into account in the planning of all new activities in the water environment. The Environment Agency, as competent authority in England and Wales, is responsible for delivering the objectives of the WFD Regulations. The WFD Regulations require specific measures to be proposed to prevent and control groundwater pollution and achieve good groundwater chemical status. These measures include criteria for assessing the chemical status of groundwater and for identifying trends in pollution of groundwater bodies. Hazardous substances must be prevented from entering groundwater.
Floods and Water (Amendment etc.) (EU Exit) Regulations 2019	These Regulations, which were made pursuant to section 8(1) of the European Union (Withdrawal) Act 2018, made amendments to legislation in the fields of floods and water arising from the withdrawal of the United Kingdom from the European Union.

Planning Policy Context

National Policy Statements

11.2.2 The Airports National Policy Statement (NPS) (Department for Transport, 2018a), although primarily provided in relation to a new runway at Heathrow Airport, remains a relevant consideration for other applications for airport infrastructure in London and the southeast of England.

11.2.3 The NPS for National Networks (Department for Transport, 2014)[1] sets out the need for development of road, rail and strategic rail freight interchange projects on the national networks

[1] . The Department for Transport (DfT) published a revised draft National Policy Statement for National Networks ("NPSNN") for consultation on 14 March 2023. The consultation closed on 6 June 2023 and the DfT is currently analysing responses. The draft NPSNN confirms in paragraph 1.16 that the existing NPSNN remains the relevant government policy and has full force and effect in relation to any applicable applications for development consent accepted for examination before designation of the updated NPSNN. The draft NPSNN further notes in paragraph 1.17 that the emerging draft NPSNN is capable of being an important and relevant consideration in the Secretary of State's decision making process. As such, the Applicant will continue to monitor the progress of the NPSNN review process and incorporate any updates to the Project's application documentation where considered appropriate in due course.

and the policy against which decisions on major road and rail projects will be made. This has been taken into account in relation to the highway improvements proposed as part of the Project.

11.2.4 Table 11.2.2 provides a summary of the relevant requirements of these NPSs and how these are addressed within the ES.

11.2.5 The Draft National Policy Statement for Water Resources Infrastructure (Department for Environment and Rural Affairs, 2018) has been consulted on and responses are currently being considered by the UK government. Any implications for the Project will be considered when the NPS is issued.

Table 11.2.2: Summary of NPS Information Relevant to this Chapter

Summary of NPS requirement	How and where considered in the ES
Airports NPS	
4.7: Where the applicant's proposals in relation to surface access meet the thresholds to qualify as nationally significant infrastructure projects under the Planning Act 2008, or is associated development under section 115 of the Planning Act 2008, the Secretary of State will consider those aspects by reference to both the National	The consideration of the impacts and effects of the Project on the water environment as a result of the highways improvement proposals addresses the requirements of the NPS for National Networks in **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) for flood risk, and in **ES Appendix 11.9.3: Water Quality HEWRAT Assessment** (Doc Ref. 5.3) for water quality.

Summary of NPS requirement	How and where considered in the ES
Networks NPS and the Airports NPS, as appropriate.	
4.46 and 4.49: Detailed consideration must be given to the range of potential impacts of climate change using the latest UK Climate Projections available at the time, and to ensuring any environmental statement that is prepared identifies appropriate mitigation or adaptation measures.	Reference is made to the influence of climate change on the assessment in Sections 11.6 and 11.10.
4.47: Where transport infrastructure has safety-critical elements, and the design life of the asset is 60 years or greater, the applicant should apply the latest available UK Climate Projections,	While the existing and northern runways would be considered as safety-critical infrastructure, the design life of the Project as a whole has been assumed to be 40 years having had consideration for the past history of development of airport and roads infrastructure at Gatwick. The proposed road junction improvements have been assessed separately (but in the context of the wider airport development having occurred) assuming a 100 year lifetime. Climate change uplifts applied have been based on the latest available published Environment Agency Flood risk assessments: climate change allowances guidance (2016a) which are based on UK Climate Projections (Met Office) 2018 (UKCP18); the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) provides further details of the climate change uplift values applied. The Project is classified as a Nationally Significant Infrastructure Project (NSIP). Consequently a 'Credible Maximum Scenario' sensitivity test has been undertaken, to determine the impact of a greater increase in peak river flows due to climate change in

Summary of NPS requirement	How and where considered in the ES
considering at least a scenario that reflects a high level of greenhouse gas emissions at the 10%, 50% and 90% probability levels.	accordance with Flood risk assessments: climate change allowances guidance (Environment Agency, 2016a), see **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).
5.153: The applicant should consider the risk of all forms of flooding to the Project or arising from the Project and demonstrate how these risks will be managed and, where relevant, mitigated, so that the Project remains safe through its lifetime.	A **Flood Risk Assessment** (**ES Appendix 11.9.6** (Doc Ref. 5.3)) has been produced for the Project, which considers all forms of flood risk from and due to the Project and describes the proposed flood mitigation strategy that forms part of the Project. This ES chapter summarises the key findings of the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).
5.154: Take into account the impacts of climate change, clearly stating the Project lifetime over which the assessment is made.	Climate change impacts have been considered in **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) and in Section 11.10 of this chapter.
5.154: Assessing any residual risks after risk	Potential residual risks are discussed in Section 11.9 where it is demonstrated how these would be managed appropriately, ensuring that flood risk to the Project, or third parties within the study area, would not be increased.

Summary of NPS requirement	How and where considered in the ES
reduction measures have been taken into account and demonstrating how these are acceptable for the Project.	
5.154: Consider if there is a need to remain operational during a worst-case flood event during the Project's lifetime and the need for safe access and exit arrangements.	In accordance with Flood risk assessments: climate change allowances guidance (Environment Agency, 2016a), the Project has been tested with a more extreme increase in peak river flow as a Credible Maximum Scenario (considered the equivalent of a worst-case flood event), of the 1 per cent (1 in 100) Annual Exceedance Probability (AEP[2]) event plus an allowance of +40% for climate change on peak river flow. It has been demonstrated within **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) that the runways would not be flooded and would remain operational for such an event, if required. In terms of the terminal buildings and their surrounding areas, existing flood risk could potentially have an operational impact but GAL's **Flood Resilience Statement** in **ES Appendix 11.9.6 Annex 6** (Doc Ref. 5.3) would ensure that any flooding would be safely managed. Dry access and egress routes above peak flood water levels are available via high-link bridges and multi-storey car parks from the terminal buildings.
5.154: Provide evidence for the Secretary of State to apply the Sequential Test and Exception Test, via a suitable flood risk assessment.	Evidence for the application of the Sequential and Exception Tests is included in the **Flood Risk Assessment** (**ES Appendix 11.9.6** (Doc Ref. 5.3)).
5.183: The Secretary of State will generally need to give more weight to	The impacts are identified in the **Water Framework Directive (WFD) Compliance Assessment** in **ES Appendix 11.9.2** (Doc Ref. 5.3).

[2] Annual Exceedance Probability (AEP) refers to the chance that a flood event of a particular magnitude is experienced or exceeded during any one year.

Summary of NPS requirement	How and where considered in the ES
impacts on the water environment where a project would have adverse effects on the achievement of the environmental objectives established under the Water Framework Directive Compliance Assessment.	
NPS for National Networks	
Sections 5.90 – 5.115 set out the requirements in relation to flood risk. Where flood risk is a factor the application must be supported by a Flood Risk Assessment and that the Sequential and Exception Tests have been applied in accordance with the National Planning Policy Framework (NPPF).	A **Flood Risk Assessment** has been included as **ES Appendix 11.9.6** (Doc Ref. 5.3) that informs the assessment of the impact of the Project and also demonstrates the Project's compliance with the Sequential and Exception Tests.

Summary of NPS requirement	How and where considered in the ES
Sections 5.219 to 5.231 set out the requirements in relation to water quality and resources. An applicant should ascertain the existing status of, and carry out an assessment of the impacts on, water quality water resources and physical characteristics (geomorphology) as part of the environmental statement.	The existing status of water resources in the study area is summarised in Section 11.6 (Baseline Environment) and the impacts are assessed and summarised in Section 11.9.

National Planning Policy Framework

11.2.6 The National Planning Policy Framework (NPPF) (Ministry of Housing Communities and Local Government (MCLG), 2021) sets out the planning policies for England. It describes how these should be applied and aims to contribute towards sustainable development.

11.2.7 The NPPF does not include specific policies for nationally significant infrastructure but states that:

'these are determined in accordance with the decision-making framework in the Planning Act 2008 (as amended) and relevant national policy statements for major infrastructure, as well as any other matters that are relevant (which may include the National Planning Policy Framework)'

11.2.8 Section 14 of the NPPF: 'Meeting the challenge of climate change, flooding and coastal change' is relevant to the water environment and considers the impact of climate change to flood risk, coastal change and water supply.

11.2.9 Paragraphs 152 to 173 set out flood risk policies to be followed by all proposed developments. These policies set strict tests to protect people and property from flooding. Where these tests are not met, national policy is clear that new development should not be allowed. The main steps are designed to ensure that if there are better sites in terms of flood risk, or a proposed development

cannot be made safe for its lifetime, ensuring flood risk is not increased elsewhere, it should not be permitted.

11.2.10 Compliance with national and local flood risk planning policy is demonstrated in Section 3.3 of the **Flood Risk Assessment** (**ES Appendix 11.9.6** (Doc Ref. 5.3)).

11.2.11 Section 15 of the NPPF: 'Conserving and enhancing the natural environment' is relevant to water quality and sets out the requirement of:

'e) 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…'

11.2.12 It also states that development should, wherever possible, help to improve local environmental conditions including water quality.

11.2.13 Compliance with the water quality requirements of the NPPF are demonstrated in **ES Appendix 11.9.2: WFD Compliance Assessment** (Doc Ref. 5.3) and throughout Section 11.9 of this chapter.

11.2.14 The NPPF is supported by the National Planning Practice Guidance (NPPG) (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, 2021) which provides guidance across a range of topic areas. These include climate change, EIA, flood risk and coastal change, the natural environment, water supply, wastewater and water quality.

11.2.15 Guidance on climate change focuses on suitable mitigation and adaptation measures in the planning process. This includes considering availability of water and water infrastructure for the lifetime of a development and designing responses to promote water efficiency and protect water quality. Also, assessing the impact of and promoting design responses to flood risk for the lifetime of a development, accounting for how climate change would increase that risk.

11.2.16 Guidance on flood risk and coastal change sets out the steps to be followed in order to ensure development is steered to areas at low risk of flooding, providing evidence that it would remain safe for its lifetime and would not increase flood risk elsewhere.

11.2.17 Guidance on water supply, wastewater and water quality includes advice on how planning can ensure acceptable water quality and the delivery of adequate water and wastewater infrastructure.

Other Relevant National Planning Policy

11.2.18 Other national aviation planning policy documents considered include:

- Aviation Policy Framework (Department for Transport, 2013);
- Beyond the Horizon - The Future of UK Aviation - Making Best Use of Existing Runways (HM Government, 2018);
- Aviation 2050 - The Future of UK Aviation; A consultation (Department for Transport, 2018b); and
- Flightpath for the Future, (Department for Transport, 2022).

11.2.19 The Aviation Policy Framework sets out that it is essential to better understand and manage the risks associated with climate change for the long-term resilience of the aviation sector, although this pre-dated the Airports NPS.

11.2.20 The Future of UK Aviation – Making Best Use of Existing Runways sets out the UK government's framework for sustainable airport growth, making the case for more efficient use of the infrastructure available. This policy document requires that the applicant will need to demonstrate how the Project would mitigate against local environmental issues, which is addressed in Section 11.8. In December 2018, the Government published a Green Paper: Aviation 2050 - The Future of UK Aviation. The consultation ran from 17 December 2018 to 20 June 2019, and anticipated the publication of a final Aviation 2050 Strategy, in the following year.

11.2.21 Flightpath for the Future includes in its ten point plan for the future of UK aviation supporting growth in airport capacity where it is justified.

Local Planning Policy

11.2.22 Gatwick lies within the administrative area of Crawley Borough Council and adjacent to the boundaries of Mole Valley District Council to the northwest, Reigate and Banstead Borough Council to the northeast and Horsham District Council to the southwest. The administrative area of Tandridge District Council is located approximately 1.9 km to the east of Gatwick, while Mid Sussex District Council lies approximately 2 km to the southeast. Gatwick is located in West Sussex, immediately adjacent to the bordering county of Surrey.

11.2.23 The relevant local planning policies applicable to the water environment and taken into account for this assessment based on the extent of the study area for this assessment are set out in Table 11.2.3. Further details are provided at **ES Appendix 11.2.1: Summary of Local Planning Policy – Water Environment** (Doc Ref. 5.3).

Table 11.2.3: Local Planning Policy

Administrative Area	Plan	Policy	Where Addressed
Adopted Policy			
Crawley	Crawley 2030: Crawley Borough Local Plan 2015-2030	ENV8: Development & Flood Risk ENV9: Tackling Water Stress ENV10: Pollution Management & Land Contamination	**ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) **ES Appendix 11.9.8: Water Supply Assessment** (Doc Ref. 5.3) **ES Appendix 11.9.3: Water Quality HEWRAT Assessment** (Doc Ref. 5.3) **ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref. 5.3)

Administrative Area	Plan	Policy	Where Addressed
Horsham	Horsham District Planning Framework (excluding South Downs National Park) 2015	Policy 38: Flooding	**ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3)
Mole Valley	Mole Valley Local Plan 2000	ENV65: Drainage and Run Off ENV67: Groundwater Quality	**ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3)
	Mole Valley Core Strategy 2009	CS20: Flood Risk Management	**ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3)
Reigate and Banstead	Reigate and Banstead Local Plan: Core Strategy 2014	CS10: Sustainable Development	**ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3))
	Reigate and Banstead Borough Submission Development Management Plan 2018-2027	CCF2: Flood Risk	**ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3)
Tandridge	Tandridge District Core Strategy 2008	CSP15: Environmental Quality	**ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) **ES Appendix 11.9.8: Water Supply Assessment** (Doc Ref. 5.3)
	Tandridge Local Plan Part 2: Detailed Policies 2014-2029	DP21: Sustainable Water Management	**ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3)
Emerging Policy			
Crawley	Draft Crawley Borough Local Plan 2021-2037	EP1: Development and Flood Risk EP3: Land and Water Quality GI1: Green infrastructure SDC1: Sustainable Design and Construction SDC3: Tackling Water Stress GAT1: Development of the Airport with a Single Runway	**ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) **ES Appendix 11.9.8: Water Supply Assessment** (Doc Ref. 5.3)

Administrative Area	Plan	Policy	Where Addressed
Horsham	Draft Horsham District Local Plan 2019-36 (Regulation 18 Submission)	Policy 25: Environmental Protection Policy 27: The Natural Environment and Landscape Character Policy 37: Climate Change Policy 39: Sustainable Design and Construction Policy 40: Flooding	**ES Appendix 11.9.3: Water Quality HEWRAT Assessment** (Doc Ref. 5.3) **ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref. 5.3) **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3)
Mole Valley	Future Mole Valley 2020-2037 Local Plan Proposed Submission Version	EN9: Natural Assets EN12: Pollution Control EN13: Standards and Targets For Combatting The Climate Emergency INF3: Flood Risk	**ES Appendix 11.9.3: Water Quality HEWRAT Assessment** (Doc Ref. 5.3) **ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref. 5.3) **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3)
Tandridge	Our Local Plan 2033 (Regulation 22 Submission) 2019 Tandridge District Council	TLP47: Sustainable Urban Drainage and Reducing Flood Risk	**ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3)

11.3 Consultation and Engagement

11.3.1 In September 2019, Gatwick Airport Limited (GAL) submitted a Scoping Report to the Planning Inspectorate, which described the scope and methodology for the technical studies being undertaken to provide an assessment of any likely significant effects and, where necessary, to determine suitable mitigation measures for the construction and operational periods of the Project. It also described those topics or sub-topics which are proposed to be scoped out of the EIA process and provided justification as to why the Project would not have the potential to give rise to significant environmental effects in these areas. The **Scoping Report** is provided in ES Appendix 6.2.1 (Doc Ref. 5.3).

11.3.2 Following consultation with the statutory bodies, the Planning Inspectorate (on behalf of the Secretary of State) provided a Scoping Opinion on 11 October 2019. The **Scoping Opinion** is provided in ES Appendix 6.2.2 (Doc Ref. 5.3).

11.3.3 Key issues raised during the scoping process specific to the water environment are listed in **ES Appendix 11.3.1: Summary of Stakeholder Scoping Responses – Water Environment** (Doc Ref. 5.3) and summarised in Table 11.3.1, together with details of how these issues have been taken into account within the ES.

Table 11.3.1: Summary of Scoping Responses

Details	How/where taken into account in ES
The ES should assess impacts to the Baldhorns Brook, Ifield Brook and Stanford Brook and Mole (Hersham to River Thames confluence at East Molesey) where significant effects are likely to occur (ID 4.5.1)	The ES has scoped out these watercourses as no significant effects are likely to occur. Justification is provided in Table 11.4.2.
The ES should include an assessment of the potential impacts from increased flows on watercourses due to an increase in hardstanding/impermeable areas and consider water quality (ID 4.5.2)	The potential impacts from increased flows due to an increase in hardstanding/impermeable areas are considered in the **Flood Risk Assessment** in **ES Appendix 11.9.6** (Doc Ref. 5.3) and summarised in this chapter. An assessment of the impact on water quality from de-icing and the highway improvement works is provided in Section 11.9. The assessment of water quality from the highways improvement works is considered in **ES Appendix 11.9.3: Water Quality HEWRAT Assessment** (Doc Ref. 5.3). The assessment of water quality with respect to de-icer management is considered in **ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref. 5.3).
The ES should quantify the baseline of such inputs/outputs of the balancing ponds in order to account for any changes and subsequent impacts and effects (ID 4.5.3)	Baseline surface water flows and discharge volumes from the balancing ponds are reported in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3). These are compared to the equivalent with-Project values to identify any impacts and effects. The assessment of the inputs and outputs with respect to water quality are considered in **ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref. 5.3).
Ecology and geology and ground conditions should be cross-referenced where applicable (ID 4.5.4)	Cross references are provided where necessary. In addition, inter-relationships between topics are considered in Section 11.11 and in **ES Chapter 20: Cumulative Effects and Inter-Relationships** (Doc Ref. 5.1).
The ES should include sufficient detail regarding mitigation measures during construction and operation and explain how this will be secured (ID 4.5.5)	Mitigation measures are set out in Section 11.8.
The ES should address the apparent contradiction regarding the capacity of the wastewater network in paragraphs 7.5.46 and 7.5.14 of the Scoping report.	Paragraph 7.5.46 of the Scoping Report is referring to the current condition of the wastewater network where there are three pumping stations which have

Details	How/where taken into account in ES
The ES should assess impacts to the existing drainage regime and its associated infrastructure (ID 4.5.6)	long running times during peak periods indicating stress on the system, namely PS03, PS07 and PS08. PS08 is currently being refurbished and fitted with higher capacity pumps which will accommodate future growth. PS03 and PS07 are both proposed to be replaced by new installations as part of the Project, and these would be sized to accommodate the projected growth. Paragraph 7.5.14 of the Scoping Report reflects the future situation (with the Project). This ES considers the impact on the existing drainage regime and infrastructure where this is to be retained as part of the Project. Where new or replacement infrastructure is included in the Project, the assessment has been performed on this rather than the existing infrastructure.
The ES must describe how pluvial and fluvial flows will be managed during the construction period and assess any significant effects of the proposed development (ID 4.5.7)	Fluvial and surface water/pluvial flood risk during the construction period is considered within the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) and in Section 11.9.
Mitigation beyond what is proposed in the Scoping Report should be considered, specifically, to reduce consumption and to increase water recycling (ID 4.5.8)	Appropriate mitigation measures in terms of re-use, behaviours and new technologies have been examined, and applied to demand forecasts where appropriate to update future demand requirements. All considered efficiencies are detailed in **ES Appendix 11.9.8: Water Supply Assessment** (Doc Ref. 5.3).
The assessment of flood risk in the ES should take into account the potential impacts of climate change using the latest UK Climate Projections (UKCP) available at the time of preparation (ID 4.5.9)	The potential impacts of climate change have been taken into account within **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3). The **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) has been updated to support the ES and adopts the new UKCP18 projections that have informed the current guidance, Flood Risk Assessments: Climate Change Allowances published in February 2016, last updated in May 2022 (Environment Agency, 2016a) are as listed below: ▪ Peak River Flow Climate Change Allowances by Management Catchment published in July 2021 and updated in February 2022 (Environment Agency, 2022a).

Details	How/where taken into account in ES
	▪ Peak Rainfall Climate Change Allowances by Management Catchment published in May 2022 (Environment Agency, 2022b). This is the best national representation of how climate change is likely to affect flood risk for peak river flow and peak rainfall intensity available (from a policy and guidance perspective).
The assessment in the ES should, as appropriate, have regard to information being prepared by Crawley Borough Council, Reigate and Banstead Borough Council and Mid Sussex District Council for their water cycle study (ID 4.5.10)	In the 'Gatwick Sub-region' Water Cycle Study (2020), SESW stated that there was sufficient capacity at their treatment works to meet projected demand. Additionally, at a meeting with GAL on 3/10/19, SESW stated that capacity issues at the treatment works would be unlikely as a result of the Project. Proposed future works at the treatment works will allow for additional demand, and Gatwick has two additional points of connection which could allow supply from alternative sources to be implemented through rezoning, should the current source be deemed at risk.
The Applicant is advised to review the Inspectorate's Advice Note 18 when determining the scope and methodology of the WFD assessment and consultation with the Environment Agency and LLFA (ID 4.5.11)	The **WFD Compliance Assessment** is included as **ES Appendix 11.9.2** (Doc Ref. 5.3) and takes into account Advice Note 18.

11.3.4 The PEIR was issued to inform the statutory consultation carried out on the Project in Autumn 2021. It presented the preliminary findings of the EIA process for the Project at that time. The consultation responses specific to the Water Environment assessment and the way in which they have been taken into account in this ES chapter are set out in Table 11.3.2. Further detail about the consultation process for the Project and the way in which the consultation responses have been addressed is provided in the separate Consultation Report.

Table 11.3.2: Summary of Consultation in Response to the PEIR

Consultee	Key Theme	How/where taken into account in ES
Crawley Borough Council (CBC)	More ambitious water efficiency measures.	Through liaison SESW has not stated that they believe their infrastructure and sources would not be able to meet the additional demands of the Project.
	Concern regarding the Project impacts on Crawley Sewage Treatment Works.	The proposed Gatwick treatment works is located in close proximity to the existing Thames Water (TW) Crawley Sewage

Consultee	Key Theme	How/where taken into account in ES
		Treatment Works (STW). However given its relatively small size it is considered that the new works would not compromise the ability of TW to expand their STW in the future.
	Further details of proposed fluvial and pluvial flood risk mitigation strategy.	The flood mitigation measures for the Project are presented in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).
	Concern regarding the Project impacts on water stress in the southeast.	Through liaison SESW has not stated that they believe their infrastructure and sources would not be able to meet the additional demands of the Project.
Horsham District Council	Possible water efficiency measures should be identified and implemented as part of the NRP	GAL is considering water re-use opportunities outside of the Project. The assessment conservatively assumes no introduction of water efficiency measures during the life of the Project.
	Consider cumulative impacts between West of Ifield site and the GAL NRP	Consideration of cumulative effects of development is considered in Section 11.11.
Reigate and Banstead Borough Council	Uncertainty regarding downstream fluvial flood risk impacts	The Project would not increase flood risk to other parties as demonstrated in the **Flood Risk Assessment**, see **ES Appendix 11.9.6** (Doc Ref. 5.3). The floodplain compensation areas (FCA) proposed as mitigation for loss of floodplain will be constructed before any loss of corresponding floodplain due to the Project.
	Concern with number of the proposed interventions	The interventions have been developed to ensure there are no significant environmental effects to the water environment as a result of the Project.
	Major road works and flood alleviation measures should be completed before the runway is fully operational.	The **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) demonstrates that there would be no increase in flood risk during construction. Flood mitigation measures would be in place in advance of corresponding loss of floodplain.
	Further details requested of how groundwater impacts the proposed Flood Compensation Areas (FCA).	The water environment and geology and soils chapters of the ES consider these changes on groundwater. A ground investigation has informed the ES (see **ES Appendix 11.9.5: Groundwater Assessment** (Doc Ref. 5.3)) which concludes

Consultee	Key Theme	How/where taken into account in ES
		that the excavation of Museum Field and Car Park X FCAs would not significantly affect groundwater resources.
	Concern regarding the siting of the Longbridge roundabout ponds.	The highway surface water drainage strategy for Longbridge and the rest of the highways improvements take flood risk constraints into account. The proposed surface water attenuation pond is located outside of the River Mole floodplain. Further information is available in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).
	Concern regarding the siting of the drainage ponds at Longbridge roundabout within an Area of High Archaeological Potential.	The proposed attenuation pond is located outside the defined Area of High Archaeological Potential - see Section 7.9 of **ES Chapter 7: Historic Environment** (Doc Ref. 5.1).
	Clarity on airfield surface water drainage and discharge rates to Gatwick Stream	The Project does not change the overall surface water drainage strategy for the airfield. There will be no new outfalls to receiving watercourses or increase to peak discharge rates. Runoff will continue to drain to existing ponds augmented by additional below-ground attenuation storage across the airfield to ensure no increase to flood risk. Further information is included in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).
	Further details requested of proposed works on Dog Kennel Pond.	The capacity of Dog Kennel Pond will now no longer be modified by the Project. Further information is included in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).
	Clarity that contaminated water meets quality standards.	The Project will not result in any deleterious impact upon the water quality of watercourses that receive runoff from the airport. Treatment of runoff potentially contaminated with deicer will be as existing as documented in **ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref. 5.3).
	Concern that historic flooding events have not been taken into	The surface water drainage and fluvial mitigation strategies both include allowances

Consultee	Key Theme	How/where taken into account in ES
	account in hydrological and hydraulic modelling	for the predicted impact of climate change as required by the NPS and NPPF based on United Kingdom Climate Projections 2018 (UKCP18) as translated into Flood Risk Assessments: Climate Change Allowances guidance by the Environment Agency (2016a). The **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) demonstrates that through the provision of additional attenuation storage and floodplain compensatory storage the Project would not increase flood risk to other parties for its lifetime taking climate change into account.
	Further details on proposed flood compensation areas requested.	The **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) demonstrates that there will be no increased risk of flooding to other parties as a result of the Project. The existing flood risk at the airport would be safely managed by the **Flood Resilience Statement** (**ES Appendix 11.9.6 Annex 6** (Doc Ref. 5.3)) developed by GAL. Each highways drainage attenuation pond includes 300mm freeboard above its peak design water level from the 1% (1 in 100) Annual Exceedance Probability (AEP) event plus a 40% climate change allowance. Each pond will include an overflow weir or channel to safely convey any exceedance flows should they occur, for example due to a blockage or extreme rainfall in excess of the design event.
	Concern regarding the adequacy of the proposed and remaining existing surface water flood alleviation measures	The Project will not increase flood risk to other parties. **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) demonstrates that through the provision of additional attenuation storage peak flows to receiving watercourses will not increase including an allowance for climate change.
	Quality of discharges to the fluvial network	The Project will not worsen the water quality of receiving watercourses that receive runoff from the airport or the highways improvements as set out in **ES Appendix 11.9.3: Water Quality**

Consultee	Key Theme	How/where taken into account in ES
		HEWRAT Assessment (Doc Ref. 5.3) and **ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref. 5.3).
	Consideration of cumulative impacts	The consideration of cumulative impacts is considered in **ES Chapter 20: Cumulative Effects and Inter-Relationships** (Doc Ref. 5.1).
	Concern regarding safe evacuation during extreme flooding events	GAL has developed a **Flood Resilience Statement**, included in the **ES Appendix 11.9.6 Annex 6** (Doc Ref. 5.3) that demonstrates how GAL would respond to such an event.
	Further information is requested of proposed treatment works	The need for the new treatment works is included in **ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref. 5.3), and a drawing included in **ES Appendix 11.9.4 Annex 5: UPM Impact Assessment Results** (Doc Ref. 5.3).
	Clarity as to whether contaminated water could be recycled to potable standards	GAL is considering water re-use opportunities outside of the Project. The Project assessment conservatively assumes no introduction of water efficiency measures during the life of the Project.
	Request for a maintenance programme and effective monitoring reporting of the water infrastructure	Maintenance proposals would be developed as part of the detailed design process. Monitoring proposals for the water environment are included in Table 11.8.1.
	Clarification on connection between Pond D and proposed underground storage in Car Park Y.	The airside surface water drainage network across the airport is connected to Pond D which discharges to the River Mole. The proposed storage beneath Car Park Y would discharge directly into Pond D. Ponds E, F and G drain direct to the Gatwick Stream.
	Further details are requested as to when the works are undertaken to prioritise protection of the natural environment.	The sequencing of construction works is assessed in paragraphs 11.9.3 to 11.9.52
Mole Valley District Council	Further details are requested for how water quality impacts of the proposed development will be mitigated.	The water quality mitigation measures are set out in **ES Appendix 11.9.3: Water Quality HEWRAT Assessment** (Doc Ref. 5.3) and **ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref. 5.3).

Consultee	Key Theme	How/where taken into account in ES
Tandridge District Council	Concern regarding additional surface runoff and contamination of groundwater.	The potential for contaminants to be mobilised during construction as a result of leaching into groundwater is assessed within section 10.9 of **ES Chapter 10: Geology and Ground Conditions** (Doc Ref. 5.1) (under sub sections titled Impacts on Aquifers for each assessment period). Impacts would be mitigated through implementation of the remediation strategy and Code of Construction Practice.
	Concern regarding potential encroachment upon floodplains and the increase in hard surfacing.	The Project includes mitigation for the increase in impermeable area and encroachment into the floodplain as set out in **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).
West Sussex County Council	Further details on potential failure of Pond A.	Pond A will be removed as part of the Project. Failure of airport infrastructure is addressed by regular GAL maintenance activities and operational incident response.
Surrey County Council	Further detail on surface water flood risk and sustainable drainage requested	The detailed design for the Project will not be developed until after the DCO application. Information of the airfield and highways improvement surface water drainage strategies are included in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).
	Consider maintenance of drainage features.	The detailed design for the Project will not be developed until after the DCO application. Information of the airfield and highways improvement surface water drainage strategies are included in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).

11.3.5 In June 2022 an additional consultation was undertaken to update stakeholders and the local community on the ongoing work and refinement to the Project proposals, which included a targeted, statutory consultation on the design changes to the proposed highway improvement changes. As these changes to the Project could lead to new or materially different significant environmental effects compared to those reported in the PEIR, an updated PEI was issued as part of this additional consultation. The consultation responses specific to the water environment and the way in which they have been taken into account in this ES chapter are set out in Table 11.3.3.

Table 11.3.3: Summary of Consultation in Response to the Updated PEI

Consultee	Key themes	How/Where taken into account in ES
Surrey County Council	Compliance with latest (UKCP18) Environment Agency climate change	The updated climate change rainfall intensity allowances published by the EA in May 2022 have informed the outline design for the airfield and highways surface water drainage systems, which are summarised in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3). As documented in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3), the Project incorporates two design lives: 40 years for the airfield and 100 for the highways surface access elements. Consequently the climate change allowances adopted vary between the drainage design for these elements. In accordance with the updated Environment Agency (2016a), Flood Risk Assessments: Climate Change Allowances guidance the highways drainage strategy adopts the Upper End allowance of +40%, the airfield drainage the Central allowance of +25% and a further sensitivity test will be undertaken using +40%.
Crawley Borough Council	Further detail on drainage impacts requested	The **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) includes outline details of the drainage proposals including mitigation for the Project.
	Request for a hydraulic model build report	The model build reports are included as **ES Appendix 11.9.6 Annexes 3, 4 and 5** (Doc Ref. 5.3).
	Request for a concept design of the Museum Field floodplain compensation area	Concept drawings of the FCA are included in **Fluvial Mitigation Measures Indicative Designs** of the **ES Appendix 11.9.6 Annex 1** (Doc Ref. 5.3)
	Request for a construction period plan for management of surface water during construction	Construction impacts of the Project are considered in Section 11.9 of this chapter. **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3) sets out the proposed management measures.
	Further details requested of proposed treatment works	The need for the new treatment works is included in **ES Appendix 11.9.4: Water**

Consultee	Key themes	How/Where taken into account in ES
		Quality De-Icer Impact Assessment (Doc Ref. 5.3), and a drawing included in **ES Appendix 11.9.4 Annex 5** (Doc Ref. 5.3).
Mid-Sussex District Council	Further details requested of proposed treatment works	The need for the new treatment works is included in **ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref. 5.3), and a drawing included in **ES Appendix 11.9.4 Annex 5** (Doc Ref. 5.3).
Mole Valley District Council	Further details requested of proposed treatment works	The need for the new treatment works is included in **ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref. 5.3), and a drawing included in **ES Appendix 11.9.4 Annex 5** (Doc Ref. 5.3).
	Further details requested of modifications to the River Mole (runway) culvert	The Project will not increase the length of culverts on Main Rivers, the extension of the River Mole culvert beneath the runway will be daylighted (an open mesh roof) to mitigate the impact of the extension, see **Daylighted Channel Extension of River Mole** in **ES Appendix 11.9.2 Annex 1** (Doc Ref. 5.3).
Reigate and Banstead Borough Council	Quality of discharges to the fluvial network	**ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref. 5.3)
	Concern regarding loss of vegetation.at South Terminal roundabout	Vegetation impacts are addressed in **ES Chapter 9: Ecology and Nature Conservation** (Doc Ref. 5.1).
Fittleworth Parish Council	Additional pressure on water resources due to increased demand as a result of the Project	Liaison is ongoing with SESW who supply water to the airport. SESW has not raised any concerns regarding their ability to meet the additional demand made by the Project.
Leigh Village Parish Council	Uncertainty regarding downstream fluvial flood risk impacts	The **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) includes the assessment of impact upon fluvial flood risk and demonstrates that this will not be increased by the Project including an allowance for climate change in accordance with national planning policy.
	Impact on drainage capacity	The Project will comply with national planning policy and consequently will include mitigation measures (additional drainage attenuation tanks to store additional runoff and floodplain compensation areas to store displaced fluvial floodwater) to ensure that there is no increase

Consultee	Key themes	How/Where taken into account in ES
		in flood risk to other parties, including an allowance for the predicted impacts of climate change, as set out in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).
	Clarity sought on the course of the River Mole	The River Mole will be re-naturalised immediately downstream of the runway culvert over a length of approximately 300m. Existing watercourse crossings will be modified to facilitate the improvements to Longbridge Roundabout, but there will be no further modifications to the Mole downstream.
National Highways	Request for further information demonstrating no increase in flood risk to the strategic road network	Information on the proposed highways surface water drainage strategy is included in the **Surface Access Highways Surface Water Drainage Strategy** of **ES Appendix 11.9.6 Annex 2** (Doc Ref. 5.3). The highways drainage networks have been designed with attenuation measures to ensure no increase in peak runoff rates up to the 1 in 100 plus an allowance for climate change of +40% event. **ES Appendix 11.9.6 Figure 6.2.1** (Doc Ref. 5.3) demonstrates that there would not be an increase in fluvial flood risk to the strategic road network as a result of the Project.
Thames Water	Review of assets potentially impacted by the Project	Asset schedule reviewed at a meeting on 27 May 2022. None were found to be adversely affected by the Project that could not be mitigated.
	Further assessment of the impacts to receiving sewage treatment works required	The assessment assumes wastewater flows east of the London to Brighton railway would be redirected eastwards to Crawley STW. GAL has engaged with Thames Water (including by providing **ES Appendix 11.9.7: Wastewater Assessment** (Doc Ref. 5.3)) to allow Thames Water to assess the impacts to the receiving STW in line with their statutory duties.

11.3.6 Outside of the above-described public consultations, GAL also continued to engage with key stakeholders and during such engagement, key issues raised specific to the water environment

are listed in Table 11.3.4, together with details of how these issues have been taken into account within the ES.

Table 11.3.4: Summary of Consultation and Engagement

Consultee/issue	Date	Details	How/where taken into account in ES
Environment Agency			
Flood risk, geomorphology, water quality and groundwater	15 August 2019	Introductory presentation to the Project and site visit. The Environment Agency has updated published flood zones with those developed from the new Upper Mole Hydraulic model (refer to paragraph 11.6.61 and **ES Figure 11.6.4** (Doc Ref. 5.2)).	Sections 11.4 and 11.9.
De-icer contamination and water quality	24 September 2019	Discussion and agreement of methodology and approach.	The methodology agreed for the impact assessment is detailed in **ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref. 5.3).
Flood Risk	25 November 2019	Presentation of emerging fluvial impacts and mitigation.	**ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).
Flood risk, geomorphology, water quality and groundwater	28 January 2021	Reintroduction to the Northern Runway Project.	N/A
Flood risk	17 February 2021	Review of hydraulic modelling updates.	**ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).
Water	29 April 2021	Review of draft PEIR and scoping review comments.	Throughout this Chapter plus supporting figures and appendices.
Water	25 May 2021	Presentation of non-flood risk approach to assessment	Section 11.4
Water quality, WFD culverts	24 March 2022	Review of approach to water quality and WFD assessment	Section 11.9, **ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref.

Consultee/issue	Date	Details	How/where taken into account in ES
			5.3) and **ES Appendix 11.9.2: WFD Compliance Assessment** (Doc Ref. 5.3)
WFD, culverts	5 July 2022	Review of impacts to watercourses for culverting	Section 11.9 and **ES Appendix 11.9.2: WFD Compliance Assessment** (Doc Ref. 5.3)t
WFD, Mole culvert	24 November 2022	Review of modifications to River Mole culvert	Section 11.9 and **ES Appendix 11.9.2: WFD Compliance Assessment** (Doc Ref. 5.3)
East Sussex County Council as the Lead Local Flood Authority			
Flood risk	17 November 2022	Highways drainage proposals	**ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).
Culverts	30 November 2022	Ordinary watercourse culverting proposals	Section 11.9 and **ES Appendix 11.9.2: WFD Compliance Assessment** (Doc Ref. 5.3)
Surrey County Council as the Lead Local Flood Authority			
Flood risk	17 November 2022	Highways drainage proposals	**ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).
Culverts	30 November 2022	Ordinary watercourse culverting proposals	Section 11.9 and **ES Appendix 11.9.2: WFD Compliance Assessment** (Doc Ref. 5.3)
West Sussex County Council as the Lead Local Flood Authority			
Flood Risk	September and October 2019	All primary flood risk related documentation is publicly available and has been sourced and reviewed. It is considered by GAL that this information is sufficient to inform the PEIR.	Sections 11.4 and 11.9. **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).
All water environment aspects	6 February 2020	General progress update	Throughout this Chapter plus supporting figures and appendices
All water environment aspects	14 October 2021	General progress update	Throughout this Chapter plus supporting figures and appendices

Consultee/issue	Date	Details	How/where taken into account in ES
All water environment aspects	31 January 2022	General progress update	Throughout this Chapter plus supporting figures and appendices
All water environment aspects	10 May 2022	General progress update	Throughout this Chapter plus supporting figures and appendices
All water environment aspects	29 June 2022	General progress update	Throughout this Chapter plus supporting figures and appendices
All water environment aspects	29 July 2022	General progress update	Throughout this Chapter plus supporting figures and appendices
All water environment aspects	31 October 2022	Update on ES emerging findings	Throughout this Chapter plus supporting figures and appendices
Crawley Borough Council			
Groundwater	23 September 2019	Request for information to Crawley Borough Council on groundwater flooding and unlicensed abstractions.	Information has been requested but has not been received at the time of writing. However, a previous study in the area (Arcadis, 2023) has been referenced which provides information on unlicensed abstractions.
All water environment aspects	6 February 2020	General progress update	Throughout this Chapter plus supporting figures and appendices
All water environment aspects	14 October 2021	General progress update	Throughout this Chapter plus supporting figures and appendices
All water environment aspects	31 January 2022	General progress update	Throughout this Chapter plus supporting figures and appendices
All water environment aspects	16 March 2022	General progress update	Throughout this Chapter plus supporting figures and appendices
All water environment aspects	10 May 2022	General progress update	Throughout this Chapter plus supporting figures and appendices
All water environment aspects	29 June 2022	General progress update	Throughout this Chapter plus supporting figures and appendices
All water environment aspects	29 July 2022	General progress update	Throughout this Chapter plus supporting figures and appendices

Consultee/issue	Date	Details	How/where taken into account in ES
All water environment aspects	31 October 2022	Update on ES emerging findings	Throughout this Chapter plus supporting figures and appendices
Flood risk and drainage	10 January 2023	Additional details on flood risk and drainge mitigation strategy	Throughout this Chapter plus supporting figures and appendices
Thames Water			
Wastewater	3 October 2019	Introductory presentation to the Project, hydraulic model construction and impact assessment methodology.	The ES includes an assessment of the impacts using the methodology outlined in the meeting. Thames Water will be undertaking their own assessment of impact upon their network.
Wastewater	17 June 2021	Update on PEIR assessment, TW survey progress	N/A
Wastewater	8 July 2021	General position update of both parties	N/A
Wastewater	16 July 2021	Discussion on hydraulic modelling approach	**ES Appendix 11.9.7: Wastewater Assessment** (Doc Ref. 5.3)
Wastewater	27 May 2022	Review of assets potentially affected by the Project	N/A
Wastewater	22 November 2022	Presentation of ES emerging findings	Throughout this Chapter plus supporting figures and appendices
Sutton and East Surrey Water (Water Supply)			
Water supply	24 October 2019	Introductory presentation to the Project, and water supply methodology for demand forecasting.	Sections 11.4 and 11.9, and SESW will be undertaking their own impact assessment.
Water supply	13 January 2020	SESW stated that their network and sources would be able to meet the increase in demand of the Project.	Throughout Section 11.9.

11.4 Assessment Methodology

Relevant Guidance

11.4.1 The assessment of the effects of the Project on the water environment has been undertaken in accordance with the legislation summarised in Section 11.2 and is adapted from the guidance in the Design Manual for Roads and Bridges (DMRB) LA 113 – Road Drainage and the Water Environment (Highways England *et al.*, 2020). Where appropriate, informed professional judgement has been used, primarily in relation to geomorphology, where there is a lack of published guidance to date. Flood risk has been assessed in accordance with the requirements of the NPPF (Department for Levelling Up, Housing and Communities, 2021) and the accompanying online Flood risk and coastal change guidance, last updated August 2022. For the purposes of this assessment, the Project has been classed as 'Essential Infrastructure'. The NPPG (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, 2021) includes 'Essential transport infrastructure which has to cross the area at risk' within this category.

