Guidance on consideration of water in Strategic Environmental Assessment

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Scotland's 4th National Planning Framework has recently been published. This document is therefore being reviewed and updated to reflect the new policies. You can still find useful and relevant information here but be aware that some parts may be out of date and our responses to planning applications may not match the information set out here.

1. Consideration of water in Strategic Environmental Assessment (SEA)

1.1 The water environment is made up of a wide range of features including rivers, lochs, streams, reservoirs, canals, wetlands, aquifers, estuaries, coasts and seas. Water is essential for our health and that of habitats and ecosystems; it supports wetland habitats and species, human activity including industries such as aquaculture and power generation, and provides us with drinking water.

1.2 The quality the water environment is defined under the Water Framework Directive. Surface water bodies are described in terms of their "ecological status" which takes account of water quality and morphology pressures as well as pressures resulting from abstraction and impoundment. Groundwater bodies are defined in terms of their "status" taking account of water quality and abstraction pressures. A summary of this overall ecological status / status for all water bodies in Scotland can be accessed at www.environment.gov.scot/our-environment/water/. More detailed information on the pressures affecting individual water bodies can be accessed at www.sepa.org.uk/data-visualisation/water-environment-hub/.

2. Existing environmental problems and potential significant effects

2.1 Overall Scotland's water environment is in a good condition but a wide range of problems exist at local levels; while environmental effects from industry are declining effects from urban development and intensification of land use are increasing. A variety of aspects of the water environment can be affected by activities promoted through plans, programmes and strategies (PPS), including:

- water quantity (including flooding);
- water quality;
- the physical form of water features (morphology); and
- the sustainability of natural ecosystems.

2.2 PPS which seek to do the following have the potential to affect the water environment:

- influence the location, layout and design of new development;
- promote engineering works in or within the vicinity of water features;
- promote use of the water environment for any activity e.g. drinking water supply, aquaculture, fisheries, power generation, agriculture, horticulture, recreation or tourism;

- change potential discharges to or movements of water e.g. new development which increases the amount of waste water requiring treatment, installation of new flood defences, or agricultural activity resulting in increased runoff.

2.3 Table 1 below sets out examples of current environmental problems in relation to water, their potential causes, and the likely significant effects which a PPS could have on these existing problems.

Table 1 – Existing environmental problems relating to water, their potential causes and examples of likely significant effects

Existing problems relating to water quality	**Causes of existing problems**
Diffuse and point source pollution result in a variety of water quality problems, including: • Nutrient contamination - increased concentrations of nutrients in water and eutrophication of surface water bodies encourages algae growth, which affects aquatic ecosystems (e.g. smothering fish habitats), drinking water resources and causes nuisance. • Nitrate Vulnerable Zones – 4 areas designated in the 1st cycle of River Basin Planning (2009-2015) based on concentrations of nitrates in surface waters and groundwater. • Depletion of oxygen levels in water caused by high levels of organic matter in water. • Increase of suspended solids in water leading to increased sedimentation, smothering of gravels, reduction in light penetration and increased sedimentation causing fish to suffocate, damage of spawning sites / insect habitats and stunting aquatic plant growth.	Sources of diffuse pollution include: • Agriculture – activities including livestock rearing, cultivation of land for crops, processing, storage and transport of products, and generation, disposal and storage of waste can all result in diffuse pollution - main pollutants are nutrients (e.g. fertilisers, animal manures, slurries and effluent from livestock feeds), bacteria, sediment and pesticides. • Forestry - of main concern is the release of phosphate during forestry operations into highly sensitive upland lochs and the effects of acidification. • Sea / coastal transport - impacts (discharges, leakage, litter lost overboard) largely restricted to transitional and coastal waters. • Atmospheric deposition – resulting from emissions of sulphur dioxide and oxides of nitrogen and other more diffuse sources such as ammonia. • Urban development - significant risks to rivers, transitional and coastal waters leaks / overspills from sewerage and surface water runoff systems. • Heavy metals, oil and other hydrocarbons (e.g. polycyclic aromatic hydrocarbons - PAHs) cause pollution, which affects aquatic ecosystems.

