



# Drainage and Wastewater Management Plans

## Technical Summary: Options Development and Appraisal (ODA)

March 2023  
Version 3



## 1. Background

The Options Development and Appraisal (ODA) is a key stage in the development of a Drainage and Wastewater Management Plan (DWMP). It provides a process for identifying the investment needs in each wastewater system to reduce the risks that were identified during the preceding [Baseline Risk and Vulnerability Assessment \(BRAVA\)](#) stage.

The ODA stage enables us to identify and evaluate all available options for each specific wastewater system based on feasibility, net benefit, cost and the reduction in the BRAVA risk band. It also helps us understand which of the potential options would provide best value in managing or reducing the risks. From this evaluation, we can determine the “preferred option” to include in our investment needs for each wastewater system.

This technical summary describes how we have implemented the ODA in accordance with the [national DWMP framework](#). It provides a transparent benchmark to explain how we are making our investment decisions for the 25-year planning horizon. Initially, 71 wastewater systems were prioritised to be taken through the ODA process, although this was later reduced to 61 to allow for engagement with partner organisations during the ODA process (see “[Selection of Wastewater Systems](#)” technical summary).

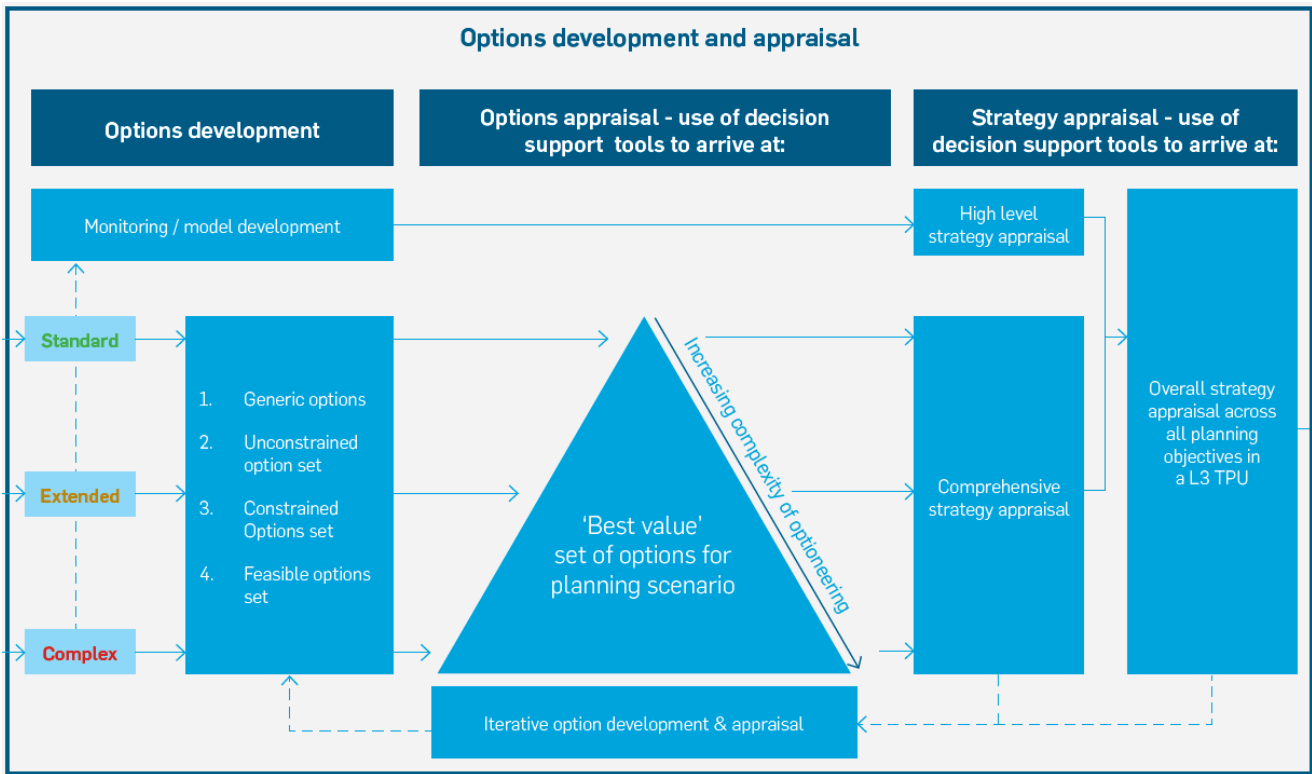
We also developed “best value” options by considering, where possible, interventions that are likely to reduce the risks to more than one of the 14 planning objectives and provide the best mix of social, economic and environmental benefits. We selected the combination of options that are the most effective in reducing the overall risks across the planning objectives whilst also providing the best long-term outcomes for our customers, communities, the environment and local economies as the preferred options in our DWMP.

## 2. National Framework Guidance

The national guidance for the production of DWMPs “*provides a framework that will enable companies to develop robust ‘best value’ interventions to identified exceedances of planning objectives where these arise in the planning period. A key principle in the development of the DWMP is that the ODA process should be undertaken for any L3 Tactical Planning Unit (TPU) where a risk is identified. Options appraisal should then include potential interventions at L3, L2 and L1 to produce an optimised L2 plan that delivers against the planning objectives for the L2 Strategic Planning Area (SPA) and derived from those set at a company level.*”

The framework outlines key steps in developing and appraising options as shown schematically in Figure 1. It sets out how the framework has been applied to each wastewater system, described as the level 3 Tactical Planning Unit (L3 TPU) as set out in the national guidance.

Figure 1: Schematic of ODA Process



### 3. How we applied the Framework for our ODA

#### 3.1 Overview of the ODA Process

The basic principle of ODA is to identify a suite of generic options, then use a value and benefits driven appraisal process to filter out options that are not viable. The process results in a select number of feasible options from which a preferred option can be chosen. A summary of the process is provided in Annex C.

The Problem Characterisation stage of the DWMP is an interface process between the BRAVA and the ODA. It provides a detailed approach to understand the nature of the risks identified in BRAVA and helps to define the likely ODA “complexity” for each wastewater system (see the [Problem Characterisation technical summary](#)).

There are three levels of ODA complexity: Standard (Green), Extended (Amber) and Complex (red) as shown in Figure 1. We took a consistent approach to the ODA for each of the three complexity types. Understanding the likely complexity for each wastewater system provided us with an appreciation of the likely time and resources it would take to complete each ODA. The Red (complex) wastewater systems would require more development work and could require building a hydraulic model if one was not already available than the amber or green. Therefore, it would be expected to take longer to deliver. Knowing these relative requirements enabled us to manage and prioritise the ODA workflow.

The national guidance sets out the appraisal criteria and the questions that needed to be asked at each stage of the process, see Figure 2.

Figure 2: Overview of the Options Screening Criteria in our ODA

Generic Options	Unconstrained Options	Constrained Options	Feasible Options
<p><b>Screening Questions:</b></p> <ul style="list-style-type: none"> <li>• Could this generic option be utilised to manage and/or reduce the risks identified in the BRAVA?</li> </ul>	<p><b>Screening Questions:</b></p> <ul style="list-style-type: none"> <li>• Is the option <b>technically feasible</b> given site, operational or option-specific circumstances?</li> <li>• Is it <b>cost effective</b> (based on a simple high, medium, low cost assessment)?</li> <li>• Does the option achieve the required <b>outcome</b>?</li> <li>• Are there <b>environmental risks</b> that cannot be mitigated or benefits provided?</li> <li>• Would the option likely be supported by <b>customers</b>?</li> <li>• Risk and uncertainty – does the option provide <b>resilience</b> against future uncertainties?</li> </ul>	<p><b>Screening Questions:</b></p> <ol style="list-style-type: none"> <li><b>1. Feasibility and risk:</b> <ul style="list-style-type: none"> <li>• Customer acceptability?</li> <li>• Political acceptability?</li> <li>• Timeline for implementation</li> <li>• Dependencies</li> <li>• 'Third parties'</li> <li>• Planning and regulatory constraints</li> </ul> </li> <li><b>2. Engineering and cost:</b> <ul style="list-style-type: none"> <li>• Engineering complexity</li> <li>• Cost</li> </ul> </li> <li><b>3. Performance:</b> <ul style="list-style-type: none"> <li>• Outcomes</li> <li>• Flexibility to adapt</li> <li>• Resilience</li> </ul> </li> <li><b>4. Operational</b></li> <li><b>5. Environmental</b> <ul style="list-style-type: none"> <li>• High Level Screening (air, land, water, biodiversity, natural capital)</li> </ul> </li> </ol>	<p><b>Provide for each Feasible Option:</b></p> <ul style="list-style-type: none"> <li>• A description of the option</li> <li>• A description of how the option being described differs from baseline activities (<b>note 1</b>)</li> <li>• Scale of the benefits to be achieved against single or multiple planning objectives.</li> <li>• An assessment of customers' likely support for the option.</li> <li>• An estimate of the time needed to investigate and implement the option, including the earliest start date (<b>note 2</b>)</li> <li>• An assessment of the risks and uncertainty associated with the option.</li> <li>• An assessment of the flexibility of the option to adapt to future uncertainty.</li> <li>• An explanation of whether the option depends on an existing scheme or a proposed option, or is mutually exclusive with another option.</li> <li>• An assessment of factors or constraints specific to the option (e.g. planning risks).</li> <li>• A description of how the option will be utilised and impact on costs.</li> <li>• An assessment of the environmental impacts of the option</li> <li>• A Habitats Regulations Assessment if an option could affect any designated European site. (<b>note 3</b>)</li> <li>• An assessment of the costs and benefits.</li> </ul>