Scope of the Assessment

11.4.2 The scope of this chapter has been developed in consultation with relevant statutory and non-statutory consultees as detailed in Table 11.3.1, Table 11.3.2, Table 11.3.3 and Table 11.3.4 and it was also informed by the consultation on the PEIR in 2021 and updated PEI relating to the highway improvement changes in 2022 (see **ES Appendix 11.3.1: Summary of Stakeholder Scoping Responses – Water Environment** (Doc Ref. 5.3)).

11.4.3 Taking into account the scoping and consultation process, Table 11.4.1 summarises the issues considered as part of this assessment.

Table 11.4.1: Issues Considered within the Assessment

Issue	Potential Effects
Construction Period (including Demolition): Water Environment	
Geomorphology	Sediment from construction areas washed off into watercourses increasing turbidity and impacting on morphology.
	Damage and loss of riparian vegetation.
	Damage and loss of natural bed and banks.
	Changes in flow (discharge and velocity) in channel and on floodplain.
	Changes in river continuity.
	Change in drainage strategy altering flows to receiving watercourses affecting flood risk, geomorphology and water quality.
	Modifications to groundwater recharge or flow paths could affect surface water flows due to connection via river terrace deposits.
Groundwater	Construction dewatering affecting groundwater levels flows, creating potential settlement and mobilisation of contaminants.
	Piling introducing contaminants and creating contaminant pathways.

Issue	Potential Effects
	Modifications to groundwater recharge or flow paths could affect surface water flows due to connection via river terrace deposits.
	Spillage at surface impacting the quality of groundwater resources.
Water Quality	Contaminated runoff or spillage from construction areas impacting surface water quality.
	Dewatering for foundations/sub-surface structures resulting in changes to surface water quality.
	Change in drainage strategy altering flows to receiving watercourses affecting flood risk, geomorphology and water quality.
	Dewatering for foundations, basement and other sub-surface structures resulting in changes to groundwater flow and quality of groundwater resources (including any private water supplies, if present).
Flood Risk	Temporary storage of materials reduces the volume of floodplain storage increasing flood risk.
	Increased flood risk due to existing surface water flow paths being interrupted, diverted or created by construction works, or due to increased compaction of ground or increase in impermeable area.
	Failure of temporary over-pumping arrangements of the surface water drainage and wastewater networks resulting in flooding.
	Dewatering for foundations, basement and other sub-surface structures resulting in changes to groundwater levels and flow routes and altering flood risk, exacerbated due to potential hydraulic connectivity between groundwater and surface water resources.
	Temporary works for outfalls etc. within river channels leading to increase in flood risk.
	Change in drainage strategy altering flows to receiving watercourses affecting flood risk, geomorphology and water quality. Discharges from construction activities leading to increased flows to the surface water network increasing the risk of flooding from the surface water drainage. Sediment from construction areas washed off into surface water drainage causing blockage and flooding.
	Construction activity leading to physical damage to surface water drainage assets and causing flooding.
	Temporary haul roads during construction periods
Wastewater	Increased flows during construction due to additional workers at the airport discharging to the wastewater network.
Water Supply	Increased demand on existing water supply/water resources to support construction activities.
Operational Period: Water Environment	

Issue	Potential Effects
Geomorphology	Narrowing of channel width with extensions of culverts and bridge widening. Potential increase in stream energies locally. Loss and or damage to channel bed form and substrate.
	Homogeneity of channel cross-section with extension of culverts and bridge widening. Potential for loss of natural variance in velocities and secondary flows cells, leading to changes in velocity and geomorphological processes.
	Disruption of quantity and dynamics of flow and sediment supply, due to changes in bed and bank form, channel planform, cross-section and gradients. Potential effects due to extension of culverts, bridge widening, river renaturalisation and creation of FCA.
	Increased sediment supply. Damage to channel bank form.
	Change in sediment dynamics due to changes in runoff.
	Change in physicochemical quality due to changes to natural bed and banks.
	Loss and damage to riparian zone due to new structures and/or additional access requirements for maintenance.
	Loss of natural bank form and material.
	Reduction in channel – floodplain coupling due to extension of culverts and bridge widening.
Water Quality	Additional de-icer being used to address increase in air traffic movements, with potential impact on surface water quality if not appropriately stored and if contaminated runoff is not treated effectively.
	Runoff from increased impermeable areas increasing sediment and pollutant loadings in watercourses.
	Potential for air quality effects on surface water quality, i.e. airborne contaminants being deposited on the ground, ultimately ending up in surface water.
	Increased pollutant loadings resulting from increases in road traffic volumes could reach surface water features from accidental spillages via outfalls or other surface water pathways. This could include suspended solids and contaminants bound to them and oils and related compounds.
Groundwater	Discharges to ground, e.g. from road drainage impacting groundwater flows or levels.
	Foundation/box structures, piling or cuttings/underpasses intercepting/diverting groundwater flow leading to impacts on groundwater levels and/or flow.
	Increased impermeable areas (such as car parks) leading to a reduction in recharge to shallow groundwater, impacting both groundwater levels and quality and associated increased surface water flood risk.
	Change in groundwater flow paths from sub-surface structures affecting groundwater fed ecological features (such as wetlands).
Flood Risk and Surface Water Drainage	Increased runoff due to additional impermeable areas increases flood risk.
	Changes to channel structures (e.g. culverts) reduces capacity and increases flood risk.

Issue	Potential Effects
	Changes in drainage strategy – increased runoff leading to an increase in flood risk.
	Increased fluvial flood risk due to loss of floodplain storage arising from elements of the Project within the floodplain.
	Increased flood risk due to existing surface water flow paths being interrupted, diverted or created by the Project, or due to increased impermeable area.
	New development placing more people (working and using the airport) or assets in path of potential reservoir failure flow path.
	Foundation/box structures intercepting/diverting groundwater flow leading to waterlogging and/or groundwater flooding.
	Increased runoff due to additional impermeable areas increases flood risk.
	Changes to the A23 resulting in increased surface water runoff increasing flood risk.
Wastewater	Additional treated effluent from an increase in passenger and staff numbers impacting surface water quality if appropriate wastewater collection and treatment is not provided.
	Increased discharges to the existing wastewater sewer system leading to flooding if insufficient capacity is available.
	The provision of new pumping stations creating a risk of flooding within the airport, both landside and airside (in event of failure).
Water Supply	Increase in potable water demand, requiring new infrastructure and affecting sustainability of supply from local water resource zone.

11.4.4 Taking into account the scoping and consultation process a summary of the effects scoped out of the assessment is presented in Table 11.4.2.

Table 11.4.2: Issues Scoped Out of the Assessment

Issue	Justification
Tidal/coastal flood risk	The airport is approximately 35 km north of the nearest coastline and ground levels are generally above 55 m above ordnance datum (AOD) and therefore are not at tidal/coastal flood risk.
Groundwater impact on public water supply	There are no public water supply boreholes in the study area and the nearest Source Protection Zone for public supply boreholes is over 8 km away.
Groundwater Dependent Terrestrial Ecosystems (GWDTEs)	No potential GWDTE have been identified within the study area. See **ES Chapter 9: Ecology and Nature Conservation** (Doc Ref. 5.1).
Geomorphological impacts on Withy Brook and Burstow Stream	The geomorphology of the watercourses is not considered to be impacted by the Project on Withy Brook and Burstow Stream as they are all over 1 km upstream or downstream of the Project and following review of likely flow velocities (paragraph 11.4.7). No change would be expected on these watercourses. These watercourses are therefore scoped out given the distance and location of the watercourses and their surrounds from the

Issue	Justification
	Project. Burstow Stream was scoped into the assessment at the PEIR stage based on the extent of the highways works. However, Burstow Stream has since been scoped out of the geomorphological assessment due to the reduced extent of the highways works that are now proposed (although it remains in the Water Quality HEWRAT assessment because of discharges from the highways network that discharge to the Burstow Stream Tributary and Burstow Stream).
Geomorphological impacts on Ifield Brook, Stanford Brook, Baldhorns Brook and the Mole (Hersham to River Thames confluence at East Molesey)	The geomorphology of the watercourses is not considered to be impacted by the Project on Ifield Brook, Stanford Brook and Baldhorns Brook as they are all >3 km upstream of any Project and following review of likely flow velocities (paragraph 11.4.7). No change would be expected on these watercourses. The Mole (Hersham to River Thames confluence at East Molesey) has also been scoped out. Whilst it is an adjacent water body to the Project, it is over 60 km downstream of any Project. It has therefore been assumed that any impacts that the works may have on the Mole would not be significant this far downstream.

Study Area

11.4.5 The water environment study area is identified in **ES Figure 11.4.1** (Doc Ref. 5.2).

11.4.6 The study area is generally defined by a 2 km radius beyond the Project boundary. Taking into account the nature of the Project, impacts are predicted to occur in close proximity to the Project boundary and it is considered that a 2 km study area would be sufficient to identify significant effects. However the study area for assessment was extended beyond 2 km where a hydrological pathway was identified for example as a result of the collection of additional data, Project design evolution and site surveys. The study area was also extended to ensure that all likely significant effects that could occur as a result of the Project were considered, as recorded in the relevant detailed assessment appendices to this chapter.

11.4.7 For geomorphological effects, a study area has been defined that covers the catchments of the receptors identified and a smaller site study area has been defined based on the channels that would be directly impacted (**ES Appendix 11.9.2 Figure 4.1.1** (Doc Ref. 5.3)). The catchments of the receptors cover a combined extent of 237 km^2, including the catchments of the River Mole upstream of Horley, River Mole (Horley to Hersham), Tilgate Brook and Gatwick Stream at Crawley, and Burstow Stream, which intersect with the Project boundary. A smaller multi-reach scale study area was initially defined based on the extent of the Project boundary. This was further refined following the scoping stage based on a high-level review of velocity information taken from the Upper Mole fluvial hydraulic model. The smaller study area encompasses sections of the River Mole, Gatwick Stream, Crawter's Brook, Burstow Stream Tributary and Man's Brook.

11.4.8 For surface water quality, the 2km radius beyond the Project boundary is considered a sufficient study area. This distance has been defined to identify receptors that could reasonably be affected by direct impacts associated with the Project.

11.4.9 For flood risk, the study area cannot necessarily be defined by distance but rather the hydraulic and morphological characteristics and connectivity of water receptors. Consequently, the flood risk study area has been extended where necessary to fully assess the Project's impact upon watercourses, surface water and groundwater.

11.4.10 For wastewater the assessment of potential effects is limited to the infrastructure at Gatwick. It is understood Thames Water will undertake an impact assessment of the Project on the downstream public sewerage conveyance and treatment system.

11.4.11 For water supply the assessment of potential effects is limited to the water source, and does not cover deficiencies in water infrastructure, either internal or managed by SESW. It is understood that SESW will undertake an impact assessment of the Project on their water network infrastructure to identify any sections requiring upgrade as a result of projected increases in water demand, a response from SESW is awaited .

Methodology for Baseline Studies

11.4.12 The year 2022 has been adopted as the baseline for the EIA for water environment given the availability of current information. A future baseline scenario has been developed for the start of the Project.

Desk Study

11.4.13 The data sources that have informed the assessment of impact are summarised in Table 11.4.3:

Table 11.4.3: Data Sources

Source	Dataset
gov.uk Open Data	Source Protection Zones* Consented discharges* Thames River Basin Management Plan (RBMP)
Environment Agency	Licensed abstractions and consented discharges* Water quality monitoring locations* Abstraction license strategy (Catchment Abstraction Management Strategy) (CAMS) Pollution incidents Groundwater vulnerability and soil leaching potential* Catchment Data explorer Flood Map for Planning: Flood Zones 2 and 3 Risk of Flooding from Surface Water Extent: 3.3% (1 in 30), 1% (1 in 100) and 0.1% (1 in 1000) AEP Events Reservoir Flood Extents: Dry Day and Wet Day Historic Flood Map
British Geological Survey	1:50,000 digital geology mapping (superficial and bedrock)* Groundwater flood susceptibility mapping* Web based information from GeoIndex Onshore (British Geological Survey)

Source	Dataset
Hydraulic Models	Hydraulic models are available for the River Mole, Gatwick surface water network, integrated fluvial and surface water network, pollution control and river impact, and wastewater network
National Library of Scotland	Historical Ordnance Survey maps
MAGIC Website	Designated sites Aquifer designations Nitrate vulnerable zones Drinking water protected/safeguarded areas
Lead Local Flood Authorities / Local Authorities	Unlicensed groundwater and surface water abstraction (awaited) Surface water flood management plans (SWMPs) Records of local flood history Crawley Borough Council Strategic Flood Risk Assessment 2020
Gatwick Airport Limited	Ground investigation data Historical water consumption data Previous water demand forecast studies Wastewater network historical operational data Pollution control system monitoring data De-icer use records Historic weather records
National River Flow Archive	River flow data

Note: Items marked * accessed from Geosure reports

Surface Water

Geomorphology

11.4.14 The watercourse catchment extents have been used to undertake a desk-based review of geomorphological conditions (**ES Appendix 11.9.2 Figure 4.1.1** (Doc Ref. 5.3)). This provides an overview of the catchments, how they currently function and a summary of information on historical changes. This information has been supplemented with information gained via walkover surveys in September 2019 and March 2022 (see paragraph 11.4.26).

WFD Regulations Compliance Assessment

11.4.15 A WFD Regulations Compliance Assessment has been undertaken using desk study methods (**ES Appendix 11.9.2: WFD Compliance Assessment** (Doc Ref. 5.3)). The Environment Agency's Catchment Data Explorer database (2022) was used to assess surface and groundwater water bodies present within the Project's study area as part of a desk study review. The water body information provided as part of this includes their ID numbers, designation and classification details. The WFD Regulations compliance mapping from Catchment Data Explorer was also reviewed along with any other supporting data.

11.4.16 The WFD Regulations Compliance Assessment includes:

- an assessment of the existing status of the Main River water bodies;
- an impact assessment, which considers the potential impacts of the activities associated with the Project;

- identification of ways to avoid or minimise impacts; and
- identification of whether an activity may cause deterioration or jeopardise the water body achieving Good Ecological Status or Potential (GES or GEP).

Water Quality – HEWRAT Assessment for Highways Improvements and Car Parks

11.4.17 A desktop review of available baseline information for surface water quality, flows, drainage network, resources, designations, discharges and abstractions has been undertaken to establish the baseline conditions of surface waterbodies within the study area.

Water Quality – De-icer Impact Assessment

11.4.18 The assessment of de-icer contaminated runoff impact on surface water quality was undertaken using a pollution control and river impact model built with the InfoWorks™ ICM software. In order to validate the model for its surface water flooding performance, an existing model was rebuilt and revalidated against an extensive flow survey of 32 monitors and against six months of water quality data for the winter of 2017/18. This winter was selected as a validation event as it was particularly harsh requiring extensive use of de-icer (see paragraph 1.3.2 of **ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref. 5.3)). Winters since 2017/18 have been milder with less de-icer use, or with few flights due to COVID. Further detail on the pollution control and river impact model is provided **Water Quality De-Icer Impact Assessment** in **ES Appendix 11.9.4** (Doc Ref. 5.3).

Groundwater

11.4.19 The baseline groundwater conditions have been evaluated based on desk study information, including BGS mapping, limited data from GI undertaken at Gatwick between 2006 to 2018 and two Project specific GI investigations undertaken in 2022 in the vicinity of Museum Field and the highways improvements (SOCOTEC 2022a, SOCOTEC 2022b). Data sources used in the assessment are summarised in Table 11.4.3. This is considered to provide sufficient information to assess the effects of the Project, particularly as it has been augmented by a contemporary targeted GI.

11.4.20 To develop an overview of the groundwater regime, a qualitative conceptual site model (CSM) (presented in the groundwater baseline in Section 11.6) has been developed to set the context of groundwater within the overall water environment and to support the groundwater impact assessment. The CSM has been used to inform the sensitivity of groundwater as a resource and determine the significance of the effects.

Flood Risk and Surface Water Drainage

11.4.21 A baseline assessment of all sources of flood risk and surface water drainage has been undertaken. The findings are reported in an **Flood Risk Assessment** for the Project (**ES Appendix 11.9.6** (Doc Ref. 5.3)). The **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) has been undertaken in accordance with the Airports NPS (Department for Transport, 2018a), NPPG (Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government, 2021) and NPPF (Department for Levelling Up, Housing and Communities, 2021). It considers baseline flood risk to the Project from all sources, including fluvial, surface water, groundwater, flooding from reservoirs and sewer/ water supply flooding.

11.4.22 The **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) has incorporated the findings of a desk study using publicly available information and of detailed hydraulic modelling. GAL, in partnership with the Environment Agency, has recently completed the development of a fluvial hydraulic model for the Upper River Mole catchment. This includes other watercourses in the vicinity of the airport that may be impacted by the Project. This model has been used to confirm the baseline fluvial flood risk conditions. Further detail on the model is provided in the **ES Appendix 11.9.6 Annex 5** (Doc Ref. 5.3).

11.4.23 The assessment of surface water flood risk was undertaken using a drainage and surface model built with the InfoWorks™ ICM software. In order to validate this model for its surface water flooding performance, an existing model was rebuilt and revalidated against an extensive flow survey of 32 monitors. Further detail on the surface water model is provided in **ES Appendix 11.9.6 Annex 3: Airfield Surface Water Drainage Hydraulic Model Build Report** (Doc Ref. 5.3).

Water Infrastructure

Wastewater

11.4.24 A hydraulic model of the wastewater system was built and calibrated in early 2019. It comprises a digital twin of the network serving the airport and is based mainly on asset survey data and calibrated against periods of dry and wet weather. The model was updated with peak 2018 daily passenger numbers, and the future baseline scenario loadings have been applied, allowing the impacts to be assessed. More recent passenger numbers would be affected by the reduction in passenger numbers due to the Covid pandemic and would therefore not provide a representative comparison. Further detail on the wastewater model is provided in **ES Appendix 11.9.7: Wastewater Assessment** (Doc Ref. 5.3).

Water Supply

11.4.25 Baseline consumption data have been completed through the analysis of previous forecasted demands as detailed in ‘London Gatwick – Water Masterplan 2020 & 2028 Forecast – Full backing report’ (GAL, 2018) and comparing predicted forecast demands with actual consumption values for 2017 and 2018, adjusting the demand curve accordingly and extrapolating out to 2047. This has been adjusted to account for any previously proposed water efficiencies which have yet to be implemented to the current facilities**.**

Site-Specific Surveys

11.4.26 A geomorphological walkover survey was undertaken of publicly accessible areas and airside areas within the smaller study area to develop a detailed baseline of channel characteristics on the watercourses which are potentially impacted by the Project. The survey took place in September 2019 and water levels were higher than average following a prolonged period of heavy rainfall. As a result, the bed and much of the banks were not visible. However, some information on the banks, processes and existing pressures was recorded, supplemented by photographs taken on site. A further two walkover surveys were undertaken in March 2022 and April 2022 to collect additional detailed survey information at watercourses where there were changes to the design since the PEIR stage. During the surveys, water levels were average, and the bed and banks were visible. Additional photographs were captured along parts of the River Mole and Man’s Brook to supplement existing baseline information. In combination, these walkover surveys provide sufficient information for a robust assessment.

11.4.27 Manhole and sewer flow surveys have been undertaken by GAL to inform the development of the surface water drainage and pollution control and river impact hydraulic models of the airport.

Methodology for Impact Assessment

Suface Water

Geomorphology

11.4.28 The potential geomorphological impacts of the Project and flood risk mitigation components have been identified for each watercourse. The baseline assessment is taken to be indicative of the current morphological condition of the watercourses. Descriptions of the potential effects of construction and operational activities have been outlined using expert judgment of fluvial geomorphological processes. A qualitative assessment of the magnitude of the impacts, both spatially and temporally, has been established with reference to GIS information, baseline conditions (including existing morphological pressures) and the Project design. The sensitivity of each watercourse to impacts is based on the water body status published on the Environment Agency's Catchment Data Explorer website for WFD. This publishes data on the status of each water body, as required by the RBMP. For water bodies not designated under the Regulations, sensitivity is assigned based on diversity of morphological features and processes, state of natural equilibrium, and extent of artificial modification or anthropogenic influence.

WFD Regulations Compliance Assessment

11.4.29 The WFD Regulations Compliance Assessment is a detailed assessment comprising identification of WFD baseline parameters for each water body potentially affected by the Project; impacts to relevant water bodies as a result of Project elements; incorporation of Environment Agency mitigation measures; and a cumulative assessment of other Projects. Impacts are assessed largely through qualitative methods, with reference to geomorphological and ecological survey information.

Water Quality – HEWRAT Assessment for Highways Improvements and Car Parks

11.4.30 The surface water quality assessment has been undertaken for surface water receptors that could potentially be impacted by the highway improvements and car park elements of the Project within the study area.

11.4.31 A review of the existing baseline conditions for each identified watercourse determined the sensitivity of the watercourse with regards to water quality. For the construction period of the highway improvements and car park elements of the Project, a qualitative assessment of the magnitude of impacts for each watercourse, both spatial and temporal, has been established with reference to the baseline conditions and the Project.

11.4.32 For the operational period of the highway improvements and car park elements of the Project, quantitative assessment has been undertaken using the Highways England Water Risk Assessment Tool (HEWRAT) Version 2.0.4 (Highways England, 2019) and CIRIA's Simple Index Approach methods (CIRIA, 2015), respectively. These assessment methods utilised information from the proposed drainage scheme for the Project surface access highway improvements summarised in **Annex 2** of the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3)and Project design information for the car parks.

Water Quality – De-icer Impact Assessment

11.4.33 Projected future contamination from de-icer use has been calculated from a forecast model developed in 2013 and recalibrated against 2017/18 winter de-icer use. The pollution control and river impact model has been subjected to the potential increase in de-icer use associated with forecast winter air traffic movements and increase in airfield pavement areas for the maximum design scenario in 2038. The impacts have been assessed in terms of exceedance of available capacity and potential discharge to the water environment, compared to the baseline case taking account of the proposed mitigation works to be implemented by the Project.

11.4.34 Future de-icer use has been calculated and applied to the pollution control and river impact model as detailed in **ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref. 5.3). An uplift factor for pavement de-icer has been calculated assuming that 100% of any additional impermeable area generated within the airside boundary will be de-iced at the same application rate (litres per hectare) as reported in the baseline year worst day. An uplift for aircraft de-icer has been calculated based on projected increase in winter departures against the 2017-18 baseline year.

11.4.35 The assessment assumes that the proportion of aircraft de-iced remains the same as the baseline and therefore no allowance has been made for the impact of climate change potentially reducing the number of ATMs that will be de-iced due to predicted warmer winters.

11.4.36 The pollution control and river impact model has been used to define the impact of the Project on river quality at all locations where de-icer contaminated runoff could be discharged into the water environment as detailed in **ES Appendix 11.9.4: Water Quality De-Icer Impact Assessment** (Doc Ref. 5.3).

Groundwater

11.4.37 Groundwater impacts have been evaluated against the baseline information summarised in paragraphs 11.4.19 and 11.4.20.

11.4.38 The risk from groundwater flooding has been included in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).

11.4.39 To support the impact assessment from dewatering (see **ES Appendix 11.9.5: Groundwater Assessment** (Doc Ref. 5.3)), the Sichardt method (eg Preene et al, 2016) was used to estimate the dewatering radius of influence around each excavation expected to intercept groundwater. Where the zone of influence estimated using the Sichardt equation is quite small, a minimum zone of influence of 25m has been conservatively assumed and applied in the review.

11.4.40 To support assessment of impacts from discharge of surface water runoff to low flow watercourses (see **ES Appendix 11.9.3: Water Quality HEWRAT Assessment** (Doc Ref. 5.3)), groundwater assessments have been undertaken in accordance with HEWRAT the method described in Appendix C of DMRB LA 113 (Highways England, 2020).

Flood Risk and Surface Water Drainage

11.4.41 An assessment of the Project's impact on flood risk has been undertaken and the findings have been reported in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3). The assessment is primarily based on site-specific fluvial hydraulic modelling that has been developed by GAL in partnership with the Environment Agency. The impact of the Project has been

assessed by adding it to the baseline version of the hydraulic model and re-running the model. The modelling results have been used to assess the magnitude of impact of the Project on fluvial flood risk and to develop mitigation measures where required.

11.4.42 Results from the validated surface water drainage model have been utilised in combination with Environment Agency mapping to provide an assessment of the impact of the Project on surface water drainage flood risk.

11.4.43 A further hydraulic model was constructed to test the sensitivity of the airfield surface water drainage network to fluvial flooding. This 'Integrated Model' was based on the fluvial and surface water drainage models. Further detail on the Integrated Model is provided in the **Integrated Hydraulic Model Build Report** in **ES Appendix 11.9.6 Annex 4** (Doc Ref. 5.3).

11.4.44 Flood risk from groundwater and water supply sources have been assessed based on existing available information and previous known flooding incidents within the study area. A qualitative assessment has been undertaken to identify areas that could be vulnerable to groundwater flooding. Further details are included in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).

Water Infrastructure

Wastewater

11.4.45 The assessment of impacts has been undertaken using a calibrated hydraulic model of the Gatwick wastewater sewer system. The model has been subject to the projected increases in discharges during the various stages of the Project and the impacts assessed in terms of exceedance of available capacity and consequent flooding compared to the baseline case, taking account of the proposed mitigation works to be implemented as part of the Project. Further detail on the model is provided in **ES Appendix 11.9.7: Wastewater Assessment** (Doc Ref. 5.3).

Water Supply

11.4.46 An assessment of the impact on water supply infrastructure has been undertaken by assessing the Project elements that will increase water consumption through increased passengers and temporary construction workforce combined with potential efficiencies to be implemented during construction. This has been combined with updated baseline consumption information, as detailed in paragraph 11.4.25. The updated consumption values have been supplied to SESW to confirm the water source contains sufficient capacity for the required water consumption.

Assessment Criteria and Assignment of Significance

11.4.47 The water environment encompasses a number of disciplines covering all aspects of the water cycle. For each of these the sensitivity of receptors and magnitude of impact of the Project have been defined. These have then been combined to determine the significance of the effect of the Project (based on the elements identified in **ES Chapter 5: Project Description** (Doc Ref. 5.1)) on each water element. The criteria for each of these assessments are included in Table 11.4.4, Table 11.4.5 and Table 11.4.6. The following sections explain the information utilised and approach to determine the significance of the effect.

11.4.48 The definition of effect and impact in terms of the EIA process are drawn from the glossary of the Highways Agency DMRB (Highways Agency *et al*, 2008), which provides general guidance:

- Impact: Change that is caused by an action; for example, land clearing (action) during construction which results in habitat loss (impact).
- Effect: Term used to express the consequence of an impact (expressed as the 'significance of the effect'), which is determined by correlating the magnitude of the impact to the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria. For example, land clearing during construction results in habitat loss (impact), the effect of which is the significance of the habitat loss on the ecological resource.

11.4.49 Impact magnitude takes into account the impact duration. The following definitions have been adopted for the ES:

- short term: A period of months, up to and including one year;
- medium term: A period of more than one year, up to and including five years; and
- long term: A period of greater than five years.

11.4.50 The significance of an effect is determined based on the sensitivity of a receptor and the magnitude of an impact. This section describes the criteria applied to characterise the sensitivity of receptors and magnitude of potential impacts. The terms used to define magnitude and sensitivity have been adapted from those used in DMRB LA113 (Highways England *et. al.,* 2020), which is described in further detail in **ES Chapter 6: Approach to Environmental Assessment** (Doc Ref. 5.1). It is noted that for groundwater the definitions applied on Groundwater Dependent Terrestrial Ecosystems (GWDTEs) have been modified from those in LA113 to make them applicable to this assessment. The sensitivity, magnitude and significance have been assessed for each water discipline (see paragraph 11.1.1) and then combined into a single classification for the following water receptors (unless stated otherwise):

- surface water (encompassing geomorphology and water quality);
- groundwater;
- flood risk (from all sources including surface water drainage); and
- water infrastructure (encompassing wastewater and water supply).

11.4.51 These receptors, collectively, cover the potential impacts related to each water element considered. The assessment of significance of the effect has been undertaken for the Project with embedded mitigation taken into consideration.

Receptor Sensitivity/Value

11.4.52 The sensitivity of receptors has been classified for each water environment discipline in accordance with the criteria set out in Table 11.4.4. As part of the assessment there are a number of potential effects which would arise from the risk of an impact rather than a certain consequence of the Project. An example of this is the risk of a pollution incident. The methodology takes account of the fact that in the worst case the consequence of these types of risk on relevant receptors could be high but the likelihood of the impact occurring would be expected to be low.

Table 11.4.4: Sensitivity Criteria

Sensitivity	Water Environment Receptor	Criteria
Very High	Surface water	All watercourses having a high (or potential to achieve high) WFD Regulations classification for physico-chemical and biological elements status, 'pass' for specific pollutants and/or priority substances and shown in a RBMP. Watercourse part of a protected site/international designation related to wet features (e.g., a riverine Special Area of Conservation (SAC) or Special Protection Area (SPA)). Water Quality: Non-WFD classified watercourses if part of a protected site. Q_{95} likely to be equal or greater than (≥) 1.0 m^3/s Geomorphology: Non WFD Regulations classified watercourses may be applicable if they demonstrate qualities such as: a channel in stable equilibrium and exhibiting a range of natural morphological features (such as pools, riffles and bars); diversity in morphological processes reflects unconstrained natural function; free from artificial modification or anthropogenic influence.
	Groundwater	Principal bedrock and superficial aquifers. Groundwater flow and yield associated with licensed groundwater abstractions. Groundwater quality associated with SPZ1 (Inner Protection Zone) associated with licensed abstractions. Buildings of regional or national importance, such as Grade I and II* listed buildings, scheduled monuments, hospitals, power stations and large industrial sites. Water feeding GWDTEs with a high or moderate groundwater dependence with a high environmental importance and international or national value, such as Ramsar sites, Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Sites of Special Scientific Interest (SSSIs).
	Flood risk	Essential infrastructure or highly vulnerable development (as defined in the NPPF flood risk vulnerability classification); essential transport infrastructure, essential utility infrastructure, wind turbines, emergency services stations and dispersal points required to be operational during a flood, basement dwelling, caravans and mobile

Sensitivity	Water Environment Receptor	Criteria
		homes, and installations requiring hazardous substances consent.
	Wastewater infrastructure	Water use or infrastructure supporting human health, economic activity or environmental protection at a regional scale. For example, an integrated water resources system that serves the whole of the Southeast of England.
	Water Supply infrastructure	Water use or infrastructure supporting human health, economic activity or environmental protection at a regional scale. For example, an integrated water resources system that serves the whole of the Southeast of England.
High	Surface water	All: Watercourse having a good (or potential to achieve good) WFD Regulations classification or having established RBMP objectives (for a later RBMP cycle) to achieve good physico-chemical and biological elements status (good potential for HMWBs), pass for specific pollutants and/or priority substances and shown in a RBMP. Watercourse contains species protected under EC or UK legislation for ecology and nature conservation but is not part of a protected site or national designation related to wet features (e.g. a riverine SSSI). Water Quality: Non-WFD Regulations classified water bodies may be applicable if protected species are present, indicating good water quality and supporting habitat. Q_{95} likely to be <1.0m^3/s. Geomorphology: Non-WFD Regulations classified watercourses may be applicable if they demonstrate qualities such as: a channel achieving near-stable equilibrium and exhibiting a range of natural morphological features (such as pools, riffles and bars); diversity in morphological processes reflects relatively unconstrained natural function, with minor artificial modification or anthropogenic influence.
	Groundwater	Secondary A aquifers. Groundwater flow and yield and quality associated with extensive non-licensed private water abstractions (i.e. feeding ten or more properties or supplying large farming / animal estates). Groundwater quality associated with SPZ2 (Outer Protection Zone) associated with licensed abstractions. Residential and commercial properties and Grade II listed buildings.

Sensitivity	Water Environment Receptor	Criteria
		Water feeding GWDTEs of low groundwater dependence with a high environmental importance and international or national value, such as Ramsar sites, SACs, SPAs and SSSIs; or water feeding highly or moderately GWDTE with a national non-statutory UK Biodiversity Action Plan (BAP) priority.
	Flood risk	More vulnerable development (as defined in the NPPF); hospitals, residential institutions, dwellings, non-residential uses for health services, landfill sites and sites used for holiday or short-let caravans/camping.
	Wastewater infrastructure	Water use or infrastructure supporting human health, economic activity or environmental protection at a nationally significant city scale.
	Water Supply infrastructure	Water use or infrastructure supporting human health, economic activity or environmental protection at a nationally significant city scale.
Medium	Surface water	All: Watercourse having a less than good (or potential to achieve less than good) WFD Regulations classification shown in a RBMP and/or local designation related to wet features (e.g. a riverine Local Nature Reserve (LNR)). Water Quality: Water body not classified under WFD Regulations. May have a number of anthropogenic pressures and/or pollutant inputs from discharges and/or surrounding land-use relative to flow volume. Q_{95} likely to be >0.001m^3/s. Geomorphology: Non-WFD Regulations classified watercourses may be applicable if they include channels currently showing signs of historical or existing modification and artificial constraints, and/or attempting to recover to a natural equilibrium and exhibiting a limited range of natural morphological features (such as pools, riffles and bars).
	Groundwater	Secondary B and Secondary Undifferentiated aquifers. Groundwater flow and yield and quality associated with small scale private water abstractions (i.e. feeding fewer than ten properties). Groundwater quality associated with SPZ3 (Source Catchment Protection Zone) associated with licensed abstractions and with licensed abstractions for which no SPZ is defined. Unoccupied residential and commercial properties and buildings.

Sensitivity	Water Environment Receptor	Criteria
		Water feeding GWDTEs of low groundwater dependence with a national non-statutory UK BAP priority; or water feeding highly or moderately groundwater dependent GWDTE sites with no conservation designation.
	Flood risk	Less vulnerable development (as defined in the NPPF); emergency services stations, commercial units, agricultural land, other waste treatment, minerals working, water treatment works and Sewage Treatment Works (if adequate pollution control is in place).
	Wastewater infrastructure	Water use or infrastructure supporting human health, economic activity or environmental protection at a catchment scale. For example, Crawley STW.
	Water Supply infrastructure	Water use or infrastructure supporting human health, economic activity or environmental protection at a water supply zone scale.
Low	Surface water	All: Minor local watercourses not having a WFD Regulations classification shown in a RBMP and no designated features. Water body not having a WFD Regulations classification shown in a RBMP. Water Quality: May have a large number of anthropogenic pressures and/or pollutant inputs from licensed discharges and/or surrounding land-use relative to flow volume. Q_{95} likely to be ≤0.001m^3/s. Geomorphology: A channel currently showing signs of extensive historical or existing modification and artificial constraints. There is no evidence of diverse fluvial processes and morphology and active recovery to a natural equilibrium.
	Groundwater	Very poor groundwater quality and / or very low permeability make exploitation of groundwater unfeasible. No active groundwater supply. Industrial buildings that are currently not utilised, all derelict buildings and infrastructure that serves a single dwelling. Water feeding GWDTEs of low groundwater dependence with no designation or groundwater that supports a wetland not classified as a GWDTE, although may receive some minor contribution from groundwater.

Sensitivity	Water Environment Receptor	Criteria
	Flood risk	Water compatible development (as defined in the NPPF); flood control infrastructure, marine facilities (docks, marinas etc.), amenity open space and recreation facilities, and lifeguard/coastguard stations.
	Wastewater infrastructure	Water use or infrastructure supporting human health, economic activity or environmental protection at a local or individual business or property scale.
	Water Supply infrastructure	Water use or infrastructure supporting human health, economic activity or environmental protection at a local or individual business or property scale.
Negligible	Surface water	All: Minor ephemeral drains and channels.
	Groundwater	Unproductive strata. Non-GWDTE wetlands.
	Flood risk	Water compatible development (as defined in the NPPF).
	Wastewater infrastructure	Water use or infrastructure not supporting human health, economic activity or environmental protection.
	Water Supply infrastructure	Water use or infrastructure not supporting human health, economic activity or environmental protection.

Magnitude of Impact

11.4.53 The magnitude of impact on the water environment has been assessed based on the degree of change created by the Project and the impact this will cause on the receptor. Table 11.4.5 summarises the assessment criteria.

11.4.54 Pollution categories described in Table 11.4.5 are based on the Ofwat / Environment Agency Common Classification Scheme (Incidents and their Classification: the Common Incident Classification Scheme, Environment Agency 2016):

- CAT1 – major, serious, persistent and/or extensive impact or effect on the environment, people and/or property.
- CAT2 – significant impact or effect on the environment, people and/or property.
- CAT3 – minor or minimal impact or effect on the environment, people and/or property.
- CAT4 – substantiated incident with no impact.

11.4.55 For geomorphology, the magnitude of impact on the receptors was determined in a matrix which combines the duration and scale of the impact into a qualitative descriptor (Table 3.2.2 in **ES Appendix 11.9.1: Geomorphology Assessment** (Doc Ref. 5.3)). This was based on a qualitative assessment of the spatial GIS datasets, baseline conditions (including existing morphological pressures) and the proposed design with embedded mitigation. The qualitative descriptors for the magnitude of impact are provided in Table 11.4.5.

Table 11.4.5: Impact Magnitude Criteria

Magnitude of Impact	Water Environment Receptor	Criteria
High Adverse	Surface water	Loss or extensive change to a fishery. Loss of regionally important public water supply source. Loss or extensive change to an internationally designated nature conservation site. Works would adversely impact the geomorphology on a waterbody scale. Reduction in water body WFD status. Results in loss of attribute and/or quality and integrity of the attribute. Construction works in-channel and/or extensive construction works adjacent to a watercourse which are likely to risk a major, measurable shift from baseline water quality. Risk of adverse impacts on protected aquatic species. Construction works on multiple tributaries of a watercourse resulting in the risk of a significant cumulative impact on water quality. *Following applicable for highways improvement works only*: Failure of both acute-soluble and chronic-sediment related pollutants in the Highways England Water Risk Assessment Tool (HEWRAT) assessment and compliance failure with Environmental Quality Standards (EQS) values. Calculated risk of pollution from a spillage ≥2% annually (spillage assessment).
	Groundwater	Major or irreversible change to groundwater aquifer(s) flow, water level, quality or available yield which endangers the resources currently available. Groundwater resource use / abstraction is irreparably impacted upon, with a major or total loss of an existing supply or supplies. Changes to water table level or quality would result in a major or total change in, or loss of, a groundwater dependent area, where the value of a site would be severely affected. Changes to groundwater aquifer(s) flow, water level and quality would result in major changes to groundwater baseflow contributions to surface water and / or alterations in surface water quality, resulting in a major shift away from baseline conditions such as change to WFD status. Dewatering effects create significant differential settlement effects on existing infrastructure and buildings leading to extensive repairs required.
	Flood risk	Increase in peak flood level (>100 mm).
	Water infrastructure	Loss of regionally important water supply source. High risk of flooding from wastewater sewer system (>5 incidents per annum).

Magnitude of Impact	Water Environment Receptor	Criteria
		Total failure of asset. Major outage. Major regulatory risk (e.g. significant risk of failure of Upper Tier permits, or of failing to achieve water supply quality standards). Likely to cause CAT1 pollution (see paragraph 11.4.54). Exceeds installed capacity of asset.
Medium Adverse	Surface water	Partial loss in productivity of a fishery. Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies. Works would adversely impact geomorphology of the waterbody at a multi-reach scale. Contribution to reduction in water body WFD status. Results in loss of attribute and/or quality and integrity of the attribute. Construction works adjacent to a watercourse which are likely to result in a measurable shift away from baseline water quality. Degradation of regionally important public water supply or loss of major commercial/industrial/agricultural supplies. Contribution to but not cause a reduction in water body WFD Regulations classification. *Following applicable for highways improvement works only:* Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT but compliance with EQS values. Calculated risk of pollution from spillages ≥1% annually and <2% annually.
	Groundwater	Moderate long term or temporary significant changes to groundwater aquifer(s) flow, water level, quality or available yield which results in moderate long term or temporarily significant decrease in resource availability. Groundwater resource use / abstraction is impacted slightly, but existing supplies remain sustainable. Changes to water table level or groundwater quality would result in partial change in or loss of a groundwater dependent area, where the value of the site would be affected, but not to a major degree. Changes to groundwater aquifer(s) flow, water level and quality would result in moderate changes to groundwater baseflow contributions to surface water and / or alterations in surface water quality, resulting in a moderate shift from baseline conditions upon which the WFD status rests. Dewatering effects create moderate differential settlement effects on existing infrastructure and buildings leading to consideration of undertaking minor repairs.
	Flood risk	Increase in peak flood level (>50-100 mm).
	Water infrastructure	Degradation of regionally important public water supply.

Magnitude of Impact	Water Environment Receptor	Criteria
		High risk of flooding from wastewater sewer system (2 to 5 incidents per annum). Temporary outage of asset. Moderate regulatory risk (e.g. moderate risk of failing). Reduced ability to achieve agreed performance standards (e.g. Water pressure requirements). Potential to cause CAT2 pollution.
Low Adverse	Surface water	Minor effects on water supplies and/or river quality. Works would adversely impact the geomorphology of the waterbody on a reach scale. Results in some measurable change in attributes, quality or vulnerability. Construction works within the watercourse catchment that may result in a risk of a minor, measurable shift from baseline water quality. *Following applicable for highways improvement works only:* Failure of either acute soluble or chronic sediment related pollutants in HEWRAT. Calculated risk of pollution from spillages ≥0.5% annually and <1% annually.
	Groundwater	Minor changes to groundwater aquifer(s) flow, water level, quality or available yield leading to a noticeable change, confined largely to the Project boundary. Changes to water table level, groundwater quality and yield result in little discernible change to existing resource use. Changes to water table level or groundwater quality would result in minor change to groundwater dependent areas, but where the value of the site would not be affected. Changes to groundwater aquifer(s) flow, water level and quality would result in minor changes to groundwater baseflow contributions to surface water and / or alterations in surface water quality, resulting in a minor shift from baseline conditions (equivalent to minor but measurable change within WFD status). Dewatering effects create minor differential settlement effects on existing infrastructure and buildings which may need to be monitored but where repairs may be avoidable.
	Flood risk	Increase in peak flood level (>10-50 mm).
	Water infrastructure	Minor effects on regional water supply. Low risk of flooding from wastewater sewer system (<2 incidents per annum). Reduction in performance of asset, marginal regulatory compliance. Reduced ability to achieve level of service standards (e.g. Water pressure requirements). Potential to cause CAT3 pollution.