• Microbiological contamination affects the amenity value of the water environment and poses a risk to human health and ecosystems e.g. bathing and shellfish waters. • Contamination with toxic substances such as heavy metals, persistent organic substances which are not degraded during sewage treatment or inadequately treated industrial discharges, which can accumulate within the food chain. • Contamination resulting from acid mine drainage (e.g. low pH, heavy metals, ochre) leading to an impact on ecosystems, human health and the amenity value. • Contamination with pesticides and veterinary medicines (including sheep dip) affecting human health and ecosystems.	Sources of point source pollution include: • Sewage treatment – discharges from inadequate sewage treatment causes river, transitional and coastal water pollution. • Industry – mainly discharges from factories, particularly chemicals and the food and drink sectors. • Waste management - mainly a historical landfill problem; no new landfills have been identified as risks to groundwater / transitional waters. • Mining and mineral extraction and contaminated land - abandoned coal mines are a significant source of groundwater and surface water pollution; • Freshwater aquaculture – while modelling is now used to ensure that the size of fish farms is limited so as not to impact water quality, pre-existing farms continue to pollute some freshwater lochs. • Marine aquaculture – SEPA research (Fish Farm Survey Report published November 2018) concluded that medicine used at Scottish salmon farms is significantly impacting local marine environments.

Example of typical effects of a PPS on water quality

Major positive ++ Action very likely to lead to an overall large reduction, or a series of smaller reductions, in water pollution levels. *E.g. major sources of water contamination will be removed on a large scale in the area (e.g. removal of phosphorus from sewage treatment discharges by the introduction of secondary waste water treatment).*

Minor positive + Action very likely to lead to a moderate reduction, or a series of smaller reductions, in water pollution levels. *E.g. moderate or minor sources of water contamination will be removed on a large scale (e.g. removal of a medium energy generation plant producing gaseous emissions leading to acidification of water).*

Minor negative – Action very likely to lead to moderate increase, or a series of minor increases, in water pollution. *E.g. contaminants present in water will increase on a small scale (e.g. additional loading on sewage treatment works by increase in housing).*

Major negative - - Action very likely to lead to severe increase, or a series of lesser increases, in water pollution. *E.g. significant increase in marine waste disposal areas on a large scale.*

Existing problems relating to water quantity

Abstraction / impoundment of water can lead to:

- Reduction in base-flow of groundwater to surface waters leading to a reduction in river flows.
- Reduction in the amount of water available for others to abstract.
- Variation in water levels in lochs and reservoirs leading to regular drying out of the shoreline, preventing the growth of plants and spawning of fish.
- Exacerbation of low levels of water in rivers has the potential to damage the ecology of rivers and associated wetlands.
- Reduced recreation / amenity value of the water environment.

Causes of existing problems

- Water supply (public and private) - abstraction of surface water and groundwater and storage of water in reservoirs places a burden on water resources, particularly during the summer. Public demand is increasing abstraction pressures on rivers and lochs but this is offset to some extent by falling demand from industry. Groundwater abstraction is growing.
- Hydropower generation - abstraction of water, construction and operation of impoundments, and obstruction to fish movement affect the water environment including water quantity (usually limited to rivers and lochs).
- Agriculture - demand for irrigation has increased over the last 20 years. Usually a localised problem and tends to be most pronounced during dry weather when multiple irrigation licence holders increase their rate of abstraction at the same time.

Example of typical effects of a PPS on water quantity

Major positive ++ Action very likely to lead to an overall large improvement, or a series of smaller improvements, in the sustainable use of water resources. *E.g. a significant number of water resource issues will be resolved resulting in an increase in resource capacity / availability.*

Minor positive + Action very likely to lead to a moderate improvement, or a series of smaller improvements, in the sustainable use of water resources. *E.g. a limited number of water resource issues will be resolved, availability improved or pressure on existing resources alleviated.*

Minor negative – Action very likely to lead to moderate reduction, or a series of minor reductions, in sustainable use of water resources. *E.g. a limited number of water resource issues will be exacerbated, availability will decrease temporarily or pressure on existing resources be increased.*

Major negative - - Action very likely to lead to severe reduction, or a series of lesser reductions, in sustainable use of water resources. *E.g. a significant number of water resource issues will be exacerbated, availability will decrease permanently.*