We have clarified our interpretation of the Feasible Options text in Figure 2 by adding the following notes:

Note 1. Baseline Activities – The ODA presents options to reduce the risks identified during the BRAVA stage (baseline 2020) of the DWMP

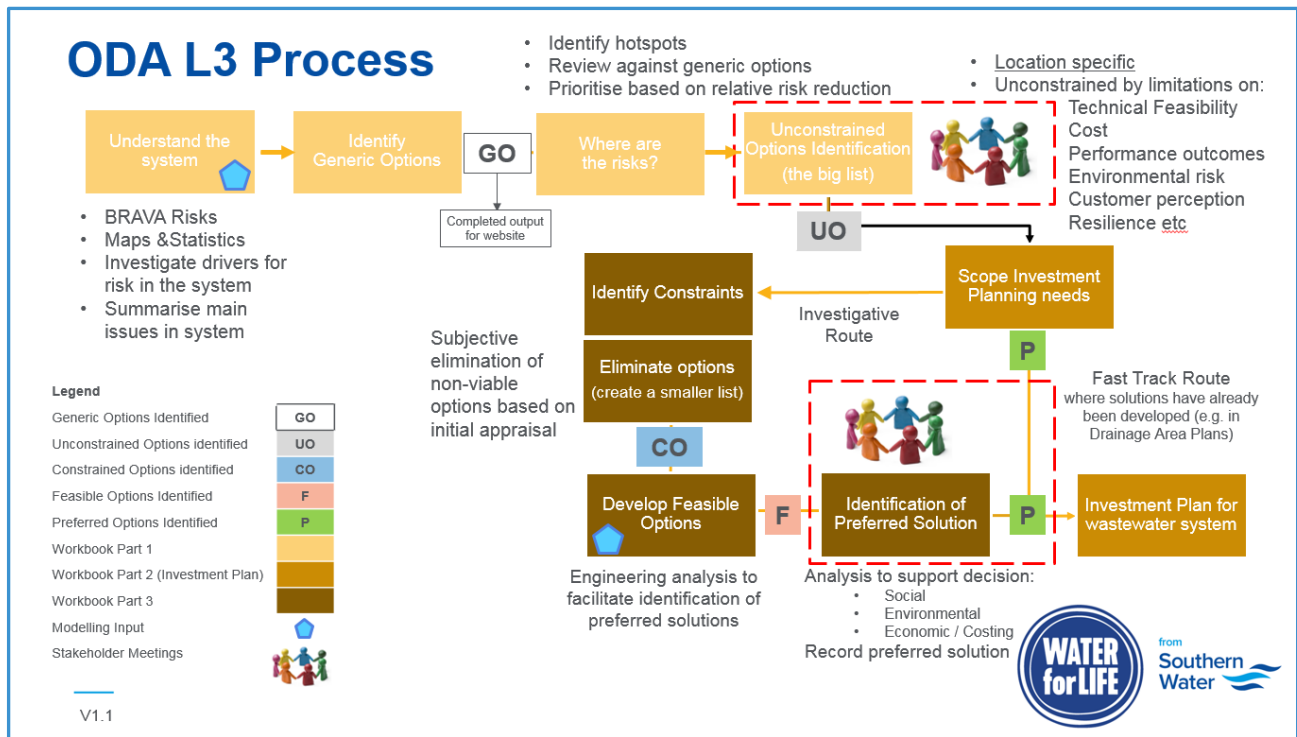
Note 2. Refer to Timing of the Investment Needs section on page 14. This details the AMPs in which the options are expected to be delivered:

- short (AMP8: 2025 - 2030)
- medium (AMP9: 2030 – 2035 & AMP10: 2035 – 2040)
- long (AMP11: 2040 – 2045 & AMP12: 2045-2050).

Note 3. The Strategic Environmental Assessment (SEA) report detailing the Habitat Regulations Assessment as specified has been published along with the DWMP on the [SEA](#) page of Southern Water DWMP Website.

We adopted the DWMP national framework process and developed it further to ensure it could be applied consistently across all our wastewater systems. Our process is illustrated in Figure 3.

Figure 3: ODA process for each Wastewater System (Level 3 planning unit)



The ODA process began at the River Basin Catchment (RBC) scale (level 2) by looking across all the wastewater systems (level 3) in that RBC. The data and results from the BRAVA and PC stages of the DWMP were collated to understand the performance against the planning objectives at risk in each wastewater system.

We followed the same process for each of the 61 wastewater systems taken through the ODA process in the first round of our DWMP.

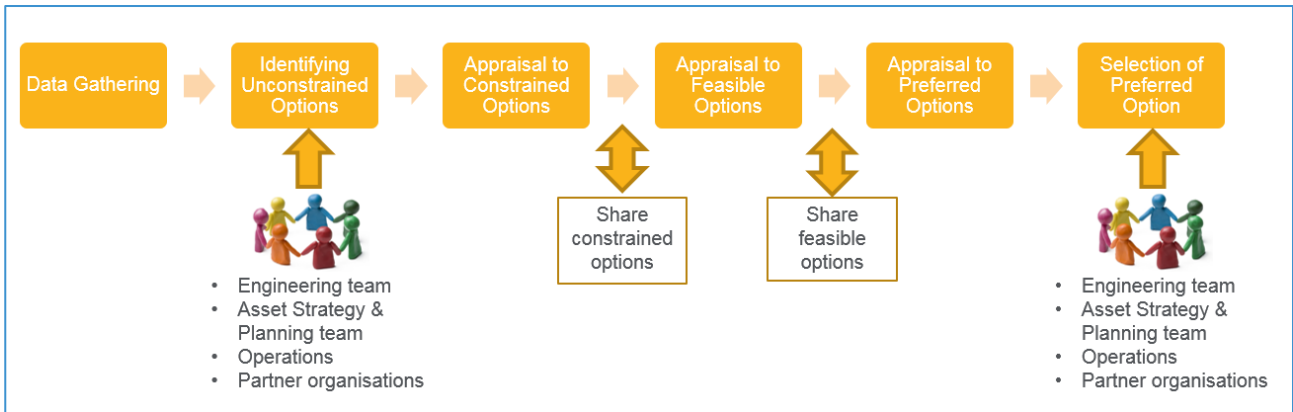
The appraisal process consisted of four main steps:

- (i) Generic Options identification
- (ii) Unconstrained to Constrained Options
- (iii) Constrained to Feasible Options
- (iv) Feasible to Preferred Options.

As part of steps (ii) and (iii) there is a “fast-track” route, illustrated in Figure 3 above. The only options we fast-tracked were those taken from our earlier development of Drainage Area Plans (DAPs). More information on this is available below in 3.1.2 Developing Unconstrained Options.

We involved our internal experts and partner organisations at key stages in the appraisal process, as shown in Figure 4. The steps in the ODA process are explained below.

**Figure 4: Approach to working with partners for the ODA stage**



### 3.1.1 Identifying the Generic Options

The national guidance provided examples of the type of generic options that could be used in the first stage of the ODA development. The example is provided in Figure 5.

