

United Utilities Water

DRAFT Drainage and Wastewater Management Plan 2023

Kent Leven DWMP

Document Reference: SPA_06

June 2022

Contents

Acronyms.....	3
1. Introduction to the DWMP	4
2. Background to the Kent Leven catchment.....	6
2.1 Strategic Planning Group (SPG).....	11
3. Risk identification	12
3.1 Risk Based Catchment Screening (RBCS) and Horizon Scan	12
3.2 Baseline Risk and Vulnerability Assessment (BRAVA) and Resilience.....	13
3.3 Problem characterisation.....	20
3.3.1 Complex catchments.....	20
3.3.2 Strategic growth catchments	20
3.3.3 Kendal	21
4. Options development	26
4.1 Kent Leven partnership options.....	27
5. Options for the Kent Leven	28
5.1 Options considered	28
5.2 Preferred options	30
5.3 Overview of preferred options in each TPU.....	35
5.3.1 Ambleside.....	36
5.3.2 Grange-Over-Sands	37
5.3.3 Holme	38
5.3.4 Kendal	39
5.3.5 Milnthorpe	40
5.3.6 Ulverston.....	41
5.3.7 Windermere	42
5.3.8 TPUs with population less than 2,000: <i>Bela sub catchment</i>	43
5.3.9 TPUs with population less than 2000: <i>Crake sub catchment</i>	44
5.3.10TPUs with population less than 2000: <i>Kent sub catchment</i>	45
5.3.11TPUs with population less than 2000: <i>Leven sub catchment</i>	46
6. Next steps.....	47
7. References.....	48

Acronyms

For a list of acronyms, refer to document C0003.

1. Introduction to the DWMP

The Drainage and Wastewater Management Plan (DWMP) is a long-term plan setting out how we intend to maintain robust and resilient drainage and wastewater systems, now and in the future. This is the first time that we are developing the plan and we have taken a comprehensive approach as we recognise the importance of long-term planning.

The heart of the plan will be built around collaborative and innovative working while encompassing all activities relating to drainage, flooding and delivering a wastewater service that protects the environment. We have led on this plan, but have developed it in consultation with our partners as we will be delivering the DWMP in partnership with other organisations such as the Environment Agency and local councils.

By developing the DWMP, we have an opportunity to:

- provide a basis for more collaborative and integrated planning alongside stakeholders across the region to tackle shared and interrelated risks relating to drainage, flooding and protecting the environment;
- strengthen partnership working with all key stakeholders to drive integrated investment in the environment and communities;
- develop a plan that will help address the increasing environmental expectations from customers and stakeholders and work towards the ambitions set out in Defra’s 25-year plan;
- collectively explore innovative solutions such as Sustainable Drainage Systems (SuDS) and nature-based solutions to understand what is best for the North West; and
- embed Systems Thinking to better understand drainage and environmental interactions, and to maximise the potential for integrated solutions.

Throughout the DWMP process, we have engaged with stakeholders to share our data and findings, to ensure that the solutions delivered are co-created, drive efficiencies and will benefit the communities and environment that we live and work in.

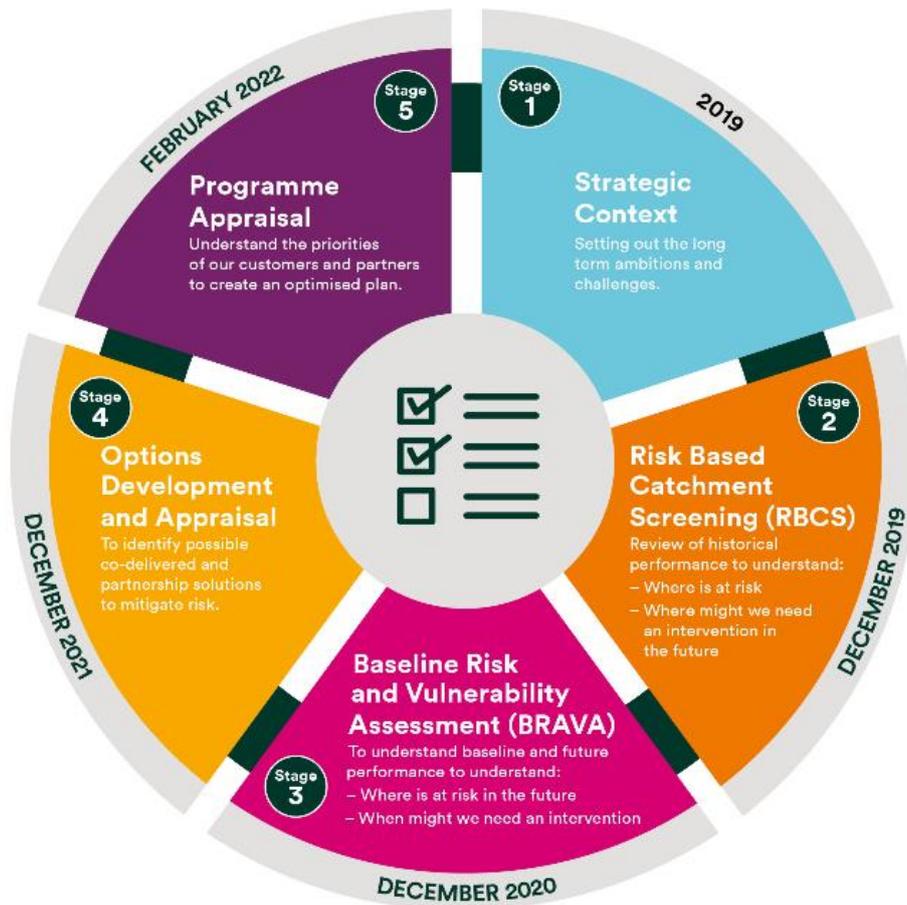
The plan will be set out at three levels (Figure 1) to maximise the potential for partnership working and for effective engagement between regulators and stakeholders at both company-wide level and more locally.

Figure 1 Geographical scales applied for planning and collaboration within DWMP



The plan is made up of five main stages (Figure 2) which each contribute to developing the most sustainable and effective future for the North West. These stages include setting out the long-term ambition for the region, identifying risk and understanding the possible interventions and solutions that could be developed.

Figure 2 Five stages of the DWMP



Across the North West, there are 14 Strategic Planning Areas (SPAs) and the purpose of this document is to share local, place-based information.

We will share the results from the different stages of the DWMP and how the DWMP plans to make a difference in the Kent Leven SPA.

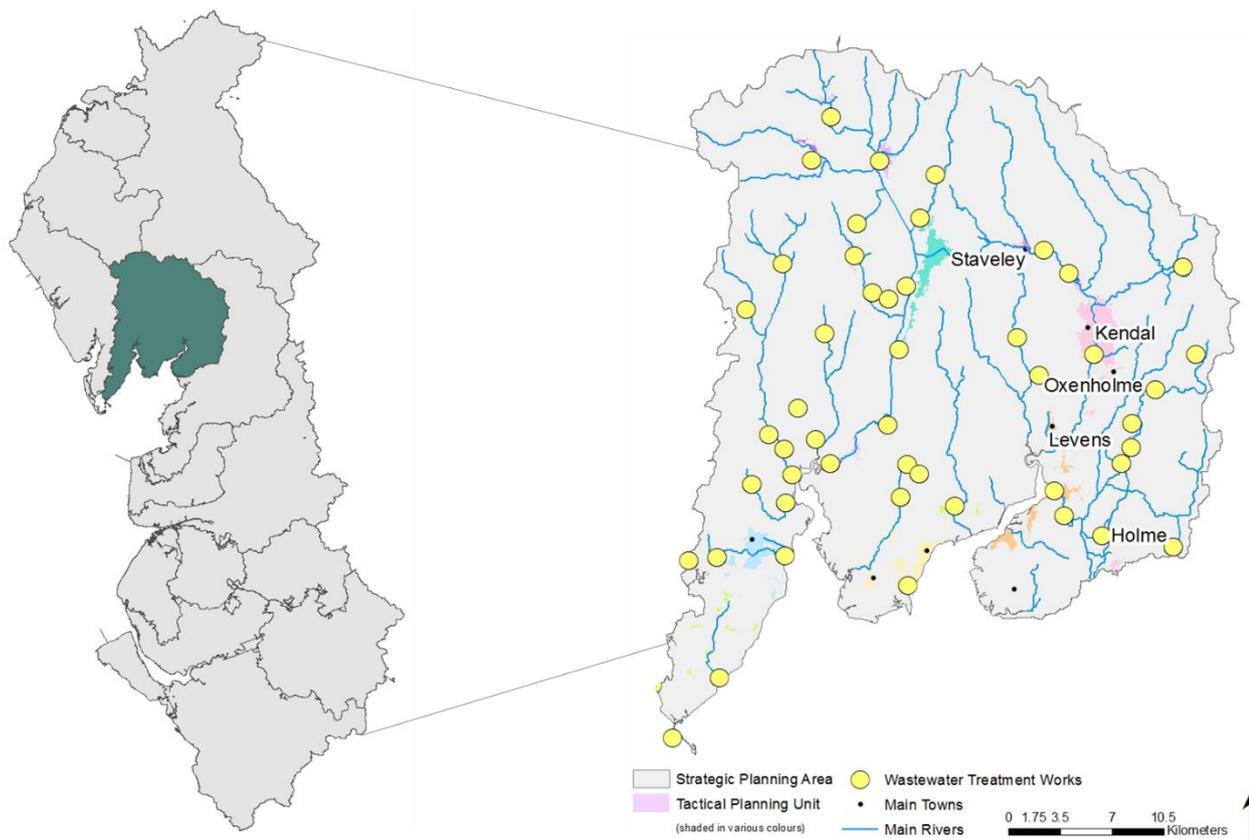
2. Background to the Kent Leven catchment

The Kent Leven is a large catchment (1119.7km²) south of the Lake District National Park. It has many areas designated for conservation such as Leighton Moss Site of Special Scientific Interest (SSSI) and it consists of many of the national park's iconic fells and lakes. The land use within the Kent Leven catchment mainly consists of livestock agriculture; there are also areas that are large towns with a significant tourist industry such as Windermere, Ambleside and Kendal ^[1].

There are four main sub- catchments:

- Bela – The River Bela flows from the south east to the south west of Kendal, starting from the Killington reservoir through the pastureland and enters Morecambe Bay downstream of Milnthorpe ^[2]. There are no large urban centres in this catchment, instead it is dominated by agriculture.
- Crake – Located in the west area of the catchment, Crake drains the Lakeland Fells above Coniston Water into the Leven Estuary ^[3].
- Kent – Located along a central band in the catchment area. The River Kent dominates this catchment, flowing through the large town of Kendal and draining into the Kent estuary ^[4].
- Leven – The largest sub catchment within the Kent Leven catchment area located within the Lake District National Park. This area includes Windermere Lake which drains through the River Leven into Morecambe Bay ^[5]. The land use is predominantly sheep and beef farming, but large tourist areas such as Bowness-on-Windermere, Ambleside, Hawkshead and Grasmere also are found within this sub catchment ^[6].

There are 46 wastewater tactical planning units (TPU), also known as wastewater treatment works (WwTW drainage catchments) within the Kent Leven SPA. A TPU is the drainage catchment area encompassing all the sewers and wastewater assets e.g. pumping stations, which drain into the associated wastewater treatment works. The TPUs within the SPA vary in size from larger catchments such as Windermere and Ambleside to smaller, rural catchments such as Spark Bridge. The TPUs are highlighted in Figure 3.

Figure 3 Map of the Kent Leven SPA

There are numerous strategic management plans within the Kent Leven that are owned by various other organisations. Within the Kent Leven catchment, there are active management plans such as:

- The Environment Agency River Basin Management Plan (RBMP) and Flood Risk Management Plan (FRMP);
- Lead Local Flood Authority (LLFA) Surface Water Management Plans (SWMP);
- North West and North Wales Coastal Group Shoreline Management Plan (SMP); and
- Local council plans.

Each of these strategic plans focuses on managing particular risks and links to programmes of work. A high-level summary of these management plans is shown in Table 1.

The DWMP aims to collaborate, share best practice and to align with other strategic plans throughout the SPA. This will help to highlight common challenges, ambitions and goals where there are shared or interconnected risks and opportunities.

Table 1 Summary of stakeholder management plans

Management plan	Overview	Key aspects for the Kent Leven catchment
<p>River Basin Management Plan (RBMP) ^[7]</p> <p>Owner: Environment Agency</p>	<p>A river basin district covers an entire river system, including river, lake, groundwater, estuarine and coastal water bodies. The RBMP aim is to improve the quality of our water environment to best support wildlife, agriculture, and businesses, and to boost regeneration and recreation.</p>	<p>The main reasons for not achieving good ecological status are physical modifications and pollution from rural areas and wastewater.</p> <p>Future challenges predicted by the Environment Agency include invasive non-native species, physical modifications, changes in natural flow and water levels, and pollution from a range of sources.</p>
<p>Flood Risk Management Plan (FRMP) ^[8]</p> <p>Owner: Environment Agency</p>	<p>The FRMP is a strategic plan, which reviews and develops measures to manage the risk of flooding from rivers, the sea, surface water, groundwater and reservoirs. The plan outlines flood risk areas, hazards, and set out measures and objectives to manage flood risk.</p>	<p>In the Kent and Leven catchment, there are over 10,000 people (9%) and approximately 3,400 non-residential properties that are at risk of fluvial and coastal flooding. Approximately 30% of agricultural land, 22% SSSI sites and 77% of Ramsar sites are at risk of flooding.</p> <p>There are a number of towns and villages within the catchment which have some form of flood alleviation such as Grasmere, Kendal, Ulverston and Dalton-in-Furness. Smaller communities within the catchment typically have property level mitigation in place.</p> <p>The December 2015 storms affected numerous towns and villages across the catchment such as Keswick, Cockermouth, Flimby, Allonby, Workington, Braithwaite and Seatoller. Since then, a programme of recovery was put in place. The Cumbria Floods Partnership Group was also formed which will consider mitigation measures such as improvements to existing flood defences and upstream management options such as slow the flow.</p> <p>Across the Kent Leven catchment there are 39 measures from earlier plans to manage flood risk.</p>