Existing problems relating to physical pressures	**Causes of existing problems**
• Physical impacts associated with historical engineering and urban development are responsible for a large proportion of water quality downgrades on rivers and transitional waters including loss of floodplain wetlands and associated biodiversity. • Potential increase in the risk of flooding due to construction of embankments, culverts and other engineering activities. • Loss of in-channel habitats due to dredging, and significant changes to erosion and sediment deposition in the surrounding channel as a result of channel straightening. • Loss of bankside vegetation, often with increased risk of bank erosion downstream and resultant loss of in-channel habitat supporting fish, invertebrates and aquatic plants, increased inputs of fine sediments, and elevated water temperatures. • Loss of sensitive intertidal ecosystems (e.g. saltmarshes, mudflats) associated with land claim has a serious impact on ecology, fish stocks, sediment transport and flooding. • Migration of fish and other organisms impeded by creation of structures such as culverts, dams and small weirs - may also affect erosion and deposition rates, and result in a loss of sediment supply downstream.	• Historical engineering and urban development – including diversion / canalisation of rivers, culverts, embankments, canals, coastal defences and ports. Impacts from engineering are declining whilst risks and impacts from urban development are growing significantly. • Land reclamation - a significant problem for transitional waters and coastal waters, affecting over half of those at risk. Demand for reclaimed land is increasing from industry, urban development, energy generation and ports and marinas. • Agricultural activity - places a variety of physical pressures on the water environment including construction of flood embankments, hard bank protection, straightening and realignment of rivers, removal of bankside vegetation, run-off, land drains and culverts, bank trampling / riparian damage by livestock and other activities in the riparian zone. • Forestry - the impact of historical planting of conifer plantations close to the banks of water bodies has been identified as a significant issue in terms of loss of natural bankside vegetation. • Hydropower generation – including creation of impoundments and infrastructure within / in proximity to water bodies.
Example of typical effects of a PPS on physical pressures	

Major positive ++ Action very likely to lead to an overall large improvement, or a series of smaller improvements, in the physical state of the water environment. *E.g. a significant number of culverts will be removed and water features restored to a more natural state. Large scale reduction in adverse erosion and sedimentation rates.*

Minor positive + Action very likely to lead to a moderate improvement, or a series of smaller improvements, in the physical state of the water environment. *E.g. some culverts will be removed and / or water features restored to a more natural state in the Plan area. Small scale reduction in adverse erosion or sedimentation rates.*

Minor negative – Action very likely to lead to moderate reduction, or a series of minor reductions, in the physical state of the water environment. *E.g. culverting of small or localised stretches of watercourse or modification of natural water features. Small scale increase in adverse erosion or sedimentation rates in water bodies.*

Major negative - - Action very likely to lead to severe reduction, or a series of lesser reductions, in the physical state of the water environment. *E.g. large scale increase in adverse erosion or sedimentation rates on a large scale.*

Existing problems relating to flooding	**Causes of existing problems**
SEPA's 2018 National Flood Risk Assessment 2 identified that there are around 284,000 homes, businesses and services across Scotland at risk of flooding from rivers, surface water and the sea, and by 2080 climate change will increase the numbers at risk by an additional 110,000 properties. Flooding can result in: • Loss of / damage to material assets e.g. buildings and contents, roads, waste and energy infrastructure, agricultural land. • Human health risks including death / injury, and a potential increase in infectious diseases and mental health issues. • Loss of in-channel habitats due to increased erosion during floods which can affect fish, invertebrates and aquatic plants.	• Flooding is a natural process, but patterns and impacts of flooding can be exacerbated by human influence. Urban development and historical engineering including development on floodplains, inadequate culverting / flood defence measures and increases in impermeable surfaces contribute to flood problems, plus increasing demand on surface water drainage systems. • Agricultural activity can lead to a loss of floodplains e.g. through use of floodplains for agricultural activity and increased surface runoff caused by intensification / changes in land management. • Climate change is predicted to result in increased frequency and severity of river and coastal flooding, and flooding as a result of intense rainfall overloading drainage systems.

	• Mining and mineral extraction can contribute to flooding e.g. as a result of cessation of mine pumping. • Failure of infrastructure e.g. drainage systems, sewers and flood defences.
Example of typical effects of a PPS on flooding *Major positive* ++ Action very likely to lead to an overall large reduction, or a series of smaller reductions, to flood risk / improves resilience to flooding and the consequences of flooding. *E.g. increase of flood storage resulting in reduced risk to a significant number of homes / assets.* *Minor positive* + Action very likely to lead to a moderate reduction, or a series of smaller reductions, to flood risk / improve resilience to flooding and the consequences of flooding. *E.g. increase of flood storage resulting in reduced risk to a number of homes / assets.* *Minor negative* – Action very likely to lead to a moderate increase, or a series of smaller increases, to flood risk / decreases resilience to flooding and the consequences of flooding. *E.g. decrease in flood storage resulting in increased risk to a number of homes / assets.* *Major negative* - - Action very likely to lead to a severe increase, or a series of lesser increases, to flood risk / decreases resilience to flooding and the consequences of flooding. *E.g. decrease in flood storage resulting in increased risk to a number of homes / assets.*	
Existing problems relating to invasive non-native species Invasive non-native species (INNS) include giant hogweed, Japanese knotweed, Himalayan balsam, and rhododendron. INNS can out-compete native species and as a result can greatly reduce biodiversity. They can also be a public health hazards – for example the sap from giant hogweed can cause blistering on contact with skin.	**Causes of existing problems** Non-native species (plants and animals) find their way into the wild and are dispersed as a result of human activity including (but not limited to) activities such as boating, forestry, and engineering.
Example of typical effects of a PPS on invasive non-native species *Major positive* ++ Action very likely to result in the eradication of an invasive non-native species from a water feature. *Minor positive* + Action may result in better management of an invasive non-native species within a water feature.	