**Figure 5: Guidance on generic options for the ODA process**

Management area	Description
Customer side management options	Generic options to manage the use of water in and arising from customer properties
Surface water management	Generic options within catchments to manage surface water flows entering the conveyance system
Combined and foul sewer systems	Generic options to manage flows within the conveyance system to minimise impacts on customers and the environment
Wastewater treatment works	Generic options to manage flows and loads at wastewater treatment works to minimise impacts on customers and the environment













We adopted the Source-Pathway-Receptor (SPR) model, which is widely used in environmental risk management, for our ODA process. This model helped us to consider and identify opportunities to tackle and reduce the risks in the following order:

- (i) Source – measures that prevent or slow the flow of rainwater or wastewater before it enters and inundates the drainage and wastewater system.
- (ii) Pathway – measures that optimise or enhance how we use our infrastructure including pipes, pumps, treatment works and other assets to manage risk in the drainage and wastewater system.
- (iii) Receptor – measures that reduce or mitigate impacts on our customers and the environment.

The SPR model used for our ODA is shown in Figure 6.

We added an additional category called ‘other’ to ensure that the need for any studies, investigations and development of hydraulic models were also considered and identified.

**Figure 6: The Source-Pathway-Receptor Model application for ODA**

Type of Measures	Generic Option Categories	Icon	Examples of Generic Options
<b>Source</b> (Demand) Measures (to reduce likelihood)	Control / Reduce surface water run-off		Natural Flood Management; rural land management and catchment management; SuDS including blue and green infrastructure; storm management
	Reduce groundwater levels		Reduce leakage from water supply pipes; pump away schemes to locally lower groundwater near sewer network
	Improve <b>quality</b> of wastewater		Domestic and business customer education; incentives and behaviour change (reduce Fats, Oils & Grease, wet wipes etc.); monitoring trade waste at source; on-site black water and/or greywater pre-treatment
	Reduce the <b>quantity</b> / demand		Water efficient appliances; water efficient measures; blackwater and/or greywater re-use; treatment at source
<b>Pathway</b> (Supply) Measures (to reduce likelihood)	Improve Sewer Network		Asset optimisation; additional network capacity; storage; separate flows; operational improvements; structural repairs; re-line sewer pipe and manholes; smart networks.
	Improve Treatment Quality		Increase treatment capacity; rationalisation of treatment works (centralisation / de-centralisation); install tertiary plant; UV plant or disinfection facilities; innovation; improve Technical Achievable Limits; new WTWs
	Wastewater Transfer to treatment elsewhere		Transfer flow to other network or treatment sites; transport sewage by tanker to other sites
<b>Receptor</b> Measures (to reduce consequences)	Mitigate impacts on Air Quality		Carbon offsetting; noise suppression /filtering; odour control and treatments
	Improve Land and Soils		Sludge soil enhancement
	Mitigate impacts on receiving waters		River enhancement, aeration
	Reduce impact on properties		Property flood resilience; non-return valves; flood guards / doors; air brick covers
Other	Study / Investigation		Additional data required; hydraulic model development; WQ monitoring and modelling

Typical examples of the types of generic options [Figure 6](#) for each of the 12 generic option categories are provided in [Figure 6](#). However, the list is not intended to be prescriptive for the SPR model.

Examples of options not specified above, but which fit into the Generic Option Categories are:

- Modify consents – this option is included under the generic option pathway of “Improve Treatment”. Several systems investigate the descriptive option of “Permit Review”. For example, in the Worthing wastewater system: option WOE.A.PW02.1.
- Catchment management incentives – Within the generic option pathway of “Study / Investigation”, we included the option of developing a Nutrient Budget. This looks at the

issue of Nutrient Neutrality, Planning Objective 11, specifically of both Nitrogen/Nitrate (N) and Phosphorus/Phosphate (P) within our systems. We will improve this planning objective in future DWMPs through a greater understanding of the causes and impacts of nutrients. Current studies have shown a strong link with types of land use, for example poultry farming produces very high levels of N per m<sup>2</sup> in Natural England's Nutrient Budget compared to a [new development](#).

- Network treatment and pre-treatment – This option was included within the Source and Pathways sections of the SPR model, specifically 'Water Quality' and 'Network Improvement' as a potential option. We will work with industrial, trade waste users and highways authorities to develop these options for cycle 2 in more detail.

Two generic option categories, "Mitigating the impacts on air quality" and "Improving land and soils", were shown greyed out as development of these option types was excluded from the scope of the first cycle of the DWMP. However, we intend to include these in future cycles.

The SPR model was discussed with our internal expert colleagues and partner organisations during workshops for each of the 11 River Basin Catchments (RBCs) in April and May 2021. The generic options for the wastewater systems in the RBC were selected and the options for each of the 61 wastewater systems were published in the ODA section of each RBC on our [website](#).

### 3.1.2 Developing Unconstrained Options

The next step was to refine the generic options into specific unconstrained options that had the potential to address the significant risks in each wastewater system. Technical experts and partner organisations reviewed the risks, identified any hotspots or clusters of risks, and investigated the generic options to identify those that could reduce the risks from very or moderately significant to a Band 0 (not significant).

The approach used creative thinking to enable all ideas to be identified free of any screening or constraints, such as cost or technical feasibility. This led to a long list of unconstrained options that were specific to the risks in the wastewater system. In some cases, more than one option was identified that could achieve Band 0 so both were taken forward into the appraisal to explore which would have the greatest benefits and represent best value for our customers, communities and the environment.

As well as this, we used information from our previous plans, including DAPs and Drainage Strategies, to inform our DWMP. Options in these plans that had previously been through an options development and appraisal, and which had been identified as a preferred option but which had not yet been implemented, were added to our list of Unconstrained Options and 'fast-tracked' through to the list of feasible options.

## 3.2 Reasons for Rejection

Any options removed at each of the screening stages of the ODA were recorded in a table of Feasible Options for each wastewater system. This table includes an overview of the reasons for the option's rejection. Full details of the reason are recorded within the relevant stage of the ODA screening where the option was rejected. See below, 8 The Rejection Register, for more information.

## 3.3 Unconstrained Options Screening

The national framework sets out six questions to use in evaluating the benefits of each unconstrained option:



- Is the option technically feasible given circumstances specific to the site and operational requirements such as energy use and biomass production?
- Is the option likely to be cost effective, based on a simple high, medium, low-cost assessment?
- Can the option deliver the required outcome?
- Are environmental risks addressed and mitigated?
- Based on customer insight, is the option likely to be supported by customers?
- Does the option provide resilience against future uncertainties?

Using expert engineering judgement based on past experience, we used a simple “Yes” or “No” answer to the questions.

A “No” answer to any of the questions meant the option was discounted. These are set out as the ‘Reason for Rejection’ see below, 8 The Rejection Register, and shown on our website in the Feasible Options tables under the ODA section for each River Basin Catchment. A “Yes” answer meant the option was taken forward into the Constrained Options Screening stage.

### 3.4 Constrained Options Screening

The unconstrained ‘Yes’ options became our list of constrained options. At this stage, we completed a more detailed and robust screening process using a multi-criteria analysis (MCA). The MCA approach incorporates a set of social, environmental and economic screening criteria to ensure the wider multiple benefits on our investment decisions are identified and taking into account in the selection of options. The MCA approach was set out in our Strategic Environment Assessment ([SEA](#)) Scoping Report and is a key part of the strategic environmental assessment of our DWMP.

#### 3.4.1 Multiple Benefits Assessment

The MCA is the first stage of assessing options for multiple benefits set out in the categories shown below. Where options that address multiple planning objectives were identified, more work on multiple benefits was undertaken and further assessment took place during the 4.2 Feasible Options stage (see section 4.2).

A synergistic “basket of measures”, based on synergies between linked risks and interdependent options, was undertaken at the Programme Appraisal stage of the DWMP.

#### 3.4.2 The Multi-Criteria Analysis (MCA)

The MCA assessed the potential benefit of each constrained option in the following categories and sub-categories (criteria):

- Feasibility and Risk: this assesses:
  - Dependencies – does it rely on or provide opportunities for others to work with us?
  - Planning and regulatory constraints – an assessment of site-specific issues, for example, would planning permission be required?
- Engineering and Cost:
  - Engineering complexity – consideration of the stages and phasing of development.
  - Cost – indicative costs based on more detailed investigations (low, medium, high).

- Performance and Sustainability
  - Certainty of outcomes – can it deliver the key outcome?
  - Flexibility to adapt or change – is it flexible enough to be adapted if the risks or other material matters such as technology advances change?
  - Resilience – will it increase the resilience of the system above and beyond the stated outcomes.
- Operational – will it remain compliant with permits and other constraints and requirements?
- Environmental – This section is aligned to the Strategic Environmental Assessment (SEA) which has been completed and published on the [SEA section of our website](#). The 9 questions identify environmental and biodiversity net gain by looking at different and specific environmental benefits. It takes into consideration the positive or negative impacts on:
  1. Air
  2. Biodiversity, flora, and fauna
  3. Historic environment
  4. Landscape
  5. Soil
  6. Water
  7. Climate factors
  8. Population and human health
  9. Material assets.

