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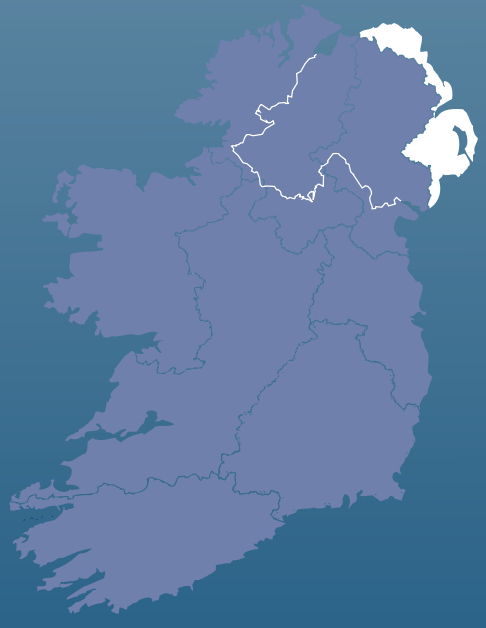
Strategic Environmental Assessment for the Water Framework Directive River Basin Management Plans and Programmes of Measures - North Eastern RBD

Environmental Report

APPENDICES



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north eastern river basin district

North South Shared Aquatic Resource (NS SHARE)

INTERREG IIIA

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Additional Information on the Baseline Environment

Drinking and Bathing Water Quality Information

Table 1 Drinking Water Quality within the Study Area

Ward Area	Water Supply Zone	Details of Water Quality Incidents or Events in 2006
Antrim	Dunore North, Bellaghy, Killylane, Dunore East	Recurring Trihalomethanes contraventions (ongoing into 2007) at Killylane. Authorised departure granted while water treatment upgrade work carried out
Ards	Clandeboye, Lisbane, Lough Cowey, North Penninsula	-
Belfast	Ballyhanwood, Dunmurry, Purdysburn North, Breda East, Dunmore East, Breda West, Oldpark, Dorisland, Woodvale	-
Carrickfergus	Killylane, Dorisland	Recurring Trihalomethanes contraventions (ongoing into 2007) at Killylane. Authorised departure granted while water treatment upgrade work carried out
Castlereagh	Ballyhanwood, Purdysburn South, Clandeboye, Lisbane, Lisnabreeny	-
Londonderry	Carmoney, Foyle, Limavady	Recurring iron contraventions due to cast-iron water mains (ongoing into 2007) at Limavady. Further investigation and survey of water mains in the area. Interim flushing programme. Longer-term action includes water main rehabilitation.
Down	Fofanny-Banbridge, Dunore-East, Fofanny-Newry, Downpatrick, Lisbane	-
North Down	Ballysallagh, Purdysburn North, Breda East, Conlig, Holywood	-
Larne	Buckna, Killylane, Dorisland	Recurring Trihalomethanes contraventions (ongoing into 2007) at Killylane. Authorised departure granted while water treatment upgrade work carried out
Lisburn	Fofanny-Banbridge, Dunmore East, Lurgan-Magheraliskmisk, Lisburn North, Downpatrick, Lisnabreeny, Dunmurry, Stoneyford	-
Moyle	Alcrossagh, Altnahinch, Dungonnell, Rathlin	-
Newtownabbey	Dunmore North, Killylane, Dorisland, Dunore East	Recurring Trihalomethanes contraventions (ongoing into 2007) at Killylane. Authorised departure granted while water treatment upgrade work carried out

Source: Drinking Water Quality in Northern Ireland 2006, Environment and Heritage Service.

