GREATERLONDONAUTHORITY

Mayor of London's

Draft Water Strategy

Sustainability Appraisal Report
Part B: Appraisal of the Draft Water Strategy

August 2009

Prepared for the Greater London Authority
by
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ABBREVIATIONS

ABI	Association of British Insurers
AQMA	Air Quality Management Area
BAP	Biodiversity Action Plan
BAU	Business as usual
BAU+10	Future business as usual in 10 years time
BME	black and minority ethnic
BREEAM	BRE Environmental Assessment Method
CAMS	Catchment Abstraction Management Strategies
CEP	Collingwood Environmental Planning
CFMP	Catchment Flood Management Plan
CREH	Centre for Research into Environment and Health
CCAS	Climate Change Adaptation Strategy
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
CSO	Combined sewer overflow
DCLG	Department for Communities and Local Government
Defra	Department for Environment Food and Rural Affairs
EA	Environment Agency
EqIA	Equalities Impact Assessment
EC	European Commission
EDS	Economic Development Strategy
EEC	European Economic Community
ENDS	Environmental Data Services
EU	European Union
FoE	Friends of the Earth
GLA	Greater London Authority
GOL	Government Office for London
GCSE	General Certificate of Secondary Education
GQA	General Quality Assessment
HIA	Health Impact Assessment
HSE	Health and Safety Executive
IIA	Integrated Impact Assessment
IPPR	Institute for Public Policy Research
km	Kilometre
LDA	London Development Agency
LHC	London Health Commission
LSDC	London Sustainable Development Commission
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
OECD	Organisation for Economic Co-Operation and Development
ODPM	Office of the Deputy Prime Minister
OFWAT	Office of Water Services
PM10	fine particulate matter
PPG	Planning Policy Guidance
PPS	Planning Policy Statement
RBD	River Basin District
RBMP	River Basin Management Plan
RICS	Royal Institution of Chartered Surveyors
SA	Sustainability Appraisal
SAC	Special Areas of Conservation
SEA	Strategic Environmental Assessment
SELL	Sustainable Economic Leakage Level
SFRA	Strategic Flood Risk Assessment
SPA	Special Protection Area
SPG	Supplementary Planning Guidance
SSSI	Sites of Special Scientific Interest
SUDS	Sustainable Drainage Systems
TfL	Transport for London
TTSG	Thames Tideway Strategy Group
UK	United Kingdom
WAF	Water Action Framework
WFD	Water Framework Directive
WHO	World Health Organisation
WRMU	Water Resources Management Units
WS	Water Strategy

PART B: APPRAISAL OF THE DRAFT WATER STRATEGY

4. EVOLUTION OF THE SUSTAINABILITY BASELINE IN THE ABSENCE OF THE WATER STRATEGY

Introduction

4.1 Sections 4 to 7 of the SA Report present the findings of the appraisal of the draft Water Strategy and in particular Stage B of the SA process – *Developing and Refining Options* (see Section 3 of the SA Report which describes the stages and tasks in the SA process), namely:

- **Section 4:** evolution of the sustainability baseline in the absence of the Water Strategy (tasks A3, A4, B3 and B4);
- **Section 5:** developing the Strategy alternatives (task B2);
- **Section 6:** testing the Strategy objectives against the SA objectives (task B1) predicting and evaluating the effects of the draft Strategy (tasks B3 and B4), mitigating the adverse effects and maximising the beneficial effects (task B5); and
- **Section 7:** proposed measures to monitor the significant effects of the Strategy implementation.

4.2 Note that the version of the draft Water Strategy appraised here is the version issued for public consultation (28 August 2009).

Evolution of the sustainability baseline in the absence of the Water Strategy

Establishing the sustainability context

4.3 As set out in Section 1 (Part A) the SA of the draft Water Strategy incorporates a health impact assessment and the requirements of the SEA Regulations[1]. The Regulations require that an SEA to produces an Environment Report including an assessment of the relevant aspects of the current state of the environment, and the likely evolution thereof without implementation of the plan. In this case, this SEA requirement is incorporated into the SA and the current and future baseline considers aspects that cover more than just environment.

4.4 Section 3 (Part A) sets out the current sustainability baseline in relation to six topics. The information has been structured into six broad topics, by grouping the 17 sustainability appraisal objectives (see Section 2, Part A), together with a section on cross-cutting issues. These topics were specifically selected for the purposes of the SA of the draft Water Strategy, as they provide a simplified structure for presenting the relevant contextual information. The information included in this section has been specifically selected to inform the appraisal of the potential sustainability effects of the draft Water Strategy and therefore some topics are at a greater level of detail than others. The topics, and how they relate to the SA objectives, are set out in Box 16 below.

[1] Environmental Assessment of Plans and Programmes Regulations 2004 No. 1633 which implements the requirements of the European Directive 2001/42/EC, known as the SEA Directive.

Box 16: Coverage of sustainability appraisal objectives under topics within context section

1. People and Health

- Governance
- Education and Awareness
- Health and Well Being
- Equality and Diversity
- Safety and Security

2. Place

- Liveability and Place
- Accessibility and Availability
- Landscape, Historic and Cultural Environment
- Biodiversity
- Air Quality

3. Climate Change

- Climate Change

4. Water management

- Water Quality
- Water Resources
- Drainage
- Flood Risk

5. Waste and Resources

- Waste Management and Resource Use

6. Economy

- Economy

7. Cross-cutting

4.5 The sustainability baseline in section 3 (Part A) includes summaries of existing and emerging regulations, policies, plans and strategies relevant to each topic area (presented in full in Appendix 6). These existing regulations, policies, plans and strategies, together with underlying trends (such as a growing number of smaller households) are the underlying pressures and drivers for change, which will influence the status and evolution of issues that make up the sustainability baseline. Even if the Mayor were to decide not to develop a Water Strategy, the response of the underlying baseline issues and factors to these drivers and pressures will lead to potentially significant changes to the existing baseline over the 10 year intended timeframe of the strategy.

4.6 Given the complexity of and degree of uncertainty inevitable when trying to predict future change, a full understanding of this likely evolution is not possible. However, Section 3 (Part A) seeks to draw out key likely aspects of the future evolution of the baseline under each topic, over the intended 10 year time frame of the strategy. Consideration of this future baseline is an important aspect of the SA, as it is only by developing some understanding of how implementing the Water Strategy might change the evolution of these factors and issues, that a meaningful assessment can be made of its sustainability implications.

4.7 This section draws upon the sustainability context set out in Section 3 (Part A) and represents an assessment of the likely evolution of the baseline in relation to each topic, based on reviewing the baseline information, existing and predicted future trends, and the likely influence of other external plans, strategies and processes. This evolution of the sustainability baseline differs from the future Business as Usual (BAU+10) presented in Section 5, as the BAU+10 scenario is constructed to represent an alternative to the strategy, and is therefore focussed specifically on those issues addressed by the Water Strategy.

Evolution of the sustainability baseline

The influence of other policies, plans and strategies

4.8 Table 12 sets out how key existing policies, plans and strategies may influence the evolution of the sustainability baseline over the intended 10 year timeframe of the Water Strategy (2009/10 – 2019/20). This table draws on the full list of other policies, plans and strategies reviewed in Appendix 6 and listed in Section 3 (Part A). The plans included in the analysis in Table 12 are those considered to be most influential in terms of leading to change in key aspects of the baseline, they include significant national plans and regulations, and key plans and strategies prepared by the Environment Agency plans, water companies or the Mayor of London.

4.9 The list in Table 12 is not intended to be exhaustive, and many other plans and strategies will have an influence on the future evolution of the baseline in one way or another, however this selection is intended to highlight the likely key policy drivers for future change.

4.10 As noted, the predicted future sustainability baseline seeks to go beyond those topics and issues addressed specifically by the draft Water Strategy (therefore different from the BAU+10 scenario, which does concentrate on these topics and issues). However, SA, as a process, is expected to be both *'relevant'* and *'proportionate'* to the plan or strategy being appraised. As a result the policies, plans and strategies reviewed and the sustainability context information collated is intended to be relevant to the draft Water Strategy, and this focus is reflected in the policies, plans and strategies included in Table 12.

Table 12: Important policies, plans and strategies influencing the future baseline

	Period of influence, milestones (■) and description of likely effect on baseline											
Key policies, plans and strategies For full details see Appendix 6, Part A	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
National												
Future Water – the Government's Water Strategy for England (Defra 2008)												
	Summary National level strategy with a time-frame to 2030, with the overarching aim of improving water quality, ensuring security of supplies, managing water demand and use efficiency, as well as improving surface water drainage and managing future flood risk. The strategy also seeks to account for and ensure that water management is adapted to a changing climate. *Timeframe and milestones* Strategy covers entire 10 year period, and contains a detailed list of "actions". No specific milestones over period 2009 – 2019. *Influence on evolution of the baseline* Likely to influence evolution of topics: 1. People and Health; 3. Climate Change; 4. Water Management.											
Water Supply (water quality) regulations 2000 as amended 2007												
	Summary Key regulatory instrument relating to water quality. Sets requirements for water suppliers and local authorities in relation to quality of supply (wholesomeness) and water treatment. *Timeframe and milestones*											

	Period of influence, milestones (■) and description of likely effect on baseline											
Key policies, plans and strategies For full details see Appendix 6, Part A	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
	Regulations likely to cover entire 10 year period. Came into force prior to 2009, and no specific milestones over the period 2009 – 2019. *Influence on evolution of the baseline* Likely to influence evolution of topics: 1. People and Health; 3. Climate Change; 4. Water Management; 5. Waste and Resources											
The Water Environment (Water Framework Directive) (England And Wales) Regulations, 2003 Draft Thames River Basin District Management Plan (RBMP) (Environment Agency 2009)	■	■		■			■					
	Summary Transposition into English and Welsh law of the Water Framework Directive. Establishes river basins as the appropriate management scale for water issues (ecological quality, abstraction, supply, demand management, flooding). *Timeframe and milestones* Regulations cover entire 10 year period and beyond. Milestones include: - By December 2009 – establish Thames River Basin Management Plan. - December 2009 – establish programme of measures in the Thames river basin district to deliver environmental objectives (ensuring good ecological quality). - 2010 – ensure proper water pricing policies are in place. - December 2012 – programmes of measures in each river basin district to become operational. - By December 2015 – main environmental objectives to be met, and Thames RBMP to be reviewed and updated – RBMPs to be reviewed and updated on a 6-yearly cycle. *Influence on evolution of the baseline* Likely to influence evolution of topics: All, but especially 4. Water Management.											
Climate Change Act (2008)			■					■				
	Summary The Climate Change Act provides the highest level framework for tackling climate change. It sets binding targets for the reduction of green house gas emissions, and improve carbon management. It also includes specific measures to support climate change adaptation, including a UK wide climate risk assessment and national adaptation programme – both to be reviewed every 5 years. The Act also gives the Government the power to require public authorities and statutory undertakers (including water companies) to report on how they have assessed the risks of climate change and how they will address these risks. *Timeframes and milestones* 1st national risk assessment report due 2011 (3 years after Act came into force) and every 5 years. Annual reports on progress towards meeting mitigation (emissions) targets, as well as progress in meeting adaptation objectives. *Influence on evolution of baseline* Statutory national targets to reduce carbon emissions are intended to drive change to a lower-carbon economy. The national climate risk assessment and requirements on statutory undertakers including water companies to plan for climate risks are likely to raise awareness and reduce vulnerability to climate impacts. Likely to influence evolution of topics: 2. Place; 3. Climate Change; 4. Water Management; 6. Economy.											
Draft Flood and Water Management Bill (Defra												
	Summary											

	Period of influence, milestones (■) and description of likely effect on baseline											
Key policies, plans and strategies For full details see Appendix 6, Part A	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
2009)	The draft Flood and Water Management Bill has been prepared in response to the Pitt Review (2008) and the EU Floods Directive. The draft Bill is intended to present a national policy response to the predicted impacts of climate change and population increase, especially increased water demand and more frequent extreme weather events, more widespread water stress, increased risk of drought, more water quality problems and a greater risk of flooding. Key provisions of the Bill include: clarifying responsibility for flood risk management; enabling water companies to control more non-essential uses of water during droughts; encouraging sustainable drainage; making it easier to resolve sewage misconnections. *Timeframes and milestones* Consultation on the draft Bill closed on July 24 2009. The timeframe for progressing the Bill through parliament has not yet been set. *Influence on the evolution of the baseline* The Bill, once adopted as an Act has the potential to provide the high policy framework for change in relation to a number of water and flood related issues. In particular the promotion of sustainable drainage, better management of flood risks, and action to improve sewage misconnections, which is a significant issue in parts of London. Likely to influence evolution of topics: 3. Climate Change; 4. Water Management											
Code for Sustainable Homes (DCLG 2008)		■			■			■				
	Summary The Code for Sustainable Homes provides a single national standard for the design and construction of more environmentally sustainable homes. To achieve higher code levels (from 1 – lowest, to 6 – highest) greater levels of energy, water, resource and other environmental efficiencies need to be met. For example a Code level 1 home would achieve 20% greater water efficiency than an average new home. Through a phased tightening of the Building Regulations certain elements of the Code are to be made statutory for new homes (and potentially new non-domestic buildings). *Timeframes and milestones* Under proposed changes to the Building Regulations, the follow milestones apply: 2010 – 25% improvement in the energy efficiency of new homes / 25% improvement in energy efficiency of new non-domestic buildings (proposal). 2013 – 44% improvement in the energy efficiency of new homes. 2016 – all new homes to be "zero" carbon. *Influence on evolution of baseline* Although statutory requirements do not include water efficiency goals, it is likely that homes built to higher levels of energy efficiency may also include other efficient design and fittings. Likely to influence evolution of topics: 3. Climate Change; 4. Water Management; 5. Waste and Resources.											
London												
Thames and London Catchment Abstraction Management Strategies (CAMS) (Environment Agency, 2004 and 2006)		■		■								
	Summary CAMS set out a strategic assessment of water abstraction in each area, setting out where water is, or is not available for abstraction, and forming the basis for the granting of abstraction licences. CAMS were initially developed on a cyclical basis, with the first cycle running from April 2001 to March 2008. From 2008, CAMS need to be updated, and the process											

	Period of influence, milestones (■) and description of likely effect on baseline											
Key policies, plans and strategies For full details see Appendix 6, Part A	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
	of managing abstraction licenses is to be modified to be "time-limited" and more responsive to uncertainties, such as the effects of climate change. *Timeframes and milestones* No specific milestones, however CAMS are intended to be 6-yeart plans, and thus the Thames and London CAMS will need to be reviewed and updated in 2010 and 2012 respectively. *Influence on evolution of baseline* When new CAMS are developed for Thames and London, the new approach to abstraction management and especially time-limited licensing is likely to help better regulate, manage and restrict excessive abstraction. Likely to influence evolution of topics: 1. People and Health; 3. Climate Change; 4. Water Management.											
Thames region Catchment Flood Management Plan (CFMP) (Environment Agency 2009) Thames Estuary 2100 project and TE2100 Flood Risk Plan, consultation draft (Environment Agency 2009)												
	Summary The Thames CFMP is a region-wide flood risk management plan, with a planning timescale of 50-100 years. It identifies future flood risks, and opportunities and priorities for managing these risks. The TE2100 project was founded with the aim of developing a long-term tidal flood risk management plan for London and the Thames estuary. In April 2009 a draft flood risk plan was published which describes the actions that are needed in the short (2010-2035) medium (2035-2070) and long term (2070-2100) to manage flood risk, and who will undertake them. The plan provides detailed action plans for the management of flood risk on the tidal Thames. *Timeframes and milestones* No specific milestones. CFMP covers the 10 year strategy period, and beyond, with a planning timescale of 50-100 years. TE2100 flood risk plan also covers the entire 10 year strategy period, and beyond. Some actions are prioritised within the period 2009 – 2020, however these are to numerous to detail here. *Influence on evolution of baseline* Thames region extends beyond London, however the appropriate management of flood risk in London is considered explicitly within the CFMP. The TE2100 sets out the strategic direction for managing flood risk in discrete policy areas across the estuary, and contains recommendations on what actions the Environment Agency and others will need to take. Likely to influence evolution of topics: 1. People and Health; 2. Place; 3. Climate Change; 4. Water Management.											
London Plan (GLA 2008) A New Plan for London (GLA 2009)	■		■	■								
	Summary The London Plan is the key spatial plan for London. A number of policies relate to issues the draft Water Strategy seeks to address, these are listed in Appendix 6 (Part A). The key mechanism for the delivery of policies included in the London Plan is through London borough's Local Development Frameworks / Development Plan Documents. The Mayor has recently published his intention to review the London Plan. Although *A New Plan for London* does not include specific revisions, however it outlines the Mayor's intention to: strengthen policies to minimise and manage flood risks, especially to development and infrastructure; continue to promote sustainable drainage; protect and conserve water supplies; support improved sewerage infrastructure; ensure water quality is protected and improved. The Mayor also intends to explore the concept of water neutrality. *Timeframes and milestones* Formal end date of the London Plan is 2026, however many targets included relate												

Key policies, plans and strategies For full details see Appendix 6, Part A	Period of influence, milestones (■) and description of likely effect on baseline 2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	to 2016. Milestones for specific targets are not included here. Public consultation on a full draft new London Plan is planned for autumn 2009, with a new London Plan intended for publication in the winter of 2011 – 12. *Influence on evolution of baseline* The London Plan contains specific targets (among many others): - Housing development. - A maximum water use target of 105 litres per person per day for residential development (to be reviewed). - That leakage reduction targets should be met or exceeded. - CO_2 emissions reduction targets. - Waste management and recycling targets. Likely to influence evolution of topics: All.											
Sustaining Success – the Mayor's Economic Development strategy (GLA and LDA 2005)	*Summary* The Economic Development Strategy (EDS) seeks to set out a plan for the sustainable, equitable and healthy growth and development of London's economy to 2016. Recognises the importance of the city's waterways and rivers in contributing to London's success – both as transport routes and as a source of value themselves. *Timeframes and milestones* The EDS has timeframe to 2016. No specific milestones. *Influence on evolution of baseline* Provides outline of priorities and high-level support for investment in: infrastructure and places; people; enterprise; marketing London. Seeks specifically to promote development of London's waterways as a "contributor to London's success". Supports "the most effective and sustainable way of using resources" – including water. Likely to influence evolution of topics: 1. People and health; 6. Economy.											
London Transport Strategy (GLA 2001) and Revisions (2004 and 2006) Transport: Way to Go! (GLA 2008)			■									
	Summary The London Transport Strategy, and revisions set out measures to improve transport infrastructure especially for public transport and to reduce congestion. Investment is targeted in rail, underground and bus infrastructure. The congestion charge and low emissions zones (now being implemented) were key proposals in the transport strategy. Transport Way to Go! Sets out the Mayor's initial proposals for a revised Transport Strategy for London to replace the current strategy a the end of it's proposed strategic timeframe (2011). *Timeframes and milestones* The Transport Strategy (2001) has a 10 year timeframe (2001 – 2011). Way to Go! Is the precursor to the Mayor's new transport strategy which will replace the current strategy. The Milestone recorded above is the end-date of the current Transport Strategy, and assumed introduction of the Mayor's new strategy. *Influence on evolution of baseline* Both the existing Transport Strategy and the Mayor's proposals for a new Transport Strategy support the promotion of London's waterways for transporting people and freight. Likely to influence evolution of topics:											

	Period of influence, milestones (■) and description of likely effect on baseline											
Key policies, plans and strategies For full details see Appendix 6, Part A	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
	1. People and health; 6. Economy.											
Water Resources Management Plans For each water company serving London: - Thames Water - Three Valleys Water - Sutton and East Surrey Water - Essex and Suffolk Water		■										
	Summary Each water company is required to produce a water resource management plan, setting out how they will supply water to meet customer needs (and new demand, such as from housing development) over a 25 year period (2010 – 2035). Given this long timeframe the plans set out how they will respond to underlying trends, such as population changes, climate change and lifestyle changes. *Timeframes and milestones* Water resource management plans have a 25 year time frame, 2010 – 2035. *Influence on evolution of baseline* The plans set out, for example how the water companies will: - Ensure security of supply, such as through provision of new resources. - Invest in leakage reduction measures. - Promote and support demand management, through water efficiency and increased metering. Likely to influence evolution of topics: 1. People and health; 3. Climate Change; 4. Water resources; 6. Economy.											
Future water and sewerage charges 2010 – 15: Draft determinations Ofwat (2009)	*Summary* Ofwat's price determinations (draft proposals) set limits on the prices that water and sewerage companies can charge their customers between 2010 and 2015. Under the proposed prices set by Ofwat, household bills will remain broadly stable until 2015. *Timeframes and milestones* The price determinations set the prices that can be charged by water and sewerage companies over the period 2010 – 2015. *Influence on evolution of the baseline* By setting prices at a level aimed at broadly keeping household bills stable, the price determinations should help reduce the risk of water and sewerage companies passing on costs (e.g. for leakage reduction or resource development) to consumers. This may help reduce the number of households at risk of water poverty. Likely to influence evolution of topics: 1. People and health; 4. Water resources; 6. Economy.											

Predicted evolution of the baseline topics in the absence of the strategy

4.11 Drawing on the analysis in Table 12, and the highlighted aspects of the future evolution of the sustainability baseline presented under each topic in the sustainability context in Section 3 (Part A), Table 13 sets out in more detail how the sustainability baseline may evolve, in the absence of the draft Water Strategy, over its intended 10 year timeframe.

4.12 Table 13 describes key predicted future trends and how these may influence the evolution of the future baseline (based on the sustainability context described in Section 3 (Part A)). These predicted future trends, and possible effects on the evolution of the baseline are divided by the baseline topics set out in Box 16. There are some key drivers or pressures which will influence all topics, such as the projected growth in London's population, proposed

housing development targets, and the predicted impacts of a changing climate[2]. These are discussed under the cross-cutting topic, however these high-level drivers of change are also incorporated where appropriate within the topic specific trends.

Table 13: Summary of key trends and likely evolution of the baseline under each topic

Predicted future trends For further details see Section 3, Part A	**Likely evolution of the baseline**
People and health	
Positive change in some of the determinants of health.	Overall health likely to improve, however it is likely that existing health inequalities, and inequalities relating to (for example) employment and access to education, will continue, and could worsen.
Improved levels of access to and amenity of London's water waterways.	Positive health and quality of life effects likely, especially where more people use London's waterways for walking, cycling and relaxation.
Increased use of waterways for transport and recreation.	If increased use of waterways for transport reduces the amount of road traffic beneficial air quality, noise disturbance and associate effects are possible. Increased recreational use of waterways likely to have beneficial health effects by encouraging greater levels of physical activity.
Increased penetration of domestic water metering.	Beneficial effect on managing water use and helping to balance water supply and demand. However, an increase in water bills could impact negatively on vulnerable and low-income households, and increase the proportion of households facing "water poverty" – where more then 3% of household income is spent on water services.
Increased frequency and severity of floods due to climate change, and pressure for increased development in areas at risk of flooding.	As flood events have a disproportionate effect on vulnerable groups, this may result in increased negative effects on these groups.
Place and quality of surroundings	
Overall projected population increase and a trend towards higher population densities in many areas.	A number of effects likely to arise from increased population and population density, including: - A rise in noise pollution and disturbance. - Air pollution due to increased need to travel and car journeys.
Improved amenity of London's waterways and blue ribbon network.	Areas around London's waterways likely to become more attractive places to live, work and for recreation.
Increased levels of built development to meet housing and employment growth goals.	Increased levels of development will put pressure on existing land-uses, including greenspaces, habitats, areas of biodiversity value, and sport / play spaces.
Climate Change	
Warmer drier summers	Reduced reliability of water resources (river flows, groundwater recharge etc), potentially restricting options for supply, requiring more frequent drought actions and influencing the environmental and amenity value of watercourses. This overlaps with the Water Resources topic. More intense urban heat island effect, especially during hot summer periods. This overlaps with the People and Health topic.
Warmer wetter winters	Increased risk of all types of flooding, reduced number of winter deaths attributable to cold. This overlaps with the People and Health topic.