The scoring for each option was based on a set scale from major positive to major negative. Each was assigned a numerical figure which was used to generate either a “Reason for Rejection” or the expected “Net Benefits” output (see associated sections for further details), as follows:

- Major Positive (+3)
- Moderate Positive (+2)
- Minor Positive (+1)
- Neutral (0)
- Minor Negative (-1)
- Moderate Negative (-2)
- Major Negative (-3)
- Uncertain (0)

We developed the environmental criteria scoring from previous experience of SEAs and the Water Resources Management Plan (WRMP). As an example, the criteria for embodied and operational carbon emissions is classified under our “Environmental: Climate Factors” category.

An extract of our benefits appraisal criteria and scoring is shown in Figure 7: [Extract from Benefits Appraisal Criteria for Screening Constrained Options](#) and the full criteria are included in

Annex A - Appraisal Criteria for Screening Constrained Options.

Figure 7: Extract from Benefits Appraisal Criteria for Screening Constrained Options

DWMP Appraisal Criteria	Datasets/ Key Themes	Effect	Description	
Feasibility and Risk: • Dependencies	<ul style="list-style-type: none"> <li>• Permission for access to land</li> <li>• Need to work in partnership</li> <li>• Dependent upon others taking action (e.g. customers)</li> <li>• Dependent upon other actions / projects being completed</li> </ul>	+++	Major Positive	Option facilitates partnership working to deliver long term sustainable solutions with major wider benefits Partners have proactively identified this option, and have expressed an interest to work together and co-fund the delivery Option works in isolation - no dependencies of other actions being completed first
		++	Moderate Positive	This option facilitates partnership working to deliver moderate wider benefits. Partners likely to have their own needs to work with us. No dependencies on us taking other actions to achieve the outcomes
		+	Minor Positive	This option facilitates partnership working to deliver minor wider benefits, and partners are engaged with us
		0	Neutral	There are no positive or negative issues with the deliverability of this option
		-	Minor Negative	This option requires support and funding from partners, yet they are not engaged and the option could have some minor negative impacts for partners (e.g. loss of land for other uses)
		--	Moderate Negative	This option requires access to 'non-designated' land owned by others This option requires significant investment from partners, yet partners are not supportive of this option. This option requires major changes in changes in customer behaviour in the long-term
		---	Major Negative	This option requires purchase of 'designated' land This option requires total change in customer behaviour in the short term. This option requires changes in law
		?	Uncertain	There is not enough information to ascertain the impact of this option for this criteria

Included in the MCA is the screening score for cost. At this Constrained Options Screening stage, we used expert engineering judgement to estimate the relative scale of the associated cost of the option, from high to low, to determine the net benefit. Once an option had passed the MCA screening, a quantitative price was assessed during the Feasible Options stage: see section 4.2 Feasible Options.

The outcome from the MCA meant we could decide whether an option was feasible in terms of the overall scores. An option was rejected if it scored one or more major negatives, or multiple moderate negatives, across all the appraisal criteria and became a 'Reason for Rejection'. The assessment also helped us identify if further hydraulic modelling analysis was required to develop a better understanding of the scope or potential benefits of an option.

An exception was applied to the options:

- That involve studies / investigations as these will need to be completed before the options can be developed and screened.
- Where the preferred options had previously been identified through our DAP studies for flooding and growth as these have already been through a rigorous appraisal process in the earlier planning process.

Options that were not rejected were taken forward as feasible options. These were then priced to provide an estimate of the delivery cost.

The appraisal process and evaluation criteria will be further developed for future versions of the DWMP. This is to create greater alignment with the WRMP and Water Industry National Environment Programme (WINEP) appraisal approaches and to align it with the six capitals approach currently being developed for use across our business. As the six capitals approach is still under development, we were not able to incorporate it into the first cycle of the DWMP. In future, the six capitals should be integral to the business costing tool, see below section 4.2.1 Costing of Feasible Options, and our DWMP will therefore also consider the cost, impact on and benefits for:

- Human – workforce capabilities and wellbeing



- Intellectual – knowledge and processes
- Social and Relationship – relationships with and customers' trust in us
- Manufactured – pipes, treatment works, offices and IT equipment
- Financial – financial health and efficiency
- Natural – materials and services we rely on from the environment.

## 4. Net Benefits and Feasible Options

### 4.1 Assessing the Net Benefits

Identifying and assessing the net benefits for each option followed the Constrained Screening process. Net benefits were generated by entering the assigned numerical figure associated with the scoring of the options during the MCA. The MCA subjectively assesses the scores as “Major Positive” = +3, through 0 for “Neutral” or “Uncertain”, to “Major Negative” = -3. These scores were grouped into the five categories and the net benefit is the option with the highest score.

There are 9 categories in the Environmental section aligned to that used in the SEA. These 9 categories assess environmental / Biodiversity Net Gain for the DWMP. As stated in section 3.4.1 Multiple Benefits Assessment informs the SEA, which is published separately on the DWMP website.

### 4.2 Feasible Options

#### 4.2.1 Costing of Feasible Options

The feasible options were defined as “solutions” and detail the scale and location based on the best information available at the time of developing the ODA. Many of the options identified were traditional solutions, such as storage tanks that involve engineering and construction of new assets or enhanced maintenance on existing assets.

This approach was taken to enable the pricing of options based on examples from previous investment in wastewater infrastructure within the business. However, the DWMP looks to deliver more long-term sustainable options using nature-based solutions. While the cost of traditional approaches will set the limit of funding to reduce the risk, we are challenging ourselves to deliver the outcomes for less cost using more sustainable solutions.

We also identified studies and investigations where more information was needed to understand the risks or to enable us to develop options for our next cycle of the DWMP. We assigned a business-as-usual cost to these.

Working with our Cost Intelligence Team (CIT) we developed a comprehensive DWMP Costing Tool to estimate the cost of the options. Traditional engineering solutions were priced using existing “top down” cost models, including a catalogue of unit costs for new assets or maintenance activities based upon historical, bottom-up cost curves for wastewater projects completed in previous investment periods.

The final estimated cost reflected the size and scale of the preferred option.

We also developed top-down cost curves for our non-traditional options, such as Sustainable Drainage Systems (SuDS), based on available data from national projects.

Our estimation of the costs predominantly fell into four categories:

- New Assets - we calculated an initial outlay of capital expenditure (CAPEX) and an estimate of operating expenditure (OPEX) using our CIT-developed costing tool. As an example, we used the tool to cost new storage capacity for a Combined Emergency Overflow. We input the required storage capacity of the tank into the costing tool which automatically calculated the CAPEX, OPEX, Indirect Costs and Risk Cost.
- Improve Resilience – where the investment need involved improving the resilience of an asset. For example, where a wastewater pumping station needs investment to prevent operational failures, we used the costing tool to price the scope of the preferred option to produce a capital maintenance cost.
- Enhance Maintenance – where the investment need requires an increased level of maintenance to target parts of the wastewater network susceptible to a poor level of performance or structural failures. We calculated the enhanced maintenance cost based on the type and scale of activities identified in the preferred option and the costing tool.
- Studies and Investigations – where the investment need required further investigation or verification of the drivers and risks to identify root causes and appropriate measures to resolve them. We based the cost for this on previous investigations undertaken and incorporated this as a unit rate in our costing tool, making a high-level estimation of the funding required.

Where available, the preferred options from previous DAPs that had not already been delivered were included as options in our DWMP, including the previous cost estimates.

Where information was not available to price the options, we defined a set of rules and assumptions to enable the cost estimation. These are included in Annex B – Costing Assumptions.

#### 4.2.2 Risk Band Reduction

The next stage of the ODA process was to understand the efficacy of the feasible options in achieving Band 0. This required an assessment of the feasible option and by how much it could reduce the risk banding.

To calculate the level of risk reduction required to achieve the band 0 threshold, we quantified the required reduction in risk as a measurable target, shown in Figure 8. The options were tested against the target to understand which feasible option (or options) were needed to achieve the required level of risk reduction. For example, for each sewer rehabilitation programme, such as reducing pipe bursts and collapses, we set the effectiveness of the preferred option as a specific percentage of the number of incidents per kilometre.

For the Good Ecological status, Bathing Waters and Shellfish Waters planning objectives, a subjective risk band reduction was applied based on the preferred option from the Storm Overflow planning objective. The drivers and root causes are similar if not the same.

