Water Cycle Study November 2020

Regulation 18 Consultation on the Draft Local Plan

Dover District **Local Plan**

Supporting document

DOVER DISTRICT COUNCIL

Water Cycle Study

Executive Summary

Dover District Council has started the process of producing a new Local Plan, which will allocate sufficient land for 11,920 new homes in the period up to 2040 as well as making provision for employment space and gypsy and traveller pitches.

As part of its Infrastructure evidence base, the Council has produced this Water Cycle Study which aims to draw out and comment on any water-related issues which may affect the delivery of the Plan, as well as providing a summary of the District's water environment and key water-relevant issues. To do this, the report capitalises on input from both the District's water providers, Southern Water and Affinity Water, relating to supply and wastewater, as well as the Environment Agency's advice on abstraction and water quality.

Understanding the impact of the growth proposed in the new Local Plan on the existing water infrastructure and the District's natural environment will be important in enabling sound Policies to be drafted in the Plan.

To this end, the Water Cycle Study provides a summary of the Policy and Legislative context for the water environment and identifies water-relevant policies from Dover's existing development plan documents, before giving an overview of the process leading to the adoption of the new Plan in 2022. The environmental context is described in Chapter 3, before Chapter 4 gives an overview of the external input which informed this Study.

Other relevant evidences, plans and considerations are summarised in Chapter 5, before a conclusion of the report's findings is provided in Chapter 6. This conclusion leads onto Chapter 7, containing suggestions for ways in which Planning Policy can influence the water environment, before recommendations are made to inform the drafting of Local Plan policy.

Taken from Planning Practice Guidance: "A Water Cycle Study is a voluntary study that helps organisations work together to plan for sustainable growth. It uses water and planning evidence to understand environmental and infrastructure capacity and can identify joined up and cost effective solutions that are resilient to climate change for the lifetime of the development."

Contents and List of Figures

1. Introduction

What is a Water Cycle Study?

1.1 A Water Cycle Study is a voluntary undertaking, normally carried out by Local Planning Authorities (LPA) during the formulation of a new Local Plan. The Study takes into account the levels of development required during the Plan period and encourages the LPA, water authorities and the Environment Agency (EA) to work collaboratively in order to achieve growth that is well-integrated, appropriately-located and sustainable in the context of clean and safe water provision.

1.2 This is important because adequate supplies of clean water are essential to our overall quality of life. Supplies are needed to meet our domestic, industrial, recreational and agricultural needs and to maintain a wide variety of wildlife. The Kent Environment Strategy (2016) identified Kent as one of the driest regions in England and Wales, and while recent progress has been achieved in reducing average consumption (from 154 l/p/d across Kent in 2012/13 to the most recent figure of 124l/p/d across the two Dover water zones) this does not negate the need to reduce consumption further. In the context of climate change the need for robust water management strategies is more cogent than ever before.

Why is a Water Cycle Study needed?

1.3 In March 2017 the decision was taken by the Dover District Council (the Council) to review its Core Strategy and as a result of this the Council is currently in the process of preparing a new Local Plan (the Plan) for the District. The Plan will set out the quantum and distribution of housing and jobs growth within the District for the for the years 2020 to 2040.

1.4 This Water Cycle Study will form part of the Council's Infrastructure evidence base to support the new Local Plan and will also provide an update to the District's previous Water Cycle Study, which was published in 2009. In undertaking this Study it is useful at this stage to set out the key water-centric considerations for Plan-making, namely abstraction, infrastructure (including water supply and wastewater) and water quality.

1.5 The considerations in the previous paragraph are not readily confined to the District's boundaries and in practice many water providers operate across several LPA areas. Often there are processes of water transfer within companies and trade between providers that add layers of complexity to water provision.

1.6 Therefore this Study aims to provide: a high-level assessment of the hydrology and topography of the District; a summary of the legislation which underpins the provision of and access to clean and safe water and; capitalise on water cycle input from

stakeholders to inform the drafting of strategic and development management policies in the Plan

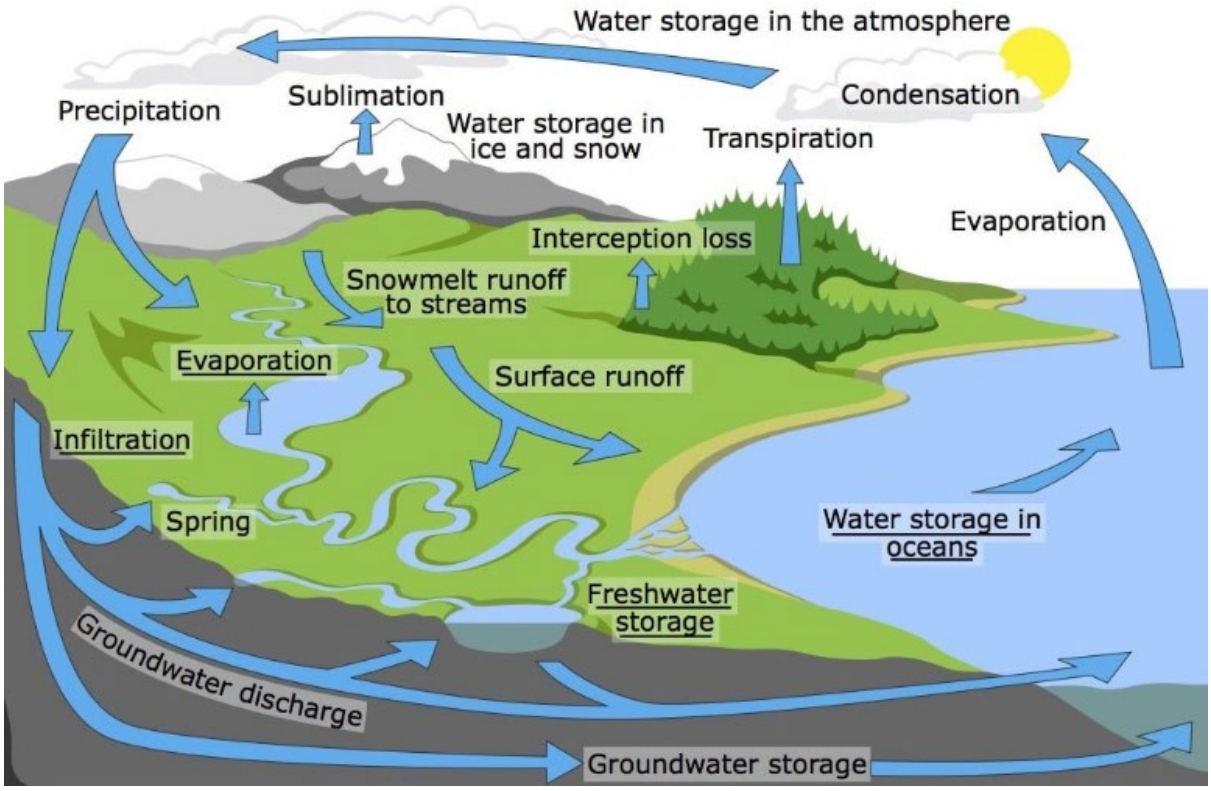

Figure 1 The Hydrological Cycle Source: Environment Agency, 2020

1.7 Figure 1 illustrates that human processes of development impact on levels of infiltration, evaporation, surface runoff, interception/transpiration, freshwater and groundwater storage. It is for these reasons that the Council will work with its partners to either achieve improvements for or at least avoid negative impacts on the water environment resulting from the levels of growth forecast.

What Type of Study is this and how will it be used?

1.8 This Study will utilise data provided by the District's two water providers, Affinity Water and Southern Water, to understand the coverage of each provider as well as drawing upon information from the providers' Water Resource Management Plans (WRMP) that set out the future water infrastructure in the District. Additionally advice will be sought from the Environment Agency (EA) due to their role in Abstraction Licensing, and for the provision of data collected by the them relating to water quality. This process will align the Study with the four Plan-making considerations in Paragraph 1.4.

1.9 Once concluded, the Study will be used to identify current issues and constraints within the District's water cycle and provide evidence to support local planning policy intervention where needed. The Study will also reconcile through collaborative working the forecast growth for the District with the management plans of the water providers. The Study will also be used to ensure that, in the context of climate change the Council's plans are well-evidenced and justifiable and align with advice given by the water providers and Environment Agency.

1.10 The following section will outline the national and local policy guidance for Water Cycle Studies as well as summarising several previous studies which are relevant to Dover District's water environment and providing an overview of the process for the new Local Plan.

2. Policy Context

National Policy/Guidance on Water Cycle Studies

2.1 The Water Environment Regulations (2017) apply to surface waters (including some coastal waters) and groundwater. The Regulations set out requirements to: prevent the deterioration of aquatic ecosystems; protect, enhance and restore water bodies to 'good' status; and, achieve compliance with standards and objectives for protected areas. To meet the objectives of the Regulations, Local Authorities must have regard to the relevant River Basin Management Plan which, for the South East, was most recently updated by the EA in 2015.

2.2 The National Planning Policy Framework (2019) at paragraph 20 provides, among other things, that strategic policies should make sufficient provision for water supply, wastewater, flood risk and coastal change management. Paragraph 170 of the NPPF makes recommendations for contributing to and enhancing the natural and local environment, and Paragraph 180 provides that new development should be appropriate for its location in the context of health, living conditions and the natural environment

2.3 The National Policy Statement for Waste Water (2012) forms part of the overall framework of national planning policy and sets out Government policy for the provision of major waste water infrastructure, and is used by decision makers as the primary basis for deciding development control applications for waste water developments that fall within the definition of Nationally Significant Infrastructure Projects (NSIP) as defined in the Planning Act 2008.

Relevant Previous Studies

This Study sits in the context of, and will be informed by:

- 2.4 Kent County Council's *Kent Water for Sustainable Growth Study* (WfSG)(2017). The WfSG concluded that the status of water bodies in Kent is adversely affected by a range of pressures on their environmental quality. The WfSG found that due to growth pressures, a range of additional water supply options need to be considered against the requirements for all water companies and that measures should be taken to minimise the impact of further growth. This would be through management of future demand (including the consideration by LPAs of adopting the Building Regulations optional standard for water use (110 l/p/d) as the preferred policy target for new development). In terms of wastewater, the WfSG found that future 'Good' status is not possible for many watercourses due to limits related to current conventional treatment, but that future technologies may change this and so the effect of growth needs to be continually assessed as Local Plan development continues to ensure growth does not exacerbate the existing limitations

- 2.5 Dover District Council's Water Cycle Study (2009). The 2009 Study advises that future demand for water supply in the District should be met firstly by increasing water efficiency and reducing leakage followed by making more efficient use of existing resources. These steps were based on the EA's identification of all the District's groundwater sources as being over-abstracted. The Study concluded that headroom for wastewater treatment and water quality would not constrain development in the District, although strategic upgrades to sewerage infrastructure would be necessary in order to accommodate the levels of growth forecast, particularly in the Dover/Whitfield catchment.
- 2.6 Strategic Flood Risk Assessment and Site Specific Guidance for Managing Flood Risk (2019). carried out by Herrington Consulting and adopted March 2019, the SFRA provided background and context to sources of flooding in Dover District and historic flood events. The SFRA advised on the impacts of climate change on the District's watercourses and weather, as well as providing evidence to support the Council's Policies for the management of flood risk and to assist with the testing of site proposals.