Magnitude of Impact	Water Environment Receptor	Criteria
Negligible Adverse	Surface water	Measurable but insignificant adverse effects on flow, supplies or quality. Works would adversely impact the geomorphology of the waterbody on a local scale. Results in effect on attribute, but of insufficient magnitude to affect the use or integrity. Construction works within the watercourse catchment that are not anticipated to result in a risk of a change in water quality. *Following applicable for highways improvement works only*: No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants). Risk of pollution from spillages <0.5%.
	Groundwater	Very slight change from groundwater baseline conditions. Dewatering effects create no or no noticeable differential settlement effects on existing infrastructure and buildings.
	Flood risk	Negligible increase to peak flood level (≤10 mm).
	Water infrastructure	No measurable impact on regional water supply. Negligible risk of flooding from wastewater system (<1 incident per annum). Minor reduction in performance of asset, but still achieves regulatory standards.
No Change	Surface water	No loss or alteration of characteristics, features or elements; no observable impact in either direction.
	Groundwater	No loss or alteration of characteristics, features or elements; no observable impact in either direction.
	Flood risk	Due to the tolerance of hydraulic models used to assess flood risk impacts, it is often not possible to distinguish between No Change and Negligible impacts. Therefore, where model results are used to assess change in flood risk, negligible is used where the model is predicting No Change.
	Water infrastructure	No loss or alteration of characteristics, features or elements; no observable impact in either direction.
Negligible Beneficial	Surface water	Measurable but insignificant benefits on flow, supplies or quality. Works would beneficially impact the geomorphology of the waterbody on a local scale. Results in effect on attribute, but of insufficient magnitude to affect the use or integrity. Construction works within the watercourse catchment that are not anticipated to result in a risk of a change in water quality. *Following applicable for highways improvement works only*: No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants). Risk of pollution from spillages <0.5%.

Magnitude of Impact	Water Environment Receptor	Criteria
	Groundwater	Slight measurable positive effect (e.g. increased recharge) upon an aquifer and/or groundwater receptors.
	Flood risk	Negligible reduction in peak flood level (≤10mm).
	Water infrastructure	Slight measurable positive effect on regional water supply. Small decrease in demand on wastewater sewer system. Minor improvement in performance of asset, but still achieves regulatory standards.
Low Beneficial	Surface water	Minor improvements in surface water quality (e.g. through removal/mitigation of a poor-quality discharge). Works would beneficially impact the geomorphology of the waterbody on a reach scale. Results in some beneficial effect on attribute or a reduced risk of negative effect occurring. *Following applicable for highways improvement works only*: HEWRAT assessment of either soluble or sediment-bound pollutants becomes a 'pass' from an existing baseline of a ''failure'' condition. Calculated reduction in existing spillage risk by 50% or more (when existing spillage is <1% annually).
	Groundwater	Reduction of groundwater hazards to existing structures. Reductions in waterlogging and groundwater flooding.
	Flood risk	Reduction in peak flood level (>10-50 mm).
	Water infrastructure	Minor measurable positive effect on regional water supply. Medium decrease in demand on wastewater sewer system. Increase in performance of asset; bring non-compliant asset into compliance. Improved ability to achieve level of service standards (e.g. water pressure requirements). Reduced risk of CAT3 pollution.
Medium Beneficial	Surface water	Works would beneficially impact the geomorphology of the waterbody on a multi-reach scale. Contribution to improvement in water body WFD classification. Results in moderate improvement of attribute quality. *Following applicable for highways improvement works only:* HEWRAT assessment of both soluble and sediment-bound pollutants becomes a 'pass' from an existing baseline of a ''failure'' condition. Calculated reduction in existing spillage risk by 50% or more when existing spillage is >1% annually. Contribution to improvement in water body WFD Regulations classification.
	Groundwater	Contribution to improvement in water body WFD classification. Improvement in water body CAMS (or equivalent) classification.

Magnitude of Impact	Water Environment Receptor	Criteria
		Support to significant improvements in damaged GWDTE.
	Flood risk	Reduction in peak flood level (>50-100 mm).
	Water infrastructure	Measurable positive effect on regional water supply. Significant decrease in demand on wastewater sewer system. Reduced risk of outage of asset. Brings marginally compliant asset into regulatory compliance. Improved ability to achieve agreed performance standards (e.g. water pressure requirements). Reduced risk of CAT2 pollution.
High Beneficial	Surface water	Removal of existing polluting discharge or removing the likelihood of polluting discharges occurring to a watercourse. Works would beneficially impact the geomorphology of the waterbody on a waterbody scale. Improvement in water body WFD classification. Results in major improvement of attribute quality. Removal of existing polluting discharge or removing the likelihood of polluting discharges occurring to a water body. Improvement in water body WFD Regulations classification.
	Groundwater	Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Recharge of an aquifer. Improvement in water body WFD classification.
	Flood risk	Reduction in peak flood level (>100 mm).
	Water infrastructure	Significant positive effect on regional water supply. Significant decrease in demand on wastewater sewer system and sewage treatment facilities. Significantly reduced risk of outage of asset. Brings non-compliant asset into regulatory compliance. Significantly improved ability to achieve agreed performance standards (e.g. water pressure requirements). Significantly reduced risk of CAT1/2 pollution.

Significance of Effect

11.4.56 The significance of the effect upon the water environment has been determined by taking into account the sensitivity of the receptor and the magnitude of the impact. The method employed for this assessment is presented in Table 11.4.6. Where a range of significance levels are presented, the final assessment for each effect is based upon expert judgement.

11.4.57 In all cases, the evaluation of receptor sensitivity, impact magnitude and significance of the effect has been informed by professional judgement and is underpinned by narrative to explain the

conclusions reached. The significance of the effect is assessed once embedded and additional mitigation is factored in.

11.4.58 For the purpose of this assessment, any effects with a significance level of minor or less are not considered to be significant in terms of the Infrastructure Planning Environmental Impact Assessment (EIA) Regulations 2017, as amended (referred to as the 'EIA Regulations').

11.4.59 However, specifically for flood risk, national planning policy requires that no increase in flood risk occurs elsewhere due to the Project. Therefore, any increase in flood risk to third parties due to the Project that is not of 'negligible' magnitude would be considered to require mitigation.

Table 11.4.6: Assessment Matrix for Assigning Significance of Effect

Sensitivity	Magnitude of Impact (Adverse or Beneficial)				
	No Change	Negligible	Low	Medium	High
Negligible	No change	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	No change	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	No change	Negligible or Minor	Minor	Moderate	Moderate or Major
High	No change	Minor	Minor or Moderate	Moderate or Major	Major or Substantial
Very High	No change	Minor	Moderate or Major	Major or Substantial	Substantial

11.4.60 A description of the significance levels, assigned taking account of embedded and additional mitigation, is as follows:

- Substantial: Only adverse effects are normally assigned this level of significance. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major effect to a site or feature of *local* importance may also enter this category.
- Major: These beneficial or adverse effects are considered to be very important considerations.
- Moderate: These beneficial or adverse effects may be important. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
- Minor: These beneficial or adverse effects may be raised as local factors and may be important in enhancing the subsequent design of the Project.
- Negligible: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

11.4.61 Effects whose significance is assessed as moderate or greater would be considered to be environmentally significant.

11.5 Assumptions and Limitations of the Assessment

11.5.1 The ES includes the following key limitations as part of the assessment for the water environment.

- The potential influence of groundwater flooding on flood risk from other sources (for example sewer flooding) has been considered qualitatively within the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3), rather than explicitly in the wastewater hydraulic model.
- High water levels during the September 2019 geomorphology walkover survey meant the banks and bed were not visible in most areas, however sufficient information was obtained to fully assess effects of relevance to this study, further walkovers were undertaken in March 2022 and April 2023, conducted in typical conditions to supplement this where required.
- Water quality evaluation is limited to the worst case worse six months of winter period 2017/18. In a full urban pollution modelling evaluation, a full ten year rainfall series would be run, with a full range of environmental conditions (weather and river flow) experienced in that ten year series. The lack of available data, and the complexity and run time of the model, means that it is not possible to run a full ten year series. Evaluating the worst six month period will generate a worse water quality result than would be generated over a full ten year period, therefore this is a conservative assessment.
- Groundwater quality relating to contaminated land is assessed as part of **ES Chapter 10: Geology and Ground Conditions** (Doc Ref. 5.1) and is not assessed in this chapter.
- Information on private water supplies has been requested from Crawley Borough Council but had not been received at the time of writing. However, a previous study in the area (Arcadis, 2023) has been referenced which provides information on unlicensed abstractions.
- Information on local groundwater flooding events was limited to a review of the Crawley Borough Strategic Flood Risk Assessment (SFRA) (Crawley Borough Council, 2020). Additional information on local groundwater flooding events has been requested from Crawley Borough Council but at the time of writing none had been received.
- The dewatering assessment is semi-quantitative, based on the empirical Sichardt methodology (Preene et al., 2016) to estimate the dewatering radius of influence around each excavation expected to intercept groundwater.
- At this stage of assessment only preliminary design details are available. Additional GI will be undertaken at the detailed design phase to further inform the design considerations for subsurface structures including foundations.
- Final excavation depths and areas are to be confirmed at the detailed design phase.
- Limited information on the footprint of excavations is available and is to be confirmed at the detailed design phase.
- Further dewatering review at the detailed design phase may be required if it is determined that additional subsurface excavations beyond those considered in this ES are included (secured via DCO requirement in Schedule 2 of the **Draft Development Consent Order** (Doc Ref 2.1)).

11.5.2 Key assumptions made at this stage of assessment include the following. Further details of assumptions are included in the relevant Appendices covering each element of the water environment.

- Scour protection will be designed for the outfalls using soft engineering where possible.
- The amount of pavement de-icer used per unit of airfield, and per air traffic movements (broken down by aerodrome reference code) during the operational period will remain the

same as existing. Specifically, it has been assumed that there will be no change to the de-icer strategy, other than the pavement de-icer Konsin has been permanently replaced in operations by Safegrip Eco2 (as is currently the case). There are no specific de-icing pads or holdover zones assumed.

- Where there may be potential impacts to WFD water bodies there are engineering and/or design solutions that can be implemented to reduce the potential deterioration to classification status.
- The realigned River Mole will not be netted for airport safeguarding purposes.
- Thames Water will complete an assessment of the impact of an increase in passenger numbers as a result of the Project on water treatment capacity at Crawley and Horley STW. GAL has engaged with Thames Water (including by providing **ES Appendix 11.9.7: Wastewater Assessment** (Doc Ref. 5.3)) to allow Thames Water to assess the impacts to the receiving STW in line with their statutory duties
- The impact of any wastewater infrastructure improvements identified by Thames Water within the Horley and Crawley STW catchments have not been assessed as part of this chapter, however increased wastewater treatment capacity is considered as part of the cumulative assessment.
- This ES includes an assessment on the Gatwick wastewater sewer network capacity, not the existing STW.
- Winter 2017/18 is adopted as a good baseline for a cold winter year and climate change does not impact the volume of pavement or aircraft de-icer used.
- The predicted flood hazard that would result from the failure of the Gatwick Stream Flood Storage Area embankment is incorporated into the Environment Agency Risk of Flooding from Reservoirs published mapping, as confirmed by the Environment Agency in a meeting on 25 May 2021. It is anticipated that the inspection and maintenance regime would result in a very low likelihood of failure.
- Although much of the evidence for the groundwater assessment is based on desk study information and limited GI data from 2006 to 2022 as indicated in paragraph 11.4.19, it is assumed, given the relatively slow rate of long-term change in groundwater conditions, that this data may be used to represent the current (present day) baseline.
- A qualitative CSM has been developed to set the context of groundwater within the overall water environment and to support the groundwater impact assessment as presented in Section 11.6.
- Based on the generally flat topography of the airfield, the water table in the superficial deposits is also assumed to be relatively flat. In locations where there is limited groundwater level data, shallow groundwater is assumed to follow the contours of the topography.
- Based on the Strategic Flood Risk Assessment (SFRA) for Crawley Borough (Crawley Borough Council, 2020) it is understood that there have been no groundwater flooding events recorded in the study area. The risk from groundwater flooding has been included in **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).
- Based on the CSM presented in Section 11.6, maximum groundwater levels are conservatively assumed to be 1 mbgl for locations without site specific groundwater level data.
- Project elements with anticipated excavations of less than 1m have been scoped out as they are not anticipated to encounter groundwater.
- Excavations considered in the groundwater dewatering assessment (**ES Appendix 11.9.5: Groundwater Assessment** (Doc Ref. 5.3)) include Project elements where the current design indicates either:

- a requirement for an excavation deeper than 1mbgl; or
- proposed structures to a depth of greater than 1mbgl.

- For purposes of this assessment, unless otherwise specified, information on expected final depth of structures (plus 0.5m) was used as an estimate of the total excavation depth.
- Excavations considered in the groundwater dewatering assessment (**ES Appendix 11.9.5: Groundwater Assessment** (Doc Ref. 5.3)) are assumed not to penetrate the Tunbridge Wells Sands.
- Based on the current design, it is assumed there are no direct discharges to the ground proposed as part of the Project. It is assumed that all new drainage attenuation ponds would not infiltrate runoff to ground.
- Retaining walls and other subsurface structures associated with the surface access works are assumed to extend no longer than 250m and to a depth that does not penetrate the Tunbridge Wells Sands.
- Unless otherwise specified, all other temporary or permanent subsurface structures associated with the Project such as piling foundations, sheet pile walls, etc. are assumed of length less than 150m and to extend to a depth that that does not penetrate the Tunbridge Wells Sands.
- It is assumed there would be no infiltration to ground from SuDS features prior to discharge via outfalls and these features have not been included in the assessment. As the detailed design evolves, assessment of infiltration from SuDS features may be required.
- All receiving watercourses are assumed to be unlined ditches and are, therefore, categorised as continuous shallow linear infiltration systems.
- Professional judgement has been used to extrapolate groundwater levels, lithologies and physiochemical properties from ground investigation data in the vicinity of the outfalls considered.
- For the provision of new car parks, it is assumed that sufficient treatment for water quality effects would be integrated into the design which would be considered as embedded mitigation. The details of these mitigation measures and their treatment efficiencies will be considered at a future design stage and would be secured via a DCO requirement in Schedule 2 of the **Draft Development Consent Order** (Doc Ref 2.1).
- For temporary car parks that cannot be relocated outside the flood inundation extents for the 1 per cent AEP plus 16 per cent allowance for climate change event, it is assumed that any buildings, including welfare facilities, will be placed on steel legs in order to elevate above the peak water level within the compound site.
- As part of its Decade of Change II sustainability targets to 2030 GAL intends to reduce water consumption by passenger by 50%. As a conservative approach (it would over-estimate future water consumption and therefore demand on sources and the distribution network) the water supply assessment does not take this future reduction in demand into account.

11.5.3 Despite the limitations listed in paragraph 11.5.1 and the requirement to adopt the assumptions listed in paragraph 11.5.2, it is considered that sufficient information was available to provide an assessment of environmental effect of the Project on the water environment.

Project Design and Limits of Deviation (LOD)

11.5.4 There is no defined subsurface LOD at this stage. Final depths for excavations and subsurface structures will be informed by additional GI as part of the detailed design phase, secured via DCO Requirement in Schedule 2 of the **Draft Development Consent Order** (Doc Ref 2.1). It is noted

that the Surface Access horizontal LOD (secured in **ES Appendix 5.2.1: Surface Access General Arrangement Plans** (Doc Ref. 5.3) does not affect potentially sensitive groundwater receptors included in this assessment.

11.5.5 In respect to flood risk and surface water, the assessment has been undertaken on the Project as described in **ES Chapter 5: Project Description** (Doc Ref. 5.1). Any changes to the Project as a result of the LOD, would only be progressed if they did not lead to any materially new or materially different environmental effects in comparison to those reported in this Environmental Statement.

11.6 Baseline Environment

Current Baseline

11.6.1 Key water environment features relevant to the Project are identified in **ES Figure 11.6.1** (Doc Ref. 5.2).

Surface Water

11.6.2 The study area has identified a number of water features ranging from watercourses, streams, ditches and ponds. Only water features which are deemed to have the potential to be directly or indirectly impacted by the Project are detailed in the baseline.

11.6.3 The study area is located within the River Mole catchment within the Thames River Basin District. The majority of WFD water bodies have an objective to reach 'good' status for both ecological and chemical water quality elements by 2021 or 2027. Heavily Modified Water Bodies (HMWB) and Artificial Water Bodies (AWB) must aim to achieve good ecological potential (GEP), which takes account of the existing modifications or characteristics which constrain the ability to improve hydromorphological or biological quality compared to water bodies with fewer modifications. Table 11.6.1 summarises the attributes and applicable WFD classifications of those waterbodies within the study area.

Table 11.6.1: Classification of elements for WFD Regulations for waterbodies within the study area (Environment Agency, 2022a)

Watercourse	WFD Regulations Waterbody ID	Heavily Modified or Artificial Waterbody	Overall Waterbody Status/Potential	Ecological Status	Chemical Status
Mole (Horley to Hersham)	GB106039017621	N/A	Moderate	Moderate	Fail
Mole upstream of Horley	GB106039017481	Designated heavily modified	Moderate	Moderate	Fail
Tilgate Brook and Gatwick Stream	GB106039017500	Designated heavily modified	Moderate	Moderate	Fail

Watercourse	WFD Regulations Waterbody ID	Heavily Modified or Artificial Waterbody	Overall Waterbody Status/Potential	Ecological Status	Chemical Status
Burstow Stream	GB106039017520	N/A	Bad	Bad	Fail

Geomorphology

11.6.4 A geomorphological baseline was established for the River Mole, Gatwick Stream, Crawter's Brook, Burstow Stream Tributary and Man's Brook (**ES Figure 11.6.1** (Doc Ref. 5.2)). These watercourses were deemed to have the potential to be directly or indirectly impacted by the Project. Design changes in terms of proposed flood mitigation measures between the scoping stage and the PEIR stage have resulted in the following being scoped out of the assessment, given that they are no longer considered to be impacted by the Project: Mole (Horley to Hersham), Burstow Stream and Withy Brook.

11.6.5 The catchment terrain of the scoped in watercourses is dominated by the Low Weald topography of the Wealden Basin and is underlain by clay of the Wealden Group. Surface geology mainly comprises alluvium and river terrace sands and gravels.

11.6.6 The Mole (upstream of Horley) catchment area is approximately 30 km^2 and includes the urban areas of Crawley and Three Bridges, and Gatwick (Environment Agency, 2022c). The Mole forms at the confluence of the tributaries of Ifield Brook and Baldhorns Brook, north of Crawley, where it flows north-eastwards through mainly rural land, receiving field drain runoff. This section of the watercourse has a naturally meandering planform and wide channel of 5 metres.

11.6.7 At the southern perimeter of Gatwick, the River Mole is joined by Crawter's Brook. Crawter's Brook is a narrow stream of approximately 2 m width which rises in Tilgate Forest in the south and flows northwards through Crawley via a network of culverts and open channels towards the southern perimeter of the airport. The watercourse is realigned westwards along a straightened channel to meet the River Mole. The River Mole then runs via a culvert, with a syphon overflow used in flood conditions, under the existing main and northern runways. North of the runways, the River Mole re-emerges from the culvert and syphon. The River Mole is realigned and straightened to flow westwards, and is joined by Man's Brook, a small 2-4-metre-wide stream which rises at Tilgate Wood and flows eastwards through agricultural land to the west of the River Mole. The River Mole is also joined by Westfield Stream, a small realigned and heavily modified channel which rises northwest of the runway, connecting to the Mole via a balancing pond. The River Mole has been realigned around the northern perimeter of the airport, confined in a low valley between the airport infrastructure and urban residential areas. The River Mole passes under the London Road (A23) bridge, after which it meets its confluence with Gatwick Stream. Downstream of the confluence, the River Mole continues northwards confined between London Road (A23) and an urban residential area, before passing under the Brighton Road (A23) bridge at Longbridge Roundabout. The River Mole has a naturally sinuous planform as it flows northwards through managed arable and pasture land onward beyond the study area.

11.6.8 Gatwick Stream is a tributary of the River Mole. It rises in Worth Forest below Clays Lake in West Sussex and flows northwards through Tilgate Forest, through Maidenbower, Three Bridges and

Tinsley Green to the confluence with the River Mole. Tilgate Brook is a tributary of Gatwick Stream, approximately 300 metres in length. Crawley STW, operated by Thames Water, is located to the east of the Gatwick Stream, downstream of Crawley. Gatwick Stream is approximately 8 km in length, with a catchment area of 14 km^2 (Environment Agency, 2018). The river planform is sinuous as it flows through Tinsley Green: a mixture of wooded area and parkland. The width of the channel typically measures 4-5 metres along this section. Downstream of the STW, the watercourse passes through a culvert under the Brighton-London mainline railway and flows northwards along an engineered straightened course adjacent to the A23. The watercourse is narrower at this point with an approximate width of 3 metres. The watercourse is culverted under the South Terminal building and under Airport Way, where it re-emerges into Riverside Garden Park, to the north of the A23, as a 900 metre long section of natural meandering channel. Downstream, the watercourse is straightened as it flows between the A23 and residential areas, before joining the River Mole to the southeast of Longbridge Roundabout.

11.6.9 Burstow Stream is a tributary of the Mole. It rises at Crawley Down in Sussex, flowing through mostly rural areas and the urban area of Copthorne, joining the Mole at Horley. Burstow Stream is approximately 2 km away from the airport, however a tributary of the watercourse is within the study area. Burstow Stream Tributary (also known as Haroldslea Stream) is a tributary of the Burstow Stream. It is a small channel fed by several drains from agricultural land and road drains. The stream is typically less than 2 metres in width. Current OS mapping indicates the stream originates south of Horley as a drain along Balcombe Road and is culverted under the M23 motorway. The stream flows mostly overground through the residential area south of Horley where it joins Burstow Stream.

11.6.10 Further details of the watercourses' evolution and detailed channel characteristics ascertained from the walkover survey are included in **ES Appendix 11.9.1: Geomorphology Assessment** (Doc Ref. 5.3).

WFD Regulations Compliance Assessment

11.6.11 The baseline for WFD Regulations compliance is set as the present day using data from 2019, as supplied by Environment Agency's Catchment Data Explorer database (2022). The water bodies assessed in the WFD Regulations compliance assessment are:

- Mole upstream of Horley (water body ID number GB106039017481),
- Tilgate Brook and Gatwick Stream at Crawley (GB106039017500),
- Burstow Stream (GB106039017520),
- Mole (Horley to Hersham) (ID: GB 106039017621), and
- Groundwater water body Copthorne Tunbridge Wells Sands (GB40602G602400).

11.6.12 These are identified in **ES Appendix 11.9.2 Figure 4.1.1** (Doc Ref. 5.3).

11.6.13 The Mole upstream of Horley is classed as Heavily Modified with a current potential status of Moderate, and overall objective of Good by 2027. As stated in the WFD Regulations compliance assessment and on the Catchment Data Explorer database (Environment Agency, 2022c), there are no protected areas within the Mole upstream of Horley waterbody. The Mole is considered to be of high sensitivity.

11.6.14 Tilgate Brook and Gatwick Stream at Crawley is Heavily Modified with a current potential status of Moderate, and an overall objective of Moderate by 2027. As stated in the WFD Regulations

compliance assessment, and on Catchment Data Explorer (Environment Agency, 2022c), River Mole Urban Wastewater Treatment Directive is a linked protected area within the water body. This water body is considered to be of high sensitivity.

11.6.15 The Burstow Stream is a main river and is not designated as artificial or Heavily Modified. Its current status is Bad with an overall objective of Poor by 2027. There are no protected areas within the water body. This water body is considered to be of medium sensitivity.

11.6.16 The River Mole (Horley to Hersham) is a main river not designated as artificial or Heavily Modified. Its current status is Moderate, with an overall objective of Moderate by 2027. As stated in the WFD Regulations compliance assessment and on Environment Agency's Catchment Data Explorer (2022), there are three Nitrates Regulations sites, and Mole Gap to Reigate Escarpment Habitats Regulations site within the water body. This water body is considered to be of high sensitivity.

11.6.17 The groundwater body is Copthorne Tunbridge Wells Sands. Its current status is Good with an overall objective of achieving Good. This is considered to be of high sensitivity.

11.6.18 A summary of the surface waterbody WFD Regulations information is presented in Table 11.6.2.

Table 11.6.2: Surface Waterbody WFD Regulations Summary Information

WFD Regulations Waterbody	Mole (upstream of Horley)	Tilgate Brook and Gatwick Stream	Burstow Stream	Mole (Horley to Hersham)
River Basin Management Plan (RBMP)	Thames River Basin District RBMP: 2015	Thames River Basin District RBMP: 2015	Thames River Basin District RBMP: 2015	Thames River Basin District RBMP: 2015
Operational Catchment	Mole Upper Trib	Mole Upper Trib	Mole Upper Trib	Lower Mole and Rythe
Waterbody ID	GB106039017481	GB106039017500	GB106039017520	GB106039017621
Classed as Heavily Modified Waterbody	Yes	Yes	No	No
WFD Regulations Overall Status (2019)	Moderate	Moderate	Bad	Moderate
Physicochemical Status	Moderate	Good	Moderate	Moderate
Chemical Status	Fail	Fail	Fail	Fail
Hydromorphological Quality Elements	Supports Good	Supports Good	Supports Good	Supports Good

Surface Water Quality

11.6.19 The River Mole is identified as a statutory Main River. Other Main Rivers within the study area include Burstow Stream, Gatwick Stream, Tilgate Brook and Crawter's Brook. Minor watercourses within the study area include Withy Brook and Haroldslea Stream. These watercourses are considered to have the potential to be directly or indirectly impacted by the Project for surface water quality.

11.6.20 The status of physico-chemical elements (a component of overall ecological status) for the WFD waterbodies within the study area is presented in Table 11.6.3.

Table 11.6.3: Classification of physico-chemical elements for WFD Regulations for waterbodies within the study area (Environment Agency, 2022c)

WFD Regulations water body (ID)	Physico-chemical quality elements				
	Ammonia	Dissolved Oxygen	Phosphate	pH	Overall
Mole (Horley to Hersham)	Poor	Good	Poor	High	Moderate
Mole upstream of Horley	High	Bad	Moderate	High	Moderate
Tilgate Brook and Gatwick Stream at Crawley	High	High	Good	High	Good
Burstow Stream	High	Good	Moderate	High	Moderate

11.6.21 Reasons for not achieving good across the four water bodies include poor nutrient, livestock and soil management, sewage discharge, private sewage treatment, invasive species (North American signal crayfish), urbanisation, transport drainage, riparian activities, and land drainage.

11.6.22 There are eight Environment Agency surface water monitoring stations (Environment Agency, 2022d) within the study area. A summary of the sampling points is outlined in Table 11.6.4.

Table 11.6.4: Surface water monitoring stations (Environment Agency, 2022d)

Sampling Point Name	Sampling Point ID	Location	Approximate Distance from Project	Sampling Summary
Mole Above Horley S/W	TH-PMLR0018	526970 143350	1.3km	202 samples taken between 2000 and 2022
Mole At Timberham Bridge, Gatwick	TH-PMLR0034	526930 142040	0.3km	214 samples taken between 2000 and 2022
Mole Above Gatwick Stream	TH-PMLR0017	527590 142410	0.65km	267 samples taken between 2000 and 2021
Gatwick Stream Above Pond 'E'	TH-PMLR0012	528690 140290	0.15km	210 samples taken between 2000 and 2022
Gatwick Stream Above Mole	TH-PMLR0011	528184 142152	0.5km	272 samples taken between 2000 and 2022
Gatwick Stream At Tinsley Bridge, Tinsley	TH-PMLR0013	529130 139690	1km	236 samples taken between 2000 and 2022
Mole Above Gatwick Airport	TH-PMLR0016	526020 139790	0.4km	281 samples taken between 2000 and 2022

Sampling Point Name	Sampling Point ID	Location	Approximate Distance from Project	Sampling Summary
Man's Brook at Spicers Bridge	TH-PMLR0313	524741 140805	1km	132 samples taken between 2010 and 2022

Surface Water Quality – HEWRAT assessment

11.6.23 From the perspective of applicable water quality assessments associated with routine runoff from highways ambient background concentrations of copper (Cu), zinc (Zn) and water hardness (calcium carbonate ($CaCO_3$)) and pH are the determinants of interest to inform such assessments. From the monitoring locations identified within the study area, background concentrations for those determinants are available to be used where required.

11.6.24 There are no Nitrate Vulnerable Zones (NVZs) or Drinking Water Protected Areas (surface water).

11.6.25 There is a Drinking Water Safeguard Zone for surface water across the airport site and wider study area: Thames SWGZ4015, 4016_Cookham Teddington & Wey under the West Thames Environment Agency area (Defra, 2022).

Surface Water Flow

11.6.26 The ability of a receiving watercourse to provide dilution of runoff from highways is dependent upon flow within the watercourse; greater flow values indicate greater dilution potential. As a precautionary approach low flows are considered. The Q_{95} value of a watercourse is the flow, in cubic metres per second (m^3/s), which is equalled to or exceeded 95% of the time. Q_{95} values for watercourses within the study area have been obtained from the National River Flow Archive (NRFA) (UK Centre for Ecology and Hydrology, 2022). Data on the Baseflow Index (BFI) have also been obtained from these gauging stations. The BFI provides an indication of the contribution that groundwater makes to the flow in a watercourse. The higher the value, the greater the contribution of groundwater to the baseflow component of the watercourse. The Q_{95} and BFI values from these gauging stations are presented in Table 11.6.5.

Table 11.6.5: Q_{95} flows and BFI for gauged watercourses within the study area (UK Centre for Ecology and Hydrology, 2022)

Watercourse Name	Gauging Station ID	Q_{95} (m^3/s)	BFI
Mole at Horley	39053	0.28	0.45
Gatwick Stream at Gatwick Link	39086	0.265	0.61
Gatwick Stream at Gatwick	39024	0.105	0.56
Mole at Gatwick Airport	39054	0.015	0.23

Surface Water Quality – Highways Improvements and Car Parks runoff catchments

11.6.27 The existing surface water drainage network for the highways improvements element of the Project is served by 17 surface water catchments. Further information on the existing drainage mechanisms serving these catchments is outlined in the drainage strategy (see **ES Appendix 11.9.6 Annex 2** (Doc Ref. 5.3)). Table 11.6.6 details the existing highways drainage catchments and receiving watercourses. A description of the drainage networks serving the airfield is included in paragraphs 11.6.29 to 11.6.37.

Table 11.6.6: Existing drainage catchments

Existing Catchment	Receiving Watercourse
0	Burstow Stream
1	Burstow Stream
1a	Haroldslea Stream
2	Gatwick Stream
2a	Unknown
3	Gatwick Stream
4	Gatwick Stream
5	River Mole
6	River Mole
7	River Mole
8	River Mole
9	River Mole
10	River Mole
11	River Mole
12	River Mole
13	Unknown
14	Withy Brook

Surface Water Dependent Designated Sites

11.6.28 There are no surface water dependent designated sites within the study area.

Water Quality – De-icer

11.6.29 The baseline for water quality is the same as for the WFD Regulations status, using the same water bodies as receptors. WFD Regulations data are used as the baseline from which to assess future changes.

11.6.30 The airfield surface water drainage and pollution control systems are included in **ES Figure 11.6.1** (Doc Ref. 5.2).

11.6.31 The western extent of the airfield drains to Pond A. During non de-icer contamination periods, surface water discharges through Pond A to the River Mole with no attenuation. When de-icer is

in use (either pavement or aircraft), a penstock on the discharge point is closed, and the contaminated runoff is routed to Pond M.

11.6.32 Pond M receives flows from the Pond M Drainage catchment, including pumped flows from Pond A. If the water quality is better than a specific biochemical oxygen demand (BOD) and pH threshold, the runoff is pumped into the western 'clean' compartment of Pond M, attenuated, and discharged at greenfield runoff rates to the River Mole. If the water quality is worse than the threshold, it is retained in the eastern 'dirty' compartment of Pond M, before being pumped onwards and then drained under gravity towards Dog Kennel Pond and Pond D.

11.6.33 Dog Kennel Pond has a dirty' and 'clean' compartment. The runoff from the long stay car parking northwest of Dog Kennel Pond drain under gravity to the 'clean' compartment, from where it flows through an oil interceptor and is pumped at a controlled rate to the River Mole. Runoff from the airfield and from Pond M drain to the dirty side of Dog Kennel Pond, from where it drains under gravity to Pond D.

11.6.34 Pond D is the key drainage pond receiving the majority of runoff from Gatwick. Runoff from the Pond D catchment drains under gravity to Pond D (lower) and is then raised by Archimedes Screws. If the water quality meets the required standard, runoff enters Pond D (upper) via a series of separator channels and discharges to the River Mole. Discharge to the River Mole is at a rate permitted by the Environment Agency.

11.6.35 As set out above, when the runoff meets the minimum required water quality standard of less than 10 mg/l BOD, Pond D discharges to the River Mole. When water quality is worse than the required standard, the pond discharges to the 'dirty' water pumped main which conveys runoff for further treatment and temporary storage at two long term storage lagoons with storage capacities of 220,000 m^3 (old) and 100,000 m^3 (new), and then ultimately to Crawley STW operated by Thames Water. There are restrictions placed on the peak flow that can be transferred to the sewage treatment works under agreement with Thames Water.

11.6.36 There are two permitted environmental conditions where there may be a discharge of worse than the 10 mg/l BOD standard from Pond D (upper) to the River Mole. The first is if the total capacity of the two long term storage lagoons has been exceeded. The new long term storage lagoon was constructed in 2011 of sufficient capacity to ensure it was never exceeded even in a particularly cold and wet winter. The pond capacity was not exceeded during the very cold and wet winter of 2017/18. Secondly, if the capacity of the conveyance system between Pond D (lower) and the long-term storage lagoons is exceeded and Pond D lower was full, there will be a discharge to the Mole that could exceed the 10 mg/l BOD threshold. This type of discharge is classed as an Emergency Discharge by GAL and is needed to protect North Terminal / Apron, the fuel farm and the cargo and waste centre facilities from flooding. Such a discharge would only occur when there is sufficient flow in the Mole to ensure adequate dilution that would not result in damage to the watercourse and aquatic ecology.

11.6.37 The River Mole at the point of discharge has a Bad status for dissolved oxygen. This is supported by the pollution control and de-icer impact mode which indicates that the discharge from Pond D can be contributing to a Bad status for Biochemical Oxygen Demand, as shown in Table 11.6.7:

Table 11.6.7: Modelled BOD baseline status

Discharge location	Modelled 90% class BOD	Modelled 99%ile class BOD
River Mole at D Pond discharge	Good	Bad

Groundwater

11.6.38 The geology and hydrogeology of the study area are set out in **ES Chapter 10: Geology and Ground Conditions** (Doc Ref. 5.1), although key information is repeated here to provide the context for the assessment of impact for groundwater resources. Mapping of both superficial deposits and bedrock strata is provided in **ES Figure 11.6.3** (Doc Ref. 5.2).

Geology and Hydrogeology

11.6.39 Groundwater occurs in relatively thin, shallow superficial deposits of Alluvium and River Terrace Deposits (RTD) that underlie the airport in a number of discontinuous bands. These deposits are classified as a Secondary A aquifer. These groundwater horizons may be discrete and isolated, although there may be more continuous shallow groundwater horizons close to or adjacent to existing and/or historic watercourses. The alluvium and head aquifers are likely to be thin, no more than 2 metres at their thickest and become thinner towards the margins of the outcrop. The RTD are likely to be slightly thicker than the alluvium and head deposits, up to around 5 metres, but will be similarly thin towards their margins. The permeability of the alluvium and head is likely to be relatively low, dependent on the proportion of clay content; a higher clay content will result in lower permeability. The RTD have a relatively high permeability and storage. Based on literature values (Freeze and Cherry 1979, Domenico and Schwartz 1990), permeability is assumed to be of the order of 1.6e-04 m/s for the RTD assuming a lithology of silty sand/sands.

11.6.40 Beneath the superficial deposits lies the Weald Clay Formation, primarily comprising mudstones. This is a thick sequence (confirmed to at least 35 m in some areas of the Project) of bedrock strata, classified as an unproductive aquifer. Although there may be groundwater in weathered zones near the surface, it generally acts as an aquiclude thereby largely precluding the passage of groundwater. This prevents any downward migration of groundwater from the overlying upper, shallow aquifer, although there may be some very limited downward connectivity where the mudstone is extensively weathered. Groundwater within the Weald Formation strata is considered of negligible importance. Hydraulic conductivity of the Weald Clay is assumed to be on the order of 2e-09 m/s based on literature values for clay (Freeze and Cherry 1979, Domenico and Schwartz 1990).

11.6.41 Also classified as a secondary A aquifer, the Upper Tunbridge Wells Sand Formation lies, mostly at depth, beneath the Weald Clay. There is some sub-crop of this strata to the extreme southeast of the site, although it is largely isolated from the surface by the mudstone of the overlying Weald Clay and there is unlikely to be significant connectivity with the surface. The Upper Tunbridge Wells Sand Formation has a moderate to low permeability (around 22 m^2/day), dependent on the proportion of siltstone (Jones et al, 2000).

11.6.42 The Environment Agency aquifer designations for each of the different identified geological units and the corresponding sensitivities for these aquifer receptors are summarised in Table 11.6.8.

Table 11.6.8: Aquifer Designations and Sensitivity

Geological Unit	Lithology	Aquifer Designation	Aquifer sensitivity
Alluvium	Clay, silt, sand and gravel	Secondary A Aquifer	High
Head	Clay, silt, sand and gravel	Secondary Undifferentiated Aquifer	Medium
RTD	Sand and gravel	Secondary A Aquifer	High
Weald Clay	Mudstone	Unproductive Strata	Negligible
Upper Tunbridge Wells Sand	Interbedded sandstone and siltstone	Secondary A Aquifer	High
Upper Tunbridge Wells Sand	Mudstone	Unproductive Strata	Negligible

Table Notes: Secondary A aquifers are described by the Environment Agency 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.

Secondary B aquifers are described by the Environment Agency as predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

Secondary Undifferentiated aquifers are assigned in cases where it has not been possible to attribute either category A or B to a rock type.

Unproductive strata are described by the Environment Agency as rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Groundwater Flow and Levels

11.6.43 Minimum recorded groundwater depths have been plotted and depth to groundwater contours generated. These are shown on **ES Figure 11.6.3** (Doc Ref. 5.2).

11.6.44 Groundwater levels have been observed at shallow depths within the superficial deposits, between around 0.8 and 3 mbgl (metres below ground level). Groundwater was also encountered within the weathered layers of the Weald Clay Formation, between shallow depths of 1-2 mbgl up to 8 mbgl.

11.6.45 Depth to the water table was observed to vary through the year by over 1.2 m in some locations, and as little as 0.7 m in others. Limited seasonal fluctuation has been observed, with the variation in available data mostly relating to shorter term rainfall events, with very rapid increase in water levels and quick recessions. This is indicative of a small and low storage aquifer.

11.6.46 Based on the generally flat topography of the airfield, the water table in the superficial deposits is also assumed to be relatively flat. Further, many of the superficial deposits are found in isolated areas and are likely to have limited depth, extent and connectivity. What groundwater flow there is will likely follow the local topography, and as such will deflect towards the local or historic watercourses. The nature of the weathering of the Weald Clay means that the groundwater may be found in relatively isolated pockets without complete hydraulic connectivity across the study area.

Recharge and Surface Water Interaction

11.6.47 The shallow groundwater is primarily recharged by rainfall. The large swathes of impermeable surfaces (runways, taxiways, aprons etc) across the airport will locally limit this recharge rainfall.

11.6.48 Perched groundwater contained within layers of the superficial deposits may be present. There is likely to be a good hydraulic connectivity between groundwater in superficial deposits and the surface watercourses but this may vary locally depending on the nature of superficials (i.e. ranging from clay layers within the Alluvium to RTD).

11.6.49 Due to the generally low permeability of the bedrock, there is not expected to be any significant connection between the bedrock materials and the surface water. Overall baseflow contribution to the watercourses from the bedrock may therefore be relatively low.

11.6.50 There may be some regional contribution to baseflow from the Upper Tunbridge Wells Sand Formation, but this is only partially exposed to the extreme southeast of the study area (and outside the Project boundary) and is not likely to be significant in this location. However, south and east of Crawley (in excess of 5 km to the southeast of the airport boundary) the Upper Tunbridge Wells Sand Formation provides spring flow to the headwaters of the Gatwick and Burstow streams (Environment Agency, 2013).

11.6.51 There are no natural lakes or ponds identified within the Project boundary that are classified WFD surface water bodies. There are no sites of ecological importance supported by shallow groundwater.

Groundwater Abstractions and Discharges to Groundwater

11.6.52 There are no consented discharges to groundwater.

11.6.53 There are no SPZs for public water supplies within the groundwater study area, and no drinking water safeguard zones. One licenced groundwater abstraction for general use has been identified approximately 1 km south of the Project boundary (Table 11.6.9). It is considered that this most likely abstracts from the Tunbridge Wells Sand Formation which is found at depth below the Weald Clay confining layer. It is not clear if this source is used for drinking water, but if so, it would, by default, have an associated SPZ1 of 50 m radius. The Mole abstraction licensing strategy (Environment Agency, 2013) identifies that the Tunbridge Wells Sands currently receives little pressure from groundwater abstraction (i.e. it is little utilised).

Table 11.6.9: Licensed Groundwater Abstractions

Licence no.	NGR	Annual license Quantity	Daily Max	Source	Start (Expiry)
TH/039/0032/016	526681 138924	47,450 m^3	130 m^3	Groundwater (Borehole)	17/10/12 (31/03/2029)

11.6.54 Information on registered, unlicensed private water supplies was requested from the relevant local authorities but no response has been received at the time of writing. However, a previous study in the area (Arcadis, 2023) indicates one (1) private water supply (PWS) registered with Reigate & Banstead Borough Council is located approximately 350 metres outside of the Project Boundary (DCO) at TQ 29508 42108 with use indicated as 1 to >1000 cubic metres per day for gardening use.

11.6.55 No active licenced discharges to groundwater have been identified in the study area.

Groundwater Dependent Terrestrial Ecosystem

11.6.56 No potential GWDTEs have been identified within the study area (see **ES Chapter 9: Ecology and Nature Conservation** (Doc Ref. 5.1) which includes aquatic habitats and ecology).

Flood Risk (from all sources)

11.6.57 The Project **Flood Risk Assessment** (**ES Appendix 11.9.6**(Doc Ref. 5.3)) provides an assessment of all potential sources of flood risk, including fluvial, surface water, groundwater, sewer flooding and flooding from reservoirs, to inform the ES. It addresses the requirements of the Airports NPS, the NPS for National Networks (Department for Transport, 2014), local policies and the NPPF. Key findings regarding baseline flood risk conditions are summarised below.