[2] Although climate change itself is in essence a "response", to the "driver" of increased levels of green-house gas emissions in the atmosphere arising from the burning of fossil fuels and other (largely) anthropogenic activities.

Predicted future trends For further details see Section 3, Part A	**Likely evolution of the baseline**
Higher frequency and severity of storms and rainfall	Increased risk of flooding, especially surface water, groundwater and river flooding. Increased risk of combined sewer overflows (CSOs). Disruption and damage to property and infrastructure. This will overlap with People and Health, Place, Water Resources and Economy topics.
Rising sea levels and more frequent and significant tidal surges	Risk to tidal flooding effecting large areas of London. Potentially significant damage and disruption to infrastructure and property. This overlaps with People and Health, Place, Water Resources and Economy topics.
Implementation of the Climate Change Act and London Climate Change Strategy, as well as other initiatives and programmes.	Promotion of energy efficiency in new development, new technologies and raised awareness of climate change as an issue may lead to a decline in per-capita energy use and CO_2 emissions over the next 10 years. However, overall energy consumption and emissions could rise due to projected increases in population and economic development. This overlaps with People and Health, Place and Economy topics.
Water Management	
Implementation of water regulations, especially the Water Framework Directive.	The chemical and biological quality of London's waterways is improving. Implementation likely to lead to improvements in the ecological quality of London' waterways, but potential improvements could be undermined by the effects of a changing climate.
Introduction of measures to encourage water use efficiency (e.g. Code for Sustainable Homes).	May help reduce London's water deficit by reducing per-capita usage. However, if projected population and development growth outweighs improvements in per-capita use of water, overall water demand will rise, exacerbating existing deficits.
Development of new water resources.	May help reduce London's water deficit by increasing supply, although significant new resource development is likely to take more than 10 years to plan and construct.
Replacement and repairs to water supply infrastructure.	Reduced leakage and thus water lost during supply, which is likely to help reduce London's water deficit.
Effects of a changing climate (see Climate Change topic).	Many effects, including: - Reduced river flows in hot / dry periods. - Increased incidence of all types of flooding including combines sewer overflows. - Exacerbation of London's water deficit. See Climate Change topic for more detail.
Waste and resources	
Statutory waste management and recycling targets, and campaigns to encourage behaviour change.	Decrease in waste arisings and increase in recycling and composting levels. However, projected increase in population and construction will result in increased resource use and waste generation – both domestic / municipal waste, sewage sludge, and construction and demolition waste. Dealing with this waste may pose a threat to water quality, such as through increased leachate.
Economy	
London to continue to have a strong and dynamic economy	Existing extensive economic inequalities likely to continue and to increase over time.
Current economic downturn to continue for at least the first few years of the 10 year period.	The effects of the ongoing economic downturn are likely to exacerbate economic inequalities, and restrict investment in new development and projects (including those related to water).
Increased levels of housing and other built development.	Pressure on land for housing and other development likely to lead to developments encroaching further into areas at risk of flooding.

Predicted future trends For further details see Section 3, Part A	**Likely evolution of the baseline**
Climate change impacts, especially increased incidence and severity of floods.	Flooding can have significant negative economic and social effects, disrupting transport networks and other infrastructure, inundating homes and businesses, and impacting on physical and mental wellbeing of those affected, which in turn imposes and economic cost on society. Increased risk and incidence of flooding will increase the potential scale and risk of these costs.
Cross-cutting	
Population increases	Relates to all topics. Significant effects on all aspects of water use, management and disposal in the capital, potentially increasing demand for water (even where per-capita use falls), increasing effluent requiring treatment and disposal, and putting ever greater pressure on existing sewage infrastructure.
Increased housing and other built development.	Relates to all topics. Pressure to build new homes / commercial developments may lead to more homes and businesses being located in areas at risk of flooding, exacerbate flooding elsewhere and increase the number for properties, infrastructure and people vulnerable to flooding.
Climate change effects	Relates to all topics, especially Climate Change. Will affect all aspects of life in London, and may impact particularly on water related uses such as flooding and the reliability of supply.

5. APPRAISAL OF STRATEGIC ALTERNATIVES

Main strategic alternatives considered

5.1 The Mayor has limited powers over many issues concerning water management in London. The draft Strategy is therefore largely intended to be an influencing document and will need to be delivered through a partnership of organisations. As a result, and given the strategic nature of the Water Strategy and wider policy context, the range and scope of alternatives that could be considered as part of the strategy development and the SA processes were potentially limited. However, the SA has considered broad strategic alternatives including the business as usual situation along with the predicted situation in 10 years time without the implementation of a Water Strategy. Considering this scenario was particularly useful as it provided an indication on whether the Mayor's draft Water Strategy will make a significant difference to the sustainability of water management in London.

5.2 As described in the methodology section (Part A, Section 2), due to time that has elapsed, and the significance of the differences between them, the previous draft Water Strategy (December 2007) has also been considered as a discrete option to the final draft Water Strategy (August 2009).

5.3 As part of the appraisal of alternatives, the SA also considered the sustainability effects of each of the elements in the three policies included in the draft Strategy covering water use, rainwater drainage and wastewater disposal (see Section 6 below) both individually and as part of a package of measures. Whilst some of these elements are intended to operate in combination, others are hierarchical and represent discrete alternative management options. This is also described in Section 2 (Part A).

5.4 Figure 7 below illustrates the approach to appraising the sustainability of the draft Water Strategy including alternatives.

Summary of the business as usual, future business as usual and previous draft Water Strategy scenarios

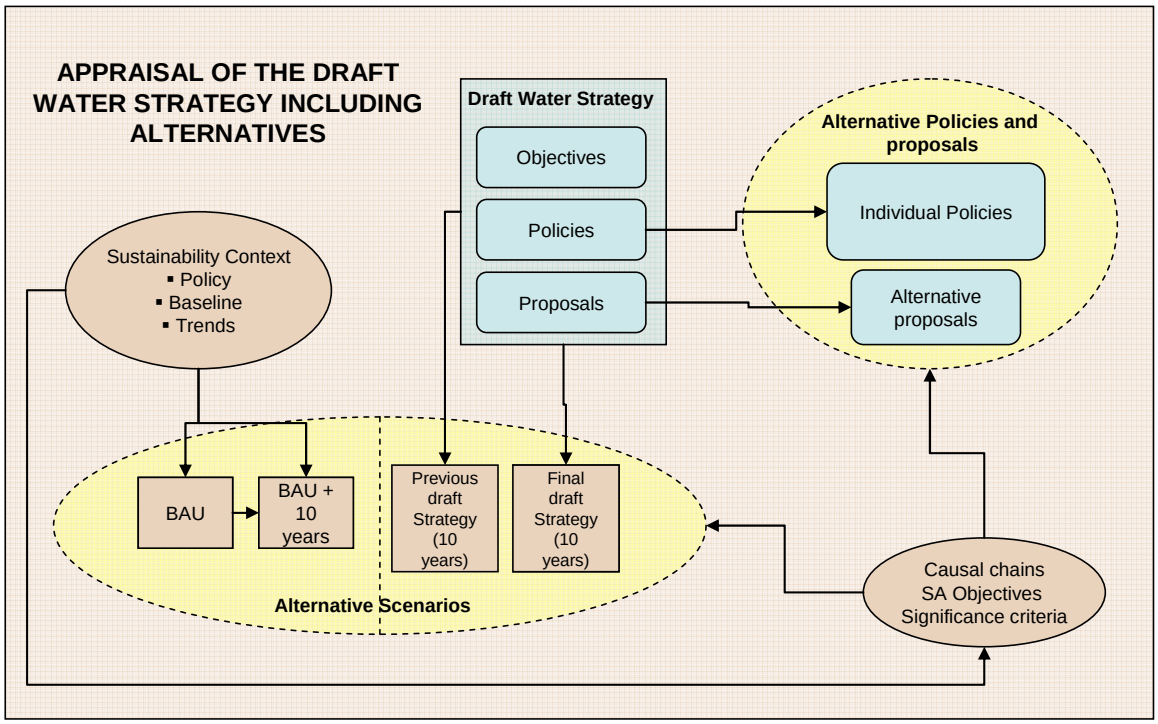
5.5 In order to assess the overall effectiveness of the final draft Water Strategy in meeting its objectives and whether it will make a difference compared with what will happen as a result of existing trends and policy and initiatives, four scenarios were examined. A summary description is presented in Table 14:

- **Business as usual (BAU)** - the current situation of water management in London and key existing sustainability issues. This scenario was constructed using the baseline information and policy context presented in Section 3 of the SA Report.
- **Future business as usual (BAU+10)** - the predicted future situation of water management and potentially key sustainability issues in London in 10 years time. This timescale was chosen because it is the same as the period covered by the draft Water Strategy. This scenario was constructed using trends and predictions identified in Section 3 and the BAU scenario to present an estimate of the future situation without the implementation of the draft Strategy.
- **Previous draft Water Strategy (December 2007)** – the version of the draft strategy prepared following consultation with the London Assembly and function bodies. This scenario was included as the policies and proposals differed considerably from the

current draft (August 2009) and was considered as a reasonable alternative to the latest draft. This previous draft was subject to appraisal earlier in the process.

- **Final draft Strategy (August 2009)** – this scenario provides a description of the draft Strategy as currently proposed.

Figure 7: Appraisal of the Draft Water Strategy including alternatives



5.6 Table 14 summarises the current and predicted policy context and key issues for water management in London (current BAU and future BAU). The table is divided into four water themes covered in the draft Strategy: water resources, water use, drainage and wastewater disposal. The table also summarises the approach to managing these themes included in the previous and current draft Water Strategy.

Table 14: Summary of the Alternative Scenarios

Current BAU	Future BAU (10 years)	Previous draft Strategy (December 2007)	Final Draft Strategy (August 2009)
Water resources			
London is one of the capital cities with the lowest per capita water availability. The capital experienced the last serious drought in 2005-06 which caused a hosepipe ban. 80% of London's supply is abstracted from the Thames upstream of Teddington Weir and the River Lee and stored in reservoirs; the remaining 20% come from local groundwater in the chalk aquifer under London[3]. Most of London's water comes from outside the region. Although Thames Water met its leakage reduction targets in 2007/08 and 2006/07, this was not the case for the previous three years and leakage levels are still high. Disruption caused by fixing leaks is one of the barriers to reducing leakage levels. In addition, most of the water resource units in London are already considered over abstracted. The over abstraction of water resources also has implications for water quality and its environmental and amenity value. A report by the Environment Agency on the 'significant water management issues' in each of the10 river basin districts in England and Wales found in the Thames RBD large populations and low rainfall mean that one third of aquifers and 17% of rivers are over abstracted. This means that over abstractions are a key problem in achieving the environmental objectives of the WFD[4].	Droughts are likely to become more frequent over the next 10 years due to climate change. The London Plan includes a target for 30,500 additional homes per year until 2016[5]. In 2007 London contained 3.22 million dwellings (up from 2.91 million in 1991), 3.11 million households and 1.11 million single person households in 2004[6] so if the target is reached, new homes will add around 1% to the existing stock every year or 10% more homes over the next 10 years. New housing built in London over the next ten years would, alone, lead to the use of 66 million extra litres of water per day (not including leakage). However, if Thames Water reduces their leakage to their target for 2009-10, i.e. 685 million litres per day this would be around 30 ml/day more available water compared to 2007-08 leakage rates (715 ml/day). This will also have a positive effect on achieving energy efficient water operations as the water lost to leakage has already been treated with the consequent energy use. However, if leakage reduction is partly achieved by a reduction in pressure this would have potential impacts on certain people, for instance those who live in high rise buildings (usually low income) or those with health problems that require high water use, etc. Fixing and replacing leaks causes disruption e.g. to transport, in order to meet leakage targets. Thames Water's Draft Water Resources Management Plan indicates that so far 800km of pipes have been replaced in London and that by 2010 a total of 2,168km will be replaced but there is no longer term information[7]. So it is uncertain whether the disruption is likely to continue or increase in the next 10 years. However, some initiatives to minimise disruption have been recently put in place: e.g. the LONDON Works Programme which provides a register of all street works which should enable utilities to plan their own work with regards to other ongoing activities. Thames Water will probably include a longer term leakage management plan in its Water Resource Management Plan which will be consulted on next year, finalised in 2009 and take	The approach to water resources management that the previous draft Water Strategy promoted was based on reducing leakage and increasing water efficiency, reclaiming rainwater and greywater and developing new resources as a last resort. The previous draft Strategy contained several proposals to support this approach. For instance, one of the proposals calls for Thames Water to prepare a 25 year plan for replacing the Victorian infrastructure in London. This plan would be developed in consultation with the GLA, the Environment Agency, Ofwat and the Consumer Council for Water. The previous draft Strategy also contained a proposal for universal metering in London (10 years for houses and 20 years for flats) that would be beyond current water companies predictions for metering (see future scenario under water use below). Linked to this, the previous draft Strategy contained a proposal to investigate the potential effect of different tariffs in order to protect vulnerable consumers from an increase in their water bills due to metering. The previous draft Strategy included a new standard for water efficiency in new developments of 105 litres per person/ per day. The previous draft Strategy also included a proposal for major developments to provide a proportion of their water consumption through on-site	The final draft Water Strategy promotes the same hierarchy for the management of water resources as the previous draft. The draft Water Strategy contains proposals to support this approach, although these differ from those in the previous draft Strategy. Proposals include: encouraging Thames Water to achieve the best UK industry standard of leakage by 2035; support for the introduction of metering in all houses by 2015 and blocks of flats by 2020; encouragement that all homes should meet Code for Sustainable Homes Level 3 by 2010 and 6 by 2016; and, proposals to raise awareness of the benefits of water efficiency and the quality of London's tap water. Code Level 3 would require household water consumption of not more than 105 litres/person/day, and Level 6 80 litres/person/day. Proposals in relation to metering and new homes meeting higher Code Levels are seeking change over and above current standards (e.g. water companies predictions of metering penetration, and mandatory requirements in relation to the Code).

[3] Water Strategy, May 2009 draft
[4] ENDS Report 391, August 2007, p.45-46, 'Hurdles to meeting water targets mapped'

Current BAU	Future BAU (10 years)	Previous draft Strategy (December 2007)	Final Draft Strategy (August 2009)
Recent flooding has highlighted the lack of contingency measures to protect water supply in an emergency.	effect in 2010. However, leaking pipes also cause considerable disruption, for instance to London Underground, and leakage management should reduce this. Thames water is in the process of commissioning a major desalination plant in Beckton. When complete this will contribute to achieving security of supply. However, this will have other implications in terms of emissions, energy use and other impacts, e.g. increase in water bills. Thames Water has also proposed a major new reservoir near Abingdon in Oxfordshire to help cope with the projected future increase in demand for water from London, Swindon and Oxfordshire[8]. However, following comments from the Environment Agency, Thames Water has delayed the scheme by 5 years[9] and even if it were to progress at a later date, given the predicted planning and construction timescales, the reservoir would not be operational until 2025 at the earliest. The EA considers that the additional homes planned in the Thames RBD will add to the problem of over abstractions[10].	reclamation. The previous draft Strategy also proposed the development of a water action plan/ framework to set out how the Strategy's preferred approach to water resources management and the related proposals would be implemented in practice.	
Water use in London			
Per capita water use in London is estimated at about 161 litres per day and has risen from 87 litres per day in 1961. Only a minority of homes are metered, so there is no financial incentive to decrease water consumption. In addition, consumers often underestimate their consumption and fail to make the link between water use and its effect on the water environment. Water consumption is tied to human behaviour, habits and other social	Water companies predict that the average water use in the South East will increase to 180 litres per person per day by 2030. The increase is expected to be the result of a number of factors including increase in garden watering and additional water for personal hygiene[11]. Single person households (which have larger per capita water consumption) are also on the increase. Increasing the water efficiency of new buildings will have a very small effect on total water use as new build is a small proportion of total stock (approximately 10% more in the next ten years as discussed above). Defra will allow water companies in water stressed areas (including the entire South East) to implement 'compulsory metering'[12]. The draft Flood and Water Management Bill[13]	See above comments under Water Resources. In addition, the previous draft Water Strategy contained a proposal for water companies to collect more disaggregated data on water use in order to better understand the social factors that influence this consumption.	See above, especially proposals to encourage the rapid introduction of water metering, and that new homes should meet Code for Sustainable Homes Level 3 by 2010 and Level 6 by 2016.

[5] GLA (2008) The London Plan (Consolidated with Alterations Since 2004) *Policy 3A.1*
[6] Sustainable Development Indicators- London Factsheet (March 2009); available: http://www.defra.gov.uk/sustainable/government/progress/regional/documents/london_factsheet.pdf Accessed: 12/05/09
[7] Thames Water (2008) Draft Water Resource Management Plan (2008) – Volume 2 Main Report
[8] Thames Water (2008) Draft Water Resource Management Plan (2008) – Volume 2 Main Report
[9] Thames Water (2009) Statement of Response – Draft Water Resource Management Plan (2009)
[10] ENDS Report 391, August 2007, p.45-46, 'Hurdles to meeting water targets mapped'
[11] Do we need large-scale water transfers for south east England?', Environment Agency, 2006
[12] Defra (2007) The government's response to the consultation on water metering in areas of serious water stress
[13] Defra (2009) Draft Flood and Water Management Bill

Current BAU	Future BAU (10 years)	Previous draft Strategy (December 2007)	Final Draft Strategy (August 2009)
factors which are poorly understood. Water companies also lack incentives to promote water efficiency. Drinking water quality is very high in London, however sales of bottled water remain high.	proposes enabling water companies to control more non-essential uses of water during droughts. Thames Water has stated that it prefers a targeted progressive metering strategy over installing new water meters on change of occupancy[14] and that progressive metering over a ten year period, starting in 2010. The other water companies in London plan to focus on installing meters on change of occupancy. This means that levels of metering will increase in London, with the three water companies responsible for delivering drinking water in London included projections of meter penetration in their draft Water Resource Management Plans. There is likely to be an increase in water bills in London, reflecting the costs of large infrastructure projects including the desalination plant in Beckton and the Tideway Tunnel which is intended to reduce combined sewer overflows (see below). Unless action is taken to help specific target groups this may increase the number of households that spend more than 3% of their disposable income on water and sewerage. However Ofwat has recently produced its draft determinations on price limits for the period 2010 – 2015[15], which set the prices which water companies can charge their customers. These seek to limit the extent that water companies can pass on costs to consumers, and the price levels proposed by Ofwat are consistently below water company business plan estimates. Climate change is predicted to increase the frequency of droughts and this could lead to more hosepipe bans, and other measures to control non-essential water uses, especially when the draft Flood and Water Management Bill (see above) is passed into law. Water companies may receive more incentives to increase their customers' water efficiency. For instance, Ofwat has set voluntary targets for water companies in water stressed areas to reduce the volume of water delivered to customers by 1% until the end of the current spending review (2005-2010). Reuse of greywater and rainwater harvesting are likely to remain minor options reserved for new developments. The London Plan includes maximising rainwater harvesting and grey water recycling as two of a series of measures to achieve efficient use of water (Policy 4A.16).		

[14] Thames Water (2008) Draft Water Resource Management Plan (2008) – Volume 2 Main Report.
[15] Ofwat (2009) Draft determinations on price limits 2010 – 2015 – see http://www.ofwat.gov.uk/

Current BAU	Future BAU (10 years)	Previous draft Strategy (December 2007)	Final Draft Strategy (August 2009)
Rainwater drainage in London			
The existing drainage system was not designed to cope with current population. In addition, increased development and paving of gardens, etc is increasing the amount of run off. This has an impact on the risk of surface flooding and also has negative impacts on the water environment. Rainwater harvesting is still a very minor option in London limited to the use of waterbutts and some isolated new schemes. The cost of incorporating SUDS in developments is not necessarily higher than other drainage options, however the costs and responsibility for maintenance and management of the schemes are often an issue. Recent floods (e.g. summer 2007) have highlighted both the risk and consequences associated with poorly maintained drains and surface water flooding, but also the lack of co-ordination and gaps in the governance of the drainage system.	The projected rise in population in London will continue to increase pressure on the drainage system. The frequency and severity of storm events is also predicted to increase due to climate change. The trend to pave over front gardens is also likely to continue. However, it could be mitigated by policy 4A.14 of the London Plan, which provides for the retention of soft landscaping in front gardens, and the fact that planning permission is now required for impermeable surfaces in front gardens larger than 5 square metres. The draft Flood and Water Management Bill (2009) prepared in response to the Pitt Review (2008) and the EU Floods Directive includes key provisions relating to: clarifying responsibility for flood risk management and encouraging sustainable drainage. PPS25 identifies the potential for SUDS to reduce flooding downstream of developments and promotes the incorporation of sustainable drainage in developments. It also suggests that local authorities should work closely with the Environment Agency, sewerage undertakers, navigation authorities and prospective developers to enable surface water run-off to be controlled as near to the source as possible through SUDS[16]. London Plan Policy 4A.14 on Sustainable drainage states that 'the use of sustainable urban drainage systems should be promoted for development unless there are practical reasons for not doing so.' The hierarchy included in Policy 2 of the draft Water Strategy is included under this policy. However, even if SUDS were included in all new developments, new build will only constitute a small proportion of total housing stock even over the 10 year period. In the absence of large scale changes in drainage practice, proposed development and population pressures in London may lead to more localised flooding caused by overflowing of drains and also by surface water having nowhere to go. Increased surface flooding will cause an increase in both economic and social (health, wellbeing etc) effects of flooding. Flood mortality and morbidity will increase particularly mental health effects, but also, potentially direct deaths by drowning. Recovering from these and economic effects will be harder for low income groups and other vulnerable people.	The previous draft Water Strategy's preferred approach to surface water management was based on first reclaiming rainwater for non-potable uses, then providing sustainable urban drainage and attenuation, when this is not possible discharging to a watercourse or separate drain and as a last resort discharging surface run-off to a combined sewer. The previous draft Strategy contained proposals for new developments of a certain size (more than 10 dwellings) to manage their water run-off so there is a reduction of 50% compared to the undeveloped site. Another proposal required large developments (over 100 dwellings) to establish a separate foul and surface water drain when a surface water drain or receiving watercourse is available. The aim of this proposal was to avoid excess run-off being discharged into the combined sewer system which may lead to combined sewer overflows and localised flooding. The previous draft Water Strategy also included a proposal to map the drainage network including its ownership and assess the potential for surface flooding and the drainage system capacity.	The final draft Water Strategy adopts the same preferred hierarchy for the management of surface water. The final draft Water Strategy contains two proposals to support the management of surface water, and these are considerably altered from those in the previous draft Strategy. A proposal is included to encourage rainwater harvesting, grey water recycling and sustainable drainage. This is intended to be delivered through policies in the new London Plan. A further proposal seeks a strategic London level Surface Water Management Plan, to be developed through the Drain London Forum, working with other partners.