Limitations in the information available or in our understanding of this data at the time of developing the ODA meant that some of the risk reduction (denoted by \*\*) was not readily established. Predominantly this will be addressed by studies and investigations, providing the necessary information for future cycles of the DWMP. For example, we were unable to apply a risk

band reduction to the planning objective on [Nutrient Neutrality](#) as studies and investigations are needed to provide more information before a nutrient budget and band reduction can be established.

**Figure 8: Risk Reduction associated with Band Reduction**

Planning Objective	Description	Quantifiable Risk Reduction
1	Internal Sewer Flooding Risk	Reduction in number of internal flooding incidents
2	Pollution Risk	Reduction in number of pollution incidents
3	Sewer Collapse Risk	Reduction in number of sewer collapse incidents
4	Sewer Flooding 1 in 50 year storm	Reduction in number of properties at risk from flooding
5	Storm Overflow Performance	Reduction in number of CSO spill events
6	Risk of WTW Compliance (Quality)	**Reduced risk of WTW Quality Compliance Failure
7	Annualised Flood Risk (Hydraulic Overload)	Reduction in number of properties at risk of flooding
8	Wastewater Treatment Works (WTW) Dry Weather Flow (DWF) Compliance	**Reduced risk of WTW Dry Weather Flow Compliance *
9	Achieve Good Ecological Status / Potential	**Reduction in water bodies failing GES/GEP due to water company operations (measured by the EA)
10	Improve surface water management	Reduced number of properties at risk from surface water flooding
11	Secure nutrient neutrality	**Number of receiving waters obtaining Nutrient Neutral status
12	Reduce groundwater pollution	Reduce length of poor condition sewers within SPZ/SGZ
13	Improve bathing water quality	**Number of receiving bathing waters obtaining Excellent status
14	Protect shellfish water quality	**Number of receiving shellfish water obtaining CEFAS A status

### 4.2.3 Multiple Benefits

We evaluated each option to see if it would reduce the risks across more than one planning objective. For example, implementing a customer education campaign to increase awareness about FOG (fats, oils and grease) and Unflushables to reduce the number of blockages, may also reduce the risks of internal flooding and pollution caused by blockages, addressing three planning objectives at the same time.

We combined several feasible options if it were necessary to achieve the risk reduction to Band 0. Aggregating multiple feasible options in this way allowed us to create a 'basket of measures' for the specific planning objective, and to determine the investment needed to achieve Band 0.

See the technical summary on [Programme Appraisal](#) for how we used risk band reductions to prioritise our preferred options.

## 5 Timing of Investment Needs

The timescale assigned for each option is based on the timing of the risks. The risk assessments are biased towards existing risks with only 6 of the 14 BRAVA risk assessments currently considering how the risks change up to 2050. Many of the options identified in the current (2020 baseline) planning horizon require investment in the short term to resolve current risks. These are the options to be considered for our Asset Management Plan cycle 8 (AMP8) Business Plan for the period 2025 to 2030.

The options to reduce the risks that are forecast to materialise in the medium term have been identified for inclusion in our Business Plans for AMP9 (2030 to 2035) and AMP10 (2035 to 2040).

The options to reduce the risks that are forecast to materialise in the long term have been identified for inclusion in our Business Plans for AMP11 (2040 to 2045) and AMP12 (2045 to 2050).

We will develop these risk assessments further so that all assessments will forecast future risks and enable us to have a fuller picture of the future investment needs and a more robust basis for adaptive planning in future cycles of the DWMP. Investment needs earmarked for the medium and long term will be reviewed in the next cycle of the DWMP as we gain better certainty on growth and climate change.

We will forecast and monitor changes in risk, taking future uncertainties and pressures on our infrastructure into account to determine whether we are over or under predicting the risks. If or when a current Band 0 (not significant) or Band 1 (moderately significant) risk becomes more serious we will adapt our approach for AMP9 (2030 – 2035) and apply a different investment strategy and pathway.

This will enable us to provide best value investments for our future needs.

## 6 Best Value and Least Cost

### 6.1 Best Value

We have defined 'Best Value' as the feasible option with the most 'Net Benefits' relative to the CIT cost incurred.

Examples of Best Value include:

1. Surface Water Separation: generally, separation has a high Estimated Cost in comparison to storage, but it provides "Major Positives" in terms of the additional benefits of biodiversity net gain, future resilience and, potentially, planning policies will be favourable.
2. Storage: this option provides "Major Positives" in terms of potential planning policy considerations on underground storage under permitted development rights, certainty of outcomes, and engineering expertise. Generally, storage has a lower Estimated Cost compared to separation.
3. Jetting programmes: have been assigned a positive reduction banding score as these will reduce incidents and properties that are at risk of Internal Sewer Flooding (PO1), while also providing a positive reduction in banding by the removal of incidents affected by Pollution Risk (PO2).

## 6.2 Least Cost

We defined 'Least Cost' as the option that is the cheapest way of reducing the risk to band 0. While the 'Least Cost' option may ultimately deliver the required reduction in BRAVA risk band, it will not necessarily provide the outcomes or multiple benefits looked for, such as nature-based solutions and other environmental outcomes under the [guiding principles of the DWMP](#), or meet our obligations for biodiversity net gain or our journey towards carbon net zero.

However, because the MCA formula uses 17 multiple factors to determine Best Value or Least Cost, a "Least Cost" finding is extremely unlikely unless it has returned Neutral across each and all of the 17 factors considered during the Constrained Option stage. A Neutral score means the option has been assessed to offer no positive or negative issues. For example, under feasibility and risk (planning and regulatory), if there are no positive or negative issues with the planning and regulatory constraints of the option, then it is "Neutral".

## 7 Feasible Options Summary Table

The Feasible Options Tables for each wastewater system are published under the ODA sections on our website for each River Basin Catchment. The tables show the net benefits, the preferred option and the Best Value / Least Cost, for each option identified.

The table summarises the factors that determine a preferred option across the ODA by setting out:

- the initial 12 Generic Option Categories.
- the generic options for the specific location.
- the screening at the Unconstrained Option stage including the "Reason for Rejection" and at which of the 6 question or questions were answered with a "No".
- the Constrained Screening stage, with the "Net Benefits" influencing the "Reason for Rejection" if triggered at this stage.
- the estimated cost.
- whether it's the preferred option.
- if it provides "Least Cost" or "Best Value".

## 8 The Rejection Register

The reasons for rejection are compiled in the table of Feasible Options. This is our "Rejection Register", which records the "Reason for Rejection" and shows at which stage of the ODA it was rejected. These tables are published for each of the 61 Wastewater Catchment Systems under the ODA pages within each River Basin Catchment.

By keeping a comprehensive record of rejected options, subsequent DWMPs will be able to review previously rejected options to confirm if new technology and practices mean that they are now feasible.

For more information on the 'Unconstrained' and 'Constrained Screening' Stages – see the associated and relevant sections 3.3 Unconstrained Options Screening and 3.4 Constrained Options Screening above in this document.



## 9 Preferred Option

The 'Preferred Option' is a numerical evaluation of which option provides the greatest 'Net Benefits'. It confirms whether it is 'Best Value' and records if it is from a pre-existing plan (DAP). Throughout the ODA process, from Unconstrained Options to the Feasible Options, consideration has been given to the findings from the stakeholder workshops held in the Spring and Summer of 2021 and March 2022. We reviewed the options to check alignment with the options put forward by our partners in these meetings and made sure these were included in our Investment Needs. These partner-proposed options have an inherent positive net benefit due to in-built partnership opportunities.