<p>Shoreline Management Plan (SMP) ^[9]</p> <p>Owner: North West and North Wales Coastal Group</p>	<p>The SMP is a non-statutory, high level policy document for coastal flood and erosion risk management planning that was formally adopted in August 2016. It provides a large-scale assessment of the risks associated with coastal processes and helps to reduce these risks to people and the environment by identifying the most sustainable policies for managing flood and coastal erosion risks in the short term (0–20 years), medium term (20–50 years) and long term (50–100 years).</p>	<p>The long term plan is to continue to protect the settlements of Arnside and Sandside from flooding and erosion and to maintain the integrity of the railway as long as it remains. In order to mitigate the impacts of these defences on the evolution of the estuary, in combination with expected future sea level rise, the long term plan also allows for creation of areas of new habitat and flood storage areas, by moving defences inland where opportunities exist.</p> <p>Grange-over-Sands will justify ongoing coastal defence.</p> <p>The long term plan is to continue to protect property and infrastructure at Greened, but to also return much of the remaining estuary back to a more natural system.</p> <p>Between the Leven estuary and Pile Island the general plan is to allow natural functioning of the shoreline without intervention, although local protection could be justified where the road or property is at risk.</p> <p>The long term plan for Wanly Island is to manage flood and erosion risk to residential areas and landfill sites and maintain the overall integrity of the island.</p> <p>Havering Dunes on the northern bank and Sandscape Dunes on the southern bank. The plan is to continue to allow these dune systems to evolve naturally, providing important natural defence features. For low lying land around the estuary, the long term plan therefore is to set back defences where opportunities exist, while continuing to protect necessary infrastructure and residential / commercial property in main villages and towns.</p>
<p>Surface Water Management Plan (SWMP) ^[10]</p> <p>Owner: Lead Local Flood Authority (LLFA)</p>	<p>A SWMP is a plan which outlines the preferred surface water strategy for a location. Although owned and led by the LLFA, a SWMP is produced in collaboration with other drainage owners, water companies included.</p> <p>Partners work together to understand the surface water flood risk in an area and agree an approach to address these issues innovatively and in a cost-effective way, and where appropriate, in partnership.</p> <p>A SWMP is a long-term plan and should influence development.</p> <p>The decision on whether a SWMP is appropriate is down to the LLFA, generally they are produced for areas considered to experience a high flood risk.</p> <p>United Utilities Water (Uuw) continues to work closely with LLFAs and supports the development of SWMPs where required, and the delivery of SWMPs where they are published.</p>	

<p>Catchment Based Approach (CaBA) Catchment Plan ^[7]^[11]</p> <p>Owner: Beck to Bay South Cumbria Catchment Partnership</p>	<p>The aim of the partnership is to bring together stakeholders to create and deliver a focussed, sustainable and collaborative action plan to deliver benefits within the catchment.</p>	<p>The vision of the catchment partnership is to support a healthy, sustainable and diverse catchment system, which provides a wide range of benefits.</p> <p>The catchment plan focuses on strategic aims such as:</p> <ul style="list-style-type: none"> • high water quality; • resilience to flood and drought conditions; • sustainable development; • widespread biosecurity and invasive species control; and • diverse habitats that are rich in wildlife. <p>Currently, 57% of waterbodies are failing to meet the required status. The main current and future challenges identified by the partnership include physical modifications, changes in natural flow and water levels, and pollution from agriculture and rural areas.</p>
--	---	--

2.1 Strategic Planning Group (SPG)

We appreciate that there are many organisations with formal roles and responsibilities relating to drainage, flooding and protection of the environment. By participating in the creation of a DWMP, much more can be achieved compared to working on our plans in isolation.

Within DWMP, SPGs have been a key form of engagement with stakeholders across the region. SPGs have operated at a local, catchment scale to allow stakeholders to input into the identification of priority and shared risk locations, and develop an understanding of potential collaborative solutions to tackle shared risks. The SPGs have covered a wide range of issues including reducing flooding and improving water quality. A key driver is understanding where there may be potential to achieve multiple benefits through solutions.

Through the SPGs, we have been able to consult with strategic partners on the various stages of the DWMP (Figure 4) and share outputs as and when they become available. This has been a two-way process and stakeholders have had the opportunity to share information with us such as action plans, confirmed projects, priority areas and ambitions for the future which could be developed and delivered in partnership. We have been able to review and incorporate the information shared during the different stages of the DWMP process.

Within the Kent Leven SPA we have engaged with stakeholders such as:

- The Environment Agency;
- Cumbria County Council;
- South Lakeland District Council; and
- South Cumbria Rivers Trust (host of the Kent Leven Catchment Based Approach (CaBA) partnership).

More information on co-creation activity undertaken with the SPG can be found in Technical Appendix 2 – Stakeholder Engagement (TA2). The outputs from this activity in the Kent Leven catchment are outlined in Section 4.

Figure 4 DWMP framework for engagement

A framework for engagement in the North West



3. Risk identification

A key component of the DWMP has been around risk identification. This has been a mixture of both historical risk and forecast risk. Activities to understand this were completed through the Risk Based Catchment Screening (RBCS) and Baseline Risk and Vulnerability Assessment (BRAVA) stages. We have also undertaken numerous additional assessments to understand wider resilience and catchment risks.

Further detail on the approaches can be found in Technical Appendix 4 – Risk Based Catchment Screening (TA4) and Technical Appendix 5 – Understanding Future Risk (TA5).

3.1 Risk Based Catchment Screening (RBCS) and Horizon Scan

The RBCS stage is a series of high-level assessments that are used to review and screen each TPU to determine whether a more detailed assessment is required during the Baseline Risk and Vulnerability Assessment (BRAVA) stage.

The assessments are designed to span the key aspects of a wastewater company's responsibilities: from the network, to the treatment works, to its interaction with the environment. Examples of the assessments considered are internal sewer flooding, storm overflow performance, and pollution incidents. The assessments typically used three to five years of historical data.

Additional assessments termed 'horizon scanning' were undertaken to understand wider exogenous factors and opportunities that could inform future investment e.g. major infrastructure projects, private septic tank locations and potential major infrastructure projects (HS2 etc). Areas with potential future developments were also considered and further information on projected growth areas can be found within the associated Local Plans.

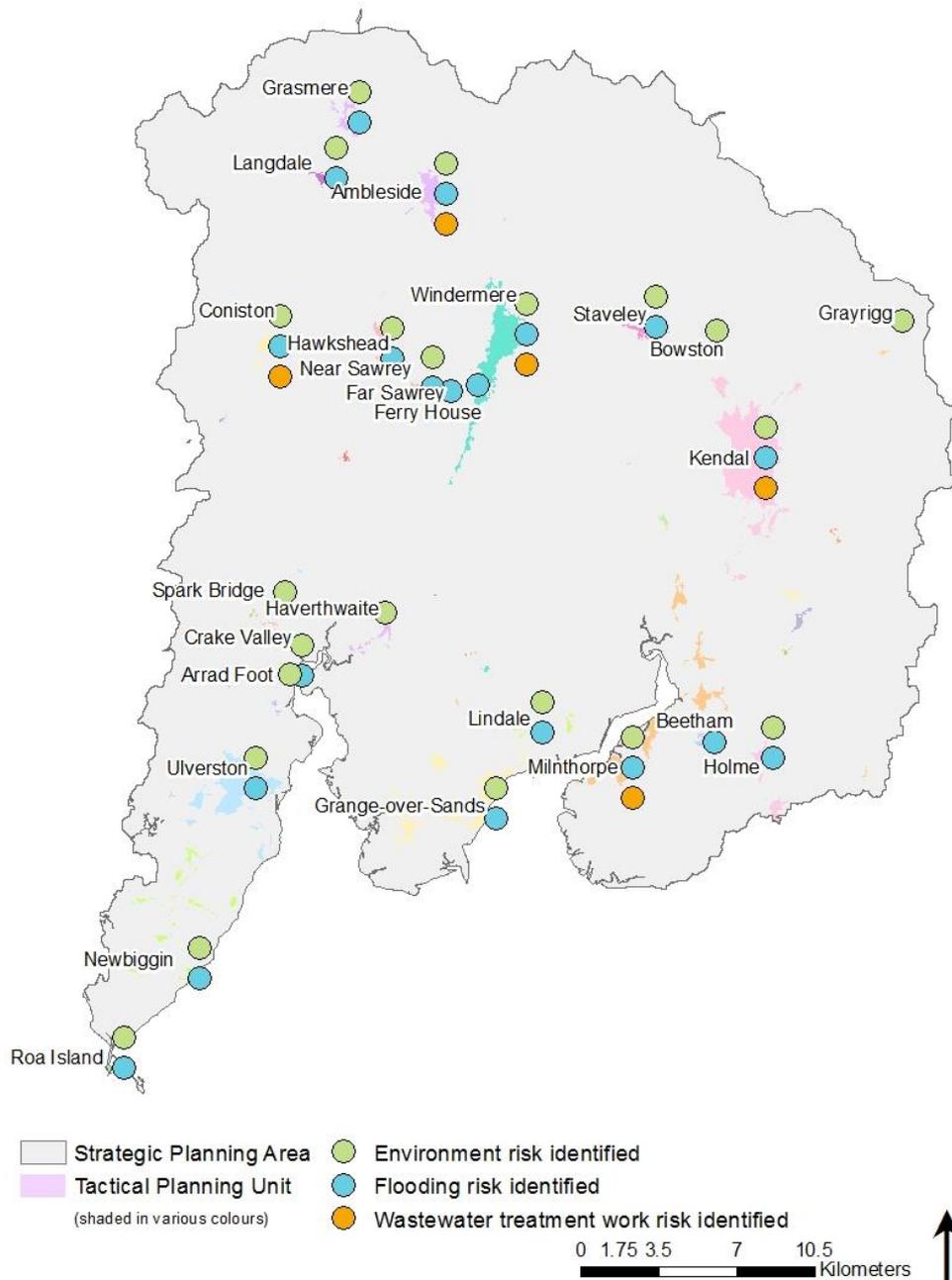
Within the Kent Leven SPA, the RBCS stage identified 27 out of 46 TPUs that required further investigation and therefore passed onto the BRAVA stage (outlined in Section 3.2).

Figure 5 indicates which of the RBCS categories (environmental, flooding and wastewater treatment works capacity) have triggered within each TPU. There are numerous TPUs which did not trigger for RBCS across any of the categories and are therefore not shown in Figure 5. A list of these TPUs can be found in Table A.1 in the Appendix. Environmental and flooding categories are the most common within the Kent Leven catchment which is supported by the highest-triggered RBCS assessments which are:

- Storm Overflow Assessment Framework - (22/46) – Environment; and
- External Sewer Flooding - (20/46) – Flooding.

Further detail on the approaches and assessment results can be found in TA4.

Figure 5 Map of the RBCS results for the Kent Leven SPA. Risk categories indicate areas triggering further investigation following RBCS. TPUs not triggered in RBCS can be found in table A.1 of the appendix



3.2 Baseline Risk and Vulnerability Assessment (BRAVA) and Resilience

The TPUs that were identified during RBCS were then taken forward into BRAVA, which aims to assess the baseline and future position of system performance against the DWMP planning objectives, to understand where there may be issues. It is also to understand wider resilience issues that could also impact upon the DWMP planning objectives. This stage considers risk at 2020, 2030 and 2050 design horizons.

In addition to BRAVA, a range of resilience assessments were undertaken and will have been incorporated throughout the plan to allow us to expand our understanding of wider core risks, such as how the water quality of rivers may change as a result of climate change. We have also assessed risks such as fluvial and/or coastal flooding and fluvial and/or coastal erosion and land stability.

Further detail on the approaches and assessment results can be found in TA5, and Technical Appendix 6 – Resilience (TA6).

The BRAVA and resilience results for the Kent Leven catchment are outlined in Table 2 to Table 5.

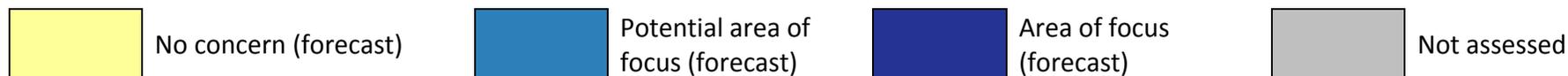
Table 2 Environmental BRAVA results

Tactical Planning Unit	Environmental					
	Pollution Assessment	Storm Overflow Performance		Bathing and Shellfish Spill Assessment		
	2020	2020	2050	2020	2030	2050
Ambleside						
Arrad Foot						
Beetham						
Bowston						
Coniston						
Crake Valley						
Far Sawrey						
Ferry House						
Grange-Over-Sands						
Grasmere						
Grayrigg						
Haverthwaite						
Hawkshead						
Holme						
Kendal						
Langdale						
Lindale						
Milnthorpe						
Near Sawrey						
Newbiggin						
Roa Island						
Satterthwaite						
Spark Bridge						
Staveley						
Torver						
Ulverston						
Windermere						

BRAVA	
	No concern (forecast)
	Potential area of focus (forecast)
	Area of focus (forecast)
	Not Assessed / Not Applicable

Table 3 Flooding BRAVA results

Key



Tactical Planning Unit	Flooding												
	Internal Flooding Risk			External Flooding Risk			Sewer Collapse Risk	Risk of Flooding in a Storm (1:50yr)		Flooding of Open Spaces			Blockage Assessment
	2020	2030	2050	2020	2030	2050	2020	2020	2050	2020	2030	2050	2020
Ambleside	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Dark Blue	Dark Blue	Dark Blue	Dark Blue
Arrad Foot	Grey	Grey	Grey	Grey	Grey	Grey	Dark Blue	Grey	Grey	Grey	Grey	Grey	Yellow
Beetham	Light Blue	Dark Blue	Light Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Dark Blue	Yellow	Yellow	Yellow	Dark Blue
Bowston	Grey	Grey	Grey	Grey	Grey	Grey	Dark Blue	Grey	Grey	Grey	Grey	Grey	Dark Blue
Coniston	Light Blue	Light Blue	Light Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Dark Blue	Dark Blue	Dark Blue	Light Blue
Crake Valley	Light Blue	Light Blue	Light Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Yellow	Yellow	Dark Blue	Yellow
Endmoor	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Grey	Yellow	Yellow	Dark Blue	Dark Blue	Dark Blue	Grey
Far Sawrey	Light Blue	Light Blue	Light Blue	Yellow	Yellow	Yellow	Dark Blue	Yellow	Yellow	Dark Blue	Dark Blue	Dark Blue	Light Blue
Ferry House	Grey	Grey	Grey	Grey	Grey	Grey	Dark Blue	Grey	Grey	Grey	Grey	Grey	Dark Blue
Grange-Over-Sands	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Dark Blue	Dark Blue	Dark Blue	Light Blue
Grasmere	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Dark Blue	Dark Blue	Dark Blue	Dark Blue
Grayrigg	Grey	Grey	Grey	Grey	Grey	Grey	Dark Blue	Grey	Grey	Grey	Grey	Grey	Yellow
Haverthwaite	Grey	Grey	Grey	Grey	Grey	Grey	Dark Blue	Grey	Grey	Grey	Grey	Grey	Yellow
Hawkshead	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Dark Blue	Dark Blue	Dark Blue	Yellow
Holme	Light Blue	Light Blue	Light Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Dark Blue	Dark Blue	Dark Blue	Light Blue
Kendal	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Light Blue
Langdale	Light Blue	Light Blue	Light Blue	Yellow	Light Blue	Dark Blue	Dark Blue	Yellow	Yellow	Dark Blue	Dark Blue	Dark Blue	Light Blue
Lindale	Light Blue	Light Blue	Light Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Yellow	Yellow	Yellow	Dark Blue
Low Park	Light Blue	Light Blue	Light Blue	Dark Blue	Dark Blue	Dark Blue	Grey	Yellow	Yellow	Yellow	Yellow	Yellow	Grey
Milnthorpe	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Dark Blue	Dark Blue	Dark Blue	Light Blue