[16] http://www.ciria.org/suds/planning_england_and_wales.htm

Current BAU	Future BAU (10 years)	Previous draft Strategy (December 2007)	Final Draft Strategy (August 2009)
	This will also have a negative effect on the water environment and associated wildlife as untreated rainwater runoff will be discharged untreated in watercourses causing an increase in pollution and alteration of natural flows. The reduction in water quality will have a knock on effect on the amenity and recreational value of watercourses and a reduction of potential health and well-being benefits.		
Wastewater disposal in London			
Most of central London's sewerage network is over 100 years old and was not designed to cope with the current level of population. This network is mostly 'combined' i.e. one pipe for sewage and drainage. Combined sewer overflows (CSOs) allow diluted storm sewage to (caused by storm events overwhelming the sewers) to spill untreated into the Thames with consequences for the quality and aesthetics of the river. The pressure on the sewer system also causes an increase in the risk of sewer flooding. In newer areas, a separate foul water system exists. However, misconnections of the foul and rainwater drains are common in London and have a negative impact on the water environment and increase the risk of sewer flooding. In the Thames River Basin District one of the main point source pollution problems comes from CSOs on the tidal Thames and the River Lee[17].	The projected increase in population and per capita water consumption will increase pressure on the sewerage system. As discussed above, new build will constitute around 10% more housing in London, over the 10 year period (approximately 1% per annum) which could in theory lead to a similar increase in the amount of wastewater produced by households (this does not take into account potential increase in water consumption or potential water recycling). Construction of the first stage (the Lee Tunnel) of a planned interceptor tunnel project to intercept unsatisfactory CSOs, is expected to commence in 2009, and be completed by 2014. Construction of the second phase (Thames Tunnel) is not expected to begin before 2012 with completion expected in 2020. Before the completion of these tunnels more sewer flooding and more combined sewer overflows could occur from the combination of higher population density, more frequent (and intense) storms caused by climate change and the limited capacity of the sewerage system. This will have a knock on effect on biodiversity and the amenity and recreational value of water courses. However, improvements to water treatment will be necessary over the next few years in order to achieve the standards set by the WFD.	The approach promoted by the previous draft Water Strategy to manage the disposal of wastewater was to discharge to a separate sewer whenever possible and to a combined sewer as a last resort. However, the previous draft Strategy recognised that in most cases there is not likely to be a choice. The previous draft Strategy contained proposals to address two key issues related to this theme in London: reducing the risk of sewer flooding and reducing misconnections. The former was a proposal to establish a programme to remove the risk of sewer flooding from properties in the risk register. The latter was a proposal that aims to investigate how misconnections may be better identified in household surveys at the time of sale.	The final draft Strategy proposes the same approach to managing the disposal of wastewater. The final draft Water Strategy includes three proposals to support this approach. These include: support for the construction of the Thames and Lee Tunnels to reduce storm discharges to the Thames; encouragement for the use of surveys to identify sewer misconnections; and, proposed partnership working to identify means of managing sewage to provide renewable energy and reduce greenhouse gas emissions.

[17] Environment Agency (2009) Water for life and livelihoods, a consultation on the draft River Basin Management Plan for the Thames River Basin District

Appraisal of the Alternative Scenarios

5.7 In order to provide a comparison with the final draft Water Strategy (August 2009) (see Section 6) the sustainability of the current and future BAU scenarios, as well as the previous draft Water Strategy (December 2007) have been assessed and a summary of the results has been included in Table 15. The likely effects of the BAU, future BAU and previous draft Water Strategy were appraised against the SA objectives and criteria (see Section 2 and Appendix 4). The significance criteria developed for the SA of the draft Water Strategy (see Appendix 5) were used in order to help evaluate the significance of the effects. The appraisal of the previous draft Water Strategy is included in the appendices to this report, in particular Appendices 11, 12 and 13. These were part of the appraisal completed in December 2007, and do not reflect subsequent changes to the sustainability context (between 2007 and 2009) which may, in some cases have altered the direction and/or significance of effects.

5.8 The appraisal categorised the significance of the effects using a qualitative 5-point scale. The appraisal of the BAU and future BAU are presented in matrices in Appendix 9 and the previous draft Water Strategy (December 2007) in Appendix 13, with a summary presented in Table 15. For comparison, the detailed appraisal of the final draft Water Strategy as a whole has been recorded in Table 37.

5.9 The appraisal of the effects of the BAU scenarios (both current and predicted future) has highlighted a number of potentially negative effects on sustainability, particularly under drainage and wastewater disposal (see Table 15 and Appendix 9 for further details). In some areas the sustainability effects are predicted to improve (i.e. get more positive / less negative), but in others the sustainability effects are predicted to worsen (i.e. get more negative / less positive) which reflects both predicted trends and where policy interventions and other initiative are expected to address certain issues (and in other areas where they are not). Overall, however, the sustainability effects are predicted to improve for many SA objectives between current BAU and BAU+10.

5.10 The previous draft Water Strategy (December 2007) was predicted to improve most of the effects predicted against almost all objectives compared with the BAU / BAU+10. In particular in relation to education and awareness, water resources and drainage.

Table 15: Summary of the Appraisal of the Business as Usual Alternative Scenarios and previous draft Strategy

Water management theme and Scenario	Sustainability Objectives																
	1. Governance	2. Education and Awareness	3. Health and Well-being	4. Equality and Diversity	5. Safety and Security	6. Liveability and Place	7. Accessibility and Availability	8. Landscape, Historic and Cultural Environment	9. Biodiversity	10. Air Quality	11. Climate Change[18]	12. Water Quality	13. Water Resources	14. Drainage	15. Flood Risk	16. Waste Management and Resource Use	17. Economy
Water Resources																	
Water Resources (BAU)	0	--	+	+	+?	0	0	0	-	0	-	-	-	0	0	0	+
Water Resources (BAU + 10 yrs)	0/+	+?	+	-?	+	0/+	0	0	-/+	-	-/+	-	+	0	0	-	-/+
Previous draft Water Strategy (Dec 2007)	+	++	+/-?	-?	+/-?	+?	0	0	+/++	0	+	+	++	0	0	0/-?	+/--
Drainage																	
Drainage (BAU)	-	-	-	-	-	-	0/-	0/-	-	0	-	-	0	--	-	0	-
Drainage (BAU + 10 years)	0/+	+?	-	-	+?	-/+	-/+	-/+	-/+	0	-/+	-	+	-?	-/+	-	-/+
Previous draft Water Strategy (Dec 2007)	+	0	+?	-?	+?	+?	0	0	+	0	+?	+?	+?	++	+	0	+?
Wastewater																	
Wastewater (BAU)	0	-	-	-	-	-	0/-	0/-	--	0	0/-?	--	0/-	-	-	0	-
Wastewater (BAU + 10 years)	0/+	+?	-/+	-	+?	-/+?	-/+	-/+	-/++	-	-/+	-/+?	0	-?	-/+	-	-/+
Previous draft Water Strategy (Dec 2007)	0	0	+?	-?	+?	0/-?	0	0	+?	0	0	+?	0	0	+	0	0

Key:

Major positive: ++ Minor positive: + Neutral: 0 Minor negative: - Major negative: -- Uncertain:? Mixed: -/+

[18] Objective split between (8i) mitigation and (8ii) adaptation to Climate Change

6. APPRAISAL OF THE DRAFT WATER STRATEGY

Introduction to the appraisal of the draft Water Strategy

6.1 This section presents the findings of the appraisal of the different elements included within the draft Water Strategy (August 2009) as well as the strategy overall. The appraisal concentrated on four aspects:

i) Appraisal of the compatibility of the **draft Strategy objectives** with the Sustainability Appraisal objectives;

ii) Appraisal of the **Policies**;

iii) Appraisal of the **Proposals**; and

iv) Appraisal of the **draft Strategy overall**, including cumulative effects.

Compatibility of the draft Water Strategy objectives and the SA objectives

Purpose of testing the compatibility of the objectives

6.2 The Government's SA guidance[19] recommends that a strategy's objectives are tested against the SA objectives to ensure they are consistent and to identify potential tensions. Whilst the aim should be to achieve consistency between the plan and SA objectives, in practice there may well be tensions between depending on the nature of the plan. Where win-win outcomes cannot be achieved, the Mayor will need to determine where the priorities should lie.

Objectives of the draft Water Strategy

6.3 The draft Water Strategy has the following overall objectives (after paragraph 1.20):

1. ***To use the water London already has more effectively and efficiently.*** *The majority of London's water supplies come from the rivers Thames and Lee upstream of the tidal reaches, and it is unrealistic to view London in isolation of the upstream freshwater catchments. As the demand for water rises across the whole Thames basin, London can no longer just rely on drawing in ever more water to meet their needs. Instead it needs to use the water that it already has more effectively and efficiently, reducing leakage, reducing demand for water and simultaneously reducing carbon emissions.*

2. ***To minimise the release of untreated wastewater and diffuse pollution into the water environment.*** *Untreated wastewater can find its way into London's rivers and watercourses via the drainage system. The design of the combined sewer system and sewage treatment works permits this under storm conditions in order to prevent flooding. Incorrectly connected drains add to the pollution of rivers and canals. Rainwater runoff in*

[19] ODPM (2005) *Sustainability Appraisal of Regional Spatial Strategies and Local Development Documents*

an increasingly paved London carries yet more pollutants – so called 'diffuse' pollution because it has no single source – into ponds, lakes and streams. All these have serious consequences for health, biodiversity, tourism and the overall quality of life.

3. ***To reduce the threat to people and their property, businesses and essential infrastructure from sewer, groundwater and surface water flooding and to mitigate its effects.*** *As the climate changes London needs to maintain and improve its resilience against fluvial and tidal flooding – to be covered more fully in the Climate Change Adaptation Strategy. However, all too often other sources of flooding – flooding from surface waters (as experienced in the summer of 2007), groundwater and sewers – are overlooked. These problems are also likely to get worse as a result of climate change. Proper attention being given to the nature of the site in terms of site layout and building design, and properly integrated, designed and managed drainage and sewage systems are all essential to alleviating these types of flooding.*

6.4 These objectives have been amended during the SA process and the drafting of the Strategy. These changes include:

- Changes made as a result of the October 2006 SA commentary, e.g. the objectives were reworded to be stated as desired end points, thus for instance objective 2 originally read: '***minimising*** *the release of wastewater*….' and it has been changed to '***to minimise***…'.
- Changes made as a result of the consultation with the London Assembly and Functional Bodies (March 2007). In particular, objective 1 changed from '*To secure a fair share of water for Londoners and London's water-related environment through the best use of the available water*'.
- Changes made to the scope of coverage of flooding within the draft Strategy following internal GLA discussions. This resulted in the decision to include only sewer, groundwater and surface water flooding in the draft Water Strategy. Fluvial and tidal flooding will be included in the forthcoming Climate Change Adaptation Strategy. Originally, objective 3 referred to 'flooding' in general and did not limit it to particular sources (see paragraph 6.8 below).
- Changes made as a result of SA commentary (June 2009), e.g. the inclusion of the term *'efficiently'* and reference to the need to reduce leakage within objective 1, and, the inclusion of text referring to the need to reduce the threat of flooding to *'businesses and essential infrastructure'* in objective 3. All recommendations made in the June 2009 SA commentary and responses and changes made by the GLA are detailed in Appendix 8 (Part A).

Compatibility of the draft Strategy and SA objectives

6.5 The results of testing the draft Strategy objectives against the SA objectives are presented in Table 16. The draft Water Strategy objectives were considered to be either compatible or neutral when tested against the SA objectives, with no significant potential conflicts identified. There are therefore limited changes proposed to the objectives arising from any potential conflicts identified by the SA. However, some more general comments and recommended changes to the wording of the objectives are detailed below:

Objective 1: To use the water London already has more effectively and efficiently

6.6 Comments and recommended changes to the first objective include:

- This objective is generally compatible (or neutral) with the SA objectives, with no significant potential conflicts identified.
- While the objective is positive in sustainability terms, it could potentially be strengthened by seeking to promote the concept of water neutrality in future urban and land use planning policies in London. "Water neutrality" means that impacts on water resources are considered before a development project or an activity is decided upon as well as the measures necessary to reduce the impact of these should they proceed. The total water use after the new development should be equal to – or less than – the total water use in the area before the planned development in particular, in water stressed areas. Given the current and predicted future situation with water availability in London this is likely to need to be within an overall strategy of reducing demand, which should be the ideal long-term goal of more effective and efficient use of water, together with leakage reduction and demand management measures.

  As it is a relatively new concept, the Strategy could take the lead in developing a clear definition of water neutrality in the context of London, set it in the context of sustainable supply and demand within necessary environmental limits, as well as setting a specific timetable over which water neutrality should be achieved in all new development.

Objective 2: To minimise the release of wastewater and diffuse pollution into the water environment

6.7 Comments and recommended changes to the second objective include:

- This draft Strategy objective is generally compatible (or neutral) with the SA objectives. One minor recommendation is that the text accompanying the objective could note that the incidence of storms and extreme rainfall, and therefore associated combined sewage overflows and run-off events are likely to be increased under the predicted impacts of climate change (the wording of the supporting text to objective 3 provides a useful template for this).

Objective 3: To reduce the threat to people and their property, businesses and essential infrastructure from sewer, groundwater and surface water flooding and to mitigate its effects.

6.8 Comments and recommended changes to the third objective include:

- This draft Strategy objective is generally compatible (or neutral) with the SA objectives.
- The GLA has included tidal and fluvial flooding issues in the forthcoming draft Climate Change Adaptation Strategy rather than in the draft Water Strategy. However, as the draft Water Strategy aims to promote integrated water management - '*the integration of water management as a whole is central to the success of this strategy*' (paragraph 1.6) - it would be beneficial for the Water Strategy to cover flooding from all sources including tidal and fluvial flooding. In particular, because current and short-term flood risk is not only caused by climate change and given the different timescales to be covered by the two Strategies (i.e. 10 years for the draft Water Strategy and 50 years for the Climate

Change Adaptation Strategy), the Water Strategy is the more appropriate strategy to deal with these issues in the short-term.

Even though the intention is for the Climate Change Adaptation Strategy to be published concurrently with the Water Strategy, this inclusion would not necessary lead to duplication between the two strategies given their different perspectives and time horizons. In addition, in the future the revisions of the strategies may not occur at the same time.

The draft Water Strategy also seeks to promote integration between land and water management (paragraph 1.6) and given the need for coordinated action between the spatial planning system and flood risk management, for example, it is important to cover all sources of flooding.

- This objective specifically refers to groundwater flooding, however there is limited coverage of this issue within the draft Strategy (see paragraphs 4.26 – 4.33). Groundwater flooding is not, for example, covered specifically within any of the proposals or policies in the draft Strategy. If this is a significant issue, consideration should be given to incorporating it within a proposal or policy.

Table 16: Compatibility of the Water Strategy objectives and the SA objectives

Water Strategy Objectives	Sustainability Objectives																
	1. Governance	2. Education and Awareness	3. Health and Well-being	4. Equality and Diversity	5. Safety and Security	6. Liveability and Place	7. Accessibility and Availability	8. Landscape, Historic and Cultural Environment	9. Biodiversity	10. Air Quality	11. Climate Change[20]	12. Water Quality	13. Water Resources	14. Drainage	15. Flood Risk	16. Waste Management and Resource Use	17. Economy
1. To use the water London already has more effectively and efficiently	0	+	+	+	+	+	0	+	+	0	+ +	+	+	0	0	0	+
2. To minimise the release of untreated wastewater and diffuse pollution into the water environment	0	+	+	0	+	+	+	+	+	0	0 0	+	+	0	0	0	+
3. To reduce the threat to people and their property, businesses and essential infrastructure from sewer, groundwater and surface water flooding and to mitigate its effects	0	0	+	+	+	+	+	0	+	0	0 +	+	0	+	+	+	+

Key:	Compatible:	+	Neutral:	0	Possible conflict:	-

[20] Objective split between (8i) mitigation and (8ii) adaptation to Climate Change

Comments on the principles

6.9 The draft Water Strategy also includes a series of principles for water management in London that together with the objectives above *are* '*proposed as the basis for translating the vision into specific actions in the later chapters of this Strategy*'[21]:

1. ***Delivering practical changes locally.*** *There are many ways in which London can use the water that it already has more effectively. We need to reduce our ineffective water consumption before looking beyond London for new resources.*

2. ***Maintaining London's infrastructure for future generations.*** *London now has to bear the cost of past failures to maintain and renew its infrastructure. We have to bear these costs rather than pass an even larger burden on to future generations.*

3. ***Promoting consumer awareness and help consumers to avoid unnecessary consumption.*** *There are many opportunities, and a need, to educate Londoners about where their water comes from, how we can use the water that we already have more effectively and efficiently, and how we can all benefit from doing so.*

5. ***Working together.*** *Organisations should work together to avoid duplication, minimise conflicts and achieve better results.*

6.10 Generally the principles are positive from a sustainability perspective, although some comments and potential additions which would strengthen the principles include:

- Reference to managing water **sustainably**, and within environmental limits and thresholds could be incorporated;
- Reference could be added to applying the **precautionary principle** to water management and in particular to the potential impacts on sustainability; and
- Adding a reference to managing water resources in order to maintain or improve the **health and well being** of London's population and having regards to **equality** issues and minimising potential impacts on **vulnerable groups**.

Other comments on the introductory section

6.11 This section includes a few further recommendations on the draft Water Strategy and in particularly on the introductory section:

- To reflect the addition of text in the objectives supporting more effective and efficient use of water in London compared with the previous draft, the final sentence of supporting text paragraph 1.18 under the heading towards sustainable development could be revised to read: *'London must start to use the water that it already has more effectively* ***and efficiently'***.
- It is important that the Strategy sets out explicitly how the process of **developing, adopting and reviewing the draft Strategy** will take place and over what timescale. For instance, it could be stated that the Strategy revised every five years as a minimum or more frequently to reflect policy or other changes (specific triggers for reviewing the

[21] Draft Water Strategy paragraph 1.20.

Strategy could be included, for example). The sub-section on monitoring and implementation (paragraphs 1.21 and 1.22) does not include these details.

- Although the draft Strategy includes a sub-section on implementation and monitoring (paragraphs 1.21 and 1.22), this in fact simply states that the *'majority of actions… will be implemented by organisations other than the Mayor of London'*. However, even where partnerships and external organisations will be key to the delivery of many aspects of the Strategy, it would be useful to include details on how progress in implementing the Strategy will be **monitored** and what **indicators and targets** will be used to measure progress against the delivery of the Water Strategy's objectives.

  Relatively high-level, strategic indicators may be appropriate, however some mechanism for assessing the effectiveness of the Strategy is recommended. Details on how and by whom these indicators would be monitored would also ideally be included. Some of the potential indicators are likely to be collected already on a regular basis by, for example, water companies, Ofwat, the Environment Agency, Defra and the London Boroughs. Some that are appropriate may also be reported on by the Mayor in his periodic state of the environment reports. However, some of those indicators are likely to only be collected using other boundaries not just London, e.g. Environment Agency or water company regions, Water Framework Directive River Basin Districts, etc. Therefore, introducing monitoring of key indicators at the London level would be particularly valuable. In addition, there may be gaps in the necessary data to monitor the Strategy, and where this is the case additional actions may need to be added to ensure it is collated. See Section 7 for further details on monitoring

- Given that the Strategy will need to be implemented by many partner organisations and actions will be delivered by other strategies and plans, explicit reference could be made to how the draft Strategy's preferred approach to water management in London and the proposals it contains will be **implemented and the standards achieved**. This could be achieved partly through the development of a **water action plan or framework** which maps out the various responsibilities and timescales, but also through recommendations for revisions to other mayoral strategies and plans, local authority spatial development plans, partnership working and lobbying government, for example.

Appraisal of the Draft Water Strategy Policies

6.12 This section summarises the key findings of the detailed appraisal of the draft Water Strategy Policies for water use, drainage and disposal of wastewater in section 3, 4 and 5 of the draft Strategy respectively. The results of the detailed appraisal of these policies are included in the matrices in Appendix 11. These matrices are the same as those completed for the appraisal of the previous draft Water Strategy (December 2007) as they remain largely the same as the policies included in the previous draft (at that time referred to as Preferred Management Options). Where appropriate the minor differences between the appraisal of the December 2007 and August 2009 versions have been marked in Appendix 11.

6.13 Note that each of the three policies included in the draft Strategy is made up of several "elements" (four, seven and two in number respectively). As discussed in Sections 1 and 2, in some polices these elements operate as a hierarchy whereas in others they are not mutually exclusive and the elements could be implemented together. The appraisal considered the potential sustainability effects of each of these elements.

6.14 The appraisal of the draft Water Strategy's Policies was carried out in three iterative steps:

- Review of the evidence base around water use, drainage, and wastewater in London drawing on the draft Strategy and the context collated for the SA (see Section 3 in Part A);
- Use of causal chain analysis to identify the key potential pathways, effects and receptors of each policy (see below and also Appendix 10); and
- An appraisal of the policies against the sustainability objectives and criteria to evaluate the potential significance of the effects (see below and Appendix 11).

6.15 The approach described above was piloted for one of the sets of policies (at that time called "preferred management options") in December 2006 and discussed with the GLA and the SA Advisory Group prior to rolling out the approach to the other sets of policies. Health specific effects were investigated through causal chain analysis drafted for the Health Stakeholder Workshop held in March 2007 and further refined at the event (see separate report available from the GLA).

6.16 The causal chain analysis and matrices include in Appendices 10 and 11 were developed during the appraisal of the previous draft Water Strategy (December 2007), however due to the very limited change in the policies between this earlier draft and the current draft Strategy (August 2009), they have been modified only to reflect the minor changes made.

6.17 A detailed appraisal of the effects of each of the policies, including each of the elements under it, was undertaken. Each of the SA objectives and criteria were considered (see Appendix 4) and the significance criteria utilised (see Appendix 5) to guide the scoring of potential effects. The results have been presented in appraisal matrices included in Appendix 11. The matrices include:

- a score against each objective (this score was based on the significance criteria included in Appendix 5);
- a commentary on the likely positive and negative effects of each of the elements in the policy under each objective;
- a commentary on the potential enhancement and mitigation measures under each objective; and
- a summary commentary on the potential effects of each policy, including recommendations for improving or clarifying the policies from a sustainability perspective and mitigating the potential negative effects and enhancing the potential positive effects.

6.18 The results of the appraisal of the effects of each policy has been summarised in the following sections, but for a more detailed commentary and explanation on the scores, reference should be made to the significance criteria, causal chains analysis and detailed matrices included in Appendices 5, 10 and 11 respectively.

Appraisal of the Policy 1: managing water use in London

6.19 The policy for managing water use in London is included in Box 17 below:

Box 17: Policy 1 – Water use in London
The Mayor believes that we should apply the following hierarchy for managing water supply and demand in London: 1= Reduce the loss of water through better leakage management 1= Improve the efficiency of water use in residential, commercial and public buildings (both new and existing) 3. Use reclaimed water for non-potable uses (rainwater harvesting and grey water recycling) 4. Develop, as necessary, those water resources that have the least climate change and environmental impact.

6.20 The appraisal of the elements under the policy for water use are summarised in Table 17 below, but for a more detailed commentary and explanation on the scores, see the detailed matrix included in Appendix 11.

Table 17: Summary of the Appraisal of the elements in Policy 1: Managing Water Use

	Sustainability Objectives																
Policy 1: Water Use	1. Governance	2. Education and Awareness	3. Health and Well-being	4. Equality and Diversity	5. Safety and Security	6. Liveability and Place	7. Accessibility and Availability	8. Landscape, Historic and Cultural Environment	9. Biodiversity	10. Air Quality	11. Climate Change[22]	12. Water Quality	13. Water Resources	14. Drainage	15. Flood Risk	16. Waste Management and Resource Use	17. Economy
1= (a)	+?	+	0/-	-/+	+/?	0/-	0	0	+/0	0	+	+?	++/+	0	0	-	-/+
1= (b)	+?	+	+	-	+/0	+	0	0	+/++	0	+	+	+/++	0	0/-	0	+
3	0	+/-	-/+	-/0	+/0	+/-	0	0	+	0	+/-	+?	+	+/++	+?	0	+
4	?	-?	-/+	-/+	+	-/+	-/+	-/+?	-?	0/-?	+/-?	-?	+/-?	0	0?	-	+/-

Key:
Major positive: ++ Minor positive: + Neutral: 0 Minor negative: - Major negative: - - Uncertain:? Mixed: -/+

Note: see Box 17 for details of the element under the policy

Policy 1 (element 1= (a)): Reduce the loss of water through better leakage management

6.21 The key potentially significant positive effects of policy element 1= (a) are:

- This option would potentially have positive effects on **water resources** and **water quality** and could help reduce the current water deficit and achieve security of supply. However, there is uncertainty associated with this element as it does not include details, such as, what level of leakage reduction would be achieved, how and by when.
- Reducing leakage would have a positive effect on watercourses and water resources and could even reduce abstractions. This policy element is also likely to have a positive effect on **climate change mitigation and adaptation** as it would mean increasing the efficiency of the energy used in water treatment and reduce vulnerability to water shortages and drought. Reducing waste of water through leakage could also improve Thames Water's image and could help them motivate their customers to reduce their water consumption.