### **Southern Water**

Version 3  
March 2023

## Annex A - Appraisal Criteria for Screening Constrained Options

DWMP Appraisal Criteria	Datasets/ Key Themes	Effect	Description	
Feasibility and Risk  •Dependencies	<ul style="list-style-type: none"> <li>•Permission for access to land</li> <li>•Need to work in partnership</li> <li>•Dependent upon others taking action (e.g. customers)</li> <li>•Dependent upon other actions / projects being completed</li> </ul>	+++	Major Positive	Option facilitates partnership working to deliver long term sustainable solutions with major wider benefits Partners have proactively identified this option, and have expressed an interest to work together and co-fund the delivery Option works in isolation - no dependencies of other actions being completed first
		++	Moderate Positive	This option facilitates partnership working to deliver moderate wider benefits. Partners likely to have their own needs to work with us. No dependencies on us taking other actions to achieve the outcomes
		+	Minor Positive	This option facilitates partnership working to deliver minor wider benefits, and partners are engaged with us
		0	Neutral	There are no positive or negative issues with the deliverability of this option
		-	Minor Negative	This option requires support and funding from partners, yet they are not engaged and the option could have some minor negative impacts for partners (e.g. loss of land for other uses)
		--	Moderate Negative	This option requires access to 'non-designated' land owned by others This option requires significant investment from partners, yet partners are not supportive of this option. This option requires major changes in changes in customer behaviour in the long-term
		---	Major Negative	This option requires purchase of 'designated' land This option requires total change in customer behaviour in the short term. This option requires changes in law
		?	Uncertain	There is not enough information to ascertain the impact of this option for this criteria
Feasibility and Risk  •Planning and Regulatory Constraints	<ul style="list-style-type: none"> <li>•Planning permission required</li> <li>•Does it meet regulator expectations, approved approaches, and compliance</li> </ul>	+++	Major Positive	This option provides a major positive contribution to support the local economy and planned growth This option is fully compliant with regulatory policy, and is an exemplar for future sustainable water management
		++	Moderate Positive	This option provides a moderate contribution to support the local economy and planned growth This option is fully compliant with regulatory policy, and encourages sustainable water management
		+	Minor Positive	This option provides a minor contribution to support the local economy and planned growth This option is compliant with regulatory policy, and is sustainable
		0	Neutral	This option has no positive or negative benefits in terms of planning and regulatory constraints
		-	Minor Negative	This option requires development of specific technical and regulatory guidance This option requires change to a Local Plan or local planning policy
		--	Moderate Negative	This option needs changes in legislation and regulatory policy to enable it to proceed
		---	Major Negative	Option would NOT be permitted under UK laws Option would NOT be permitted by the regulators
		?	Uncertain	There is not enough information to ascertain the impact of this option for this criteria

Engineering and Cost  •Complexity	<ul style="list-style-type: none"> <li>•Novel</li> <li>•Innovation</li> <li>•Experience</li> <li>•Skills</li> <li>•Technology</li> </ul>	+++	Major Positive	<p>This option is tried and tested, low complexity, and engineering standards and design experience available</p> <p>This option proactively delivers new more sustainable water management to mainstream innovative ideas that have been tested and delivered elsewhere. This option has low complexity/risk constructability challenges, (or none), that can be easily managed on site by SWS or approved contractors.</p>
		++	Moderate Positive	<p>This option is not complex and there are skills in SWS and its supply chain to design, build and operate</p> <p>This option is innovative and has been tried and proved to be successful elsewhere in the UK</p> <p>This option is not complex in terms of constructability challenges and there are skills within SWS and its' supply chain to manage these risks on site.</p>
		+	Minor Positive	<p>This option is not complex and there are skills in the UK to design, build and operate</p> <p>This option is innovative and has been tried and proved to be successful elsewhere in other countries.</p> <p>This option is not complex in terms of constructability challenges and there are skills within the UK to manage on site. Requires input from specialist supply chain to design and build.</p>
		0	Neutral	<p>This option has no positive or negative benefits in terms of complexity.</p> <p>This option has no positive or negative impacts in terms of constructability.</p>
		-	Minor Negative	<p>This option is complex but there are skills in the UK to design, build and operate.</p> <p>This option is innovative but has been tried and proved to be successful elsewhere.</p> <p>This option is complex in terms of constructability challenges and there are skills within the UK to manage on site. Requires input from specialist supply chain to design and build.</p>
		--	Moderate Negative	<p>This option is complex, there are limited skills to design, build and operate</p> <p>This option is innovative and has been tried elsewhere but is still high costs / high risk.</p> <p>This option is complex in terms of constructability challenges and there are limited skills to manage on site. Requires input from specialist supply chain to design and build.</p>
		---	Major Negative	<p>This option is highly complex and there are no skills in the industry to design, build and operate.</p> <p>This option is new, innovative, has not been verified to work elsewhere, is high cost and high risk.</p> <p>This option has high complexity/ risk constructability challenges that require special permits and/ or outourced skills to design, build and operate. Potential for high economic/ socio-environmental impacts.</p>
		?	Uncertain	<p>From the level of information available the effect that the option would have on this objective is uncertain</p>

Engineering and Cost  •Return on Investment (potential benefit cost ratio)		+++	Major Positive	This option has a high return on investment in the short and long term This option is expected to be affordable in the short term
		++	Moderate Positive	This option will have a positive return on investment in the short and long-term
		+	Minor Positive	This option will have a positive return on investment in the long-term only due to climate change and growth This option will be affordable in the medium to long term
		0	Neutral	The return on investment is likely to be neutral (i.e. benefit cost ratio of 1)
		-	Minor Negative	This option will have a minor negative return on investment in the long term
		--	Moderate Negative	This option will have a moderately negative return on investment in the short and long term This option will be unaffordable in the short term
		---	Major Negative	The costs for this option will be disproportionately high and therefore unaffordable even in the long term
		?	Uncertain	There is not enough information to ascertain the impact of this option for this criteria
Performance and Sustainability  •Certainty of Outcomes	•Risk of investment not securing the outcomes	+++	Major Positive	This option will deliver multiple outcomes for communities and the environment by reducing several significant risks in this wastewater system with more sustainable approaches, and deliver wider benefits. The certainty of delivery is high
		++	Moderate Positive	This option will deliver multiple outcomes for communities and the environment by reducing several significant risks in this wastewater system, and deliver wider benefits, but the certainty of delivery is moderate
		+	Minor Positive	This option will deliver a good outcome for communities and the environment by reducing a significant risk in this wastewater system, but the certainty is moderate or low
		0	Neutral	This option has no positive or negative benefits in terms of outcomes
		-	Minor Negative	This option has high certainty but there is a risk that the outcomes will not be achieved
		--	Moderate Negative	This option has low certainty and a moderate risk that the outcomes will not be achieved
		---	Major Negative	This option will NOT deliver any outcomes and/or reduce the risks in this system
		?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain
Performance and Sustainability  •Flexibility to adapt / change	•Adaption for climate change •Manage adaptive approaches •Uncertainties	+++	Major Positive	This option is a good long term sustainable option that will reduce the risks in current and future climates, and with planned growth. Future investment will not be necessary.
		++	Moderate Positive	This option is a good long term option that incorporates a 'managed adaptive' approach in order to respond to future uncertainties.
		+	Minor Positive	This option is a good option that is flexible for future changes in climate and growth
		0	Neutral	This option has no positive or negative benefits in terms of adaptation and future change
		-	Minor Negative	This option reduces current and some future risks for a limited time, but there is no option to adapt the solution in the future.
		--	Moderate Negative	This option needs to be delivered in one phase and does not provide flexibility for future adaptation / enlargement
		---	Major Negative	This option does not allow for future uncertainties and constrains future options/choices
		?	Uncertain	There is not enough information to ascertain the impact of this option for this criteria

Performance and Sustainability  •Resilience	•Reliability •Redundancy •Resistance •Response & Recovery	+++	Major Positive	This option provides a major enhancement to the resilience of our wastewater system by increasing reliability, resistance and/or provides redundancy. This option provide a significant reduction in the need for operational response and recovery in the event of an extreme event.
		++	Moderate Positive	This option provides a moderate enhancement to the resilience of our wastewater system by increasing reliability, resistance and/or provides redundancy.
		+	Minor Positive	This option provides a minor enhancement to the resilience of our wastewater system by either increasing reliability, resistance or provides redundancy.
		0	Neutral	This option has no positive or negative benefits in terms of resilience
		-	Minor Negative	This option would create additional assets that would require operational response in the event of failure, and could lead to a flood or pollution incident
		--	Moderate Negative	This option would create vulnerabilities for a critical asset that if failed would lead to loss of service, flooding or pollution
		---	Major Negative	This option would create significant additional vulnerabilities and a single point of failure for critical assets that if failed would lead to loss of service, flooding or pollution
		?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain
Operational	•Reduction in operational costs •Skills and capability to maintain •Skills and capability to operate	+++	Major Positive	This option significantly reduces existing operational costs and resource needs through passive design (i.e. no operation needed) and requires no ongoing maintenance
		++	Moderate Positive	This option reduces operational costs and resource needs This options is easy to maintain and we have the skills and capability in house
		+	Minor Positive	This option reduces operational costs
		0	Neutral	This option has no positive or negative benefits in terms of operations
		-	Minor Negative	This option will incur a minor increase in operational costs This option requires new skills but there are readily available in house
		--	Moderate Negative	This option will moderately increase operational costs. This option will require new skills but they are available from our supply chain
		---	Major Negative	This option will significantly increase operational costs This option requires skills that are not readily available in house or from our supply chain
		?	Uncertain	There is not enough information to ascertain the impact of this option for this criteria
Environmental  Air: Reduce and minimise air emissions	Air Quality Management Zones	+++	Major Positive	The option would result in a major enhancement of the air quality within one or more AQMAs.
		++	Moderate Positive	The option would result in a moderate enhancement of the air quality within one or more AQMAs.
		+	Minor Positive	The option would result in an enhancement of the air quality.
		0	Neutral	The option would not result in any effects on Air Quality and AQMAs.
	Air Quality Monitoring Sites	-	Minor Negative	The option would result in a decrease of the air quality.
		--	Moderate Negative	The option would result in a decrease of the air quality within one or more AQMAs.
		---	Major Negative	The option would result in a major decrease in the air quality within one or more AQMAs.
		?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain.