Fluvial Flood Risk

11.6.58 Gatwick is located within the Thames River Basin District and within the Upper Mole catchment. The River Mole flows through the airport, passing under the main and existing northern runways in culvert. Tributaries of the River Mole, including the Crawter's Brook, the Gatwick Stream and Westfield Stream all run through or adjacent to the Project boundary. Therefore, fluvial flood risk is the primary risk of flooding to the Project. The Environment Agency Flood Zones classification is used as the basis on which the Sequential Test is applied. It identifies the probability of flood risk in each Flood Zone. Flood Zones 1, 2 and 3a are defined by the Environment Agency, ignoring the presence of flood defences and without taking account of the predicted impact of climate change to the future probability of flooding. Flood Zone 3b should be defined by local planning authorities in agreement with the Environment Agency, taking into account the presence of flood defences.

11.6.59 Flood Zones 2 and 3 are identified in **ES Figure 11.6.4** (Doc Ref. 5.2). There are areas of Flood Zone 3 (areas at risk of flooding in a 1 per cent (1 in 100) AEP event) and Flood Zone 2 (area at risk of flooding in between a 1 per cent and 0.1 per cent (1 in 100 to 1 in 1000) AEP event) within the Project boundary. These are associated with the River Mole, Westfield Stream, Man's Brook and Crawter's Brook on the western and southern sides of the airport and with the Gatwick Stream on the eastern side. Beyond the Project boundary, the Flood Zones are quite extensive and include a number of potential receptors for the Project, including residential areas and transport infrastructure that serves both Gatwick and the wider region.

11.6.60 There are areas of the airport at risk of fluvial flooding in the existing scenario from a 1 per cent (1 in 100) AEP event. Should such predicted flooding occur, it would be managed to ensure the safety of passengers and staff by the GAL's **Flood Resilience Statement** (see **ES Appendix 11.9.6 Annex 6** (Doc Ref. 5.3)).

Upper Mole Hydraulic Model

11.6.61 The Upper Mole Hydraulic Model was updated by GAL in partnership with the Environment Agency. The objective was to improve the understanding of flood risk in the area, particularly to Gatwick. The model was completed in 2018 and further updated in 2021 to mirror small modifications made by the Environment Agency to flow distribution and structural elements in the model upstream of the airport in Crawley. It is understood that the Environment Agency used this version of the model to update their published flood zones in February 2021. The model was

further updated in 2022 to inform this assessment. The updates better reflect the operation of the Gatwick Stream Flood Storage Area (FSA) during inundation events observed by Gatwick operations staff. Further information is included in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).

11.6.62 Based on the model results flooding occurs within the Project boundary for the 1 per cent (1 in 100) AEP event. The flooding extents for the 1 per cent (1 in 100) AEP event based on the Upper Mole Hydraulic model have been compared to the published Flood Zone 3 in **ES Figure 11.6.4** (Doc Ref. 5.2). Similar to the published Flood Zones, flooding is primarily associated with the River Mole and Crawter's Brook on the western and southern sides of the airport, and with the Gatwick Stream on the eastern side, around the South Terminal building. However, the actual flooding extents are significantly different from published Flood Zones. The differences between the two models and extents are discussed in more detail in **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3). These variances have been raised with the Environment Agency. The Gatwick Upper Mole model has been adopted for assessment of fluvial flood risk in this ES.

11.6.63 The information included in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) and summarised above provides the basis to apply the Sequential and, where necessary, Exception Test for the Project.

Surface Water Flood Risk

11.6.64 The assessment of existing surface water flood risk to the Project has been based on the Environment Agency Risk of Flooding from Surface Water mapping (RoFSW) and surface water modelling produced for the Project by GAL.

11.6.65 The Environment Agency RoFSW mapping was used to make an overarching assessment of the existing surface water flood risk to the Project. It was used to determine overall patterns of surface water flooding and therefore, to steer the assessment of risks, impacts and mitigation measures that follow.

11.6.66 According to the RoFSW extents identified in **ES Figure 11.6.5** (Doc Ref. 5.2), surface water flooding occurs in several areas of the airport. Areas at high risk (greater than 3.3 per cent (1 in 30) AEP of flooding) are predominately associated with areas around existing watercourses or drainage features, although there are isolated pockets of high risk likely to be the result of rainfall filling local depressions rather than overland flow paths. Areas at medium risk (between 3.33 per cent and 1 per cent (1 in 30 and 1 in 100) AEP of flooding) are generally small and adjacent to the areas at high risk. A large area at medium risk is located near the River Mole and south of the existing main runway. There are larger areas predicted to be at low risk (between 1 per cent and 0.1 per cent (1 in 100 and 1 in 1000) AEP of flooding) within the airport, particularly to the south of the main runway and in proximity to existing terminal buildings.

11.6.67 The surface water drainage model developed by GAL has also been used to provide an understanding of the existing level of surface water flood risk from the Project. The assessment of modelling results has been included in **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3). Overall, it is considered that the Environment Agency RoFSW mapping provides an informative assessment of existing surface water flood extents, while the Gatwick surface water drainage model provides an understanding of the current runoff volume and rates, as well as an indication of how climate change would affect surface water flooding.

Groundwater Flood Risk

11.6.68 Groundwater is present in the superficial deposits, particularly the RTD, beneath the study area. This may occur in relatively small, discrete and discontinuous bodies, or, particularly adjacent to current and historic watercourses, may form more continuous groundwater bodies. Further information on the geological strata underlying the site is presented in the baseline groundwater text in paragraphs 11.6.38 to 11.6.42 and in **ES Chapter 10: Geology and Ground Conditions** (Doc Ref. 5.1).

11.6.69 Groundwater levels respond to direct recharge from rainfall but also, adjacent to water bodies, may respond to changes in levels in the watercourse. The rate of this response and the "outward" propagation of these levels from surface waters, may vary considerably across the site, depending upon the transmissivity and storage properties of the aquifer.

11.6.70 There are relatively sparse data for groundwater levels, but where these are available, they suggest groundwater levels are close to the surface at shallow depths within the superficial deposits (between around 0.8 and 3 mbgl) and within the weathered layers of the Weald Clay Formation (between shallow depths of 1-2 mbgl up to 8 mbgl). Annual groundwater level fluctuation may be of the order 0.7 – 1.2 m, but this is based on a very limited dataset, mostly away from the influence of surface watercourses.

11.6.71 Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (superficial deposits flooding), or with unconfined aquifers ("clearwater" flooding).

11.6.72 British Geological Survey (BGS) mapping identifies that there is susceptibility to groundwater flooding throughout areas of the site underlain by superficial deposits (i.e. superficial deposits flooding), with a moderate level of confidence. Areas susceptible to groundwater flooding are shown in **ES Figure 11.6.6** (Doc Ref. 5.2).

11.6.73 There is also identified susceptibility to groundwater flooding from the Tunbridge Wells Sand (clearwater flooding), but with a low level of confidence.

11.6.74 Based on the Crawley Borough Council SFRA (Crawley Brough Council 2020) there have been only two occurrences of groundwater flooding recorded in the Crawley area but are not located near the airport. The SFRA identifies groundwater flood risk as mostly negligible in the vicinity of Gatwick with some localised areas with low to moderate risk depending on the subsurface geology.

Flood Risk from Reservoir Failure

11.6.75 Environment Agency Reservoir Flood Extents, last updated in January 2023, show two reservoir failure flooding scenarios, "dry day" and a "wet day". The "dry day" scenario predicts the flooding extent if a reservoir fails when rivers are at normal level while a "wet day" shows how much worse flooding would be if a river is already experiencing extreme natural flood. The reservoir flood risk flood extents are illustrated in **ES Figure 11.6.7** (Doc Ref. 5.2).

11.6.76 For the dry day scenario, the western side of the airport, including Taxiways Uniform and Lima and north to the Gatwick fuel farm, would be at risk of flooding. While on the eastern side, localised flooding would impact the South Terminal and nearby stands.

11.6.77 For the wet day scenario, impacts can be seen across much of the eastern side of the airport, including both terminals, as well as the Main Runway to the west and large commercial areas on the River Mole floodplain. Similarly, the extent of wet day failure extends across much of the airport structures, including terminals, stands and taxiways.

11.6.78 GAL operates the two long term storage lagoons adjacent to Crawley STW that receive contaminated runoff. The consequences of a potential failure from these structures have been mapped by GAL, and can be seen on **ES Figure 11.6.7** (Doc Ref. 5.2) as Gatwick Breach Flood Extents. In the event of a failure, flows would travel northwards primarily through the airport car parks to the east of the London to Brighton mainline railway. The flow path does not cross the railway and would pass under the M23 spur via the B0236 bridge and then towards the residential areas to the north of the motorway. The A23 and M23 would not be flooded. In the unlikely event of a breach of the lagoons, the Project elements that would be affected would be those that are east of the railway line, principally the Surface Access works to the South Terminal, works to the car parks located in this area and the hotel and office provision after 2032.

11.6.79 In conjunction with the Environment Agency, GAL constructed the Gatwick Stream Flood Alleviation Scheme which included a flood storage area (FSA) on the Gatwick Stream to the south of Crawley STW. This includes an embankment to retain flood water which could theoretically fail. The FSA falls under the auspices of the Reservoirs Act 1975 and as with the lagoons is subject to a monitoring inspection regime and therefore the risk of failure is considered to be very low. The Environment Agency confirmed at a meeting on 25 May 2021 that the predicted flood extent of such a failure is included in the flood risk from reservoirs mapping and is similar to that of the reservoir flooding extent downstream (northwards) of the FSA.

Sewer/Water Distribution Infrastructure Flooding

11.6.80 Gatwick has a complex water distribution and sewer network that should be considered as a potential source of flood risk. The failure of sewer or water supply infrastructure within or upstream of the Project boundary could result in flooding, although the risk of this is likely to be low given the maintenance and monitoring activities undertaken by GAL to avoid this.

11.6.81 At the time of writing, it was reported by GAL personnel that part of the Thames Water network, located in Horley, periodically reaches its capacity, causing flows to back up to the airport, as was observed during the June 2019 flow survey. This is not thought to pose a risk of flooding to the airport as flooding from the Thames Water network (beyond the operational airport) would occur first due to the topography, and this would limit the potential for surcharging within the network at the airport upstream. However, it could have an operational impact on the Gatwick sewers as the surcharging would reduce velocities in the pipes and sediment deposition is more likely to occur although this should be dealt with under the normal maintenance of the network.

11.6.82 The Crawley Borough Council SFRA (Crawley Borough Council, 2020) does not include a specific section on recorded sewer flooding events. However, given the reported capacity issues on the Thames Water network despite the lack of evidence of any historical flooding to the airfield as a result of these, there is considered to be a medium risk of sewer flooding at the airport.

Water Infrastructure

Wastewater

11.6.83 The current configuration of the wastewater system is shown on **ES Figure 11.6.8** (Doc Ref. 5.2). The airport wastewater network comprises two discrete systems: one serving the North Terminal and discharging to Thames Water's Crawley sewage treatment works, and a second network serving the South Terminal and a hotel development on the North Terminal site discharging to Thames Water's Horley sewage treatment works approximately 6 km to the north of the airport via the trunk sewer system.

11.6.84 The North Terminal system is characterised by a combination of gravity networks discharging to pumping stations. The main terminal area is served by Pumping Station 8 (PS8), which receives flows from two pumping stations and the gravity network. The gravity network drains the main north terminal area, Pier 4 East, Pier 5 and the Sofitel and Hampton Hilton hotels. Pumping Station 10 (PS10) drains the Premier Inn hotel, Shell garage and Contractor Support Centre. Pumping Station 11 (PS11) drains the southern part of the terminal and Pier 4 West. PS8 discharges flows to the west into a gravity sewer which also serves the fuel farm and the sanitation block (where waste from aircraft is discharged), plus other ancillary buildings: this gravity sewer routes south towards the cargo terminal and discharges into Pumping Station 7 (PS7). The west side of the cargo terminal and the Boeing hangar are served by Pumping Station 6 (PS6), which discharges into the PS7 gravity system. PS7 is a terminal pumping station which discharges flows directly to the Thames Water trunk sewer on London Road on the south boundary of the airport conveying flows to Crawley STW approximately 1 km to the east.km to the east.

11.6.85 The central parts of the airport comprising Pier 6, the fire station and control tower areas are served by Pumping Station 2 (PS2) with the Pier 6 flows discharging via Pumping Station 44 (PS44) at the pier. PS2 pumps flows forward to a gravity network discharging to Pumping Station 3 (PS3). This system also receives flows from the Virgin hangar, the Central Area Recycling Enclosure (CARE) facility, old control tower/motor transport facilities (via Pumping Stations 4 and 5) and the fire training ground via Pumping Station 45 (PS45). All flows from PS3 are injected into one of the twin pumping mains from PS7 so also discharge to the trunk sewer on London Road.

11.6.86 The South Terminal system on the west side of the railway is a predominantly gravity network although there are two small pumping stations serving Pier 2 and a larger Pumping Station 40 (PS40) serving part of the International Departure Lounge, which also receives the pumped flows from Pier 2. Gravity flows from the main terminal building, offices and service facilities discharge into a gravity sewer running north along Perimeter Road East to which PS40 discharges. The system on the east side of the railway is served by two gravity networks discharging to Pumping Station 19 (PS19 serving the car hire and car parking facilities) or Pumping Station 23 (PS23 serving the hotel, office and fast-food facilities). These both pump across the railway using pipes fixed to bridges to discharge into the Perimeter Road East gravity sewer. North of the terminal building, this gravity sewer receives flows from Pier 3, the police station and the new Premier Inn before routing north across the A23 dual carriageway to discharge to Thames Water's Horley STW sewer network.

11.6.87 In 2019 GAL commissioned a study to model the wastewater network, calibrate it and use it as a tool for assessing the current performance (Jacobs, 2019). The model was based on the records held by GAL which are largely the result of a comprehensive survey of the network undertaken

supplemented by drawings from recent works. The calibration was based on a short-term flow survey performed in May and June 2019 for which flow and depth monitors captured the performance of the network at ten strategic locations: the survey was fortunate to record the end of a particularly dry period and a severe storm, so the operation of the network in fairly extreme conditions was observed. Although the network is nominally for wastewater only, the observed flows confirm that there were small pockets of the estate that discharged storm flows.

11.6.88 The model was used to evaluate the performance of the wastewater network against the busiest day of 2018 for passenger numbers. This data was utilised as, with the exception of 2019 (which would not be expected to be significantly different), it is the most recent representative data due to the impact of the covid pandemic on passenger numbers. This evaluation was conducted for both dry weather and wet weather conditions equivalent to a 3.3 per cent (1 in 30) AEP storm (a typical event frequency for testing flood risk from sewer systems). The assessment of performance found that the wastewater network was adequate for the wastewater flows discharged in dry weather, but in wet weather PS7 had long running times during peak periods indicating stress on the system and the upstream network was at risk of flooding in extreme storm events. The 2018 model build report recommended replacing the existing pumps with models of increased capacity. In addition, the flow survey observed a possible constraint in the capacity of the Thames Water sewer network discharging to Horley sewage treatment works downstream of the airport connection.

11.6.89 The future baseline model incorporates an upgrade to PS40 and associated pumping main which GAL is implementing to address problems with low velocities in the existing main.

Water Supply

11.6.90 Potable water is supplied to Gatwick via a single interconnected network, supplied via a 300 mm main at the inlet meter. This supply includes that to the fire hydrant main. There are two additional potential supply points to the internal Gatwick network, but these are normally closed.

11.6.91 As previously described baseline consumption data was taken from the 'London Gatwick – Water Masterplan 2020 & 2028 Forecast – Full backing report, 2018' (GAL, 2018). This report details a previous study into the water consumption at the site and forecasts demand through to 2028 and has been included in **ES Appendix 11.9.8 Annex 4** (Doc Ref. 5.3). This report assumes that with no additional development consumption will increase to 749 Megalitres per year. This is a worst-case assessment and assumes no new water efficiency measures will be implemented.

Summary

11.6.92 Table 11.6.10 summarises the sensitivity of the identified receptors

Table 11.6.10: Summary of Receptor Sensitivity

Receptor	Sensitivity	Justification
Surface Water		
River Mole	High	Watercourse has the potential to achieve 'Good' WFD Regulations classification Q_{95} likely to be <1.0m^3/s.

Receptor	Sensitivity	Justification
Gatwick Stream	High	Watercourse has the potential to achieve 'Good' WFD Regulations classification Q_{95} likely to be <1.0m^3/s.
Crawter's Brook	High (geomorphology) Medium (water quality)	Watercourse has the potential to achieve 'Good' WFD Regulations classification (geomorphology) Watercourse not classified under WFD regulations. Q_{95} likely to be >0.001m^3/s. (Water Quality)
Burstow Stream	Medium (water quality)	Watercourse has the potential to achieve 'Less than Good' WFD Regulations classification Q_{95} likely to be >0.001m^3/s.
Burstow Stream Tributary/Haroldslea Stream	Low (geomorphology) Medium (water quality)	Minor ephemeral channel (geomorphology) Water body not classified under WFD Regulations. Q95 likely to be >0.001m3/s. (Water Quality)
Man's Brook	High	Watercourse has the potential to achieve 'Good' WFD Regulations classification Q_{95} likely to be <1.0m^3/s.
Withy Brook	Medium	Water body not classified under WFD Regulations. Q95 likely to be >0.001m3/s. (Water Quality)
Groundwater		
Unproductive strata (Weald Clay)	Negligible	See criteria in Table 11.4.4
Secondary undifferentiated superficial aquifer (head)	Medium	See criteria in Table 11.4.4
Secondary A superficial aquifer (alluvium/RTD)	High	See criteria in Table 11.4.4
Secondary A Upper Tunbridge Wells Sand aquifer	High	See criteria in Table 11.4.4
Grade II* listed buildings, Airport Infrastructure, Transport Infrastructure	Very High	See criteria in Table 11.4.4
Grade II listed buildings, Residential and Commercial properties	High	See criteria in Table 11.4.4
River Mole	High	Watercourse has the potential to achieve 'Good' WFD Regulations classification Q_{95} likely to be <1.0m^3/s.
Gatwick Stream	High	Watercourse has the potential to achieve 'Good' WFD Regulations classification Q_{95} likely to be <1.0m^3/s.

Receptor	Sensitivity	Justification
Crawter's Brook	High (geomorphology) Medium (water quality)	Watercourse has the potential to achieve 'Good' WFD Regulations classification (geomorphology) Watercourse not classified under WFD regulations. Q_{95} likely to be >0.001m^3/s. (Water Quality)
Fluvial Flood Risk and Surface Water Drainage		
Residential properties	High	Limited (comparative) opportunity and means to address flood risk individually. Proportionally higher impact from flooding than others
Industrial properties	Medium	Consequences covered by insurance and greater resiliency.
Transport infrastructure	Very High	Significant financial consequences on a regional and potentially national scale, risk to life.
Airport Infrastructure	Very High	Significant financial consequences on a potentially national and international scale, risk to life.
Airfield grassed areas	Low	Very limited consequences, if any.
Water Infrastructure – Wastewater		
Gatwick wastewater network	Medium	Water use or infrastructure supporting human health, economic activity or environmental protection could be impacted at a catchment scale. For example, Crawley or Horley Sewage Treatment Works.
Water Infrastructure – Water Supply		
Gatwick potable water supply network	High	Water use or infrastructure supporting human health, economic activity or environmental protection at a nationally significant city scale.

Future Baseline Conditions

11.6.93 The assessment of likely environmental effects needs to consider any potential changes in the baseline that would alter the conclusions of the assessment. The primary source of future change with respect to the water environment baseline is considered to be climate change. A number of developments (see **ES Chapter 4: Existing Site and Operation** (Doc Ref. 5.1) for a full description) have been included in the future baseline that are consented and would progress in the absence of the Project. They are summarised below with a description of their potential influence on the future baseline:

- Western Pier 6 extension – limited change to the water environment (undertaken on existing impermeable areas).
- Runway resurfacing – limited change to the water environment.
- Construction of Rapid Exit Taxiway Echo Romeo – relatively small increase in airfield impermeable area which would include its own mitigation measures.

- Additional car parking – potential reduction in peak runoff due to local planning requirements for betterment.
- Local widening of North and South roundabout junctions – potential changes to impermeable area.
- Increased hotel capacity – increased water demand and wastewater flows.
- Potential efficiency savings in water consumption in line with Decade of Change (GAL, 2021), although as a conservative approach these have not been taken into account in the assessment (see paragraph 11.5.2).
- Increase in air passenger numbers – potential increase in wastewater generated.
- Increase in air transport movements – potential increase in de-icer used.

11.6.94 Commentary on wastewater infrastructure in this document relates to Gatwick's private wastewater network. The Thames Water public sewer network to which the airport discharges may undergo some changes in response to the increase in flows subject to the outcome of the forthcoming Thames Water Development Impact Assessment (see paragraph 11.9.2).

Initial Construction Period: 2024-2029

Surface Water

Geomorphology

11.6.95 For geomorphology, evolution of the watercourses, due to their natural adjustment, is expected. The River Mole and Gatwick Stream are currently exhibiting some evidence of channel adjustment, such as deposition of sediment and the development of natural bedforms, and erosion of bed and banks to develop natural variability in channel form. These channels have been assessed as having a low to moderate energy, with limited ability for planform adjustment. It is anticipated that if left undisturbed, the watercourses would continue to laterally adjust slowly, and potentially through incision if unable to move laterally within the defined wider corridor. The remaining watercourses in the study area exhibited less evidence of adjustment, with lower energies, and are considered unlikely to adjust significantly. No change to the baseline is therefore considered for the initial construction period.

WFD Regulations Compliance Assessment

11.6.96 The WFD Regulations future baseline will be affected by climate change and the impacts caused to habitat because of water levels, higher probability of severe storms, and potential changes in species preference. These changes are difficult to predict and potentially extraneous to the changes in the water bodies as a result of construction and operation. Overall, there will be no significant effect as the water bodies respond to changes and attempt to reach a new equilibrium. However, notwithstanding this, within the context of the timeframe for the initial construction period (2024-29), no climate change impacts are identified, and therefore no changes to the baseline are expected.

Water Quality – Highways Improvements and Car Parks

11.6.97 Climate change may lead to changes in both low and high flows in watercourses, leading to subsequent changes in dilution capacity. Land use changes and measures to improve watercourses in line with legislative objectives may also result in an improvement in baseline water quality.

11.6.98 It is not anticipated that the current baseline will change considerably in the initial construction period 2024-2029.

Water Quality – De-icer

11.6.99 Winter peak day ATMs will continue to increase and the amount of aircraft de-icer used will increase, assuming environmental weather conditions are the same as the baseline year (the cold winter of 2017/18). However, the impact of climate change and weather variability on de-icer use and discharges to the environment are challenging to predict. The latest projections of future climate change (UKCP18[3]), accessed in December 2022, indicate that winters will become wetter and warmer on average which will reduce the amount of both pavement and de-icer applied.

11.6.100 Modelling and operational data has indicated that there is presently minimal spare capacity for future development within the long-term storage facilities and existing treatment systems.

11.6.101 Therefore, for the purposes of this assessment, the assessment of impact against baseline uses the worst-case scenario of assuming winter 2017/18 weather conditions, with de-icer load predictions based on peak winter ATMs in 2038.

Groundwater

11.6.102 The increase in impermeable area associated with consented developments is very minor. Discharge is understood to be to surface water features and not to ground. As such for groundwater, no significant changes to the current baseline are expected.

Flood Risk and Surface Water Drainage

11.6.103 For flood risk and surface water drainage, the main source of future change to the baseline conditions is climate change. For the initial construction period, and as a conservative approach (see Table 11.6.11), a 16 per cent allowance on peak river flows has been applied to consider the impact of climate change on fluvial flood risk.

Water Infrastructure

Wastewater

11.6.104 There are two consented projects that are expected to increase hotel capacity by an additional 250 rooms before the Project commences. These would have a very slight increase on wastewater loading and water supply but that increase is not anticipated to be significant.

Water Supply

11.6.105 Based on the Project programme (see **ES Chapter 5: Project Description** (Doc Ref. 5.1)), the increase in water consumption has been calculated and combined with the updated forecast to give total water demand. Water demand for construction activities has also been estimated and added to get a net change in water demand. Based on the programme of works, no works undertaken will directly impact on water demand, and therefore the baseline remains unchanged.

[3] https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp-headline-findings-v2.pdf

First Full Year of Opening: 2029

Surface Water

Geomorphology

11.6.106 It is anticipated that airport growth and any effects from climate change would not have a significant effect on geomorphology, when compared to the baseline assessment, for the same reasons outlined above for the initial construction period (2024-29). Therefore, changes to the baseline are not expected for the first year of opening (2029) for these aspects, with the exception of continued evolution of the watercourses due to natural adjustment.

WFD Regulations Compliance Assessment

11.6.107 The WFD Regulations future baseline will be affected by climate change and the impacts caused to habitat because of water levels, higher probability of severe storms, and potential changes in species preference. These changes are difficult to predict and potentially extraneous to the changes in the water bodies as a result of construction and operation. Overall, there will be no significant effect as the water bodies respond to changes and attempt to reach a new equilibrium.

Water Quality – Highways Improvements and Car Parks

11.6.108 It is anticipated that airport growth and any effects from climate change would not have a significant effect on water quality, when compared to the baseline assessment, for the same reasons outlined above for the initial construction period (2024-29). Therefore, changes to the baseline are not expected for the first year of opening (2029) for these aspects.

Water Quality – De-icer

11.6.109 Winter peak day aircraft movements will continue to increase and the amount of aircraft de-icer used will also increase, assuming environmental weather conditions are the same as the baseline year (the cold winter of 2017/18). For the purposes of this assessment, the assessment of impact against baseline adopts the worst-case scenario of assuming winter 2017/18 weather conditions, with de-icer load predictions based on peak winter ATMs in 2038.

Groundwater

11.6.110 It is anticipated that airport growth and any effects from climate change would not have a significant effect on groundwater resources, when compared to the baseline assessment, for the same reasons outlined above for the initial construction period (2024-29). Therefore, changes to the baseline are not expected for the first year of opening (2029) for these aspects.

Fluvial Flood Risk and Surface Water Drainage

11.6.111 For the first full year of opening, and as a conservative approach (see Table 11.6.11), a 16 per cent allowance on peak flows has been applied to consider the impact of climate change on fluvial flood risk.

Water Infrastructure

11.6.112 It is anticipated that airport growth and any effects from climate change would not have a significant effect on water infrastructure (wastewater and water supply), when compared to the baseline assessment, for the same reasons outlined above for the initial construction period

(2024-29). Therefore, changes to the baseline are not expected for the first year of opening (2029) for these aspects.

Interim Assessment Year: 2032

Surface Water

Geomorphology

11.6.113 It is anticipated that airport growth and any effects from climate change would not have a significant effect on geomorphology when compared to the baseline assessment, for the same reasons outlined above for the initial construction period (2024-29) and the opening year (2029). Therefore, changes to the baseline are not expected in 2032 for these aspects, with exception for geomorphology with continued evolution of the watercourses due to natural adjustment.

WFD Regulations Compliance Assessment

11.6.114 The WFD Regulations future baseline will be affected by climate change and the impacts caused to habitat because of water levels, higher probability of severe storms, and potential changes in species preference. These changes are difficult to predict and potentially extraneous to the changes in the water bodies as a result of construction and operation. Overall, there will be no significant effect as the water bodies respond to changes and attempt to reach a new equilibrium.

Water Quality – Highways Improvements and Car Parks

11.6.115 It is anticipated that airport growth and any effects from climate change would not have a significant effect on water quality when compared to the baseline assessment, for the same reasons outlined above for the initial construction period (2024-29) and the opening year (2029). Therefore, changes to the baseline are not expected in 2032 for these aspects.

Water Quality – De-icer

11.6.116 Winter peak day aircraft movements will continue to increase and the amount of aircraft de-icer used will also increase, assuming environmental weather conditions are the same as the baseline year (the cold winter of 2017/18). For the purposes of this assessment, the assessment of impact against baseline adopts the worst-case scenario of assuming winter 2017/18 weather conditions, with de-icer load predictions based on peak winter ATMs in 2038.

Groundwater

11.6.117 It is anticipated that airport growth and any effects from climate change would not have a significant effect on groundwater when compared to the baseline assessment, for the same reasons outlined above for the initial construction period (2024-29) and the opening year (2029). Therefore, changes to the baseline are not expected in 2032 for these aspects.

Flood Risk and Surface Water Drainage

11.6.118 For the interim assessment year, and as a conservative approach, a 16 per cent allowance on peak flows has been applied to consider the impact of climate change on fluvial flood risk (see Table 11.6.11 below.

Water Infrastructure

11.6.119 Improvements to the North and South Terminals are anticipated to be completed by 2030, and hotel facilities are anticipated to be completed by 2032. This will allow for projected increases in staff numbers and passenger numbers. It is estimated that in the worst-case if these facilities were full to capacity, this would generate an increase in demand of 223 Megalitres per year. In addition to the updated forecasted baseline consumption in 2038 of 720 Megalitres per year, and estimated consumption due to construction activities of 3 Megalitres per year, this gives a total demand for this period of 946 Megalitres per year. This calculation does not include for any water efficiencies or water recycling that would reduce consumption per passenger and is based on high level information for new facilities, e.g. footprint of proposed building, where better information is not available.

Design Year: 2038

Surface Water

Geomorphology

11.6.120 Continued evolution of the watercourses is expected due to the effects of climate change, natural channel adjustment, and supporting RBMP objectives for the River Mole catchment. Climate change could potentially alter the hydrological regime of the watercourses. Increased frequency/severity of droughts and floods could potentially lead to the watercourses adjusting to differing patterns of erosion and deposition. However, it is likely that the adjustment would remain localised and be of relatively low magnitude given the low to moderate energy channel types. Natural channel adjustment will continue to occur on all watercourses. Left undisturbed, the watercourses would continue to adjust slowly laterally and potentially through incision if constrained laterally within the defined wider corridor.

WFD Regulations Compliance Assessment

11.6.121 The Thames RBMP provides details of the anticipated ecological status (which is partly dependent on stream morphology) for the WFD Regulations water bodies within the study area by 2027 (Defra, 2015). Of note are the following measures which could lead to improvement in individual quality elements: tackling non-native species, removal of fish barriers, and restoration of more natural morphology where man-made modifications exist.

Water Quality – Highways Improvements and Car Parks

11.6.122 It is anticipated that airport growth and any effects from climate change would not have a significant effect on water quality when compared to the baseline assessment, for the same reasons outlined above for the initial construction period (2024-29) and the opening year (2029). Therefore, changes to the baseline are not expected in 2038 for these aspects.

Water Quality – De-icer

11.6.123 Winter peak day aircraft movements will continue to increase and the amount of aircraft de-icer used will also increase, assuming environmental weather conditions are the same as the baseline year (the cold winter of 2017/18). For the purposes of this assessment, the assessment of impact against baseline adopts the worst-case scenario of assuming winter 2017/18 weather conditions, with de-icer load predictions based on peak winter ATMs in 2038. Therefore, this is the maximum design scenario assessed.

Groundwater

11.6.124 For groundwater, climate change predictions suggest that changes in rainfall patterns are likely to lead to change in groundwater recharge due to impacts from wetter winters but also from reduced summer recharge. In the Gatwick area, modelling based on historic groundwater recharge data and existing greenhouse emissions standards indicates that there may be a 40 per cent reduction in potential groundwater recharge in the Gatwick area by the end of the 21st century (Airports Commission, 2014).

11.6.125 A conservative range of groundwater levels have been used in this assessment which are considered to account for potential changes in groundwater recharge due to climate change, and therefore no changes to the baseline assessment are anticipated for 2038.

Flood Risk and Surface Water Drainage

11.6.126 The Environment Agency's Flood Risk Assessments: Climate Change Allowances guidance were last updated in May 2022 (Environment Agency, 2016a) and are the best national representation (from a guidance perspective) of how climate change is likely to affect flood risk for peak river flow and peak rainfall intensity available at the time of writing this chapter. The allowance to be made for the predicted impact of climate change on peak river flows and rainfall intensity is subject to the river basin district, in this case identified as the Mole Management Catchment. The allowances for peak river flow were updated and republished by the Environment Agency in February 2022 to reflect UKCP18 data. The uplift factors to be applied in small urban catchments are indicated in Table 11.6.11. The uplift factor to be applied is determined by the location, design life and vulnerability classification of the Project.

Table 11.6.11: Recommended climate change allowance for peak river flows

Applies to the Mole Catchment	Total potential change anticipated for 2020s (up to 2039)	Total potential change anticipated for 2050s (2040 to 2069)	Total potential change anticipated for 2080s (2070 to 2125)
Upper End	27%	26%	40%
Higher Central	16%	12%	20%
Central	11%	6%	12%

11.6.127 According to Flood Risk Assessments: Climate Change Allowances guidance (Environment Agency, 2016a), the Higher Central allowance should be used for 'Essential Infrastructure' in Flood Zone 2 and 3.

11.6.128 The assessment was undertaken based on a 40-year lifetime for the airfield elements of the Project (up to 2069). It is considered that a longer design life would not be realistic given it is likely there will be further significant changes to the Airport in that timescale. Gatwick has changed considerably during the past 40 years and that is anticipated to continue. Assessment of climate change allowances over a longer design life is therefore considered disproportionate. An allowance of 12 per cent has therefore been applied to incorporate the predicted impact of climate change for the design event peak river flow (see Table 11.6.11).

11.6.129 The highways improvements are considered to have a longer lifetime of 100 years (up to 2132), given the nature of highways design and duration, therefore a climate change allowance of 20 per cent has been adopted for peak river flow for these elements to assess the impact from and to

fluvial flood risk. The twin approach has been confirmed in discussions between GAL and the Environment Agency.

11.6.130 As the Project is classified as an NSIP, the impact of a more extreme increase in predicted peak river flow due to climate change is required, referred to as a 'Credible Maximum Scenario'. A sensitivity test has therefore been undertaken on the Project assessing the impact of the upper end allowance for peak river flow of 40 per cent.

11.6.131 The allowances for peak rainfall intensity were published by the Environment Agency in May 2022 to reflect UKCP18 data. Table 11.6.12 indicates the recommended uplift factors for the Mole Management Catchment, in line with the current Environment Agency climate change allowances. The uplift factor to be applied is determined by the location, rainfall event, design life and vulnerability classification of the Project.

Table 11.6.12: Total potential change of peak rainfall intensity anticipated for 2010 to 2125 for the 1% AEP Rainfall Event

Applies to Mole Catchment	Total potential change anticipated for 2050s (up to 2069)	Total potential change anticipated for 2070s (2061 to 2125)
Upper End	40%	40%
Central	20%	25%

11.6.132 As the adopted lifetime of the surface access works is 100 years (up to 2132), the Flood Risk Assessments: Climate Change Allowances guidance (Environment Agency, 2016a), and outlined in Table 11.6.12, states the 'Upper End' allowance of plus 40 per cent for the 2070s epoch (2061 to 2125) should be adopted for the highways surface water drainage design for the 1 per cent (1 in 100) AEP event.

11.6.133 As outlined in Table 11.6.12 and given the adopted lifetime for the airfield works of 40 years (up to 2069), the airfield surface water drainage design has adopted the 'Central' allowance of plus 25 per cent for the 2070s epoch (2061 to 2125) in accordance with Flood Risk Assessments: Climate Change Allowances guidance (Environment Agency, 2016a) for the 1 per cent (1 in 100) AEP event.

11.6.134 The 40 per cent intensity has also been tested as a credible maximum scenario (as a sensitivity analysis) for the airfield drainage, in order to test the impact of a larger potential change as a result of climate change.

Water Infrastructure

Wastewater

11.6.135 No changes to the baseline are expected: the airport wastewater sewer network itself is not expected to change. However, regional growth and climate change pressures on the downstream public wastewater collection and conveyance facilities may result in changes implemented by Thames Water. This will be considered by Thames Water in its Development Impact Assessment.

Water Supply

11.6.136 During the period to 2038, Pier 7 works will be completed, increasing water consumption by an additional 369 Megalitres per year. This increased total on-site consumption to a total demand for

this period of 1,315 Megalitres per year. This calculation does not include for any water efficiencies or water recycling that would reduce consumption per passenger.

Highways Assessment Year: 2047

Surface Water

Geomorphology

11.6.137 It is anticipated that the future baseline for the Assessment Year 2047 would reflect the changes described in the Design Year 2038, including further evolution due to climate change, natural adjustment and meeting the policy objectives in the Thames RBMP.

WFD Regulations Compliance Assessment

11.6.138 The Thames RBMP provides details of the anticipated ecological status (which is partly dependent on stream morphology) for the WFD Regulations water bodies within the study area by 2027 (Defra, 2015). Of note are the following measures which could lead to improvement in individual quality elements: tackling non-native species, removal of fish barriers, and restoration of more natural morphology where man-made modifications exist.

Water Quality – Highways Improvements and Car Parks

11.6.139 It is anticipated that airport growth and any effects from climate change would not have a significant effect on water quality when compared to the baseline assessment, for the same reasons outlined above for the initial construction period (2024-29) and the opening year (2029). Any potential changes to the baseline for the 2047 highways assessment year have been assessed through the use of HEWRAT for the operational period of the project.

Water Quality – De-icer

11.6.140 It is anticipated that the future baseline for the Assessment Year 2047 would reflect the changes as described in the Design Year 2038.

Groundwater

11.6.141 It is anticipated that airport growth and any effects from climate change would not have a significant effect on surface water drainage when compared to the baseline assessment, for the same reasons outlined above for the initial construction period (2024-29) and the opening year (2029). Any potential changes to the baseline for the 2047 highways assessment year have been assessed through the use of HEWRAT for the operational period of the Project.

Flood Risk and Surface Water Drainage

11.6.142 It is anticipated that the future baseline for the Assessment Year 2047 would reflect the changes to flood risk due to climate change as described in the Design Year 2038.

Water Infrastructure

Wastewater

11.6.143 No changes to the baseline are expected: the airport wastewater sewer network itself is not expected to change. Climate change impacts will increase the risk of flooding within the Gatwick wastewater network. Also, regional growth and climate change pressures on the downstream

public wastewater collection and conveyance facilities may result in changes implemented by Thames Water. This will be considered by Thames Water in its Development Impact Assessment.

Water Supply

11.6.144 It is anticipated that the future baseline for the Assessment Year 2047 would reflect the increase in predicted passenger numbers and associated demand and will not have any significant adverse impact on water supply and the source. This will be considered by SESW in water resource plans to ensure water demand is met.

11.7 Key Aspects of the Project

11.7.1 The assessment has been based on the maximum design scenarios identified within **ES Chapter 5: Project Description** (Doc Ref. 5.1).

Table 11.7.1 identifies the maximum design scenarios relevant to this assessment. The maximum design scenario selected is the one having the potential to result in the greatest effect on an identified receptor or receptor group. Effects of greater adverse significance are not predicted to arise should any other option identified in **ES Chapter 5: Project Description** (Doc Ref. 5.1) be taken forward in the final design of the Project.

Table 11.7.1: Maximum Design Scenarios

Element	Potential Impact	Maximum Design Scenario	Justification
Initial Construction Period: 2024-2029			
Surface Water - Geomorphology	Damage to River Mole banks and watercourse due to construction activities associated with River Mole renaturalised channel. Extended River Mole channel downstream of existing runway culvert	Creation of renaturalised channel on floodplain adjacent to existing channel, creating approximately an additional 300m channel length. 26m of daylighted channel on the River Mole.	Works being undertaken within existing River Mole corridor to complete the renaturalised channel and accommodate taxiway realignment.
Surface Water -Water Quality – Highways Improvements and Car Parks	Potential for pollutants to enter watercourses through construction related activities, routine runoff and spillage risk during operation.	Construction related activities taking place in close proximity to watercourses. Pollutants entering the watercourses as a result of routine runoff and spillage during operation of the highway.	Environmental assessment for potential construction and operational effects are no greater than slight adverse.
Surface Water – Water Quality – De-icer	Impact of additional treated de-icer contaminated runoff on river quality in the River Mole.	2017/18 environmental conditions, with pavement de-icer uplifted by percentage increase in impermeable area, and	This scenario could cause additional de-icer contaminated runoff to be discharged to the

Element	Potential Impact	Maximum Design Scenario	Justification
		ATMs increased to forecast winter ATMs and associated code shift.	River Mole if mitigation was not provided.
Groundwater	Dewatering (groundwater flow, levels, settlement, 11-87pprox.11-8711-87ion of contaminants). Diversion of groundwater flow. Groundwater flood risk to buried structures/ services. Piling introducing contaminants or creating contaminant pathways. Spillage at surface impacting the quality of groundwater resources.	Approximate depths of excavations: ▪ Museum Field FCA: 2.6 m, ▪ Car Park X FCA: 2 m, ▪ Car Park Y (drainage attenuation storage) 10 m, ▪ fire training ground: 5 m, ▪ new pumping stations: up to 10 m, ▪ substations: up to 3 m; CARE, motor transport and surface transport facilities: 5 m, ▪ coaching gates: 10 m, ▪ wastewater treatment works: 3 m, ▪ surface access works attenuation ponds: 2.5 m, ▪ Syphons below noise mitigation feature and runways: 5 m. Below ground works or surface works may impact recharge/ groundwater quality.	These activities would impact on groundwater flow and levels and groundwater quality. Flood risk, surface water and geomorphology elements unaffected.

Element	Potential Impact	Maximum Design Scenario	Justification
Flood Risk and Surface Water Drainage	Increased flood risk due to loss of floodplain storage, increased impermeable area and temporary structures in or near watercourses. Increase in impermeable area increasing risk of surface water flooding.	Proposed Construction related temporary haul road crossing the River Mole, involving the alteration of floodplain adjacent to the watercourse. Juliet West Taxiway and End Around Taxiways encroaching into floodplain (refer to **ES Chapter 5: Project Description** (Doc Ref. 5.1)).	This scenario would reduce floodplain storage and increase the rate and volume of runoff if no mitigation was in place (long-term impact for taxiways).
Water Infrastructure – Wastewater	Flooding arising from increased flows in the wastewater network exceeding capacity, potentially disrupting airport operations, particularly in and around the terminal buildings.	Peak wastewater flow discharges from passengers, construction workers and other airport related flows on the busiest day of the assessment year which constitutes the highest combined impact of normal airport flows coincident with construction activities, where this coincides with a 3.3% (1 in 30) AEP storm event.	This scenario is a common standard for urban drainage systems.
Water Infrastructure – Water Supply	Increase in demand from construction activities. This could impact the water source upstream.	The maximum design scenario considered is for construction activities occurring within the construction period by year, in addition to the future baseline forecast passenger demand increase.	Based on Project peak construction water demand.
First Full Year of Opening: 2029			
Surface Water - Geomorphology	See Initial Construction Period: 2024-2029 potential impacts. Not worse than construction period.	Construction related activities taking place in close proximity to watercourses.	Environmental assessment for potential construction and operational effects are no greater than slight adverse.