Table 2 Bathing Water Quality within the NERBD

Council Area	Bathing Water Area	Quality 2007	Quality 2006
Antrim	Ballycastle Bay	Good	Excellent
	Waterfoot (Red Bay)	Good	Excellent
	Carnlough	Good	Excellent
	Brown's Bay	Good	Excellent
North Down	Helen's Bay	Good	Excellent
	Crawfordsburn	Good	Excellent
	Ballyholme	Poor	Excellent
	Groomsport	Excellent	Excellent
	Millisle	Excellent	Excellent
	Ballywater	Good	Good
South Down	Tyrella	Excellent	Excellent
	Murlough Bay	Excellent	Excellent
	Newcastle	Poor	Good

Source: Bathing Water Directive Compliance (2002 to 2007) (accessed at http://www.ni-environment.gov.uk/2007-bathingwater-compliance.pdf)

APPENDIX to CHAPTER 6

Other Plans, Programmes and Policies of Relevance to the NE RBD RBMP AND POM

Table 1 Other Legislations, Plans, Policies and Programmes of Relevance – International

Topic	Title	Summary of Objectives	Links to Plan	Where are these Objectives addressed in the Plan?
Cultural Heritage	Convention for the Protection of the Archaeological Heritage of Europe (revised) (Valletta 1992)	Objective is to protect the archaeological heritage as a source of the European collective memory and as an instrument for historical and scientific study.	The impacts of the Plan on archaeological heritage are largely expected to be associated with site level impacts (e.g. change in hydrologic regime, construction of new infrastructure). The favouring of sites and measures that carry a lower risk of impacts to archaeological heritage could be emphasised in the Plan.	The requirement to carry out environmental impact assessment, including archaeological, architectural and cultural heritage assessments prior to implementation of specific items in the POM is aimed at addressing the objectives of this Convention.
	Convention for the Protection of the Architectural Heritage of Europe (Granada 1985)	Objectives seek to provide a basis for protection of architectural heritage and are a means for proclaiming conservation principles, including a definition of what is meant by architectural heritage, such as monuments, groups of buildings and sites. The Convention also seeks to define a European standard of protection for architectural heritage and to create legal obligations that the signatories undertake to implement.	The impacts of the Plan on architectural heritage are largely expected to be associated with site level impacts (e.g. change in hydrologic regime, construction of new infrastructure). The favouring of sites and measures that carry a lower risk of impacts to architectural heritage could be emphasised in the Plan.	See Above.
	The World Heritage Convention United Nations Convention Concerning the Protection of the World Cultural and Natural Heritage (Paris 1972)	Objectives seek to ensure the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage and ensure that effective and active measures are taken for these.	The impacts of the Plan on cultural and natural heritage are largely expected to be associated with site level impacts (e.g. change in hydrologic regime, construction of new infrastructure). The favouring of sites and measures that carry a lower risk of impacts to cultural and natural heritage could be emphasised in the Plan.	The requirement to carry out environmental impact assessment, including cultural and natural heritage assessments prior to implementation of specific items in the POM is aimed at addressing the objectives of this Convention.
Environment / Pollution Prevention	The MARPOL Convention International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78).	Objectives include for the protection of the marine environment.	The purpose of the Plan is to achieve good water quality status in all water bodies, including coastal water bodies, or maintain high quality or good status in those bodies currently achieving these. As such the Plan will aim to prevent pollution of the marine environment.	The POM, which is an integral part of the Plan, includes specific measures aimed at addressing pollution of the marine environment. It should be noted however that these measures are restricted to the one-nautical mile radius boundary identified in the Plan.

Topic	Title	Summary of Objectives	Links to Plan	Where are these Objectives addressed in the Plan?
Human Health/Air	World Health Organisation (WHO) Air Quality Guidelines (1999) and Guidelines for Europe (1987)	Objectives seek the elimination or minimisation of certain airborne pollutants for the protection of human health.	The impact of the Plan on air emissions is largely expected to be associated with site level impacts (e.g. transport and disposal of wastewater sludge, construction of new infrastructure). The measures included in the Plan should aim to prevent such pollution and promote a scenario which minimises the emission of the pollutants specified under the guidelines. The favouring of measures in the Plan that generate lower concentrations of air emissions could be emphasised.	The requirement to carry out environmental impact assessment, including air impact assessment at both the project and construction level, prior to implementation of specific projects related to the POM is aimed at addressing the objectives of these Guidelines.