[22] Objective split between (8i) mitigation and (8ii) adaptation to Climate Change

6.22 The key potentially significant negative effects of the policy element 1= (a) are:

- Works carried out to replace mains and fix leaks can cause **disruption to public transport and to access to services and amenities**. An increase in **noise and air pollution and damages to street trees and public open space** is also possible. However, these effects would only be temporary and not likely to be of major significance compared with existing background levels. An exception to this would occur if there was a spatial dimension to leakage management, for instance if a great proportion of the works were carried out in the same area or in particularly deprived areas. This work would also reduce the disruption caused by leaks particularly on public transport – it is also noted that the Mayor has also agreed a new code of contact with Thames Water to help reduce traffic disruption.
- If managing leakage involves pressure reduction there could be potentially negative effects on **health** resulting from contaminants entering the system. It could also have adverse impacts on the fire service and those with particular water needs, such as the long-term ill or disabled people. There is also a related **equality** issue as the effects of a reduction in pressure would be worse for those living in high rise buildings which in general are more likely to include poorer households.
- **Costs of replacing mains and fixing leaks** in the long-term are likely to be passed on to customers and this could, subject to how the tariff structure is set, have a disproportionate effect on low income households, particularly large families, the elderly and long-term ill or disabled people. Some of these groups could also be worst affected by disruption as they are more likely to depend on public transport. Air quality issues associated with the potential increase in traffic congestion could also have a worse effect on those who are already have poor health.
- The increase on household and business water bills could also provide an incentive to reduce water consumption. However, this could have a negative **health effect on lower income groups** in particular as they could reduce their water consumption beyond healthy levels. The impact of additional costs on vulnerable groups could be mitigated through appropriate tariff structures.

Policy 1 (element 1= (b)): Improve the efficiency of water use in residential, commercial and public buildings (both new and existing)

6.23 This policy element is generally likely to have positive effects on sustainability. Most of the positive effects are likely to be of minor significance as although measures to improve water efficiency can offer high potential savings, they would have to be installed in a large number of properties and businesses to make significant savings. Implementing this policy element would in general have positive effects particularly under the SA objectives on people and water resources.

6.24 The key potentially significant positive effects of policy element 1= (a) are:

- Reducing water use would **increase the availability of water** and help reduce the existing water deficit.
- Reducing the need to **develop new water resources** and also to increase **abstractions** from the environment, both of which could have significant negative effects.

- A further potential positive effect could be **reducing the energy used and consequently CO_2 emissions** resulting from water supply operations. There would also be a reduction in the energy used to heat water, as a lower volume of water would equate to less energy used.
- Less water used, would also result in less water being discharged to sewers, which would have a positive effect on **reducing sewer overload, discharges, CSOs and sewer flooding**. However, these effects are not likely to be significant as they would be dependent on water efficiency being widely implemented.

6.25 The key potentially significant negative effects of policy element 1= (b) are:

- For **non-metered households**, the **incentive** to buy water efficient appliances and retrofit their homes is not likely to be high. Penetration of water metering is low at the moment.
- **Human behaviour** is unpredictable and having water efficient fittings and appliances could result in some people using more water, e.g. having baths instead of showers, if they perceive that there is a surplus of water and thus efficiency measures could have the opposite effect to that intended[23].
- The potential **cost** of introducing these measures means that lower income households may not be able to afford to retrofit their homes. An increase in metering could also affect low income households if the right tariff structures are not implemented.

Policy1 (element 3): Use reclaimed water for non-potable needs (rainwater harvesting and grey water recycling)

6.26 The options could range from having a water butt in the garden to installing a rainwater harvesting system or a greywater recycling system for a property / development. The potential for water savings would vary accordingly. Water butts could reduce peak demand, e.g. in summer. Larger scale reclaimed water systems could reduce demand throughout the year.

6.27 The key potentially significant positive effects of policy element 3 are:

- This policy element is likely to have in general positive effects on **water quality**, as it should reduce surface run-off, pollution in water courses and help maintain natural flows (see next section on drainage). The magnitude of the effects would depend on the type of reclaimed device/system and the penetration of these measures.
- Rainwater harvesting and greywater recycling could also reduce the volumes in surface and combined drains and could help **reduce sewer overload and prevent sewer flooding** (see following section on wastewater disposal) which would potentially have positive impacts on the environment.

6.28 The key potentially significant negative effects of the policy element 3 are:

- Negative effects could arise from the **cost of installing** reclaimed water systems and the **increased use of energy** for pumping. However, installing a water butt is a relatively cheap option.

- Using reclaimed water **may reduce the incentive to save water** as it may be perceived as plentiful.
- The use of reclaimed water could lead to misconnections between with dual systems which could lead to **health effects** such as stomach upsets or other health problems. Storage of rain or greywater could also lead to microbiological contamination of stored water which may have to be adequately treated dependent upon its use. However, these effects are not likely to be highly significant. Reclaiming water options could also contribute to reducing risk of sewer and surface flooding consequently reducing health impacts.

Policy element 4: Develop, as necessary, those water resources that have the least climate change and environmental impact

6.29 There is a high degree of uncertainty associated with the potential effects of implementing this policy element. Depending on the type of new resource developed the effects could be very different, but all potential options for the development of new water resources have the potential to have significant negative effects on **climate change mitigation** as well as **waste management and resource use**.

6.30 The key potentially significant positive effects of policy element 4 are:

- Developing new resources is likely to have a positive effect on achieving **security of supply**, **adapting to the effects of climate change**, for instance droughts, and potentially enabling an increase in development including housing.

6.31 A general comment on the wording of this policy element is that *'as necessary'* could be interpreted differently by different stakeholders. An example of alternative wording that would be preferred is '*if need is demonstrated'*.

Overall comments on Policy 1: managing water use in London

6.32 An alternative element that could have been included under this policy in addition to the last element on new water resources is new resource development regardless of the impact on climate change. This has to an extent been considered in the above appraisal as desalination was included. However, this option could reduce the incentive to fix leaks and could exacerbate the effects of climate change. The GLA has therefore decided that this is an unacceptable option and to only include water resources that have the least climate change and environmental impact as an option in the draft Strategy.

6.33 Given the projected population and housing development increases in London, the current level of supply without the development of any new resources is unlikely to be considered a realistic option for the future if there is not a significant increase in water efficiency. Security of supply could be in danger, water could become a constraint on development and the effects of climate change such as droughts and higher temperature would contribute to make water scarcer.

6.34 At present water companies are only spending a relatively small amount on promoting efficiency measures and retrofitting. The low penetration of metering reduces the incentive

[23] This has been an observed phenomenon in resource efficiency, and is sometimes termed the "Jevons Paradox". See, for

for users to restrict consumption. However, water demand fell by 10% during the hosepipe ban imposed by Thames Water from April 2006 to January 2007, even at the peak of the heat wave in July 2006, showing that constraint measures and awareness raising programmes can have significant effects on water demand.

6.35 The use of reclaimed water can have considerable benefits in terms of reducing the use of potable water, as well as encouraging more sustainable urban drainage, reducing risk of surface flooding and pollution from run-off. However, these systems may be expensive and the pumping required consumes energy and consequently can produce greenhouse gas emissions. Reclaimed water systems are likely to be more appropriate for large new developments due to economies of scale and the cost of retrofitting. Another option would be installing water butts, which would not have such an impact on reducing surface flooding and pollution to watercourses, but would be relatively cheap, can help reduce peak demand, as they are usually used for watering gardens in summer and have limited impact on greenhouse gas emissions (depending on the material they are constructed from). The magnitude and significance of the effects would depend on how widespread this measure becomes.

6.36 A potential negative effect of policy element 1= (b) and 3 is that they could lead to some consumers using more water if there was a perception that water efficient appliances and fittings and rainwater harvesting increase the water available for use.

6.37 Some negative effects could arise for low income groups as they would be less able to retrofit their homes; another issue is that in order to promote water saving measures wider penetration of metering would be essential which could also affect lower income groups. It would be necessary to implement adequate tariffs, but also to promote the 'vulnerable groups' tariff to these groups. Installing rainwater or greywater systems could be expensive and increase the price of new homes which could again impact on some lower income groups.

Recommended mitigation and enhancement for Policy 1

6.38 The chapter on managing water use in the draft Water Strategy contains six related proposals (see Table 20). These proposals include: the expectation of reduced leakage; rapid introduction water metering, including reference for the need for tariffs to protect vulnerable and low-income households; new homes to meet Code for Sustainable Homes level 6 by 2016; highlighting the need for existing homes to become more water efficient; raising awareness of the benefits of water efficiency; and, the promotion of tap water and raising awareness of the climate change impacts of bottle water. These proposals set out actions that are intended to contribute to achieving the policy for managing water use in London.

6.39 Other comments on mitigation and enhancement of the effects of Policy 1 include:

- From a sustainability perspective, the **policy elements are in the appropriate order** for managing water resources. Reducing the current levels of leakage and improving water efficiency should be the priority as any new resource developed would be wasted at current leakage rates and involve other negative effects such as increasing abstractions. Having the first two policy elements as equal first is welcomed from a sustainability perspective, as reducing leakage and improving efficiency should not be considered sequentially as they should happen concurrently.

example: J.M. Polimeni et al (2009), *The Myth of Resource Efficiency – The Jevons Paradox*, Earthscan.

- Works to **replace mains and fix leaks should be managed to minimise disruption and in partnership with other organisations**, such as Transport for London and the Boroughs, so any disruption can be minimised. The recently agreed code of conduct for utility companies (referred to in paragraph 3.12) should help in this regard, however wider cooperation and partnership working may be necessary to ensure disruption is kept to a minimum.
- Paragraphs 3.13 and 3.14 note that if leakage management involves pressure reduction, there may be **impacts on high rise buildings, implications for fire fighting and the possibility of contamination** due to backflow, and that care needs to be taken to avoid these risks. A further impact of reduced pressure may be the effects on those with particular water use needs, such as the **long-term ill or disabled people**, and measures should also be taken to ensure those groups with particular needs are not negatively affected.
- The use of **reclaimed water** has other implications (e.g. for health due to potential cross-connections of the drinking water supply). The inclusion of supporting text (paragraph 3.47) referring to BSI's consideration of a British Standard and Defra's intention to develop standards for non-potable water is welcomed as potential mitigation; the need for adequate training and monitoring to be provided in order to minimise cross-connections and the risk of health related problems; and, that a relatively simple way of avoiding cross-connections could be requiring different colour pipes for the drinking water and the non-potable water supply, are welcomed from a sustainability perspective.
- **Proposals to install water meters in all properties in London (proposal number 3) and the expectation that hew homes should meet Code for Sustainable Homes levels (proposal number 4)** should contribute to achieving the policy element 1= (b): improving efficiency in new and existing property.
- The issues of **cost and differential impact on low income and other vulnerable groups** is a common effect for all the policy elements. In order to avoid and / or mitigate this effect, and also in the light of proposal 3 which seeks universal metering, having the right tariffs for these groups, is a key area for consideration. Proposal 3 does state that *'tariff arrangements should encourage the efficient use of water but protect vulnerable and low-income households'* which should help mitigate for this potential effect.
- The **differential effect of water metering and affordability of water** should be monitored and appropriate actions taken in the light of any significant effects.

Appraisal of Policy 2: drainage in London

6.40 The policy for drainage in London is included in Box 18 below:

Box 18: Policy 2 – Drainage in London
The Mayor proposes the following hierarchy for the drainage of rainwater: 1. Store rainwater for use later 2. Use porous surfaces to let rainwater soak into the ground where soil conditions allow 3. Slow the runoff by directing rainwater into ponds or open water features for gradual release to a watercourse 4. Slow the runoff by directing rainwater into tanks or sealed water features for gradual release to a watercourse 5. Discharge rainwater direct to a watercourse 6. Discharge rainwater to a surface water drain 7. Discharge rainwater to the combined sewer, as a last resort.

6.41 The appraisal of the set of elements under the policy for drainage are summarised in Table 18 below, but for a more detailed commentary and explanation on the scores, see the detailed matrix included in Appendix 11.

Table 18: Summary of the Appraisal of the elements in Policy 2: Drainage in London

Policy 2: Drainage	Sustainability Objectives															
	1. Governance	2. Education and Awareness	3. Health and Well-being	4. Equality and Diversity	5. Safety and Security	6. Liveability and Place	7. Accessibility and Availability	8. Landscape, Historic and Cultural Environment	9. Biodiversity	10. Air Quality	11. Climate Change[24]	12. Water Quality	13. Water Resources	14. Drainage	15. Flood Risk	16. Waste Management and Resource Use	17. Economy
1	0	0	0/+?	-?	+?	0/+?	0	0	+	?	-/+/0?	+	+	++/+	+	0	+?
2	0	0	0/+?	-?	0/+?	0/+?	0	0	+	0	0/+?	+	+	++/+	+	0	+?
3	0	0	0/+/-?	-?	0/-?	0/+?	0	0/+?	+/++	0	0/+	+	+	++/+	+	0	+?
4	0	0	0/+?	-	0/+?	0/+/-?	0	0	0/+	0	0/+	+?	+	+	+	0	+?
5	0	0	0/+?	0	0/-?	0/-	0	0	-/0	0	-	-	-	-	-	0	-?
6	0	0	-	-	0/-?	0/-	0	0	-/0	0	-	-/--	-	-	--	0	-
7	0	0	-	-	-	-	0	0	-	?	-	--	-	-	--	0	-

Key:
Major positive: ++ Minor positive: + Neutral: 0 Minor negative: - Major negative: -- Uncertain:? Mixed: -/+

Policy 2 (element 1): Store rainwater for use later

6.42 Some of the potential effects of this policy element have already been discussed under policy element 3 of the managing water use in London policy above.

6.43 In summary, the key potentially significant positive effects of policy element 1 are:

- Improving **water resources and quality** and reducing the **risk of flooding**.
- As a consequence of these effects, there are likely to be positive effects on **biodiversity, safety and security and adaptation to climate change**.

6.44 In summary, the key potentially significant negative effects of policy element 1 are:

- The **cost associated with installing and maintaining SUDS** which could cause impacts on equality, as it could result in a decrease in affordability of housing which would particularly affect lower income groups. However, the costs associated with SUDS are not necessarily more than traditional drainage systems, but they do raise issues of responsibility (and financing) of management and maintenance.
- Several **health** related effects have also been highlighted under policy element 3 of the managing water use policy above.

Policy 2 (element 2): Use porous surfaces to let rainwater soak into the ground where soil conditions allow

6.45 The key potentially significant positive effects of policy element 2 are:

- Improving the **water quality** and **biodiversity** by reducing pollution to watercourses and maintaining natural flows.
- Reducing the risk of **surface flooding** and consequently having an indirect effect on **safety and security**. It could also have potentially positive effects on **adaptation to climate change**.

6.46 The key potentially significant negative effects of the policy element 2 are:

- The **cost of installing and maintaining** these systems which have been mentioned under policy element 1. However, as with policy element 1, most of the effects identified are uncertain and depend on how widespread the installation of SUDS becomes and it is likely to be more an issue of the approach needed being different to traditional drainage systems rather than involving additional total cost.

Policy 2 (element 3): Slow the run-off by directing rainwater into ponds or open water features for gradual release to a watercourse

6.47 This policy element it likely to have similar effects as policy element 2 above. However, it could also have other potentially positive effects related to providing water features such as ponds given their potential **amenity value** and providing opportunity for **enhanced biodiversity**. These features could also provide **recreation and amenity opportunities** for local residents and therefore could have a positive effect on residents' **health and well being**.

6.48 Potential negative effects are that they could pose a potential public safety risk and require on-going maintenance.

Policy 2 (element 4): Slow the run-off by directing rainwater into tanks or sealed water features for gradual release to a watercourse

6.49 This policy element is likely to have similar effects to policy element 2 above in terms of **reducing the risk of flooding** and **improving safety and security supply** and adaptation to some of the **effects of climate change**, such as the increased frequency and intensity of storms.

[24] Objective split between (8i) mitigation and (8ii) adaptation to Climate Change

6.50 If this policy element included a mechanism to remove pollution, it could also have potential positive effects on **water quality and biodiversity**. Even if it does not include pollution attenuation, it would at least help **maintain natural flows** in receiving watercourses.

Policy 2 (element 5): Discharge rainwater direct to a watercourse

6.51 Discharging surface run-off directly to a watercourse can cause an increase in pollution and disruption of natural flows. Therefore this policy element could have negative effects on **water quality, biodiversity and liveability and place** as an increase in pollution may cause a decline in the aesthetics of receiving water bodies.

6.52 This policy element could also pose an additional flood risk as run-off discharged to a watercourse could potentially cause localised flooding following heavy rainfall. Therefore this policy element may cause **negative effects on health and safety and security** due to both the potential increase in the risk of flooding and the increase in pollution in water bodies which could have consequences particularly for recreational users.

Policy 2 (element 6): Discharge rainwater to a surface water drain

6.53 Discharging surface run-off to a separate sewer system has in general similar potential effects as policy element 5, discharging rainwater direct to a watercourse. However, it could also contribute to **increasing the risk of surface water flooding**.

Policy 2 (element 7): Discharge rainwater to the combined sewer, as a last resort.

6.54 Discharging run-off to the combined sewer increases the risk of combined sewer overflows with potential negative consequences for **water quality, biodiversity and the aesthetics of water bodies**. This policy element could also increase the **risk of sewer flooding**.

6.55 However, as it is discussed in the next section focussing on the wastewater hierarchy, the planned Thames Tidal and Lee Tunnels will contribute to reduce the impacts of discharges to the combined sewer.

Overall comments on Policy 2: drainage in London

6.56 Policy element 1 to 4 would potentially have, in general, positive effects and elements 5 to 7 neutral or negative effects on watercourses, biodiversity and people as the former could help reduce the risk of flooding and potential public health risks and loss of amenity issues related to water pollution. The first policy element, storing rainwater, has the added advantage of potentially providing water for non-potable uses and therefore reducing the demand for potable water. Potential negative effects of this policy element have been discussed in the previous section on water resources under the third option: use of reclaimed water.

6.57 Creating water features or ponds as part of SUDS schemes can improve amenity value of a local area which could contribute to improved mental health and well-being of residents. However, the presence of these features could also pose a public safety risk.

6.58 The significance of effects of these policy elements also depends on whether SUDS are implemented just as part of new developments or are retrofitted within existing built up areas,

as the volume of drainage from new developments obviously only represents a small proportion of the total.

6.59 Discharging rainwater to a surface drain or directly to a watercourse is in theory preferable as it reduces the frequency of CSOs, however, pollution and the increased risk of flooding are also a result of misconnections. Moreover, the type of sewerage system will be determined by the location, topography, etc. and in many cases there may not be a choice. However, as discussed in the next section, the building of a 'sewer interceptor' tunnel should contribute to reduce or eliminate the effects of CSOs in London.

6.60 The Mayor's preferred approach to manage surface run-off represented by this set of policy elements follows the best practice 'surface management train' which addresses quantity and quality at all stages of the drainage system.

6.61 A question around this set of policy elements is how would SUDS be financed, managed and maintained. The magnitude and/or significance of the effects also depend on how widespread these schemes become. Incorporating SUDS in new developments is more practical than retrofitting, but new build will only constitute a small proportion compared to the existing housing stock. An important reason to include SUDS in new developments is that as recent floods have demonstrated urban drainage systems are currently at capacity and therefore new development should not increase the existing pressure. Although these systems may require alternative approaches compared with traditional drainage systems, in terms of financing, building and maintaining, they are likely to contribute to reduce the risk and consequences of flooding. Also, if SUDS have wider benefits in terms of water quality and flood risk management there is a question as to who should pay for these schemes.

6.62 An issue regarding the significance of the potential effects of all the policy elements in this set is that they are not likely to be significant unless SUDS are widely implemented.

Recommended mitigation and enhancement

6.63 The draft Water Strategy includes two proposals to support this policy, which will seek to deliver mitigation and enhancement by detailing the conditions under which it should be implemented in practice. These proposals include a commitment to encourage rainwater harvesting, grey-water recycling and SUDS through policies in the new London Plan, and the intention to work with partners, through the Drain London Forum to create a strategic-level surface water management plan for London.. This London level plan is intended to assist boroughs in developing their surface water management plans, as well as enabling a regional submission for government funding to manage surface water flood risks in London, and thus should be a catalyst for more co-ordinated action.

6.64 Other comments on mitigation and enhancement of the effects of the policy elements include:

- From a sustainability perspective, the **policy elements are in the appropriate order** for managing water resources. However, SUDS should always be designed to fit the characteristics of a development and the local situation and therefore what is appropriate in one place may not be appropriate in another. Therefore policy elements 2 to 4 may not always operate in a hierarchy.

Appraisal of the policies for the Disposal of Wastewater in London

6.65 The set of policy elements for disposal of wastewater in London is included in Box 19:

Box 19: Policy 3 – Disposal of Wastewater in London
1. Discharge wastewater to a foul sewer
2. Discharge wastewater to the combined sewer, as a last resort.

6.66 The key sustainability effects have been summarised in Table 19 below. A detailed explanation of the scores in Table 19 below has been included in Appendix 11.

Table 19: Summary of the Appraisal of the Policy Element for Wastewater

Policy 3: Wastewater	Sustainability Objectives															
	1. Governance	2. Education and Awareness	3. Health and Well-being	4. Equality and Diversity	5. Safety and Security	6. Liveability and Place	7. Accessibility and Availability	8. Landscape, Historic and Cultural Environment	9. Biodiversity	10. Air Quality	11. Climate Change[25]	12. Water Quality	13. Water Resources	14. Drainage	15. Flood Risk	16. Waste Management and Resource Use	17. Economy
1	0	0	0/-?	-?	0/-?	0/-?	0	0/-?	+/-?	0	0	+/-?	0	0	+/-	0	+/-?
2	0	0	-/--	-	-	-/--	0	-	-	0	0/-	-	0	0	-	0	-

Key:
Major positive: ++ Minor positive: + Neutral: 0 Minor negative: - Major negative: -- Uncertain:? Mixed: -/+

Policy element 1: Discharge wastewater to a foul sewer

6.67 The potential negative effects caused by this policy element are mostly related to the **risk of misconnections** between the foul and the surface water drainage system in separate system. These misconnections cause sewage discharges into watercourses hence the potential negative effects on **water quality, biodiversity, liveability and place, health and landscape**.

6.68 Although using a separate system should **reduce the risk of sewer flooding**, misconnections can increase this risk which is the reason why this policy element has the potential to cause both positive and negative effects on flood risk.

Policy element 2: Discharge wastewater to the combined sewer, as a last resort

6.69 The main potentially negative effects of this policy element are either associated with the **increase in risk of sewer flooding or with combined sewer overflows**.

6.70 This policy element could have negative effects on **aesthetic amenity** and consequently on people's perception of their local area caused by combined sewer overflows (CSOs). These

[25] Objective split between (8i) mitigation and (8ii) adaptation to Climate Change

CSOs and the **increased risk of sewer flooding** could pose a threat to **public health and safety**. The presence of raw sewage presents a threat for recreational users of water bodies in particular.

6.71 Certain vulnerable groups are likely to be most significantly affected by the consequence of flooding, and the increase in the risk of flooding could have a negative effect on **local businesses and the economy**.

Overall comments on the Disposal of Wastewater in London Policy

6.72 Although it is far more preferable to discharge wastewater into a separate system (i.e. with one pipe for sewage and another one for surface run-off), rather than into a combined system, policy element 1 could have several negative effects due to the potential additional risk of misconnections. The main issues arising from policy element 2 are the occurrence of combined sewer overflows and the consequences for water quality, aesthetics and risks to health of recreational water users and other vulnerable groups.

6.73 However, the type of sewer a property is connected to is, in many cases not likely to be optional and depends on the characteristics of the area of London within which it is located. The draft Water Strategy states that the policy represents the 'ideal hierarchy, but it is recognised that in many areas there is limited choice'.

6.74 Discharging wastewater into a separate system has the potential to cause positive effects on biodiversity and water quality potentially as well as on vulnerable groups as it reduces the risk of sewer flooding (compared to discharging wastewater to a combined sewer). However, in reality misconnections affect a great proportion of those houses/businesses connected to the separate system (1 in 10 properties in some areas), and this, in practice causes the opposite effects.

6.75 Discharging wastewater to a combined system has the potential to cause negative effects on biodiversity and water quality, as well as on vulnerable groups. The overload of the system, which causes sewer flooding and the discharges of sewage from CSOs, are the main causes of this.