Element	Potential Impact	Maximum Design Scenario	Justification
Surface Water -Water Quality – Highways Improvements and Car Parks	Pollutants entering watercourses through construction activities and routine runoff and spillage risk during operation.	Construction related activities taking place in close proximity to watercourses. Pollutants entering the watercourses as a result of routine runoff and spillage during operation of the highway.	Environmental assessment for potential construction and operational effects are no greater than slight adverse.
Surface Water – Water Quality – De-icer	Discharge of diluted untreated de-icer to the River Mole from Pond D upper.	2017/18 environmental conditions, with pavement de-icer uplifted by percentage increase in impermeable area, and ATMs increased to forecast winter ATMs and associated code shift.	The worst-case design scenario has been assessed as being design year 2038. Assuming the 2017/18 weather conditions, maximum pavement area and maximum ATMs, no operational improvements in de-icer application and no change to treatment infrastructure is the maximum design scenario. No interim design scenario could have a greater impact on the environment.
Groundwater	See Initial Construction Period: 2024-2029 potential impacts.	Not greater than Initial Construction Period. Ongoing construction works include Hangar 7, Car Park Y (hotel and car park), surface access works, pumping stations, substations and CARE.	Similar to the Initial Construction Period (2024 to 2029) ongoing activities would impact on groundwater flow and levels and groundwater quality.
Flood Risk and Surface Water Drainage	Proposed highways access works encroaching into floodplain (refer to Chapter 5: Project Description).	This scenario would reduce floodplain storage, if no mitigation was in place (long-term impact for access works).	Increased flood risk due to loss of floodplain storage.

Element	Potential Impact	Maximum Design Scenario	Justification
Water Infrastructure – Wastewater	Flooding arising from increased flows in the wastewater network exceeding capacity. Potentially disrupting airport operations, particularly in and around the terminal buildings.	The maximum design scenario considered is for peak wastewater discharges on the busiest day of the assessment year for which the peak day passenger numbers are expected by GAL to increase by approximately 6 per cent from the 2029 baseline, where this coincides with a 3.3 per cent (1 in 30) AEP storm event.	This scenario is a common standard for urban drainage systems.
Water Infrastructure – Water Supply	Ongoing construction activities will have an impact on water supply due to the increase in demand.	The maximum design scenario considered is for construction activities occurring throughout the year, in addition to the Baseline demand.	This scenario would represent the maximum demand for water supply.
Interim Assessment Year: 2032			
Surface Water - Geomorphology	See Initial Construction Period: 2024-2029 potential impacts. Not worse than construction period.	Construction related activities taking place in close proximity to watercourses.	Environmental assessment for potential construction and operational effects are no greater than slight adverse.
Surface Water -Water Quality – Highways Improvements and Car Parks	The Project is assumed to be in place for this element.		
Surface Water – Water Quality – De-icer	Impact of additional treated de-icer contaminated runoff on river quality in the River Mole.	2017/18 environmental conditions, with pavement de-icer uplifted by percentage increase in impermeable area, and ATMs increased to forecast winter ATMs and associated code shift.	The worst-case design scenario has been assessed as being design year 2038. Assuming the 2017/18 weather conditions, maximum pavement area and maximum ATMs, no operational improvements in de-

Element	Potential Impact	Maximum Design Scenario	Justification
			icer application and no change to treatment infrastructure is the maximum design scenario. No interim design scenario could have a greater impact on the environment.
Groundwater	Dewatering (groundwater flow, levels, settlement, 11-91pprox.11-9111-91ion of contaminants). Diversion of groundwater flow. Groundwater flood risk to buried structures/ services. Spillage at surface impacting the quality of groundwater resources.	Construction works ongoing in this period include Pier 7 and new hangar. Approximate depth of excavation for new hangar: 10 m. Below ground works or surface works may impact recharge/ groundwater quality.	These activities would impact on groundwater levels and flow and groundwater quality.
Flood Risk and Surface Water Drainage	Proposed highways access works encroaching into floodplain (refer to Chapter 5: Project Description).	This scenario would reduce floodplain storage, if no mitigation was in place (long-term impact for access works).	Increased flood risk due to loss of floodplain storage.
Water Infrastructure – Wastewater	Flooding arising from increased flows in the wastewater network exceeding capacity. Potentially disrupting airport operations, particularly in and around the terminal buildings.	The maximum design scenario considered is for peak wastewater flow discharges on the busiest day of the assessment year for which the peak day passenger numbers are expected by GAL to increase by approximately 19 per cent from the 2032 baseline, where this coincides with a 3.3 per cent (1 in 30) AEP storm event.	This scenario is a common standard for urban drainage systems.
Water Infrastructure – Water Supply	The potential impact on the water supply system is an increase in demand from	The maximum design scenario considered is for construction activities	This scenario would represent the

Element	Potential Impact	Maximum Design Scenario	Justification
	ongoing construction activities and from the extensions to the North and South Terminals.	occurring throughout the assessment year, in addition to the forecast existing passenger demand increase.	maximum demand for water supply.
Design Year: 2038			
All aspects	The assessment assumes the completed Project is in place.		
Design Year: 2047			
All aspects	The assessment assumes the completed Project is in place.		

11.7.2 The following sections provide a high-level overview of the Project in a water environment context. These works are described with the potential effects they would have if unmitigated. The works are also identified associated with embedded mitigations (e.g. FCA) which themselves could have associated effects on the water environment.

Alterations to the Existing Northern Runway, Taxiways and Holding Areas

11.7.3 The existing northern runway would be adjusted to reposition the centreline 12 metres further north. There would be a number of associated works to taxiways that would require the construction of new areas of hardstanding. Redundant areas would be broken out and removed. This would result in an increase in impermeable area and consequently surface water runoff volume (including potentially polluted runoff). It would also encroach into the existing floodplain and disconnect areas that currently flood from the floodplain. The increased impermeable area could increase the area to receive application of pavement de-icer potentially increasing the load reaching the drainage network.

Pier and Stand Amendments

11.7.4 A new Pier 7 is proposed to the northwest of Pier 6, adjacent to the existing cargo facility covering approximately 10.1 hectares. It is not anticipated this would have a significant impact on the water environment as it would be constructed on existing impermeable areas, connect into existing drainage infrastructure and would not therefore affect existing runoff and drainage patterns.

11.7.5 There would be a series of modifications to existing stand provision across the airfield that would have the potential to alter the distribution of runoff and the use of de-icer which could affect water quality if unmitigated. However, all runoff would continue to drain to the existing airfield ponds.

Reconfiguration of Existing Airport Facilities

11.7.6 A number of existing facilities would require reconfiguration, relocation or additional facilities to be provided, to accommodate the proposed changes to the airport, including CARE, cargo, the fire training ground, hangars, noise mitigation (e.g. walls and bunding) and internal access routes and forecourts. These elements have the potential to redistribute and increase runoff across the airfield, however, runoff would continue to drain to existing ponds. The noise mitigation measures could sever or remove existing floodplain.

Hotel and Commercial Facilities

11.7.7 An increase in passenger and aircraft operations would require additional office and hotel provision to meet the needs of airport companies and passengers. Provision of new office space could provide for up to three new office blocks, each office building having a footprint of approximately 1,024m^2. Three new hotels are proposed as part of the Project. The office and hotel elements could affect water infrastructure requiring the provision of additional water supply and an increase in wastewater flows. These developments would be undertaken on existing impermeable areas and would therefore not affect flood risk and drainage.

Main Contractor Compound (MA1)

11.7.8 The main compound would be used from 2024 to 2035. It is anticipated to support approximately 700 construction workers. It would be a securely fenced compound in an area west of the perimeter road on an area of hardstanding currently occupied by car parking. This could increase runoff to the drainage system and increase the risk of pollution to the water environment. The workers would increase demand on water supply sources and the wastewater network.

Airfield Satellite Contractor Compound

11.7.9 The satellite compound would be used from 2024 to 2034. It is anticipated to support approximately 370 construction workers. This would be a securely fenced compound anticipated to be to the west of Taxiway Uniform and south of the Boeing hangar currently comprising a construction compound for the Boeing hangar, grassland, a reed bed and a hedgerow. Parts of this compound would be within the existing River Mole floodplain. The compound could increase runoff through ground compaction and provision of impermeable surfaces. The additional worker numbers would increase demand on water supply sources and the wastewater network.

Surface Access Satellite Contractor Compound, South Terminal

11.7.10 The compound would support approximately 254 construction workers and would be used from 2028 to 2032. It would be a securely fenced compound of approximately 2 hectares of greenfield land located to the north of the South Terminal roundabout and Airport Way. The compound could increase runoff compared to the baseline situation that would need to be managed to prevent an increase to flood risk. It could also introduce the risk of pollution to the receiving watercourse(s) or sewers. The additional worker numbers would increase demand on water supply sources and the wastewater network.

Pentagon Field

11.7.11 Approximately 100,000m^3 of inert spoil arising from the Project construction works is to be placed and landscaped at Pentagon Field; an area of farmland to the east of the airfield. The northern edge of the field is at risk of surface water flooding based on the RoFSW mapping. Overall the spoil would be placed to ensure no change in surface water flow direction.

Car Parking

11.7.12 New car parking would be required on site in order to meet additional demand generated by the proposed increase in passengers, and to replace existing parking spaces that would be lost due to development associated with the Project. New car parking would be provided at North Terminal Long Stay, Multi-storey car parks J, Y and H. Excavations for new car parks could affect

groundwater resources. Without mitigation the additional car parks could increase the risk of pollutants (typically hydrocarbons and heavy metals) entering the surface water drainage network and then receiving watercourses.

Surface Access Improvements

11.7.13 In order to accommodate the proposed increase in passenger numbers and taking into account other known and planned developments in the area, improvements are likely to be required to the South Terminal, North Terminal and Longbridge roundabouts and to add capacity and will include increasing the number of lanes on the A23 and M23 spur plus grade separated junctions. This could be detrimental to the water environment by increasing flood risk due to encroachment into the floodplain and increased runoff, it could be potentially detrimental to water quality by increasing the discharge of pollutants to receiving watercourses and the modifications to the existing London Road and Brighton Road bridges over the River Mole could affect geomorphology.

11.7.14 During construction piling activities could affect groundwater resources. Temporary services, pedestrian and vehicle watercourse crossings could potentially increase flood risk on the River Mole.

11.7.15 Proposed surface access improvement works would include widening of the existing Airport Way embankment southwards. This would encroach onto the footprint of Pond F by approximately 1400m^2. This has been found to have no impact on the surface water drainage network as reported in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).

11.7.16 Other surface access improvements: rail and Inter-Terminal Transit System (ITTS), are not anticipated to affect the water environment as their development would not interact with the water environment during the operational period of the Project. Construction period impacts are considered in Section 11.9.

CARE Facility

11.7.17 Construction of the new CARE facility would require the breakout and removal of existing car park hardstanding, removal of existing greenfield areas of trees and potentially hedgerows. This would result in an increase in impermeable area and consequently runoff to the drainage network. Below ground works could impact on groundwater.

Noise Mitigation Feature

11.7.18 Reshaping and relocation of the existing noise mitigation feature between 2024 to 2026 would involve the clearance of the young woodland planting which currently covers the feature. A new noise mitigation feature would be constructed adjacent to Lowfield Heath Road that would consist of a combination of a wall and earth bund. This could cause localised changes to surface water flows and fluvial flood extents. Below ground works could impact on groundwater. The noise mitigation feature would intercept an overland flood flow path from the Mann's Brook and therefore would include syphons to maintain floodplain connectivity.

Fire Training Ground

11.7.19 The fire training ground would be consolidated and re-provided immediately to the north of its current location. This could change the runoff pathway of potentially polluted water. Below ground works could impact on groundwater.

North Terminal Extension and Forecourt

11.7.20 The main improvements to the North Terminal would include an extension of the departure lounge, an extension of the baggage hall and an extension of baggage reclaim. Small amounts of hard and soft landscaping would be removed within the forecourt area and re-provided. The increase in passenger numbers that this allows would increase water supply requirements and wastewater produced. It would also increase impermeable area and consequently runoff.

South Terminal Extension and Forecourt

11.7.21 Construction and operation of a terminal building extension, including a two-storey autonomous vehicle transition space to Pier 7. This would result in increased passenger numbers and consequently water supply requirements and wastewater produced. It would also increase impermeable area and consequently runoff.

Offices at South Terminal

11.7.22 Construction and operation of two office blocks in Car Park H east of South Terminal and the Hilton Hotel could increase water demand and wastewater flows.

Fluvial Flood Risk Mitigation Measures

11.7.23 A number of mitigation measures are embedded into the Project to meet national planning policy to ensure no increase in fluvial flood risk to other parties. Details of these measures are included in Table 11.8.1 and the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3), but include:

- Museum Field floodplain compensation area (FCA);
- realignment and naturalisation of the River Mole downstream (north) of the northern runway;
- Car Park X FCA;
- two syphons beneath taxiway Yankee and the western end-around taxiway to maintain floodplain connectivity;
- six syphons beneath the northwest noise mitigation feature to maintain floodplain connectivity; and
- six culverts beneath the active travel path associated with surface access works between Car Park Y and the A23

Surface Water Drainage Flood Risk Mitigation Measures

11.7.24 A number of mitigation measures are embedded into the Project to meet national planning policy to ensure no increase in surface water flood risk to other parties, and to reduce the risk of flooding to assets at Gatwick. Details of these measures are included in Table 11.8.1 and the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3), but include:

- attenuation storage in a new facility at Car Park Y to reduce risk of surface water flooding to the North Terminal;
- attenuation storage within the airfield surface water drainage network; and
- a new surface water attenuation feature and pumping station to mitigate the additional hard standing being created in the Pond A Catchment and mitigate for the removal of Pond A.

11.7.25 The highways improvements include a number of features including ponds, swales and tanks to store and attenuate the increased runoff from the highway as a result of the increased impermeable area. The measures will ensure no increase in flood risk to other parties. Further details are included in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).

Water quality – De-icer Mitigation Measures

11.7.26 A new de-icer contaminated runoff treatment system would be constructed adjacent to the long-term storage lagoons. This treatment will treat up to 100l/s and the treated effluent will be of sufficient quality to improve the quality in the Gatwick Stream or be of sufficient quality to be reused by Gatwick.

11.8 Mitigation and Enhancement Measures Adopted as Part of the Project

11.8.1 A number of measures have been designed into the Project to reduce the potential for impacts on the water environment. These are listed in Table 11.8.1. Also, measures to mitigate construction effects are outlined in paragraph 11.8.6.

Access Bridges over Man's Brook

11.8.2 Two farm access bridges over Man's Brook, upstream of the airfield, proposed to allow landside maintenance in the locations shown on **ES Figure 11.7.1** (Doc Ref. 5.2). Both bridges will be clear span crossings with no bed or bank reinforcement or support within the watercourse channel. The crossings would be approximately 4.2 metres in width and would require clearance of approximately 1 metre either side of the bridges to enable installation and would require minor modification of the adjacent floodplain to accommodate the approach ramps, but where possible, existing ground levels will be the same.

Widening of Larkins Road

11.8.3 The existing Larkins Road within the airport boundary would require realignment to accommodate the extension to Taxiway Lima. The realigned route (shown in **ES Figure 11.7.1** (Doc Ref. 5.2) in purple (designated as surface access works) allowing a 9.3 metre wide road with 5 metres buffer on either side (except for the area to the south of Pond M between Brockley Wood and Hangar 11) and would remain within the existing airport boundary.

Aquatic Ecology Improvement Measures

11.8.4 A small weir (300mm high) is proposed to the River Mole across the southern (upstream) face of the east box of the culvert that conveys the river beneath the runways (see **ES Figure 11.7.1** (Doc Ref. 5.2)). The intention would be to concentrate flows into the west box to improve fish passage during periods of low flow.

Table 11.8.1: Mitigation, Monitoring and Enhancement Measures

Measures Adopted as Part of the Project	Justification	How secured
Mitigation		
Provision of compensatory flood storage	Floodplain storage would be lost due to ground raising for Project elements within the floodplain. Provision has been made to introduce new FCA as close as possible to areas where floodplain storage would be lost. These include Museum Field FCA connected to the River Mole via a spillway and a FCA at the existing Car Park X. The FCA would include measures to reduce its own impact: ▪ Fish refuges. For example, low points within the FCA could be connected to the watercourse by swales to encourage any fish that move with rising flood water to return to the river as flood waters recede. ▪ Design flow control structure to reduce water levels behind the embankment slowly. (If the water level receded rapidly fish are more likely to be stranded.) ▪ Loss of aquatic habitat for fish should be mitigated by in-channel habitat elsewhere.	Flood Compensation Delivery Plan secured as a DCO requirement in Schedule 2 of the **Draft Development Consent Order** (Doc Ref 2.1). Flood risk activity Permit in **List of Other Consents and Licences** (Doc Ref. 7.5)
Additional attenuation storage within the existing airfield surface water drainage network	The Project would result in an increase in impermeable area across the airfield. Pond A would be removed by the Project to accommodate the relocated northern runway and taxiway Juliet. The additional runoff and the attenuation volume lost by the removal of Pond A needs to be compensated for elsewhere to ensure no increase in flood risk. The Project includes a number of storage features within the drainage network, including below Car Park Y (see **ES Figure 11.8.1** (Doc Ref. 5.2), Table 7.3.1 of the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3)). Additionally a new pumping facility at Pond A will ensure that there is no additional discharge from the Pond A drainage catchment to the River Mole.	Design Principles secured in **Design and Access Statement** (Doc Ref. 7.3) Environmental Permitting in **List of Other Consents and Licences** (Doc Ref. 7.5)
Realignment of the River Mole	The relocation of the northern runway and Juliet Taxiway requires the realignment of the River Mole. This would include the general enhancement of the River Mole channel area to increase its capacity. The existing River Mole culvert and syphon outfall structures would be extended as part of this work.	**ES Appendix 8.8.1: Outline Landscape and Ecology Management Plan** (Doc Ref. 5.3)

Measures Adopted as Part of the Project	Justification	How secured
New section of River Mole channel at existing runway culvert exit	The Project affects existing culverted watercourses. The move northwards of the Juliet Taxiway would require an extension of the existing River Mole culvert beneath the runways, however, this has been avoided by means of providing an expanded metal grid at ground level from where the River Mole channel runs below the Juliet taxiway strip to the landside perimeter track. This new section of channel will also include a low flow channel, planting to soften the sides of the new channel (including in-channel protection measures to retain vegetation during high flows), a bed with substrate to allow vegetation to establish and a fish resting pool at the downstream end of the new channel. These measures should improve fish passage through the culvert.	Design Principles secured in **Design and Access Statement** (Doc Ref. 7.3)
Burstow Stream Tributary culvert design	An extension to the existing culvert on the Burstow Stream Tributary due to the enhancements of M23 spur is unavoidable. This has been designed to be as short as possible.	Design Principles secured in **Design and Access Statement** (Doc Ref. 7.3)
Provision for new airfield syphons	Where proposed taxiways would bisect parts of floodplain areas, areas of floodplain would be disconnected. Two syphon connections are proposed to retain floodplain connection on both sides of the taxiway.	Design Principles secured in **Design and Access Statement** (Doc Ref. 7.3)
Provision for new noise mitigation feature syphons	The north-west noise mitigation feature would be formed of a combination of noise wall and earth embankment and would block a predicted overland flood flow path from the Man's Brook into the airfield. The bisection of the flow path could increase flood risk off-site without mitigation. Syphons would be installed beneath the noise mitigation feature to maintain floodplain connectivity.	Design Principles secured in **Design and Access Statement** (Doc Ref. 7.3)
Surface access improvements drainage strategy	The surface access improvements proposed as part of the Project would result in additional surface water runoff due to the introduction of additional impermeable area. As part of these works, it is proposed that a drainage network would be installed, consisting of carrier drains, filter drains, ditches and attenuation ponds, along with flow control arrangements to limit discharges to watercourses. Therefore, surface water runoff would be restricted to pre-development values, and where possible, greenfield rates.	**ES Appendix 11.9.6 Flood Risk Assessment - Annex 2** (Doc Ref. 5.3) Design Principles secured in **Design and Access**

Measures Adopted as Part of the Project	Justification	How secured
	This would ensure no increase in flood risk as a result of these works. Drainage requirements will also consider no detriment to the water quality of the receiving watercourses.	**Statement** (Doc Ref. 7.3)
Additional de-icer treatment from Long Term Storage Lagoons	A proposed water treatment works will be constructed before the first year of full operation. This treatment system would extract 100l/s from the long- term storage lagoons. The treatment system will either treat the stored contaminated runoff to a quality sufficient to be discharged to the Gatwick Stream, or at a quality sufficient to be reused as potable or non-potable water within the airport. This treatment works is assumed to typically operate for a 6-month period over the winter months during the typical period of de-icer use which would be equivalent to the provision of an additional 1,576,800m^3 of storage based on the treated volume over such a time period, compared to the baseline provision of 350,000m^3 storage in the long term storage lagoons. The treatment works could also reduce the discharge from the pollution storage lagoons into Crawley STW. A schematic of the proposed contaminated water path for the airfield is included as **ES Figure 11.8.1** (Doc Ref. 5.2). The works would require a new Environmental Permit for discharge and a Flood Risk Activity Permit from the Environment Agency.	Design Principles secured in **Design and Access Statement** (Doc Ref. 7.3) Environmental Permitting in **List of Other Consents and Licences** (Doc Ref. 7.5)
Wastewater System Capacity Upgrades	The potential impact on the wastewater sewer system is flooding arising from increased flows in the network exceeding the available capacity. This could disrupt airport operations, particularly in and around the terminal buildings. Improvements to the wastewater sewer system as part of the Project would include the following: ▪ replacement of pumps and pumping main at pumping station PS06 to provide additional capacity; and ▪ construction of a new pumping station on the east side of the Brighton-London mainline railway to convey all wastewater flows from this area to Crawley STW to relieve the gravity outfall pipe discharging to Thames Water's Horley STW sewer network. The configuration of the 11-99pprox.11-99ter system with the Project is shown on **ES Figure 11.8.2** (Doc Ref. 5.2).	Design Principles secured in **Design and Access Statement** (Doc Ref. 7.3)

Measures Adopted as Part of the Project	Justification	How secured
Geomorphological mitigation for River Mole renaturalised channel and valley	Realignment and renaturalisation of the River Mole would include geomorphological mitigation in its design. Creation of a more natural planform and a two-stage channel would improve flow regime (not only for the 1% (1 in 100) AEP flow), channel diversity and floodplain coupling. The design would include varied cross sections to mimic natural processes, bed and bank forms, and would be of a suitable bed gradient, sinuosity and appropriate substrate at the realignment in order to maintain sediment transport capability. Suitable substrate would be added to the renaturalised channel following the works.	Design Principles secured in **Design and Access Statement** (Doc Ref. 7.3)
Geomorphological mitigation for FCA	Soft/bio engineering would be used in preference to concrete where natural banks require protection at the connecting spillways to the new FCA. The bank forms would also be varied where they are being altered/lowered to aid natural variance of flow in the channel. Ecological planting would take place on the newly created floodplain compensation areas. This would restore natural vegetation to the floodplain whilst protecting the banks from erosion.	Design Principles secured in **Design and Access Statement** (Doc Ref. 7.3)
Geomorphological mitigation for River Mole channel extension within the Juliet taxiway planform	The daylighted channel on the River Mole culvert would be designed with a depressed invert and a natural bed gradient in order to maintain sediment transport capability. The extension would also be designed with splayed wing walls to reduce the light and dark barrier. There would be inclusion of baffles or a low flow channel to retain sediment and create suitable depth of flow under a range of conditions. The section of the River Mole channel within the Juliet taxiway planform would include a grated cover to create a daylighted culvert to minimize the light and dark barrier.	Design Principles secured in **Design and Access Statement** (Doc Ref. 7.3)
Geomorphological mitigation for Burstow Stream Tributary culvert extension	The Burstow Stream Tributary culvert would be designed with a depressed invert and a natural bed gradient in order to maintain continuity of flow and sediment transport capability. The culvert would also be designed with splayed wing walls to reduce the light and dark barrier.	Design Principles secured in **Design and Access Statement** (Doc Ref. 7.3)
Groundwater mitigation	Additional GI will be undertaken at the detailed design period to further inform the design considerations to ensure both ground and groundwater conditions are taken into account in the detailed design to 11-100pprox.11-100 risk to groundwater quality and to 11-100pprox.11-100 impedance	Design Principles secured in **Design and Access**

Measures Adopted as Part of the Project	Justification	How secured
	to groundwater flow and to 11-101pprox.11-101 risk of groundwater flooding. All foundations at or below structures expected to intercept high groundwater levels and which could form a barrier to groundwater flow would be designed to allow existing groundwater flow paths to function. This would prevent an increase in groundwater flood risk and would protect flood-sensitive receptors elsewhere. This will be achieved during the detailed design stage and using complementary ground investigation results.	**Statement** (Doc Ref. 7.3)
Monitoring		
Water quality monitoring	GAL would continue to monitor the quality of water discharges to ensure compliance with environmental permits post Project. Given the increased de-icer loading, additional water quality monitoring within Gatwick's system would be implemented as part of the overall water quality management system.	Environmental Permitting in **List of Other Consents and Licences** (Doc Ref. 7.5)
Groundwater quality monitoring	Groundwater quality testing to ensure an appropriate water discharge strategy is adopted.	Environmental Permitting in **List of Other Consents and Licences** (Doc Ref. 7.5)
Geomorphological monitoring	Regular monitoring of any change to the channel bed and banks would be undertaken, particularly in the vicinity of the River Mole re-naturalised channel, the Museum Field FCA spillway, car park X outfall, and existing Gatwick Stream outfall, which is connected to the new water treatment works, following completion of the Project. This would be undertaken using fixed point photography. If significant negative change occurs, appropriate mitigation would be implemented. For example, excessive erosion of the bank would require suitable bank protection measures to stabilise the bank. Any monitoring programme developed should have a resolution and timing appropriate to the impacts being monitored. It is recommended that the monitoring is carried out over a period of between 3 to 5 years, and data is collected at intervals of 3 to 6 months, and post-flood events.	**ES Appendix 8.8.1: Outline Landscape and Ecology Management Plan** (Doc Ref. 5.3)

Measures Adopted as Part of the Project	Justification	How secured
Best-practice measures during construction	A number of measures have been set out to in the Water Management Plan mitigate effects on the water environment during construction. See paragraphs 11.8.5 and 11.8.6.	**ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3) **ES Appendix 5.3.2: CoCP Annex 1 – Water Management Plan** (Doc Ref. 5.3)
Enhancement		
Fish passage on River Mole weir	Creation of a fish pass on the weir located immediately upstream of the River Mole runway culvert to improve fish passage particularly during low flow conditions.	Design Principles secured in **Design and Access Statement** (Doc Ref. 7.3)
Weir on River Mole runway culvert	A small weir (300mm high) is proposed to the River Mole across the southern (upstream) face of the east box of the culvert that conveys the river beneath the runways (see **ES Figure 11.7.1** (Doc Ref. 5.2)). The intention would be to concentrate flows into the west box to improve fish passage during periods of low flow	Design Principles secured in **Design and Access Statement** (Doc Ref. 7.3)
All Water Environment disciplines	At this stage, no further specific enhancement measures have been developed as part of the Project. However, the realignment of the River Mole and other flood mitigation measures would provide general enhancement by decreasing off-site flooding. As the Project develops, further opportunities for enhancements will be explored.	Design Principles secured in **Design and Access Statement** (Doc Ref. 7.3)

11.8.5 In addition to the measures identified above, a number of further measures are proposed in order to manage potential impacts associated with construction activities. These will be implemented through the **Code of Construction Practice (CoCP)** in **ES Appendix 5.3.2** (Doc Ref. 5.3). The **Outline Construction Workforce Travel Plan** is provided in **ES Appendix 5.3.2 Annex 2** (Doc Ref. 5.3) and the **Outline Construction Traffic Management Plan** in **ES Appendix 5.3.2 Annex 3** (Doc Ref. 5.3).

11.8.6 For a Project of this scale there are a large number of measures that would be implemented to mitigate effects during construction. These would include measures such as the following:

- Constructing adequate temporary Sustainable Drainage Systems (SuDS) or conventional drainage to contain surface water and silt during the construction period.

- Identifying the location of services before any work commences to avoid any damage during construction.
- Ensuring adequate dewatering takes place during excavation activities or construction of subsurface features and foundations, in line with any permitting requirements.
- Ensuring dewatering does not mobilise existing contamination or lead to settlement or other such effects.
- Piling risk assessment (in accordance with the Environment Agency guidance) including mitigation of risk to controlled waters during piling installation to ensure piling works do not create preferential pathways for contamination.
- Ensuring the drainage system has adequate capacity to store any additional surface water runoff or groundwater required to be pumped out of excavations.
- Implementation of measures to protect groundwater during construction, including good environmental practices.
- Implementation of water efficiency measures to minimise additional water use, such as pressure management, grey water recycling and rainwater harvesting, and water efficient controllers on tap and urinals.
- Where river realignment is proposed, construction activities should be planned to ensure no increase in fluvial flood risk, with temporary mitigation provided if required.
- Where the construction of Project elements within the floodplain is proposed, phasing would be developed to ensure adequate mitigation is provided prior to the loss of any floodplain as a result of construction activities, where reasonably practicable. Where this is not practical, ensure temporary floodplain compensation is provided if the construction activities would increase flood risk elsewhere.
- Constructing the River Mole renaturalised channel offline and leave to vegetate over before flow is initiated down the channel. This would reduce the release of fine sediment and the likelihood of any unexpected large-scale channel change.
- Preparing an incident response plan prior to construction. This would be present on site throughout construction, informing all site workers of required actions in the event of a flooding incident.
- Using site materials free of contamination, avoiding any potential contamination of local surface water flow paths.
- Ensuring that wet cement does not come in to contact with surface water or groundwater.
- Measures to control the storage, handling and disposal of potentially polluting substances during construction should be implemented.
- Material stockpiles should be located a reasonable distance away from any watercourses and/or overland flow paths.

11.9 Assessment of Effects

11.9.1 The assessment of effects has been undertaken for each element of the Project. The assessment takes a reasonable worst-case approach considering the completion of construction in 2038, in addition to effects during construction, an interim assessment year and a further assessment year of 2047.

11.9.2 The capacity of the public sewer network to which the private Gatwick wastewater system discharges and the downstream STW is the responsibility of Thames Water under the terms of its license as the statutory authority. Discussions with Thames Water are ongoing to agree the quantity and distribution of discharges from the airport in the future. An assessment will be

required to determine the impact on both the Thames Water sewer network and treatment capacity. It is understood Thames Water will undertake a Development Impact Assessment to confirm whether there will be any impact from the Project. GAL has engaged with Thames Water (including by providing **ES Appendix 11.9.7: Wastewater Assessment** (Doc Ref. 5.3)) to allow Thames Water to assess the impacts to the receiving STW in line with their statutory duties If capacity issues are identified, Thames Water will be responsible for reinforcing their network to support development and they will recoup their costs through infrastructure charges to GAL. The anticipated effect on the Thames Water wastewater infrastructure resulting from the Project is based on the projected increase in wastewater flows pending completion of any mitigation works. This, and the mitigation works required – if any – are to be confirmed by Thames Water. In the event that there is not sufficient capacity or that improvements cannot be made to provide this capacity, an expansion to the existing Crawley STW may be required. This would be undertaken separately by Thames Water. However, an area of land has been identified to allow the expansion on land owned by GAL, should this be required.

Initial Construction Period: 2024-2029

11.9.3 This section sets out effects that are anticipated to occur during the Project initial construction period between 2024 and 2029.

11.9.4 For the purpose of this assessment, the classification of impact magnitude also takes into account impact duration. For the construction period, most impacts are considered to have a 'medium term' duration, defined as a period of more than one year and up to five years.

11.9.5 Mitigation would be implemented through the **ES Appendix 5.3.2: Code of Construction Practice (CoCP)** (Doc Ref. 5.3), and these measures are discussed in Section 11.8. For the construction period, the magnitude of each impact has been determined based on professional judgement and taking account of the proposed mitigation measures, including the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3).

11.9.6 During the initial construction period, works would generally be contained within the existing operational airport boundary (the surface access highways improvements would follow later) with some additional activities taking place beyond the boundary. The latter includes construction of flood mitigation measures and the establishment of construction compounds. In addition, the surface access improvement would begin towards the end of this initial construction period. Within this period the following flood mitigation areas would be constructed:

- removal of Pond A;
- River Mole renaturalised channel;
- Museum Field FCA;
- Car park X FCA; and
- underground surface water storage at car park Y.

Surface Water

Geomorphology

11.9.7 General airfield construction activities have the potential to impact geomorphology on all watercourses. These impacts may include the following:

- increase to suspended sediment loads due to channel disturbance from working in the channel, and runoff from construction areas. Impacts to sediment transport and bed substrate downstream;
- increase in potential for erosion of bed and banks due to excavation and earthworks, and removal of riparian vegetation;
- loss of and damage to riparian vegetation due to vegetation clearance; and
- disruption of quantity and dynamics of flow and sediment supply, due to changes in bed and bank form.

11.9.8 Best practice measures to mitigate the construction impacts (secured as **Code of Construction Practice in ES Appendix 5.3.2** (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1)) would substantially control these impacts. The duration of these impacts would be medium term and the magnitude of the impact on Gatwick Stream (high sensitivity), River Mole (high sensitivity), Crawter's Brook (high sensitivity), and Burstow Stream Tributary (low sensitivity) would be negligible adverse. This would result in a **minor adverse** effect for Gatwick Stream, River Mole, Crawter's Brook, and a **negligible** effect for Burstow Stream tributary). This is not considered to be environmentally significant.

11.9.9 The diversion of the River Mole into a new naturalised river valley would begin in 2024. This would require excavation and earthworks along a 417 m length in the floodplain adjacent to the existing channel. The existing channel would be infilled along this section, and the upstream and downstream of the renaturalised channel would be reconnected to the main watercourse. These activities may impact the existing watercourse through:

- destabilisation of banks due to bank top loading and ground vibration;
- damage to bank face due to modification and removal of bank material;
- destabilisation of banks due to vegetation clearance, as vegetation binds the bank material and draws water;
- disruption of quantity and dynamics of flow and sediment supply, due to changes in bed and bank form, channel planform, cross-section and gradients, as the channel adjusts; and
- loss of existing bed forms and sediment, due to infilling of the original channel.

11.9.10 Best practice measures secured in **ES Appendix 8.8.1: Outline Landscape and Ecology Management Plan** (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1) and the offline construction of the River Mole renaturalised channel would reduce the release of fine sediments and the likelihood of any unexpected large-scale change. Given the range of potential impacts, the length of the channel potentially impacted and the temporary nature of the impacts, the magnitude of the impact is considered low adverse on a high sensitivity receptor, resulting in a **minor adverse** effect, which is not considered environmentally significant.

11.9.11 The River Mole renaturalisation and provision of the floodplain compensation area, which involves the lowering of ground levels are considered to provide the most detrimental impacts to the water bodies, mainly for their effects on habitat and fish during construction. During construction of the River Mole denaturalised channel, the magnitude would be considered low adverse in terms of water quality/ elements on a receptor of high sensitivity. This would result in a **minor adverse** effect during this period which would not be environmentally significant.

11.9.12 Construction of the existing culvert exit modifications, implementation of the daylighted channel, and the re-provisioning of the syphon to the north of the northern runway, would have the permanent effect of loss of existing bed and bank form, material, and riparian vegetation. This

could result in localised disruption of quantity and dynamics of flow and sediment supply. The length of the River Mole culvert daylighted channel is approximately 26m. The mitigation secured as **Code of Construction Practice in ES Appendix 5.3.2** (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1) reduces the impact by re-establishment of riparian vegetation and minimising the area impacted. The area potentially impacted would also be relatively small, and part of the existing culvert would be replaced. There is the potential to increase suspended sediment loads due to channel disturbance from working in the channel. This would have a localised impact on the geomorphology of the channel due to the mitigation secured as **Code of Construction Practice in ES Appendix 5.3.2** (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1) that will be put in place to reduce these impacts. For example, phased vegetation clearance to minimise the areas of exposed ground and reduce the potential risk for runoff, and stabilisation by seeding with grass, using geotextile covers or other suitable means. The magnitude of the impact would be negligible adverse resulting in a **minor adverse** effect which is not considered environmentally significant.

11.9.13 A small weir (300mm high) is proposed to the River Mole across the southern face of the east box of the culvert that conveys the river beneath the runways. Construction of the weir would require in-channel works on the bed and banks at the watercourse confluence between Crawter's Brook and the River Mole. The bed and banks at this location are lined with concrete and no bed features are present. There is the potential for localised, temporary disruption of quantity and dynamics of flow and sediment during construction at both the upstream and downstream of the proposed weir due to the in-channel works and change to the cross-sectional form of the watercourse. The effects are localised and temporary, and mitigation (secured as Design Principles in **Design and Access Statement** (Doc Ref. 7.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1)) following best practice measures would minimise adverse effects. The magnitude of the impact would be low adverse resulting in a **minor adverse** effect which is not considered environmentally significant.

11.9.14 The works to create the Museum Field FCA would involve lowering the existing ground level by up to approximately 2.6 metres (this is the maximum excavation depth as existing ground levels vary), excavating between 80,000 to 88,000m^3 of material. The FCA would connect to the River Mole via a swale spillway which would involve lowering the watercourse bank up to 10 metres length. Impacts on the River Mole (high sensitivity) could include sediment pollution and a change in bed form. However, with the implementation of the best practice measures secured as **Code of Construction Practice in ES Appendix 5.3.2** (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1), the magnitude of the impact is assessed as low adverse resulting in a **minor adverse** effect on the River Mole. This is not considered to be environmentally significant.

11.9.15 Ground lowering and increase of the depth of water in the floodplain in Museum Field FCA would have the effect of increased sediment loading within the River Mole during construction. The effect would be localised as the FCA is set back from the watercourse and implementation of mitigation secured as **Code of Construction Practice in ES Appendix 5.3.2** (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1) reduces would reduce the release of fine sediments entering the channel. Temporary works associated with the FCA would isolate the FCA from the River Mole during construction reducing the risk of the FCA flooding during construction, and the release of fine material into the River Mole. The magnitude of the impact is low adverse, and the significance of the effect is **minor adverse**, which is not environmentally significant.

11.9.16 Construction of a temporary bridge is required over the River Mole at its narrowest point to connect haul road from Museum Field to northwest zone of Airfield. The bridge would span 42m over the watercourse with a width of 7.9 metres and abutment height of 1.3m setback from the bank top. Construction of the bridge would require removal of vegetation from the floodplain; however, the bridge would be elevated over the watercourse so not to interact with the river banks or bed directly. Shading of the river bank and bed by the bridge has the potential to impact existing riparian vegetation, however the road will be in place for one year and the impacts would be localised as the Project element impacts a short length of watercourse and small footprint on the floodplain setback from the bank top. The effects would be temporary with the provision of best practice measures adopted through the mitigation (secured as **Code of Construction Practice in ES Appendix 5.3.2** (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1)), such as reinstatement of vegetation following the works, where required. The magnitude of the impact would be negligible adverse resulting in a **minor adverse** effect which is not considered environmentally significant.

11.9.17 The works to provide the Car Park X FCA, would involve lowering of the car park ground level by up to 2 metres in an area of approximately 28,000m^2. The FCA would connect to the River Mole downstream via an outfall structure, which may take the form of a flapped culvert. Construction of the concrete outfall headwall on the River Mole (high sensitivity) would have the effect of change in bank form, sediment pollution and localised changes to flow and sediment supply and could impact on fluvial processes and geomorphology for this water body. With the implementation of the best practice measures secured as **Code of Construction Practice in ES Appendix 5.3.2** (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1) and given the length of channel impacted would be relatively small, the magnitude of the impact is negligible adverse resulting in a **minor adverse** effect which would not be environmentally significant.

11.9.18 Ground lowering in the Car Park X FCA could have the effect of increased sediment loading within Crawter's Brook (high sensitivity – geomorphology) during construction. There is potential for impacts on sediment variability, floodplain connection, and change to ecological habitat footprints. The measures secured as **Code of Construction Practice in ES Appendix 5.3.2** (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1) would mitigate for increased sediment loading to the channel, and any floodplain/watercourse exchange of physical indicators. The area impacted would be relatively small and set back from the watercourse, therefore the magnitude of the impact is considered to be negligible adverse. This would result in a **minor adverse** effect, which is not environmentally significant.

11.9.19 Construction of new surface access arrangements at Longbridge Roundabout would begin in 2028. The works would involve replacement and widening of the existing A23 Brighton Road bridge over the River Mole (high sensitivity) by an additional 6.4 m and increasing the span by 5 m, development in the floodplain to accommodate widening and modifications to the A23. On the west side of the River (at Gatwick Dairy Farm), the highway is drained to the outfall via a new attenuation basin. The existing outfall will be maintained, but slightly moved north due to proposed earthworks. On the east side of the River (at Church Meadows) attenuation will be via an oversized pipe that would discharge to the River Mole via an existing outfall. There would also be the widening of the existing A23 London Road bridge to the south over the River Mole (high sensitivity). The bridge would be widened by an additional 9.65 m (maximum). These activities may impact the watercourse by disruption of quantity and dynamics of flow and sediment supply. This would occur due to localised damage to the bank face during modification and removal of bank material and riparian vegetation, and temporary release of fine sediments into the

watercourse, including runoff from construction areas. This would have a temporary and localised impact on the geomorphology of negligible adverse magnitude on the channel of the River Mole (high sensitivity) due to the mitigation as **Code of Construction Practice in ES Appendix 5.3.2** (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1) that would be put in place. The effects would be **minor adverse** which is not environmentally significant.

11.9.20 Two small permanent access bridges are to be constructed over Man's Brook, east and west of Brook Farm. The bridges are to be suitable for agricultural use and to enable pedestrian access. The bridges are clear span bridges with no bed or bank reinforcement or support in the watercourse. The bridge span is up to 8 metres and the width up to 4.2 metres, with a soffit level of 0.6m higher than the bank top. The foundations are no less than a distance of 1 metre from the watercourse. The length of the bank disturbed by the activity shall extend to no more than 2 metres to either side of the bridge. Construction of the bridges would require removal of vegetation from the floodplain; however, the bridge would be elevated over the watercourse so not to directly interact with the river banks or bed. Localised destabilisation of banks may occur due to bank top loading and ground vibration during construction. The mitigation (secured as **Design Principles** in **Design and Access Statement** (Doc Ref. 7.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1)) follows best practice measures which would minimise works on the bank top and reduce the potential for instability using temporary bank and bank top protection, where necessary, and reinstating vegetation, where possible. The impacts would be localised as the Project element only requires a small section of bank top for the construction of the bridges. The effects would be localised and mostly temporary. The magnitude of the impact would be low adverse resulting in a **minor adverse** effect which is not considered environmentally significant.

WFD Regulations Compliance Assessment

11.9.21 The assessment of effects during construction for the WFD surface water body elements are detailed in **ES Appendix 11.9.2: WFD Compliance Assessment** (Doc Ref. 5.3).