Tactical Planning Unit	Flooding												
	Internal Flooding Risk			External Flooding Risk			Sewer Collapse Risk	Risk of Flooding in a Storm (1:50yr)		Flooding of Open Spaces			Blockage Assessment
	2020	2030	2050	2020	2030	2050	2020	2020	2050	2020	2030	2050	2020
Near Sawrey													
Newbiggin													
Roa Island													
Satterthwaite													
Spark Bridge													
Staveley													
Torver													
Ulverston													
Windermere													

Table 4 Wastewater treatment works BRAVA results

Tactical Planning Unit	Wastewater Treatment Works		
	Risk of Wastewater Treatment Works (WwTW) Capacity		
	2020	2030	2050
Ambleside			
Beetham			
Coniston			
Crake Valley			
Grange-Over-Sands			
Grasmere			
Holme			
Kendal			
Milnthorpe			
Near Sawrey			
Newbiggin			
Spark Bridge			
Staveley			
Ulverston			
Windermere			

BRAVA	
	No concern (forecast)
	Potential area of focus (forecast)
	Area of focus (forecast)
	Not assessed

Table 5 Environmental and flooding resilience results

Tactical Planning Unit	Resilience Assessment		
	Environmental		Flooding
	Potential for changes in the water quality of rivers as a result of climate change	Potential for changes in catchment contributions as a result of climate change	Outfall locking
	2050	2050	2020
Ambleside	More resilient	More resilient	Not assessed
Arrad Foot	More resilient	More resilient	Not assessed
Ayside	More resilient	More resilient	Not assessed
Beetham	More resilient	More resilient	Not assessed
Bouth	More resilient	More resilient	Not assessed
Bowston	More resilient	More resilient	Not assessed
Brigsteer	More resilient	More resilient	Not assessed
Broughton Beck	More resilient	More resilient	Not assessed
Coniston	More resilient	More resilient	Less resilient
Crake Valley	Less resilient	Less resilient	More resilient
Crooklands	More resilient	More resilient	Not assessed
Endmoor	More resilient	More resilient	Not assessed
Far Sawrey	More resilient	Not assessed	Not assessed
Ferry House	More resilient	More resilient	Not assessed
Field Broughton	Less resilient	Less resilient	Not assessed
Grange-Over-Sands	Not assessed	Not assessed	Less resilient
Grasmere	More resilient	Not assessed	Not assessed
Grayrigg	More resilient	More resilient	Not assessed
Hawkshead	More resilient	More resilient	Not assessed
High Newton	More resilient	More resilient	Not assessed
Holme	Less resilient	More resilient	Not assessed
Hutton Roof	Less resilient	Less resilient	Not assessed

Resilience	
More resilient	More resilient
Less resilient	Less resilient
Not assessed	Not assessed

Tactical Planning Unit	Resilience Assessment		
	Environmental	Flooding	
	Potential for changes in the water quality of rivers as a result of climate change	Potential for changes in catchment contributions as a result of climate change	Outfall locking
	2050	2050	2020
Kendal			
Langdale			
Lindale			
Loppergarth			
Low Park			
Lowick Green No 1			
Marion Lane End			
Near Sawrey			
Newbiggin			
Outgate			
Oxen Park			
Satterthwaite			
Spark Bridge			
St Johns			
Staveley			
Staveley-In-Cartmel Tank			
Torver			
Troutbeck			
Underbarrow			
Windermere			

3.3 Problem characterisation

3.3.1 Complex catchments

Complex catchments were determined using problem characterisation that used a combination of complex and strategic catchment scores based on strategic need (largely derived from growth and climate forecast models) and modelled risks in each of the TPUs (largely based on BRAVA). Within the Kent Leven SPA, the Kendal TPU was identified to be 'complex' based on problem characterisation.

3.3.2 Strategic growth catchments

Through the various risk identification assessments, a number of locations were identified through opportunity workshops that require more strategic analysis. These are areas with high growth, a high number of risks and multiple potential scenarios. Different bespoke scenarios are applied to strategic catchments based on the needs and drivers of the catchments to understand the variability of risk as a first step for optioneering, so that the range of options developed can mitigate a different range of scenarios.

There are no TPUs within the Kent Leven SPA that were identified as having 'strategic growth'.

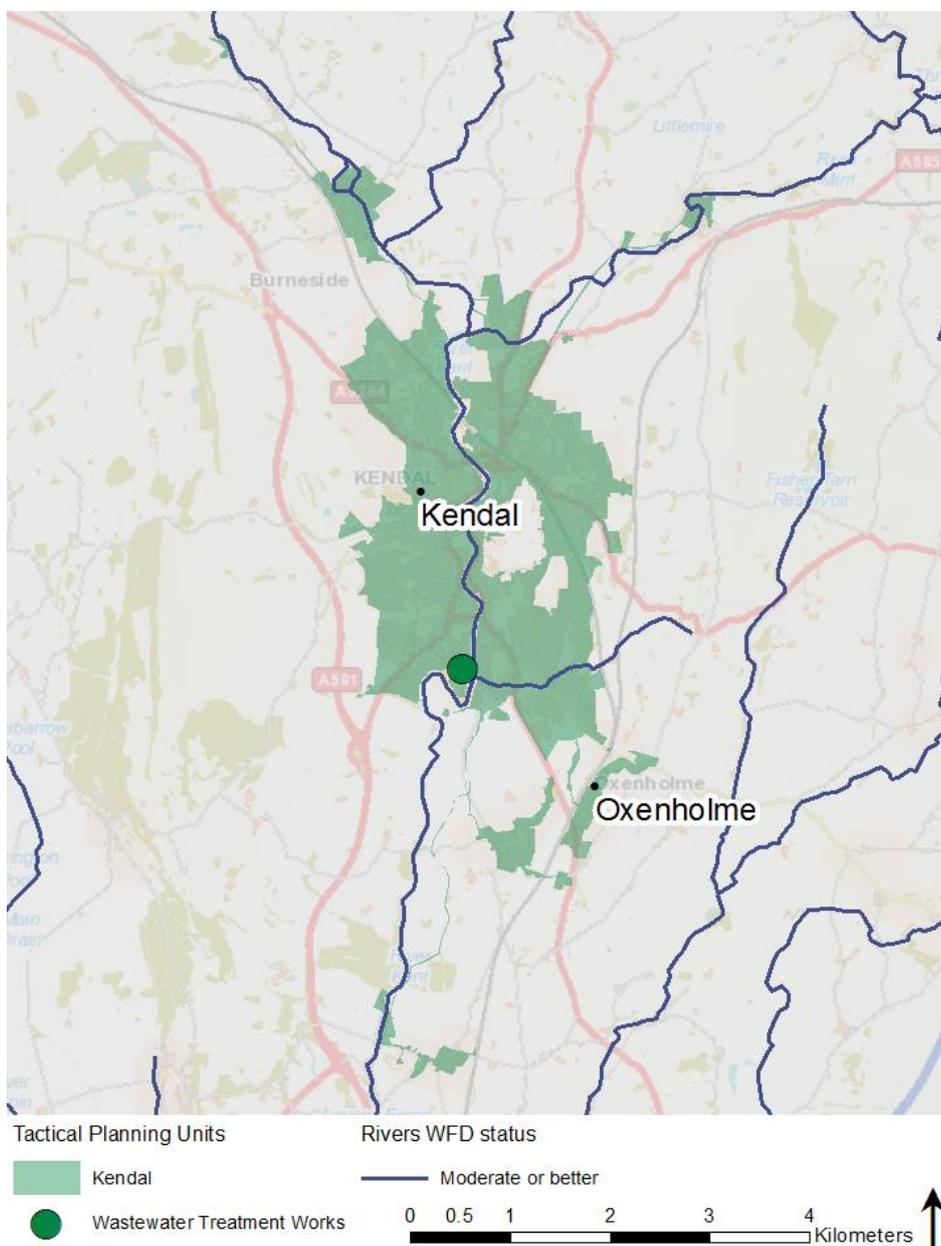
Note: Water Industry National Environment Programme (WINEP) and storm overflows guidance are still being developed. This could lead to significant changes in preferred options and could result in large-scale, short and long-term investment needs. This will be fully reviewed between draft and final DWMP publication, in addition to other aspects such as nutrient neutrality, bathing waters and shellfish water expectations. Between draft and final DWMPs the impact of storm overflow requirements will also require optimising against the other needs and opportunities.

3.3.3 Kendal

The Kendal TPU is to the south east of the Kent Leven SPA (Figure 6), consisting of over 380km of sewer network which serves approximately 15,600 properties and a residential population of over 32,000 people. The population is projected to grow significantly, with an increase of 14% by 2050, which could drive associated development and increase pressure on our network and assets. The main watercourses are the rivers Kent, Mint and Sprint, which are all classed as ‘moderate’ under the Water Framework Directive (WFD) 2019.

Kendal is a complex catchment, due to uncertainty associated with forecasts of demographic, economic, and behavioural changes over the planning period. The treatment works was redeveloped during the 2015-2020 funding cycle to incorporate a Nereda process. We are currently monitoring performance and Kendal TPU will be reassessed when there is appropriate base data available. Alongside this the BRAVA process identified risks for internal flooding, external flooding, flooding of open spaces, flooding in a 1-in-50-year storm event, pollution, sewer collapse, and blockages by 2050.

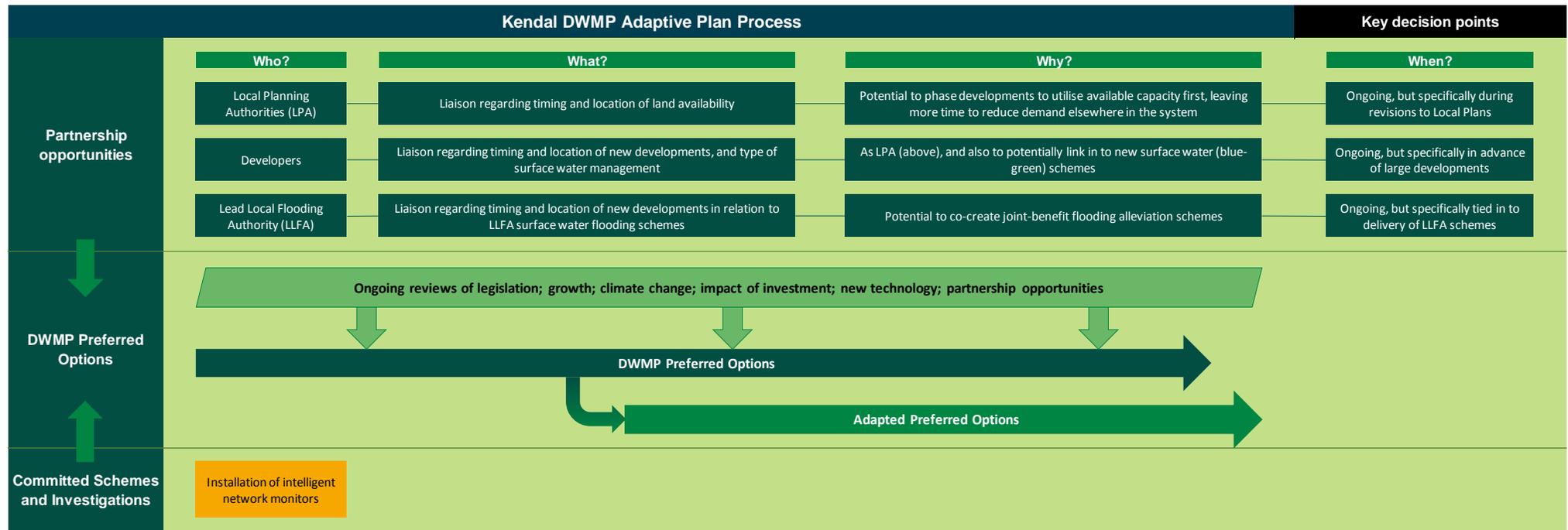
Figure 6 Map of the Kendal TPU



3.3.3.1 Kendal adaptive plan

The first part of the adaptive plan process (Figure 7) highlights the importance of partnership working and regular data reviews.

Figure 7 Kendal adaptive planning process



Partnership working

In a catchment where growth is a significant factor in future performance, it is key to maintain regular conversations with those stakeholders that have knowledge about future developments and can potentially influence their impact. Key organisations include:

- Local Planning Authority;
- The Environment Agency;
- Lead Local Flood Authorities; and
- Housing developers.

The DWMP plan for each TPU is developed based on a number of data sources. Some of these are prone to change over time, which means that original assessments can become out of date. As data from these sources change, it makes sense to re-evaluate the DWMP plan to check the impact on the plan. Examples of data that change over time are shown in Table 6.

Table 6 Examples of data that change over time and can impact upon the plan

Type of data or information	Possible impacts of changes
Government legislation	More or less stringent requirements or regulations, which may require different levels of investment, and policy changes that may drive better or worse incentives on demand.
Development growth projections	These will vary with time in line with economic conditions, changing demographics, or government policy. This can result in the number of new houses and businesses growing at a different rate than originally forecast.
Climate change projections	As more climate data becomes available, climate projections are modified, which may indicate changes to temperature and rainfall patterns.
Impact of investment	As new drainage schemes or new strategies are implemented, we will continue to evaluate their performance. If they turn out to be more or less successful than anticipated, this may allow the extent of another option type to be reduced or increased accordingly.
Development of new technology	Over time, new technology provides opportunities to address and resolve risks differently, or more efficiently.
Partnership opportunities	We will work closely with key stakeholders to address risks jointly. Over time, these stakeholders may see changes in their own risks and funding levels, which may present opportunities for greater collaboration.

Figure 8 shows the second part of the Kendal adaptive plan, reflecting the different option types identified as being appropriate for Kendal. Each line represents a different option type – e.g. school education programme. The plan shows that each option type will be regularly reviewed in line with the method described in part one. This allows new information and opportunities to be used to adapt the plan by either increasing or reducing the extent of some option types.