Dover DPD's and new Local Plan Overview

Dover DPD's

2.7 Figure 2 sets out and briefly describes the suite of documents which make up the existing Development Plan for the District:

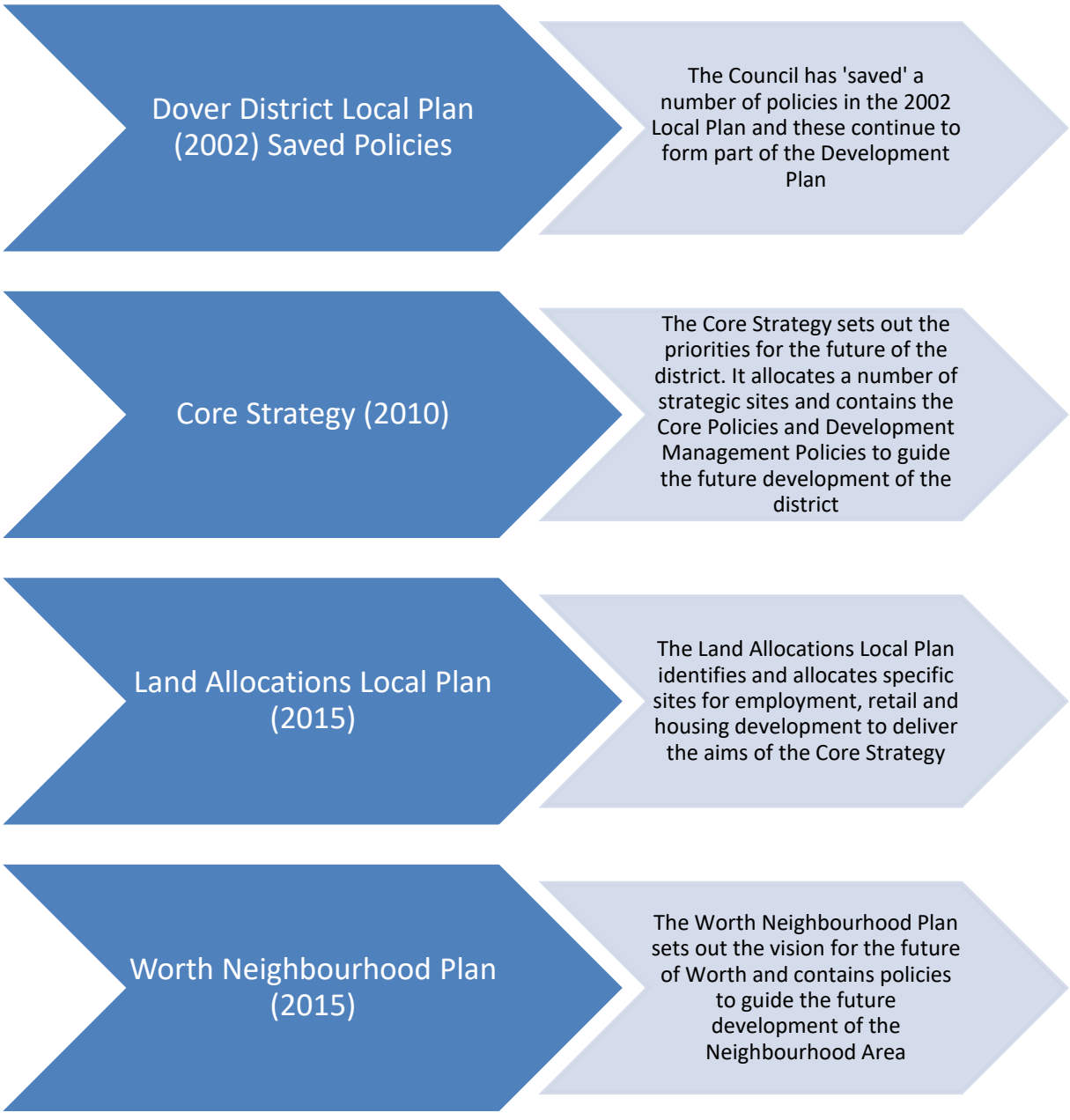

Figure 2 – Existing Development Plan Documents

2.8 Water-related policies in the current Development Plan include:

Policy Number	Policy Title	Summary of Policy
Core Strategy (2010):		
CP6	Infrastructure	Permits development only where infrastructure already exists or there is a reliable mechanism to enable infrastructure provision. A table summarising the infrastructure which would be required to support the Core Strategy was provided alongside the Policy. In terms of **water supply**, this consisted of a new trunk main, service reservoir and booster station to serve the Whitfield urban extension, as well as local network upgrades to serve developments across the district. As regards **wastewater,** the requirements were a new local system and upgrade to serve the Whitfield urban extension, and local sewer upgrades to serve developments across the district.
DM17	Groundwater Source Protection	Restricts the types of development that can be permitted in Groundwater Source Protection Zones 1 and 2 unless adequate safeguards against contamination are provided

Figure 3 - Water-related Development Plan policies

2.9 Examples of other water-related material considerations include:

Abstraction (linking a site to supply infrastructure)	Foul drainage
Contamination	Flood Risk (Fluvial, Coastal and Overland Flow Paths

Figure 4 - Water-related material considerations

New Local Plan Overview

2.10 The District's new Local Plan is a review of the Core Strategy (2010) and will replace the saved policies from the Local Plan (2002) and the Land Allocations Local Plan (2015).

2.11 The New Local Plan will cover the period up to 2040, and Figure 5 (taken from the Local Development Scheme agreed December 2019) illustrates the timescale for the adoption of documents which will form part of the future Development Plan.

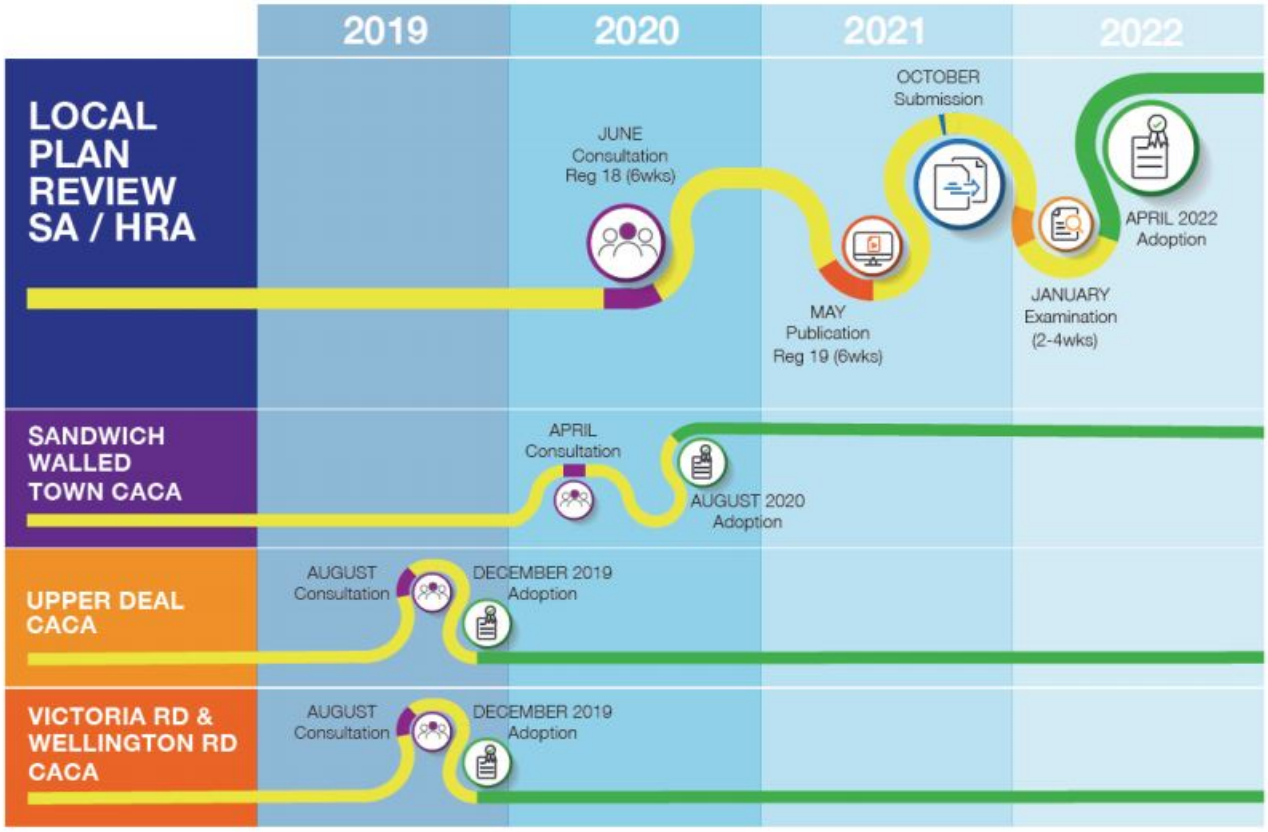

Figure 5 - Local Development Scheme diagram

2.12 The new Local Plan should as a minimum provide for the objectively assessed need for housing within the District (NPPF para 11). To determine the minimum number of homes Local Planning Authorities are expected to follow the standard method set out in the Government's Planning Practice Guidance for assessing local housing need. Applying the Government's standard method in 2020 to the District results in a minimal housing need of 596 dwellings per annum (dpa) and equates to 11,920 dwellings over the 20-year Plan period. This figure is not set and will change,

up to submission of the Plan as new data is published by the Ministry for Housing Communities and Local Government (MHCLG).

2.13 The Council has undertaken a Housing and Economic Land Availability Assessment (HELAA), following a Call for Sites exercise in 2017. The purpose of the HELAA is to identify a future supply of land in the District which is suitable, available and achievable for housing development uses over the Plan period. The HELAA is a technical piece of evidence required by the NPPF (paragraph 67) to support Plan making, but it does not in itself determine which sites will ultimately be allocated for development in the Local Plan. The findings of the HELAA, in addition to Sustainability Appraisal (SA) work, will be used to inform the development of the growth strategy that will be taken forward in the Plan. This will then help determine which HELAA sites are taken forward as allocations in the Local Plan.

2.14 The Council's preferred set of sites will then be incorporated into the Regulation 18 Draft Local Plan which will be publicly consulted upon, alongside a further Call for Sites exercise. The results of the Regulation 18 consultation will be analysed and the assessment of any new sites received by the Council will then be carried out. Following this, the Regulation 19 (Submission) Plan, will prescribe the Council's housing need and the strategy to accommodate it, and will be prepared and consulted upon in 2021. Figure 6 summarises the process.