Minor negative – Action may result in a slight increase in levels of an invasive non-native species.
Major negative - - Action very likely to result in an increase in presence / distribution of invasive non-native species.

2.4 Significance of effects is set out using a scoring system ranging from a "major positive" effect to a "major negative" effect. As an example, using these significance criteria if the magnitude of the effect is large, but the receptor that experiences the effect is not particularly sensitive, then the significance of the effect is likely to be less. Responsible Authorities may wish to use these criteria as the basis of developing a method that suits the PPS being assessed.

2.5 Neutral, mixed and uncertain effects of a PPS on water

- Neutral effects - an action which is unlikely to have any beneficial or negative effects on any existing water problem. Neutral scoring should only be used where it is very likely that the effect on the current environmental baseline or trends will be neither positive nor negative. It is possible that a neutral effect may be enhanced through mitigation measures such as policy or project intervention.

- Mixed effects – an action which is likely to result in a combination of positive and negative effects, particularly where effects are considered on sub-issues, areas or criterion. Such mixed effects will be hard to predict, but could be significant in the long-term, or when taken with other effects e.g. cumulative or synergistic.

- Uncertain effects - the effect of an action on water is not known, or is too unpredictable to assign a conclusive score. Uncertainty may arise where an action covers a range of issues, or where the manner in which the action is implemented is a material factor in the nature of the effects it may have.

2.6 Where a PPS has the potential to have significant environmental effects on another EU Member State these effects are known as Transboundary effects. Transboundary water pollution is a particular problem for pollutants that are not easily destroyed (including suspended sediments). These pollutants can survive for periods of days or years and can be transported incredibly long distances through water bodies or by flood events. In relation to water transboundary effects generally result from Member States which share catchments. For example engineering works (e.g. reservoirs, flood defence) in the upper reaches of a shared catchment in one Member State could lead to flooding or a decrease in water availability downstream in a neighbouring Member State. Similarly point and diffuse sources of water pollution (e.g. nutrients, toxic substances) occurring in the upper reaches of a shared catchment in one Member State could lead to a

decrease in water quality in lower reaches of the river, estuaries and coastal areas in adjacent Member States.

3. SEA objectives

3.1 SEA objectives can be used to develop a systematic, rigorous and consistent framework with which to assess environmental impacts. The level of detail appropriate for the SEA objectives will depend on the characteristics of the PPS being assessed and the potential significance of its environmental effects. Where appropriate, "headline" SEA objectives can be broken down into sub-objectives or assessment criteria – examples of SEA water objectives are set out in Table 2 below.

Table 2 - Examples of SEA water objectives and assessment questions

Headline objective	Sub-objectives	Example assessment questions
To protect and enhance the state of the water environment.	• To reduce levels of water pollution. • To ensure sustainable use of water resources. • To improve the physical state of the water environment. • To reduce the risk of flooding. • To reduce the impact of invasive non-native species on the water environment.	• Will the PPS contribute to reducing levels of pollution? • Will the PPS increase the number of people or properties at risk of flooding?

3.2 Additional details of this approach and how it can be combined with site assessments for local development planning can be found in the Local Development Plan Site Assessment and SEA checklist which has been produced by the Consultation Authorities.

4. Baseline information

4.1 Sufficient data about the current and likely future state of the environment should be collected to allow the Responsible Authority to predict and evaluate the potential effects of the PPS. However, where such information is not available, any data gaps and difficulties should be listed in the Environmental Report. The gathering of new data may be appropriate to include as recommendations in the Environmental Report, Post Adoption Statement or Monitoring proposals.

4.2 The sources of baseline information and trends set out in Table 3 below cover the water issues which we would typically expect to see presented (depending on the scope and purpose of the PPS) at the Scoping or Environmental Report stage. These include:

- Ecological status of water bodies and protection and enhancement measures displayed on the Water Environment Hub in support of the River Basin Planning process.
- Current classification data displayed on Water Classification Hub
- Mapped information on green space of value in protecting and enhancing blue-green networks with associated environmental, social and economic benefits.
- State of designated waters such as bathing waters, drinking water protected areas, groundwater, nutrient sensitive areas, shellfish waters, and water dependent areas of international importance for conservation;
- Water quality in relation to Water Framework Directive targets, water supplies, water resources and abstractions;
- Sources of diffuse and point source pollution affecting the PPS area;
- Infrastructure including waste water treatment, drainage capacity, drinking water supply, reservoirs, and flood defences;
- Flood risk and resilience.