Table 2 Review of Legislations, Plans, Policies and Programmes – European Union

Topic	Title	Summary of Objectives	Links to Plan	Where are these Objectives addressed in the Plan?
Air	The Air Framework Directive Directive on Air Quality Assessment and Management (Framework Directive) (1996/62/EC)	Objectives include the prevention and/or reduction of airborne pollutants for the protection of human health and environment.	The impacts of the Plan on air emissions are largely expected to be associated with site level impacts (e.g. transport and disposal of wastewater sludge, construction of new infrastructure). The Plan should aim to prevent such pollution and promote a scenario that would minimise the emission of the pollutants regulated under the Directive. The favouring of measures in the Plan that carry a lower risk of air emissions could be emphasised in the Plan.	See WHO Guidelines.
	Directive on National Emission Ceilings for Certain Atmospheric Pollutants (2001/81/EC)	Objectives seek to limit the national emissions of certain airborne pollutants for the protection of human health and the environment.	The Plan should aim to prevent such pollution and promote a water management scenario that would minimise the emission of the pollutants regulated under the Directive so as to ensure compliance in both jurisdictions.	See WHO Guidelines.
Biodiversity	The EU Biodiversity Strategy Communication on a European Community Biodiversity Strategy	Objectives seek to prevent and eliminate the causes of biodiversity loss and maintain and enhance current levels of biodiversity.	Although the principal impacts of the EU nature conservation strategy and its founding legislation (see below) will primarily be at a site level, the favouring of water infrastructure and management measures that carry a lower risk of damage to biodiversity could be emphasised in the Plan. It should be noted that the impacts of the Plan on biodiversity are largely expected to be positive.	See UN Convention on Biodiversity. In addition, the requirement to carry out environmental impact assessment, including ecological impact assessment, prior to implementation of specific projects related to the POM is aimed at addressing the objectives of this Strategy.
Climate	Second European Climate Change Programme (ECCP II) 2005.	Objectives seek to develop the necessary elements of a strategy to implement the Kyoto protocol.	See UN Kyoto Protocol.	See UN Kyoto Protocol.
	Adapting to climate change in Europe – options for EU action {SEC (2007) 849}	Objective is to kick-start a Europe-wide public debate and consultation on how to take forward possible avenues for action in adapting to climate change at EU level.	Impacts related to climate change should be considered during development of the Programme of Measures for the Plan.	See UN Kyoto Protocol.

Topic	Title	Summary of Objectives	Links to Plan	Where are these Objectives addressed in the Plan?
Human Health	The EU Environment and Health Strategy 2004-2010 (first period)	Objectives seek to prevent and reduce the impacts of pollution on human health.	Elements of the Plan that could create direct and indirect health impacts should be included in the assessment. It should be noted that the impacts of the Plan on biodiversity are largely expected to be positive due to improvements in water quality.	The items in the POM aimed at reducing pollution discharges to water, including dangerous substances are, in part, aimed at reducing impacts to water quality, human health and the general environment. In addition, the requirement to carry out environmental impact assessment, including assessment of air emissions, prior to implementation of specific projects related to the POM is aimed at addressing the objectives of this Strategy.
	Laying down the Health Conditions for the production and placement on the market of live bi-valve molluscs (91/492/EEC)	Objectives seek to ensure a suitable environment for shellfish growth and protect consumers of shellfish. It classifies shellfish harvesting areas according to the quality of shellfish populations. The classification determines the conditions under which shellfish harvested from those waters can be offered for sale.	Under the WFD, waters containing economically significant aquatic species are to be designated as protected and be addressed as part of the Plan.	The measures included in the POM are primarily aimed at improving and/or preserving water quality. The shellfish areas identified within the Register of Protected Areas are identified in the Plan and are subject to specific measures to protect their water quality.
Sustainable Development	EU Common Agricultural Policy	Aims to provide farmers with a reasonable standard of living, consumers with quality food at fair prices and to preserve rural heritage.	Elements of the Plan that could create direct and indirect impacts on agricultural land uses should be included in the assessment.	The mitigation measures required to fulfil SEA Objective 10 are aimed at addressing the objectives of this policy.
	The Gothenburg Strategy (2001) Communication from the Commission on “a Sustainable Europe for a Better World”	Objectives seek to make the future development of the EU more sustainable. Informs the 6th EAP and the Irish sustainable development strategy.	Elements of the Plan that could create direct and indirect impacts on land use should be included in the assessment.	The mitigation measures required to achieve each of the SEA Objectives are aimed at addressing the environmental objectives of this Strategy. In addition, economic sustainability has been explored through the economic assessment of the individual aspects of the POM.
	The Sixth Environmental Action Programme (EAP) of the European Community 2002-2012	Objectives seek to make the future development of the EU more sustainable.	Elements of the Plan that could create direct and indirect impacts on land use should be included in the assessment.	See Above.