Environmental  Biodiversity, Flora, Fauna: Protect and enhance biodiversity, priority species, vulnerable habitats and habitat connectivity (no loss and improve connectivity where possible)	SPA SAC Ramsar site SSSIs MPA MCZ NNR LNR Priority habitats and species Non-designated sites Terrestrial, aquatic and marine habitats, species and protected sites Green networks and corridors (e.g. foraging areas and commuting routes, migration routes, hibernation areas etc. at all scales)	+++	Major Positive	The option would result in a major enhancement on the quality of designated sites / habitats due to changes in flow or groundwater levels, water quality or habitat quality and availability. The option would result in a major increase in the population of a priority species. Effects could be caused by beneficial changes in water flows/water quality, or large amounts of creation or enhancement of habitat, promoting a major increase in ecosystem structure and function. The option would result in a major reduction or management of INNS.
		++	Moderate Positive	The option would result in a moderate enhancement on the quality of designated and/or non-designated sites / habitats due to changes in flow or groundwater levels, water quality or habitat creation and enhancement measures. The option would result in a moderate increase in the population of a priority species. Effects could be caused by beneficial changes in water flows/water quality, or moderate amounts of creation or enhancement of habitat, promoting a moderate increase in ecosystem structure and function. The option would result in a moderate reduction or management of INNS.
		+	Minor Positive	The option would result in a minor enhancement of the quality of designated and/or non-designated sites / habitats due to changes in flow or groundwater levels, water quality or habitat creation and enhancement measures. The option would result in a minor increase in the population of a priority species. Effects could be caused by beneficial changes in water flows/water quality, or small amounts of creation or enhancement of habitat, promoting a minor increase in ecosystem structure and function. The option would result in a minor reduction or management of INNS.
		0	Neutral	The option would not result in any effects on designated or non-designated sites including habitats and/or species). It will not have an effect on INNS.
		-	Minor Negative	The option would result in a minor negative effect on the quality of designated and/or non-designated sites / habitats due to changes in flow or groundwater levels, water quality or habitat loss or degradation. The option would result in a minor decrease in the population of a priority species. Effects could be caused by detrimental changes in flows/water quality, or small losses or degradation of habitat leading to a minor loss of ecosystem structure and function. The option would result in a minor increase or spread of INNS
		--	Moderate Negative	The option would result in a moderate negative effect on the quality of designated and/or non-designated sites / habitats due to changes in flow or groundwater levels, water quality or habitat loss or degradation. The option would result in a moderate decrease in the population of a priority species. Effects could be caused by detrimental changes in flows/water quality, or moderate loss or degradation of habitat leading to a moderate loss of ecosystem structure and function. The options would result in a moderate increase or spread of INNS.
		---	Major Negative	The option would result in a major negative effect on the quality of designated and/or non-designated sites / habitats due to changes in flow or groundwater levels, water quality or habitat loss or degradation. The option would result in a major decrease in the population of a priority species. Effects could be caused by detrimental changes in flows/water quality, or large losses or degradation of habitat leading to a major loss of ecosystem structure and function. The option would result in a major increase or spread of INNS.
		?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain

Environmental  Historic Environment: Conserve, protect and enhance the historic environment, including archaeology	Listed buildings: - Grade I listed structures - Grade II* listed structures Registered Parks and Gardens: - Grade I Registered Parks and Gardens - Grade II* Registered Parks and Gardens Registered Parks and Gardens Protected Wreck Registered Battlefields Scheduled Monuments Conservation Areas World Heritage Sites	+++	Major Positive	The option will result in enhancements to designated heritage assets and/or their setting, fully realising the significance and value of the asset, such as: • Securing repairs or improvements to heritage assets, especially those identified in the Historic England Buildings/Monuments at Risk Register; • Improving interpretation and public access to important heritage assets.
		++	Moderate Positive	The option will result in enhancements to designated heritage assets and/or their setting. Improving interpretation and public access to important heritage assets.
		+	Minor Positive	The option will result in enhancements to non-designated heritage assets and/or their setting.
		0	Neutral	The option will have no effect on cultural heritage assets or archaeology.
		-	Minor Negative	The option will result in the loss of significance of undesignated heritage assets and/or their setting, notwithstanding remedial recording of any elements affected. There will be limited damage to known, undesignated archaeology important sites with a consequent loss of significance only partly mitigated by archaeological investigation
		--	Moderate Negative	The option will result in the loss of significance of undesignated heritage assets and/or their setting, notwithstanding remedial recording of any elements affected. The option will diminish of significance of designated heritage assets and/or their setting, notwithstanding remedial recording of any elements affected.
		---	Major Negative	The option will diminish the significance of designated heritage assets and/or their setting such as: • Demolition or further deterioration in the condition of designated heritage assets especially those identified in the Historic England Buildings/Monuments at Risk Register. • Loss of public access to important heritage assets and lack of appropriate interpretation. • There will be major damage to known, designated archaeology important sites with a consequent loss of significance only partly mitigated by archaeological investigation.
		?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain
Environmental  Landscape: Conserve, protect and enhance landscape, townscape and seascape character and visual amenity	Areas of Outstanding Natural Beauty National Character Areas Green Belt land National Park	+++	Major Positive	The option would have a major positive contribution to designated landscape (AONB or National Park) management plan objectives The option results in new, above ground infrastructure that significantly enhances the local landscape, townscape or seascape.
		++	Moderate Positive	The option would have a moderate positive contribution to designated landscape management plan objectives The option results in new, above ground infrastructure that has a moderate positive effect on the local landscape, townscape or seascape.
		+	Minor Positive	The option results in new, above ground infrastructure that has a minor positive effect on the local landscape, townscape or seascape.
		0	Neutral	The option would not result in any effects on the local landscape, townscape or seascape.
		-	Minor Negative	The option results in new, above ground infrastructure that has a minor negative effect on the local landscape, townscape or seascape.
		--	Moderate Negative	The option would have a moderate negative effect on a designated landscape or feature (i.e. significant visually intrusive infrastructure) whose effects could not be reasonably mitigated. The option results in new, above ground infrastructure that has a moderate negative effect on the local landscape, townscape or seascape
		---	Major Negative	The option would have a negative effect on a designated landscape or feature (i.e. significant visually intrusive infrastructure) whose effects could not be reasonably mitigated. The option results in new, above ground infrastructure that has a major negative effect on the local landscape, townscape or seascape.
		?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain.