Table 3 – Sources of baseline information and trends	
State and trend information and key messages.	www.environment.gov.scot/our-environment/water/
Background to the **River Basin Management Planning** process put in place with a view to protecting and improving the water environment in line with Water Framework Directive objectives.	www.sepa.org.uk/environment/water/river-basin-management-planning/

Water Environment Hub – provides information on water bodies across Scotland on an individual basis outlining pressures and measures and the objectives (targets) that have been set across River Basin Planning Cycles. These have been derived using 2014 Classification data.	www.sepa.org.uk/data-visualisation/water-environment-hub/
Sampling results for Scotland's 86 **designated bathing waters** carried out annually between May and September.	http://apps.sepa.org.uk/bathingwaters/
The **drinking water quality regulator** provides reports on the location, quality and regulation of public and private water supplies.	www.dwqr.org.uk/
Flood maps and **Flood Risk Management Strategies** contain information on the causes and consequences of flooding.	www.sepa.org.uk/environment/water/flooding/
Maps and data in relation to the **aquaculture industry** in Scotland.	http://aquaculture.scotland.gov.uk/
Information on **water levels** at 392 monitoring sites for lochs, rivers and coastlines around Scotland.	www.sepa.org.uk/environment/water/water-levels/
The **Scottish Pollutant Release Inventory** (SPRI) is the database and map of annual mass releases of specified pollutants to air, water and land from SEPA regulated industrial sites.	www.sepa.org.uk/environment/environmental-data/spri/
The **Greenspace Scotland Map** identifies accessible recreational and leisure greenspace and is an important resource in considering the potential to improve and further enhance blue-green infrastructure with the multiple benefits this has in terms of place-making.	www.greenspacescotland.org.uk/scotlands-greenspace-map.aspx
Dynamic Coast: **Scotland's Coastal Change Assessment** provides maps, datasets and a model to establish historical coastal change and allows comparison to current	http://www.dynamiccoast.com/

coastal positions in order to estimate past erosion/accretion rates and project future changes.	
The Marine Scotland MAPS NMPi (**National Marine Plan** interactive) interactive tool, part of the Marine Scotland Open Data Network, has been designed to assist in the development of national and regional marine planning.	https://marinescotland.atkinsgeospatial.com/nmpi/

5. Other plans, programmes and strategies

5.1 Comprehensive links to other plans, programmes and strategies relevant to the topic of water can be found at:

- www.sepa.org.uk/environment/water/
- www.environment.gov.scot/our-environment/water/
- www.nature.scot/professional-advice/land-and-sea-management/managing-coasts-and-seas
- www.nature.scot/professional-advice/land-and-sea-management

Table 4 – Key PPS and their associated provisions relevant to water

PPS title	Key provisions	Relevant SEA water objectives
Water Framework Directive (2000/60/EC)	Contains provisions to prevent deterioration in the status of surface water and groundwater bodies; protect, enhance and restore all surface water and groundwater bodies; prevent or limit the input of pollutants to groundwater and reverse any significant and sustained upward trend in the concentration of pollutants in groundwater; comply with European-wide measures against priority hazardous substances; and achieve compliance with any relevant standards and objectives for protected areas.	All

Water Environment and Water Services (Scotland) Act 2003	Enabling legislation in Scotland for the Water Framework Directive.	All
Urban Waste Water Directive (91/271/EEC)	Provisions to protect the environment from the adverse effects of sewage discharges.	Reduce levels of pollution
Nitrates Directive (91/676/EEC)	Provisions to reduce water pollution caused or induced by nitrates from agricultural sources and to prevent further such pollution.	Reduce levels of pollution
Marine (Scotland) Act 2010	Objective is to manage the competing demands on marine resources in a sustainable way; establishes requirement to prepare a National Marine Plan and creates Scottish Marine Regions.	All
National Marine Plan (2015)	Management provisions for Scottish inshore (out to 12 nautical miles) and offshore (12 to 200 nautical miles) waters in relation to reserved and devolved functions.	All
Flood Risk Management (Scotland) Act 2009	Introduces a framework to reduce the adverse consequences of flooding; transposes EU Floods Directive; updates legislation on flooding; amends reservoirs legislation.	Flooding
Flood Risk Management Strategies (2015)	14 Flood Risk Management Strategies explain the causes and consequences of flooding in high risk areas, and set objectives and identify actions to manage this risk. Required by the Flood Risk Management (Scotland) Act 2009.	Flooding
Local Flood Risk Management Plans (2016)	Implementation plans for the Flood Risk Management Strategies. Provides more information on how and when the actions identified in each Strategy will be delivered. Required by the Flood Risk Management (Scotland) Act 2009,	Flooding