Recommended mitigation and enhancement

6.76 The draft Water Strategy includes three proposals which aim to support the implementation of this policy. These include: encouragement for partnership working to support the construction of the Thames and Lee Tunnels to reduce storm discharges from the combined sewer (proposal 10); support for the Royal Institute of Chartered Surveyors (RICs) to consider surveys of sewer misconnections (proposal 11); and, support for partnership working to explore how the management of sewage can provide renewable energy and reduce greenhouse gas emissions (proposal 12).

6.77 Based on the results of the appraisal of this policy, a key area for mitigation and enhancement is the prevention of misconnections. Proposal 11 seeks to encourage the consideration of including this in surveys of properties at the time of sale, which if established would help to identify some misconnections. However the proposal does not include concrete timescales or targets, and surveys at the point of sale would, in any case, only identify misconnections in properties for sale. Proposal 11 is discussed in more detail in Section 7.

6.78 Although in most cases there is not a choice of the type of sewer a new development can connect to, where there is a choice, a separate sewer is preferred. The policy elements are in this case hierarchical and one option should be preferred, however in certain locations there may be limited options for a new development.

Appraisal of the Draft Water Strategy Proposals

6.79 The findings of the appraisal of the proposals included in the draft Strategy are presented in this section.

Introduction to the proposals included in the Draft Strategy

6.80 The draft Water Strategy is intended to complement the plans and strategies of other organisations (such as the Government's Water Strategy for England, published in 2008). While drawing on existing policies, strategies and plans, it also seeks explicitly to influence their future development. The strategy intends to have this influencing role through the identification of policies setting out water management hierarchies (appraised above) together with specific proposals for action. The draft Water Strategy contains 12 specific proposals (see Table 20).

6.81 The proposals cover issues such as reducing leakage, introducing universal water metering, ensuring new homes meet high Code for Sustainable Homes levels, raising awareness of the benefits of water efficiency in existing homes, raising awareness of the high quality of tap water and impacts of drinking bottled water, etc.

6.82 Several of the proposals will have to be delivered by other organisations, because of the existing institutional and policy framework for water management (e.g. water companies) or carried out by the Mayor in partnership with other organisations such as London Boroughs, water companies, regulators, etc.

6.83 In some cases, the proposals reflect standards already contained in legislation, other policies or guidance, e.g. the Code for Sustainable Homes. In other cases the proposals seek to have an influencing or awareness raising effect, such as in relation to water efficiency in existing homes, and the quality of London's tap water. A number of the proposals set out the Mayor's intention to work in partnership with other organisations to achieve an outcome, such as with water companies and the Environment Agency.

Table 20: List of proposals included in the draft Water Strategy by chapter

Pressure on water resources
1. The Mayor will work with the water companies, the Environment Agency and other partners in seeking the effective management of London's existing and future water resources to meet the needs of the growing population whilst protecting the natural environment.
Managing water use
2. Thames Water should, through its Water Resources Management Plan, aim to achieve the best UK industry standard for leakage by 2035, in order to bring London in line with the best standards of world cities.

3. The Mayor will work with water companies and other partners to support the rapid introduction of water metering throughout London. The Mayor considers that all houses in London should have meters installed by 2015, and all blocks of flats by 2020. All new flats in London should have an individually metered water supply. Tariff arrangements should encourage the efficient use of water but protect vulnerable and low-income households.
4. The Mayor believes that, where possible, all new homes should meet the highest level of the Code for Sustainable Homes for water consumption.
5. The Mayor has announced a commitment to improve the energy efficiency of London homes. This strategy highlights the need for existing homes to become more water efficient. Improving energy and water efficiency at the same time is both sensible and the least cost way of helping Londoners to control their energy and water bills as well as to reduce their greenhouse gas emissions.
6. The Mayor will work with the water companies, the Environment Agency, and other partners in joint programmes to raise awareness of the benefits of water efficiency, including the possible savings that they can achieve through their water and energy bills.
7. The Mayor will work with the water companies and other partners to raise awareness of the high quality of London's tap water, the contribution of bottled water to climate change, and the benefits of drinking water to health and well-being. He will also encourage restaurants, bars and hotels across London to serve tap water to customers.
Managing rainwater
8. The Mayor will encourage green roofs, rainwater harvesting, grey water recycling and sustainable drainage through planning policies in his new London Plan.
9. The Mayor will work with partners through the Drain London Forum to create a strategic-level surface water management plan for London by 2012. This plan will assist Boroughs in producing their Surface Water Management Plans, will prioritise strategic actions and enable a regional submission for government funding to manage surface water flood risks in London.
Disposal of wastewater in London
10. The Mayor will work with Thames Water and other partners to support the construction of the Thames and Lee Tunnels, in a cost-effective way and minimising disruption, as a means of greatly reducing storm discharges from the combined sewer system and improving the quality of the water in the River Thames.
11. The Royal Institution of Chartered Surveyors should consider including a survey of sewer misconnections as part of the surveys at the time of sale of a property.
12. The Mayor will work with Thames Water and other partners to identify ways in which the management of sewage can provide renewable energy and reduce emissions of greenhouse gases. The Mayor encourages Thames Water and other partners to identify opportunities to use new technologies to contribute towards the Mayor's targets for decentralised energy, particularly through the production of biogas, and greenhouse gas emissions reduction.
Paying for water services
No proposals

Approach to the appraisal of the proposals

6.84 The appraisal was undertaken by considering the likely effects of implementing each proposal against the SA objectives and criteria (see Appendix 4). Each of the proposals included in the draft Strategy was appraised and potential positive and negative effects identified, together with recommendations for potential changes or additions to mitigate for negative or enhance positive effects. The approach to the appraisal of the proposals is described in Section 2 in paragraphs 2.28 – 2.30.

Results of the appraisal of the draft Water Strategy proposals

6.85 The results of the appraisal of each proposal are presented in the summary appraisal tables below (Tables 22 to 32) and a summary of the results of the appraisal of each of the

proposals against each SA objective is presented in 0. Proposal 5 and 6 were appraised together as they are both promoting water efficiency.

Table 21: Summary matrix of the appraisal of the draft Water Strategy Proposals

Proposals	Sustainability Objectives																
	1. Governance	2. Education and Awareness	3. Health and Well-being	4. Equality and Diversity	5. Safety and Security	6. Liveability and Place	7. Accessibility and Availability	8. Landscape, Historic and Cultural Environment	9. Biodiversity	10. Air Quality	11. Climate Change[26]	12. Water Quality	13. Water Resources	14. Drainage	15. Flood Risk	16. Waste Management and Resource Use	17. Economy
Proposal 1	+	0	+	0	0	0	0	0	+	0	0	+	+	0	0	0	+
Proposal 2	0	+	0/-	0/-	0	0	0	0	+/0	0	+	+?	+	0	0	0/-	+/-
Proposal 3	+	+	0/-	+/-	+	0	0	0	+	0	+	+	++	0	0	0	+/-
Proposal 4	0	+	0	+/-	+	0	0	0	+	0	+	+	+	+	+	+	+/-
Proposal 5 / Proposal 6[27]	+	+	0	0/+	0/+	0	0	0	0	0	0/+	0/+	+	0	0	0	0
Proposal 7	0	+	0/+	0	0	0	0	0	0	0	0/+	0	0	0	0	0/+	0
Proposal 8	0	0	0/-	0/-	0	0	0	0	0/+	0	0/+	0/+	0/+	+	+	0	0
Proposal 9	+	0	0/+	0	0	0	0	0	0	0	0/+	0/+	0	+	+	0	0/+
Proposal 10	+	0	+/-	0	0	0/+	0	0	+	0	0/+	+	0	0	+	+/-	0
Proposal 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proposal 12	+	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0

Key:
Major positive: ++ Minor positive: + Neutral: 0 Minor negative: - Major negative: - - Uncertain:? Mixed: -/+

Table 22: Appraisal findings for Proposal 1

Proposal 1: The Mayor will work with the water companies, the Environment Agency and other partners in seeking the effective management of London's existing and future water resources to meet the needs of the growing population whilst protecting the environment.	
Context	**Summary of potential sustainability effects**
Much more detailed context relevant to this proposal is included in sustainability baseline under the *water management* topic in section 3 (Part A). • The majority of London's water supplies come from the rivers Thames and Lee. About 80% of all of London's supply is taken from the Thames upstream of Teddington Weir. This water is stored in a number of reservoirs around the capital. • The remaining 20% of London's supply is abstracted from chalk aquifers (groundwater). • The Environment Agency[28] has categorised London as an area of 'severe' water stress. This	**Positive** • The supporting text refers to the Water Resources Working Group established by the Mayor, which brings together the four water companies serving London and the regulators (Environment Agency and Ofwat) as well as other stakeholders – with the aim of improving working relations and the flow of information. If successful this is likely to have positive effects on governance by bringing all partners and stakeholders together and involving them in formal and informal decision making. • Ensuring security of water supplies in future is

[26] Objective split between (8i) mitigation and (8ii) adaptation to Climate Change
[27] Proposal 5 and proposal 6 have been appraised together as they both seek to promote and raise awareness of water efficiency.

relates to the ratio of demand and supply both now and in the future.

- Four water companies provide water services for London: Sutton and East Surrey water; Essex and Suffolk water; Thames water; and, Three Valleys water.
- The population and number of households in London are projected to rise considerably over the next 20 years. To meet these changes the current London Plan has set a target of 30,500 additional homes per year over the period to 2026. More people, and more homes will mean the need to supply more water, and treat more sewage and run-off.
- To meet future needs and protect the environment it is essential that water supply and demand are balanced – through measures to ensure supplies (e.g. new resources, reduced leakage) and reduce demand (e.g. increased metering, water efficient appliances etc.).
- Thames Water is constructing a new desalination plant at Beckton – this is in the final stages of commissioning. This plant is intended to provide additional supplies, when needed. Thames Water has also proposed a major new reservoir in the upper Thames to secure supplies to London. However this proposal has been delayed and the Environment Agency[29] has stated that it is not satisfied that the proposed reservoir provides the best solution for the company's customers or the environment.
- This proposal overlaps / will rely upon the delivery of other proposals in the Water Strategy, particularly proposals 2 to 6.
- Given the high-level nature of this proposal, the context under all other proposals is also relevant.

likely to help avoid the need to restrict supply / reduce flows in future. This is predicted to have a minor positive effect on health and wellbeing.

- The proposal explicitly seeks to ensure water resources meet future needs, *'whilst protecting the environment'*. This should help to ensure that future water resource management supports ecosystem health etc. and thus a minor positive effect is predicted in relation to biodiversity.
- Minor positive effects are also predicted in relation to water quality and water resources, as effectively managing these is the central aim of this proposal. Minor indirect effects are predicted due to the strategic–level of this proposal.
- Water is essential for a functioning economy, and thus minor positive effects are predicted, particularly in the long-term.

Negative

- No significant negative effects predicted.

Recommendations for mitigation and enhancement

The sustainability effects of this proposal will depend upon how it is implemented. In itself the proposal simply seeks to encourage partnership working, and as a result is considered unlikely to have any significant direct effects.

However, how water resources are managed in the future, such as developing new resources to meet future needs, has the potential to cause very significant environmental, social and economic effects. Many of these are considered in the appraisal of other proposals.

Specific recommendations for mitigation / enhancement include:

- Supporting text paragraph 2.24 refers to the Water Resources Working Group. The proposal could be strengthened by including reference to this group, and other specific partnerships as appropriate, which are important for the success of water resources management.
- The supporting text in section 2 of the draft Water Strategy includes detailed discussion and analysis of the context of present and future water resources, supply and demand in London. This is welcomed, however as the proposal also seeks the protection of the natural environment, the text could be strengthened by the inclusion of a sub-section to highlight the importance of sufficient water for a healthy natural environment and the long-term health of habitats and species.

[28] Environment Agency (2007) *Areas of water stress: final classification*.
[29] Environment Agency (2007) *Response to Thames Water's consultation – the Upper Thames Major Resource Development (UTMRD), Stage two preferred scheme and design options report*

Table 23: Appraisal findings for Proposal 2

Proposal 2: Thames Water should, through its Water Resources Management Plan, aim to achieve the best UK industry standards for leakage by 2035, in order to bring London in line with the best standards of world cities.	
Context	**Summary of potential sustainability effects**
• Water company June returns to Ofwat, as presented in the draft Water Strategy indicate that 26.8% of water supplied in London was lost due to leakage in the year 2007/08. The worst leakage problems are in inner London, which is served by Thames water. • The draft Water Strategy (paragraph 3.3) estimates that reducing leakage in the mains by one percentage point would provide enough water for 224,000 people (assuming these people live in homes to Code for Sustainable Homes level 3). • Thames Water's Statement of Response to its draft Water Resources Management Plan has proposed a long-term leakage target of 114 litres per property per day in 2030/35, compared to 209 litres per property per day in 2008/09. • However, the best UK industry standard sought by the Mayor is equivalent to 80 litres per property per day. • Water companies are seeking to me sustainable economic leakage level (SELL) targets. These are discussed more fully under the *water management* topic in section 3 (Part A). In meeting SELLs the water companies are: o Replacing old leaky distribution means o Lowering the water pressure in the distribution network o Finding and fixing leaks in the distribution mains o Repairing leaks in customers supply pipes.	The appraisal of this proposal relates to and overlaps with the appraisal of Policy 1, see above and Appendix 11. The implementation of this proposal relies on Thames Water taking on board the recommendation in its Water Resources Management Plan. The direct effects of the proposal are not expected to be significant. The positive effects identified below, and in 0 are based on the assumption that Thames Water adopts the Mayor's proposed leakage target. **Positive** • Reduced leakage could help encourage behaviour change among Thames Water's customers due to awareness of the reduced levels of leakage and importance of water saving is emphasised. • Positive effects are predicted in relation to water resources and water quality, as reducing leakage will mean less water is needed to be abstracted, which is likely to improve flows in water courses with beneficial quality effects. • Increased flows and reduced abstraction may also improve ecosystems and habitat health, therefore a positive effect is predicted in relation to biodiversity. • Positive effects are also predicted in relation to climate change mitigation and adaptation, as reducing leakage will reduce vulnerability to potential future water shortage, and a more efficient network is likely to enable less energy intensive supply. **Negative** • Potential waste generation, disruption, congestion and noise disturbance arising from leakage reduction works have the potential for negative effects on health and wellbeing, waste arising and resource use and the wider economy. These effects are predicted to be short-term and temporary in nature. • Potential negative health effects and costs (affecting equality) associated with reduced pressure in the mains, such as the need for pumps in high-rise buildings and risk of backflows causing contamination to water supplies. These effects are highlighted under the appraisal of Policy 1, above. • If in the long-term the costs of leakage reduction are passed onto consumers through increased water rates / charges, this could impact most on low-income / vulnerable people, thus potential negative effects are predicted in relation to health and wellbeing and equality and diversity.
Recommendations for mitigation and enhancement	
Specific recommendations for mitigation / enhancement include: • The differential effect of affordability of water should be monitored and appropriate actions taken in the light of any significant effects on vulnerable groups and low income households (including the appropriate setting of tariffs). • Implementation of the code of practice with utility companies to reduce traffic disruption.	

Table 24: Appraisal findings for Proposal 3

Proposal 3: The Mayor will work with water companies and other partners to support the rapid introduction of water metering throughout London. The Mayor considers that all houses in London should have meters installed by 2015, and all blocks of flats by 2020. All new flats in London should have individually metered water supply. Tariff arrangements should encourage the efficient use of water but protect vulnerable and low-income households.	
Context	**Summary of potential sustainability effects**
• Achieving universal metering in by 2015 greatly exceeds water companies' predictions for the penetration of metering (see Figure 4 in Part A). • At present the draft Water Strategy (paragraph 3.18) estimates that 22.7 per cent of households have a metered water supply in London, compared to around 26 per cent in the UK. • There are particular challenges in relation to installing meters in flats, especially where they were not designed or constructed with metering in mind. • The draft Water Strategy cites research showing that household metering can reduce water use by between 10 and 15 per cent. • This proposal is closely related to chapter 6 of the draft Water Strategy: *Paying for water services*.	**Positive** • A number of potentially positive effects have been identified as this proposal is aiming to lead to a reduction in water use. One estimate is that average reduction in water use that could be achieved by metering is between 10-15%. • Universal metering accompanied by suitable tariffs could also help water companies to manage demand during peak consumption periods or dry periods. For instance, tariffs could be increased during those periods in order to penalise unsustainable uses, e.g. sprinklers etc. This should preclude the use of hosepipe bans without having an impact on households with high demand due to e.g. illness or high occupancy. • The requirement to install meters in all houses and blocks of flats in London, by 2015 and 2020 respectively, may generate employment opportunities and economic activity related to meter installation. • The proposal also promotes a partnership approach which could have a positive effect on Governance. • A further positive effect has been identified on Education and Awareness as having a water meter should increase people's awareness of their water use and provide incentive for behavioural change. • Reducing water consumption could have a positive effect on the water environment and associated biodiversity. Water abstractions can be responsible for low flows and loss of dilution capacity and consequent increase in pollution of water bodies which affects related biodiversity. • Reducing water consumption could have a positive effect on both adaptation to climate change and also on mitigation, as it would reduce the energy used in treating water and also pumping and heating water in the household. • Explicit recognition of the need to arrange tariffs such that vulnerable and low-income groups are protected is likely to minimise the risk of disproportionate impacts on these groups, and the possibility that metering could exacerbate inequalities. **Negative** • Although the proposals seeks to protect vulnerable and low-income households, it is possible that for certain households, particularly those on the margins of these groups, metering could lead to an increased in water poverty or reduced consumption to unhealthy levels. • The high cost associated with installing water meters and the lower potential of savings for flats

	would have a potentially negative impact under the Economy objective.
Recommendations for mitigation and enhancement	
Specific recommendations for mitigation / enhancement include: • Further detail could be provided on how the standard required by this proposal could be implemented, e.g. what mechanism the Mayor intends to use to work with water companies and other partners. It would also be useful to refer to how the achievement of universal metering would be phased with interim targets, e.g. 50% of flats in the next 10 years, etc. It could also be useful to include details on monitoring and revision of the targets, e.g. after 5 years. • Other measures to achieve the same reduction in water use could be investigated as the cost of achieving and maintaining universal metering is likely to be very high. • A proposal for universal metering with longer timescales would be closer to water companies' projections for increasing metering (see Figure 4 in Part A), but as such would not constitute a difference from the Business as Usual scenario and therefore this proposal would not make any difference to the current policy context. • The differential effect of water metering and affordability of water should be monitored and appropriate actions taken in the light of any significant effects.	

Table 25: Appraisal findings for Proposal 4

Proposal 4: The Mayor believes that, where possible, all new homes should meet the highest level of the Code for Sustainable Homes for water consumption.	
Context	**Summary of potential sustainability effects**
• Average water consumption in London is about 150-170 litres per person per day. However, this average figure conceals considerable variation, e.g. habits, season, appliances etc. • In terms of water use, Code Level 3 equates to 105 litres per person per day, and Code Level 6 80 litres per person per day. Compared to current consumption this represents a dramatic improvement, however this does only relate to new homes, and not existing stock. • Current government policy is that (from May 2008) a rating in relation to the Code is mandatory for all new homes[30]. This does not mean that any particular level of the Code must be met, but that buyers must be provided with information relating to how the home performs against the Code. However, publicly funded housing projects are required to meet Code Level 3. • Code Level 3 is also the 'essential standard' for all new residential development included in the London Plan. • Following a commitment made in the Housing Green Paper[31], an amended Building Regulations Part G will come into force in October 2009, setting a maximum daily usage standard of 125 litres per person per day. • Achieving Code Level 5/6 is likely to require the installation of systems to recycle grey water and harvest rainwater, which is supported by Policy 1, element 3.	Although the Code for Sustainable homes covers various aspects of the environmental impacts of housing (energy, material use, etc.) the appraisal here focuses on the water consumption as this is referred to in the proposal. **Positive** • This proposal would have in general positive effects under the water resources and quality and biodiversity, climate change and safety and security objectives assuming it led to all homes meeting the highest code level not just publicly funded housing. However, no firm date is included for when this will be achieved, like 2016. • Homes build to higher Code Levels may raise awareness of occupants of the benefits of using water (and other resources) more efficiently and effectively, thus a positive effect is predicted in relation to education and awareness. • Homes build to highest Code Levels (5 and 6) will need to incorporate grey water recycling and rainwater harvesting, as well as sustainable drainage measures. These are likely to have a positive effect on drainage and mitigating flood risk, both by managing surface water better, and by attenuating rainfall thus reducing the risks of surface water flooding. • A potential additional benefit of achieving higher Code Levels is that by introducing these levels in new build, it could help improve the technology and reduce the cost of water efficient fixtures and fittings which could help increase water efficiency in existing homes when replacing water fittings. **Negative** • Achieving Code Level 3 (equivalent water use of 105 litres per person per day) would add relatively

[30] www.communities.gov.uk/thecode
[31] DCLG (2007), *Homes for the future: more affordable, more sustainable - Housing Green Paper*

	little to the cost of building new homes (around 0.1-0.2%). However, Code Level 6 is estimated to potentially add between 0.6% and 4.4% to the cost of a new home, which could have a negative effect on the affordability of new homes. Both positive and negative effects are predicted in relation to equality, as homes built to higher Code levels will be more energy and water efficient, and thus households living in such homes will be less likely to suffer from fuel or water poverty.

Recommendations for mitigation and enhancement

The proposal is limited to new residential development, so all the positive effects identified are likely to be of minor magnitude relative to the overall use of water from all the existing housing stock. The London Plan contains a target to build 30,650 additional homes per year until 2016. The number of dwellings in London was 3.12 million in 2003[32], so new build represent approximately a one percent increase in the total stock or 10% over 10 years.

Specific recommendations for mitigation / enhancement include:

- The inclusion of a firm commitment to meet Code Level 6 by 2016 for all new homes (not just publicly funded developments) and the removal of the caveat "where possible" would improve the proposal from a sustainability perspective. Paragraph 13 in the Executive Summary states that "the Mayor considers that more ambitious standards are appropriate for new homes, given that London is designated as being in an area of serious water stress" which is welcomed, however this is not included or emphasised in the paragraphs before proposal 4 in section 3 (i.e. paragraphs 3.23 - 3.29).
- The Code for Sustainable Homes is relevant to residential developments only. Water efficiency standards for non-residential developments could also be included in order to strengthen this proposal, such as through reference to existing (e.g. BREEAM) or future standards for commercial buildings. It is noted that water efficiency in commerce is included as a sub-section to chapter 3 of the draft Water Strategy (following proposals 5 and 6), however no specific proposal is included in relation to this issue.
- Additional text could be included to set out how the Code Levels included by this proposal should be implemented, for example through inclusion as a policy in future revisions to the London Plan, or amendments to the Mayor's Supplementary Planning Guidance on Sustainable Design and Construction (2006). The supporting text could also set out how, and in what timeframe, the standard the Mayor's 'believes' should be achieved could eventually become a mandatory requirement.

Table 26: Appraisal findings for proposal 5 and proposal 6

Proposal 5: The Mayor has announced a commitment to improve the energy efficiency of London homes. This strategy highlights the need for existing homes to become more water efficient. Improving energy and water efficiency at the same time is both sensible and the least cost way of helping Londoners to control their energy and water bills as well as to reduce their greenhouse gas emissions.

Proposal 6: The Mayor will work with the water companies, the Environment Agency, and other partners in joint programmes to raise awareness of the benefits of water efficiency, including the possible savings that they can achieve through their water and energy bills.

Context	Summary of potential sustainability effects
• The draft Water Strategy includes an estimate that London has 3.2 million existing homes, and thus the potential savings from improving water efficiency in this existing stock are very significant. • Improved efficiency can be achieved by changing household behaviour, and the installation of more water efficient fixtures and appliances (such as low flow taps and shower-heads). • The Environment Agency has calculated that retrofitting existing homes with relatively simple existing technologies could save up to 31 litres per person per day over the current Building Regulations requirements[33].	**Positive** • Limited significant effects are likely, however minor positive effects may result from proposal 6, where awareness raising is successful in changing behaviour in relation to water use. • Possible positive effects are likely in relation to governance (due to partnership working), education and awareness and water resources, as the aim of the proposals is increased awareness of the benefits of more efficient water use, and the end result of changed use patterns is intended to be reduced water usage, which will help reduce pressure on water resources.