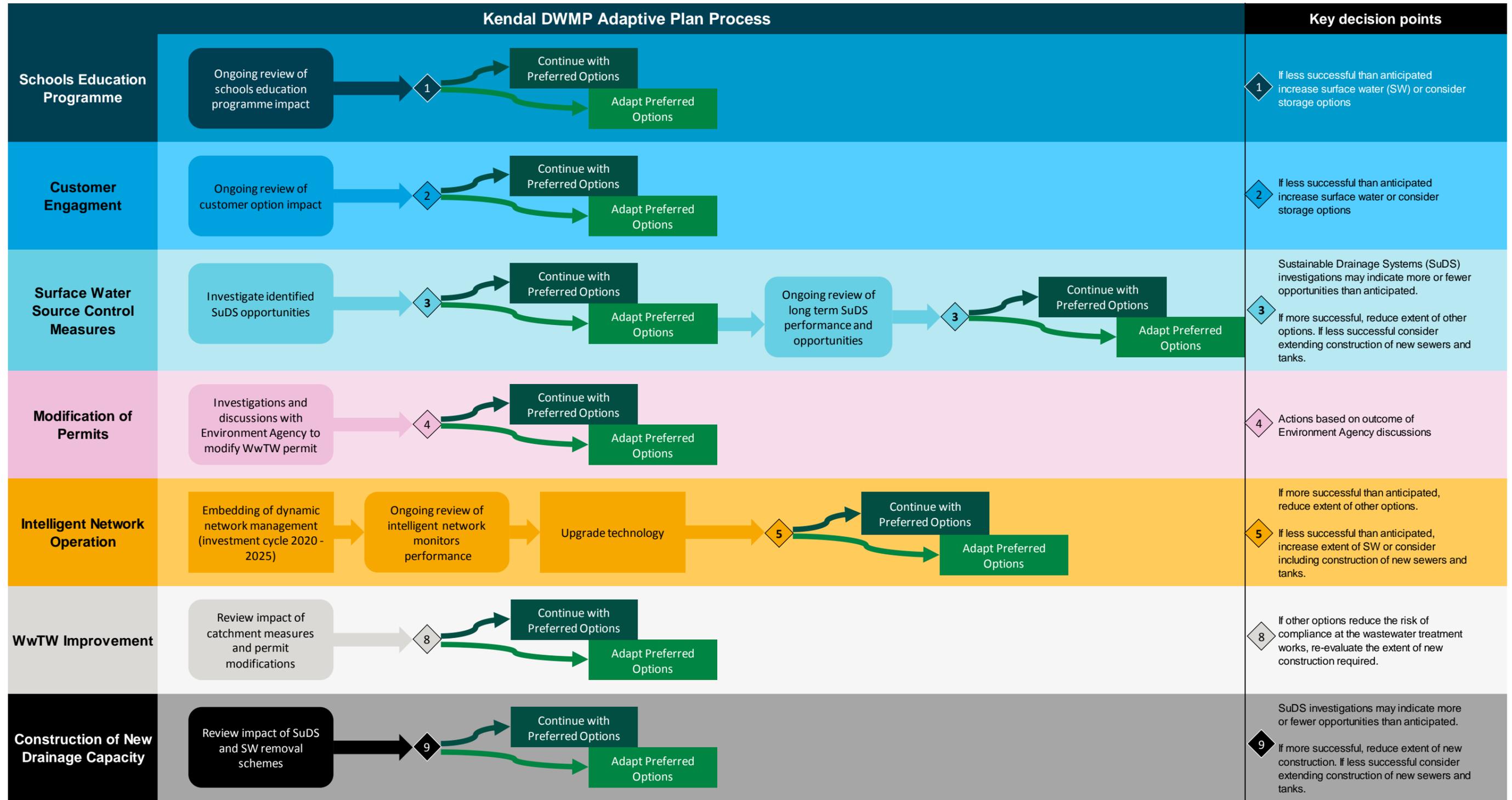
Within Kendal, there are opportunities to carry out investigations before making final decisions on the final strategy. This means that we can properly evaluate options before committing to significant investment. These investigations will take into account things such as:

- Technical feasibility;
- Benefit of the work;
- Customer impact;
- Environmental impact; and
- Cost.

The adaptive plan below demonstrates multiple potential scenarios and pathways, and should be read in conjunction with the optimised DWMP plan for the relevant TPU (refer to Section 5.3).

The adaptive plan should be reviewed regularly in order to incorporate potential changes in key factors such as legislation, population growth and climate change, which could impact standards or targets, as highlighted in Figure 7. The adaptive plan may contain potential investigations which are currently excluded from the optimised DWMP plan (refer to Section 5.3) until there is more certainty. It is therefore important that both the adaptive plan and the optimised plan are developed together.

Figure 8 Kendal adaptive plan – Possible adaptive pathways as knowledge and opportunities change over time



4. Options development

The approach for options development is an iterative screening process to identify most appropriate solutions for issues in each TPU. These solutions were taken forward for a best value assessment which will select the preferred option (Figure 9).

An options hierarchy was then used which has been endorsed by customers and stakeholders from across the North West to select preferred solutions (Figure 10). The hierarchy covers a range of option types from behavioural, to blue-green solutions e.g. SuDS and traditional grey solutions e.g. storage tanks, across benefits such as reducing demand, better system management and creating capacity.

A key element to this has been built around co-development, co-funding and co-delivery through partnerships and third parties (for instances where a specific skill set is required).

Figure 9 Options development process

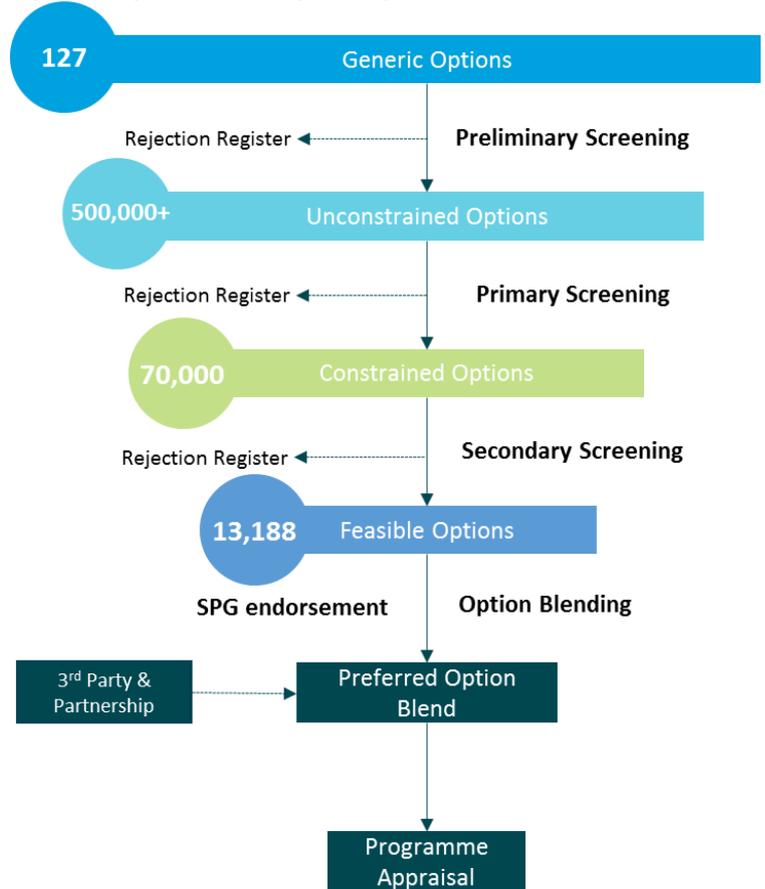
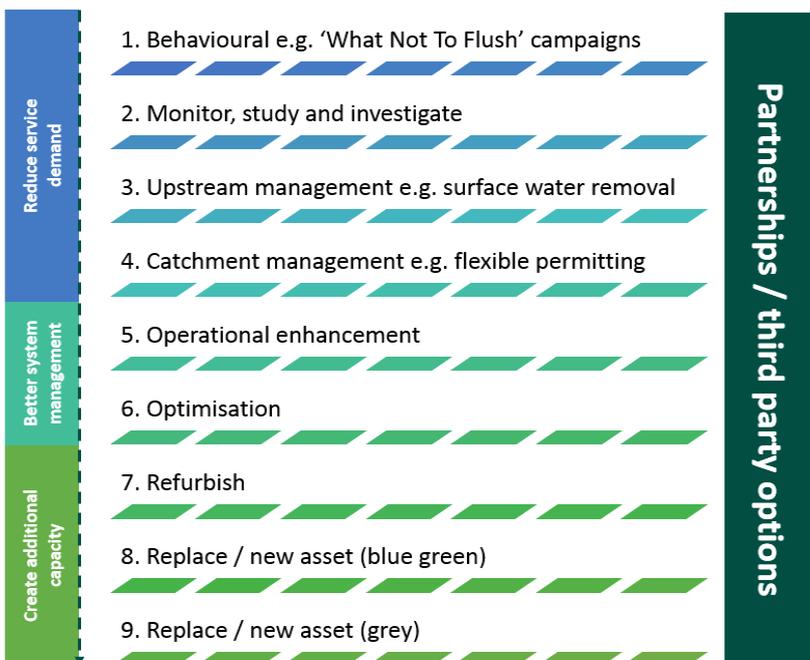


Figure 10 Options hierarchy



5. Options for the Kent Leven

5.1 Options considered

Following a number of iterative screening processes outlined in Section 4, a list of feasible options was developed for each TPU within the Kent Leven catchment. Options can be categorised into a number of categories:

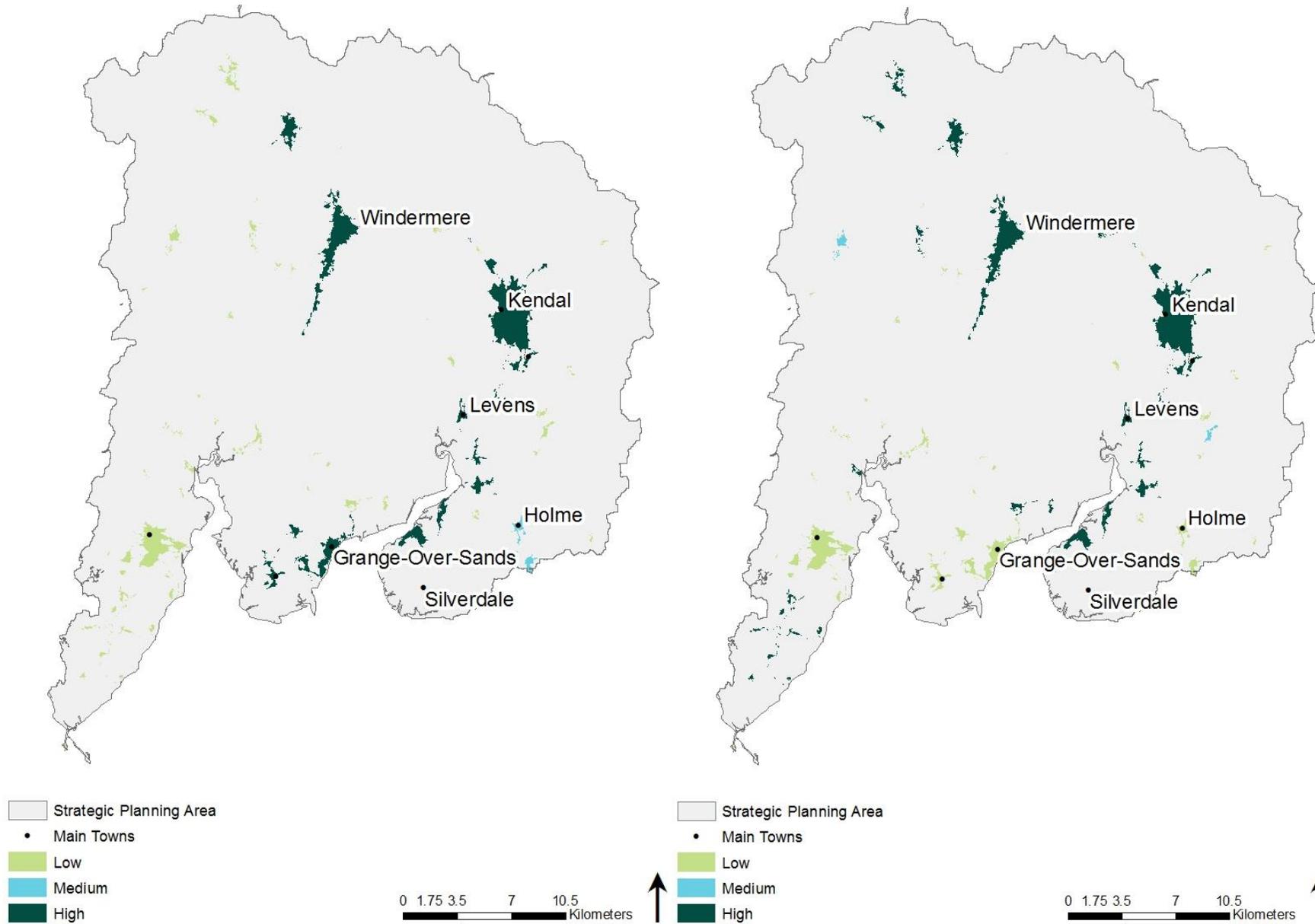
- Customer engagement;
- Monitor and investigate;
- Upstream management;
- Catchment management;
- Operational enhancement;
- Optimisation;
- Refurb/New asset (blue/green); and
- Refurb/New asset (grey).

Of these options, a number can be considered regional options – those which could be implemented across the North West but may bring tangible benefits in some areas more than others. These can be investigated further, ahead of investment cycle 2025 – 2030 where viable.

Across the Kent Leven catchment, customer engagement options (Figure 12), comprising of options to work with customers to reduce demand and increase awareness of ‘what not to flush’, have been identified as having the potential to deliver the highest benefit in Ambleside, Windermere and Kendal TPUs.

Additionally, Sustainable Drainage System (SuDS) options have been assessed, these form a key part of the strategy to manage rainwater from entering the sewer system in Windermere, Hawkshead and Ambleside TPUs (Figure 12).

Figure 12 Maps show the benefit of implementing regional customer engagement (left) and sustainable drainage solutions (right) options across the Kent Leven SPA



5.2 Preferred options

Note: Water Industry National Environment Programme (WINEP) and storm overflows guidance are still being developed. This could lead to significant changes in preferred options and could result in large-scale, short and long term investment needs. This will be fully reviewed between draft and final DWMP publication, in addition to other aspects such as nutrient neutrality, bathing waters and shellfish water expectations. Between draft and final DWMPs the impact of storm overflow requirements will also require optimising against the other needs and opportunities detailed in this section to assess synergy/conflict and best value.

The data below do not include planned investment in addressing storm overflows. The future standards for overflows are currently the subject of the Government’s Storm Overflow Discharge Reduction Plan Consultation, and the outcome is not yet determined, so it has not been possible to include these in the screening process described below.

A high-level regional assessment has been carried out to estimate the likely investment requirements to address all overflow risks, but due to the uncertainty described above, this has not been broken down by Strategic Planning Areas. This information can be found in the DWMP main document.