Water Quality – Highways Improvements and Car Parks

11.9.22 Construction activities related to the surface access works improvements have the potential to impact water quality on all watercourses. These impacts may include the following:

- increase to suspended sediment loads due to channel disturbance from working in the channel, and runoff from construction areas. Impacts to suspended solid concentrations, alterations to pH and turbidity; sediment transport and bed substrate downstream; and
- accidental spillage of potentially harmful pollutants e.g., fuels, oils, lubricants.

11.9.23 The construction activities described for new surface access arrangements at Longbridge Roundabout would have the potential to impact on water quality through increases in sediment generation arising from bank disturbance, vegetation clearance and topsoil removal. The use of potentially polluting and harmful substances for the works could migrate through pathways to reach receiving watercourses. With the implementation of best practice measures outlined within the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3) the residual risk of sediment mobilisation and harmful pollution incidents occurring is reduced. This would have a temporary and localised impact of negligible adverse magnitude. For the River Mole and Gatwick Stream (both high sensitivity) this results in an effect of **minor adverse** which is not environmentally significant.

11.9.24 Construction works at Longbridge roundabout also include the creation of a site compound in 2024. Activities within construction site compounds can include re-fuelling, concrete batch mixing and storage of polluting substances. Site compounds will require their own temporary drainage systems and measures in place for the disposal of effluent and sewerage. The risk of pollutants from accidental spillages reaching watercourses is greater where construction compounds are located in close proximity to watercourses as there is a greater number of pathways to reach watercourses. The proposed Longbridge roundabout contractor compound would be located to the north of the roundabout, immediately adjacent to the River Mole (high sensitivity). Best practice measures as outlined in **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3) would be implemented, for example:

- the operation of the compound has been considered in the context of the floodplain;
- permanent structures which cannot be moved are located outside of the floodplain;
- any use of the area within the floodplain, such as the storage of materials, will be capable of being moved should a flood occur;
- appropriate storage (including bunding) of stored fuels; and
- ensuring no direct drainage pathways to the watercourse.

11.9.25 The magnitude of impact with inclusion of these measures would be negligible adverse. The effects on the River Mole and the Gatwick Stream would be **minor adverse** which is not environmentally significant.

11.9.26 The creation of a site compound (in 2024) is also proposed for the South Terminal (Surface access satellite contractor compound South Terminal). This compound would be located within the catchment which drains to the Gatwick Stream (high sensitivity) via an existing primary pipe (termed as ‘main surface water sewer’ on as built drawings). With the implementation of best practice measures as outlined in the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3) (including bunding of stored fuels and ensuring no direct drainage pathways to the watercourse), the magnitude of impact with these measures in place is anticipated to be negligible adverse on the Gatwick Stream. The effect is **minor adverse** which is not environmentally significant.

11.9.27 As indicated early construction works are due start on the South Terminal Roundabout and North Terminal Roundabout in 2029. Initial enabling and construction works in these areas have the potential to cause a reduction in surface water quality. Vegetation removal, topsoil stripping and excavation works increase the risk of suspended solids entering watercourses from sediment laden runoff. The use of potentially polluting and harmful substances for the works could migrate through pathways to reach receiving watercourses. With the implementation of best practice measures as outlined in the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3) (for example, appropriate storage/removal of excavated materials and the provision of appropriate storage for potentially polluting substances), the magnitude of impact with these measures in place is anticipated to be negligible adverse. For the enabling and early construction works at the North Terminal Roundabout, the effects on the River Mole (high sensitivity) and the Gatwick Stream (high sensitivity) are **minor adverse** which is not significant. Similarly for the enabling and early construction works at the South Terminal Roundabout, the effects on the Gatwick Stream (high sensitivity), Burstow Stream tributary (medium sensitivity) and Burstow Stream (medium sensitivity) is **minor adverse** which is not environmentally significant.

Water Quality – De-icer

11.9.28 The effect of the increased use of de-icer due to the increase in ATMs and additional pavement is mitigated by the new de-icer treatment provided at the long-term storage lagoons. This treatment works significantly reduces the risk of runoff contaminated with de-icer discharging to the River Mole (high sensitivity) and improves river quality for Biochemical Oxygen Demand from Bad to Good. This would be a medium beneficial magnitude of impact compared to baseline; therefore, the significance of effect has been assessed as **moderate beneficial** which is environmentally significant.

11.9.29 The new treatment works adjacent to Crawley Sewage Treatment Works will provide a high-quality effluent to the Gatwick Stream (high sensitivity) which will provide dilution for storm discharges and final effluent from Thames Water Crawley Treatment works. This would be a medium beneficial magnitude of impact compared to baseline; therefore, the significance of effect has been assessed as **moderate beneficial** which is environmentally significant.

Groundwater

11.9.30 Given the assumption that the depth of Project elements will not penetrate the Upper Tunbridge Wells Sand (see Section 11.5), there are not likely to be impacts from the Project on the deeper Upper Tunbridge Wells Sand aquifer as it is isolated beneath the impermeable Weald Clay resulting in **no change**.

11.9.31 Excavation for building foundations and other infrastructure could result in dewatering of the superficial secondary A and undifferentiated aquifers which could impact on groundwater flows and levels. These in turn could impact secondary receptors such as GWDTEs or surface water, affect the existing built environment with differential settlement impacts, or re-direct contamination in groundwater. Although dewatering activities would be kept minimum, potential impacts could still occur. A preliminary dewatering assessment is provided in **ES Appendix 11.9.5: Groundwater Assessment** (Doc Ref. 5.3) with summary of effects on identified receptors as follows:

(1) Due to the limited depth, extent and connectivity of the superficial aquifers, the impacts of any construction dewatering to groundwater flows and levels on the high sensitivity Secondary A aquifers and medium sensitivity secondary undifferentiated aquifers are expected to be localised and short-term in duration and are therefore considered low adverse. This would therefore result in **minor adverse** effects for both Secondary A and undifferentiated aquifers and which would not be environmentally significant.

(2) The bedrock (Weald Clay) is considered an unproductive strata of negligible sensitivity. For dewatering occurring within the Weald Clay there is likely to be only minimal groundwater seepage into any excavation and the magnitude of any impacts from dewatering on groundwater flows and levels are considered to be negligible adverse. Effects would therefore be **negligible adverse**, which would not be environmentally significant.

(3) The magnitude of groundwater resource impacts on the high sensitivity surface water receptors (River Mole, Gatwick Stream, and Crawter's Brook) range from negligible adverse to low adverse. Any impacts are expected to be localised and short-term in duration. This would result in **minor adverse** effects which would not be environmentally significant.

(4) At this design stage, potential impacts to high and very high sensitivity structures (which include airport infrastructure, transport infrastructure, residential/commercial buildings, and listed buildings) as a result of differential settlement effects cannot be ruled out and impacts could vary from a magnitude of negligible adverse to low adverse. This would result in **minor adverse to moderate adverse** effects which could be environmentally significant.

(5) Based on the expected localised and short-term effects and proposed mitigation measures, impacts from contamination sources on medium to high sensitivity aquifer receptors and high sensitivity surface water receptors are considered to have a magnitude of negligible adverse which would result in a **minor adverse** effect which is not environmentally significant.

11.9.32 Piling for building foundations could result in the introduction of contaminants or the creation of new contaminant pathways to the superficial aquifers. This would result in a low adverse impact on both the secondary undifferentiated superficial aquifers (medium high sensitivity receptor) and secondary A superficial aquifers (high sensitivity receptor). However, incorporation of the best practice and mitigation measures identified as part of the piling risk assessment would reduce these impacts to a **negligible** adverse effect, which is not significant. For the Weald Clay of negligible sensitivity and low hydraulic conductivity, the risk of contamination is considered to have a negligible impact which lead to **negligible** effects which would not be environmentally significant.

11.9.33 Construction of sub-surface structures could result in the diversion of groundwater flow, potential mobilisation of contaminants and potentially enhance groundwater flood risk in the superficial aquifers. Based on the preliminary design, it is assumed that subsurface structures are generally less than 250 m in length and terminate within the Weald Clay bedrock. As a result, impacts are expected to be localised and not significant. Exceptions to this include Pier 7 works and Car Park X which may require subsurface foundations of length of 700 to 800 m. Additional GI will be undertaken at the detailed design phase to further inform the design considerations (as secured as **Design Principles** in **Design and Access Statement** (Doc Ref. 7.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1)) to ensure both ground and groundwater conditions are taken into account in the detailed design to minimise impedance to groundwater flow and to minimise risk of groundwater flooding, as per design mitigation measures detailed in Section 11.8. This would result in a low adverse impact on aquifer receptors of medium to high sensitivity. Therefore, the effect for both Secondary A and undifferentiated aquifer receptors would be **minor adverse** which would not be significant. For the Weald Clay of negligible sensitivity, there is considered to be low risk of diversion of flow and increases in groundwater flooding due to subsurface structures and would be considered to have a negligible adverse impact which lead to **negligible adverse** effects which would not be environmentally significant.

11.9.34 Spillage of contaminants at the surface could impact the quality of groundwater. Best practice measures to mitigate the construction impacts (implemented through the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3)) would substantially control these impacts. The duration of these impacts would be medium term and the magnitude of the impact on the superficial aquifers as a whole are expected to be low adverse for both the secondary undifferentiated aquifers (medium sensitivity) and the Secondary A aquifers (high sensitivity). This would result in a **minor adverse** effect for both Secondary A and undifferentiated aquifer receptors which would not be significant. For the Weald Clay of negligible sensitivity and low

hydraulic conductivity, spillage of contaminants at the surface is considered to have a negligible adverse impact which lead to **negligible effects** which would not be environmentally significant.

Flood Risk

Fluvial Flood Risk

11.9.35 Loss of floodplain storage could occur due to construction activities in floodplain areas, including the works in river channels (e.g., for outfalls), increasing fluvial flood risk. The receptors considered in the assessment of flood risk have been identified as: transport infrastructure (very high sensitivity), residential properties (high sensitivity), industrial properties (medium sensitivity), airport infrastructure (very high sensitivity) and airfield grassed areas (low sensitivity).

11.9.36 Sections of the Museum Field, Car Park Y and Car Park X solutions would be implemented within this period (in advance of loss of floodplain), mitigating the risk of flooding from the loss of floodplain from the Taxiway Juliet and end around taxiways. All proposed construction compounds in this initial construction period are expected to be located outside of flood risk areas, or where this cannot be avoided, all construction compound welfare facilities will be elevated above peak flood levels.

11.9.37 The renaturalisation of the River Mole has potential to increase flood risk due to the temporary works required within the river channel and the floodplain to enable the diversion to be safely undertaken. The works would be programmed to ensure that as much of the new channel as practicable is completed prior to any loss of existing channel capacity. Any loss of channel capacity would therefore be of minimal duration and the contractor would have measures in place, such as temporary pumps, to ensure that there is no increase in flood risk should a flood event occur during this time.

11.9.38 A temporary haul road crossing the River Mole would be installed to the west of Pond A, prior to the realignment of the River Mole, as a part of the construction of the Museum Field FCA works. This temporary crossing would be required to create an access/haul road from Museum Field to Pentagon Field to transport the excess excavated material through Gatwick Campus instead of local roads. Works will be carried out with clear span watercourse crossings which are set back 5m from top of bank and existing ground levels would be maintained where practicable to minimise loss of floodplain. As there is no detail of the temporary crossings at this stage, a 1 per cent (1 in 100) AEP plus 16 per cent uplift for climate change event standard is proposed to be used to size the crossing structure.

11.9.39 Hydraulic modelling has been undertaken to assess the flood risk during the initial construction period (2024-2029) using the 1 per cent (1 in 100) AEP plus a 16 per cent climate change allowance event. A 16 per cent allowance is in accordance with Environment Agency Flood Risk Assessments: Climate Change Allowances guidance (2016a) for the construction timeframe. It has been shown that there would be no adverse impacts to flood risk outside of the Project boundary during the initial construction period. There are increased depths seen around the relocated fire training ground and proposed Taxiway Juliet Spur (to be constructed in next phase). The FCA measures proposed to mitigate the loss of floodplain would also offer betterment compared to the baseline (over 100 mm reduction in peak floodwater depth) in several areas within and outside of the Project boundary. Full details of the change in flood depth as a result of the Project are presented in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).

No additional impacts are seen due to the temporary River Mole water crossing and associated change to the floodplain associated with the Museum Field haul road.

11.9.40 Despite the loss of existing floodplain (fluvial flooding) as a result of the Project the provision of the associated embedded mitigation measures reduces flood risk to residential and industrial properties resulting in a negligible beneficial magnitude of impact resulting in a **minor beneficial** effect (not significant). There would be no change to the risk of flooding to transport infrastructure and a negligible beneficial magnitude of impact and **minor beneficial** effect (not significant) on airport infrastructure. The change in flood risk to the grassed areas of the airfield would result in a negligible beneficial magnitude of impact to some areas resulting in a **negligible to minor beneficial** effect, and a high adverse magnitude of impact and a **minor adverse** effect to others. These effects are not environmentally significant.

Surface Water Flood Risk

11.9.41 Existing surface water flow paths may be interrupted, diverted or created by construction works, due to increased compaction of ground, increase in impermeable area, or by level changes as a result of temporary works. The discharge of groundwater as a result of dewatering of foundations, basement and other sub-surface structures could result in changes to surface water flow paths. Therefore, any increase in surface water runoff that could potentially not be conveyed by the existing drainage system would be managed on site or dealt with through temporary drainage. This could result in a negligible adverse magnitude of impact (i.e. <10 mm change in flood depth as stated in Table 11.4.5) on all receptors, although no specific instances where this is likely have been identified at this stage. This would result in a **minor adverse** effect for residential properties (high sensitivity), transport infrastructure (very high sensitivity) and airport infrastructure (very high sensitivity); and a **negligible to minor adverse** effect on industrial properties (medium sensitivity) and airfield grassed areas (low sensitivity). These effects are not environmentally significant.

11.9.42 Increased surface water flood risk could also occur as a result of changes in rates and volumes of surface water runoff being discharged into the existing drainage system. As mentioned in Section 11.8 and in accordance with the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3) , the drainage system would be designed to ensure it has adequate capacity to store any additional surface water runoff at all stages of the construction period. Therefore, any increase in surface water flood risk would result in **no change** to residential and industrial properties and transport infrastructure, and a negligible adverse magnitude of impact on airport infrastructure and grassed areas. The effect on airport drainage infrastructure therefore has been assessed as **minor adverse** and **negligible to minor adverse** for ai11-113pprox infrastructure and airfield grassed areas respectively. These effects are not environmentally significant.

11.9.43 The placing and landscaping of inert spoil on Pentagon Field would avoid the areas of surface water flood risk (1 per cent (1 in 100) AEP extent) to ensure the works do not displace floodwater. This would result in a **negligible** magnitude of impact to surface water flood risk to residential and industrial properties and transport infrastructure producing a **minor adverse** effect on airfield infrastructure and grassed areas, which are not environmentally significant.

Groundwater Flood Risk

11.9.44 Increase in the risk of groundwater emergence could occur as a result of construction activities lowering ground levels or impeding groundwater flows.

11.9.45 Appropriate mitigation and construction measures (for example active or passive abstraction of intercepted groundwater) as detailed in Section 11.8, would be anticipated to mitigate any increase in groundwater levels as a result of the construction and therefore any change would be of negligible adverse magnitude (as described in Table 11.4.5). This would result in a **minor adverse** effect for residential properties (high sensitivity), transport infrastructure (very high sensitivity) and airport infrastructure (very high sensitivity); and a **negligible to minor adverse** effect on industrial properties (medium sensitivity) and airfield grassed areas (low sensitivity). These effects are not environmentally significant.

Water Infrastructure

Wastewater

11.9.46 Discharges to the wastewater network by construction workers and construction activities are estimated to increase the peak system loading by 1 per cent. Hydraulic modelling has been undertaken to determine the impact of the additional flows, which are very small compared to the normal daily flows and demonstrated to be well below the available capacity of the network and treatment facilities. As a result, the magnitude of impact of the construction on the Gatwick wastewater network (medium sensitivity) has been assessed as negligible adverse with an effect of **negligible adverse** and are not environmentally significant.

Water Supply

11.9.47 Increased water consumption would be expected through staff welfare facilities and construction processes, e.g. vehicle washes and concrete pouring. Temporary water supply points to support construction would be agreed with the local water supply company: SESW and metered to monitor consumption. Calculations have been undertaken to determine the additional demands on water supply and these have been deemed to have a negligible adverse magnitude of impact on the Gatwick potable water supply (low sensitivity). This would result in a **negligible to minor adverse** effect which is not environmentally significant.

Further Mitigation

11.9.48 Further mitigation would be secured as a requirement in secured as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1), see **ES Appendix 5.2.3: Mitigation Route Map** (Doc Ref. 5.3).

11.9.49 For groundwater impacts to buildings and infrastructure, a settlement analysis would be undertaken as an additional mitigation during the detailed design phase once additional GI data is available which will inform construction methodologies and any required asset protection measures (such as, but not limited to, ground re-enforcement), to ensure that there are no significant residual differential impacts on the existing build-in environment. Taking this and the embedded commitment included in the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3) into account, the effects will likely be reduced to **minor adverse** which is not environmentally significant.

11.9.50 Whilst there would be temporary impacts on all other aspects on the water environment during the construction period, with the application of best practice construction practices (as set out in the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3)), the potential impacts would not be environmentally significant, and would be reduced to an acceptable level. No further mitigation is proposed at this stage.

Future Monitoring

11.9.51 No monitoring beyond that currently undertaken by GAL (e.g. monitoring of outfall water quality to ensure compliance with discharge consents) and that indicated in Table 11.8.1 is anticipated as a result of the Project for the water environment during construction.

Significance of Effects

11.9.52 With the implementation of the further mitigation measures noted above, the significance of the effects on the water environment during this period of the Project would range from **no change** to **minor adverse** which is not environmentally significant.

First Full Year of Opening: 2029 (up to 2032)

11.9.53 According to the proposed construction programme, all of the proposed flood mitigation measures would have been completed by the first full year of opening; Museum Field and Car Park X FCA. Further details on the sequencing of mitigation is provided in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3). After 2029, the main works that could impact fluvial flood risk would be the proposed surface access improvement works which would include their own mitigation measures and the satellite airfield contractor construction compound that would encroach on the floodplain would remain until 2032.

Surface Water

Geomorphology

11.9.54 During the first full year of opening, change to the geomorphology of surface waterbodies is expected to continue as the watercourses adapt and adjust to construction works associated with various watercourses. Best practice measures to mitigate the construction impacts would continue to ameliorate the impacts. The magnitude of impact on the surface water bodies would be negligible adverse. This would result in a **minor adverse** effect for Gatwick Stream, River Mole, Crawter's Brook and Man's Brook, and a **negligible adverse** effect for Burstow Stream Tributary. This is not environmentally significant.

11.9.55 The North Terminal highway works are setback from the Gatwick Stream (high sensitivity), however there is the potential for sediment pollution due to runoff from construction areas. With the implementation of best practice measures secured as **ES Appendix 5.3.2: CoCP Annex 1 – Water Management Plan** (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1), the magnitude of the impact of these works is considered negligible adverse, resulting in **minor adverse** effect which is not environmentally significant.

11.9.56 The South Terminal highway works include the widening of the M23 spur road and 4 m culvert extension on the Burstow Stream Tributary (low sensitivity) to accommodate the proposed highway and new retaining wall. A new highways ditch adjacent to Burstow Stream Tributary upstream of the culvert is also proposed. There is potential for localised disruption of quantity and dynamics of flow and sediment supply, and release of fine sediments into the channels during construction. The impacts on the geomorphology of the watercourse would be localised and temporary with the provision of best practice measures secured as **ES Appendix 5.3.2: CoCP Annex 1 – Water Management Plan** (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1); therefore, the magnitude of impact would be negligible adverse and the overall effect would be **minor adverse** which is not environmentally significant.

WFD Compliance Assessment

11.9.57 The assessment of effects during operation for the WFD surface water body elements is detailed in **ES Appendix 11.9.2: WFD Compliance Assessment** (Doc Ref. 5.3).

Water Quality – Highways Improvements and Car Parks

11.9.58 Surface access works would continue during this assessment horizon with construction concluding in 2031 for the Longbridge Roundabout, South Terminal Roundabout and North Terminal Roundabout improvement works. Construction impacts on water quality associated with these works are anticipated to be the same as those outlined in the Initial Construction Period (2024 to 2029) section, paragraphs 11.9.26 to 11.9.31.

11.9.59 The South Terminal highway works include the widening of the M23 spur road and 4 m culvert extension on the Burstow Stream Tributary (medium sensitivity) to accommodate the proposed highway and new retaining wall. A new highways ditch connecting to Burstow Stream Tributary upstream of the culvert is also proposed. Sediment mobilisation and release of fine sediments can reach watercourses directly through the drainage network or overland flow and impact surface water quality. With the implementation of measures in the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3) (for example, ensuring appropriate storage/removal of excavated materials), it is anticipated that the magnitude of impact would be negligible adverse with an overall significance of effect of **minor adverse,** which is not environmentally significant.

Water Quality – De-icer

11.9.60 The effect of the increased use of de-icer due to the increase in ATMs and additional pavement is mitigated by the new treatment works provided at the long-term storage lagoons. This treatment works significantly reduces the risk of runoff contaminated with de-icer discharging to the River Mole (high sensitivity) and improves river quality for Biochemical Oxygen Demand from Bad to Good resulting in a medium beneficial magnitude of impact. This is an improvement compared to baseline; therefore, the effect is **moderate beneficial** which is environmentally significant.

11.9.61 The new treatment works adjacent to Crawley Sewage Treatment Works will provide a high-quality effluent to the Gatwick Stream (high sensitivity) which will provide dilution for storm discharges and final effluent from Thames Water Crawley Treatment works. This would be a medium beneficial magnitude of impact compared to baseline; therefore, the significance of effect has been assessed as **moderate beneficial** which is environmentally significant.

Groundwater

11.9.62 No additional effects on groundwater above those assessed in the initial construction period would be anticipated as a result of the continued construction and operation commencing in 2029. Therefore, no further assessment has been undertaken for this period.

Flood Risk

11.9.63 The Longbridge and Car Park B contractor compounds (programmed to be established in 2029) would be located adjacent to the River Mole and Gatwick Stream respectively and both fall within the extent of the 1 per cent (1 in 100) AEP including a 16 per cent climate change allowance event. It has been assumed that both compounds would be made flood resilient by elevating welfare facilities above the peak water level and situated in the shallower areas of flooding within the compound site. Car Park Z Staging and Laydown compound is located at the southeast

corner of the airfield and the majority of the proposed compound area would experience no flooding in the 1 per cent (1 in 100) AEP plus 16 per cent event flood extents. However, the access and egress route to Perimeter Rd South is inundated up to 150mm in the 1 per cent (1 in 100) AEP event plus 16 per cent. No mitigation is proposed for this compound; however the contractor would sign up for flood warning alerts from the Environment Agency and the Gatwick-specific warnings (as secured in **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3)). All other proposed construction compounds remain located outside of flood risk areas.

11.9.64 Temporary pedestrian and utilities footbridges crossing the River Mole will be installed to the north and south of the highway at both A23 Brighton Road and A23 London Road bridges as a part of the construction of access improvement works. Works will be carried out with clear span watercourse crossings which are set back 5m from top of bank, with remaining bridge structure placed on piers within the floodplain on either side of the river with temporary foundations installed, and bridge units craned into place to minimise floodplain storage loss. As there is no detail of the temporary crossings at this stage, a 1 per cent (1 in 100) AEP plus 16 per cent uplift for climate change event standard is proposed to be used to size the crossing structure.

11.9.65 Hydraulic modelling has been undertaken to assess the impact of the First Full Year of Opening on flood risk using the 1 per cent (1 in 100) AEP event including a 16 per cent climate change allowance, in accordance with Environment Agency Flood Risk Assessments: Climate Change Allowances guidance (2016a). No adverse impacts to flood risk are expected as a result of the introduction of construction compounds when mitigation measures are in place, including suitable construction phasing applied prior and during construction (see Section 11.8). The compensation measures proposed to mitigate the loss of floodplain would also offer betterment (mainly up to 50 mm flood depth decrease) in several areas within and outside of the Project boundary. No widespread downstream impacts are seen due to these temporary bridges within the River Mole floodplain. Localised areas of impacts are seen at pier locations. Full details of the change in flood depth as a result of the Project are presented in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).

11.9.66 No further additional effects on flood risk above those assessed above and in the initial construction period would be anticipated as a result of the continued construction works in this time period.

11.9.67 Despite the additional losses of existing floodplain (fluvial flooding), the provision of the associated embedded mitigation measures as a part of the initial construction period reduces flood risk to residential and industrial properties resulting in a negligible beneficial magnitude of impact resulting in a **minor beneficial** effect (not significant). There would be no change to the risk of flooding to transport infrastructure and a negligible beneficial magnitude of impact and **minor beneficial** effect (not significant) on airport infrastructure. The change in flood risk to the grassed areas of the airfield would result in a negligible beneficial magnitude of impact to some areas resulting in a **negligible to minor beneficial** effect, and a **high adverse** magnitude of impact and a **minor adverse** effect to others. These effects are not environmentally significant.

Water Infrastructure

Wastewater

11.9.68 The first full year of opening would see peak daily passenger numbers increase by approximately 6 per cent from 2029, compared to the 2029 future baseline (which would be an increase of 14

per cent on the 2018 baseline). The increase in wastewater flows would add to the wastewater system loading throughout the network so would have a potential long-term impact on the wastewater drainage system. Compared to the baseline for 2029, the Project wastewater system flows would be a maximum of 2 per cent higher for the dry weather cases, but 7 per cent lower for the wet weather cases due to the proposed mitigation works and changes in land use associated with the Project which would divert storm flow out of the wastewater system. Hydraulic modelling of this increase predicts that the magnitude of impact on the Gatwick wastewater infrastructure network (medium sensitivity) is negligible adverse with an effect of **negligible adverse** and are not environmentally significant. This is due to the wastewater network having adequate capacity to accommodate the increase in flows as a result of additional passengers and the demand from construction workers.

Water Supply

11.9.69 Existing SESW infrastructure would be able to meet the demands of increased passenger numbers during this period both from baseline increases and as a result of the Project. The demands of construction activities would be relatively small in comparison and consequently combined they would be considered to have a negligible adverse magnitude of impact on the Gatwick potable water supply (low sensitivity). This would result in a **negligible to minor adverse** effect which is not environmentally significant. Through consultation, SESW has provisionally confirmed that their sources and network can meet the additional demands of the Project during construction, including the increase in passenger numbers, subject to the outcome of their full impact assessment.

Further Mitigation

11.9.70 No additional mitigations would be required beyond those noted in the Initial Construction assessment (see paragraph 11.9.48).

11.9.71 Whilst construction activities continue in relation to surface access improvements, through the continued application of best practice construction practices (as set out in the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3)), the potential effects would be reduced to a non-environmentally significant level. All other effects during this period are not considered significant and therefore no further mitigation is proposed.

Future Monitoring

11.9.72 No additional monitoring beyond that currently undertaken by GAL (e.g. monitoring of outfall water quality to ensure compliance with discharge consents) and that indicated in Table 11.8.1 would be required as a result of the Project for the water environment.

Significance of Effects

11.9.73 No further mitigation has been identified, therefore the residual effect of the Project on the water environment in this assessment year would remain as for the initial construction period of 2024-2029.

Interim Assessment Year: 2032 (up to 2037)

Surface Water

11.9.74 In this period of the Project, the effects of construction works on the watercourses (undertaken in earlier periods of construction) would have stabilised, and it is not anticipated that there would be any further adverse effects. The implementation of the mitigation secured as **ES Appendix 5.3.2: CoCP Annex 1 – Water Management Plan** (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1) would be expected to address construction related impacts such as increases in suspended sediment concentrations.

Geomorphology

11.9.75 During the interim assessment year, change to the geomorphology of surface waterbodies is expected to continue as the watercourses adapt and adjust following construction works associated with various watercourses. Best practice measures to mitigate the construction impacts would continue to ameliorate the impacts. The magnitude of impact on the surface water bodies would be negligible adverse. This would result in a **minor adverse** effect for Gatwick Stream, River Mole, Crawter's Brook and Man's Brook, and a **negligible** effect for Burstow Stream Tributary. This is not environmentally significant.

WFD Compliance Assessment

11.9.76 The assessment of effects during operation for the WFD surface water body elements is detailed in **ES Appendix 11.9.2: WFD Compliance Assessment** (Doc Ref. 5.3).

Water Quality – Highways Improvements and Car Parks

11.9.77 For water quality, the construction surface access works for the Longbridge Roundabout, South Terminal Roundabout and North Terminal Roundabout are anticipated to be completed in 2031. Construction related activities, namely the reinstatement of site compounds, will continue to 2035. The potential impacts associated with reinstating the compounds are as those stated in paragraphs 11.9.26 and 11.9.27. No operational assessment has been completed for the interim assessment year as assessment of operational impacts of the surface access works has been undertaken for the design year (2047), which would be considered to be a worst-case due to the increased road traffic numbers which are considered in paragraphs 11.9.148 to 11.9.155.

Water Quality – De-icer

11.9.78 As stated in paragraph 11.9.60 the effect of the increased use of de-icer due to the increase in ATMs has been assessed for the design year 2047 only. The increase in ATMs and de-iced pavement area in 2047 represents the worst-case for this parameter and therefore no interim assessment has been undertaken.

Groundwater

11.9.79 Given the assumption that the depth of Project elements will not penetrate the Upper Tunbridge Wells Sand (see Section 11.5), there are not likely to be impacts from the Project on the deeper Upper Tunbridge Wells Sand aquifer (and any water sources therein) as it is isolated beneath the impermeable Weald Clay resulting in **no change**.

11.9.80 There may be additional excavation for building structures, basements, piling (e.g. Pier 7 foundation works and new hangar). The new hangar location is in an area overlying the Weald

Clay bedrock with no mapped superficial aquifer deposits present and has been scoped out of the assessment as indicated in **ES Appendix 11.9.5: Groundwater Assessment** (Doc Ref. 5.3). No subsurface excavations for Pier 7 have been confirmed as part of the current design.

11.9.81 Piling for building foundations for ongoing construction works (e.g. Pier 7 foundation works, and new hangar) could result in the introduction of contaminants or the creation of new contaminant pathways to the secondary A superficial aquifers. Effects are considered to be equivalent to those detailed in paragraph 11.9.32 for the Initial Construction Period (2024 to 2029) which are not environmentally significant.

11.9.82 Construction of sub-surface structures for ongoing construction works (e.g. Pier 7 foundation works, and new hangar) could result in the diversion of groundwater flow, potential mobilisation of contaminants and potentially enhance groundwater flood risk in the superficial aquifers (.i.e Secondary A aquifer receptors). Effects are considered to be equivalent to those detailed in paragraph 11.9.33 for the Initial Construction Period (2024 to 2029) which are not environmentally significant.

11.9.83 Spillage of contaminants for ongoing construction works (e.g. Pier 7 foundation works, and new hangar) at the surface could impact the quality of groundwater. Effects are considered to be equivalent to those detailed in paragraph 11.9.34 for the Initial Construction Period (2024 to 2029) which are not environmentally significant.

Flood Risk

11.9.84 According to the proposed construction phasing programme, all primary works that could affect current flood risk would have been completed by 2029. The measures implemented by this stage would be adequate to ensure no further increase in flood risk would occur. Other construction works at this time would have the potential to alter surface water flow paths or temporarily increase runoff. The impact of this would be anticipated to be as described in paragraph 11.9.41, with no significant environmental effects anticipated once appropriate mitigation is applied in accordance with the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3) .

Water Infrastructure

Wastewater

11.9.85 The interim assessment year 2032 would see peak daily passenger numbers increase by approximately 19 per cent compared to the 2032 future baseline. The increase in wastewater flows would add to the wastewater system loading throughout the network so would have a potential low long-term impact on the wastewater drainage system. Compared to the future baseline for 2032, the Project wastewater system flows are a maximum of 7 per cent higher for the dry weather cases, but 4 per cent lower for the wet weather cases due to the proposed mitigation works and changes in land use associated with the Project which would divert storm flow out of the wastewater system. The wastewater sewer system (of medium sensitivity) has adequate capacity to accommodate the increase in flows. The impact of the Project is therefore assessed as negligible adverse magnitude resulting in a **negligible adverse** effect, that is not environmentally significant.

Water Supply

11.9.86 This period would see an increase in water demand, due to the increase in passengers. Although unconfirmed, SESW has previously indicated that the projected increase in demand would likely not have an adverse impact on the water source. Therefore, there would be **no change** compared to the 2032 future baseline.

Further Mitigation

11.9.87 No additional significant environmental effects during the interim assessment year have been identified as part of this study and therefore no additional mitigation is proposed for the water environment.

Future Monitoring

11.9.88 No additional significant effects during the interim assessment year have been assessed as part of this study, therefore no additional monitoring beyond that currently undertaken by GAL (e.g. monitoring of outfall water quality to ensure compliance with discharge consents) and that indicated in Table 11.8.1 is anticipated as a result of the Project for the water environment.

Significance of Effects

11.9.89 No significant environmental effects have been identified once the proposed mitigation is included.

Design Year: 2038

11.9.90 This section describes the potential effects of the Project on the water environment during the operational period.

11.9.91 In order to assess the effects due to the Project, each identified impact has been assigned a magnitude after considering the embedded mitigation designed as part of the Project. Mitigation measures adopted as part of the Project have been described in Section 11.8.

11.9.92 For the purpose of this assessment, the classification of impact magnitude also takes into account impact duration. For the operational period of the Project, all impacts are considered to have a ‘long term’ duration, defined as a period of more than five years.

Surface Water

Geomorphology

11.9.93 The diversion of the River Mole into a two-stage channel includes the reinstatement of a more natural planform and restoration of more natural morphology. During operation, this would have a long-term effect of improving the flow regime and providing in-channel diversity to sediment and morphological features. There would also be floodplain and re-meandering enhancements, as well as to floodplain coupling/connection. Planting of natural floodplain vegetation would improve riparian habitats and improve bank stability. The duration of these impacts would be long term and the magnitude of impact on the River Mole (high sensitivity) would be medium beneficial. The effects would be considered as **moderate beneficial** and therefore are environmentally significant.

11.9.94 There would, however, be the potential for a reduction in water velocity along the river realignment in the long term, which may cause varying degrees of deposition at this location, along with decreased sediment availability and erosion downstream. These changes would arise due to the changes in cross-sectional form and channel gradient. The channel length in the realigned section is to be increased by approximately 160 m (with a further, changing channel gradient from 1:1250 to 1:1890. This ties into the existing downstream channel which has a gradient of 1:2035. A further approximate 150 metres of the original watercourse will be retained as backwaters, and siphon channel length will be reduced by approximately 13 metres resulting in a net increase in watercourse length within the valley of approximately 297 metres. A comparison of baseline and Project channel velocity data on the River Mole shows that in the realigned section, channel velocity is expected to reduce during flood events (**ES Appendix 11.9.6 Annex 3** (Doc Ref. 5.3)). Comparison with Hjulström charts show transport of silt and sand is11-122pprox.11-122ned, however less material is eroded. Furthermore, medium sized gravel is marginally more likely to be deposited during flood events, however it is not expected to have a major adverse effect on the watercourse. Detailed design work on the renaturalised channel is required to mitigate these potential effects. This mitigation would include creating a suitable river type for the bed gradient of the realignment to maintain sediment transport capability; and a multiple stage channel to ensure natural and varied flow conditions; creation of varied cross-sections to mimic natural process, bed and bank forms; and addition of suitable substrate. The impact is local to reach scale, however with appropriate design of the renaturalised channel, the scale of the impact would be reduced. Natural channel adjustment would also be expected during the operational period. The magnitude of the effect would be to low adverse and the significance of the effect on the River Mole (high sensitivity) would be **minor adverse**, and not environmentally significant.

11.9.95 Modification of the existing River Mole runway culvert and concrete channel lining would involve creation of additional daylighted channel from the downstream mouth of the existing runway culvert to the north of the runway. The length of the River Mole daylighted channel extension is approximately 26 m. The River Mole syphon (which activates only in flood conditions) would be extended in a new section of box culvert of around 66 m length to connect to the new section of river valley. These works would have the permanent effect of loss of existing bed and bank form and material, and riparian vegetation. The homogeneity of the new channel cross-section creates the potential for loss of natural variance in velocities and secondary flows cells, leading to changes in velocity and geomorphological processes. The potential length of the channel impacted is relatively small, and part of the existing culvert would be replaced. Provision of design features, such as covering the culvert with a highways specification grid at ground level to allow daylight to reach the watercourse and inclusion of baffles for sediment retention, would act to mitigate these effects. Furthermore, provision of geomorphological mitigation to the 200m length of new naturalised River Valley for the River Mole acts to more than compensate these effects. Therefore, the magnitude of the impact is assessed as negligible adverse on the River Mole (high sensitivity) resulting in a **minor adverse** effect, which is not environmentally significant.

11.9.96 The River Mole renaturalised channel and daylighted channel extension would have various effects on the watercourse both adverse and beneficial. The geomorphological mitigation on the River Mole diversion valley and mitigation for the adverse effects included in the construction and design of the renaturalised channel show that beneficial effects outweigh the adverse effects.

11.9.97 A small weir (300mm high) is proposed to the River Mole across the southern face of the east box of the culvert that conveys the river beneath the runways. This would enable the concentration of

summer low flows in the west box to improve fish passage. During summer low flow conditions, the weir would have the effect of altering flow characteristics at the upstream of the west box of the culvert and downstream through the culvert to the north side of the runway. These include impacts to the flow, velocity, and water depth from the culvert entrance, through to the extended culvert exit. There is potential for localised sediment deposition at the culvert entrance at the east box weir where flows are concentrated into the west box during low flow conditions. A potential reduction in velocity may allow sediment to deposit immediately upstream of the weir to form a low lateral bar, which is not anticipated to adversely impact the geomorphology of the watercourse. Due to the concrete bed and bank protection at the culvert entrance, scour is not anticipated to occur as a result of changes to flow characteristics. Changes to flow, velocity and water depth in the culvert have the potential to adversely impact the riverine sediments and marginal vegetation in the culvert, which form part of the embedded mitigation for the daylighted culvert channel extension. These effects would be minimised by the inclusion of baffles on the bed to retain sediment wherever practicable. Marginal vegetation will also be planted on berms above the low flow channel and once established, are unlikely to be adversely impacted during low flow conditions. Flow continuity and sediment transfer will be improved during summer low flow through the length of the culvert. The duration of these impacts would be long term and the magnitude of impact on the River Mole (high sensitivity) would be medium beneficial. The effects would be considered as **moderate beneficial** and therefore are environmentally significant.

11.9.98 The creation of the Museum Field FCA and connecting spillway would improve floodplain-channel coupling, and naturalisation of flows in the main channel during flood conditions. Lowering the banks for connecting the spillway to the FCA has the effect of localised loss of existing bank form. However, the impact would be reduced with mitigation designed to vary bank form where banks are being lowered/altered, which would maintain or improve natural variance of flow in the channel. There is the risk of sediment accretion at the inlet/outlet of the spillway into the River Mole, where flow velocity may be locally affected. However, detailed design could mitigate these effects including a suitably wide spillway inlet/outlet to disperse the effects on flow velocity. Ground lowering and planting of grassland in the FCA has the effect of loss of natural floodplain vegetation. These alterations to the baseline could encourage erosion of the banks and bed along the connecting spillway during flood events. The scale of impacts would be reduced with mitigation including ecological planting to restore natural vegetation to the floodplain and use of soft/bio engineered bank protection if banks need to be protected. The length of bank impacted would be relatively small and not entirely natural, and the FCA is set back from the watercourse. Furthermore, enough time would have passed since the construction period for the river to naturally adjust and for vegetation to establish on the banks to aid bank stability. The magnitude of the impact would be negligible adverse and would result in a **minor adverse** effect for the River Mole (high sensitivity) which is not environmentally significant.

11.9.99 Construction of the concrete outfall headwall from the FCA in car park X would have the effect of loss of existing bank and riparian vegetation on the River Mole (high sensitivity) and localised changes to sediment transfer and flow patterns in the channel. By 2038, sufficient time would have passed since the construction period for the river to naturally adjust. The length of channel impacted would be relatively small, therefore the magnitude of the impact would reduce to negligible adverse resulting in a **minor adverse** effect which is not environmentally significant.

11.9.100 Ground lowering and increase of the depth of water in the floodplain in car park X would have the effect of reduction in area of floodplain-channel coupling with Crawter's Brook (high sensitivity) in the long term. The measures secured as **ES Appendix 8.8.1: Outline Landscape and Ecology**

Management Plan (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1) would mitigate for increased sediment loading to the channel and any floodplain/watercourse exchange of physical indicators but cannot change the coupling effect of the floodplain which would be considered in design. The area impacted would be relatively small and set back from the watercourse, therefore the magnitude of the impact is considered to be negligible adverse. This would result in a **minor adverse** effect, which is not environmentally significant.

11.9.101 The South Terminal new surface access arrangements would result in long-term changes to the geomorphology of Burstow Stream Tributary (low sensitivity) which is currently culverted underneath the M23 spur. Extension of the existing culvert by 4-4.5 m to accommodate road widening would result in permanent loss of natural bank form and riparian vegetation. The increased homogeneity of the channel cross-section has the potential for loss of natural variance in velocities and secondary flow cells, leading to changes in velocity and geomorphological processes in the channel. There is existing concrete lining upstream and downstream of the culvert and only a relatively small area would potentially be impacted. The long-term impact on the Burstow Stream Tributary has a negligible adverse magnitude and a **negligible adverse** effect, which is not environmentally significant.

11.9.102 The North Terminal new surface access arrangements, including the noise barrier and associated earthworks, would result in long-term loss of floodplain and natural vegetation due to encroachment of highway footprint onto existing natural floodplain. The footprint of the highway works would however be set back from the banks of Gatwick Stream (high sensitivity). Construction of the outfall headwalls on the River Mole (high sensitivity) and Gatwick Stream connecting to a highway drainage attenuation tank will likely comprise of a carrier pipe and 5m wide concrete outfall headwall. The proposed outfall headwalls have the effect of loss of natural banks and localised changes to sediment transfer and flow patterns in the channel. Flow control on the outfall drain and filtering of pollutants would reduce the impact on flow and sediment transfer. The length of channel impacted is relatively small. In terms of geomorphology of the watercourse the magnitude of impact has been assessed as negligible adverse resulting in a **minor adverse** effect, which is not environmentally significant.