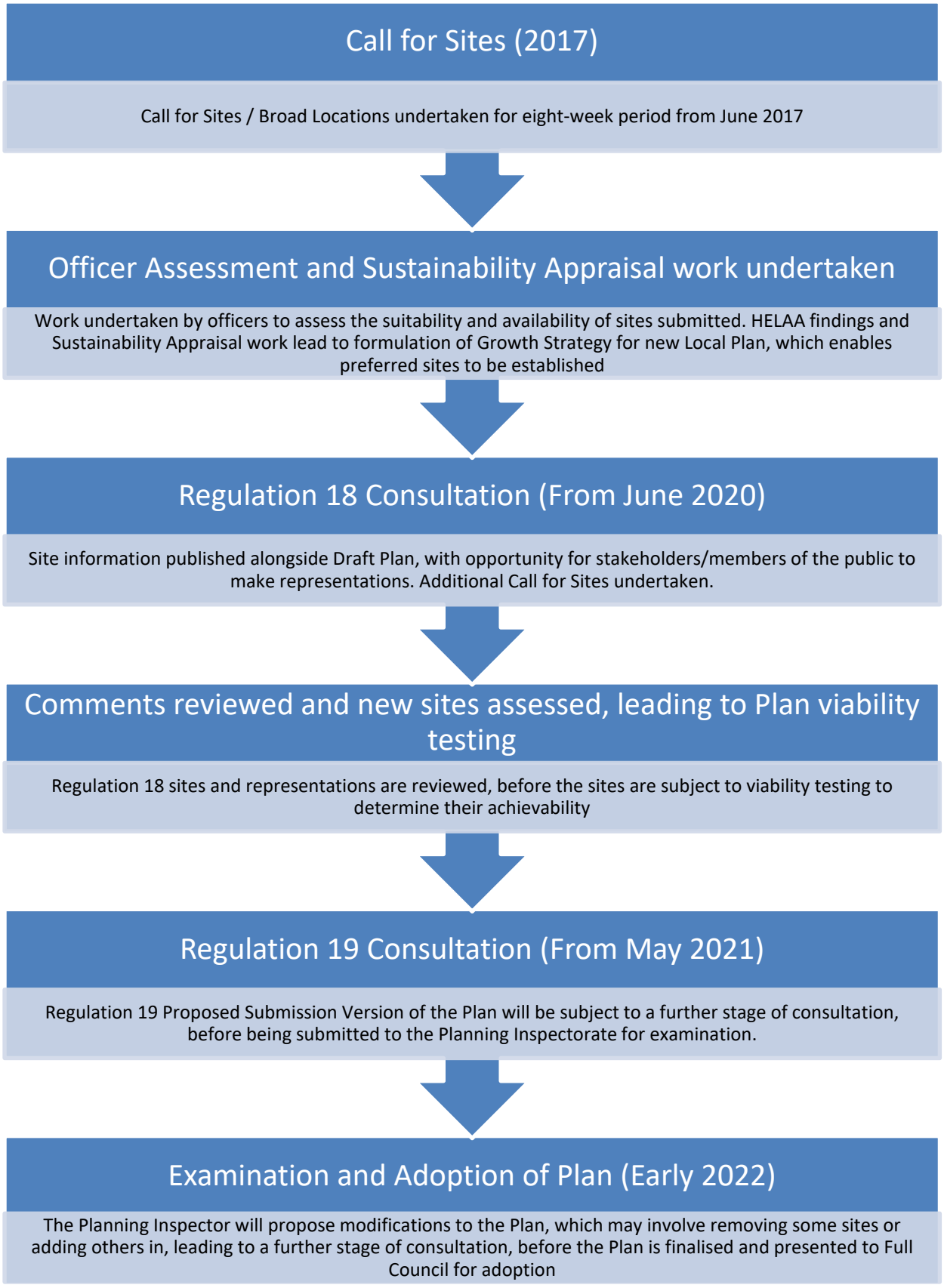

Figure 6 - Local Plan process

3. Environmental Context

3.1 Dover District has a rich and varied landscape, comprising coastal cliffs and marshes, orchards and arable lands, the rolling chalk downs with numerous ancient woodlands and intimate valleys. The District's two largest towns, Dover and Deal are located on the coast, while its other town, Sandwich, is located on the River Stour around one mile from the coast. These settlement patterns reflect the district's location at the extreme edge of the south-east of England and resultant traditional patterns of economic activity along the coast. Further inland, the district is characterised by rural areas and villages, with the next largest settlement being Aylesham, close to the district's western boundary.

3.2 The districts coastline hosts regionally and nationally important infrastructure such as the railway link between Dover and Folkestone, Samphire Hoe Nature Reserve and the Eurotunnel ventilation facility. Major road links in the district include the A20 from Dover to Folkestone and A2 to Canterbury (both of which provide onward access towards London) and the A256 from Dover to Thanet (passing close to Sandwich). The map below illustrates the district's key settlements and transport infrastructure.

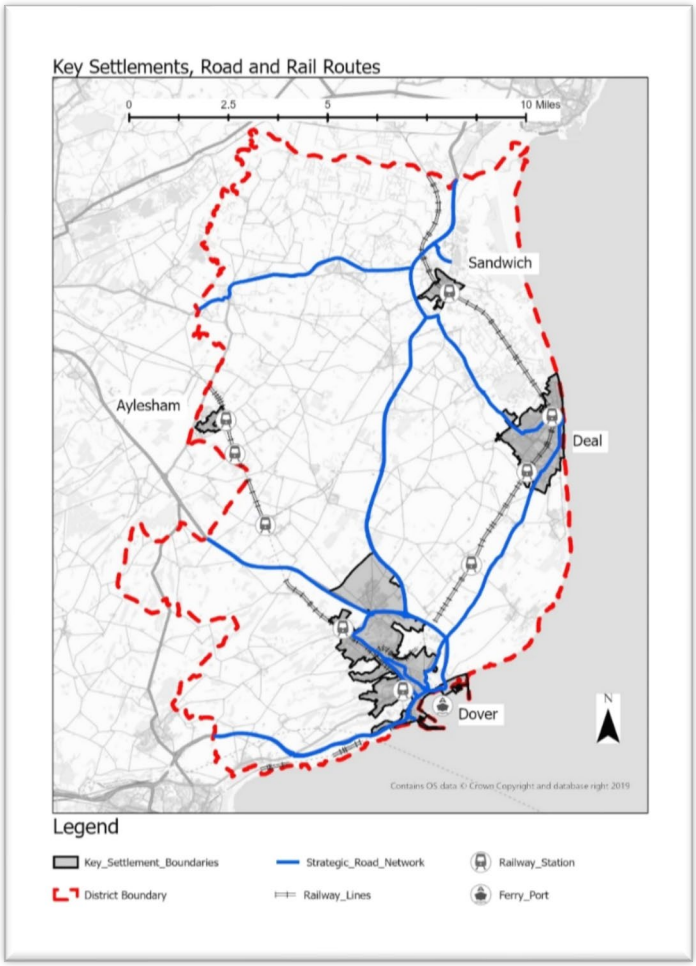

Figure 7 - Key Settlements, Road and Rail Routes

3.3 The topography within the District relates closely to the underlying geology. Throughout the District, the land generally rises to the south.

3.4 The landform is flat to the north, north west and north east of the District over Alluvium and deep clay soils, while at the Coast the landform is distinct with low-lying dunes, shingle beaches and chalk cliffs. In the centre and towards the south of the District, Upper Chalk becomes the dominant rock type, with ribbons of Dry Valley and Nailbourne Deposits resulting in a pattern of ridges and valleys. This pattern becomes more defined to the south of the District. This pattern informs the drainage, with a series of dry valleys and river valleys with marshes to the sea. The topography becomes most dramatic at the very south of the District, north of Lydden, where the true downland character of steep hills is most obvious. The map below illustrates the underlying geology and topography within the context of the district's main settlements.

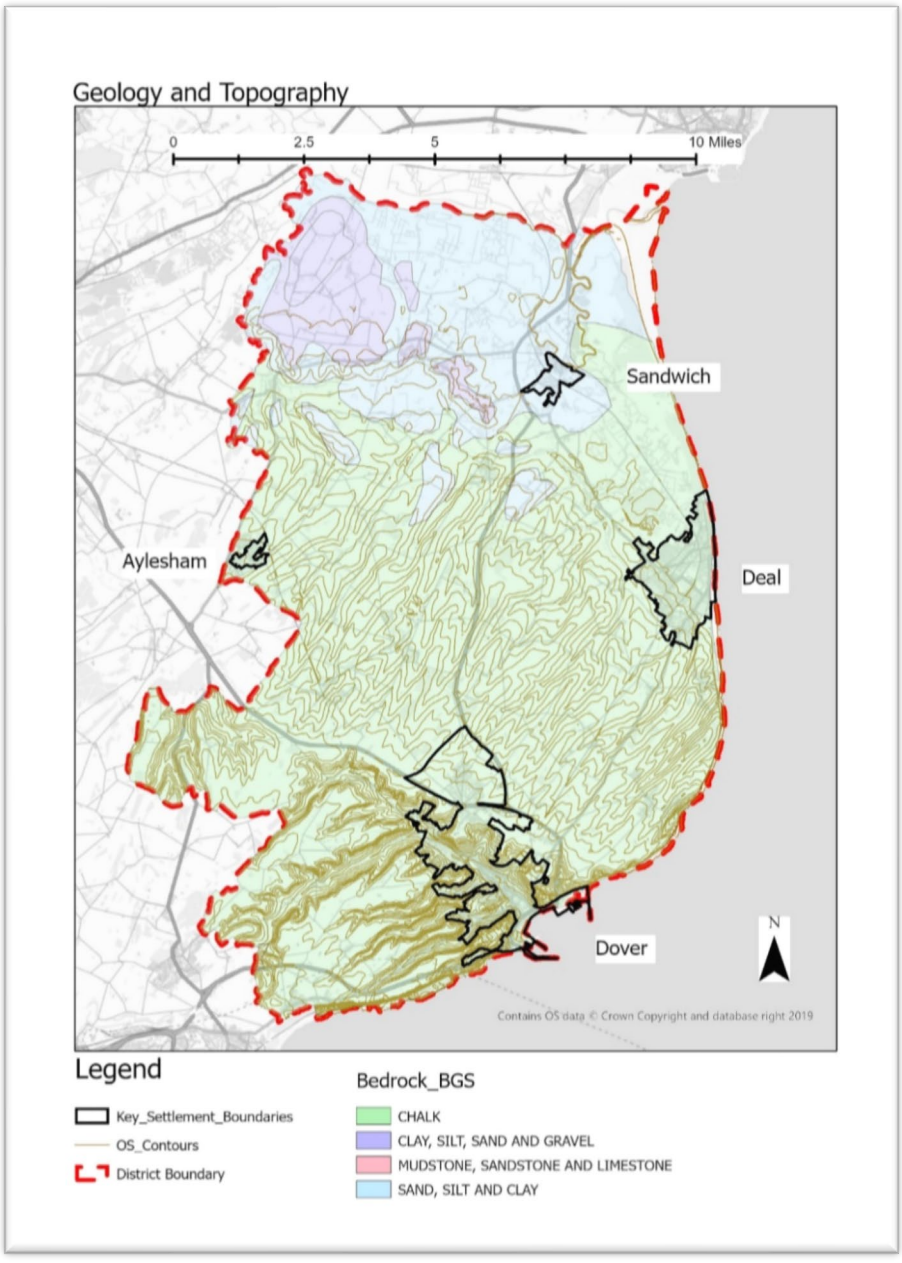

Figure 8 - Geology and Topography

3.5 About 6,900 hectares (21%) of the District are designated as part of the Kent Downs Area of Outstanding Natural Beauty and of this 876 hectares (3%) either side of Dover forms the only Heritage Coast in Kent, with the objectives of conserving both natural and scenic beauty.

3.6 There are a number of areas within the District which are of international importance due to the habitats they provide for a variety of species of flora and fauna. The district contains two Sites of Special Scientific Interest (Sandwich Bay to Hacklinge Marshes and Temple Ewell Downs), while the north of the district also contains two Special Areas of Conservation (SAC), two Special Protection Areas (SPA) and a Ramsar site, designated under wetlands of international importance. The Lydden and Temple Ewell Downs SAC is located further to the south of the district and the Dover to Kingsdown Cliffs SAC is internationally recognized for the White Cliffs. The map below illustrates the relevant environmental and landscape designations within the district.