Topic	Title	Summary of Objectives	Links to Plan	Where are these Objectives addressed in the Plan?
Waste	The Landfill Directive (99/31/EC)	The Landfill Directive sets targets to reduce landfilling of biodegradable municipal waste.	The impacts of the Plan with regard to landfilling of waste are largely expected to be associated with specific measures implemented at site level (e.g. farm slurry). Measures that do not require additional landfilling of biodegradable waste could be favoured in the Plan.	The mitigation measures aimed at reducing waste sent to landfill are aimed at achieving the objectives of this Directive.

Table 3 Preliminary Review of Legislations, Plans, Policies and Programmes - Northern Ireland

Topic	Title	Summary of Objectives	Links to Plan	Where are these Objectives addressed in the Plan
Air and Climate	UK Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007	Sets out a comprehensive strategic framework for air quality policies, and establishes Air Quality Objectives for key air pollutants.	See Air Framework Directive.	See Air Framework Directive.
	Air Quality Limit Value Regulations (NI) 2003 (SR No. 2121 of 2003) and amendments.	Sets out air quality limit or guide values for specified pollutants to be achieved by local authorities.	See Air Framework Directive.	See Air Framework Directive.
	Draft UK Climate Change Bill (2007)	The draft Climate Change Bill, the first of its kind in any country, and accompanying strategy, set out a framework for moving the UK to a low-carbon economy. The key component of the legislation requires a mandatory 60% cut in the UK's carbon emissions by 2050.	See Kyoto Protocol.	See Kyoto Protocol.
Biodiversity	UK Biodiversity Action Plan	Sets out the UK Government's response to the Convention on Biological Diversity (CBD) signed in 1992 and describes the UK's biological resources and commits a detailed plan for the protection of these resources. Includes Species Action Plans, Habitat Action Plans and Local Biodiversity Action Plans with targeted actions.	The Plan should aim to minimise impacts on biodiversity. However, impacts of the Plan on biodiversity would be primarily at a site level (i.e. the location of a particular piece of infrastructure, etc.). The favouring of water infrastructure and management measures that carry a lower risk of damage to biodiversity (i.e. through the appropriate siting of facilities) could be emphasised in the Plan. It should be noted that overall the impacts of the Plan on biodiversity are largely expected to be positive.	See the UN Convention on Biodiversity.

Topic	Title	Summary of Objectives	Links to Plan	Where are these Objectives addressed in the Plan
	Northern Ireland Biodiversity Strategy 2002 (including NI Species and Habitat Action Plans and Departmental Biodiversity Implementation Plans)	Northern Ireland Biodiversity Group (NIBG) identified 15 major issues affecting Biodiversity in Northern Ireland. The Northern Ireland Biodiversity Strategy 2002 is the Government response to the publication.	See Above.	See Above.
Cultural Heritage	The Protection of Wrecks Act 1973	Objectives seek to provide for the designation of a wreck on account of the historical, archaeological or artistic importance of the vessel or of the objects associated with it.	The impacts of the Plan on designated wrecks are largely expected to be associated with site level impacts (e.g. change in hydrologic regime, construction of new infrastructure). The favouring of sites and measures that carry a lower risk of impacts to designated wrecks could be emphasised in the Plan.	The mitigation measures recommended to achieve SEA Objective 12 is aimed at achieving the objectives of this Act.
	The Historic Monuments and Archaeological Objects (Northern Ireland) Order 1995	Objectives seek to provide for the protection of all archaeological sites and objects including those on the fore-shore and the sea-bed.	The impacts of the Plan on archaeological heritage are largely expected to be associated with site level impacts (e.g. change in hydrologic regime, construction of new infrastructure). The favouring of sites and measures that carry a lower risk of impacts to archaeological heritage could be emphasised in the Plan.	The mitigation measures recommended to achieve SEA Objective 12 is aimed at achieving the objectives of this Act.