[32] http://www.sustainable-development.gov.uk/regional/london/36.htm (Accessed: 6/12/07)
[33] Environment Agency (2007), *Water Efficiency in the South East of England, Retrofitting existing homes*

• A case study highlighted in the draft Water Strategy (paragraph 3.33) suggests that retrofitting a typical semi-detached house with a family of five could save 109 litres per person per day, and save up to £132 off energy bills (due to savings related to water heating) and a CO_2 saving of 600 kg per year.	• Secondary effects of more efficient water usage may include: reduced bills, with some positive equality effects (although some efficiency measures will impose costs which may be too high for the lowest income households); greater resilience to climate change effects; higher flow in water courses leading to improved quality. **Negative** • No significant negative effects are predicted.
Recommendations for mitigation and enhancement	
Proposal 5 is essentially a statement of fact rather than a distinct proposal. As they are written proposals 5 and 6 could form elements of one single proposal, with proposal 5 setting the context and proposal 6 providing a specific proposal for action by the Mayor. Although appraised together, as they are currently worded, proposal 5 is unlikely to have any specific effects, and as a result the effects identified above relate primarily to proposal 6. Specific recommendations for mitigation / enhancement include: • The proposals (especially proposal 6) are potentially positive from a sustainability perspective. However, it is unclear how it will be implemented / achieved in practice as there are no further details on how the Mayor will encourage / coordinate partnership working in the supporting text. Inclusion of text setting out how, in practice awareness is to be raised, and joint working encouraged would strengthen these proposals. • Supporting text (paragraph 3.37) states that the Mayor supports 130 litres per person per day as a medium-term target for reducing domestic water consumption. However it is not clear from the text what timeframe the 'medium-term' refers to, or what mechanisms might be adopted to achieve the target proposed. Additional text to clarify this would strengthen the proposals / supporting text. • Supporting text (paragraph 3.38) notes that the Mayor is working with boroughs and other partners to develop a successor to the Decent Homes Standard, which will include water efficiency objectives for social housing refurbishment. This is positive from a sustainability perspective, and could be included in or following the proposals as an example of partnership working in practice.	

Table 27: Appraisal findings for Proposal 7

Proposal 7: The Mayor will work with water companies and other partners to raise awareness of the high quality of London's tap water, the contribution of bottled water to climate change, and the benefits of drinking water to health and wellbeing. He will also encourage restaurants, bars and hotels across London to serve tap water to customers.	
Context	**Summary of potential sustainability effects**
• London's drinking water (tap water) is of excellent quality, however misconceptions of the quality and health properties of tap water remain. • Tap water is approximately 1000 times cheaper than bottled water. In addition the relatively high carbon footprint of bottled water means that for some imported brands, bottled water results in 300 times the carbon emissions per litre than tap water. • Although (in 2004) the draft Water Strategy estimates that 1.7 billion litres of bottle water were sold in the UK, this represents a very small proportion of overall water consumption. • The London on Tap campaign, launched in February 2008 by the Mayor and Thames Water is a key element in the Mayor's strategy to encourage people to drink tap water in place of bottled water. • The Mayor also supports the concept of drinking fountains.	**Positive** • Main aim of the proposal is to raise awareness of the relative impacts of bottled water consumption, and the health benefits of drinking water. A minor positive effect is therefore predicted in relation to education and awareness. • If the proposal results in more people consuming a healthy volume of water, a positive health effect is possible too, although compared to other underlying health determinants the effect is not expected to be significant. • In the long-term if reduced consumption of bottled water leads to less bottles being produced and distributed, there may be positive effects on climate change (reduced emissions), and waste and resources (reduced plastic bottle waste and resource use). However, the scale of the effects relative to other climate change mitigation and waste management actions, are not predicted to be significant. **Negative** • No significant effects predicted.
Recommendations for mitigation and enhancement	
The proposal that the Mayor will encourage restaurants, bars and hotels across London to serve tap water to	

customers is positive in principal as it will potentially raise awareness amongst customers of water issues, however in terms of potential water savings in itself is potentially of limited significance.

Specific recommendations for mitigation / enhancement include:

- The supporting text refers to the London on Tap campaign. It is unclear from the proposal whether this is the only mechanism the Mayor intends to use to implement this proposal, or if other means may be introduced in future. The proposal would be strengthened by the inclusion of text setting out how the Mayor intends to implement it, providing examples of specific initiatives and programmes he plans to introduce.

Table 28: Appraisal findings for Proposal 8

Proposal 8: The Mayor will encourage green roofs, rainwater harvesting, grey water recycling and sustainable drainage through planning policies in his new London Plan	
Context	**Summary of potential sustainability effects**
• Capturing rainwater for use in the home / workplace (for non-potable uses, such as toilet flushing) can help to 'slow' it, and relieve pressure on the drainage system. • The draft Water Strategy estimates that the use of rainwater could reduce domestic potable water use by over a third. • An increased frequency of heavy rainfall days, together with more hard, impermeable surfaces is leading to an increased problem with surface water runoff. When surface water drains are unable to cope, this can cause flooding. This is likely to become an even greater issue in future, due to the impacts of climate change on weather patterns. • The draft Water Strategy highlights the standards for Sustainable Drainage Systems (SUDS) included in the Mayor's SPG on Sustainable Design and Construction (GLA, 2006). This includes 'essential' (50% of run-off attenuated) and 'preferred' (100% of run-off attenuated) standards. • The Code for Sustainable Homes (see proposal 4) also includes criteria for the attenuation of surface water runoff. • The draft Flood and Water Management Bill (2009) sets out requirements and standards in relation to sustainable drainage.	This proposal sets out the Mayor's intention to develop policies in future revisions to the London Plan. As a result it is not expected to have any direct sustainability effects. The effects recorded below, and in 0 are those that would occur where green roofs, rainwater harvesting, grey water recycling and sustainable drainage becomes commonplace in new development. As the proposal is dependent on amending the London Plan, these effects would only be achieved in the long-term. **Positive** • green roofs, rainwater harvesting and sustainable drainage where included in development will help reduce runoff, and thus the risk of surface water and sewer flooding. • Where surface and sewer flooding is reduced this is likely to have a positive effect on water quality. • Rainwater harvesting and grey water recycling, as noted in the context, if used for the majority of non-potable uses (outdoor uses, toilet flushing, clothes washing etc.) can account for around a third of domestic water use. This would therefore reduce potable water consumption in those developments where such systems are installed, and have a positive effect on water resources. • Green roofs and SUDS can also help create habitats and thus have long-term positive effects on biodiversity. **Negative** • There is a potential negative effect on health and well being related to the risk of cross-connections between drinking water supply and reclaimed water. Reclaimed water may also require treatment if storage leads to microbiological contamination. However, this effect is not likely to be significant. • A further potential negative impact on equality and diversity has been identified this is related to the cost of installing reclaimed water systems.
Recommendations for mitigation and enhancement	
Specific recommendations for mitigation / enhancement include: • The potential risk of misconnections between reclaimed and drinking water supplies could be noted in the supporting text. Cross reference could be provided to supporting text in chapter 3 (paragraph 3.47) which refers to Defra's proposed standard for non-potable water, and the suggestion to use different coloured pipes to minimise the risk of misconnections. • The proposal could provide more detail on how the Mayor intends to 'encourage' these actions, and could	

include thresholds where 'essential' and 'preferred' standards are expected to be required. Due to economies of scale, larger developments may be more able to achieve higher levels of attenuation, and it may be more cost effective to install comprehensive rain and grey water recycling systems.

- Achieving the highest Code for Sustainable Homes Levels (as included in proposal 4) will require some on site water reclamation. It is recommended that a specific cross-reference text to proposal 4 is added to the supporting text.

Table 29: Appraisal findings for Proposal 9

Proposal 9: The Mayor will work with partners through the Drain London Forum to create a strategic-level surface water management plan for London by 2012. This plan will assist Boroughs in producing their Surface Water Management Plans, will prioritise strategic actions, and will enable a regional submission to be made for government funding to manage surface water flood risks in London.	
Context	**Summary of potential sustainability effects**
• Surface water flooding occurs when the intensity of rainfall overcomes the capacity of the land and drainage system/s to soak up and enable excess water to drain away. As noted under proposal 8, the occurrence of heavy rainfall days is expected to increase due to climate change. • No single agency or organisation has responsibility for the management or reporting of drainage and surface water flooding in London. This situation led the Mayor to establish the Drain London Forum. • The Government response to the Pitt Review[34], gave the Environment Agency a strategic overview role in relation to all forms of flood risk, while local authorities are responsible for preparing local Surface Water Management Plans.	The effects of this proposal will depend on the success of the strategic level surface water management plan in achieving the aims set out in the proposal. The inclusion of an explicit deadline for preparing the plan is welcomed. **Positive** • The Drain London Forum brings together a number of organisations and agencies, which is likely to have a positive effect on governance. • Minor positive effects, particularly in the long-term, are possible where the strategic level surface water management plan leads to improvements in the management of surface water drainage and flooding at the local level – these effects relate to reduced flood risk, and the impact this would have on: health and wellbeing; resilience to climate change; water quality; improved drainage; and the viability and resilience of London's economy. **Negative** • No significant negative effects predicted
Recommendations for mitigation and enhancement	
Specific recommendations for mitigation and enhancement include: • Further information on the aims and members of the Drain London Forum could be included within the supporting text. • The wording of proposal 9 illustrates how other proposals where the Mayor will work with others could be made more robust. Here the Mayor will work through the Forum to create a plan.	

Table 30: Appraisal findings for Proposal 10

Proposal 10: The Mayor will work with Thames Water and other partners to support the construction of the Thames and Lee Tunnels, in a cost-effective way and minimising disruption, as a means of greatly reducing storm discharges from the combined sewer system and improving the quality of the water in the River Thames.	
Context	**Summary of potential sustainability effects**
• London's combined sewers have their origins in the designs of Sir Joseph Bazalgette in the 1800s. They remove waste water and rainwater in the same pipe, from properties in central London. • Overflow outlets from these combined sewers into the tidal Thames and its tributaries were designed to avoid raw sewage flooding during intense	Given the timescales associated with planning and construction of the proposed tunnels (see context), all effects will be in the medium and long-term. The Lee Tunnel is expected to be operational by 2014, and the Thames Tunnel by 2020. **Positive** • The proposal specifically supports partnership

[34] Defra (2008), *The Government's Response to Sir Michael Pitt's Review of the Summer 2007 Floods*: http://www.defra.gov.uk/environ/fcd/floods07/Govtresptopitt.pdf

rainfall events. There are now 57 Combined Sewer Overflows (CSOs) in London. • The increase in population and heavy rainfall events means that at present the strain on the sewer system means that even relatively moderate rainfall events can lead to overflows, and discharges at some CSOs occur more than 50 times a year. • The effects of raw sewerage being discharged into the Thames include: o A fall in dissolved oxygen, causing risk to wildlife o Public health risks due to a rise in pathogens o Impact on visual amenity. • The Thames Tideway Tunnels are designed to mitigate these problems by intercepting CSOs and diverting them to existing and improved treatment works. • The Lee Tunnel on which construction is intended to start in 2009 and be complete by 2014, is expected to reduce discharges by up to 50 per cent. Construction of the Thames Tunnel is not expected to commence before 2012, with completion proposed by 2020.	working, which may help improve governance in relation to this issue. • In the long-term, the tunnels will lead to positive effects on water quality in the Thames which in turn is likely to have beneficial effects on: health and wellbeing of those using the river; visual amenity (liveability and place); biodiversity and river based wildlife. • The tunnels will improve resilience to climate change by reducing the likelihood of combined sewage overflows into the Thames even given the increased frequency and severity of rainfall events. • The tunnels are intended to improve the management and disposal of wastewater, so a minor positive long-term effect on waste management is predicted. **Negative** • Construction of the tunnels will lead to the use of resources and aggregates and the production of construction waste. • During construction of the tunnels there is likely to be noise, dust and disruption leading to some localised negative impacts on quality of life, health and wellbeing. The inclusion of a commitment to minimise disruption is therefore welcomed and if delivered it would help reduce these effects.
Recommendations for mitigation and enhancement	
Specific recommendations for mitigation and enhancement: • The proposal would benefit from further details on the mechanism(s) by which it would be delivered. • In order to deliver the commitment to minimise disruption the effects will need to be evaluated in more detail and an enforceable plan to manage disturbance put in place.	

Table 31: Appraisal findings for Proposal 11

Proposal 11: The Royal Institution of Chartered Surveyors should consider including a survey of sewer misconnections as part of the home surveys at the time of sale.	
Context	**Summary of potential sustainability effects**
• Sewer misconnections occur when householders, or plumbers, inadvertently connect household appliances and/or waste pipes to the surface water drain instead of the foul sewer. In this way foul water can be discharged into London's watercourses without being treated. • Thames Water estimate that as many as one in 20 houses in London has a misconnection, and in some areas that the figure is higher than this. • The end result of these misconnections is pollution of rivers and tributaries resulting in risks to biodiversity and wildlife, negative visual amenity, and in some cases sections of river can be so badly impacted that they can no longer support aquatic wildlife. • The Draft Flood and Water Management Bill will give sewerage companies similar powers to those of local authorities to rectify misconnections.	As this proposal is simply requesting that an external organisation 'consider' including surveys of misconnections, it is not predicted to have any direct sustainability effects. In the long-term, if these surveys are introduced, there is the potential for positive effects on the management and disposal of wastewater, water quality and health, due to the identification and rectification of sewer misconnections. However, these effects are not considered attributable as direct effects of this proposal.
Recommendations for mitigation and enhancement	
Specific recommendations for mitigation and enhancement include: • The proposal could be worded more strongly, for example to include text such as: *'the Mayor will work with the Royal Institution of Chartered Surveyors to ensure the inclusion, by* [for example] *2012, of a survey of sewer misconnections as part of the home surveys at the time of sale'.*	

Table 32: Appraisal findings for Proposal 12

Proposal 12: The Mayor will work with Thames Water and other partners to identify ways in which the management of sewage can provide renewable energy and reduce emissions of greenhouse gases. The Mayor encourages Thames Water and other partners to identify opportunities to use new technologies to contribute towards the Mayor's targets for decentralised energy, particularly through the production of biogas, and greenhouse gas emissions reduction.	
Context	**Summary of potential sustainability effects**
• Approximately 50% of London's sewage sludge is recycled to land, which is currently considered the best practicable environmental option, although it can lead to high transport costs, and associated emissions. • Over the next 10 years, Thames Water has indicated that it is seeking to introduce enhanced digestion at a number of its sludge treatment facilities (draft Water Strategy, paragraph 5.30). • Thames Water's 25 year sludge treatment strategy[35] favours processes which a) maximise energy recovery and b) minimise sludge volumes.	**Positive** • Depending on the measures adopted, positive long-term effects are possible in relation to climate change and energy due to the generation of renewable energy, and reduction in greenhouse gas emissions. The relative contribution of this sector is likely to be very small however, compared to other energy generating and greenhouse gas emitting activities and sectors. • The proposal seeks partnership working, and therefore a minor positive effect is predicted in relation to governance. **Negative** • No significant negative effects predicted.
Recommendations for mitigation and enhancement	
The effects of this proposal will depend upon what measures are developed to provide renewable energy and reduce emissions through improved management of sewage. Specific recommendations for mitigation and enhancement include: • The proposal would benefit from further details on the mechanism(s) by which it would be delivered and the specific timescales over which change is proposed.	

Overall comments on the draft Water Strategy proposals

6.86 Overall the proposals included in the draft Water Strategy are likely to have a positive effect, but this is likely to be of minor significance and many of the proposals will have limited direct effects as the majority tend to be enabling type actions which reflect the Mayor's limited responsibilities for water management. Table 21 illustrates that the majority of the effects are expected to be positive, with only a small number of potential minor negative effects.

6.87 Only one effect of major significance is predicted, which is the positive effect on water resources which could arise from the introduction of universal metering by 2015 (proposal 3). The significance and certainty attributed to the effects of this proposal, are in large part due to the fact that it contains specific recommendations together with a timeframe over which the outcome is expected. This differs from the majority of other proposals which set out high-level aspirations with limited detail of how and by when outcomes are expected to be delivered and change achieved.

6.88 The potential positive and negative effects and negative effects predicted for certain SA objectives are associated with health and wellbeing, equality and diversity (proposals 2, 3, 4, 8 and 10), waste management and resource use (2, 3 and 10), and economy (proposals 2 and 3). All of these effects are predicted to be of minor significance, and in many cases are mixed (i.e. a minor positive effect is also predicted). Potential negative effects on health and wellbeing, and equality relate to the possibility that construction works (for example to reduce leakage) may cause noise disturbance and disruption, and increased costs (e.g. through

[35] Thames Water (2008), *Thames Water's 25-year Sludge Strategy*

metering, or the need to pay for pumping in some cases) might impact most on vulnerable and low income groups. Proposal 3 and chapter 6, however, do seek to mitigate for the potential negative equality effects of increased metering penetration, by setting tariffs that protect vulnerable and low income households.

6.89 Many proposals are intended to be 'influencing' in their role, rather than suggesting specific actions or changes. It is recognised that this is in line with the intended role of the draft Water Strategy (as set out in paragraph 1.3), however as a result the proposals are not expected to result in many specific significant effects in relation to the SA objectives. In addition proposals 1, 2, 3, 6, 7, 9, 10, 11 and 12 all specifically seek partnership working, or rely on action from other organisations (e.g. Royal Institution of Chartered Surveyors in proposal 11) to instigate actions and bring about change. In some cases it is difficult to predict with any certainty what effects these proposals may have, as details of their implementation has not been included in the draft Water Strategy.

6.90 In relation to these proposals seeking to encourage or stimulate partnership working, the wording of proposal 9 illustrates how other proposals where the Mayor will work with others could be made more robust. Here the Mayor will work through the Forum to create a plan. In other proposals it is somewhat unclear what mechanisms will be used and what outcomes are intended. Where it is felt that greater clarity of implementation could be provided, specific mitigation and enhancement comments are included in Tables 22 to 32 above.

6.91 In some cases (e.g. proposals 4 and 8) the effects will be limited by the fact that these proposals are focussed on new development/s. Although seeking positive change, such as in the case of proposal 4, the meeting of higher Code for Sustainable Homes Levels, the number of new homes projected in London over the 10 year intended timeframe of the Water Strategy is a small proportion of the existing housing stock. As a result the effects predicted should be interpreted in this context.

Potential omissions amongst the proposals

6.92 Potential omissions identified include establishing **water efficiency standards for non-residential developments**. This would support the achievement of the Policy 1 (element 1=) which seeks to *'improve the efficiency of water use in residential, commercial and public buildings (both new and existing)'*. This could potentially be achieved through reference to or the encouragement of the use of existing standards for non-residential developments, such as BREEAM.

6.93 An additional potential omission identified relates to objective 3 of the Water Strategy (see above) which specifically refers to **groundwater flooding**. If this is considered to be a significant issue, it would ideally be incorporated within a proposal.

6.94 If the recommendation is accepted to include **all sources of flooding** should be covered in the Strategy, rather than just surface water and sewer flooding (see comments on the Strategy's objectives above), there will be other proposals that should be included to support the relevant policy elements. Earlier drafts of the Strategy which had this wider scope included proposals, for example, relating to assessment of flood risk for new developments, funding and decision making related to the Thames Estuary 2100 project and funding of protection of properties and economic activity in London.

6.95 More specific proposals with relevant thresholds and targets relating to meeting water requirements on-site and managing surface water drainage in major developments could be added with specific reference to updates required to the London Plan and SPG on sustainable design and construction. In addition, more detailed proposals could be provided on the potential to **save energy and generate renewable energy and reduce greenhouse gas emissions** within water management (both water supply and wastewater disposal). As part of preparing the final Water Strategy, it would benefit from developing these areas in conjunction with the preparation of the Mayor's revised Waste Strategy and the new Energy and Climate Change Mitigation Strategy.

6.96 Earlier drafts of the Strategy referred to the preparation of a **Water Action Framework**. Reference to this action plan has been deleted in the later drafts of the Water Strategy. Given that most of the policies and proposals include limited detail on how they will be implemented, it is recommended that consideration should be given to the reinstatement of the intention to develop a specific framework for action to make it clearer how they will be delivered. The text in chapter 1 on implementation and monitoring is recognised, however this does not set out a clear programme of how the Strategy will be implemented, or details of how the policies and proposals in the draft Strategy are to be developed and delivered.

6.97 A water action framework could provide more details on how the proposals will be implemented, possible timescales, the organisation responsible, how they will be monitored with indicators and targets and a timetable for review. A specific water action framework could also include details on how the Mayor's preferred standards can be operationalised. Examples of specific areas where a water action framework could provide implementation support and detail include:

- The phasing and interim targets in relation to the introduction of universal metering (proposal 3), together with details on monitoring and potential revision of targets (e.g. after 5 years).
- Detail of how the Mayor's proposal that all new homes should meet higher Code Levels should be implemented, and details of how these standards could eventually become a requirement overtime (proposal 4).

Appraisal of the draft Water Strategy overall

6.98 This section provides a summary of the findings of the appraisal of the significant sustainability effects of the draft Water Strategy overall. It aims to bring together the findings of the appraisal of the policies and proposals included in the draft Strategy as presented in the preceding sections.

6.99 As noted in Part A (Section 1) of the SA Report, the SA incorporating Strategic Environmental Assessment (SEA) and Health Impact Assessment (HIA). A separate Equalities Impact Assessment has been carried out by the GLA, however for clarity and to indicate how this appraisal has considered specific health and equalities effects, these are highlighted specifically in this section.

6.100 This section also provides a commentary on the difference that the draft Water Strategy is likely to make compared to the future business as usual (BAU+10) (see the context in Section 5).

Overall appraisal of the draft Water Strategy

6.101 An overall summary of the detailed appraisal of each of the policies and proposals is presented in Table 33. The final appraisal matrix records the results of the appraisal of the draft Water Strategy against the SA objectives. The appraisal looked at the three main water management themes included in the draft Strategy (water resources, drainage and wastewater) in detail. A summary of the appraisal against these themes is included in Table 34.

6.102 The appraisal scores included in Table 34 are based on the likely combined effects on sustainability of the proposals and policies included in the draft Water Strategy. However, the overall appraisal of the draft Water Strategy did not consider all the elements included in the three policies under each theme but concentrated on the Mayor's preferred approach to the management of each theme. For instance, under water use in London, the appraisal considered the effects of the relevant proposals and the effects of implementing the Mayor's preferred approach as represented by policy 1 element 1= (a): Reduce the loss of water through better leakage management; and, policy 1 element 1= (b): Improve the efficiency of water use in residential, commercial and public buildings (both new and existing).