Water Environment (Groundwater and Priority Substances) (Scotland) Regulations 2009	Amends the Water Environment and Water Services (Scotland) Act 2003 and the Water Environment (Controlled Activities) (Scotland) Regulations 2005 to transpose the requirements of Directive 2006/118/EC on the protection of groundwater against pollution and deterioration, and transpose the requirements of Directive 2008/105/EC on the control of Priority Substances.	Reduce levels of pollution
The Water Environment (Diffuse Pollution) (Scotland) Regulations 2008	Controls the impact of diffuse pollution on the water environment from rural land use activities. Applies to the use of fertilisers, keeping of livestock, land cultivation, drainage, construction of roads / tracks and application of pesticides and sheep dip.	Reduce levels of pollution
The Bathing Water (Scotland) Regulations 2008	Transposes the revised Bathing Water Directive (2006/7/EC); includes increased provision of public information, tighter microbiological standards and monitoring.	Reduce levels of pollution
The Designation of Nitrate Vulnerable Zones (Scotland) Regulations 2014	Implements the requirements of the Nitrates Directive in Scotland to protect waters against pollution caused by nitrates from agricultural sources.	Reduce levels of pollution
The Private Water Supplies (Scotland) Regulations 2006	Transposes the revised European Drinking Water Directive (Council Directive 98/83/EC) to ensure the provision of clean and wholesome drinking water and deliver significant health benefits to those using such supplies.	Reduce levels of pollution, ensure sustainable use of water resources
The Public Water Supplies (Scotland) Regulations 2014	Transposes the Drinking Water Directive and prescribes standards for a wide range of drinking water quality parameters.	Reduce levels of pollution, ensure sustainable use of water resources
Scotland River Basin Management Plan and Solway Tweed River	Requirement of the Water Framework Directive, setting out the actions required	All

Basin Management Plan	within each river basin to achieve set environmental quality objectives.	
Water Environment (Controlled Activities) (Scotland) Regulations 2011 as amended	Applies regulatory control over activities which may affect Scotland's water environment including rivers, lochs, transitional waters (estuaries), coastal waters, groundwater and groundwater dependent wetlands. Specific measures have been put in place to address pollution resulting from construction site runoff – GBR10 and supporting licence apply.	All
Scottish Planning Policy (2014)	A presumption in favour of development that contributes to sustainable development including protection and improvement of the water environment, avoiding flood risk and reducing the vulnerability of existing and future development to flooding.	All
National Planning Framework 3 (2014)	Takes forward the spatial aspects of the Scottish Government's Economic Strategy with a focus on supporting sustainable economic growth and the transition to a low carbon economy.	All
Climate Change (Scotland) Act 2009	Required Scottish Government to set a target for 2050, an interim target for 2020, and to provide for annual targets, for the reduction of greenhouse gas emissions; gave power to Ministers to: impose climate change duties on public bodies; make further provision about mitigation of and adaptation; make provision about energy efficiency, reduction and recycling of waste; and for connected purposes.	All
Scottish Climate Change Adaptation Programme (SCCAP) Progress Report 2018	Aims to increase the resilience of Scotland's people, environment and economy to the impacts of a changing climate. Annual progress reports are published.	All

6. Mitigation and enhancement

6.1 Mitigation involves the identification of measures which are envisaged to prevent, reduce and as far as possible offset any adverse environmental effects identified by the assessment. The best form of mitigation is avoidance; mitigation should therefore start with the avoidance of creating additional pressures on the water environment whether in the form of increased pollution, abstractions, impoundments, built development / infrastructure within or in the vicinity of the water environment, or the introduction / dispersal of invasive non-native species.

6.2 Other forms of mitigation include activities such as:

- minimising the use of hard engineering to support development – for example replacing hard bank protection with re-profiled softer banks can mitigate against habitat loss and enhance habitat creation;
- requiring environmental assessments at regional, local and project levels to be undertaken to ensure that effects on the water environment are identified and minimised;
- requiring micro-siting to ensure that built development (including energy infrastructure) is not located in areas that contain highly sensitive water features;
- requiring capacity studies to be undertaken for public water supply and treatment prior to allowing new built development and ensuring phased development is in place to align with these needs;
- requiring the use of sustainable urban drainage systems employing a treatment train approach for all types of built development;
- promoting sustainable flood management, for example re-establishing close to natural sinuosity can help mitigate against flooding, minimise changes caused by flooding and avoid the requirement for flood defences.