Topic	Title	Summary of Objectives	Links to Plan	Where are these Objectives addressed in the Plan
	Planning Policy Statement 6: Planning Archaeology and Built Heritage	This PPS sets out the Department of the Environment's planning policies for the protection and conservation of archaeological remains and features of the built heritage. It embodies the Government's commitment to sustainable development and environmental stewardship.	The impacts of the Plan on archaeological and architectural heritage are largely expected to be associated with site level impacts (e.g. change in hydrologic regime, construction of new infrastructure). The favouring of sites and measures that carry a lower risk of impacts to archaeological and architectural heritage could be emphasised in the Plan.	The mitigation measures recommended to achieve SEA Objective 12 is aimed at achieving the objectives of this Act.
Energy	Renewables Obligation Order (Northern Ireland) 2006 (April 2006)	Places an obligation on licensed electricity suppliers in the United Kingdom to source an increasing proportion of electricity from renewable sources	Increased energy usage has the potential to occur with some of the alternatives being considered as part of the SEA. Impacts associated with these, such as increased air emissions, should be assessed. The favouring of infrastructure that carry a lower energy demand could be emphasised in the Plan.	The mitigation measures aimed at addressing SEA Objective 7 are aimed at either reducing the amount of energy consumed or encouraging use of renewable energy sources. This would fulfil the objectives of this Order.
	The Energy Efficiency (Northern Ireland) Order 1999 (No. 659 (N.I. 3))	Aims at promoting energy efficiency in the public and private sectors of business and to the public as a whole, through financial assistance, advice, research and dissemination of information.	Increased energy usage has the potential to occur with some of the alternatives being considered as part of the SEA. Impacts associated with these, such as increased air emissions, should be assessed. The favouring of infrastructure that carry a lower energy demand could be emphasised in the Plan.	The mitigation measures aimed at addressing SEA Objective 7 are aimed at either reducing the amount of energy consumed or encouraging use of renewable energy sources. This would fulfil the objectives of this Order.
Planning	The Regional Development Strategy 2025 – Shaping Our Future	Offers a strategic and long-term perspective on the future development of Northern Ireland up to the year 2025	The Plan must take into account the proper planning and sustainable development of the RBD and Northern Ireland as a whole.	The mitigation measures recommended to achieve SEA Objective 2 is aimed at achieving the objectives of this Strategy.
Sustainable Development	A Sustainable Development Strategy for Northern Ireland 2006. 'First Steps to Sustainability.' (and Implementation Plans)	The Strategy and implementation plan are aimed at ensuring that progress in Northern Ireland is done with the correct balance of economic, environmental and social considerations.	See above.	See EU Gothenburg Strategy.

Topic	Title	Summary of Objectives	Links to Plan	Where are these Objectives addressed in the Plan
Water	The Sludge (Use in Agriculture) Regulations (Northern Ireland) 1990	These regulations implement Council Directive 86/278/EEC on the protection of the environment, and in particular soil, when sewage sludge is used on agricultural land. They prohibit the use of sludge from sewage treatment works being spread on agricultural land unless specified requirements are fulfilled.	See Sewage Sludge Directive.	See Sewage Sludge Directive.
	UK Marine Bill	The Marine Bill is designed to ensure clean healthy, safe, productive and biologically diverse oceans and seas, by putting in place better systems for delivering sustainable development of marine and coastal environment.	The purpose of the Plan is to achieve good water quality status in all water bodies, including coastal water bodies, or maintain high quality or good status in those bodies currently achieving these. As such the Plan will aim to prevent pollution of the marine environment.	See Ospar Convention.