Table 33: Summary matrix of the appraisal of the Policies and Proposals

Water Strategy Policies and Proposals	Sustainability Objectives																
	1. Governance	2. Education and Awareness	3. Health and Well-being	4. Equality and Diversity	5. Safety and Security	6. Liveability and Place	7. Accessibility and Availability	8. Landscape, Historic and Cultural Environment	9. Biodiversity	10. Air Quality	11. Climate Change[36]	12. Water Quality	13. Water Resources	14. Drainage	15. Flood Risk	16. Waste Management and Resource Use	17. Economy
Water Resources																	
Policy 1																	
=1 (1)	+?	+	0/-	-/+	+/?	0/-	0	0	+/0	0	+	+?	+/ ++	0	0	-	+/-
=1 (2)	+?	+	+	-	+/0	+	0	0	+/ ++	0	+	+	+/ ++	0	0/-	0	+
3	0	+/-	+/-	-/0	+/0	+/-	0	0	+	0	+/-	+?	+	+/++	+?	0	+
4	?	-?	+/-	+/-	+	+/-	+/-	+/-?	-?	0/-?	?	-?	+/-?	0	0?	-	+/-
Related Proposals																	
Proposal 1	+	0	+	0	0	0	0	0	+	0	0	+	+	0	0	0	+
Proposal 2	0	+	0/-	0/-	0	0	0	0	+/0	0	+	+?	+	0	0	0/-	+/-
Proposal 3	+	+	0/-	+/-	+	0	0	0	+	0	+	+	++	0	0	0	+/-
Proposal 4	0	+	0	+/-	+	0	0	0	+	0	+	+	+	+	+	+	+/-
Proposal 5 Proposal 6[37]	+	+	0	0/+	0/+	0	0	0	0	0	0/+	0/+	+	0	0	0	0
Proposal 7	0	+	0/+	0	0	0	0	0	0	0	0/+	0	0	0	0	0/+	0
Drainage																	
Policy 2																	
1	0	0	0/+?	-?	+?	0/+?	0	0	+	?	-/+/0?	+	+	++/+	+	0	+?
2	0	0	0/+?	-?	0/+?	0/+?	0	0	+	0	0/+?	+	+	++/+	+	0	+?
3	0	0	0/+/-?	-?	0/-?	0/+?	0	0/+?	+/++	0	0/+	+	+	++/+	+	0	+?
4	0	0	0/+?	-	0/+?	0/+/-?	0	0	0/+	0	0/+	+?	+	+	+	0	+?
5	0	0	0/+?	0	0/-?	0/-	0	0	-/0	0	-	-	-	-	-	0	-?
6	0	0	-	-	0/-?	0/-	0	0	-/0	0	-	-/--	-	-	--	0	-
7	0	0	-	-	-	-	0	0	-	?	-	--	-	-	--	0	-
Related Proposals																	
Proposal 8	0	0	0/-	0/-	0	0	0	0	0/+	0	0/+	0/+	0/+	+	+	0	0
Proposal 9	+	0	0/+	0	0	0	0	0	0	0	0/+	0/+	0	+	+	0	0/+
Disposal of wastewater																	
Policy 3																	
1	0	0	0/-?	-?	0/-?	0/-?	0	0/-?	+/-?	0	0	+/-?	0	0	+/-	0	+/-?
2	0	0	-/--	-	-	-/--	0	-	-	0	0/-	-	0	0	-	0	-
Related Proposals																	
Proposal 10	+	0	+/-	0	0	0/+	0	0	+	0	0/+	+	0	0	+	+/-	0
Proposal 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Proposal 12	+	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0

Key: Major positive: ++ Minor positive: + Neutral: 0 Minor negative: - Major negative: -- Uncertain:? Mixed: -/+

[36] Objective split between (8i) mitigation and (8ii) adaptation to Climate Change

[37] Proposal 5 and proposal 6 have been appraised together as they both seek to promote and raise awareness of water efficiency.

Table 34: Summary matrix of the appraisal of the draft Water Strategy by theme

Water Strategy Theme	Sustainability Objectives																
	1. Governance	2. Education and Awareness	3. Health and Well-being	4. Equality and Diversity	5. Safety and Security	6. Liveability and Place	7. Accessibility and Availability	8. Landscape, Historic and Cultural Environment	9. Biodiversity	10. Air Quality	11. Climate Change[38]	12. Water Quality	13. Water Resources	14. Drainage	15. Flood Risk	16. Waste Management and Resource Use	17. Economy
Water Resources	+	+	+/-?	+/-	+?	+?	0	0	+	0	+	+	++	0	0	0	+/-
Drainage	+	0	+/-?	-?	+?	+?	0	0	+	0	+?	+?	+?	+	+	0	+?
Wastewater	+	0	+/-?	-?	+?	+/-?	0	0	+?	0	0/+	+?	0	0	+?	0	0

Key: Major positive: ++ Minor positive: + Neutral: 0 Minor negative: - Major negative: - - Uncertain:? Mixed: -/+

Overall sustainability effects of the draft Water Strategy

6.103 The draft Water Strategy overall is likely to have positive or neutral effects on the SA objectives. However, the significance of most of these effects is likely to be relatively minor and / or uncertain. This is due to a number of factors, including:

- Many of the proposals require action on the part of other organisations and agencies or as part of other plans and strategies, and thus direct effects cannot be identified with certainty;
- The policies set out clear priorities for action, however there is limited detail on implementation included with the majority of the proposals, such as specific timescales, thresholds or targets;
- A number of the policies and proposals would only apply to new development (which only constitutes a small proportion of the housing stock in London), and primarily domestic water use / management. To make a more significant effect overall, major progress will be needed in the existing building stock and other sectors.

6.104 However, many of the potential effects identified could become more significant in the long-term and cumulatively as the enabling and partnership initiatives in the draft Water Strategy assist in delivering more direct and specific actions. As discussed above, it is recommended that more detail should be included in the Strategy on implementation, this could emphasise that this is the first Water Strategy and that by necessity the focus is on enabling and preparatory actions, but that subsequent reviews of the Strategy (giving likely timescales) should focus on more specific actions.

Potential positive effects

6.105 The key potential positive effects of the draft Strategy overall include:

[38] Objective split between (8i) mitigation and (8ii) adaptation to Climate Change

- The policy and proposals relating to water use and resources management have the common aim of **reduced demand for water, leakage management, and water efficiency** (especially in homes). The combined effect of these is therefore predicted to have a major positive effect on water resources, especially in the long-term.
- The draft Water Strategy explicitly seeks a role of influence in relation to other organisations and their plans and strategies, and the policies and proposals included in the draft Water Strategy cannot be delivered by the Mayor alone. Many of the proposals state that the Mayor intends to establish **partnerships with a number of other organisations and agencies, such as the water companies and the Environment Agency**. Other proposals seek to work through existing partnerships, such as the Drain London Forum. The draft Water Strategy is therefore considered likely to have a positive effect on **water management governance**.
- The draft Water Strategy is predicted to have a positive impact on people's awareness of their water consumption which could potentially lead to **behaviour change and reduced household water use.** This is due to the inclusion of proposals which directly (such as raising awareness of the benefits of household water efficiency) and indirectly (such as through the installation of metering, or construction of homes to higher Code for Sustainable Homes Levels) are likely to increase the level of knowledge and awareness of water consumption and efficiency.
- The drainage and wastewater disposal policy and proposal should help **reduce the risk of surface and sewer flooding**, especially in the long-term. Therefore the draft Water Strategy is likely to have potential positive effects on health and flood risk, although these effects are predicted to be minor in significance. The potential for minor positive effects arising from reducing the risk of flooding has been identified which will benefit security and safety and also adaptation to climate change.
- The draft Water Strategy should help **increase the security of water supply in London** (for example through measures to manage demand, and reduce leakage) which is predicted to have a minor positive effect on climate change adaptation and safety and security.
- The Strategy is also likely to have a **positive impact on the water environment in terms of improving quality and making better use of existing resources**. The draft Water Strategy is therefore also likely to have a minor positive effect on water related wildlife and habitats.

Potential negative effects

6.106 The key potential negative effects of the draft Water Strategy include:

- The potential **cost** issues associated with many of the policies and proposals included in the draft Water Strategy, e.g. metering, SUDS, water efficiency etc could have differential impacts on vulnerable groups and thereof a potential **negative impact on equality and diversity**. However, in some cases while these may represent a cost in the short to medium-term, more water efficient homes and appliances etc. may help in the long-term protect some households from water poverty.
- The high cost that would be involved in achieving metering of all houses by 2015, and all blocks of flats by 2020, could potentially have a negative impact on the economy. However, the **overall effect on the economy is likely to be mixed with some positive**

and some negative effects, as short to medium term investment is likely to protect resources for the future, and some measures (such as universal metering and meeting higher Code for Sustainable Homes Levels) will impose costs, but also create employment.

Potential cumulative impacts

6.107 There are different types of cumulative effects, but the principally concerned with the draft Water Strategy is the total effects of multiple actions on a single 'receptor', which could be certain group within the population or people living in a particular locality, the water environment or flora and fauna for example, as well as effects that may be cumulative over time. However, given the strategic level of the draft Water Strategy there is limited spatially differentiation that can be predicted between effects, in particular, so inevitably the potential cumulative effects identified are relatively generic.

6.108 Certain effects likely to arise from the draft Water Strategy could potentially be cumulative (e.g. impacts on the water environment, impacts on certain vulnerable groups etc). From the summary of the appraisal in the section above, many effects which have already been identified could be cumulative in character. The use of the causal chain analysis in particular helped emphasise where several policies and proposals are predicted to impact upon the same sustainability objective and / or receptor. It is not possible to identify an exhaustive list of potential cumulative effects, as predicting the interactions and additive effect of policies is complex and uncertain, however the cumulative effects identified are considered some of the most significant.

6.109 The sensitivity of the receptors also needs to be taken into account when evaluating the potential significance of cumulative effects. For instance, potential cumulative effects on health are important because they potentially affect particularly sensitive receptors such as certain vulnerable groups within the population.

6.110 It is worth noting that vulnerability can have many aspects and although not all of the individual members of a particular group may be vulnerable, it is true that there is a greater probability that members of such a group will be vulnerable compared to members of other, less vulnerable groups. For instance, the elderly '*may not be vulnerable just because of age, but when combined with living alone, not having a car, having a low income and disability, vulnerability may increase. Ethnic minorities may not be vulnerable because they are minorities but because they lack access to services and information, or because of language difficulties*'[39]. In addition, vulnerability is sometimes defined as being disconnected from networks and, for example, a recent review of the causes of human vulnerability concluded that these can include: a lack of access to resources, information and knowledge; limited access to resources to political power and representations, (lack of) resource availability and (lack of) access to services and social isolation[40].

6.111 Although the draft Water Strategy is predicted to have predominately positive or neutral effects on sustainability, some potentially negative cumulative effects on certain vulnerable groups were identified. However of these, the potential **additional cost arising from**

[39] Tapsell, S, Burton, R, Oakes, S and Parker, D (2005) The Social Performance of Flood Warning Communications Technologies. Technical Report. The Environment Agency, Bristol, UK.
[40] Tapsell S M, Tunstall S M, Green C, Fernández-Bilbao A (2005), Indicator set. Internal FLOODsite report (Task 11), Enfield: Flood Hazard Research Centre.

different aspects of the draft Water Strategy on the water rates and the affordability of housing is predicted to be the most significant potential cumulative negative effect. Mitigation, such as setting appropriate tariffs, is proposed relating to these effects individually in the preceding sections, but it will also be important to monitor these effects cumulatively on those low income groups which would be most significantly affected to ensure this effect is avoided (see Section 7).

6.112 In terms of the potential positive cumulative effects likely to arise from the Water Strategy, these are more numerous. The appraisal of the draft Water Strategy has in particular identified potentially **positive cumulative effects on different aspects of the water environment** - water quality, water resources, biodiversity, reducing flood risk etc – arising from different policies and proposals. This is not surprising given that this is the main objective of the Water Strategy.

6.113 It should be noted that no significant negative cumulative effects of the draft Water Strategy have been identified on health. It should also be noted that Table 33, which summarises the appraisal of the policies and proposals, presents the potential effects of all the policy elements and these will not necessarily all be implemented in combination (in many cases the elements at the top of the list represent the preferred approach) and therefore other cumulative effects of different management options operating in combination should not rise.

6.114 The draft Water Strategy is intended to influence and complement other organisations' plans and strategies. The effects of the draft Water Strategy are therefore likely to be 'in combination' or cumulative with the influence, outcomes and actions included in these other water related plans, strategies and organisational activities (see Part A, Section 3 and appendix 6). Some of the most significant of these relating to or with an influence on water management include:

- Future Water – the Government's Water Strategy for England (Defra 2008).
- Draft Flood and Water Management Bill (Defra 2009).
- The Code for Sustainable Homes (DCLG 2008) and future revisions to the Building Regulations proposed to ensure Code levels are met.
- Draft Thames River Basin District Management Plan (Environment Agency 2009).
- Thames and London Catchment Abstraction Management Strategies (Environment Agency 2004 and 2006).
- Thames region Catchment Flood Management Plan (Environment Agency 2009).
- Water Resources Management Plans for each of the water companies serving London.
- The work and influence of Ofwat, in particular determinations on price limits which set the prices water and sewerage companies can charge their customers, over a five-year period (current draft determinations are for period 2010 – 2015).

Key effects relating to health and health inequalities

6.115 As noted above, the SA of the draft Water Strategy incorporated Health Impact Assessment. To aid the identification of key potential effects on health, the key health effects of the Strategy overall are set out in Table 35 below. Table 35 also identifies which wider

determinants of health and target equality groups / other socio-economic groups that may in particular be affected by the key health and health inequalities effects predicted:

- The key determinants of health include factors such as: income; crime; quality of environment; transport; housing etc. Lifestyle variables, such as: recreation and physical activity; stress; accidents etc, will also influence health. Lifestyle variables and health determinants have an impact on demand for health and social care services and facilities.
- The GLA equality target groups are: women; Asian or Asian British; Black or Black British; people of mixed race; Irish people; Chinese and other minority ethnic communities; disabled people; older people (60+); children and young people (0 – 17); young adults (18 – 25); lesbians, gay men and bisexual people; trans people; and, faith groups.
- Other socio-economic groups could include: low income families; those with long-term illnesses; larger households, families with young children etc.

Table 35: Key effects relating to health and health inequalities

Key effects identified	Health determinants and equality target / other groups potentially effected
Positive effects	
The overall effect of protecting water resources and helping to ensure security of supplies, should reduce the need to restrict supply in future, with a minor positive effect on health and wellbeing.	*Determinants / variables:* Environment, stress and mental health (e.g. due to reduce worry about potential water restrictions), physical activity and recreation. *Equality target / other groups:* All.
Reduced risks of flooding, through measures to improve drainage and surface water attenuation, are likely to have positive health and equality effects, as flooding can have a disproportionate impact on vulnerable and low-income groups, as they are less able to respond (e.g. by moving) and less likely to have protection, such as insurance.	*Determinants / variables:* Environment, stress, housing, direct health impacts (e.g. mortality, contamination). *Equality target / other groups:* Disabled, older people, young people, low-income individual and households.
Policies and measures which have the potential to improve the physical and visual quality of the water environment, and those which may create recreation and amenity opportunities (e.g. SUDS).	*Determinants / variables:* Environment, stress / wellbeing, physical activity and recreation. *Equality target / other groups:* All.
In the long-term, measures to improve water efficiency may have beneficial equality and health effects, as they may lead to lower bills and a reduction in the risk of households experiencing water poverty. However some efficiency measures will impose costs which may be too high for the lowest income households.	*Determinants / variables:* Income, stress. *Equality target / other groups:* All. Particular effect on low-income individuals and households.
Proposal 7 seeks to promote awareness of the health benefits from drinking water. If this results in more people consuming a healthy volume of water, a positive health effect is possible, although compared to other underlying health determinants the effect is not expected to be significant.	*Determinants / variables:* Direct health effects due to consumption of healthy volumes of water. *Equality target / other groups:* All.

Key effects identified	Health determinants and equality target / other groups potentially effected
Negative effects	
If water pressure is reduced as part of measures for leakage management, there may be potential health effects resulting from backflow (especially in high-rise buildings) leading to contaminants entering the water system.	*Determinants / variables:* Stress, income (expenditure in response to problems), direct health effects. *Equality target / other groups:* All. Particular effect on low-income individuals and households.
Reduced water pressure could also have a negative equality impact (e.g. due to the cost of pump installation) which may effect in particular those living in blocks of flats / high-rise buildings.	*Determinants / variables:* Income, stress, direct health effects (e.g. where water consumption patterns change to below healthy levels). *Equality target / other groups:* All. Particular effect on low-income individuals and households.
The costs of measures such as replacing mains, fixing leaks, incorporating SUDS in development, and meeting higher Code for Sustainable Homes Levels, could in the long-term be passed on to customers.	*Determinants / variables:* Income, stress, direct health effects (e.g. where water consumption patterns change to below healthy levels). *Equality target / other groups:* All. Particular effect on low-income individuals and households, elderly, long-term ill / disabled, larger households.
If tariff levels are not set to specifically protect vulnerable and low-income households higher water bills could have a negative health effect on lower income groups in particular as they could reduce their water consumption beyond healthy levels. Explicit recognition of the need to arrange tariffs such that vulnerable and low-income groups are protected is included in proposal 3.	*Determinants / variables:* As above *Equality target / other groups:* As above
Measures to encourage the reuse of reclaimed water (rainwater and grey water) could lead to misconnections between with dual systems which could lead to health effects such as stomach upsets or other health problems.	*Determinants / variables:* Direct health effects, stress, environment. *Equality target / other groups:* All.
Noise, disruption, congestion and potential air pollution associated with construction activity, for example related to mains replacement works or the construction of the Thames and Lee Tunnels could have potentially negative health and wellbeing effects.	*Determinants / variables:* Environment, stress, recreation and physical activity (e.g. walking and cycling become less attractive), direct health effects (e.g. from air pollution) *Equality target / other groups:* All. Particular effects on those with underlying health conditions such as respiratory problems.

Mitigation and enhancement measures

6.116 Specific mitigation and enhancement measures, many of which are in the form of recommendations for amendments and additions to the current draft Water Strategy, have

been detailed in the preceding sections in relation to the objectives, principles, policies and proposals. These are not repeated here, however Table 36 sets out where specific recommendations are included in this report.

Table 36: Coverage of mitigation and enhancement recommendations

Draft Water Strategy element	Location of specific recommendations for mitigation and enhancement
Objectives	Paragraphs 6.6 – 6.8
Principles	Paragraph 6.10
Introductory section	Paragraph 6.11
Policies	Policy 1: Paragraphs 6.38 – 6.39 Policy 2: Paragraphs 6.63 – 6.64 Policy 3: Paragraphs 6.76 – 6.78
Proposals	Specific mitigation and enhancement recommendations for each proposal are included in Tables 22 to 32 Potential omissions: Paragraph 6.92 - 6.97

6.117 The following general comments relate to overall improvements that could be made to the draft Strategy. These draw on some of the higher level recommendations made elsewhere:

- The inclusion of text setting out that the implementation of certain proposals or policies will benefit from being carried out in together, e.g. metering of all properties should be accompanied by appropriate tariffs, leakage reduction and water efficiency should happen in parallel. This could be addressed through additional text in the introduction (section 1), or through specific cross-references between policies and proposals as appropriate.
- More coverage could be included in the Strategy on the particular needs and opportunities in relation to vulnerable groups or other sensitive receptors. The draft Water Strategy focuses largely on partnership working, and influencing other strategies and process to deliver policies and proposals relation to water resource management, managing rainwater (drainage) and the disposal of wastewater. However, there are limited references made to potential effects of how these themes are managed on vulnerable groups and receptors.
- The GLA has included tidal and fluvial flooding issues in the forthcoming draft Climate Change Adaptation Strategy rather than in the draft Water Strategy. However, as the draft Water Strategy aims to promote integrated water management it would be beneficial for the Water Strategy to cover flooding from all sources including tidal and fluvial flooding. Current and short-term flood risk is not only caused by climate change and given the different timescales to be covered by the two Strategies (i.e. 10 years for the draft Water Strategy and 50 years for the Climate Change Adaptation Strategy), the Water Strategy is the more appropriate strategy to deal with these issues in the short-term. Further discussion of this issue is included in paragraph 6.8, above.
- The draft Water Strategy could be strengthened by seeking to promote the concept of water neutrality in future urban and land use planning policies in London. As it is a relatively new concept, the Strategy could take the lead in developing a clear definition of water neutrality in the context of London, set it in the context of sustainable supply and

demand within necessary environmental limits, as well as setting a specific timetable over which water neutrality should be achieved in all new development. Further discussion of this issue is included in paragraph 6.6, above.

- Earlier drafts of the Water Strategy referred to the preparation of a Water Action Framework. Reference to this action plan has been deleted in the current draft Water Strategy. Given that most of the proposals do not set out in detail on how they are to be implemented, it is recommended that consideration should be given to the reinstatement of the intention to develop a specific framework for action. Further discussion of this issue is included in paragraphs 6.97 - 6.97.
- Although the draft Strategy includes a sub-section on implementation and monitoring (paragraphs 1.21 and 1.22), it would be useful to include further details on how progress in implementing the Strategy will be monitored and what indicators and targets will be used to measure progress against the delivery of the Water Strategy's objectives. Details on how frequently the Strategy will be reviewed and potential key triggers for a review of the Strategy should be included.

Why the draft Water Strategy has been selected as the preferred alternative

6.118 As described in Section 1, the development of the draft Water Strategy has been undertaken over an extended period and was initially started under the previous Mayor. Given that the strategy is non-statutory and that the Mayor has relatively limited powers and responsibilities over water management the approach and range of alternatives open to the Mayor are relatively narrow. There are also a large number of other organisations' policies, plans and strategies which potentially overlap with the Water Strategy, as well as potential overlap with other mayoral strategies like the London Plan, SPG on sustainable design and construction and the Climate Change Adaptation Strategy.

6.119 As a result of the above, the Mayor has adopted the approach presented in the draft Strategy which generally seeks to complement other plans and strategies and pulls them together by presenting a London-specific view and promotes and facilitates partnership working. In places the draft Strategy also seeks to influence future revisions of these other plans and strategies by promoting tighter or more ambitious standards than already required, however generally it presents existing requirements rather than setting a new agenda for water management in London.

Difference that the draft Water Strategy will make compared with the future Business as Usual

6.120 The Water Strategy aims to provide more integrated water management for London and act as an influencing document on organisations with responsibilities for water management. The extent to which the Water Strategy is successful in influencing other organisations' plans and policies and their actions will be important in determining the achievement of its objectives and overall effectiveness. In addition, for the Strategy to make a difference compared to the Business as Usual, the way it is implemented will be key.

6.121 A comparison of the results of the appraisal of the draft Water Strategy (see Table 34) and the future situation under Business as Usual (see Table 15), i.e. without the draft Strategy is presented in Table 37. This illustrates where the draft Strategy is predicted to make a significant improvement against each of the SA objectives - in most cases and across the three themes of water resources, drainage and waste water the effects are likely to be either the same or an improvement (either less negative or more positive effects).

Table 37: Comparison of the appraisal of the draft Water Strategy and the future situation under Business as Usual

Water management theme and Scenario	Sustainability Objectives															
	1. Governance	2. Education and Awareness	3. Health and Well-being	4. Equality and Diversity	5. Safety and Security	6. Liveability and Place	7. Accessibility and Availability	8. Landscape, Historic and Cultural Environment	9. Biodiversity	10. Air Quality	11. Climate Change[41]	12. Water Quality	13. Water Resources	14. Drainage	15. Flood Risk	16. Waste Management and Resource Use	17. Economy
Water Resources																	
Water Resources (BAU + 10 yrs)	0/+	+?	+	-?	+	0/+	0	0	-/+	-	-/+	-	+	0	0	-	-/+
Draft Water Strategy (Aug 09)	+	+	+/-?	-?	+?	+?	0	0	+	0	+	+	++	0	0	0	+/-
Drainage																	
Drainage (BAU + 10 years)	0/+	+?	-	-	+?	-/+	-/+	-/+	-/+	0	-/+	-	+	-?	-/+	-	-/+
Draft Water Strategy (Aug 09)	+	0	+/-?	-?	+?	+?	0	0	+	0	+?	+?	+?	+	+	0	+?
Wastewater																	
Wastewater (BAU + 10 years)	0/+	+?	-/+	-	+?	-/+?	-/+	-/+	-/++	-	-/+	-/+?	0	-?	-/+	-	-/+
Draft Water Strategy (Aug 09)	+	0	+/-?	-?	+?	+/-?	0	0	+?	0	0/+	+?	0	0	+?	0	0

Key:

Major positive: ++ Minor positive: + Neutral: 0 Minor negative: - Major negative: - - Uncertain:? Mixed: -/+

6.122 The SA process identified a series of sustainability problems (see Section 3) as well as the current and likely future situation in terms of water management (see Section 5). Based on the sustainability problems identified and the current and future situations, the key areas where the draft Water Strategy could potentially make a difference are:

- One of the key issues with current water management is the **number of different organisations** involved and the lack of co-ordination. The draft Water Strategy contains several proposals and priorities for management that will have to be delivered by a **partnership of organisations**. The implementation of the draft Strategy could lead to **better co-ordinated water management** for London.
- The **increase in population** is one of the main issues that will affect sustainability and water management. By promoting the manage their surface run-off, connect to an appropriate sewer, and providing on-site water reclamation, the draft Water Strategy should contribute to **reducing the impact that new developments** will have on water resources, drainage and the sewerage network of London.
- The **lack of public awareness** of their water consumption and the effect that this has on the environment is another key issue. The draft Water Strategy should help increase this

[41] Objective split between (8i) mitigation and (8ii) adaptation to Climate Change

awareness by introducing measures such as widespread **metering** and **increased water efficiency** for new developments.