Utilising data collected at the various stages of developing the DWMP (BRAVA, partnership opportunities and the data in Figure 12), preferred options were selected using a decision support tool and following the hierarchy principles. We have also included in this plan high confidence schemes that we believe are likely to have secured investment.

In addition, the partnership opportunities highlighted in Section 4.1 are considered key for delivery of the options set out below. These will be investigated in detail in preparation for the investment plan for the period 2025 – 2030.

The following colour schemes are used for all charts and graphs in this section to represent each option type (Figure 13).

Figure 13 Option types

Reduce Service Demand		Schools Education Programme
		Customer Engagement
		Surface Water Source Control Measures
		Modification of Permits
Better System Management		Intelligent Network Operation
		Enhanced Operational Maintenance
		Repair and Rehabilitation
Create Additional Capacity		New 'Green' WwTW Capacity (e.g. Reedbed)
		New 'Green' Overflow Treatment (e.g. Reedbed)
		Separation of Combined Sewers
		WwTW Transfers
		WwTW Improvement
		Construction of New Drainage Capacity

The first four option types are all grouped under the strategic heading of 'Reduce Service Demand', and are options that focus on either reducing the amount of wastewater that is produced, or preventing it from reaching the sewer network.

The second strategic group is 'Better System Management' and looks to try and manage and operate the existing assets in a more efficient or effective manner.

The final group is 'Create Additional Capacity'. This is about building new assets, for example storage tanks or new treatment work process units, where it is not possible or economical to reduce demand or improve operations any further.

Across the Kent Leven SPA, the outcomes seen as a result of potential investment and benefit in each option type are shown in Figures 14, 15 and 16.

Figures 14 and 15 show how potential investment could be split between the three high-level option strategies – reduce demand, system management and new capacity – and then further sub-divides these into the individual option types.

Figure 14 shows potential options to address environmental planning objectives, which incorporate:

- Wastewater treatment work permit compliance;
- WINEP compliance; and
- Pollution of watercourses.

Figure 15 shows potential options to address flooding planning objectives, which incorporate:

- Internal flooding;
- External flooding;
- Highway and open space flooding; and
- 1 in 50-year flooding.

Note that the percentages shown in Figures 14 and 15 are the proportions of investment within each planning objective type (flooding and environmental), but the total values of flooding and environmental investment are not equal. This split can be seen in more detail for each TPU in Section 5.3.

Figure 16 shows how these options could contribute to addressing the planning objectives – environmental and flooding.

Figure 14 Kent Leven Strategic Planning Area: Distribution of environmental investment by option type

This is an example of how investment in different options types may be used to address the environmental planning objectives. The vast majority of potential investment could be through improvements in wastewater treatment works. This chart does not show planned investment in improving overflow performance as these are not based on cost beneficial assessments.

Reduce Service Demand		Schools Education Programme
		Customer Engagement
		Surface Water Source Control Measures
		Modification of Permits
Better System Management		Intelligent Network Operation
		Enhanced Operational Maintenance
		Repair and Rehabilitation
Create Additional Capacity		New 'Green' WwTW Capacity (e.g. Reedbed)
		New 'Green' Overflow Treatment (e.g. Reedbed)
		Separation of Combined Sewers
		WwTW Transfers
		WwTW Improvement
		Construction of New Drainage Capacity

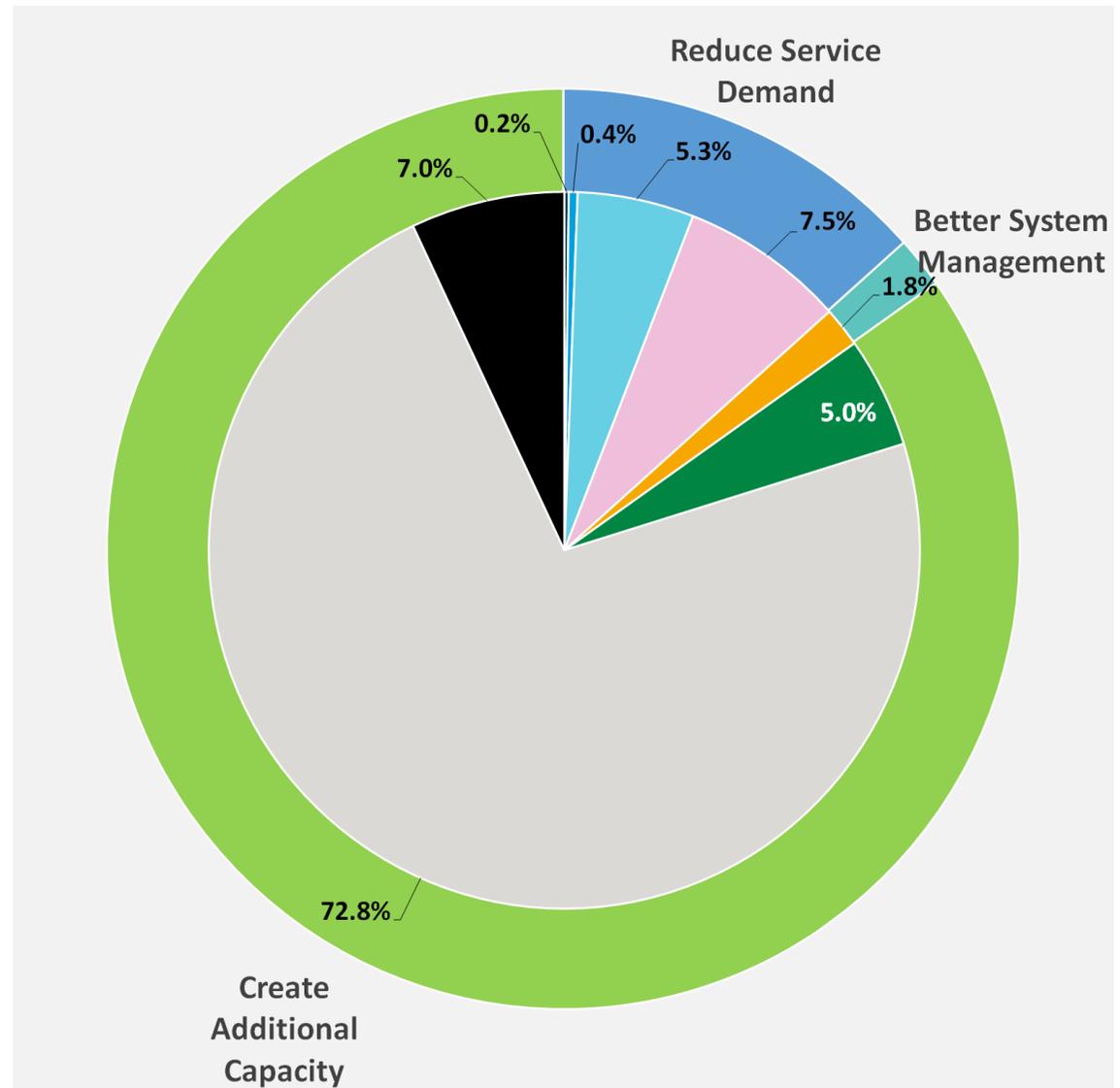


Figure 15 Kent Leven Strategic Planning Area: Distribution of flooding investment by option type

This is an example of how different options types may be used to address flooding planning objectives. Over three quarters of the potential investment could be through a strategy to reduce demand on the sewer system, seen here through surface water source control measures such as SuDS and schools and customer engagement programmes.

Around 9% of investment could be in improving existing system management, and 12% could be in construction of new stormwater storage capacity.

Reduce Service Demand		Schools Education Programme
		Customer Engagement
		Surface Water Source Control Measures
		Modification of Permits
Better System Management		Intelligent Network Operation
		Enhanced Operational Maintenance
		Repair and Rehabilitation
Create Additional Capacity		New 'Green' WwTW Capacity (e.g. Reedbed)
		New 'Green' Overflow Treatment (e.g. Reedbed)
		Separation of Combined Sewers
		WwTW Transfers
		WwTW Improvement
		Construction of New Drainage Capacity

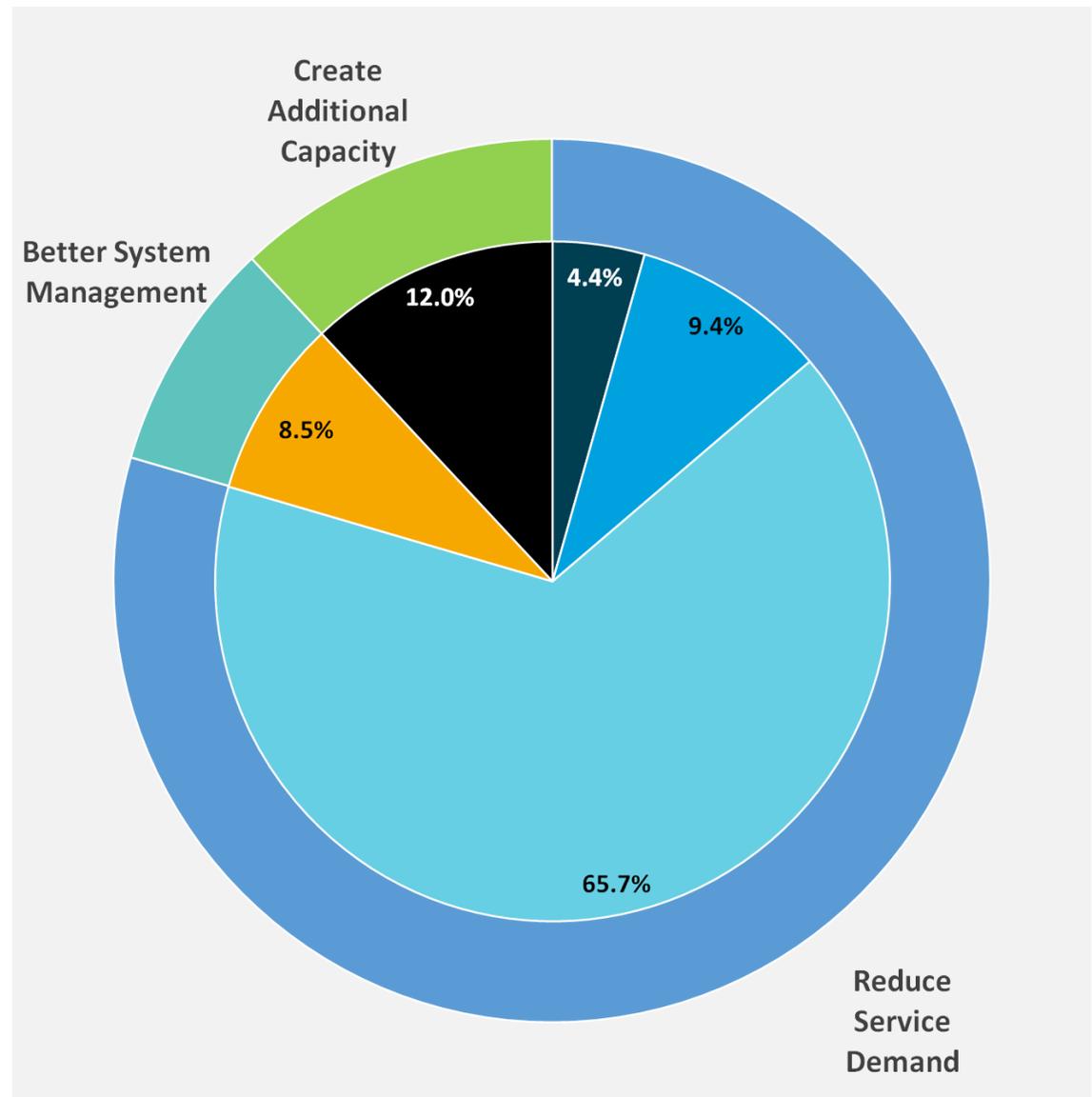


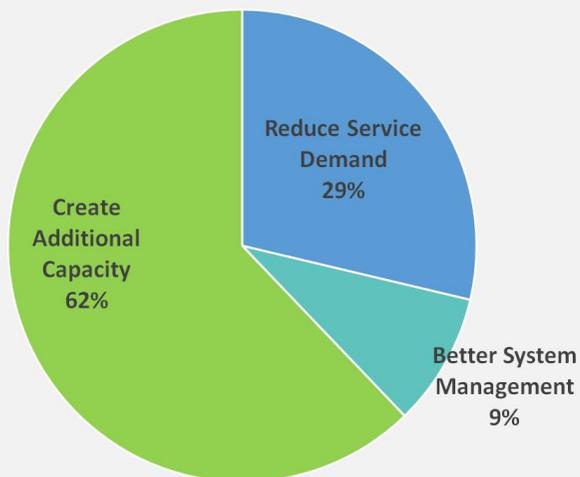
Figure 16 Distribution of benefit by option type within Kent Leven SPA

This is an example of how different option types may be used to demonstrate potential benefits against different planning objectives within the Kent Leven SPA.

United Utilities Water (UW) commitments to improving flooding performance could be met through the reduction of surface water flows, construction of new stormwater drainage capacity, and the installation of intelligent network, supported by schools and customer engagement programmes.