APPENDIX to CHAPTER 8

Additional Measures considered in the Northern Ireland and Ireland Plan Processes

Table 1 Additional Measures for Point and Diffuse Sources: Wastewater (Ire) / Urban Development (NI) / Collection And Treatment of Sewage (NI)

SEA Number	Comparable measures under consideration in NI and Ire
WW10	Install secondary treatment at plants where this is not required under the urban wastewater treatment directive. (Ire)
WW11, 12 and 13	Apply a higher standard of treatment (stricter emission controls), upgrade the plant to remove specific substances known to impact on water quality status, or install ultra-violet or similar type treatment (Ire).
WW9	Review the environmental investment required after 2015, prioritise environmental problems and develop indicative lists (NI)
UP10	Identify areas where there are potential constraints on development and address these e.g. identify whether there is capacity in the water bodies in terms of further development and categorise them as red, amber or green (NI)
WW2	Impose development controls where there is, or is likely to be in the future, insufficient capacity at treatment plants (Ire).
UB 1	Development of the Draft Strategy 'Managing Stormwater' (NI)
WW1	Introduce measures intended to reduce loading to the treatment plant (Ire).
UB6	Urban asset management plans should include surveys, mapping, and research; codes of best practice or legislation (e.g. in relation to SuDS); groundwater quality monitoring; improved infrastructure; and planning. (Ire)
	Measures under consideration in Northern Ireland
UB2	Manage misconnections through development of a strategy that considers and develops best practice throughout UK, public information awareness, identification of water quality problems caused by misconnections and develop working relationships to resolve the issue.
UB5	Development of an extended regulatory tool kit
UB7	Development of a diffuse pollution screening and modelling tool with a view to assessing diffuse loads from a wide range of sectors and allow for their prioritisation of new actions.
UB8	Promote and adopt good practice with respect to storage, use and disposal of hazardous chemicals.
WW8	Review consent conditions to ensure adequate controls and emission limits are set to achieve new water quality standards in receiving waters. Further development of mathematical models to examine cumulative impacts of discharges at a catchment scale. Detailed analysis to support the review of the consents for sewer systems and to address the volume spilt from overflows in urban areas.
UP9	Consideration of grants to improve private sewage discharges and support sustainable development.
UP4	Change current policy and guidance to improve existing controls and modify development control and enforcement practices to reflect restrictions if required.
UP7	Following mapping and assessment of the receiving water vulnerability to loading from existing on-site systems, alternate treatment options such as providing main sewers or tank maintenance programmes may be investigated in priority areas.
WW7 / UP5	Support removal of phosphates from domestic detergents to reduce nutrient loading entering the water environment.
	Measures under consideration in Ireland
WW4	Initiate research into treated wastewater characteristics to verify risk assessments and determine the impact of discharges.
WW5	Use decision-making tools in point source discharge management.
WW14	Relocate the point of discharge.

Table 2 Additional Measures for Point and Diffuse Sources: Wastewater from Unsewered Properties (Ire) / Collection And Treatment of Sewage (NI)

SEA number	Comparable measures under consideration in NI and Ire
UP2	Assess applications for new unsewered systems by applying risk mapping/decision support systems and codes of practice (Ire).
UP9	Enforce requirements for percolation and de-sludging (Ire).
UP4	Change current policy and guidance to improve existing controls on septic tanks and modify development control and enforcement practices to reflect restrictions if required (NI).
UP6	Carry out an inspection programme in prioritised locations for existing systems and record results in an action tracking system (Ire).
UP11	Consider connection to municipal systems (Ire).
UP7	Following mapping and assessment of the receiving water vulnerability to loading from existing on-site systems, alternate treatment options such as providing main sewers or tank maintenance programmes may be investigated in priority areas (NI).
	Measures under consideration in Northern Ireland
UP9	Consideration of grants to improve private sewage discharges and support sustainable development.
UP10	Identify areas where there are potential constraints on development and address these e.g. identify whether there is capacity in the water bodies in terms of further development and categorise them as red, amber or green
WW7 / UP5	Support removal of phosphates from domestic detergents to reduce nutrient loading entering the water environment.
	Measures under consideration in Ireland
UP1	Amend Building Regulations and codes of practice.
UP3	Establish certified expert panels for site investigation and certification of installed systems.