11.9.103 Replacement and widening of the A23 Brighton Road and London Road overbridges at Longbridge roundabout would result in permanent loss of floodplain and natural vegetation due to encroachment of highway footprint onto existing natural floodplain of the River Mole (high sensitivity). Permanent change to the baseline would also include: the loss of natural bed and bank form; localised changes to sediment transfer and flow patterns; and loss of natural riparian vegetation. This is due to the widening and modifications on the existing overbridges and new concrete outfall headwalls connecting the highway drainage attenuation basin/tanks. Flow control on the outfall drains and filtering of pollutants would reduce the impact on flow and sediment transfer. The length of channel impacted is relatively small. The magnitude of impact on the geomorphology of the watercourse has been assessed as negligible adverse resulting in a **minor adverse** effect, which is not environmentally significant.

11.9.104 Two small access bridges provided over Mans Brook, east and west of Brook Farm will have the effect of constricting lateral migration of the watercourse on floodplain. However, given the low energy nature of the stream and the timescales required for lateral change to occur, the magnitude of the effects is likely to be Negligible Adverse and the overall significance would be Minor Adverse. Furthermore, the bridges are designed so that no bed or bank reinforcement or support in the watercourse, therefore there are no direct in-channel impacts on the

geomorphology of the watercourse during its operation. There will be permanent loss of bank top vegetation within the footprint of the bridge foundations, and shading effects on the bank and bed beneath the structure have the potential to impact riparian vegetation. However, the existing stream is already partially shaded, and the bridges impact a short length of the watercourse. The magnitude of impact on the geomorphology of the watercourse has been assessed as negligible adverse resulting in a **minor adverse** effect, which is not environmentally significant.

11.9.105 New water treatment works at the east of Gatwick Stream will treat an additional 100l/s from long-term storage lagoon. This is in addition to the current 65l/s. Cleaned water will be return to the lagoon and overflow will be connected to an existing pollution lagoon overflow pipe which discharges into the Gatwick Stream via a 600 mm pipe. The existing outfall will be unaltered. The existing outfall pipe at the Gatwick Stream is set into a vertical outer meander bank with a concrete headwall and flat concrete apron. The pipe outfall is operated by a flapped valve. During operation, additional discharge from the treatment works has the potential to increase the duration of maximum flows from the outfall, which subsequently impacts flow velocity in the watercourse in the immediate vicinity of the outfall. Given the position of the outfall on the outer meander, the opposite bank is naturally accreting, and erosion risk is low. Alterations to flow variance can have a positive impact by encouraging the natural evolution of the watercourse through processes of erosion and deposition. The length of watercourse impacted is small and the overall significance is Minor Beneficial, which is not environmentally significant.

WFD Compliance Assessment

11.9.106 The assessment of effects during operation for the WFD surface water body elements is detailed in **ES Appendix 11.9.2: WFD Compliance Assessment** (Doc Ref. 5.3).

Water Quality – Highways Improvements and Car Parks

11.9.107 No assessment of the impacts of the highways improvements on water quality of receiving water bodies has been completed for the 2038 assessment horizon as they have been considered for the design year (2047) which would be considered to be a worst-case due to the increased road traffic numbers which are considered in paragraphs 11.9.148 to 11.9.155.

Water Quality – De-icer

11.9.108 The effect of the increased use of de-icer due to the increase in ATMs and additional pavement is mitigated by the new de-icer treatment provided at the long-term storage lagoons. This treatment works significantly reduces the risk of runoff contaminated with de-icer to the River Mole (high sensitivity) and improves river quality for Biochemical Oxygen Demand from Bad to Good. This would be a medium beneficial magnitude of impact compared to baseline; therefore, the significance of effect has been assessed as **moderate beneficial** which is environmentally significant.

11.9.109 The new treatment works adjacent to Crawley Sewage Treatment Works will provide a high-quality effluent to the Gatwick Stream (high sensitivity) which will provide dilution for storm discharges and final effluent from Thames Water Crawley Treatment works. This would be a medium beneficial magnitude of impact compared to baseline; therefore, the significance of effect has been assessed as **moderate beneficial** which is environmentally significant.

Groundwater

11.9.110 Given the assumption that the depth of Project elements will not penetrate the Upper Tunbridge Wells Sand (see Section 11.5), no impacts from the Project to the deeper Upper Tunbridge Wells Sand aquifer (and any water sources therein) have been identified as it is isolated beneath the impermeable Weald Clay resulting in **no change**.

11.9.111 During operation of the Project, there would be a long-term change in the amount of hardstanding compared to the baseline (e.g. additional hardstanding for runways, taxiways and aprons). However, this increase is considered to be a small proportion of the overall recharge area within the airport and is unlikely to bring about significant change in the recharge of groundwater to the shallow superficial aquifers. Therefore, the magnitude of impact has been assessed as low adverse resulting in a **minor adverse** effect on both the secondary undifferentiated aquifers of medium sensitivity and the Secondary A superficial aquifers of high sensitivity. This is not considered to be significant. For the Weald Clay of negligible sensitivity and low hydraulic conductivity, any change in recharge to the unproductive strata is considered to have a negligible adverse magnitude of impact and therefore **negligible adverse** effects which would not be environmentally significant.

11.9.112 As indicated in **ES Appendix 11.9.5: Groundwater Assessment** (Doc Ref. 5.3), the Museum Field FCA may intercept groundwater within the weathered Weald Clay Formation. Groundwater within the Weald Clay Formation is contained in isolated areas with minimal flow. As such, negligible seepage into the FCA would be anticipated in the long term. This would result in a low adverse magnitude of impact on a receptor of negligible sensitivity. The resultant effect would be **negligible adverse** which is not environmentally significant.

11.9.113 Construction of sub-surface structures could result in the diversion of groundwater flow, potential mobilisation of contaminants and potentially enhance groundwater flood risk in the superficial aquifers and Weald Clay. Effects are considered to be equivalent to those detailed in Section 11.9.33 for the Initial Construction Period (2024 to 2029).

11.9.114 Loss of groundwater storage within permeable superficial deposits may occur where sub-surface structures lead to the long-term loss or removal of the gravel aquifer. This is likely to be only a small proportion of the available groundwater storage within the superficial aquifer and would have only very minor localised impacts (if any), resulting in negligible adverse magnitude of impact on the superficial deposits which comprise the Secondary undifferentiated aquifers of medium sensitivity and the Secondary A aquifers of high sensitivity. The resultant effect would be of **minor adverse** significance for both secondary undifferentiated and Secondary A aquifers which is not environmentally significant.

11.9.115 It is not proposed to discharge from the surface water drainage to ground and all attenuation ponds are proposed to be lined. The groundwater HEWRAT assessment for routine runoff required as part of the proposed highways improvement works is provided in **ES Appendix 11.9.3: Water Quality HEWRAT Assessment** (Doc Ref. 5.3) and indicates a **low adverse** magnitude of impact to groundwater quality for the Weald Clay of negligible sensitivity. The significance of effects is **negligible to minor adverse** and therefore, no significant effects on groundwater quality are predicted.

11.9.116 For the accidental spillage risk assessment see **ES Appendix 11.9.3: Water Quality HEWRAT Assessment** (Doc Ref. 5.3) as the criteria for assessing both risks to surface and groundwater receptors are the same within the HEWRAT methodology.

Flood Risk

Fluvial Flood Risk

Offsite receptors

11.9.117 Elements of the Project that fall within the floodplain could lead to a loss of floodplain storage and increase fluvial flood risk. However, a number of measures have been incorporated into the design as embedded mitigation to ensure any potential impact would be reduced.

11.9.118 Fluvial hydraulic modelling results (see **ES Figure 11.9.1** (Doc Ref. 5.2)), for the 1 per cent (1 in 100) AEP event, plus a 12 per cent climate change allowance and a 20 per cent climate change allowance (see **ES Figure 11.9.2** (Doc Ref. 5.2)), show that for third party receptors anticipated flood depths would decrease by up to 100 mm for those receptors adjacent to Gatwick. Therefore, the overall magnitude of impact of the Project on residential properties (high sensitivity) and industrial properties (medium sensitivity) would be medium beneficial, resulting in an effect of **moderate to major beneficial** and **moderate beneficial** respectively. This is environmentally significant.

11.9.119 Fluvial flood risk for major transport infrastructure is not expected to be affected by the Project in the long term therefore the impact is therefore classified as **no change**.

Airport Infrastructure

11.9.120 In terms of airport infrastructure, for the 1 per cent (1 in 100) AEP event, plus a 12 per cent climate change allowance, most areas would benefit from the development of the Project. Flood depths would be decreased on average by up to 100 mm (medium beneficial impact) adjacent to the main runway, taxiways and proposed car parking areas, and up to 10 mm (low beneficial impact) for the South Terminal area and piers.

11.9.121 Within the airport infrastructure, flood depths are seen to increase in the following areas:

- at the north-west edge of the proposed fire training ground; and
- the edge of the end around taxiway next to Taxiway Yankee.

11.9.122 For the majority of the area at the fire training ground that would experience an increase in flood depth, it would be below 50mm (low adverse magnitude of impact). The proposed end around taxiway bisects the floodplain of the River Mole, however with the proposed syphons beneath the taxiway the impact to flood risk is limited to 120mm increase (high adverse impact) in water levels. The taxiway is elevated above surrounding ground levels to tie in to existing runway levels so would not flood in such an event. Neither increased areas of risk are within the operational area of the airfield, the flood extents are very localised and would not block any access and egress routes. The fire training ground facility would not be expected to be used during extreme flooding events. Therefore, the facility and the taxiway would remain safe for the Project lifetime.

11.9.123 For grassed parts of the airport, there are extended areas where flood depths decrease and some smaller areas of localised increases, including the proposed FCA. Overall, considering the area at whole, the significance of effect on grassed areas of the airport is considered to be

negligible adverse which is not environmentally significant). Table 11.9.1 summarises the effects on airport infrastructure.

Table 11.9.1: Summary of Fluvial Flood Risk Effects on Airport Infrastructure

Receptor	Sensitivity	Magnitude	Effect	Environmental Significance
Runways and taxiways	Very high	Medium beneficial	Major beneficial	Significant
Terminals and piers	Very high	Low beneficial	Moderate to major beneficial	Significant
Stands	Very high	No change	No change	Not significant
Fire training Ground	Medium	Low adverse	Minor adverse	Not significant
Car parking	Medium	Medium beneficial	Moderate beneficial	Significant
Grassed areas	Low	Negligible adverse	Negligible to minor adverse	Not significant

Surface Water Flood Risk

Offsite Receptors

11.9.124 The introduction of new impermeable areas as part of the Project could result in increased surface water runoff in the long term, or cause alterations to existing surface water flow paths that could potentially increase flood risk.

11.9.125 It has been shown in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3)that the removal of Pond A and the provision of additional attenuation storage within the Project results in no increase or decrease in discharge volumes and total peak runoff rates as a result of the Project. This is for all events up to and including the 1 per cent (1 in 100) AEP event, plus a 25 per cent (central) for the airfield and 40 per cent (upper end) for surface access highways improvements allowances for climate change.

11.9.126 Overall, the impact of the Project is not considered significant. The magnitude of impact on transport infrastructure (very high sensitivity), residential properties (high sensitivity) and industrial properties (medium sensitivity) and is therefore considered to be negligible. This would result in a **minor adverse, negligible to minor adverse** and **minor adverse** effect on these receptors respectively. These effects are not environmentally significant.

Airport Infrastructure

11.9.127 The Project includes additional attenuation storage across the airfield within the surface water drainage network and new storage beneath Car Park Y. The **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) demonstrates that surface water flood risk would increase for the 1 per cent (1 in 100) AEP event, including a 25 per cent allowance for climate change only in some very localised areas of runways, taxiways and stands within the Project boundary. This would be safely managed through the application of GAL's **Flood Resilience Statement** (**ES Appendix 11.9.6: Annex 6** (Doc Ref. 5.3)). Conversely the new storage beneath Car Park Y would reduce flood risk to the North Terminal in both summer and winter scenarios for the 1 per cent AEP event

plus 20 per cent and 40 per cent allowances for climate change. The betterment of the North Terminal can be seen in **ES Appendix 11.9.6 Figures 7.3.4** to **7.3.7** (Doc Ref. 5.3).

11.9.128 Table 11.9.1 summarises the flood risk effects to airfield infrastructure elements. The effects are not uniform due to the variability in exposure to flood risk. The changes include both beneficial and adverse impacts due to the predicted changes in surface water flood risk. Consequently, the magnitude of the potential impact to runways, taxiways and stands (very high sensitivity) is considered to be negligible adverse resulting in areas with a **minor adverse** effect which is not environmentally significant.

11.9.129 Other infrastructure receptors such as the waste management facilities and car parking across the airfield would experience a negligible beneficial magnitude of impact, which results in a **minor beneficial** effect, which is not environmentally significant.

11.9.130 For the other elements of airport infrastructure (terminals and piers) the change in modelled surface water flood risk would result in **no change** (see Table 11.9.2). Therefore, for the elements of airport infrastructure effects are not environmentally significant.

Airfield Grassed Areas

11.9.131 For grassed areas of the airfield (low sensitivity), the magnitude of impact is expected to be medium adverse (up to 100 mm of flood depth increase) resulting in a **minor adverse** effect which is not environmentally significant. Table 11.9.2 summarises the effects on each of these receptors.

Table 11.9.2: Summary of Surface Water Flood Risk Effects on Airport Infrastructure

Receptor	Sensitivity	Magnitude	Effect	Significant/not significant
Runways and taxiways	Very high	Negligible adverse	Minor adverse[A]	Not significant
Terminals and piers	Very high	No change	No change	Not significant
Stands	Very high	Negligible adverse	Minor adverse	Not significant
Waste management facilities	Very High	Negligible beneficial	Minor beneficial	Not significant
Car parking	Medium	Negligible beneficial	Minor beneficial	Not significant
Grassed areas	Low	Medium adverse	Minor adverse	Not significant

Note A: This is a worst-case scenario. As stated in paragraph 11.9.128 the magnitude of impact across the airfield varies. At some locations there is a beneficial effect due to the additional storage provided by the Project.

Groundwater Flooding

11.9.132 Foundation and/or box structures intercepting and/or diverting groundwater flows could result in an increase of flood risk elsewhere. Appropriate design controls as detailed in Section 11.8 would be applied to ensure any increase in groundwater levels would be expected to have a **negligible** magnitude of impact (as per Table 11.4.5) which is not environmentally significant.

11.9.133 The effect on airport infrastructure of very high sensitivity would therefore be **minor adverse,** and **negligible to minor adverse** on airfield grassed areas of low sensitivity which is not environmentally significant.

Reservoir Flooding

11.9.134 A number of airport infrastructure elements currently fall within reservoir failure flood extents (see **ES Figure 11.6.7** (Doc Ref. 5.2)). However, as large reservoirs, these structures are maintained and operated in accordance with the Reservoirs Act 1975 and therefore the risk of failure is considered very low. The Project proposes to make best use of existing infrastructure and therefore, no new reservoir failure flow paths are introduced to the study area. Overall, the effect is considered to be **no change**.

Sewer/Water Supply Flooding

11.9.135 During the operational period of the Project, peak daily passenger numbers would increase, introducing additional loading to the wastewater sewer system of the airport. This could have a potential long-term impact on sewer flood risk. However, modelling of this increase has shown that the sewer system would not be significantly affected by the Project. The wastewater sewer system (including the new pumping stations) would have adequate capacity to accommodate the increase in flows from surface water runoff expected to be caused by the Project. The magnitude of impact on all potential receptors (very high to low sensitivity) would therefore be negligible adverse, resulting in an effect of **negligible to minor adverse** significance which is not environmentally significant.

11.9.136 Additional water supply infrastructure would also have to be installed as part of the Project, in order to accommodate new buildings and infrastructure. However, this would be new infrastructure and would be considered to be at low risk of failing and causing flooding (negligible impact). In the case that parts of the existing water supply network are replaced as part of the Project, this could provide an overall low beneficial magnitude of impact in terms of flood risk. Overall, the effect on all potential receptors (very high to low sensitivity) would be considered **moderate** to **negligible beneficial** which is not environmentally significant.

Water Infrastructure

Wastewater

11.9.137 2038 would see peak daily passenger numbers increase by approximately 21 per cent compared to the 2038 future baseline. Compared to the future baseline for 2038, the Project wastewater system flows are a maximum of 8 per cent higher for the dry weather cases, but 4 per cent lower for the wet weather cases due to the proposed mitigation works and changes in land use associated with the Project which would divert storm flow out of the wastewater system. Hydraulic modelling has been undertaken to determine the impact of the additional flows to the Gatwick wastewater network infrastructure (medium sensitivity), taking account of the embedded mitigation measures to be implemented as part of the Project. The modelling results show that the proposed infrastructure is of sufficient capacity for the projected flows, so it is considered that the magnitude of impact is negligible adverse, resulting in a **negligible adverse** (low sensitivity) effect, that is not environmentally significant.

Water Supply

11.9.138 There is anticipated to be an increase in demand on the water supply due to the forecast increase in passenger numbers during 2038. Calculations have been undertaken to determine the extent of the increase and through discussions with SESW, the magnitude of impact on the upstream water infrastructure (low sensitivity) is considered to be low adverse, resulting in a **negligible to**

minor adverse effect which is not environmentally significant. Through consultation, SESW has provisionally stated that their sources and network can meet the additional demands of the Project during operation (subject to the full findings of their impact assessment).

Further Mitigation

Flood Risk and Surface Water Drainage

11.9.139 Whilst from an EIA perspective the level of significance is minor (adverse) or better for all effects related to flood risk, further mitigation may be put in place in order to mitigate any residual risk of increase in downstream surface water flooding to ensure compliance with the NPS. A more detailed assessment is included in the **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3).

Future Monitoring

11.9.140 From a geomorphological and WFD Regulations perspective, regular monitoring of any change to the channel bed and banks would be undertaken, particularly in the vicinity of the River Mole renaturalised channel, the Museum Field FCA spillway and the outfall from the Car Park X FCA to the River Mole following completion of the Project. This would take the form of fixed point photography. If significant negative change occurs, appropriate mitigation would be implemented. For example, excessive erosion of the bank would require suitable bank protection measures to stabilise the bank.

11.9.141 Any impacts to water quality would be identified by existing discharge monitoring undertaken by GAL (at Ponds A, M and D and in the River Mole) and by Thames Water (at Crawley STW).

11.9.142 Water demand can be further refined and updated through continuous monitoring of water consumption data and changes in passenger numbers.

11.9.143 No additional monitoring is required for other water disciplines.

Significance of Effects

11.9.144 Any effect regardless of severity could be considered significant to third parties according to the NPS. Therefore, the further mitigation measures proposed for potential residual surface water flood risk impacts would aim to ensure that no third parties are impacted by the Project. These would ensure that the Project would not increase flood risk elsewhere, and therefore the significance of the effects to third parties would be reduced to **negligible** which is not environmentally significant.

11.9.145 The potential impacts on geomorphology mainly arise due to the flood risk mitigation associated with the River Mole renaturalised channel, creation of FCA and extension of culverts. There would be a minor to negligible effect on the watercourses with the implementation of the design recommendations proposed. The overall long-term effect on the River Mole for geomorphology would be **minor beneficial**, whilst there would be a **minor adverse** effect on Gatwick Stream, Crawter's Brook and Man's Brook. The significance of the effect on Burstow Stream Tributary would be **negligible** which is not environmentally significant. Other remaining impacts on the watercourses associated to the Project, such as new access arrangements, would be offset by improvements and environmental enhancement in other areas of the catchment, as part of the embedded mitigation. Therefore, any residual effect with a significance of minor or less is not considered to be significant.

11.9.146 Based on a qualitative assessment of groundwater flood risk, it is considered that some elements of the Project may have a local impact on groundwater flow paths and levels in their immediate vicinity. These risks would easily be addressed by adopting appropriate design practices during the detailed design stage and therefore, it is considered that the residual risk from groundwater flooding will not be adversely affected by the Project. This is therefore not anticipated to change the assessment of effect.

11.9.147 No significant adverse effects have been identified for other water elements at this assessment horizon once the proposed mitigation is included.

Highways Assessment Year: 2047

Surface Water

Geomorphology

11.9.148 No further effects on the geomorphology of the surface water receptors are anticipated beyond those described in the Design Year 2038.

WFD Compliance Assessment

11.9.149 The assessment of effects during operation for the WFD surface water body elements is detailed in **ES Appendix 11.9.2: Water Framework Directive Compliance Assessment** (Doc Ref. 5.3.

Water Quality – Highways Improvements and Car Parks

11.9.150 To assess the impact of the surface access improvement works on surface water quality during the operational period, routine runoff and spillage risk assessments have been undertaken for the highways improvements works and CIRIA Simple Index Approach (SIA) assessments have been undertaken for the car parks for the 2047 design year. Full details of the methodologies, data used and results from these operational assessments are presented in the Water Quality Assessment Report in **ES Appendix 11.9.3: Water Quality HEWRAT Assessment** (Doc Ref. 5.3).

11.9.151 The Longbridge Roundabout is served by four surface water drainage catchments (11, 12, 13 and 14 – see the **ES Appendix 11.9.6 Annex 2** (Doc Ref. 5.3). The receiving watercourse for outfall 13 is unknown at this stage, therefore, this receptor cannot be assigned a sensitivity and a magnitude of impact and overall significance of effect is not able to be established. However, the results from the surface water quality assessments indicate that this outfall is a 'pass' in HEWRAT for soluble and sediment-bound pollutants and is within acceptable limits of <1 per cent occurrence for spillage risk. A groundwater assessment has also been undertaken on this outfall in case of discharge to groundwater, this established a 'low' risk to groundwater. The results of the water quality routine runoff assessment for the Longbridge Roundabout outfalls (11,12 and 14) indicate a magnitude of impact of negligible adverse with an overall significance of effect of **minor adverse** for watercourses with a receptor value of 'High' (River Mole – outfalls 11 and 12) and 'Medium' (Withy Brook – outfall 14). This is not environmentally significant.

11.9.152 The North Terminal Roundabout is served by four drainage catchments (4, 5, 6 and 7). The results of the surface water quality assessments indicate a magnitude of impact of negligible adverse with an overall significance of effect of **minor adverse** for watercourses with a receptor value of 'High' (River Mole – outfalls 5, 6 and 7, and Gatwick Stream – outfall 4). This is not environmentally significant.

11.9.153 The South Terminal Roundabout is also served by four drainage catchments (0, 1, 2, 3). The results of the surface water quality assessments indicate a magnitude of impact of negligible adverse with an overall significance of effect of **minor adverse** for watercourses with a receptor value of 'High' (Gatwick Stream – outfalls 2 and 3), and 'Medium' Burstow Stream – outfalls 0 and 1). This is not environmentally significant.

11.9.154 Routine runoff assessments for the highway improvement works 'pass' for soluble and sediment-bound pollutants both individually and as part of cumulative assessments (where relevant). All outfalls pass in the pre-mitigation scenario (Step 2) and where SuDS have been provided for attenuation purposes, these have been included within a Step 3 – post-mitigation assessment. Results from the spillage risk assessment show the Project passes with a calculated annual probability of a serious pollution incident to be below the 1% limit for both outfalls. This is not environmentally significant.

11.9.155 The drainage design for the car parking areas has not been finalised at this stage, therefore, the CIRIA SIA assessments have been undertaken based upon the existing situation and are presented in **ES Appendix 11.9.3: Water Quality HEWRAT Assessment** (Doc Ref. 5.3). Existing treatment is insufficient; however it is understood that during detailed design, sufficient treatment will be provisioned within the design as embedded mitigation, consequently no environmentally significant effects are expected, to be secured via **Design Principles** in **Design and Access Statement** (Doc Ref. 7.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1). This is not environmentally significant.

Water Quality – De-icer

11.9.156 The effect of the increased use of de-icer due to the increase in ATMs and additional pavement is mitigated by the new de-icer treatment provided at the long term storage lagoons, and additional runoff attenuation volume created as part of airfield drainage works, and at a new storage facility under Car Park Y. The additional attenuation volume created alongside the new treatment works reduces the risk of runoff contaminated with de-icer discharging to the River Mole (high sensitivity), and improves river quality for Biochemical Oxygen Demand from Bad to Good, which is classed as **moderate beneficial** magnitude of impact. This is a significant improvement compared to baseline; therefore, the significance of effect has been assessed as **moderate beneficial** which is environmentally significant.

11.9.157 The new treatment works adjacent to Crawley Sewage Treatment Works will provide a high-quality effluent to the Gatwick Stream (high sensitivity) which will provide dilution for storm discharges and final effluent from Thames Water Crawley Treatment works. This would be a medium beneficial magnitude of impact compared to baseline; therefore, the significance of effect has been assessed as **moderate beneficial** which is environmentally significant.

Groundwater

11.9.158 No further impacts on groundwater receptors are anticipated beyond those described in the Design Year 2038.

Flood Risk

11.9.159 No further impacts on the risk of flooding are anticipated beyond those described in the Design Year 2038.

Water Infrastructure

Wastewater

11.9.160 2047 would see peak daily passenger numbers increase by approximately 22 per cent compared to the 2047 future baseline. Compared to the future baseline for 2047, the Project wastewater system flows are a maximum of 9 per cent higher for the dry weather cases, but 3 per cent lower for the wet weather cases due to the proposed mitigation works and changes in land use associated with the Project, which would divert storm flow out of the wastewater system. Hydraulic modelling has been undertaken to determine the impact of the additional flows in the Gatwick wastewater network infrastructure (medium sensitivity), taking account of the proposed mitigation measures to be implemented as part of the Project. The modelling results show that the proposed infrastructure is of sufficient capacity for the projected flows, so it is considered that the impact is negligible adverse, resulting in a **negligible adverse** effect, that is not environmentally significant.

Water Supply

11.9.161 There is anticipated to be an increase in demand on the water supply due to the forecasted increase in passenger numbers between 2038 and 2047. Calculations have been undertaken to determine the extent of the increase and, through discussions with GAL and SESW, the magnitude of impact on the upstream water infrastructure is considered to be low adverse, resulting in a **negligible to minor adverse** effect (low sensitivity) which is not environmentally significant. Through consultation, SESW has stated that their sources and network can meet the additional demands of the Project during operation and will continue to be reviewed as the Project progresses.

Further Mitigation

11.9.162 No further mitigation would be required at 2047 beyond that already proposed for the design year: 2038.

Future Monitoring

11.9.163 No further monitoring would be required at 2047 beyond that already proposed for the design year: 2038.

11.10 Potential Changes to the Assessment as a Result of Climate Change

11.10.1 The impact of climate change is an integral part of the assessment for the water environment. Impacts such as increased severity and frequency of droughts and floods, changes to rainfall patterns in terms of rainfall intensity, and seasonal and annual rainfall totals, are relevant to the assessment of different water environment elements. Other aspects such as changes related to cold weather events impact on airport de-icing operations. As these climate change impacts are taken into account in the assessment, there is no anticipated change to the assessment as a result of climate change. A summary of the main climate change considerations incorporated into the assessment for each water environment element is included below.

Surface Water

Geomorphology

11.10.2 Climate change could potentially alter the hydrological regime of the watercourses over a medium to long-term time period. Increased frequency or severity of droughts and floods could potentially lead to the watercourses adjusting to different patterns of erosion and deposition. It is likely that the adjustment would remain localised and of relatively low magnitude given the channel types. Overall, the potential effect of climate change on geomorphology is unlikely to change the outcome of this assessment.

Water Quality – Highways Improvements and Car Parks

11.10.3 Climate change impacts on surface water quality aspects related to highways improvements and car parks are not anticipated to alter the assessment considerably.

Water Quality – De-icer

11.10.4 Climate change impacts on water quality aspects related to surface water quality are not anticipated to alter the assessment. However, the impact of climate change and weather variability on de-icer use is challenging to predict. The latest projections of future climate change (UKCP18) indicate that winters will become wetter and warmer on average which would generally reduce de-icer use. Further, for a given weather event (such as the winter 2017/18 event used for the assessment) with increased air traffic movements, although de-icer use by volume would be greater, total deicer load would decrease compared to the baseline due to the pavement deicer Konsin having been replaced by Safegrip ECO2. It is important to note that whilst winters are anticipated to become warmer on average, cold weather spells will still occur. This has been taken into account in the assessment, and therefore, no further change to the assessment is expected as a result of climate change.

Groundwater

11.10.5 Impacts to groundwater resources as a result of climate change are varied but include the potential for increased frequency and magnitude of groundwater flooding events. Groundwater flooding may be exacerbated where the events are linked to fluvial flooding and shallow, near-surface Secondary aquifers. Reduced groundwater resource availability may arise due to increased groundwater demand from further development or agriculture and/or changes in groundwater recharge especially during prolonged dry periods exacerbated by climate change (UK Groundwater Forum, 2019).

11.10.6 A conservative range of groundwater levels has been used in this assessment which is considered to account for potential changes in groundwater recharge, and therefore no changes to the assessment are anticipated.

Flood Risk and Surface Water Drainage

11.10.7 The impact of climate change on flood risk will be to increase the risk of both fluvial flooding and surface water flooding. However, this has been considered as an integral part of the assessment as a worst-case scenario and in line with the Environment Agency's latest Flood Risk Assessments: Climate Change Allowances guidance published in February 2016, last updated in May 2022 (Environment Agency, 2016a), for peak river climate change allowances and peak

rainfall intensity climate change allowances. This is the best national representation of how climate change is likely to affect flood risk for peak river flow and peak rainfall intensity available (from a policy and guidance perspective). There are a range of climate change allowances used for different elements of the Project, depending on the timeframe, the source of flooding, and which estimate (for example central or upper end) should be used. As climate change has been fully integrated to the assessment, no changes to the assessment are anticipated.

Water Infrastructure

Wastewater

11.10.8 Climate change has the potential to cause rainfall of increased depth, frequency and intensity to occur compared to the present rainfall patterns. As a result, storm runoff from the small contributing areas discharging to the foul sewer system would increase the flows in the network and potentially exceed the capacity of the gravity sewers or pumping stations.

11.10.9 The potential impact of climate change was tested using the 2047 flows for the future baseline and the Project scenarios. This provides the worst-case combination of passenger flows and climate change. The Environment Agency predicts a central potential increase in precipitation of 20 per cent for the 2050's epoch. For consistency with other Water ES topics, an increase of 25% has been taken as a conservative estimate of climate change. Therefore, the storm flows were increased by this percentage and the performance of the system was compared to the equivalent future baseline. The absolute impact was also assessed.

11.10.10 The climate change increase to the storm flows increases the peak flows in the foul sewer system by approximately 11 per cent: for the Project scenario compared to the Project without climate change. As a result, there are some minor increases to surcharging of the gravity pipes, and the pumps have to run for longer in order to deal with the flow, but there is no predicted flooding or significant detriment to the operation of the network. Compared to the 2047 future baseline (i.e. without the Project) with the same rainfall uplift applied, the total flows are 5 per cent lower in the Project scenario and the predicted stress on the network is considerably less due to the proposed mitigation works and changes in land use associated with the Project which would divert storm flow out of the foul system.

11.10.11 The impact on the foul sewer system would be minor adverse as there is no predicted risk of flooding in the Project scenario, but the system would experience higher degrees of surcharge. As these factors are taken into account in the assessment process, no additional changes to the assessment are anticipated as a result of climate change.

Water Supply

11.10.12 Climate change may have an impact on available water sources due to changes in annual rainfall which affect impounding reservoir catchment areas, or groundwater available for abstraction. This is not currently deemed to have a significant effect on the water source, but would be reviewed as the Project develops. Overall, the potential effect of climate change is unlikely to change the outcome of this assessment.

11.11 Cumulative Effects

Zone of Influence

11.11.1 The zone of influence (ZoI) for the water environment has been identified based on the spatial extent of likely effects.

Screening of Other Developments and Plans

11.11.2 The Cumulative Effect Assessment (CEA) takes into account the impact associated with the Project together with other developments and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise undertaken as part of the 'CEA short list' of developments. Each development on the CEA long list has been considered on a case by case basis for scoping in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

11.11.3 In undertaking the CEA for the Project, it is important to bear in mind that the likelihood of other developments and plans being constructed varies depending on how far along the planning process they are. For example, relevant developments and plans that are already under construction are likely to contribute to a cumulative impact with the Project (providing impact or spatial pathways exist), whereas developments and plans not yet approved or not yet submitted are less certain to contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors. For this reason, all relevant development and plans considered cumulatively alongside the Project have been allocated into 'Tiers', reflecting their current stage within the planning and development process. Appropriate weight is therefore given to each Tier in the decision-making process when considering the potential cumulative impact associated with the Project (eg it may be considered that greater weight can be placed on the Tier 1 assessment relative to Tier 2). Further details of the screening process for the inclusion of other developments and plans in the short list and a description of the Tiers is provided in **ES Chapter 20: Cumulative Effects and Inter-Relationships** (Doc Ref. 5.1).

11.11.4 The specific developments scoped into the CEA for the water environment from the short list and the tiers into which they have been allocated are outlined in Table 11.11.1.

11.11.5 The assumption of the Project and this assessment is that the developments in Table 11.11.1 would comply with national planning policy and would therefore include mitigation not to increase flood risk off site nor detrimentally affect the water environment.

Table 11.11.1: List of Other Developments and Plans considered within CEA

Reference Number	Application Number	Description	Distance from Project (km)	Overlap with the Project Site Boundary?
Tier 1				
1	WA/2017/1466	Extraction of clay from an area of 43.2 hectares (ha) plus other works at land at Ewhurst Brickworks Horsham Road, Ewhurst, GU6 7SW	14	No
295	DC/22/1494/REM	Land North of Horsham Old Holbrook Horsham West Sussex – Reserved matters application for the erection of 170 residential dwellings with associated infrastructure	10.4	No
297	Land North of Horsham DC/20/2047/REM	Land North of Horsham – Reserved matters application for 193 dwellings	10.4	No
298	Land North of Horsham DC/21/0066/REM	Land North of Horsham – Reserved matters application for 197 dwellings	10.4	No
299	Land North of Horsham DC/21/1427/REM	Land North of Horsham – Reserved matters application for 221 dwellings	10.4	No
300	Novartis, Horsham DC/23/0183/REM	Novartis, Horsham – Reserved Matters Application for 123 dwellings	10.6	No
301	Kilnwood Vale DC/19/1508/REM	Kilnwood Vale – Reserved matters application for 101 dwellings Phase 3C	5.8	No
305	MO/2022/1698	Proposed EIA Application at Clockhouse Quarry, Horsham Road, Capel, Dorking, Surrey for Proposed importation and deposit of 740,000 cubic metre (m3) of inert waste materials to restore the former quarry	7.73	No

Reference Number	Application Number	Description	Distance from Project (km)	Overlap with the Project Site Boundary?
306	DM/21/0644	Land West of Copthorne, West Sussex – Reserved Matters Planning Application for 197 dwellings	3.5	No
312	DM/20/4127	Outline application for an expansion of the existing commercial estate with up to 7,310 sq. m of new commercial space.	7.3	No
327	DM/19/1067	Reserved matters following outline consent (DM/15/0429) relating to the appearance, landscaping, layout and scale for 200 new dwellings including	9.8	No
335	DM/18/4321	Land West of Copthorne -Reserved Matters application for Phase 1 – 303 residential dwellings	2.5	No
338	DM/19/3549	Land West of Copthorne – Reserved matters application for 9,290sqm B8 warehouse building pursuant to condition 1	6.7	No
340	DM/19/5175	Land West of Copthorne – construction of a 6,016sqm B8 building	2.51	No
341	DM/18/3874	Land West of Copthorne – Reserved matters application for 9,290sqm B8 warehouse building pursuant to condition 1 (reserved matters) of outline planning permission 13/04127/OUTES	2.51	No
342	DM/19/4636	Land east of Brighton Road Pease Pottage phase 3 Under construction – Reserved matters application for approval of the appearance, layout, scale and landscaping of phases 4 and 5 pursuant to Outline Planning Permission DM/15/4711 comprising a total of 277 dwellings (136 homes in Phase 4 and 141 homes in Phase 5)	6.37	No
346	DM/22/3214	Demolition of existing structures and erection of 61 no. 1, 2, 3 and 4 bedroom homes located land South Of Crawley Down Road Felbridge East Grinstead West Sussex RH19 2PP	8.02	No

Reference Number	Application Number	Description	Distance from Project (km)	Overlap with the Project Site Boundary?
347	DM/23/0007	Outline application for Redevelopment of existing single dwelling house and erection of Care Home for up to 85 Bedrooms, with all matters reserved except for access. Located at Highfields West Hill East Grinstead West Sussex RH19 4DL	10.73	No
Tier 2				
354	EIA/20/0004 – Land west of Ifield	EIA Scoping for West of Ifield – allocated site. EIA Scoping for West of Ifield – allocated site. The proposed development is on a site of 194 hectares in size with a minimum of 3,250 homes and up to 4,000 homes along with social infrastructure, green infrastructure and highway links.	1.5	No
Tier 3				
356	Land North of Horsham, comprising the area north of the A264 (between Langhurst Road and Wimlands Road)	Land North of Horsham, comprising the area north of the A264 (between Langhurst Road and Wimlands Road) – Strategic Site allocated for mixed use strategic development to accommodate at least 2,500 homes and a business park	8.72	No
379	Land at Steers Lane, Forge Wood	185 dwellings (subject to implementation of outline planning permission of CR/2018/0894/OUT, or any amendment thereof, and associated Reserved Matters approval(s)	0.68	No
380	Land to the southeast of Heathy Farm, Balcombe Road	Part of the Forge Wood Key Housing Site Allocation under Local Plan, identified as “Residual Land at Forge Wood”	2.17	No

Reference Number	Application Number	Description	Distance from Project (km)	Overlap with the Project Site Boundary?
381	Tinsley Lane	Key Housing Site Allocation for 120 dwellings and community uses under Local Plan. Outline application CR/2018/0544/OUT for 150 units	2.25	No
382	Land East of London Road, Northgate	Land East of London Road, Northgate identified as broad location for housing development circa 171 net dwellings	2.27	No
384	Former GSK Site, Manor Royal	Part of the Manor Royal Main Employment Area Site Allocation under Local Plan. The site has an extensive planning history. Outline PP CR/2012/0134/OUT was granted for a mixed-use employment park. Reserved matters CR/2015/0286/ARM was approved in 2015. Applications for the approval of the design for the spine road, linking Crawley Avenue to Manor Royal, and details required by some of the conditions attached to this Outline Planning Permission, and in particular the Landscape Master Plan, have also been approved under references CR/2012/0134/ARM, CR/2012/0134/CC1 and CR/2012/1034/CC2. The spine road is complete. Reserved matters were approved last year for the remainder of the site under reference CR/2014/0415/ARM. This permission is partially built out. A new application (CR/2021/0249/FUL) has been received seeking permission for the erection of three x B8 warehouse unit	2.39	No
385	Land east of Balcombe Road and South of the M23 Spur – 'Gatwick Green'	Allocated for an industrial-led Strategic Employment Location that will provide as a minimum 24.1ha new industrial land, predominantly for B8 storage and distribution use	2.5	No
388	Land to the southeast of Heathy Farm, Balcombe Road	Housing allocation for 150 dwellings at land to the southeast of Heathy Farm, Balcombe Road	4.1	No
392	Crawley College	Town Centre Key Opportunity Site – Housing allocation for 400 dwellings	4.7	No

Reference Number	Application Number	Description	Distance from Project (km)	Overlap with the Project Site Boundary?
394	Telford Place/ Haslett Avenue	Town Centre Key Opportunity Site – Housing allocation for 300 dwellings	5	No
398	Land adjacent to Desmond Anderson	Housing allocation for 150 dwellings	6.6	No
405	Forge Wood, Pound Hill (1,900 dwellings)	Land identified as being “deliverable” within the first five years of the Crawley Local Plan (2015/16-2019/20). A number of applications made by Persimmon Homes at Forge Wood which have been approved	0.7	No
406	Forge Wood Masterplan Area, Pound Hill	Forge Wood Masterplan Area, Pound Hill – 1,083 dwellings outstanding in April 2020	0.7	No
436	SA19: Land south of Crawley Down Road, Felbridge	SA19: Land south of Crawley Down Road, Felbridge – Housing allocation for 200 dwellings	8	No
437	SA20: Land south and west of Imberhorne Upper School, Imberhorne Lane, East Grinstead	SA20: Land south and west of Imberhorne Upper School, Imberhorne Lane, East Grinstead – Housing allocation (550) with Local Centre and Care Community	8.4	No
449	DP10: Strategic allocation to the east of Pease Pottage	DP10: Strategic allocation to the east of Pease Pottage – Strategic development is allocated to the east of Pease Pottage for: 11-142pprox.. 600 new homes	7.32	No
450	DPSC3: Land at Crabbet Park	DPSC3: Land at Crabbet Park – Site is capable of delivering 2,300 new homes, but is estimated that only 1,500 will be deliverable within the Plan period.	4.61	No
452	DPH13: Land to west of Turners Hill Road, Crawley Down	DPH13: Land to west of Turners Hill Road, Crawley Down – Housing allocation of 350 dwellings	7.1	No

Reference Number	Application Number	Description	Distance from Project (km)	Overlap with the Project Site Boundary?
453	Land west of Balcombe Road, Horley Strategic Business Park	Horley Employment Park - Strategic Employment Site – 83ha with 200,000 sqm office space.	0.4	Yes
454	Land off the Close and Haroldslea Drive	Land off the Close and Haroldslea Drive – Residential allocation, up to 40 new homes, 2.4 hectare site.	1.15	No
484	Land at Plough Road and Redehall Road, Smallfield	Land at Plough Road and Redehall Road, Smallfield – 160 residential units, 5 hectare site under Proposed Plan	3.65	No
486	Land North of Plough Road, Smallfield	Land North of Plough Road, Smallfield – 120 residential units, 9.2 hectare site under Proposed Plan	4.01	No
500	Land at Lambs Business Park, Terra Cotta Road, South Godstone	Allocated for a small, medium or large-scale thermal treatment facility	10.9	No
501	DS42 Land at Povey Cross Farm, Hookwood	Land at Povey Cross Farm, Hookwood – Site identified in Reg 19 consultation draft local plan for 84 dwellings	0.4	No
502	DS41 Land west of Reigate Road, Hookwood	Land west of Reigate Road, Hookwood – Site identified in Reg 19 consultation draft local plan for 446 dwellings	0.5	No
503	DS43 Land adjacent to Three Acres, Hookwood	Land adjacent to Three Acres, Hookwood – Site identified in Reg 19 consultation draft local plan for 20 dwellings	0.7	No
504	DS44 Land south of Kennel Road, Hookwood	Land south of Kennel Road, Hookwood – Site identified in Reg 19 consultation draft local plan for 13 dwellings	0.8	No

Cumulative Effects Assessment

11.11.6 A description of the significance of cumulative effects upon the water environment arising from each identified impact is given below.

11.11.7 Due to uncertainty around the third runway at London Heathrow Airport (Heathrow R3), this development has not been included in the main cumulative effects assessment. However as Heathrow R3 remains Government policy, it has been considered separately and a qualitative assessment is provided in **ES Chapter 20: Cumulative Effects and Inter-Relationships** (Doc Ref. 5.1).