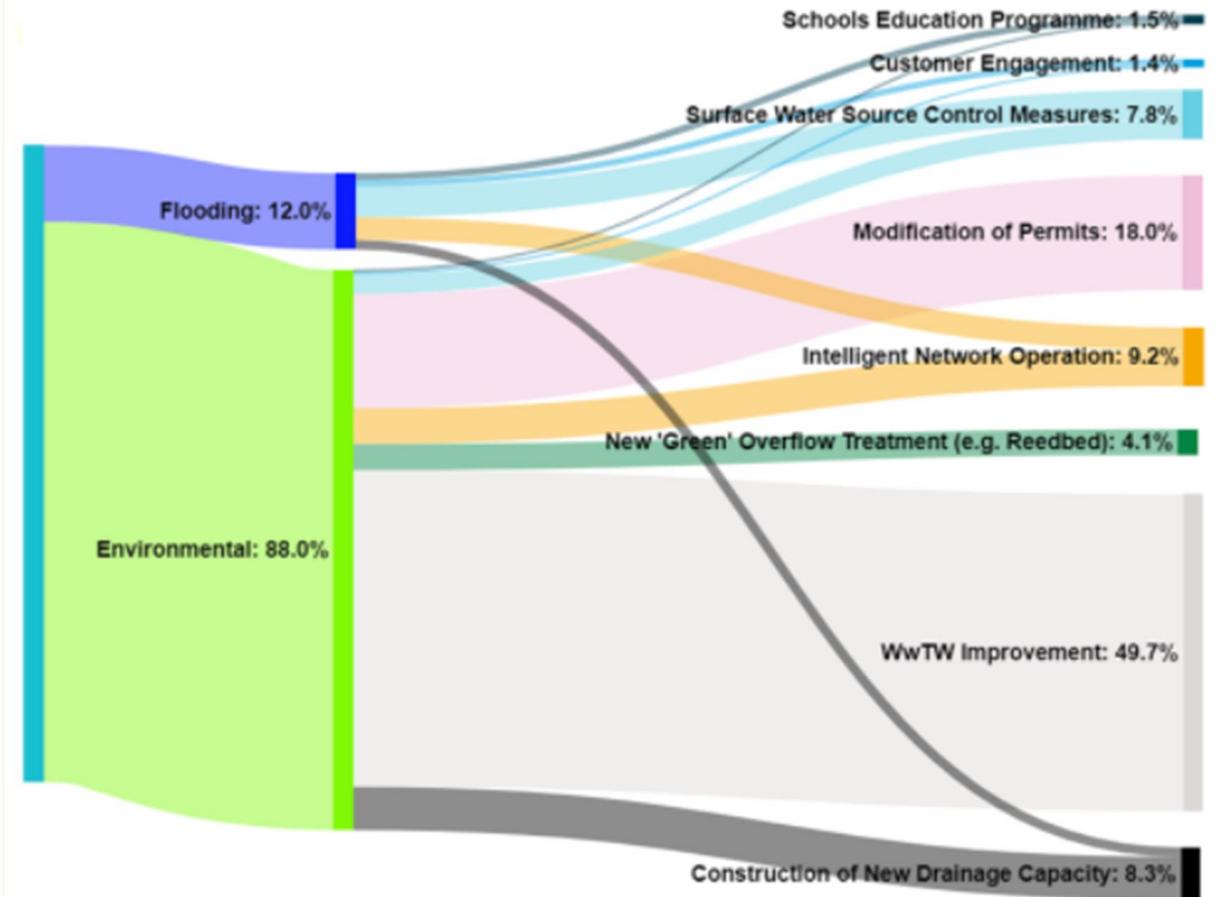
Environmental planning objectives could be met mainly through improvements to wastewater treatment works, repair and rehabilitation of existing network, construction of new drainage capacity, new 'green' overflow treatment, modification of permits and the installation of intelligent network.

**Overall planning objective benefits:
Kent Leven**



Planning objectives

Option type

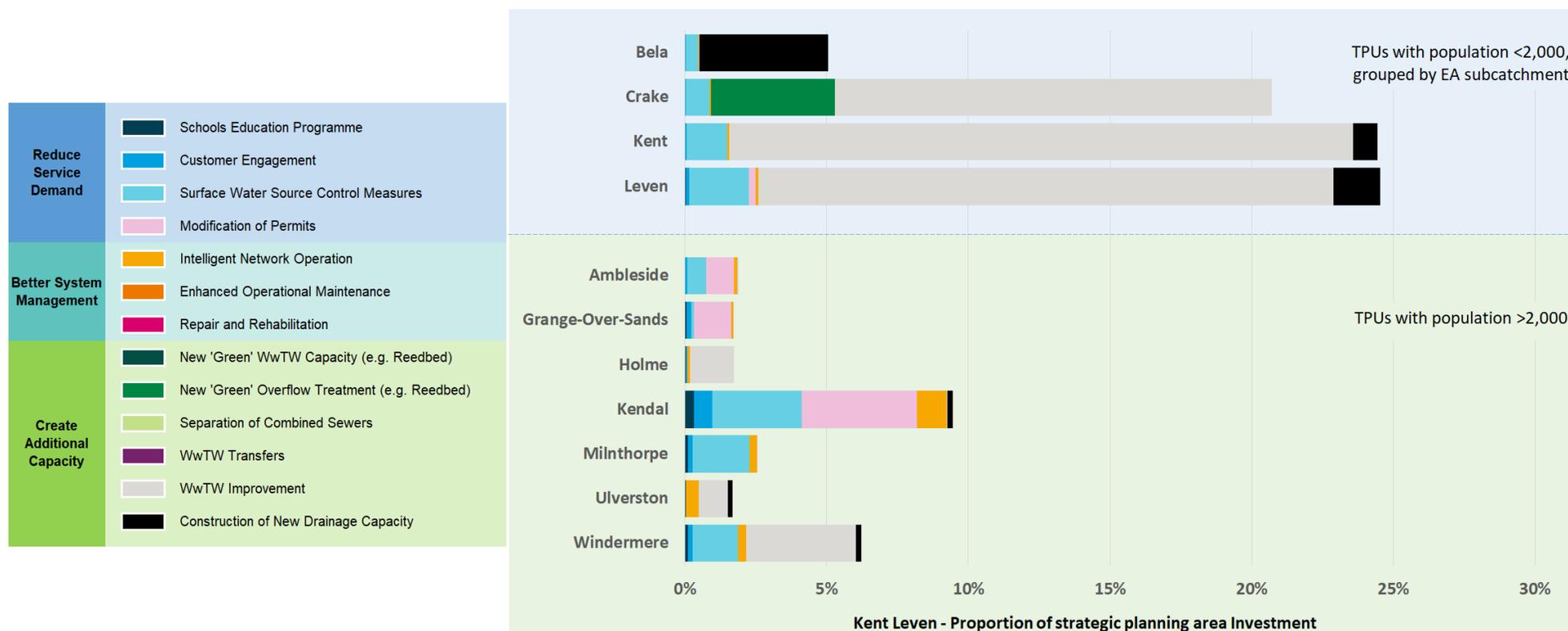


5.3 Overview of preferred options in each TPU

Figure 17 shows the proportion of Kent Leven catchment potential investment in each TPU, split up by option type. Note that the smaller TPUs within the catchment (those with less than 2,000 population) have been reported together at the top of the chart, grouped by SPA sub catchment (Environment Agency Operational Catchment boundaries).

It can be seen that in the Kent Leven catchment, the largest TPUs see the largest potential investment, which is split predominantly between surface water control, improved system management, and construction of new storm water storage tanks.

Figure 17 Proportion of investment seen in each TPU within the Kent Leven SPA



The following sub-sections show how potential investment could be split between different types of options to bring benefits to each TPU over the short, medium and long term. Some options, such as construction of new storm water storage tanks, occur at a single point in time; however, the benefit of reduced flooding may be seen long into the future. Other options, such as school education, are continual programmes that could help to encourage long-term sustainable behaviours, such as reduction in water use.

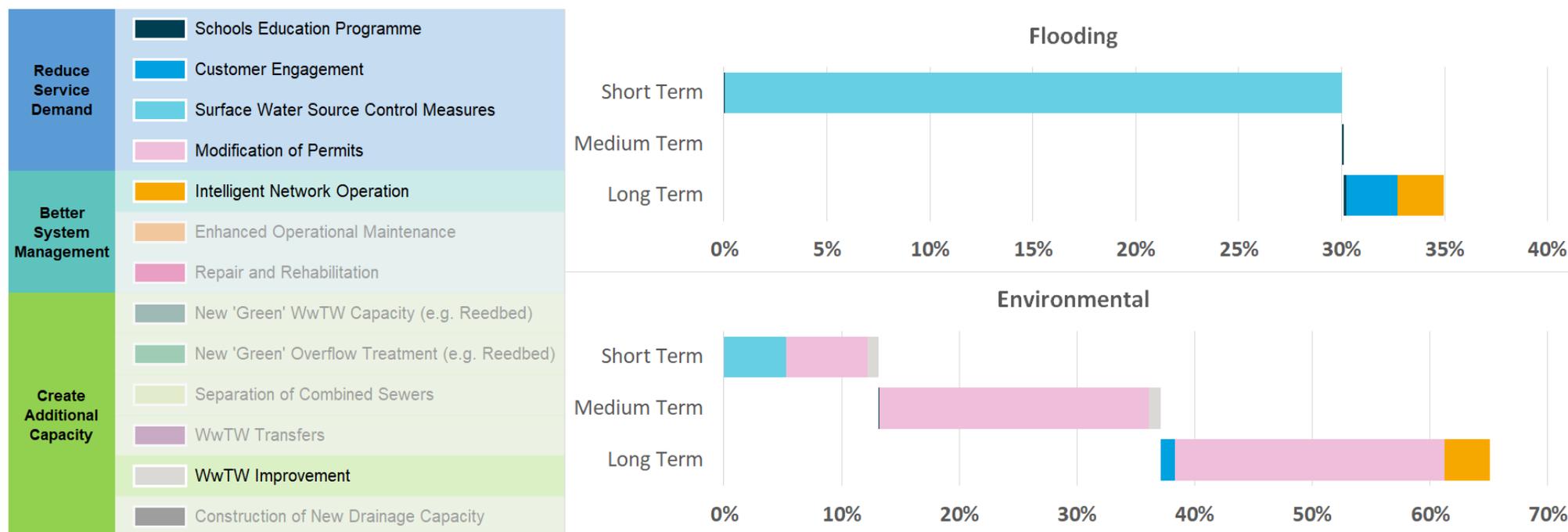
5.3.1 Ambleside

The results from the DWMP show that if we were to invest in Ambleside over the next 25 years, around 35% of the investment could be to address flooding risks, and around 65% of investment could be to address environmental risks (Figure 18).

In the short and medium terms, investments could be mainly through surface water source control measures with potential for wastewater treatment works improvements to ensure permit compliance, and the modification of permits.

In the longer term, intelligent network monitoring systems could be introduced, and customer engagement programmes could be implemented.

Figure 18 Short, medium and long-term investment in the Ambleside TPU, distributed by option type



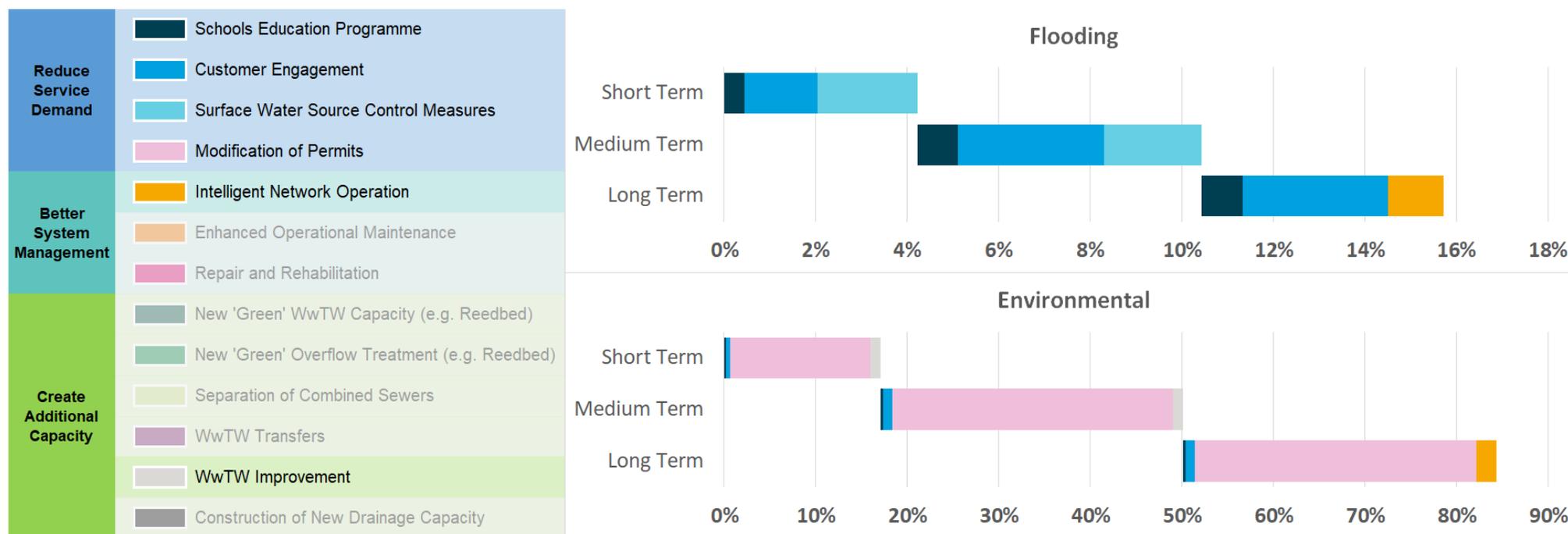
5.3.2 Grange-Over-Sands

The results from the DWMP show that if we were to invest in Grange-Over-Sands over the next 25 years, around 16% of the investment could be to address flooding risks, and around 84% of investment could be to address environmental risks (Figure 19).

In the short and medium term, potential investments could be through surface water source control measures, school and customer engagement programmes and modification of permits.

In the longer term, existing intelligent network monitoring systems could be introduced. Addressing flooding risks through school education and customer engagement programmes could also continue.

Figure 19 Short, medium and long-term investment in the Grange-Over-Sands TPU, distributed by option type



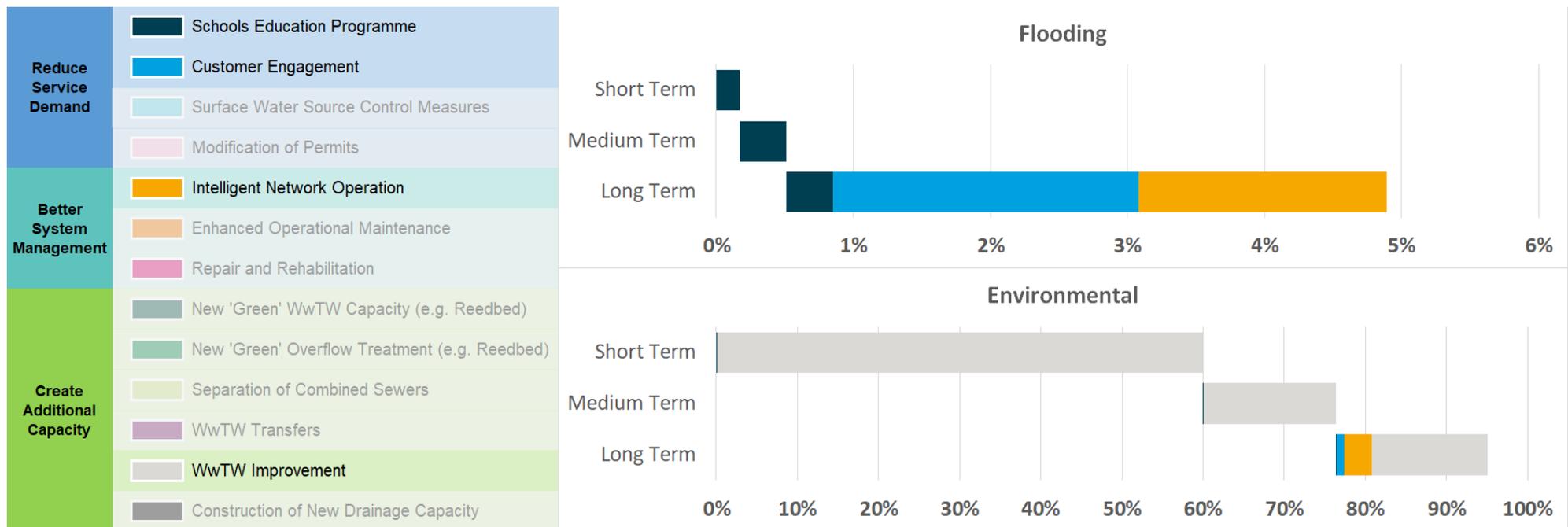
5.3.3 Holme

The results from the DWMP show that if we were to invest in Holme over the next 25 years, around 5% of the investment could be to address flooding risks, and around 95% of investment could be to address environmental risks (Figure 20).