Table 3 Additional Measures for Point and Diffuse Sources:: Industrial Discharges (ROI) / Industry and other businesses (NI)

SEA Number	Comparable measures under consideration in NI and ROI
IND1	Introduce codes of practice for potentially polluting activities and consideration of a system of General Binding Rules (NI)
IND6	Introduce Best Available Techniques (BAT) for industrial discharges (Ire)
	Measures under consideration in Northern Ireland
IND1	Implement management controls as they become available, e.g. new or improved guidance, new or revised legislation or regulations, codes of practice
IND2	Develop oil storage regulations to reduce pollution impacts
IND3	Achieve compliance with discharge consent / licence standards to reduce inputs at source
IND4	Compile an inventory of management best practice and reduction in peat usage
IND5	Further research into diffuse pollution modelling
IND7	Improve point source discharge controls after examination of the cumulative impact of discharge consents at a catchment scale
	Measures under consideration in Ireland
IND8	Relocate discharge point

Table 4 Additional Measures for Point and Diffuse Sources: Other Point Sources (landfills, quarries, mines & contaminated lands)* (ROI)
*** For Northern Ireland these sectors are considered in the RBPs under 'Industry and Other Businesses' and 'Waste' key sectors.**

SEA Number	Measures under consideration in Northern Ireland
OP1	Implement management controls as they become available, e.g. new or improved guidance, new or revised legislation or regulations, codes of practice.
OP2	Reduce pollution arising from waste management, e.g. use of Site Waste Management Plans, proper disposal of construction, demolition and electrical wastes, segregated collection
OP3	Introduce a Quality Protocol for the production of aggregates from inert waste to prevent water pollution from contaminated material
OP4	Reduce illegal disposal of waste
	Measures under consideration in Ireland
OP5	Undertake remediation projects for prioritised landfills, quarries, mines and contaminated lands, e.g. pollution containment measures and monitoring requirements.

Table 5 Additional Measures for Point and Diffuse Sources: Dangerous Substances & Chemical Pollution (ROI)

For Northern Ireland this issue is considered within the other key sectors under pollution

SEA Number	Measures under consideration in Ireland
DS2 / DS3	Review of wastewater and industrial licences to identify measures for control of point and diffuse sources through use of pollution reduction programmes.
DS4	Reduce discharges, losses and emissions from diffuse sources
DS5	Upgrade treatment to remove substances from effluent
DS6	Relocate discharge point

Table 6 Additional Measures for Point and Diffuse Sources: Agriculture (Ire and NI)

SEA Number	Comparable measures under consideration in NI and Ire
AG13	Treatment of nutrient surplus by digestors. (Ire)
AG10	Examine commercial/technical proposals that have the potential to bring about a significant reduction in the phosphorus surplus, e.g incinerator/digestor (NI)
AG8	Increase participation in rural environmental protection schemes / other agri-environment schemes particularly in priority catchments (Ire) and focus advice and regulatory action in areas where there is a lower uptake in agri-environment schemes (NI)
	Measures under consideration in Northern Ireland
AG2	Adoption of best management practices including using feedstuffs designed to minimise phosphorus in excreta without compromising animal health
AG11	Phosphorus balances on individual holdings to be introduced on a phased basis
AG7	Identification of regions where particular types of diffuse pollution problems are most severe
	Measures under consideration in Ireland
AG1 / AG3 / AG4 / AG5/ AG6	Reduce pressures by; creation of buffer strips around water bodies to prevent pollutant loss; installation of fencing to prevent livestock access to watercourses; reduction of agricultural intensity, e.g. lower stocking density on land; requiring nutrient management planning or set aside of agricultural lands.
AG9	Upgrade farm management systems.
AG12	Removal of nutrient surplus by tanker.