Surface Water (Geomorphology, Water Quality), Groundwater, Flood Risk and Surface Water Drainage

11.11.8 It is assumed that approved developments within the ZoI would include embedded and further mitigation of any effects and residual effects respectively, in order to ensure there is no deleterious impact upon the water environment. The assessment undertaken in this chapter showcases that there will be no residual significant adverse effects to flood risk and surface water drainage, geomorphology, groundwater or water quality from the Project to third parties. Therefore, no cumulative effects are anticipated among the Project and other developments within the ZoI for all assessment years.

Water Infrastructure (Wastewater and Water Supply)

11.11.9 With respect to the private Gatwick wastewater network, there are no cumulative effects, but there could be an impact on the public sewerage and treatment facilities. These are expected to be taken into account by Thames Water when they perform their forthcoming Development Impact Assessment (see paragraph 11.9.2). GAL has engaged with Thames Water (including by providing **ES Appendix 11.9.7: Wastewater Assessment** (Doc Ref. 5.3)) to allow Thames Water to assess the impacts to the receiving STW in line with their statutory duties.

11.11.10 In terms of water supply all of the developments listed in Table 11.11.1 may have an impact on water supply, as all will increase demand in the surrounding area, however not all are supplied within SESW's supply area, as the Gatwick site borders other water utility providers. Any hydraulic impact assessments would be carried out by the impacted water provider. It is recommended that regular contact be established with SESW during development of the Project programme with respect to any changes to levels of service.

11.12 Inter-Related Effects

11.12.1 This chapter of the ES assesses the effects on the water environment as a result of the Project. All the potential impacts on the water environment are assessed in this **ES Chapter 11: Water Environment** (Doc Ref. 5.1).

11.12.2 There is an interrelationship with other environmental topics including:

- Ecology and Nature Conservation;
- Geology and Ground Conditions;
- Traffic and Transport;
- Climate Change;
- Health and Wellbeing; and

- Agriculture and Recreation.

11.12.3 All potential impacts are mitigated to a level which is not considered significant for surface water (comprising geomorphology and water quality); groundwater; flood risk (including surface water drainage); and water infrastructure (comprising wastewater and water supply).

11.12.4 The assessment of effects on the water environment including the traffic and transports, climate change as well as people using recreational assets, effects on public open space and public rights of way are considered within Sections 11.8, 11.9 and 11.10. Further information on the inter-related effects are included in **ES Chapter 12: Traffic and Transport** (Doc Ref. 5.1), **ES Chapter 15: Climate Change** (Doc Ref. 5.1) and **ES Chapter 19: Agricultural Land Use and Recreation** (Doc Ref. 5.1).

11.12.5 Potential interactions with groundwater and contaminated runoff are considered within **ES Chapter 11: Water Environment** (Doc Ref. 5.1) as well as **ES Chapter 10: Geology and Ground Conditions** (Doc Ref. 5.1).

11.12.6 The assessment of effects on water environment including the impacts on water quality on people due to the Project are considered within **ES Chapter 18: Health and Wellbeing** (Doc Ref. 5.1).

11.12.7 Further information on inter-related effects is provided in **ES Chapter 20: Cumulative Effects and Inter-Relationships** (Doc Ref. 5.1).

11.13 Summary

11.13.1 An assessment has been undertaken to identify the likely effects of the Project on the water environment comprising:

- surface water (comprising geomorphology and water quality);
- groundwater;
- flood risk (including surface water drainage); and
- water infrastructure (comprising wastewater and water supply).

11.13.2 The primary effects of the Project on the water environment, without the consideration of further mitigation, are related to flooding, surface water drainage, geomorphology and water quality. However, there are potential effects on all water environment elements. A summary of the effects for each assessment period is set out below.

11.13.3 The assessment of effects for all assessment horizons for the WFD surface water body elements are detailed in **ES Appendix 11.9.2: WFD Compliance Assessment** (Doc Ref. 5.3).

Initial Construction Period: 2024-2029

Surface Water

Geomorphology

11.13.4 The assessment finds that during the initial construction period of the Project, there would be minor adverse effects on the River Mole associated with construction of the renaturalised channel and creation of FCA as part of the embedded flood mitigation measures. The effects would be temporary, however, and the renaturalisation works would deliver an overall improvement to the geomorphology of the watercourse.

11.13.5 There would be negligible to minor adverse effects to local watercourses during construction, primarily the creation of the FCAs in Car Park X and Museum Field, extension of the River Mole syphon and culvert, and creation of a small weir on the runway culvert. The assessment of effects assumes the provision of mitigation and best practice measures secured **Design Principles** in **Design and Access Statement** (Doc Ref. 7.3) and **ES Appendix 8.8.1: Outline Landscape and Ecology Management Plan** (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1). There would be minor adverse effects on the River Mole associated with construction of the surface access improvements at Longbridge Roundabout and on Man's Brook associated with the creation of two bridges. Again, with the provision of mitigation and best practice measures secured in **Design Principles** in **Design and Access Statement** (Doc Ref. 7.3) and **ES Appendix 8.8.1: Outline Landscape and Ecology Management Plan** (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1), these effects during the initial construction phase are not environmentally significant.

Water Quality – Highways Improvements

11.13.6 Construction activities have the potential to affect water quality primarily through the mobilisation of sediment or accidental spillage of potentially harmful pollutants. With the implementation fo best practice measures as outlined in the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3) these effects have been assessed as not worse than minor adverse which is not environmentally significant.

Water Quality – De-icer

11.13.7 The effect of the increased use of de-icer due to the increase in ATMs and additional pavement is mitigated by the new de-icer treatment provided at the long-term storage lagoons. This treatment works significantly reduces the risk of runoff contaminated with de-icer to the River Mole (high sensitivity) and improves river quality for Biochemical Oxygen Demand from Bad to Good. This would result in a moderate beneficial effect compared to baseline which is environmentally significant.

Groundwater

11.13.8 Excavation for building foundations and other sub-surface infrastructure could result in dewatering which could impact on groundwater flows and levels. Impacts to groundwater resources could affect high sensitivity surface water receptors (River Mole, Gatwick Stream, and Crawter's Brook). There could be localised or short-term impacts to aquifer receptors from mobilisation of existing sources of contamination. None of these activities are considered to give rise to no worse than a minor adverse effect which is not considered to be environmentally significant.

11.13.9 Potential impacts to high and very high sensitivity structures (which include airport infrastructure, transport infrastructure, residential/commercial buildings, and listed buildings) as a result of differential settlement effects from construction dewatering would result in minor adverse to moderate adverse effects which could be environmentally significant. A settlement analysis would be undertaken as an additional mitigation during the detailed design phase which will inform construction methodologies and any required asset protection measures to ensure that there are no significant residual environmental effects.

11.13.10 Potential impacts on aquifer receptors due to piling, construction of sub-surface structures, and spillage of contaminants at the surface are considered to give rise to no worse than a minor adverse effect which is not considered to be environmentally significant.

Flood Risk

11.13.11 The following conclusions can be made with regards to flood risk during construction within the Project boundary:

- Fluvial flooding is the principal source of flood risk to the Project during construction. Temporary watercourse crossings and construction compounds are located outside of the flood extents where possible or raised above the 1 per cent plus 16 per cent climate change allowance peak water level. As the mitigation measures such as Museum Field and Car Park X FCA are to be constructed in the first construction period, levels of fluvial flood risk during construction would be equivalent to the future baseline or reduced. Where minor adverse effects are still predicted to occur on airport infrastructure and airfield grassed areas, the GAL's **Flood Resilience Statement** (**ES Appendix 11.9.6 Annex 6** (Doc Ref. 5.3)) sets out how the risk would be safely managed.
- Surface water flooding is also a significant source of flooding to the Project during construction as existing surface water flow paths may be interrupted, diverted or created by construction works. Any increase in surface water runoff that could potentially not be conveyed by the existing drainage system would be managed on site or dealt with through temporary drainage.
- Based on qualitative assessment, it is considered that there is susceptibility to groundwater flooding in the Project areas underlain by superficial deposits. However, any groundwater flood risk due to the Project would be mitigated by adopting appropriate design practices as set out in the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3).
- Based on qualitative assessment, an increase in the risk of groundwater emergence could occur as a result of construction activities lowering ground levels or impeding groundwater flows. However, any groundwater flood risk due to the Project would be mitigated by adopting appropriate design practices as detailed in Section 11.8 and set out in the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3) .
- The risk of flooding from other sources during construction, including reservoirs and sewer flooding, is considered low.

11.13.12 Incorporating the mitigation measures including additional and embedded mitigation, detailed in Section 11.8 of this chapter, the residual effects of the Project on flood risk during the construction phase are not considered to be environmentally significant (refer to Section 11.9 and **ES Appendix 11.9.6: Flood Risk Assessment** (Doc Ref. 5.3) for details).

Water Infrastructure

11.13.13 Construction activities would increase load and demand on the wastewater and water supply networks respectively. However these additional flows are considered to be very small compared to normal daily flows. At worst these have been assessed as a minor adverse effect which is not considered to be environmentally significant.

First Full Year of Opening: 2029 (up to 2032)

Surface Water

Geomorphology

11.13.14 During the first full year of operation, there would be a negligible to minor adverse effect on the watercourses as they adapt and adjust to associated construction works. There would be minor adverse effects through the construction of the new surface access improvements at the South Terminal and North Terminal, with the provision of mitigation and best practice measures secured in **ES Appendix 5.3.2: CoCP Annex 1 - Water Management Plan** (Doc Ref. 5.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1). These effects during the first full year of operation are not environmentally significant.

Water Quality – Highways Improvements

11.13.15 For surface water quality for the surface access highways improvements and car parks, no significant effects have been identified for the construction or operational periods.

Water Quality – De-icer

11.13.16 The effect of the increased use of de-icer due to the increase in ATMs and additional pavement is mitigated by the new de-icer treatment provided at the long-term storage lagoons. This treatment works significantly reduces the risk of runoff contaminated with de-icer to the River Mole (high sensitivity) and improves river quality for Biochemical Oxygen Demand from Bad to Good. This would be a medium beneficial magnitude of impact compared to baseline; therefore the significance of effect has been assessed as moderate beneficial which is environmentally significant.

Groundwater

11.13.17 No additional effects on groundwater above those assessed in the initial construction period would be anticipated as a result of the continued construction and operation commencing in 2029.

Flood Risk

11.13.18 There would be additional losses of floodplain during this period but the provision of the associated embedded mitigation measures as a part of the initial construction period would mitigate these. No further effects on flood risk above those assessed in the initial construction period would be anticipated as a result of the continued construction works in this time period.

Water Infrastructure

Wastewater

11.13.19 The first full year of opening would see peak daily passenger numbers increase by approximately 6 per cent from 2029, compared to the 2029 future baseline (which would be an increase of 14 per cent on the 2018 baseline). The effect on the Gatwick wastewater infrastructure network would be negligible adverse and would not be environmentally significant.

Water Supply

11.13.20 It is understood though liaison that existing SESW infrastructure would be able to meet the demands of increased passenger numbers during this period both from baseline increases and as a result of the Project. The additional demands of construction activities would be relatively small in comparison. Consequently, this would result in a negligible to minor adverse effect which is not environmentally significant.

Interim Assessment Year: 2032 (up to 2037)

Surface Water

Geomorphology

11.13.21 During the interim assessment year of the Project there would be a negligible to minor adverse effect on the watercourses as they adapt and adjust to associated construction works. These effects are not environmentally significant.

Water Quality – Highways Improvements

11.13.22 The reinstatement of site compounds, will continue to 2035. The potential impacts associated with reinstating the compounds are as those stated in paragraphs 11.9.26 and 11.9.27.

11.13.23 No operational assessment has been completed for the interim assessment year as assessment of operational impacts of the surface access works has been undertaken for the design year (2047), which would be considered to be a worst-case due to the increased road traffic.

Water Quality – De-icer

11.13.24 The effect of the increased use of de-icer due to the increase in ATMs has been assessed for the design year 2047 only, as a worst case.

Groundwater

11.13.25 Ongoing construction activities during this period are considered to be equivalent to those detailed in the Initial Construction Period (2024 to 2029) which are not environmentally significant.

Flood Risk

11.13.26 According to the proposed construction phasing programme, all primary works that could affect current flood risk would have been completed by 2029. The measures implemented by this stage would be adequate to ensure no further increase in flood risk would occur. Any effects would be as described for the First Full Year of Opening with no significant environmental effects anticipated once appropriate mitigation is applied in accordance with the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3).

Water Infrastructure

Wastewater

11.13.27 The interim assessment year 2032 would see peak daily passenger numbers increase by approximately 19 per cent compared to the 2032 future baseline, which would add additional loading to the wastewater network. The wastewater network has adequate capacity to

accommodate the increase in flows which results in a negligible adverse effect, that is not environmentally significant.

Water Supply

11.13.28 This period would see an increase in water demand, due to the increase in passengers. SESW has previously indicated that the projected increase in demand would likely not have an adverse impact on the water source. Therefore, there would be no change compared to the 2032 future baseline.

Design Year: 2038

Surface Water

Geomorphology

11.13.29 During the design year, there would be minor to negligible adverse effects associated to operational activities on the watercourses. These relate to the River Mole channel renaturalisation, FCAs, and culvert extensions and modifications. These effects are not environmentally significant. There would be a moderate beneficial effect on the River Mole with the implementation of the mitigation proposed, which would be environmentally significant. Other remaining effects on the watercourses associated with the Project, such as new access arrangements, would be offset by improvements and environmental enhancement in other areas of the catchment, as part of the embedded mitigation.

11.13.30 The diversion of the River Mole has been assessed to have a minor adverse effect on water quality. This would be short-term during construction, and the longer-term effect is beneficial due to the naturalisation of the watercourse, which would be environmentally significant.

Water Quality – Highways Improvements and Car Parks

11.13.31 No assessment of the impacts of the highways improvements on water quality of receiving water bodies has been completed for the 2038 assessment horizon as they have been considered for the design year (2047) which would be considered to be a worst-case due to the increased road traffic numbers.

Water Quality – De-icer

11.13.32 With regard to water quality, a precautionary approach has been taken assuming that de-icer load increases proportionally with the increase in air traffic movements and increase in airfield pavement area. The Project provides infrastructure to fully treat this additional load and improve treatment of the baseline load. The assessment concludes that any effect on the water environment is moderate beneficial which would be environmentally significant.

Groundwater

11.13.33 The increase in impermeable area due to the Project would reduce the opportunity for groundwater recharge however the area lost is relatively small compared to the overall recharge area and has therefore been assessed as a minor adverse effect and not environmentally significant.

11.13.34 Loss of groundwater storage within permeable superficial deposits may occur where sub-surface structures lead to the long-term loss or removal of the gravel aquifer. The resultant effect would

be **minor adverse** for both secondary undifferentiated and Secondary A aquifers which is not environmentally significant.

11.13.35 All other effects including those due to operation of the Museum Field FCA, construction of sub-surface structures, and discharge from surface water during low flow conditions are considered no worse than **minor adverse** effect and not environmentally significant.

Flood Risk

11.13.36 The following conclusions can be made with regards to flood risk during operation within the Project boundary:

- Fluvial flooding is the principal source of flood risk to the Project. Elements proposed as part of the Project, including new taxiways and stands, would be located as close to existing infrastructure as possible. Therefore, levels of fluvial flood risk to proposed airport infrastructure would be equivalent to existing or reduced. Where minor adverse effects are still predicted to occur on airport infrastructure and airfield grassed areas, the GAL's **Flood Resilience Statement** (**ES Appendix 11.9.6 Annex 6** (Doc Ref. 5.3)) will mitigate any risk.
- Surface water flooding is also a significant source of flooding to the Project. However, in most cases surface water flow paths and ponding areas are small in extent and do not encroach on proposed elements of the Project. Where minor adverse effects are still predicted to occur, surface water drainage will mitigate any risk.
- Based on qualitative assessment, it is considered that there is susceptibility to groundwater flooding in the Project areas underlain by superficial deposits. However, any groundwater flood risk due to the Project would be mitigated by adopting appropriate design practices as set out in the **ES Appendix 5.3.2: Code of Construction Practice** (Doc Ref. 5.3).
- The risk of flooding from other sources, including reservoirs and sewer flooding, is considered low.

11.13.37 Hydraulic modelling results show that the Project would increase the risk of flooding if no mitigation was in place. Therefore, flood mitigation measures have been proposed and are embedded in the Project, such that the Project will remain safe for its lifetime without increasing flood risk elsewhere.

11.13.38 The Project would result in an increase in impermeable area across the airfield and the highways improvements. These increases will result in a corresponding increase in the volume of water discharged to receiving watercourses via existing outfalls. The airfield and highways improvements include additional storage and attenuation measures to restrict peak runoff rates to ensure no increase in existing levels of flood risk, including an appropriate allowance for climate change.

11.13.39 Overall, the significance of flood risk effects from the Project on all sources of flood risk has been assessed to be (at worst) negligible or minor adverse and therefore not environmentally significant. The development would therefore be safe for its users and would not increase flood risk elsewhere. For certain third-party receptors the Project improves fluvial flood risk.

Water Infrastructure

Wastewater

11.13.40 The effects on the private airport wastewater system will be negligible to minor adverse, as upgrading works to accommodate the forecast increased inflows are to be constructed as part of the Project. Any effects on the public sewerage conveyance and treatment facilities will be addressed by Thames Water in their forthcoming Development Impact Analysis and appropriate mitigation works will be provided if and as required. GAL has engaged with Thames Water (including by providing **ES Appendix 11.9.7: Wastewater Assessment** (Doc Ref. 5.3)) to allow Thames Water to assess the impacts to the receiving STW in line with their statutory duties. There are no significant effects either during the construction phase or the operational phase.

Water Supply

11.13.41 For water supply the assessment shows that water demand will increase due to increase in passenger, staff and construction worker numbers through the existing Project boundary, during construction, and following completion of the terminal improvements and additional hotel and commercial facilities. This can be partially mitigated through introduction of water efficiencies during construction of new facilities. Following conversations with SESW it has been provisionally stated that forecast demands are unlikely to negatively impact the water source. There are no significant effects either during the construction phase or the operational phase.

Highways Assessment Year: 2047

Surface Water

Geomorphology

11.13.42 No further effects on the geomorphology of the surface water receptors are anticipated beyond those described in the Design Year 2038.

Water Quality – Highways Improvements and Car Parks

11.13.43 Routine runoff assessments for the highway improvement works ‘pass’ for soluble and sediment-bound pollutants both individually and as part of cumulative assessments (where relevant). All outfalls pass in the pre-mitigation scenario (Step 2) and where SuDS have been provided for attenuation purposes, these have been included within a Step 3 – post-mitigation assessment. Results from the spillage risk assessment show the Project passes with a calculated annual probability of a serious pollution incident to be below the 1% limit for both outfalls. This is not environmentally significant.

11.13.44 The drainage design for the car parking areas has not been finalised at this stage, therefore, the assessments have been undertaken based upon the existing situation and are presented in **ES Appendix 11.9.3: Water Quality HEWRAT Assessment** (Doc Ref. 5.3). Existing treatment is insufficient; however it is understood that during detailed design, sufficient treatment will be provisioned within the design as embedded mitigation, consequently no environmentally significant effects are expected, to be secured via **Design Principles** in **Design and Access Statement** (Doc Ref. 7.3) as a Schedule 2 requirement in the **Draft DCO** (Doc Ref. 2.1). This is not environmentally significant.

Water Quality – De-icer

11.13.45 The assessment of the effect for de-icer use would be the same as the 2038 Design Year, similarly resulting in a moderate beneficial effect which is environmentally significant.

Groundwater

11.13.46 No further impacts on groundwater receptors are anticipated beyond those described in the Design Year 2038.

Flood Risk

11.13.47 No further impacts on the risk of flooding are anticipated beyond those described in the Design Year 2038.

Water Infrastructure

Wastewater

11.13.48 2047 would see peak daily passenger numbers increase by approximately 22 per cent compared to the 2047 future baseline. The proposed infrastructure is of sufficient capacity for the projected flows, so it is considered that the effect is negligible adverse which is not environmentally significant.

Water Supply

11.13.49 There is anticipated to be an increase in demand on the water supply due to the forecasted increase in passenger numbers between 2038 and 2047. The assessment identifies a negligible to minor adverse effect, which is not environmentally significant.

Conclusion of Assessment of Significant Effects

11.13.50 From the assessment undertaken of the potential effects on all elements of the water environment, suitable mitigation has been proposed and it is concluded that there are no significant adverse residual effects.

11.13.51 For groundwater impacts to buildings and infrastructure a settlement analysis would be undertaken as an additional mitigation during the detailed design phase which will inform construction methodologies and any required asset protection measures to ensure that there would be no significant residual environmental effects.

11.13.52 The renaturalisation of the River Mole would restore natural channel morphology and improve connection to the floodplain which would be a significant environmental benefit following some temporary non-significant adverse effects during construction.

11.13.53 The installation of the new weir on the River Mole runway culvert would result in a beneficial significant effect by improving flow depths for fish during periods of low flow.

11.13.54 There would be significant beneficial effects resulting from the provision of a new treatment works and storage beneath Car Park Y that would reduce the risk of the discharge of potentially de-icer contaminated water to the River Mole.

Table 11.13.1: Summary of Effects

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
Initial Construction Period: 2024-2029							
Surface Water - Geomorphology	High to Low	Impacts the River Mole, Gatwick Stream, Crawter's Brook, Man's Brook and Burstow Stream Tributary include: ▪ Destabilisation of banks due to vegetation clearance and bank top loading ▪ Disruption to quantity and dynamics of flow and sediment supply due to changes to bed and bank form ▪ Increase to suspended sediment loads due to channel	Medium-term	Negligible Adverse	Negligible – Burstow Stream Tributary, Minor Adverse other watercourses	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
		disturbance and runoff from construction areas					
Surface Water – River Mole Geomorphology	High	River Mole renaturalised channel geomorphology	Medium-term	Low Adverse	Minor Adverse	Not significant	
Surface Water – River Mole Geomorphology	High	Construction of daylighted channel extension and re-provisioning of syphon north of runway could affect quantity and dynamics of flow and increase suspended sediment	Medium-term	Negligible Adverse	Minor Adverse	Not significant	
Surface Water – River Mole Geomorphology	High	Construction of small weir on upstream of runway culvert	Short-term	Low Adverse	Minor Adverse	Not significant	
Surface Water – River Mole Geomorphology	High	Museum Field and car park X FCA	Medium-term	Negligible Adverse to Low Adverse	Minor Adverse	Not significant	
Surface Water – River Mole Geomorphology	High	Temporary haul road connecting Museum	Medium-term	Negligible Adverse	Minor Adverse	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
		Field and northwest zone of Airfield					
Surface Water – Crawter's Brook Geomorphology	High	Car park X FCA	Medium-term	Negligible Adverse	Minor Adverse	Not significant	
Surface Water – River Mole Geomorphology	High	Longbridge Roundabout new surface access arrangements construction works	Short-term	Negligible Adverse	Minor Adverse	Not significant	
Surface Water – Man's Brook Geomorphology	High	Two new permanent access bridges	Medium-term	Low Adverse	Minor Adverse	Not significant	
Surface Water – Water Quality – Highways and Car Parks: River Mole Gatwick Stream	High	Potential impacts to water quality through construction related activities at Longbridge Roundabout.	Medium-term	Negligible Adverse	Minor Adverse	Not significant	
Surface Water – Water Quality – Highways and Car Parks: Gatwick Stream	High	Potential impacts to water quality through creation of a site compound for the South Terminal Roundabout	Medium-term	Negligible Adverse	Minor Adverse	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
Surface Water – Water Quality – Highways and Car Parks: River Mole Gatwick Stream Burstow Stream Burstow Stream Tributary	High (River Mole, Gatwick Stream), Medium (Burstow Stream and Burstow Stream Tributary)	Potential impacts to water quality through activities associated with early construction works.	Medium-term	Negligible Adverse	Minor Adverse	Not significant	
Surface Water – Water Quality – De-icer - River Mole	High	New de-icer treatment system providing additional treatment	Long term	Moderate Beneficial	Moderate Beneficial	Significant (beneficial)	
Surface Water – Water Quality – De-icer - Gatwick Stream	High	New de-icer treatment system discharge	Long term	Moderate Beneficial	Moderate Beneficial	Significant (beneficial)	
Groundwater – superficial aquifers (Secondary undifferentiated aquifer and Secondary A aquifer)	Medium to High	Potential impacts to groundwater levels and flow from construction dewatering	Short-term	Low Adverse	Minor Adverse	Not significant	
Groundwater – Weald Clay	Negligible	Potential impacts to groundwater levels and	Short-term	Negligible Adverse	Negligible Adverse	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
(unproductive strata)		flow from construction dewatering					
Groundwater (surface water receptors)	High	Potential changes to flow due to construction dewatering	Short to medium term	Low Adverse	Minor Adverse	Not significant	
Groundwater (infrastructure receptors)	High to Very High	Potential impacts from settlement due to construction dewatering	Permanent	Negligible Adverse to Low Adverse	Minor Adverse	Not significant	Additional mitigation measures include settlement analysis to ensure no significant residual differential impacts on the build-in environment
Groundwater – superficial aquifers (Secondary undifferentiated aquifer and Secondary A aquifer)	Medium to High	Potential mobilisation of existing contaminants from construction dewatering	Short-term	Low Adverse	Minor Adverse	Not significant	
Groundwater – superficial aquifers (Secondary undifferentiated aquifer and	Medium to High	Introduction of contaminants or creation of new contaminant pathways due to piling	Medium-term	Low Adverse	Negligible Adverse	Not significant	Incorporation of the best practice and mitigation measures identified as part of the piling risk

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
Secondary A aquifer)							assessment would reduce these impacts
Groundwater – Weald Clay (unproductive aquifer)	Negligible	Introduction of contaminants or creation of new contaminant pathways due to piling	Medium-term	Negligible Adverse	Negligible Adverse	Not significant	Incorporation of the best practice and mitigation measures identified as part of the piling risk assessment would reduce these impacts
Groundwater – superficial aquifers (Secondary undifferentiated aquifer and Secondary A aquifer)	Medium to High	Sub-surface structures could impact groundwater levels and flow, mobilise existing contamination and increase risk of groundwater flooding	Long-term	Low adverse	Minor adverse	Not significant	
Groundwater – Weald Clay (unproductive aquifer)	Negligible	Sub-surface structures could impact groundwater levels and flow, mobilise existing contamination and increase risk of groundwater flooding	Long-term	Negligible adverse	Negligible adverse	Not significant	
Groundwater – superficial aquifers (Secondary	Medium to High	Spillage of contaminants at the surface	Medium-term	Low Adverse	Minor Adverse	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
undifferentiated aquifer and Secondary A aquifer)							
Groundwater – Weald Clay (unproductive aquifer)	Negligible	Spillage of contaminants at the surface	Medium-term	Negligible Adverse	Negligible Adverse	Not significant	
Flood Risk - Fluvial	Very High to Low	Loss of floodplain	Medium-term	Medium Adverse to Negligible Beneficial	Minor Adverse to Minor Beneficial	Not significant	
Flood Risk - Groundwater	Very High to Low	Lowering of ground levels or impediment of groundwater flows	Medium-term	Negligible Adverse	Negligible to Minor Adverse	Not significant	
Flood Risk- Surface Water	Very High to Low	Increased flood risk due to: ▪ alteration of surface water flow paths ▪ changes in groundwater levels ▪ changes in surface water	Medium-term	Negligible Adverse	Negligible to Minor Adverse	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
		discharge rates and volumes					
Flood Risk- Surface Water	Very High to Low	Increased flood risk due to placing and landscaping of inert spoil on Pentagon Field.	Medium-term	Negligible Adverse	Negligible to Minor Adverse	Not significant	Avoid the areas of surface water flood risk (1 per cent (1 in 100) AEP extent) to ensure the works do not displace floodwater
Water Infrastructure – Wastewater	Medium	Increased discharges to wastewater network due to construction activities and increased passengers	Medium-term	Negligible Adverse	Negligible Adverse	Not significant	
Water Infrastructure – Water Supply	Low	Increased water consumption due to construction activities	Medium-term	Negligible Adverse	Negligible to Minor Adverse	Not significant	
First full year of operation: 2029 (up to 2032)							
Surface Water – Geomorphology	High to Low	Ongoing impacts the River Mole, Gatwick Stream, Crawter's Brook, Man's Brook, Burstow Stream Tributary and surface	Medium-term	Negligible Adverse	Minor Adverse - Gatwick Stream, River Mole Crawter's Brook, and Man's Brook	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
		water drainage ponds from construction			Negligible – Burstow Stream Tributary		
Surface Water – Gatwick Stream Geomorphology,	High	North Terminal highways works	Short-term	Negligible Adverse	Minor Adverse	Not significant	
Surface Water – Burstow Stream Tributary Geomorphology	Low	South Terminal highways works	Short-term	Negligible Adverse	Minor Adverse	Not significant	
Surface Water – Water Quality – Highways Improvements and Car Parks: River Mole Gatwick Stream Burstow Stream Tributary of Burstow Stream,	High (River Mole, Gatwick Stream to Medium (Burstow Stream and Burstow Stream Tributary)	Potential water quality impacts as a result of ongoing construction works as described for Initial Construction Period: 2024 – 2029	Medium-Term	Negligible Adverse	Minor Adverse	Not significant	
Surface Water – Water Quality – Highways Improvements and Car Parks	Medium (Burstow Stream and Burstow Stream Tributary)	Potential water quality impacts as a result of activities associated with the widening of M23 spur and culvert	Medium-Term	Negligible Adverse	Minor Adverse	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
		extension on Burstow Stream Tributary					
Surface Water – River Mole	High	New de-icer treatment system providing additional treatment	Long term	Moderate Beneficial	Moderate Beneficial	Significant (beneficial)	
Surface Water – Gatwick Stream	High	New de-icer treatment system discharge	Long term	Moderate Beneficial	Moderate Beneficial	Significant (beneficial)	
Groundwater and Flood Risk	No additional significant effects beyond those in the initial construction period						
Water Infrastructure - Wastewater	Medium	Increased demand on wastewater network due to passenger growth	Long-term	Negligible Adverse	Negligible Adverse	Not significant	
Water Infrastructure - Water Supply	Low	Increased demand due to ongoing construction works and passenger growth	Long-term	Negligible Adverse	Negligible to Minor Adverse	Not significant	
Interim Assessment Year: 2032 (to 2037)							
Surface Water – Geomorphology	High to Low	Ongoing impacts the River Mole, Gatwick Stream, Crawter's Brook, Burstow Stream Tributary, Man's Brook and surface water	Medium-term	Negligible Adverse	Minor Adverse - Gatwick Stream, River Mole and Crawter's Brook, Man's Brook	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
		drainage ponds from construction			Negligible – Burstow Stream tributary		
Surface Water – Water Quality – Highways Improvements and Car Parks: All receptors.	High to Medium	Potential impacts to water quality relating to construction activities, particularly the reinstatement of site compounds.	Medium-term	Negligible Adverse	Minor Adverse	Not significant	
Surface Water – River Mole	High	New de-icer treatment system providing additional treatment	Long term	Moderate Beneficial	Moderate Beneficial	Significant (beneficial)	
Surface Water – Gatwick Stream	High	New de-icer treatment system discharge	Long term	Moderate Beneficial	Moderate Beneficial	Significant (beneficial)	
Surface Water – Water Quality	High to Medium	Reinstatement of Project compounds	Medium-term	Negligible Adverse	Minor Adverse	Not significant	
Groundwater and Flood Risk	No additional significant effects beyond those in the initial construction period						
Water Infrastructure - Wastewater	Medium	Increased demand on wastewater network due to passenger growth	Long-term	Negligible Adverse	Negligible Adverse	Not significant	
Water Infrastructure - Water Supply	Low	Increased demand due to ongoing construction	Long-term	No Change	No Change	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
		works and passenger growth					
Design Year: 2038							
Surface Water - Geomorphology	High	River Mole renaturalised channel works, including re-meandering and restoration of natural channel morphology, improved floodplain coupling	Long-term	Medium Beneficial	Moderate Beneficial	Significant (beneficial)	
Surface Water - Geomorphology	High	River Mole renaturalised channel works: changes to channel velocity and sediment transport modifications	Long-term	Low Adverse	Minor Adverse	Not significant	Embedded mitigation includes suitable river type for the bed gradient of the realignment in order to maintain sediment transport capability.
Surface Water - Geomorphology	High	River Mole daylighted channel extension results in removal of natural bed and banks	Long-term	Negligible Adverse	Minor Adverse	Not significant	Existing channel is canalised, short length of channel affected, offset by enhancements downstream

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
Surface Water - Geomorphology	High	River Mole runway culvert weir to improve low flow conditions through culvert	Long-term	Medium Beneficial	Moderate Beneficial	Significant (beneficial)	
Surface Water - Geomorphology	High	Creation of FCA: Museum Field resulting in loss of natural bank	Long-term	Low Adverse	Minor Adverse	Not significant	Small length of bank affected
Surface Water - Geomorphology	High	Car Park X FCA reduction in channel-floodplain coupling, car park X outfall loss of natural bank	Long-term	Negligible Adverse	Minor Adverse	Not significant	Small area impacted and set back from watercourse
Surface Water – Geomorphology	Low	South Terminal new surface access arrangements loss of banks due to extension of existing culvert at Burstow Stream Tributary	Long-term	Negligible Adverse	Negligible	Not significant	Small length of bank affected
Surface Water – Geomorphology	High	North Terminal new surface access arrangements encroachment onto floodplain and loss of banks due to new outfall headwalls on	Long-term	Negligible Adverse	Minor Adverse	Not significant	Small area impacted and set back from watercourse

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
		River Mole and Gatwick Stream					
Surface Water – Geomorphology	High	Longbridge Roundabout new surface access arrangements encroachment onto floodplain and loss of banks due to new outfall headwalls on River Mole	Long-term	Negligible Adverse	Minor Adverse	Not significant	Small area impacted
Surface Water - Geomorphology	High	Man's Brook permanent access bridges, permanent loss of bank top vegetation	Long-term	Negligible Adverse	Minor Adverse	Not significant	
Surface Water - Geomorphology	High	Additional discharge from the water treatment works impacts flow velocity in Gatwick Stream in the immediate vicinity of the outfall	Long-term	Negligible Beneficial	Minor Beneficial	Not significant	Small area impacted
Surface Water – River Mole	High	New de-icer treatment system providing additional treatment	Long term	Moderate Beneficial	Moderate Beneficial	Significant (beneficial)	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
Surface Water – Gatwick Stream	High	New de-icer treatment system discharge	Long term	Moderate Beneficial	Moderate Beneficial	Significant (beneficial)	
Surface Water – Water Quality (Surface access improvements)	Medium to High	Routine runoff containing soluble and sediment-bound pollutants and accidental spillage risk	Short-term	Negligible Adverse	Slight Minor Adverse	Not Significant	
Surface Water – Water Quality	High	Construction of South Terminal roundabout improving chemical elements of Gatwick Stream	Long-term	Low Beneficial	Minor Beneficial	Not significant	
Surface Water – Water Quality	Medium	Construction of North Terminal roundabout improving chemical elements of Gatwick Stream	Long-term	Low Beneficial	Minor Beneficial	Not significant	
Groundwater – superficial aquifers (Secondary undifferentiated aquifer and Secondary A aquifer)	Medium to High	Change in area of hard standing could impact recharge to groundwater	Long-term	Low adverse	Minor adverse	Not significant	
Groundwater (Weald Clay)	Negligible	Change in area of hard standing could impact	Long-term	Negligible adverse	Negligible adverse	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
		recharge to groundwater					
Groundwater (Weald Clay)	Negligible	Seepage into Museum Field FCA	Long-term	Low Adverse	Negligible Adverse	Not significant	
Groundwater – superficial aquifers (Secondary undifferentiated aquifer and Secondary A aquifer)	Medium to High	Sub-surface structures could impact groundwater levels and flow, mobilise existing contamination and increase risk of groundwater flooding	Long-term	Low Adverse	Minor Adverse	Not significant	
Groundwater (Weald Clay)	Negligible	Sub-surface structures could impact groundwater levels and flow, mobilise existing contamination and increase risk of groundwater flooding	Long-term	Negligible Adverse	Negligible Adverse	Not significant	
Groundwater – superficial aquifers (Secondary undifferentiated aquifer and Secondary A aquifer)	Medium to High	Loss of groundwater storage due to removal of permeable deposits during construction of sub-surface structures	Long-term	Negligible Adverse	Minor Adverse	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
Groundwater (Weald Clay)	Negligible	Discharge from surface water drainage to ground during low flow conditions	Long-term	Negligible to Low Adverse	Negligible to Minor Adverse	Not significant	
Flood Risk - Groundwater	Very High to Low	Lowering of ground levels or impediment of groundwater flows	Long-term	Negligible Adverse	Negligible to Minor Adverse	Not significant	
Flood Risk - Surface Water (Offsite)	Very High to Medium	Increased flood risk due to increased impermeable area	Long-term	Negligible Adverse	Negligible to Minor Adverse	Not significant	Potential impact on flood risk is long-term, however, if the risk is realised, the flooding would be a short-term event.
Flood Risk – Surface Water (on Airport)	Very High to Low	Increased surface runoff due to increased impermeable area	Long-term	Medium Adverse to No Change	Minor Beneficial to Minor Adverse	Not significant	Potential impact on flood risk is long-term, however, if the risk is realised, the flooding would be a short-term event.
Flood Risk – Fluvial (offsite)	Very High (Transport Infrastructure) to Medium (Industrial)	Change in flood risk due to encroachment into floodplain	Long-term	Medium Beneficial to No Change	Major Beneficial to No Change	Significant (beneficial)	Potential impact on flood risk is long-term, however, if the risk is realised, the flooding would be a short-term event.

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
							Third party receptors would experience lower flood depths for the design event.
Flood Risk –Fluvial (on Airport)	Very High to Low	Change in flood risk due to encroachment into floodplain	Long-term	Negligible Beneficial to Medium Adverse	Minor Beneficial to Minor Adverse	Significant (beneficial)	Potential impact on flood risk is long-term, however, if the risk is realised, the flooding would be a short-term event. Small extent of increase at Fire Training Ground
Flood Risk - Reservoir	Very High to Low	Increased exposure to flooding as a result of reservoir failure	Long-term	No Change	No Change	Not significant	Potential impact on flood risk is long-term, however, if the risk is realised, the flooding would be a short-term event.
Flood Risk - Groundwater	Very High to Low	Interception or diversion of groundwater flows due to new structures	Long-term	Negligible Adverse	Negligible to Minor Adverse	Not significant	Potential impact on flood risk is long-term, however, if the risk is realised, the flooding would be a short-term event.

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
Flood Risk – Sewer/ Water Supply	Very High to Low	Additional loading to the airport foul wastewater sewer system and additional water supply infrastructure installed	Long-term	Negligible Adverse to Negligible Beneficial	Negligible to Minor Adverse	Not significant	Potential impact on flood risk is long-term, however, if the risk is realised, the flooding would be a short-term event.
Water Infrastructure - Wastewater	Low	Increased demand on wastewater network due to passenger growth	Long-term	Negligible Adverse	Negligible Adverse	Not significant	
Water Infrastructure - Water Supply	Low	Increase in water demand due to passenger growth	Long-term	Low Adverse	Negligible to Minor Adverse	Not significant	
River Mole overall effect	Moderate Beneficial						
Gatwick Stream overall effect	Minor Beneficial						
Crawter's Brook overall effect	Minor Adverse						
Burstow Stream Tributary overall effect	Negligible						
Design Year Highways Assessment Year: 2047							
Surface Water – Water Quality De-	No additional significant effects beyond those in the 2038 operational year						

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
icer, Geomorphology							
Surface Water – water quality highways – River Mole	High	Potential water quality impacts as a result of increased traffic on highways improvements and new car parks.	Long-term	Negligible adverse	Minor adverse	Not significant	
Surface Water – water quality highways – Withy Brook	Medium	Potential water quality impacts as a result of increased traffic on highways improvements and new car parks.	Long-term	Negligible adverse	Minor adverse	Not significant	
Surface Water – water quality highways – Gatwick Stream	High		Long-term	Negligible adverse	Minor adverse	Not significant	
Surface Water – water quality highways – Burstow Stream	Medium		Long-term	Negligible adverse	Minor adverse	Not significant	
Groundwater	No additional significant effects beyond those in the 2038 operational year						

Receptor	Receptor Sensitivity	Description of Impact	Short / Medium / Long Term / Permanent	Magnitude of Impact	Significance of Effect	Significant / Not significant	Notes
Flood Risk	No additional significant effects beyond those in the 2038 operational year						
Water Infrastructure - Wastewater	No additional significant effects beyond those in the 2038 operational year						
Water Infrastructure - Water Supply	Low	Increase in water demand due to passenger growth	Long-term	Low Adverse	Negligible to Minor Adverse	Not significant	

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11.15 Glossary

Table 11.15.1: Glossary of Terms

Term	Description
AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
ATMs	Air Traffic Movements
BGS	British Geological Survey
CAMS	Catchment Abstraction Management Strategy
CBC	Crawley Borough Council
CEA	Cumulative Effects Assessment
CoCP	Code of Construction Practice
CSM	Conceptual Site Model
DCLG	Department of Communities and Local Government
DMRB	Design Manual for Roads and Bridges
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EQS	Environmental Quality Standards
ES	Environmental Statement
EU	European Union
FCA	Flood Compensation Area
FRA	Flood Risk Assessment
GEP	Good Ecological Potential
GES	Good Ecological Status
GI	Ground Investigation
GWDTE	Groundwater Dependent Terrestrial Ecosystem
HEWRAT	Highways England Water Risk Assessment Tool (used to assess the water quality impacts of highways runoff)
LEMP	Landscape Ecological Management Plan
LLFA	Lead Local Flood Authority
LNR	Local Nature Reserve
LOS	Level of service
mbgl	Metres below ground level
Ml/d	Megaliters (one million litres) per day
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPS	National Policy Statement
Ofwat	The (England and Wales) Water Services Regulation Authority
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
PS	Pumping Station
PWS	Private Water Supply

Term	Description
Q_{95}	5th percentile flow (a flow that is exceeded 95% of the time)
RBD	River Basin District
RBMP	River Basin Management Plan
REAC	Register of Environmental Actions and Commitments
RoFSW	Risk of Flooding from Surface Water
RTD	River Terrace Deposits
SAC	Special Area of Conservation
SESW	Sutton and East Surrey Water
SFRA	Strategic Flood Risk Assessment
SIA	Simple Index Approach
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
STW	Sewage Treatment Works
SWMP	Surface Water Management Plan
TW	Thames Water
UKCP	United Kingdom Climate Predictions (2009 and 2018)
ZoI	Zone of Influence