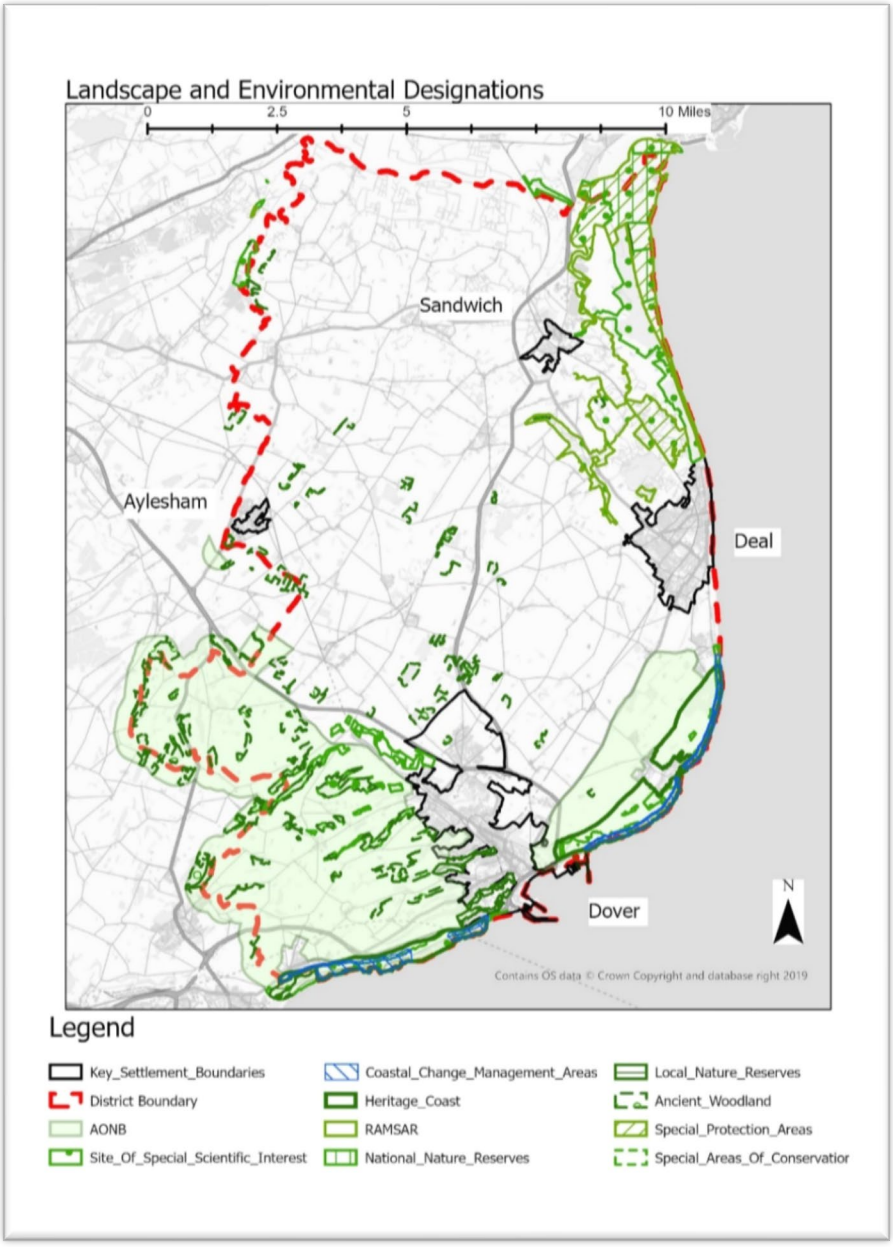

Figure 9 - Landscape and Environmental Designations

3.7 The district has three character-defining rivers: the Stour, the Wingham and the Dour. The River Dour passes through the south of district, following the valley which runs through Dover Town Centre, before flowing into the sea via a control structure at the Wellington Dock. The River Stour cuts through the northern half of the district, flowing from Stourmouth to Pegwell Bay. The reach of the Stour within the district is tidally-influenced but is also fed by a network of drainage ditches and watercourses. The River Wingham is located in the west of the district and is a tributary of the River Stour, flowing from Ash through Wingham and discharging into the Stour further to the north.

3.8 The district has 33 kilometres of coastline, 26 kilometres of which benefits from formal sea defences, with the remaining length protected naturally by high chalk cliffs. Owing to the flat nature of the north of the district, extensive areas around, and between, Sandwich and Deal are covered by Flood Zones 2 and 3, as well as some locations in Dover which are close to the River Dour. Significant portions of the district have been assessed by the Environment Agency as being at risk of flooding from Surface Water during heavy rainfall events. The below map shows key water considerations in the district in the context of the main settlements.

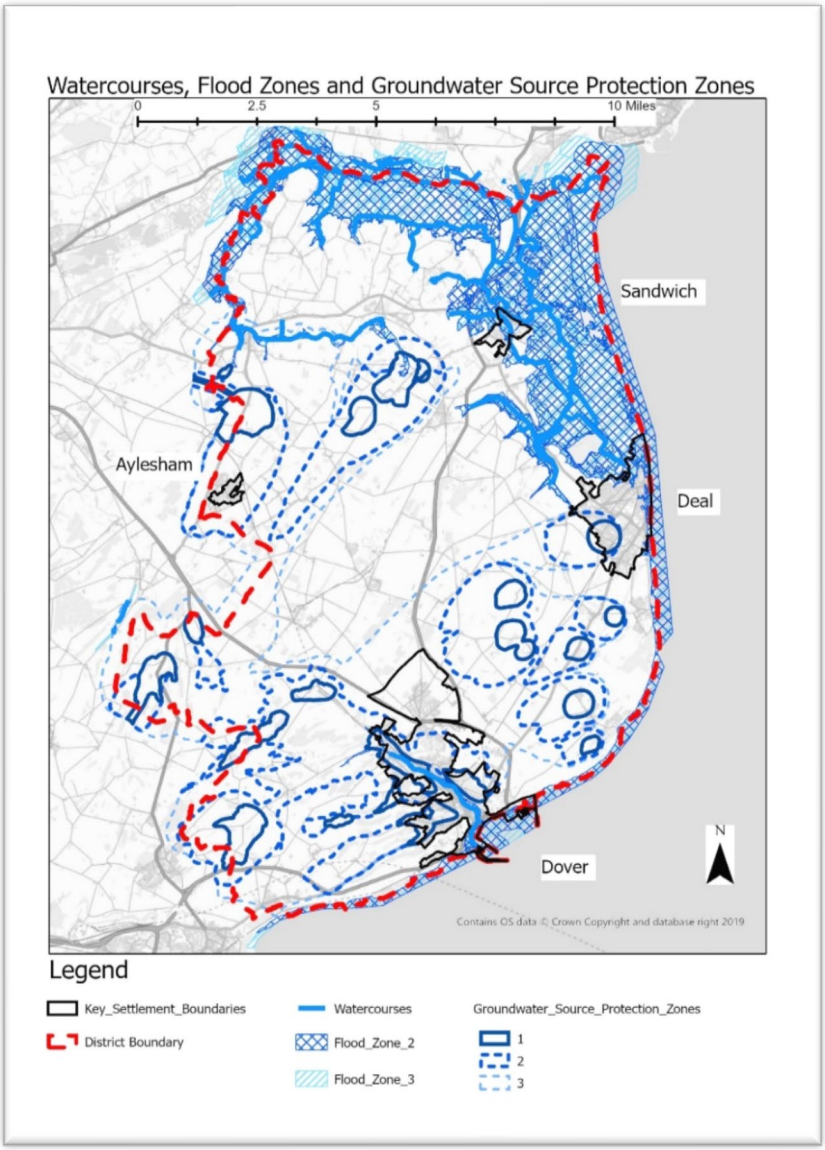

Figure 10 -
Watercourses, Flood and Groundwater Source Protection Zones

3.8 It is widely accepted that the global change in climate is accelerating as a result of post-industrial human activity, and this is likely to have significant effects on the water environment. These effects will tend to increase the size of flood zones associated with rivers and the amount of flooding experienced from other inland sources. The rise in sea level will change the frequency of occurrence of high water levels relative to today's sea levels, and will also increase the extent of the area at risk should sea defences fail. Changes in wave heights due to increased water depths, as well as possible changes in the frequency, duration and severity of storm events are also predicted. With these effects in mind, it will be vital for this Study and the water companies' WRMPs with which its conclusions will seek to align, to take account of predicted changes to the water environment as a result of climate change.

3.9 The following chapter outlines the water management plans of the District's two water providers, as well as the Environment Agency's relevant Catchment Management Abstraction Strategy and several other evidence documents.

4. External Water Cycle Evidences and Plans

4.1 Dover District is served by two water companies – Southern Water and Affinity Water. The northern half of the district including Deal, Sandwich, Eastry, Ash, Wingham and Preston is served by Southern Water, while the southern half of the district, including Dover, Whitfield, Shepherdswell and Eythorne is served by Affinity Water. The below map illustrates the coverage boundaries of each company.

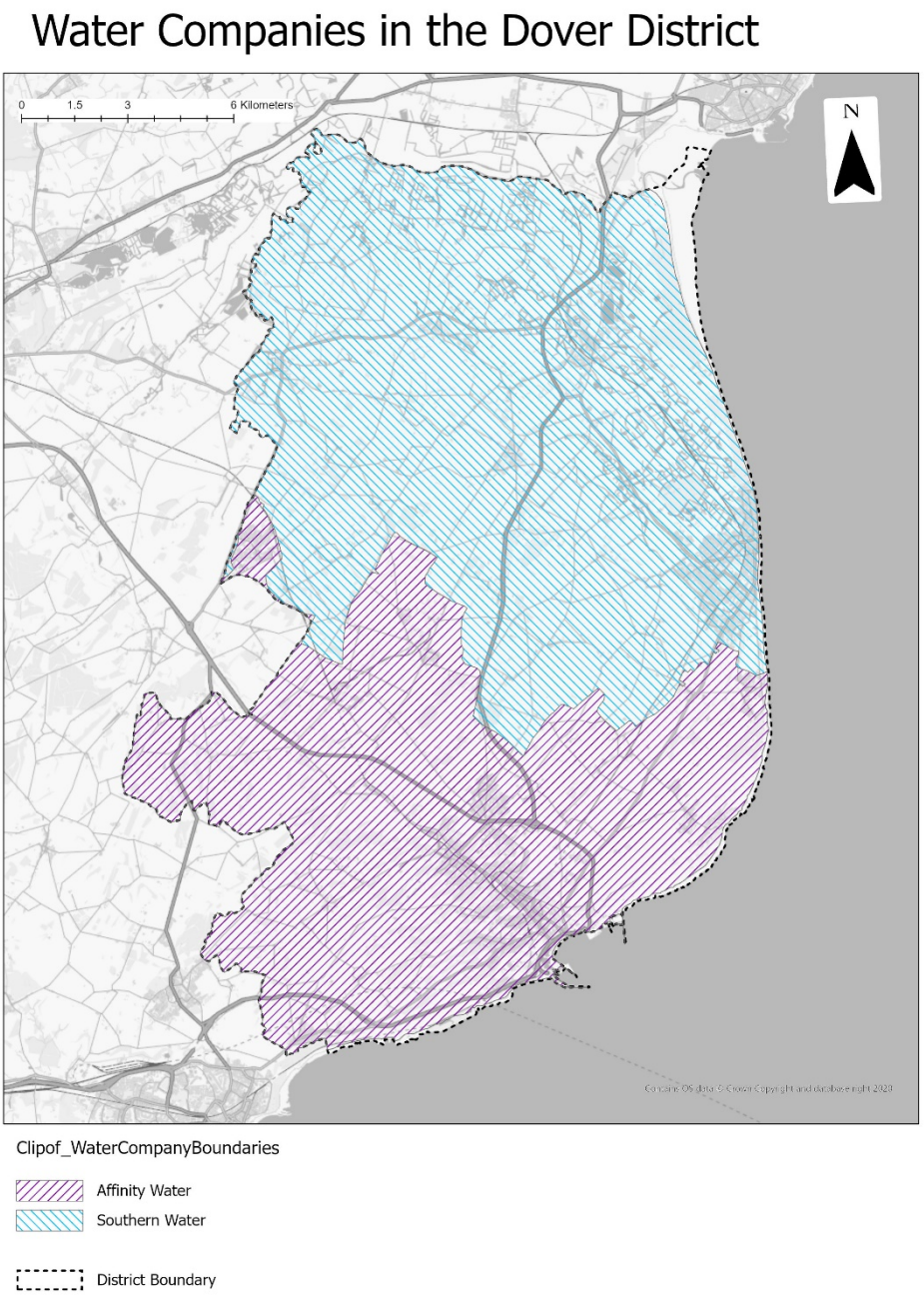

Figure 11 - Dover District Water Company Boundaries

4.2 The water companies publish Water Resource Management Plans (WRMP) which set out how they intend to supply healthy, reliable water to homes and businesses, and are reviewed every five years to reflect the latest information, technology and views of customers. The water companies measure time periods in five-year cycles, or Asset Management Periods (AMPs). The below table, taken from Southern Water's WRMP, summarises the upcoming periods:

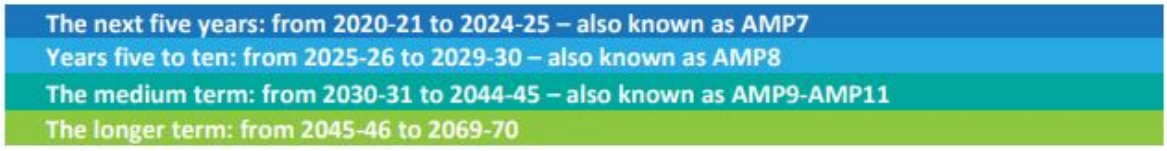

Figure 12 - Planning periods for water resources

Southern Water's Water Resources Management Plan (2019)

4.3 Southern Water's WRMP was published in December 2019 and covers the period from 2020-2070. The northern half of the Dover District falls within Southern Water's 'Thanet Kent' Water Resource Zone (WRZ), and for strategic purposes Thanet Kent is part of the 'Eastern Area'.

4.4 The WRMP (2019) summarises that 77% of water is supplied to the Thanet Kent catchment from groundwater sources, with 2% from rivers and 21% from transfers from the River Medway.

4.5 Options for the WRMP were tested against the supply-demand deficits for seven different 'states of the world' in terms of climactic conditions and intra-annual pressures on water resources, as well as different possible 'futures' in terms of the supply-demand balance. This approach allows Southern Water to ensure that their plans cover a wide, but appropriate range of futures to ensure that all the key strategic options are identified. This 'Real Options' approach identifies how solutions may change through time in the face of different possible future water resource pressures, and it also identifies a common set of options in the short term which should be developed regardless of which future may materialise. The key themes from the WRMP which affect the Eastern area (including Thanet WRZ) are summarised in the following paragraphs.

4.6 Southern Water's analysis on its supply side is informed by the predicted effects of climate change on demand, and there is uncertainty within the Kent Thanet WRZ as to whether a gain or loss of deployable output would be the result of this. However, this is offset by an expected increase in yield from Southern Water's River Medway Scheme, meaning that overall deployable output for Southern's 'Eastern Area' Catchment is expected to increase, enabling bulk transfers to take place between Southern Water's Resource Zones.

4.7 During the 2025-30 period, it is planned to develop the infrastructure to allow the full capacity of the Faversham4 transfer main to be available for transfers from Medway to Thanet.

4.8 Southern Water has committed to 'Target 100', a policy which aims to achieve a per capita consumption of 100l/h/d across the supply area by 2040, from the current level of 124l/h/d in Dover District. This will be achieved by the use of smart meters, home audits and by offering rewards for customers who save water. To encourage the use of water efficiency measures in new homes, Southern Water will incentivize developers by waiving the cost of connection to its network if homes produced are efficient enough to use less than 80l/p/d.

4.9 Southern Water intends to reduce leakage by 15% by 2025 and by 50% by 2050, as well as developing additional nitrate treatment at identified sources and implementing catchment management activity at those sources over AMP7 and AMP8, including some within the Dover District during AMP7 and AMP8.

4.10 Southern Water anticipates a 22-23% decrease in demand by 2030 due to improved efficiency measures via the methods described in paragraphs 4.7 and 4.8.

4.11 Under the WRMP (2019), two schemes are planned which specifically affect the Dover District. The first is a small-scale license variation at the West Sandwich and Sandwich sources to a flatter licence, enabling more extraction at off-peak times, and this is scheduled to be progressed during AMP6 ready for implementation during AMP7. The second scheme is the provision of a new connection at Wingham enabling a small bulk import from South East Water from 2025 onwards (AMP8). This is envisaged to help support local demand.

4.12 Southern Water's Demand Forecast (Annex 2) is based on the number of household connections increasing by slightly over 4000 in the period up to 2040.

Wastewater

4.13 Southern Water is the wastewater provider for the whole district. The locations of its wastewater treatment works (WwTWs) are illustrated by the below diagram:

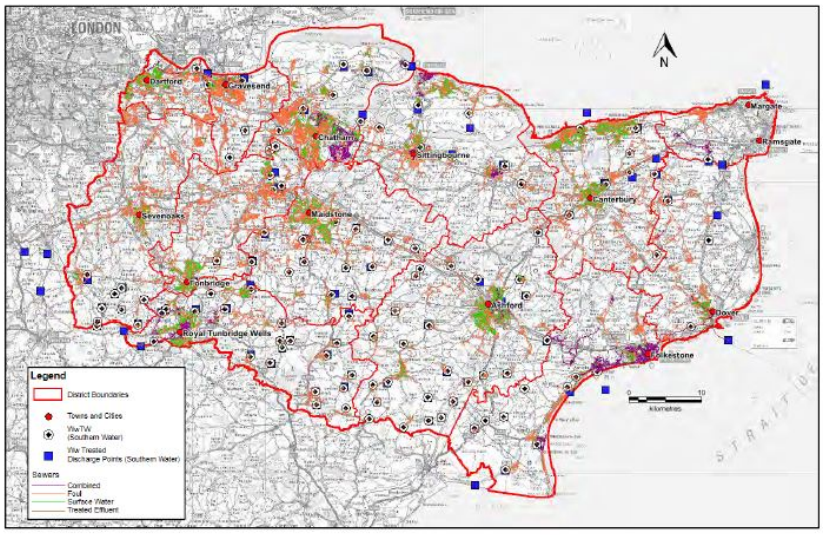

Figure 13 - Locations of Wastewater Treatment Works

4.14 Each WwTW has a defined catchment area, determined by the coverage of sewer network which drains foul water from property (and surface water where the network is combined) to the treatment facility prior to treatment and discharge. As described in the water quality section, none of the District's water sources are achieving 'good' status under the Water Framework Directive, and factors relating to the provision of water supply and wastewater treatment are key contributors to this.

4.15 Analysis carried out as part of the Kent Water for Sustainable Growth Study (2016) identified that all the WwTWs in the District have sufficient capacity to accept the additional wastewater flow from forecast housing growth. The remaining capacities as a percentage of permitted flow after growth to 2031 for WwTWs that serve Dover District are given in the table below:

WwTW	**WwTW Remaining Capacity as a percentage of permitted flow after growth to 2031**
Broomfield Bank	11%
Dambridge Wingham	29%
Eastry	49%
Weatherlees Hill	31%

Figure 14 - Treatment Works remaining capacity after growth to 2031

Drainage and Wastewater Management Plans

4.16 Southern Water is in the process of producing a Drainage and Wastewater Management Plan (DWMP) for the Stour catchment, which Dover District falls within. DWMPs are intended to enable flood risk and water management authorities, working collaboratively, to consider wastewater and drainage issues in river basin catchments over the longer term.

4.17 According to the DWMP Delivery Programme (2019) a Baseline Risk and Vulnerability Assessment is due to be completed by December 2020, with the DWMP for the Stour Catchment to be finalised by early 2023.

Affinity Water's Water Resources Management Plan 2020-2080

4.18 Affinity Water's WRMP was adopted in April 2020 and covers the period from 2020-2080. The southern half of Dover District falls within Affinity Water's 'Southeast Region (Dour Community)'.

4.19 In the Southeast region, Affinity Water abstracts 90% of its water supply from chalk boreholes, and the remaining 10% is supplies from the shallow gravel aquifer of the Dungeness peninsula. Affinity also benefits from existing imports from Southern Water to the north and South East Water to the west.

4.20 Affinity Water aims to reduce per capita consumption across its supply area to 129l/p/d by 2025 compared to their 2015/16 baseline of 152l/p/d, with a further aspiration to reduce this as low as 110 l/p/d.

4.21 Affinity Water has assessed its capabilities against four different future scenarios, named Challenging, Expected, Optimistic and Aspirational based on the complexity and severity of issues faced under each. Under all four scenarios, it was found that all of Affinity's demand management options would be required, namely reducing per-capita-consumption of household customers, reducing non-household demand and reducing leakage. Under the 'Challenging' future, Affinity's first strategic supply option would need to deliver by 2038. Given that it has a 12-year lead time, it follows that the strategic option and its need would have to be confirmed by 2023.

4.22 Affinity Water's WRMP modelling takes account of, and makes adjustments for, the uplift on demand caused by climate change with reference to UK Water Industry Research's report titled Impact of Climate Change on Water Demand.

4.23 For leakage reduction, Affinity has determined that it can economically achieve a 40% reduction between 2015 and 2045, and it will look to extend that to 50% as part of its Plan.

4.24 The WRMP forecasts a small supply-demand deficit in the Southeast in 2020 under a Critical Period scenario, as well as under Average Annual consumption in 2045 and 2080 based on a 2016 baseline. The growing deficit forecast is due to the projected population growth in Affinity's Southeast Region. Affinity Water advises that the forecast deficits can be managed through the demand management measures described above, plus the extension of bulk supply arrangements with neighbouring water companies. In addition, Affinity Water estimates that there is a 60% chance over the next 60 years that they would need to resort to exceptional drought management measures such as standpipes. Affinity Water will act to reduce this to around a 25% chance (a 1 in 200 year drought event) by ensuring the availability of increased abstraction rates at four sources in the Southeast supply region to enable more water to be put into supply under drought conditions.

4.25 Under the WRMP (2020), Affinity Water will require some licence changes and infrastructure schemes in Dover District. These primarily include removing constraints around the Dover source and strengthening of the network around Broome, which will address needs during periods of peak demand. A summary of supply-side developments for the Southeast Region is provided below:

Scheme Name	Date Required	Deployable Output (Peak, Ml/d)
AFF-EGW-WRZ7-0629: Lye Oak Variation	2021	0.14
AFF-EGW-WRZ7-0908: Tappington South Licence Variation	2044	0.7
AFF-RNC-WRZ7-0626: Broome Network Improvement	2066	2.27
AFF-RNC-WRZ7-0900: Dover Constraint Removal	2022	1.32
AFF-RTR-WRZ7-0301: Barham Import Increase (of 2Ml/d) to 4 Ml/d	2057	2
AFF-RTR-WRZ7-0639: Deal Continuation After 2020	2020	0.0714
AFF-RTR-WRZ7-0909: Barham Continuation (After 2019/20)	2020	2

Figure 15 - Affinity Water supply-side developments for the Southeast Region

4.26 While housing numbers are subject to fluctuation and are likely to have changed since figures were supplied to the water providers for use in their supply-side assessments in the production of WRMPs, DDC regularly engages with the providers and projected growth and site information has been shared throughout the Local Plan process to ensure that any necessary calculations can be made. In any case, the WRMPs are reviewed every five years and ongoing discussion with the providers will inform this process.