- By increasing public awareness of their impact on the environment and by contributing to reducing the impacts of new developments, the draft Strategy should help **improve** the **quality of watercourses** and the associated **flora and fauna**.

Difference the Sustainability Appraisal has made to the draft Strategy

6.123 The different stages and outputs of the Sustainability Appraisal process have influenced successive drafts of the Water Strategy. The key outputs / influencing points include:

- Initial Sustainability Appraisal commentary in October 2006;
- Pilot appraisal of the draft preferred set of management options in January 2007;
- Advisory Group meetings and other meetings with the GLA throughout the process;
- Health Stakeholder Workshop in March 2007;
- Draft SA Reports in December 2007 and February 2008;
- Sustainability Appraisal commentary in June 2009;
- Draft SA Report (August 2009); and,
- Ongoing dialogue and correspondence between the SA team and those responsible for the Water Strategy.

6.124 The key changes to the draft Strategy resulting from the SA process are listed in Table 38. It should be noted these include changes made to earlier versions of the draft Water Strategy (2007 and 2008) and it is possible that some changes have been reversed or omitted in the current draft (August 2009).

6.125 Note that due to the timing of the preparation and internal approval of the draft Strategy, the GLA has not been able to consider and reflect the recommendations included in this version of the draft SA Report within a revised iteration of the draft Strategy. The changes recommended in this SA Report will be considered by the GLA during the public consultation period and incorporated as appropriate in a final Strategy. The SA may therefore result in additional changes than those listed below in Table 38.

Table 38: Key changes to the draft Water Strategy as a result of the SA process

Element of draft Water Strategy	Key changes resulting from the SA process
Overall structure, scope and context	• More information provided on: o the scope of the Strategy; o the relationship with other strategies and plans; and o the role of other organisations added to the Introduction. • Comments were made at the Health Stakeholder Event regarding the lack of coverage of drinking water quality. A reference to which was subsequently added to the draft Water Strategy. • Pressure management was not included as an issue in the earlier drafts of the Strategy, which was commented on by the SA. This issue was later added to the draft Water

Element of draft Water Strategy	Key changes resulting from the SA process
	Strategy. • Various points of clarification were added.
Strategy Objectives	• Changes made to the wording so they read as objectives with desired outcomes. • Changes to the wording of the first objective on water resources to promote effective and efficient use of water. • Changes to the wording of the second objective to refer to the 'clean' water environment. • Changes to the wording of the third objective on flooding to include managing the threat of flooding to people and their property and reducing its effects rather than just protecting against it as previously included.
Policies	• In early drafts of the Strategy the policies were referred to as preferred sets of management options or "hierarchies", but at several stages it was commented that some of the "hierarchies" and the elements within them did not operate sequentially, but rather would be ideally implemented in parallel. They were subsequently renamed as "preferred sets of management options" rather than "hierarchies" – terminology which has now been revised to "policies" and "policy elements". • In early drafts of the Strategy there was an element included in the water supply "preferred set of management options" on optimising supply through maximising abstraction licence capabilities. Comments were raised by the SA on this element and its potential environmental impacts and it was later deleted. • In early drafts of the Strategy there was no policy for the disposal of waste water. Following a meeting between the GLA and the SA team, where it was suggested that it would be useful for each topic to have a policy / set of management options which acted as overarching policies that could be appraised, a set was added.
Proposals	• Additional supporting text added in relation to proposal 1 to refer to the Water Resources Working Group. • Supporting text added in relation to proposal 2, to describe the long-term benefits of short-term disruption associated with upgrading infrastructure. • Addition of text to proposal 3 to refer to 'vulnerable *and low income households*'. • Addition of supporting text following proposal 5, to highlight the benefits of partnership working.

7. IMPLEMENTATION AND MONITORING

Links to other tiers of plans and programmes and the project level

7.1 The draft Water Strategy is part of a broader hierarchy of plans, which will not be developed nor implemented in isolation. Links and relationships exist at the national, regional (London) and local levels. Because of the nature of the Water Strategy and the limited powers that the Mayor has over water management, the Strategy will need to be co-delivered by a series of key stakeholders. These include: the four water companies that serve London; the regulators including the Environment Agency, Ofwat and the Drinking Water Inspectorate; the consumer representative bodies including the Consumer Council for Water; central government departments, including Defra and DCLG; and the London Boroughs. In addition, the Strategy will need support from water users, including households and businesses, developers, and many others to be delivered.

7.2 The Water Strategy is being developed with reference to a large number of national and regional plans and strategies. At the highest level they need to reflect the broad agenda set out in *Securing the Future - UK Government Sustainable Development Strategy*. It should also reflect the requirements set out in other key government strategies such as *Making Space for Water* and *Future Water – the Government's Water Strategy for England.* At the regional (London) level the draft Water Strategy is linked to policies, strategies and targets set out in other mayoral strategies and the London Plan. The development of the Water Strategy is also closely linked with that of the Mayor's Climate Change Adaptation Strategy. Although the timescales covered by the Strategies are different there are clear relationships and synergies between them and the policies they contain.

7.3 Other key policies, plans and legislative requirements closely linked to the Water Strategy, include the Flood and Water Management Bill, Thames River Basin District Management Plan, Code for Sustainable Homes and Building Regulations, Thames and London Catchment Abstraction Management Strategies, Thames Catchment Flood Management Plan, TE2100 Flood Risk Plan, Water Resources Management Plans for each water company serving London and Ofwat's draft determination.

7.4 Whilst the above stakeholders and other organisations have policies, strategies and plans that affect London, none are specific for London. For this reason, one of the key purposes of the draft Water Strategy is to present a London specific view of water management which draws on policies, strategies and plans of others but also seeks to influence their future development.

Proposals for monitoring

7.5 A fundamental part of the SA process is to develop the monitoring proposals for the significant sustainability effects arising from implementing the Strategy. It is important to monitor performance against the sustainability objectives, which form the core of the appraisal

process, and identify where they are being achieved and where they are not, so that appropriate remedial action can be taken.

7.6 The SEA Directive requires the significant environmental effects of a plan or programme to be monitored and that the Environment Report (which is incorporated into this SA Report) should include a description of measures 'envisaged' for monitoring the implementation of the plan:

- Annex 1(i) of the SEA Directive requires the Environment Report to include "a description of the measures envisaged concerning monitoring in accordance with Article 10".
- Article 10 (1) states that "Member States shall monitor the significant environmental effects of the implementation of plans and programmes…".

7.7 In addition to the monitoring requirements arising from the SA process, it is also important to include details on how progress on implementing a strategy will be monitored and what indicators and targets will be used to measure progress against in the delivery of its objectives. The draft Water Strategy does not currently include proposals on how it will be monitoring, paragraph 1.22 states that:

> *"This Strategy does not propose any additional monitoring arrangements. The returns submitted by every water company to Ofwat in June each year, known as the June Returns, provide a mass of data which is then made available on the Ofwat web site. ..... The environmental performance of the water companies is monitored by the Environment Agency which publishes a wide range of information on, for example, water resources and river pollution incidents. Last, but not least, the Mayor is required to publish a State of the Environment Report for London every four years".*

7.8 It is recommended that details on how and by whom the Strategy itself will be monitored should be included in the final version. This should include indicators to be used to monitor its implementation, as well as targets where relevant. As stated in the Strategy many potential indicators are already collected on a regular basis by, for example, water companies, the Environment Agency, Defra, the London Boroughs and DCLG, and many indicators are included by the GLA in the state of the environment for London. However, these indicators would need to be analysed specifically against the objectives of the Water Strategy and the policies and proposals it contains to determine the success or otherwise of its implementation overall and of its constituent parts. In addition, the effects on sustainability of the implementation of the Strategy (both predicted by the SA and unexpected effects) should be monitored and reported on regularly.

7.9 An additional issue with some of the existing indicators is that they are likely to be only available for different areas not London, e.g. Environment Agency or water company regions, Water Framework Directive River Basin Districts, etc. Therefore, introducing monitoring / disaggregating data for key indicators at the London level would be particularly valuable. Where gaps exist in the necessary data to monitor the Strategy, additional actions may need to be added to collate it the relevant data.

7.10 In the case of the Water Strategy, there is likely to be considerable overlap between the indicators relevant to monitoring the implementation of the Strategy and those relevant to monitoring the significant sustainability effects arising from it. This is because of the focus of

the Strategy and the findings of the SA, which only identified a limited number of significant negative effects and many positive effects related to the objectives of the Strategy.

7.11 It is worth noting that there are three different types of indicators that can be used for monitoring :

- **Contextual indicators** – which provide monitoring of the background against which a strategy operates.
- **Output indicators** – which enable monitoring of specific proposals included in a strategy.
- **Significant effects indicators** – which provide monitoring of the important 'effects' of a strategy as identified by an SA.

7.12 Table 39 identifies potential indicators to monitor the significant sustainability effects described in Section 6. Note that there are several queries identified in the table relating to the availability of data. Feedback on monitoring from consultees responding to the SA Report would be welcome. More detailed on the SA monitoring proposals should be published as part of the Post Adoption Statement once the Water Strategy is finalised.

7.13 Note that in the table those potential indicators which were included in the London State of the Environment Report 2007 are referenced - "SOER07 indicator" – and those potential indicators for which data is currently thought not to be available are in *italics*.

Table 39: Potential indicators to monitor the significant sustainability effects of implementing the Water Strategy

Significant effects	Potential indicators	Comments / gaps and potential targets
N/A	**Background / context** • Population and demographical change [*source: Office of National Statistics*] • Housing developments permitted / completed (including breakdown by size of development) [*source: London Development Database*]	This background information would be important as context to the pressures on water management, the potential sustainability effects of the Strategy and to inform the monitoring of some of the proposals which include thresholds related scale of development etc.
Water resources in London		
Improved water efficiency (SA objective 13)	• Level of leakage in London [*source: Water companies / Ofwat*] [*SOER07 indicator*]	The leakage targets set by Ofwat for Thames Water for the remainder of the 2005-10 price review period is 690 Ml/d (2009-10). *Water Strategy target*: "achieve the best UK industry standard for water leakage by 2013". Disaggregated data not likely to be available for just London (water companies only).
	• *Water use in new residential developments* [*Potential source: Local planning authorities / water companies*] • Domestic water use in London (per capita / household) [*source: Ofwat / water companies*] [*SOER07 indicator*]	*Water Strategy target*: "all new homes should meet Level 3 of Code for Sustainable Homes by 2010, and Level 6 by 2016". (All publicly funded developments are now required to attain Code Level 3 (equal to or less than 105 litres per person per day (l/p/d)) and will be required to meet Code Level 6 (80 l/p/d) from 2016 onwards. Other housing has to meet less stringent standards under Part G of the Building Regulations which, from October 2009, will set a maximum daily usage standard of 125 l/p/d). Water use in new residential developments specifically may not be currently monitored for London; therefore it is a potential gap to fill. A mechanism to monitor this would need to be developed as it would require data from each permission / completion.

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	• *Water use in new commercial development* [*potential source: Local planning authorities / water companies*]	Water use in commercial development is included in the Policy for water use but not in any proposals. Water use in new commercial developments specifically may not be currently monitored for London; therefore it is a potential gap to fill. A mechanism to monitor this would need to be developed as it would require data from each permission / completion.
Increased awareness of water consumption and reduced water use (SA objective 13)	• Penetration of metering in London (proportion of households) • Number / proportion of existing properties metered, both houses and flats, in London [*source: Water companies / Ofwat*]	*Water Strategy target (Proposal 2)*: "all houses in London should have meters installed by 2015, and all blocks of flats by 2020. All new flats in London should have an individually metered water supply. Additional interim targets at 5, 10, 15 years would be useful". Disaggregated data not likely to be available for just London (water companies only).
	• *Water use (disaggregated spatially and by different groups)* [potential *source: Water companies / Ofwat / Environment Agency / Mayor of London*]	The Mayor and the Environment Agency have jointly undertaken a study of the likely social effects of the widespread introduction of domestic water metering in London and in the wider area of water stress in the south east and east of England. Data on water use within different vulnerable groups would be useful, including information on where use is below minimum recommended levels. This is not currently monitored for London, therefore it is a potential gap to fill.
	• *Household awareness of water consumption* [*potential source: Water companies / Ofwat / Defra*]	This may not currently be monitored, therefore it is a potential gap to fill. It would be useful to collect information on awareness for London regularly via surveys. For example, a question could be included in Defra's Environmental Attitudes survey which already includes several questions on water consumption in the household and has disaggregated statistics for London.
Improved security of water supply (SA objective 13)	• Security of supply index [*source: Water companies / Ofwat*] • Supply and demand balance areas in water surplus / deficit [*source: Water companies / Ofwat / Environment Agency*]	Thames Water has a target of achieving security of supply by 2009-10, but this target depends on their ability to achieve leakage targets and develop new schemes. Disaggregated data not likely to be available for just London (water companies only).
	• *Average water pressure and minimum levels* [*potential source: Water companies / Ofwat / Defra*]	Thames Water's supply in London is divided into more than 800 different 'district metering areas' (DMA), each of which has different pressure at different times of the day depending on changes in levels of demand[42]. Therefore, pressure can be reduced in some areas and not in others. The Water Industry Act 1991, requires the water undertakers to provide a supply of water sufficient for domestic use, but they are not required to provide water at a height greater than that to which it would flow by gravitation from the reservoir or tank from which the supply is taken. A minimum pressure of 0.7 bar[43] has to be maintained in pipes under the Water Supply and Sewerage Service (Customer Service Standards) Regulations 1989. Nevertheless, Ofwat's service standards establish 1 bar as the minimum and much of London exceeds this rate and has approximately 3 bars pressure[44].
	• *Proportion of water supplied on site from new development* [*potential source: Water companies / Ofwat / Local planning authorities / GLA*] • *Amount of water reclaimed for non-potable sources in new development* [*potential source: Water companies / Ofwat / Local planning authorities /*	*Water Strategy target*: a previous draft of the Water Strategy included a target for major developments to supply some their water requirement through on site reclamation, but this is not included in the current draft. Instead, there is a general proposal encouraging rainwater harvesting and grey water recycling. Proportion of water supplied on site from new development may not be currently monitored; therefore it is a potential gap to fill. A mechanism to monitor this would need to be developed as it would require data from each permission / completion.

[42] London Assembly Health and Public Services Committee Report 'Under Pressure', 2005.
[43] 1 bar is the pressure needed to raise water to a height of 10 meters, approx. 2 storeys high.
[44] London Assembly Health and Public Services Committee Report 'Under Pressure', 2005.

Significant effects	Potential indicators	Comments / gaps and potential targets
	GLA]	
Increased water costs (SA objective 4, 13) and 17	• *Percentage of income spent on water and sewerage in London / percentage of households spending more than 3% of disposable income on water and sewerage bills* [*potential source: Water companies / Ofwat / GLA / Defra*]	No measure of 'water affordability' is available, but there is a Government sustainability indicator that households should not spend more than 3% of their income on water and sewerage bills. Data on water affordability would be useful. This is not currently monitored; therefore it is a potential gap to fill.
	• Number of households applying for / receiving help under the Vulnerable Groups Regulations in London [*source: Water companies / Ofwat*]	Ofwat publishes figure by water company, but ideally data disaggregated for London would be available.
	• *Indicator(s) developed to monitor tariff arrangements and financial effects on different sections of the London community* [*source: Water companies / Ofwat*]	Not currently monitored; therefore it is a potential gap to fill. A mechanism to monitor this would need to be developed.
	• *Cost of metering for water companies (installation and reading meters)* [*source: Water companies / Ofwat*]	Not currently monitored; therefore it is a potential gap to fill. A mechanism to monitor this would need to be developed.
Water related habitats and wildlife (SA objective 9)	Possible indictors to monitor the effect of abstraction for public water supply within London on habitats and species (inside and outside London), including: • Low flow rivers • Condition of water depending SSSIs affected by abstraction • Indicator species affected by abstraction [*source: Natural England / Environment Agency / local wildlife groups*]	Current monitoring may not be suitably disaggregated to monitor impact of London.
Reduced affordability of new homes (SA objective 4 and 17)	• *Percentage of costs of new "affordable" home in London spent on water efficiency and supply features* (consider also whole life costs, not just installation costs?) [*potential source: Water companies / Ofwat / Local planning authorities / GLA*]	Not currently monitored; therefore it is a potential gap to fill. A mechanism to monitor this would need to be developed.
Increased incidents of illness (SA objective 3, 4 and 13)	Possible indictors to monitor the occurrence of illness caused by insufficient water use in London [*potential source: The Drinking Water Inspectorate / health authorities*]	Not currently monitored; therefore it is a potential gap to fill. A mechanism to monitor this would need to be developed.
Increased energy use / emissions from water supply (SA objective 10, 11 and 13)	• Energy used (and related emissions) from water supply to London (including energy used in pumping, treatment etc) and proportion from renewable energy [*source: Environment Agency / Energy Saving Trust / water companies / Water UK / Office of National Statistics*]	Water industry energy use is monitored - the water industry consumes 2% of the total energy in the UK[45]. For example, an indicator is included in the Water UK Sustainability Indicators 2007/08. But disaggregated data for London is unlikely to be available, therefore it is a potential gap to fill.
Drainage in London		
Reduced risk of	• *Surface water run-off from new*	*Water Strategy target*: there is a general proposal encouraging

[45] http://www.water.org.uk/home/policy/climate-change/mitigation

Significant effects	Potential indicators	Comments / gaps and potential targets
surface and sewer water flooding (SA objective 3, 4, 5, 11, 12, 13 and 14)	*development* [*potential source: Local planning authorities / GLA*]	sustainable drainage through planning policies in the new London Plan. Surface water run-off from new development may not be currently monitored for London; therefore it is a potential gap to fill. A mechanism to monitor this would need to be developed as it would require data from each permission / completion.
	• *Proportion of new development / volume discharging to combined or separate sewers* [*potential source: Local planning authorities / GLA / water companies / drainage authorities / Highways Agency*]	Proportion of new development / volume discharging to combined or separate sewers may not be currently monitored for London; therefore it is a potential gap to fill. A mechanism to monitor this would need to be developed as it would require data from each permission / completion.
	• *Number of people and properties affected by surface water and sewer flooding* [*potential source: Local planning authorities / GLA / water companies / drainage authorities*]	The water industry monitors, for example, indicators on sewer flooding e.g. the number of properties at risk of sewer flooding and number of properties actually affected by sewer flooding are included in the Water UK Sustainability Indicators 2007/08. But disaggregated data for London is unlikely to be available, therefore it is a potential gap to fill. The draft Water Strategy includes a proposal to work with partners through the Drain London Forum to create a strategic-level surface water management plan for London which will also assist Boroughs in producing their Surface Water Management Plans. These should provide more information on surface water flooding in London.
Reduced risk of surface and sewer water and improve water quality (SA objective 3, 4, 5, 11, 12, 13 and 14)	• *Number / proportion of new residential development schemes incorporating SUDS* [*potential source: Local planning authorities / GLA*]	Number / proportion of new residential development schemes incorporating SUDS may not be currently monitored for London; therefore it is a potential gap to fill. A mechanism to monitor this would need to be developed as it would require data from each permission / completion. The Draft Flood and Water Management Bill will require developers to include sustainable drainage, where practicable, in new developments.
	• *Number / proportion of new commercial and other development schemes (non residential) incorporating SUDS* [*potential source: Local planning authorities / GLA*]	Number / proportion of new residential commercial and other development schemes incorporating SUDS may not be currently monitored for London; therefore it is a potential gap to fill. A mechanism to monitor this would need to be developed as it would require data from each permission / completion. The Draft Flood and Water Management Bill will require developers to include sustainable drainage, where practicable, in new developments.
	• *Number / proportion of existing building stock incorporating SUDS* [*potential source: Local planning authorities / GLA*]	Number / proportion of existing building stock incorporating SUDS may not be currently monitored for London; therefore it is a potential gap to fill. A mechanism to monitor this would need to be developed as it would require data from each permission / completion.
Reduced incidents of illness and death caused by flooding (SA objective 3, 4, 5, 11, 12, 13 and 14)	• *Number of people suffering illness / number of deaths caused by flooding* [*potential source: Environment Agency / Health Protection Agency*]	Not currently monitored (it is generally difficult to attribute mortality and morbidity to flooding, other health effects of flooding (both physical and psychological) are well documented but not consistently monitoring and often underreported). Therefore it is a potential gap to fill.
Reduced affordability of new homes (SA objective 4, 14 and 17)	• *Percentage of costs of new "affordable" home in London spent on drainage (SUDS)* (consider also whole life costs, not just installation costs) [*potential source: Local planning authorities / GLA*]	Not currently monitored, therefore it is a potential gap to fill.
Enhanced wildlife and habitat (SA objective 9 and	• *New habitats created / improved habitats through flood schemes and SUDS* [*potential source: Local planning*	Not currently monitored, therefore it is a potential gap to fill.

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14)	*authorities / Environment Agency*]	
Wastewater disposal in London		
Reduced risk of surface and sewer water flooding (SA objective 3, 4, 5, 11, 12 and 14)	• Number of new developments discharging to combined or separate sewers [*potential source: Local planning authorities / GLA / water companies / drainage authorities*]	Number of new developments discharging to combined or separate sewers may not be currently monitored for London; therefore it is a potential gap to fill. A mechanism to monitor this would need to be developed as it would require data from each permission / completion. The Draft Flood and Water Management Bill will make connecting surface water run-off to public sewers conditional on meeting new standards and responsibility of approving SUDS to an approving body.
	• Number of properties and areas in London on the risk register that are at risk of flooding from overloaded sewers and number removed from register [*source: water companies*]	The water industry monitors, for example, indicators on sewer flooding e.g. the number of properties at risk of sewer flooding and number of properties actually affected by sewer flooding are included in the Water UK Sustainability Indicators 2007/08. But disaggregated data for London is unlikely to be available, therefore it is a potential gap to fill.
Improved river and estuary water quality (SA objective 4, 9, 12 and 14)	• Percentage / total river lengths in London of good biological quality and good chemical quality • Number of pollution incidents in London (by type) [*source: Environment Agency*] [*SOER07 indicator*]	The system of General Quality Assessment is being discontinued in preparation for the introduction of new procedures under the EU Water Framework Directive, and 2004–2006 was the last period for which all the reaches of designated rivers in London were graded. The new system will cover all 'waterbodies' and include rivers, canals, lakes, groundwater, coastal waters and estuaries.
	• Number of CSOs per year [*source: Environment Agency / water companies*]	Water Strategy target: the draft Strategy states that the Mayor strongly supports the construction of the Thames Tideway Tunnel as a solution to the problem of the CSO discharges.
	• *Number of misconnections identified and solved* [potential *source: Water companies / Local authorities*]	The draft Water Strategy includes a proposal for surveys of misconnections to be undertaken at time of sale. Disaggregated data for London is unlikely to be available, therefore it is a potential gap to fill. The Draft Flood and Water Management Bill will give sewerage companies similar powers to those of local authorities to rectify misconnections.
Reduced incidents of illness and diseased (SA objective 3, 4, 5, 12, 13 and 14)	• *Number of people suffering illness / number of deaths caused by wastewater* [*potential source: Environment Agency / Health Protection Agency*]	Not currently monitored (it is generally difficult to attribute mortality and morbidity to wastewater and is not consistently monitoring and often underreported). Therefore it is a potential gap to fill.
Water related habitats and wildlife (SA objective 9, 12 and 14)	• Number of fish kills • Possible indictor(s) on population / presence of indicator species • See water quality indicators above [*source: Environment Agency*]	Already monitored disaggregated data for London may not be available.