6.3 Opportunities for enhancement should be explored for any neutral, uncertain and minimal effects identified. PPS which include areas of existing poor water quality or flood risk will also provide opportunities for enhancement. Enhancements can often support wider initiatives aimed at improving blue-green networks in a PPS area and help achieve multiple benefits including reducing flood risk, enhancing biodiversity and promoting a sense of place. Enhancement activities may include:

- opportunities to reinstate riparian habitats, restore degraded habitats, and improve the physical condition of water bodies;
- enabling rivers to regain their natural course including re-engineering degraded rivers to restore natural profiles;
- removing or modifying man-made barriers to improve fish passage and sediment transport;

- controlling invasive non-native species.

7. Monitoring

7.1 The information gathered as a result of monitoring the environmental effects of the PPS enables the Responsible Authority to track the environmental effects of the PPS, gauge the effectiveness of any mitigation measures employed, identify unforeseen effects and manage any uncertainty encountered in the assessment process.

7.2 Table 5 below provides some examples of indicators relevant to monitoring significant effects of a PPS on water. Other more contextual indicators should be identified by the Responsible Authority to monitor for unexpected effects and consider the effectiveness of mitigation and enhancement measures.

Table 5 – Examples of SEA indicators

SEA water objective	Example of monitoring indicators
To protect and enhance the state of the water environment.	• Length of river classified as being at “poor” ecological status / potential through River Basin Management Planning (RBMP) process within Plan area (km) • Length of estuaries classified as “poor” ecological status / potential through RBMP within Plan area (km) • Volume of groundwater classified as being at “poor” status through RBMP within the Plan area (m^3) • Number of designated Bathing Waters classified as not meeting minimum standards within Plan area • Number of designated Shellfish Waters not meeting minimum standards within Plan area • Number of new water environment enhancement awards / accreditations achieved in the Plan area e.g. susdrain SuDS Awards, Building with Nature accreditation.
To reduce levels of pollution.	• Reported incidents of water pollution within Plan area (number per month)

	• Non-compliant discharges to water from regulated sources within Plan area (number per month) • Regulated point-source discharges to water within Plan area (number / volume per year)
To ensure sustainable use of water resources.	• Aquifer yield within Plan area (m^3) • Water usage within Plan area (m^3)
To improve the physical state of the water environment.	• Watercourses impacted by engineering works related to new development (number per month) • Number of water bodies classified as “heavily modified” (per year within Plan area)
To reduce the risk of flooding.	• Properties at risk from flooding within Plan area (number) • New developments in identified flood plains within Plan area (number per year) • New sites developed within 500m of the coast within Plan area (number per year) • Number and type of flooding incidents within Plan area (per year)
To reduce the impact of invasive non-native species on the water environment.	• Area / length of water features affected by INNS • Area (m^2 / km) of active control and eradication undertaken per annum to prevent or slow down spread and reduce / eradicate local populations • Number of bio-security plans in place developed by Rivers and Fisheries Trusts for Scotland (RAFTS) and marine partnerships • Number of public events held to raise awareness of the issue

8. Interaction with other topics / cumulative effects

Table 6 – Cumulative effects	
Cumulative effect	**Examples**
Time crowding - frequent and repetitive effects	Frequent and numerous water abstractions for agricultural irrigation during dry seasons leads to depletion of water resources e.g. reservoir / groundwater levels.
Time lag - long delays between cause and effect	Changes in water table affects the ecology of wetlands and marshes.
Space crowding - high spatial density of effects	Effects on aquatic ecology of acid mine leachate from several old mines within a catchment. Effects of high population density on the water environment e.g. high rates of sewage effluent discharge.
Cross-boundary - effects occur some distance away from the source	Sediment loading from development activities may affect downstream areas where flow rate decreases and transported sediments are deposited.
Synergistic - effects resulting from multiple sources or combined effects different in nature from the individual effects	Decrease in water levels due to over-exploitation of groundwater combined with water pollution associated with agricultural surface water runoff in a wetland may result in the disappearance of a certain wetland species.
Indirect - secondary effects resulting from a primary activity	Unsustainable planning of roads in sensitive wetland areas causes secondary / induced development activities and increased pressure on the aquatic environment.
Nibbling - incremental effects	Incremental effects on aquatic ecology of nutrient loading from agricultural practices.