LA Involvement with Supplier Strategies

Water Companies' Policies

4.27 **Southern Water's** WRMP (2020) plans for their operational catchments include those in the chart below:

Figure 16 - Southern Water Flagship Schemes

4.28 **Affinity Water**'s WRMP (2020) plans to address challenges in their supply areas, which are summarized in the chart below:

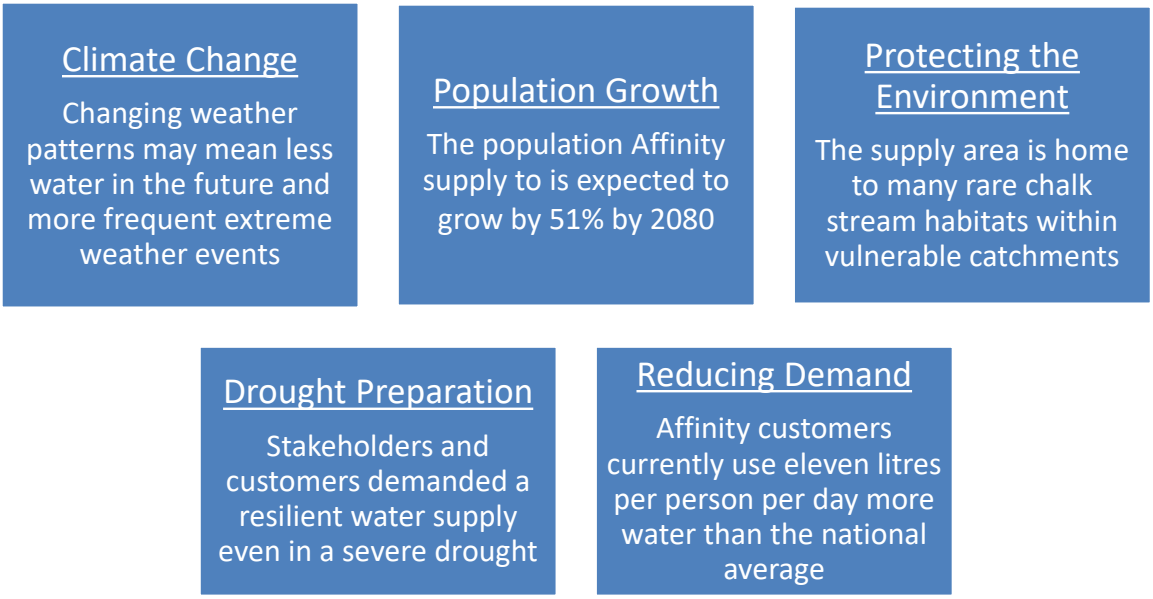

Figure 17 - Affinity Water Flagship schemes

Environment Agency Stour Abstraction Licensing Strategy (2013)

4.29 The Environment Agency is responsible for managing water resources in England and controls how much water is taken with a permitting system. The Environment Agency regulate existing water abstraction licenses and grant new ones, using the Abstraction Licensing Strategy (ALS). The Stour Abstraction Licensing Strategy (2013) is applicable to the Dover District, covering the River Stour and its tributaries, the River Dour and Dover Chalk Block and the Lydden Valley. A Licence is therefore needed where more than 20 cubic metres of water per day will be abstracted from a river or stream, reservoir, lake or pond, canal, spring or from an underground source. Whether or not a licence is granted depends on the amount of water available after the needs of the environment and existing abstractors are met and whether the justification for the abstraction is reasonable.

4.30 The Stour ALS confirms the presence of two Abstraction Points (AP) within the district, one at Dover from the River Dour and one at Hacklinge North and South Streams.

4.31 The Stour ALS calculated resource availability at four different flows, Q95 (lowest), Q70, Q50 and Q30 (highest). As can be seen from the below diagram, sections of the Dover district have no additional water available for licensing even at highest flow, while at lowest flow the majority of the district has no additional water available for licensing. Under the Q50 and Q70 flows, the only additional water available for licensing is close to Sandwich and is largely 'restricted'.

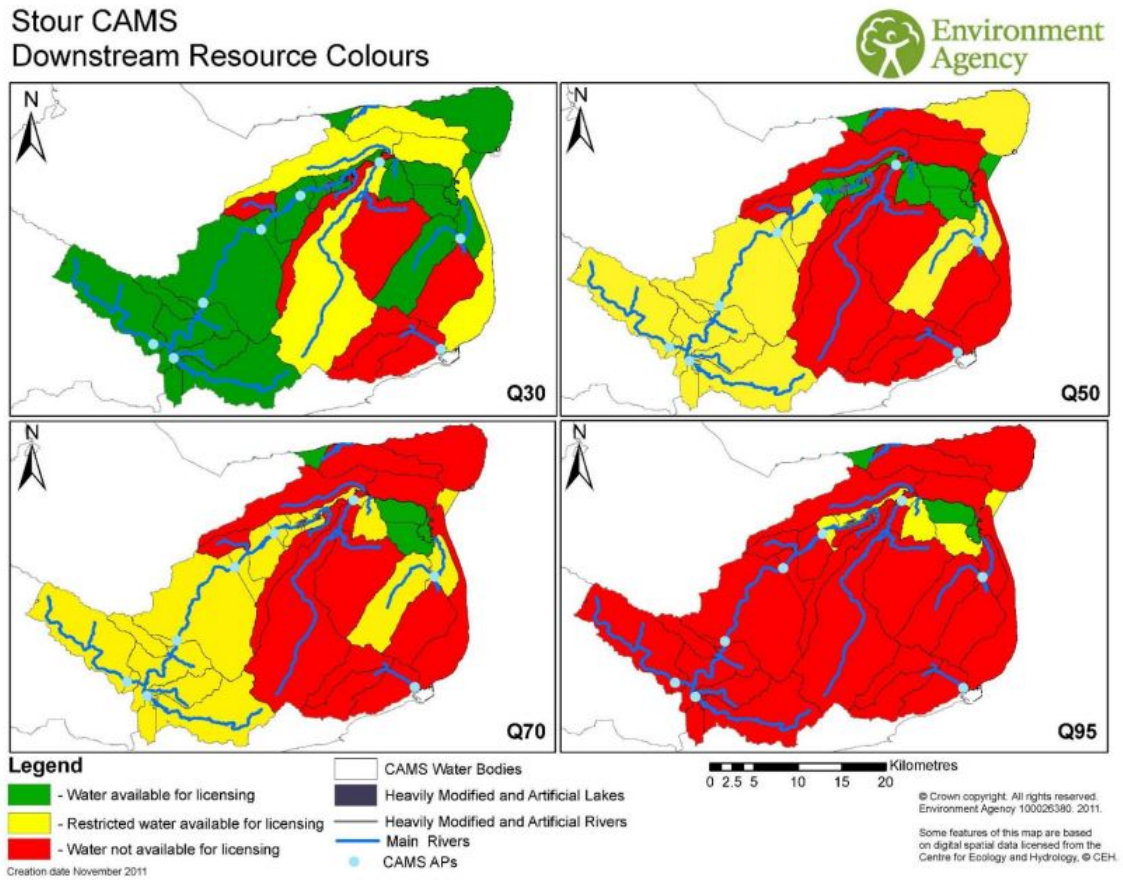

Figure 18 - Stour CAMS water availability diagram

4.32 The Stour ALS also demonstrates how only the area surrounding Sandwich has additional water resources available for licensing over and above what is already licensed. Water companies may be able to increase abstraction within their existing licenses as long as they do not cause deterioration of WFD Status (and preferably contribute to achieving 'Good' Status), and in any case the water which supplies Dover is often abstracted from outside the District boundary.

Water Quality

4.33 The Dover District is host to three main watercourses, namely the Dour in the south of the district, and the Stour and Wingham (a tributary of the Stour in the north of the district). Under the Water Framework Directive, the most recent available analysis on these watercourses dates from 2016. The classification scores water bodies based on ecological and chemical status, before an overall classification for the water body from the five status classes is arrived at: high, good, moderate, poor and bad. To achieve improvements in water quality, water bodies are given the overall score that is equal to that of their worst scoring attribute, so one poor score may hide improvements in other factors. Reasons for not achieving good status (RNAGs) are also given for each water course.

4.34 The Dour was classified as 'Poor' in 2016, driven by a 'Poor' status for fish and a 'moderate' status for phosphate, a deterioration from 'moderate' scores in 2013 and 2014. The chemical status of the Dour had improved to 'good' after failing in this category in 2013 and 2014. The Dour's RNAGs included barriers, groundwater abstraction, and intermittent sewage discharge and misconnections.

4.35 The River Stour was also classified as 'Poor' in 2016, driven by 'poor' scores for ecology, fish, and high levels of pollutants. The main issues preventing the Stour reaching 'good' status were pollution from agriculture and physical modifications.

4.36 The Wingham and Little Stour were also classified as 'poor' in 2016, driven by poor ratings for fish and 'high' concentrations of pollutants. However the chemical status of the Wingham and Little Stour remained good throughout the monitoring period (2013-2016). Reasons for not achieving good status for the Wingham and Little Stour in 2016 were barriers to fish movement, poor phosphate status and groundwater abstraction leading to reduced flow, and ammonia from water industry point source pollution.

4.37 The South East River Basin Management Plan (2015) summarises the progress of surface water bodies towards objectives set by the Water Framework Directive. The majority of water bodies have an objective of achieving 'good' status by 2027, although this is an extended deadline where there is not enough confidence that the required improvements can be improved by 2021. In many cases, the reason for not achieving the target sooner is that the required improvements are either technically infeasible or disproportionately expensive.

4.38 The issues described above are consistent with those noted in the East Kent Catchment Improvement Partnership' Stour Catchment Plan (2018). EKCIP is a group combining public, private

and third-sector organisations, and published the Catchment Plan to set out why the rivers of East Kent are not meeting environmental requirements and to summarise the solutions and work already in progress. The Stour Catchment Plan describes how for river waterbodies across the area, issues which are consistently observed include low fish populations due to structures which obstruct their passage, high phosphate levels due to discharges from wastewater treatment works and run-off from urban areas and agriculture, in addition to low flows caused by abstraction for public supply, commerce and agriculture and modifications to natural conditions due to human intervention, such as flood risk management, mining and urbanisation. The CIPs measures for improving the Stour and Dour water quality include on-site improvements to address fish passage, the promotion of agri-environment schemes to reduce nutrients in waterbodies, and for the Dour in particular, the de-culverting of the river as opportunities arise.

Shoreline Management Plans

4.39 Dover District's coastline is covered by two Shoreline Management Plans, namely SMP10 (Isle of Grain to South Foreland) covers the area from the district's northern boundary close to Pegwell Bay southwards to St Margaret's, while SMP11 (South Foreland to Beachy Head) covers Dover and the coastline to the south of St Margaret's, for which Capel le Ferne is the District's most southerly extent.

SMP10

4.40 Between Cliffs End and the River Stour, where possible, a natural, functioning coastline has been promoted due to the lack of development in situ, and the stretch between the River Stour and Sandwich Bay Estate is protected by accreting sand dunes of international conservation importance and backed by international golf links. Between Sandwich Bay Estate and Sandown Castle the remains of the mixed shingle and sand beach are supported by secondary defences, while existing defences protect the area from Sandown Castle to Oldstairs Bay.

SMP11

4.41 Chalk cliffs provide a natural defence for all areas between St Margaret's and Capel le Ferne, with the exception of the River Dour valley in which Dover is situated. Dover Harbour and Samphire Hoe Nature Reserve act as significant barriers to sediment movement eastwards along this stretch of coast, while large stretches of the Cliffs landscape are designated for their nature conservation and landscape value. It is therefore planned to allow continued erosion of the chalk cliffs between South Foreland and Dover and at Shakespeare and Abbot's Cliffs. It is predicted that the Dover-Folkestone railway line will become inoperable at some point in the 100 years from 2006 due to erosion and the line's proximity to the shoreline, and in this event the existing defences at Folkestone Warren would no longer be viable to maintain. It is anticipated that this would pose a risk to properties in Capel le Ferne, although only at the end of (or possibly beyond) the SMP's 100 year timeframe.