Environmental  Soil: Protect and enhance the functionality, quantity and quality of soils	Agricultural Land Classification Landfill sites - authorised and historic	+++	Major Positive	The option would result in a major enhancement on the quality of soils through the implementation of catchment approaches, remediation or other measures.
		++	Moderate Positive	The option would result in a moderate enhancement on the quality of soils through the implementation of catchment approaches, remediation or other measures.
		+	Minor Positive	The option is located on a brownfield site and has no effect on soils or existing land use. The option results in the remediation of contaminated land.
		0	Neutral	The option would not result in any effects on soils or land use.
		-	Minor Negative	The option is not located on a brownfield site and/or results in a minor loss of best and most versatile agricultural land or is in conflict with existing land use. The option results in land contamination.
		--	Moderate Negative	The option will result in a moderate loss of best and most versatile agricultural land or is in substantial conflict with existing land use. The option is partially overlying mineral resources leading to partial mineral sterilisation.
		---	Major Negative	The option will result in a major loss of best and most versatile agricultural land or is in substantial conflict with existing land use. The option results in land contamination. The option is directly overlying mineral resources leading to mineral sterilisation.
		?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain
Environmental:  Water: Increase resilience and reduce flood risk Protect and enhance the quality of the water environment and water resources Deliver reliable and resilient water supplies	Environment Agency Flood Defences Environment Agency Main Rivers Flood Zones 2 and 3 Surface Water Features WFD River Waterbody Catchments WFD River Waterbodies Cycle 2 Bathing Waters (for desal options) Shellfish Waters (desal options) Source Protection Zones WFD Groundwater bodies	+++	Major Positive	The option results in addressing failure of WFD Good Ecological Status / Good Ecological Potential. The option would result in a major improvement to flood risk. The option would result in a major improvements in water efficiency, reduces demand and improves resilience
		++	Moderate Positive	The option achieves savings through demand management and does not require abstraction to achieve yield. The option contributes to addressing failure of WFD Good Ecological Status / Good Ecological Potential. The option would result in a moderate improvement to flood risk. The option would result in a moderate improvements in water efficiency, reduces demand and improves resilience.
		+	Minor Positive	The option achieves savings through demand management and does not require abstraction to achieve yield. The option would result in a minor improvement to flood risk. The option would result in a minor improvements in water efficiency, reduces demand and improves resilience.
		0	Neutral	The option would have no discernible effect on river flows or surface/coastal water quality or on groundwater quality or levels. The option would not have an effect on or be affected by flood risk.
		-	Minor Negative	The option would result in minor decreases in river flows. River and/or coastal water quality may be affected and lead to short term or intermittent effects on receptors (e.g. designated habitats, protected species or recreational users of rivers and the coastline) that could not be avoided but could be mitigated. The option would result in minor decreases in groundwater quality or levels. The option is located in Flood Zone 2. The option would result in minor decreases in water efficiency, increases demand and reduces resilience
		--	Moderate Negative	The option would result in moderate decreases in river flows. River and/or coastal water quality may be affected and lead to long term or continuous effects on receptors (e.g. designated habitats, protected species or recreational users of rivers and the coastline) that could not reasonably be mitigated. The option results in the likely deterioration of WFD classification. The option would result in moderate decreases in groundwater quality or levels.
		---	Major Negative	The option would result in major decreases in river flows. River and/or coastal water quality may be affected and lead to long term or continuous effects on receptors (e.g. designated habitats, protected species or recreational users of rivers and the coastline) that could not reasonably be mitigated. The option results in the deterioration of WFD classification. The option would result in major decreases in groundwater quality or levels. The option is located in Flood Zone 2 or 3 and further contributes to flood risk. The option would result in major decreases in water efficiency, increases demand and reduces resilience.
		?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain.





Environmental:  Climate Factors: Reduce embodied and operational carbon emissions Reduce vulnerability to climate change risks and hazards	Option Carbon data UKCP18 climate data Sea level rise projections	+++	Major Positive	The option will generate additional zero carbon energy that can be fed back into the grid The option will result in a major increase in carbon sequestration.
		++	Moderate Positive	The option will be carbon neutral The option will increase resilience/decrease vulnerability to climate change effects. The option will reduce operational carbon emissions by between 100 and 1,000 tonnes CO2e/year. The option will result in a moderate increase in carbon sequestration
		+	Minor Positive	The option includes renewable energy sources that bring operational carbon to under 100 tonnes CO2e/year The option will increase resilience/decrease vulnerability to climate change effects. The option will reduce operational carbon emissions by up to 100 CO2e/year.
		0	Neutral	The option would have no discernible effect on greenhouse gas emissions, nor would the option increase resilience/decrease vulnerability to climate change effects.
		-	Minor Negative	The option will have a minor impact on resilience/decrease vulnerability to climate change effects. The option will generate operational carbon emissions of between 100 and 1,000 tonnes CO2e/year.
		--	Moderate Negative	The option will have a moderate impact on resilience/significantly decrease vulnerability to climate change effects. The option will generate operational carbon emissions of between 1,000 and 10,000 CO2e/year. The option will result in a moderate release of previously sequestered carbon.
		---	Major Negative	The option will have a major impact on resilience/significantly decrease vulnerability to climate change effects. The option will generate operational carbon emissions of more than 10,000 tonnes CO2e/year. The option will result in a major release of previously sequestered carbon
		?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain.
Environmental:  Population, Human Health Maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing Maintain and enhance tourism and recreation	Noise action important area Indices of Multiple Deprivation 2015 Functional site: - Schools - Medical facilities OS Greenspace dataset: - Allotments - Bowling green - Cemetery - Golf course - Sports facility - Play space - Playing field - Public park or garden Religious grounds - Tennis courts Natural England - Country Parks National Parks Section 15 open access areas CRoW S4 Conclusive Registered	+++	Major Positive	The option leads to major positive effect on the health of local communities and will ensure that surface water and bathing water quality is maintained within statutory limits. The option creates new, and significantly enhances existing, recreational facilities, publicly accessible greenspace and/or tourism within the operational area
		++	Moderate Positive	The option leads to positive effect on the health of local communities and will ensure that surface water and bathing water quality is maintained within statutory limits. The option enhances existing, recreational facilities, publicly accessible greenspace and/or tourism within the operational area
		+	Minor Positive	The option has a temporary positive effect on the health of local communities and will ensure that surface water and bathing water quality is maintained within statutory limits
		0	Neutral	The option would not result in any effects on human health and existing recreational facilities and/or tourism.
		-	Minor Negative	The option has a temporary effect on human health (e.g. noise or air quality). The option reduces the availability and quality of existing recreational facilities and/or tourism within the operational area.
		--	Moderate Negative	The option results in the permanent removal of existing recreational facilities, publicly accessible greenspace and/or tourism within the operational area
		---	Major Negative	The option has a significant long-term effect on human health (e.g. noise or air quality). The option results in the removal of existing recreational facilities, publicly accessible greenspace and/or tourism within the operational area.
		?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain.

Environmental:  Material Assets Minimise resource use and waste production Avoid negative effects on built assets and infrastructure	Transport: - Major roads – A roads - Major roads motorway - Railway line - National cycle route - National trails	+++	Major Positive	The option will re-use or recycle substantial quantities of waste materials and any new infrastructure will incorporate substantial sustainable design measures and materials. There will be no increase in energy consumption or energy will be from 100% renewable sources. The option improves national cycle routes or national trails.
		++	Moderate Positive	The option will re-use or recycle moderate quantities of waste materials and any new infrastructure will incorporate some sustainable design measures and materials. There will be no increase in energy consumption or energy will be from 90% renewable sources. The option improves national cycle routes or national trails.
		+	Minor Positive	The option will re-use or recycle a limited quantity of waste materials and any new infrastructure will incorporate some limited sustainable design measures and materials. There will be no increase in energy consumption or energy will be from 80% renewable sources. The option improves national cycle routes or national trails.
		0	Neutral	The option would not result in any effects on material assets.
		-	Minor Negative	The option will require new infrastructure with only limited opportunities for the re-use or recycling of waste materials. There are limited opportunities for sustainable design or the use of sustainable materials. The option results in a minor increase in energy consumption with no renewable energy options. The option results in a minor disruption on built assets and infrastructure, including transport.
		--	Moderate Negative	The option will require new infrastructure with only limited opportunities for the re-use or recycling of waste materials. The option results in a moderate increase in energy consumption with no renewable energy options. The option results in a moderate disruption on built assets and infrastructure, including transport links.
		---	Major Negative	The option will require significant new infrastructure that cannot be provided through the re-use or recycling of waste materials. There are no opportunities for sustainable design or the use of sustainable materials. The option results in a major increase in energy consumption with no renewable energy options. The option results in a major distribution on built assets and infrastructure, including transport links.
		?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain.

## Annex B – Costing Assumptions

Costs have been derived for the majority of solutions. Future users should be aware of the following limitations associated with the cost estimations:

- DAP Growth Options – Growth options have been derived to address growth developments within each level 3 wastewater catchment investigated within the DAP study. The ODA contains an entry for each development. The cost for addressing detriment associated with development has been divided equally from DAP Growth Options cost, estimated for each level 3 wastewater catchment.
- Whole life costs have not been applied in this cycle of the DWMP and do not include on-going operational expenditure. A small allowance has been included to allow for operational support during the commissioning of the asset.
- Surface water separation costs have been derived based on the extent of paved and roof area to be removed. Typical costs for surface water separation are based on a limited number of schemes.
- Costs of studies have been attributed to initiate further data collection and associated studies where the root cause of issues are unknown. An example is the wastewater level catchments attributed with Band 1 or 2 for Nutrient Neutrality or Good Ecological Status. A typical study cost has been derived to confirm the role of wastewater assets for these planning objectives.

## Annex C – ODA From Generic Options to Preferred Options