In the short and medium term, investments could be through wastewater treatment works improvements to ensure permit compliance. Flooding risk could be addressed through school education programmes.

In the longer term, intelligent network monitoring systems could be introduced, in addition to school education and customer engagement programmes, and wastewater treatment works improvements could continue.

Figure 20 Short, medium and long-term investment in the Holme TPU, distributed by option type



5.3.4 Kendal

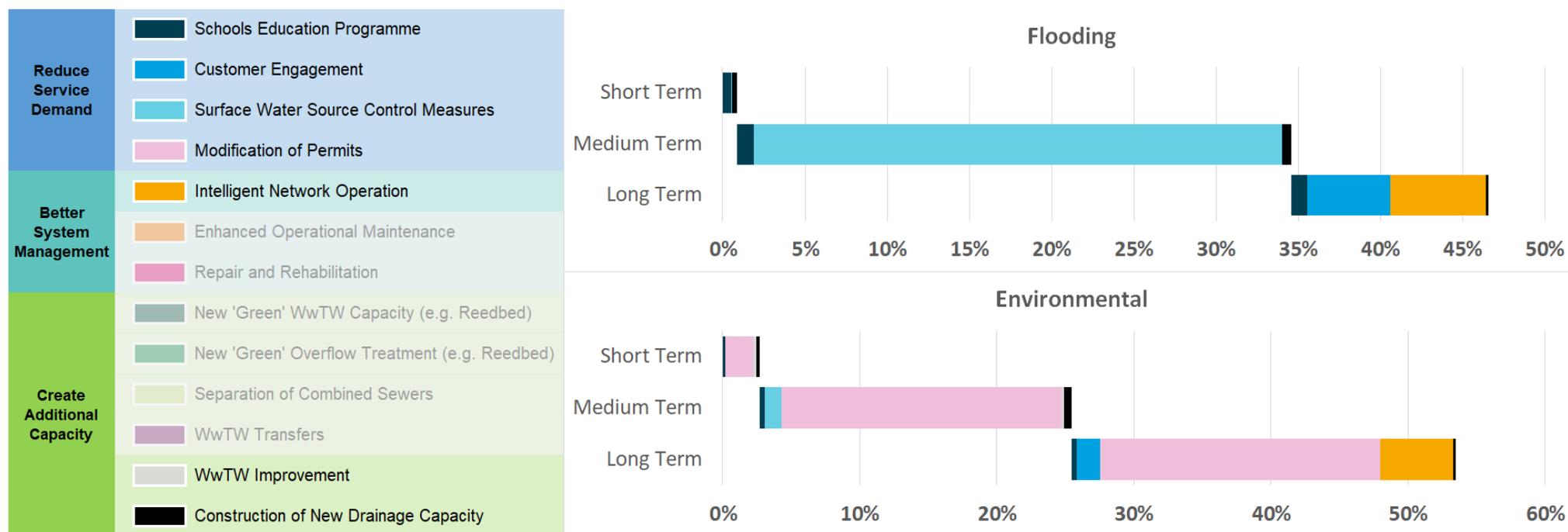
The results from the DWMP show that if we were to invest in Kendal over the next 25 years, around 47% of the investment could be to address flooding risks, and around 53% of investment could be to address environmental risks (Figure 21).

In the short term, investments could be through modification of permits and school education programmes.

In the medium term, investments could be through surface water source control measures, with the continuation of school education and customer engagement programmes.

In the longer term, existing intelligent network monitoring systems that are already in place could be replaced or updated, as well as continuing with all previous options.

Figure 21 Short, medium and long-term investment in the Kendal TPU, distributed by option type



5.3.5 Milnthorpe

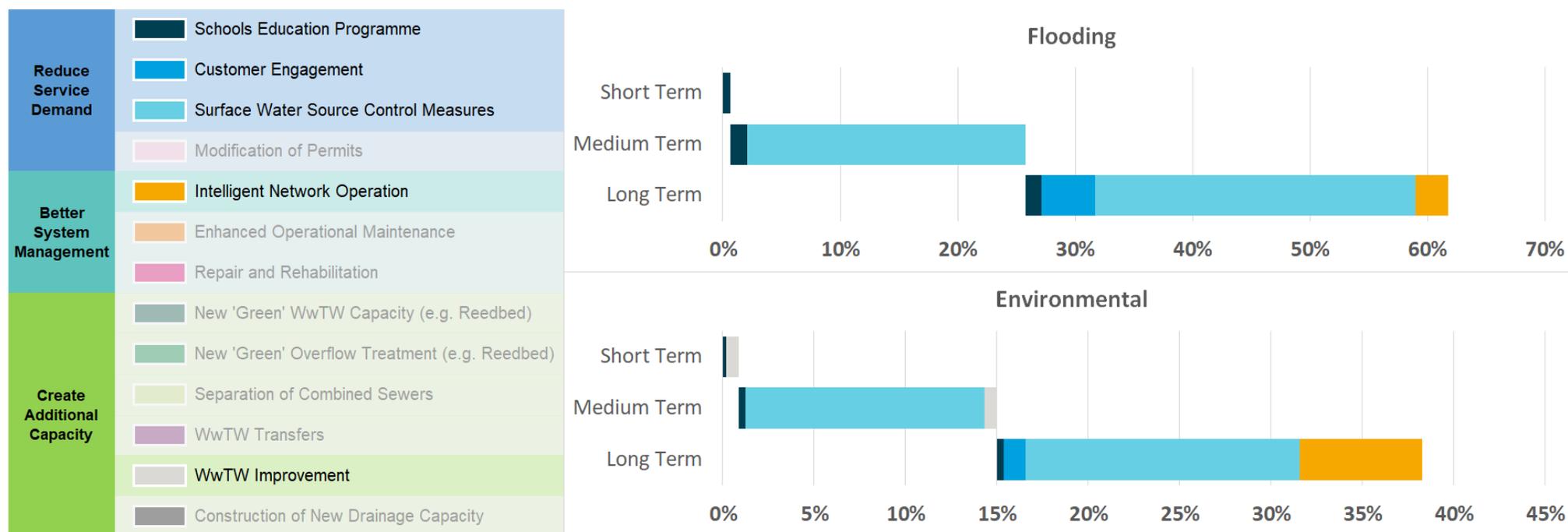
The results from the DWMP show that if we were to invest in Milnthorpe over the next 25 years, around 89% of the investment could be to address flooding risks, and around 11% of investment could be to address environmental risks (Figure 22).

In the short term, investments could be through wastewater treatment works improvements to ensure permit compliance. Flooding risk could be addressed through school education programmes.

In the medium term, investments could be through new surface water source control measures, with school education and customer engagement programmes continuing.

In the longer term, intelligent network monitoring systems could be installed as well as continuing with all previous options.

Figure 22 Short, medium and long-term investment in the Milnthorpe TPU, distributed by option type



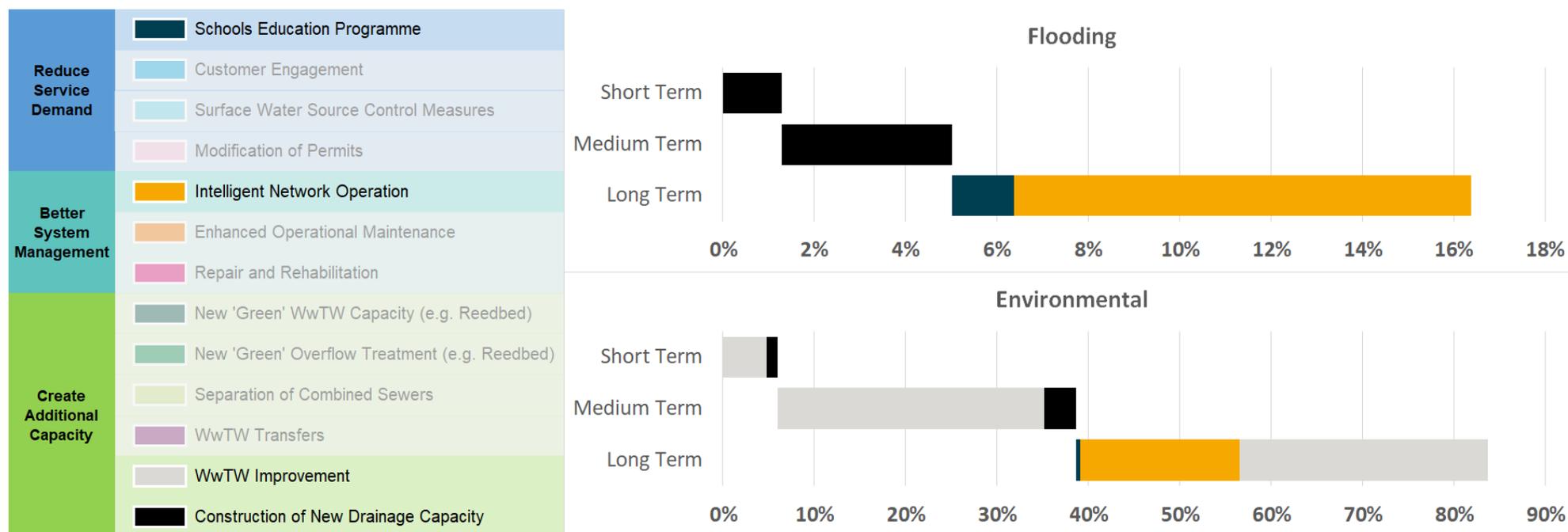
5.3.6 Ulverston

The results from the DWMP show that if we were to invest in Ulverston over the next 25 years, around 21% of the investment could be to address flooding risks, and around 79% of investment could be to address environmental risks (Figure 23).

In the short and medium term, investments could be through wastewater treatment works improvements to ensure permit compliance, and construction of new drainage capacity.

In the longer term, intelligent network monitoring and school education programmes could be introduced, and wastewater treatment works improvements could continue.

Figure 23 Short, medium and long-term investment in the Ulverston TPU, distributed by option type



5.3.7 Windermere

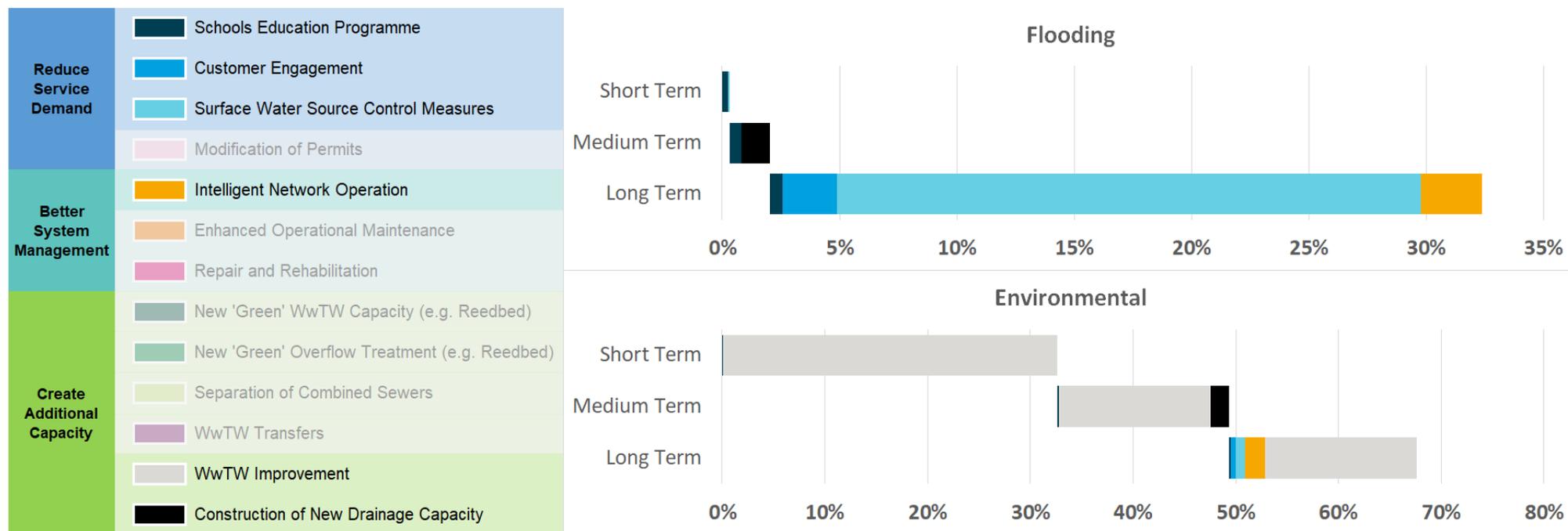
The results from the DWMP show that if we were to invest in Windermere over the next 25 years, around 32% of the investment could be to address flooding risks, and around 68% of investment could be to address environmental risks (Figure 24).

In the short term, investments could be through wastewater treatment works capacity improvements to ensure permit compliance. Flooding risk could start to be addressed through school education programmes.

In the medium term, wastewater treatment works improvements could continue, and flooding risks could be addressed through school education and customer engagement programmes.

In the longer term, investments could be mainly through surface water source control measures. The existing intelligent network monitoring systems that are already in place could be replaced or updated as well as continuing with all previous options.