5. Local Authority Water Cycle Evidences, Plans and Considerations

This chapter provides a summary of evidences, plans and considerations commissioned or produced by Dover District Council that are relevant to the Water Cycle Study.

Dover District Strategic Flood Risk Assessment (2019)

5.1 The District's 2019 Strategic Flood Risk Assessment (SFRA) provided an analysis of the main sources of flood risk to the district, alongside a detailed means of appraising development allocation sites and existing planning policies, against the risk posed by flooding over the coming century. The SFRA was prepared in consultation with the Environment Agency, Kent County Council Internal Drainage Board and Southern Water in its role as sewerage undertaker for the district.

5.2 The SFRA summarised how the district's three main towns, due to their coastal nature, are all at risk from coastal flooding, and Dover and Sandwich also face a risk of fluvial flooding from the Dour and Stour respectively. Much of the district is susceptible to flooding from groundwater sources due to the permeable underlying geology of the chalk downs, especially at the base of dry valleys where large seasonal fluctuations in groundwater levels can reactivate springs or watercourses. The SFRA advised that flooding from sewers is most likely to occur in the district's urban locations, and that as the majority of the surface water sewer network in Dover Town is hydraulically-connected to the River Dour, high water levels within the Dour can influence the risk of sewer flooding within the town.

5.3 The SFRA outlined that there has been extensive investment in defence infrastructure along the district's rivers and coast by both the EA and DDC, providing protection to the low-lying areas inland of the coast. In particular, Deal and Sandwich benefitted from significant engineering works in order to reduce the towns' flood risk.

5.4 The SFRA provided guidance on managing surface water runoff from developments, summarising that a Surface Water Management Strategy will be required for all major developments, while all development applications which are required to be accompanied by a Flood Risk Assessment will be required to incorporate sustainable drainage systems, unless there is clear evidence that this would be inappropriate.

5.5 As one of its outputs, the SFRA produced mapping to illustrate the areas at risk of flooding from different sources in the district, designed to assist with the appraisal of flood risk and to assist with spatial planning.

Climate Change

5.6 Dover District Council declared a Climate Emergency at its Full Council meeting of 29 January 2020, following the decision of its Cabinet on 4th November 2019 that there is a need for urgent

action, given the serious impact of climate change globally. The Council has set up a cross party Climate Change Member Working Group, which will prepare a strategy and action plan, with the aspiration that DDC will become a net zero carbon emitter by 2030. In addition, the Council has pledged to help support the wider community so that the district can become carbon neutral by 2050. It also supports the Kent Environment Strategy and Kent Fuel Poverty Strategy and is a signatory to the Emissions Reduction Pledge 2020. Officers have also been working with Kent partners on a draft Energy and Low Emissions Strategy.

5.7 Changes to the climate will bring new challenges to the district's built and natural environments, as well as adding new pressure onto the district's water environment. The Kent Environment Strategy (2016) identified Kent as one of the driest regions in England and Wales and hotter, drier summers are likely to further limit water supply. Wetter winters, with an increasing likelihood of extreme weather events and rising sea levels will also place additional and more frequent pressure on the district's flood defences and water infrastructure.

Impact upon the water quality of the Stodmarsh SSSI, SPA, SAC, RAMSAR and NNR

5.8 In December 2019, Natural England issued guidance to Local Authorities within the Stour Catchment due to high levels of nitrogen and phosphorus in the water environment at Stodmarsh, where sites are covered by European designations such as Site of Special Scientific Interest, Special Protection Areas, Special Area of Conservation and RAMSAR, as well as areas of National Nature Reserve.

5.9 A review of the condition of the Stodmarsh lakes against water quality targets was undertaken in 2017/18 and the evidence identified that some of the designated site units are in unfavourable condition due to existing levels of both nutrients. Natural England's guidance stated that a likely significant effect on the Stodmarsh sites due to increases in wastewater from new developments coming forward in the wider catchment cannot be ruled out, and accordingly any new development should be expected to achieve 'nutrient neutrality', using nutrient budgets and mitigation measures alongside a 'precautionary approach' from LPAs to ensure that effects are not worsened by future development. A report on the Wastewater Treatment Works which are hydrologically connected to Stodmarsh and their resultant effects on the site is due to be published by the Environment Agency's Water Industry National Environment Programme (WINEP) in 2022.

5.10 For Dover District, the guidance currently covers the Little Stour and Wingham catchment and catchment of the Dambridge WwTW. As these catchments are upstream of Stodmarsh Lakes, the Council considers it unlikely that there is a hydrological connection between the Wingham River, where the Dambridge WwTW discharges into.

5.11 In advance of this issue being considered through WINEP, the Council is taking independent hydrological advice to determine whether or not there is a hydrological connection between areas of Dover District and Stodmarsh Lakes, and therefore whether or not the requirement for development within this area to achieve nutrient neutrality should apply.

5.12 If it is determined that there is a hydrological connection, then development sites located within the north west of the District would need to demonstrate nutrient neutrality, and the Council would need to consider strategic mitigation options to enable these sites could come forward. The settlements potentially impacted by this include Preston, Wingham, Ash,
Staple, Goodnestone, Aylesham, Nonnington, Eythorne and Elvington (as shown on the map below)

5.13 This would need to be addressed through policies within the Local Plan, and draft Policy DM 42 Water Supply and Quality, would need to be revised to set out the specific requirements. This issue is also being considered as part of the Habitats Regulation Assessment which is being carried out for the Dover District Local Plan.

5.14 An update to this report will be provided once the outcome of the hydrological assessment is known.

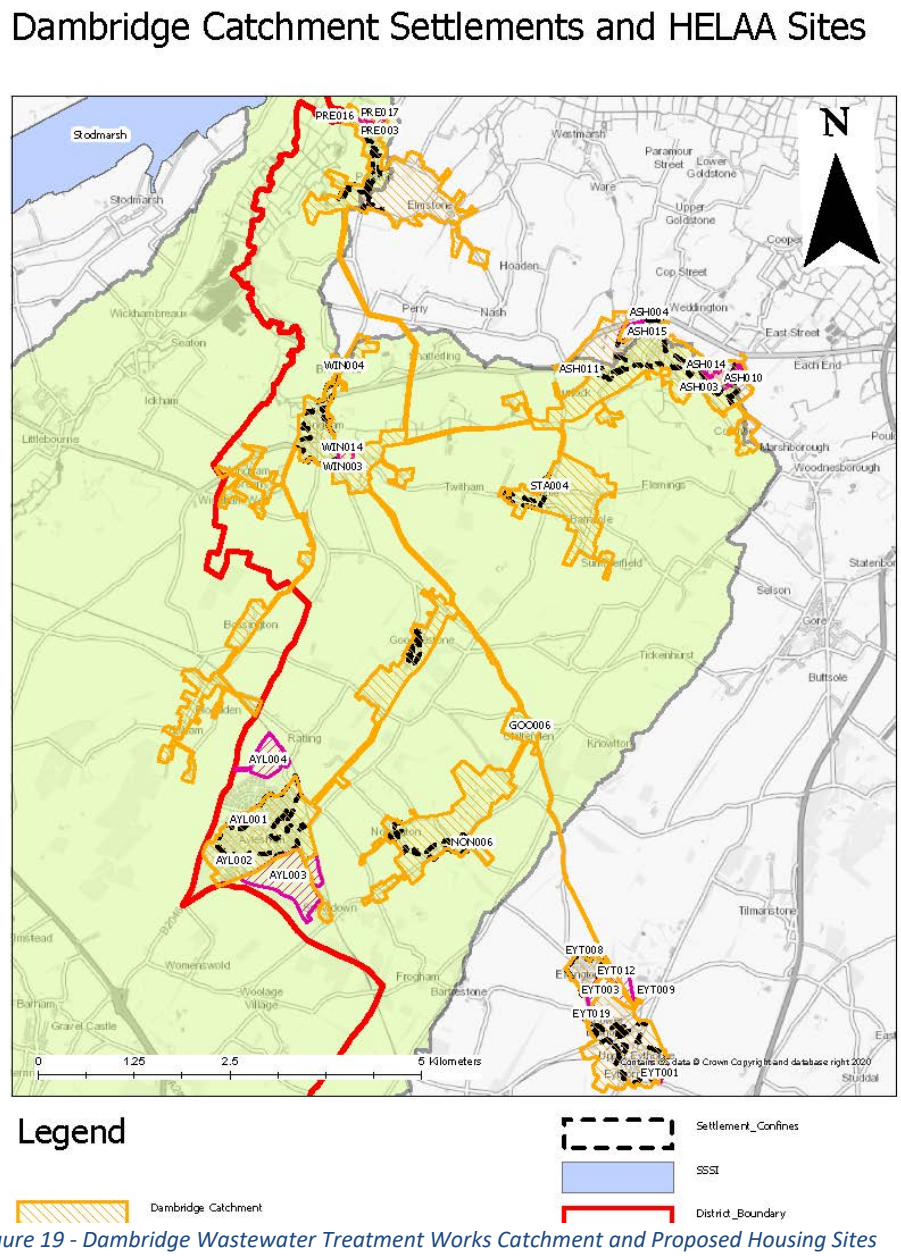

Figure 19 - Dambridge Wastewater Treatment Works Catchment and Proposed Housing Sites Affected

Sustainable Urban Drainage Systems

5.15 The Flood and Water Management Act (2010) promoted an increased awareness of the management of surface water run-off from new development, and in March 2016 the National Technical Sustainable Drainage Systems Standards were released, which mean that a detailed Surface Water Management Strategy (SWMS) needs to be submitted to the LLFA (KCC) for all major development applications. The SWMS is expected to evidence how SUDS can be incorporated within the proposed development, demonstrating compliance with the Technical Standards.

5.16 Dover's SFRA issued local guidance to encourage best practice for managing run-off within all new development, regardless of size. Namely, all development applications which are required to be accompanied by a Flood Risk Assessment will be required to incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. In addition, Construction Industry Research and Information Association's (CIRIA) SUDS Manual (2015) provides comprehensive information on all the aspects of the life cycle of sustainable drainage from initial planning through to design, construction, management and costs.

5.17 Sustainable Urban Drainage Systems (SUDS) aim to manage rainwater runoff in a natural way by replicating natural processes, thereby reducing the impact of urbanisation on flooding and protecting natural flow regimes in watercourses. SUDS, as opposed to the more traditional approach of using gullies and pipes to move water away as quickly as possible, can therefore also benefit water quality by slowing the rate at which polluted water from urban areas is washed into rivers or groundwater.

5.18 In addition to reducing the effects of development on the quantity and quality of water runoff, SUDS can provide additional social and environmental benefits such as providing space for biodiversity and ecology, improving amenity in the locality and carbon sequestration. SUDS features can be categorised as either 'green' comprising landscaped features such as landscaping and vegetation, or 'grey' comprising engineered features such as swales and other control structures. The below diagram taken from the Susdrain website shows the four 'pillars' of SUDS design:

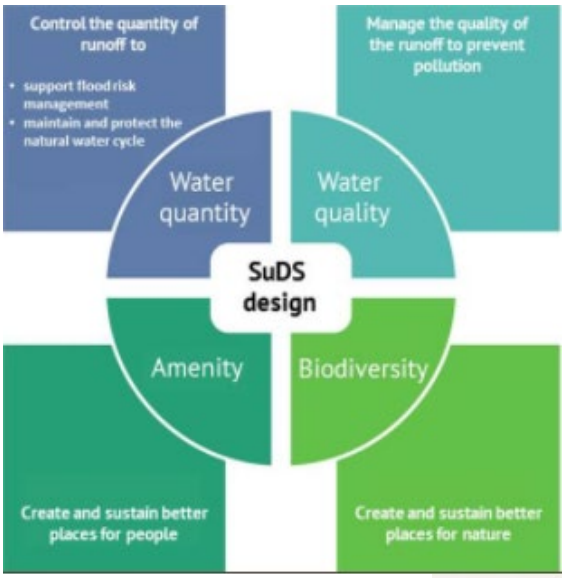

Figure 20 – Four Pillars of SUDS Design

Water Consumption Targets

5.19 With regard to water consumption targets, all new homes have to meet the mandatory national standard set out in Building Regulations of 125l/p/d, and where there is a clear local need Local Authorities can require new dwellings to meet the tighter optional Building Regulations requirement of 110l/p/d.