Table 7 - Interaction of water with other SEA topics

SEA topic	**Existing water problems and interactions with other SEA topics**				
	Water quality	Water quantity	Physical pressures	Invasive non-native species (INNS)	Flooding
Biodiversity, fauna and flora Interactions include changes in the state of the water environment affecting the sustainability of species and habitats	Affects ability of species and habitats to survive.	Increased abstraction may lead to loss of wetland habitats and species.	Structures such as culverts and weirs can prevent movement of species (e.g. migratory fish).	INNS can have a significant detrimental impact on native species and aquatic habitats.	Flooding may cause physical damage to species / habitats and increase flushing of pollutants / sediments which are detrimental to ecosystem functioning. Structures such as flood protection schemes can disrupt natural processes and cause damage to river / coastal ecosystems.
Climatic factors Interactions include water as a sink of and source	Water quality may be affected by climate change e.g. rising water temperatures.	Water quantity may be affected by climate change in the long term e.g.	Structures such as bridges and culverts may act in combination with	Changes in water temperatures may make conditions	Sea level rise due to climate change may lead to increased coastal flooding.

for greenhouse gases		sea level rise due to global ice cap melting, and / or a decrease in availability of water for uses including potable supplies.	increased water levels due to climate change and result in an increase in risk of flooding.	more favourable to the spread of INNS.	Increased quantity and speed of storm runoff as a result of climate change may result in increased risk of flooding.
Soil Interactions include erosion of soil particles and any pollutants which soil may contain affecting the water environment	Erosion of soil particles and any pollutants which soil may contain may affect the water environment.	Changes in water availability for soil may affect the structure of soil and its ability to fulfil its functions.	Changes in channel shape and structures such as weirs and bridges can affect / increase deposition of sediments and may increase soil loss through flooding.	May affect the structure of soil and soil biodiversity.	Flooding may result in soil erosion or landslides.
Air Interactions include the water environment as a potential source of greenhouse gas emissions which may lead to air pollution leading to acid rain and deposition affecting the water environment.	The water environment is a potential source of greenhouse gas emissions which may lead to air pollution leading to acid rain and deposition affecting the water environment.		Loss of natural water environment e.g. riparian habitat in urban areas through increased physical pressures of built environment (e.g. culverts) could affect local air quality by reducing availability of filtering of pollutants by vegetation.		

Population and human health Interactions include effects on human health of water pollution, flooding and amenity, and the population's effect on the water environment e.g. waste water treatment	Water quality is closely related to human health e.g. as a source drinking water.	Increased abstraction e.g. for agriculture / energy production could lead to a reduction in availability of water for other uses e.g. drinking water.	Increased physical pressures e.g. as a result of urban development may have a negative effect on mental and physical health e.g. loss of riparian habitat and its ability to filter pollutants, including noise.	INNS can affect human health through direct physical contact e.g. sap of giant hogweed causes human skin to blister on contact.	Flooding can directly affect human physical and / or mental health.
Material assets Interactions include ability to provide for services e.g. drinking water, means of energy generation and food production	Water pollution can affect the availability of drinking water and the ability of water to support industries including energy generation and food production.	Water quantity can affect the availability of drinking water and the ability of water to support industries including energy generation and food production.	New SUDS and hydropower schemes can add to material assets whilst still being a source of physical pressure on the water environment.	INNS can affect the structural integrity of some built structures e.g. Japanese Knotweed can affect structural integrity of buildings / bridges.	Creation of flood protection schemes can add to material assets and protect existing material assets.
Landscape Interactions include contribution to landscape character.	Physical aspects of water pollution e.g. litter / discoloration can affect visual amenity.	Abstraction e.g. infrastructure / visible low flows in rivers / lochs can affect visual amenity.	Physical pressures can affect landscape amenity e.g. unnatural channel shapes / culverts.	INNS can affect visual amenity of the water environment as part of the wider landscape.	Flooding can affect landscape features by the destruction of existing features / creation of new features.
Cultural heritage	Pollution can damage cultural	Changes to abstractions may	Some historic structures e.g. bank-	INNS can affect cultural heritage	Flooding can affect cultural heritage by

Interactions include reflection of historic interaction of people and the water environment.	heritage e.g. acidic run-off may affect the built environment or visible pollution can affect amenity value.	lead to loss of cultural heritage e.g. drying out of features preserved underwater / in bog conditions.	side and in-river features (e.g. weirs, dams, impoundments, piers etc.) are elements of cultural heritage.	through physical destruction e.g. Japanese knotweed can affect structural integrity of the built environment.	the destruction of existing features.