Figure 24 Short, medium and long-term investment in the Windermere TPU, distributed by option type



5.3.8 TPUs with population less than 2,000: *Bela sub catchment*

The following TPUs each have a population of less than 2,000, and have therefore been grouped together:

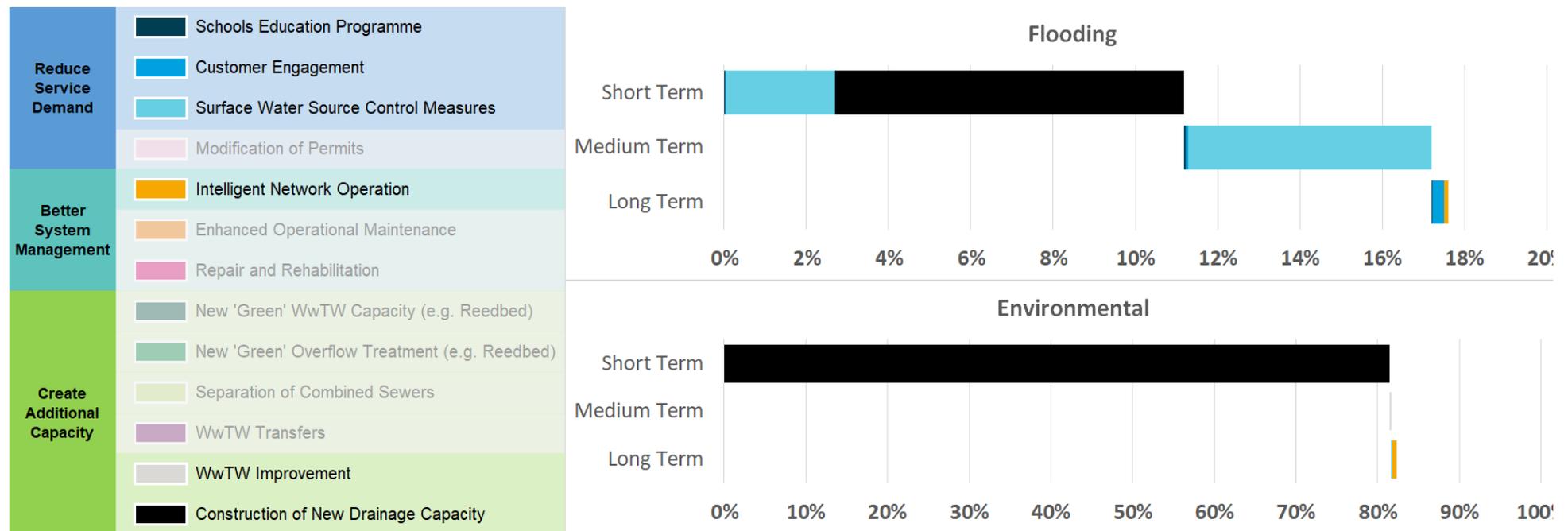
- Beetham
- Crooklands
- End Moor
- Hutton Roof
- Low Park
- St Johns

Short-term investment in these small TPUs could be in the construction of new drainage capacity and provision of surface water control measures (Figure 25).

In the medium term, surface water control measures could continue and some wastewater treatment work improvements.

In the long term, intelligent network monitoring, and school education and customer engagement programmes could be introduced.

Figure 25 Short, medium and long-term investment in TPUs with population less than 2,000 (*Bela*) distributed by option type



5.3.9 TPUs with population less than 2000: *Crake sub catchment*

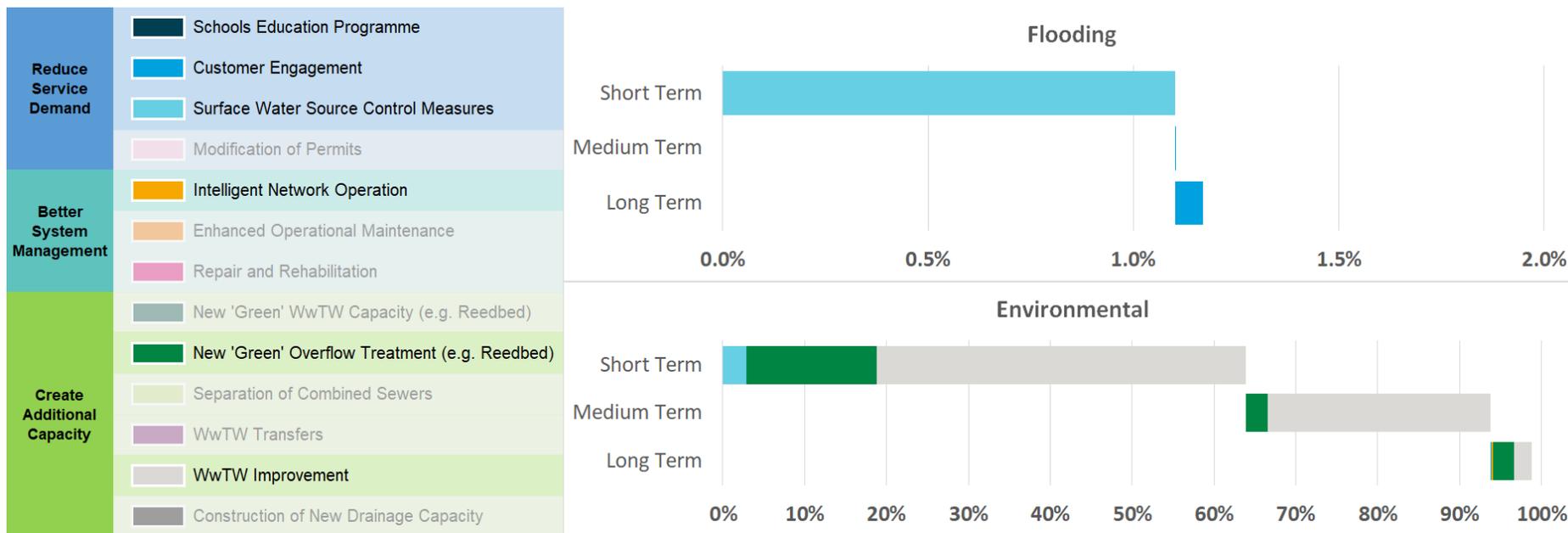
The following TPUs each have a population of less than 2,000, and have therefore been grouped together:

- Coniston
- Crake Valley
- Lowick Green No 1
- Spark Bridge
- Trover

Flooding risks could be addressed in the short term using surface water control measures. In the medium and long term, we could introduce customer engagement programmes (Figure 26).

All short, medium and long-term investment to address environmental risks could be through wastewater treatment works improvements to ensure permit compliance, surface water control measures and new green overflow treatment.

Figure 26 Short, medium and long-term investment in TPUs with population less than 2,000 (Crake) distributed by option type



5.3.10 TPUs with population less than 2000: Kent sub catchment

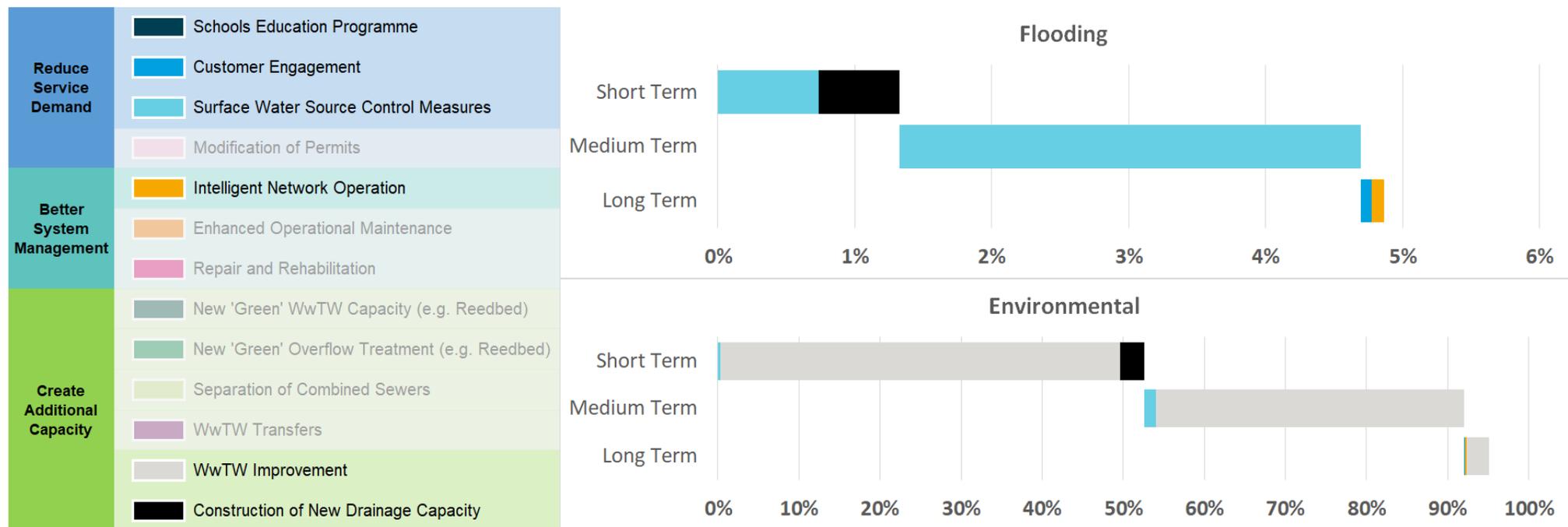
The following TPUs each have a population of less than 2,000, and have therefore been grouped together:

- Bowston
- Lindale
- Brigsteer
- Staveley
- Grayrigg
- Underbarrow

Flooding risks could be addressed in the short and medium term using surface water control measures and construction of new drainage capacity. In the long term, customer engagement programmes and intelligent network monitoring systems could be introduced (Figure 27).

Short, medium and long- term investment to address environmental risks could be through wastewater treatment works improvements to ensure permit compliance, supported by surface water control measures.

Figure 27 Short, medium and long-term investment in TPUs with population less than 2,000 (Kent) distributed by option type



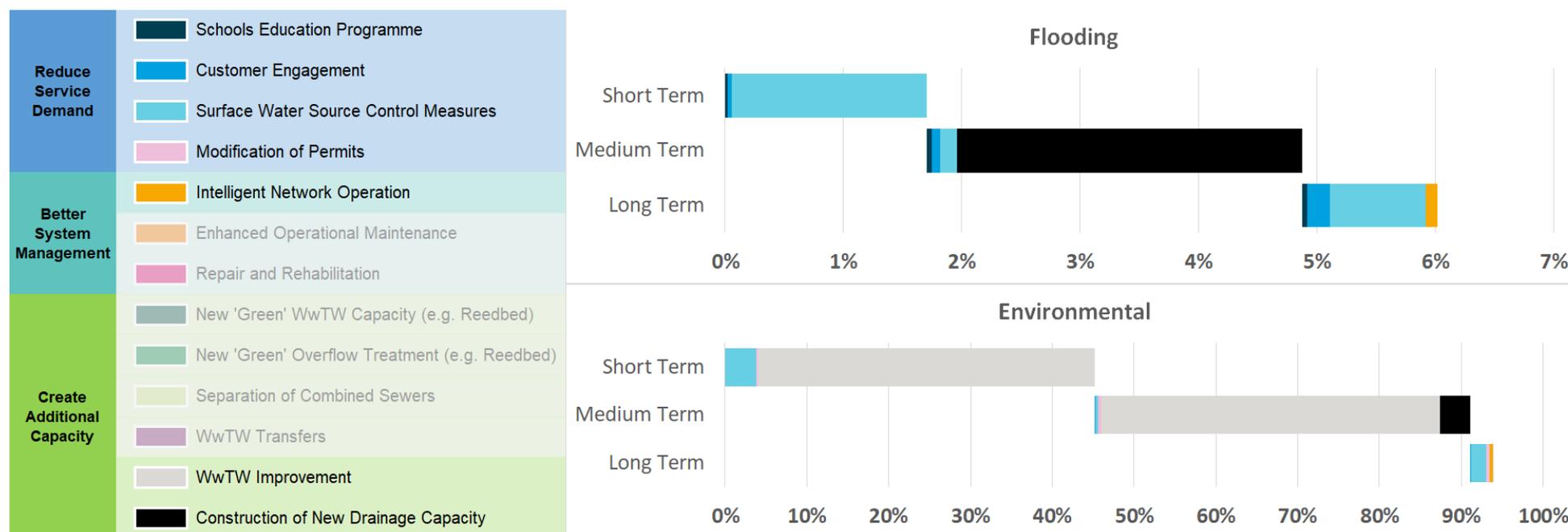
5.3.11 TPUs with population less than 2000: *Leven sub catchment*

The following TPUs each have a population of less than 2,000, and have therefore been grouped together:

- Arrad Foot
- Ayside
- Bouth
- Broughton Beck
- Far Sawrey
- Ferry House
- Field Broughton
- Grasmere
- Hawkshead
- High Newton
- Langdale
- Loppergarth
- Marton Lane End
- Near Sawrey
- Newbiggin
- Outgate
- Oxen Park
- Roa Island
- Satterthwaite
- Staveley-In-Cartmel Tank
- Troutbeck

Potential investment to address flooding risks could be through surface water control measures in the short term, and the construction of new drainage capacity in the medium term. Environmental risks could be addressed through wastewater treatment works improvements to ensure permit compliance (Figure 28).

Figure 28 Short, medium and long-term investment in TPUs with population less than 2,000 (Leven) distributed by option type



6. Next steps

The DWMP is inherently not a static plan so we will continue to work with stakeholders to develop partnership options and strategies which will make a difference within the Kent Leven SPA.

We are currently at draft publication (Figure 29) and between now and final publication in March 2023, we will reflect on updated guidance such as WINEP and storm overflows, and incorporate the feedback that we receive to ensure that the DWMP can build the best foundation to allow the North West to thrive in years to come.

Figure 29 Timeline between draft and final publication



We welcome your feedback on our draft publication of our first DWMP. Please get in touch using our mailbox:

DWMPConsultation@uuplc.co.uk

7. References

- [1] <https://environment.data.gov.uk/catchment-planning/ManagementCatchment/3045>
- [2] <https://environment.data.gov.uk/catchment-planning/OperationalCatchment/3029>
- [3] <https://environment.data.gov.uk/catchment-planning/OperationalCatchment/3111>
- [4] <https://environment.data.gov.uk/catchment-planning/OperationalCatchment/3243>
- [5] <https://environment.data.gov.uk/catchment-planning/OperationalCatchment/3251>
- [6] <https://environment.data.gov.uk/catchment-planning/OperationalCatchment/3251>
- [7] <https://environment.data.gov.uk/catchment-planning/v/c3-draft-plan/CatchmentPartnership/WEIF3301>
- [8] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/507122/LIT_10210_NORTH_WEST_FRMP_PART_B.pdf
- [9] <https://www.mycoastline.org.uk/shoreline-management-plans/>
- [10] <https://www.gov.uk/government/publications/surface-water-management-plan-technical-guidance>
- [11] <https://btob.scrt.co.uk/south-cumbria-catchment-plan>

8. Appendix

Table A.1 List of TPUs which did not trigger for RBCS across environment, flooding or wastewater treatment works categories

TPU name	Environment	Flooding	Wastewater Treatment Works
Ayside	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Bouth	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Brigsteer	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Broughton Beck	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Crooklands	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Endmoor	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Field Broughton	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
High Newton	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Hutton Roof	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Loppergarth	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Low Park	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Lowick Green No 1	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Marton Lane End	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Outgate	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Oxen Park	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Satterthwaite	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
St Johns	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Staveley-In-Carmel Tank	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Torver	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Troutbeck	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS
Underbarrow	Not triggered in RBCS	Not triggered in RBCS	Not triggered in RBCS

United Utilities Water Limited / United Utilities Group PLC
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP
unitedutilities.com



Water for the North West