5.20 Dover DC could, as part of its new Local Plan, aspire to even more stringent standards, perhaps in promotion of the Southern Water policy which allows the cost of connection to the SW network to be waived if new homes are demonstrated to use less than 80l/p/d. However, the Council must take into account viability considerations when writing Policies, as this has an impact on the achievability of any measure proposed, and feedback from engagement work undertaken to inform this Study suggests that the experience of offering the cost waiver incentive in other areas has been disappointing, with developers content to forego the incentive and build only to the 110l/p/d standard.

5.21 The next chapter will review the findings of this Study against the aims set out in Chapter 1.

6. Conclusion

6.1 This Study has aimed to set out key considerations relating to the Dover district's water environment, with a particular focus on supply, infrastructure and water quality. Input from water providers and the Environment Agency has also been relied upon in order to integrate supplier strategies with the levels of growth forecast by the district's new Local Plan.

6.2 The new Local Plan should as a minimum provide for the objectively assessed need for housing within the District (NPPF para 11). Applying the Government's standard method in 2020 to the District results in a minimal housing need of 596 dwellings per annum (dpa) and equates to 11,920 dwellings over the 20-year Plan period.

6.3 An evidence base is being pulled together in support of the new Local Plan, and the Water Cycle Study will form part of this. This means that the Water Cycle Study seeks to align the levels of growth forecast in the Plan with the strategies of the relevant water providers to ensure that sufficient resources are available to serve new dwellings. The recommendations of this Study will also be used to inform the drafting of Policies within the new Local Plan.

6.4 The draft Local Plan will go through a stage of public consultation (named Regulation 18) in early 2021, before a window where the Council will process any representations received at the Reg 18 stage. Once comments have been processed and any required changes have been filtered in, the Council will undertake a further stage of public consultation on the submission version of the Plan (Regulation 19) before the Plan's Examination is undertaken.

6.5 Kent is one of the driest regions in England and Wales so pressures on water supply in the region are acute. At the same time, as a district Dover is likely to suffer effects from climate change ranging from coastal and fluvial flooding to increasingly regular freak weather events and resultant drainage problems. The District's three largest settlements are coastal and two also contain river estuaries, which is reflected in the extent of Flood Zones coverage in and around Sandwich and in Dover. As well as the settlements described, Dover's coastline is home to significant infrastructure such as the Dover-Folkestone railway line, the Channel Tunnel Ventilation Facility at Samphire Hoe and the A2 and A20, which connect Dover Docks to much of southern England by road.

6.6 The Environment Agency's ALS details that there is significant pressure on sources of abstraction, especially in lower-flow scenarios. It therefore follows that both the district's water suppliers have committed to significant leakage reduction targets as well as demand management policies, and both companies also plan to extend existing supply arrangements with neighbouring providers.

6.7 Both Southern Water and Affinity Water have undertaken detailed modelling work in order to account for proposed housing growth and environmental conditions and have published robust strategies outlining how they will accommodate growth in their respective catchments with a range of factors and future scenarios considered.

6.8 Both the District's water providers have addressed the predicted effects of climate change in their Water Resource Management Plans, to ensure that the likelihood of droughts in future is

minimised and that their water infrastructure undergoes required upgrades enabling it to remain functional through a greater intensity of inclement weather conditions.

6.9 Accordingly, this Study has delivered on its aims of providing a high-level assessment of the hydrology and topography of the District, a summary of the legislation which underpins the provision of and access to clean and safe water and capitalising on water cycle input from stakeholders to inform the drafting of strategic and development management policies in the new Local Plan.

6.10 The following chapter uses material from earlier in the Study to outline strategic policy options relating to the water environment, before putting forward preferred options and justifications to be used in drafting new Local Plan policies.

7. Options and Recommendations

7.1 The table below sets out a range of options through which the Council could improve the integration of water considerations and planning processes, and/or minimise the impact of the forecast growth on the district's water environment. The information provided within these options and the firmer recommendations below will be used to inform the drafting of Policies in the Local Plan, while the Water Cycle Study itself will form part of the evidence base to support the draft Plan.

Area of Focus	**Method for Improvement via Local Planning Policy**
Environmental	Local planning policy can require Sustainable Urban Drainage Systems (SuDS) for new developments. SuDS aim to manage rainwater runoff in a natural way by replicating natural processes, and examples of the technology include green roofs, permeable pavement and shallow ditches or swales. It is important that the maintenance of SuDS features is secured through planning policy and conditions. The main benefits of SuDS include water attenuation, treatment and reuse, and can also be used provide an amenity benefit. Proposals for Sustainable Drainage Systems involving infiltration must be assessed and discussed with the Environment Agency, to determine their suitability in terms of the impact of any drainage into the groundwater aquifer.
Social	Local planning policy can protect the district's green infrastructure and open spaces, providing safe access to water-facing green sites, as well as avoiding inappropriate development close to water courses.
Water supply	Local planning policy can ensure that the levels of growth forecast in the district are aligned with the supply strategies of the district's two water suppliers. By working collaboratively with the providers as part of the Local Plan process, the LA can help the providers plan required infrastructure upgrades, which often require significant lead-in times. In addition, securing Section 106 contributions can help facilitate connections on individual development sites
Water demand	Local planning policy can facilitate reductions in the demand for water, with a resultant easing in pressure on the availability of supply. Requiring higher water efficiency standards in new homes would help achieve this. Other methods for reducing water demand include smart metering, incentives and rainwater harvesting and water reuse. Non-domestic consumption can also be reduced by encouraging new developments to be built to 'Very Good' or 'Excellent' BREEAM standards.
Wastewater	Local planning policy can require adequate wastewater treatment facilities to be in place prior to new development and can also limit the phasing of development to ensure that sufficient wastewater drainage is provided in conjunction with new development. Local Planning policy can also address the need of increased suitable wastewater drainage cover

	(extension of existing network) and potentially promote the use of first sewerage to remove the load on area of high groundwater vulnerability.
Flood risk and drainage	Local planning policy can require Sustainable Urban Drainage Systems (SuDS) for new developments which aids the appropriate disposal of surface water and therefore avoids any increase in flood risk resulting from development. Via measures specified in the Council's Strategic Flood Risk Assessment, local planning policy can seek to locate new development in areas which are at lower risk of coastal or fluvial flooding
Climate change	Local planning policy can help facilitate sustainable design and construction, including improved water efficiency measures. By being mindful of Coastal Change Management Area data and the Strategic Flood Risk Assessment, local planning policy can mitigate as far as possible the impacts of climate change on the water environment in the district

Figure 21 - Strategic Options for Local Planning Policy

7.2 Having assessed methods by which local planning policy can affect the District's Water Cycle, the below table summarises a range of issues which have been identified during the research for the Water Cycle Study, and presents Options the Council should take in order to address these. A justification is also provided to give context to the option described.

7.3 In producing these options, it is acknowledged that the Council will have various considerations to assess before ultimately determining any course of action. Chief among these considerations is viability, which has an effect on the level of achievable mitigation in any development proposal and within the new Local Plan as a whole.

Issues	**Water Companies Recommendations**	**Preferred Options**	**Justification**
Housing/Population Growth in SW Thanet Water Resource Zone	Options for the SW WRMP were tested against the supply-demand deficits for seven different 'states of the world' as well as different possible 'futures' in terms of the supply-demand balance. This approach also identified steps required to be taken in all scenarios, including demand reduction measures	DDC should continue to require new homes to be built to the Optional Building Regs standard of 110/l/p/d, and assist SW in working towards its 2040 per capita consumption target of 100 l/p/d where possible.	Dover, along with the whole of the South East of England, is an area of serious water stress and no further water abstraction licences are available, so to accommodate the forecast growth will require per capita demand to be reduced

Housing/population growth in AW Dour Water Resource Zone	Affinity Water has assessed its capabilities against four different future scenarios, named Challenging, Expected, Optimistic and Aspirational based on the complexity and severity of issues faced under each. Under all four scenarios, it was found that all of Affinity's demand management options would be required, namely reducing per-capita-consumption of household customers, reducing non-household demand and reducing leakage	DDC should assist AW in achieving its aspirational target of 110l/h/d. The Building Regs requirement is currently for 110 l/h/d in new builds	Dover, along with the whole of the South East of England, is an area of serious water stress water stress and no further water abstraction licences are available, so to accommodate the forecast growth will require per capita demand to be reduced
Over-abstracted watercourses – no licences available	Under the CAMS and due to the regional water stress experienced, no further water abstraction licences are available	DDC should assist the water providers in implementing demand reduction measures to ease, or at minimum not worsen pressure on existing Abstraction Points and watercourses	Dover is an area of water stress and no further water abstraction licences are available, so to accommodate the forecast growth will require per capita demand to be reduced
Poor water quality assessments	The district's three watercourses were all classified as 'poor' in 2016 WFD assessment. It is acknowledged by the EKCIP that pressure on abstraction points contributes to degradation of watercourses, among other factors such as chemical discharges from agriculture and physical modifications	DDC should therefore pursue, through the land management process, opportunities to restore watercourses to their natural state, for example the deculverting of the River Dour, as well as ensuring that schemes that are likely to have an adverse impact on water quality are not permitted	The South East RBMP concluded that in many cases progress to 'good' WFD status would be disproportionately expensive. However using the Council's powers to improve watercourses when opportunities arise could result in environmental and social benefits
Climate change – flood risk and drainage	The four WwTWs in the district were shown by the KWfSG Study to have	DDC should continue to assess, through the planning application process and as	An increase in the occurrence of freak weather events is anticipated due to

	sufficient capacity remaining after forecast growth to 2031.	specified in the SFRA, applications for development on an individual basis to ensure that the risk of flooding offsite is not increased as a result of increased runoff from development	climate change, so the district's infrastructure for wastewater and groundwater will need to be designed to cope with such events
Climate change – variations to weather patterns	SW and AW have identified steps which must be taken regardless of the future scenario, but have also assessed capabilities against 'extreme' climate change including large-scale changes to abstraction licences and increased occurrence of droughts.	DDC should assist the water providers in achieving their demand reduction targets, as these are a key pillar of each companies' plans. Both companies have schemes which can be adapted to changing future scenarios depending on the severity of effects experienced	Dover is an area of water stress and no further water abstraction licences are available, so to accommodate the forecast growth will require per capita demand to be reduced
Protecting the environment	It is acknowledged that the presence of Abstraction Points contributes to the degradation of watercourses in the district. SW acknowledge the need to find 300 million litres of water per day to leave more water in the environment to support wildlife, while AW are stopping the reliance on drought permits for additional abstraction to meet their 1 in 200 year drought resilience commitment from March 2024.	DDC should support the water companies in implementing demand reduction measures to ease, or at minimum not worsen pressure on existing Abstraction Points and watercourses	Dover is an area of water stress and no further water abstraction licences are available, so to accommodate the forecast growth will require per capita demand to be reduced

Figure 22 - Recommendations and Options to inform Policy drafting