Table 7 Additional Measures for Point and Diffuse Sources: Forestry (Ire and NI)

SEA Number	Comparable measures under consideration in NI and Ire
F1	Implement management controls e.g. new or improved guidance, legislation, regulations or codes of practice (Ire/NI)
F5 / F6 / F7 / F8 / F16 / F17	To manage eutrophication and sedimentation pressures; avoid or limit forest cover on peat sites; change the tree species mix on replanting; limit felling coup size; establish new forest structures on older plantation sites (including riparian zones, drainage layouts, species mix, open areas). Establish riparian zone management prior to clearfelling. Enhance sediment control. (Ire) Establish riparian buffer zones in advance of harvesting, managing the size of the coupe (crop) area to be felled to limit nutrient inout, managing drainage systems and establishing sediment control systems such as ponds or diffuse overland flow. (NI) Introduce more stringent actions for the most sensitive areas, when scientific evaluation establishes a need e.g. reduce nutrient loading by the phased felling (NI)
	Measures under consideration in Northern Ireland
F1	Development of maps indicating where forests should be developed taking account of sensitive and protected areas
F1	Ensure future forest development has a minimal impact on water quality especially in environmentally sensitive areas, with a need to limit nutrient and sediment losses and acidification
F20	Operations posing a significant threat to water quality assessed on a whole catchment basis
	Measures under consideration in Ireland
F2 / F3 / F4 / F13 / F14 / F15	Avoid or limit afforestation on 1st and 2nd order stream catchments in acid sensitive catchments. Restructure existing forests to include open space and structural diversity through age classes and species mix. Revise the Acidification Protocol to ensure actual minimum alkalinities are detected and revise boundary conditions for afforestation in acid sensitive areas. Mitigate acid impacts symptomatically using basic material (e.g. limestone or sand liming). Manage catchment drainage to increase residence times and soil wetting, including no drainage installation in some areas. Implement measures to increase stream production – for example with native woodland in riparian zones.
F9 / F18	Audit existing drainage networks and enhance drainage network management – minimise drainage in peat soils.
F10 / F11 / F12 / F19	To manage pesticide use; maintain registers of pesticide use; reduce pesticide usage; pre-dip trees in nurseries prior to planting out and develop biological control methods.

Table 8 Additional Measures for Physical Modifications (Ire) / Freshwater / Marine Morphology (NI)

SEA Number	Comparable measures under consideration in NI and Ire
PM1	Implement management controls as they become available e.g. new or improved guidance, legislation, regulations, codes of practice. (Ire/NI)
PM8 / PM9	Investigate significant barriers to fish movement and introduce impassable barriers remediation schemes. (Ire/NI)
PM7	Over-grazing remediation (Ire), such as stabilisation of river banks (NI)
PM5 / PM6	Channelisation investigation (Ire) and impact remediation schemes (Ire/NI), such as re-meandering of straightened channels, reconstruction of pools, substrate enhancement, removal of hard bank reinforcement/revetment or replacement with soft engineering solutions
	Measures under consideration in Northern Ireland
PM3	Complete further surveys on all water bodies following review of morphology classification results
PM4	Carry out SEA of tidal energy reserves
	Measures under consideration in Ireland
PM2	Support voluntary initiatives, such as wetlands and Integrated Coastal Zone Management schemes

Table 9 Additional Measures for Abstractions (Ire) / Abstraction and flow regulation (NI)

	Measures under consideration in Northern Ireland
AB5	Assess compliance of monitored abstractions and compensation flows with licence conditions
AB3	Address data limitations and additional monitoring needs, e.g. monitor abstraction and compensation flows, assess ecology impacts associated with hydrologic changes
AB1	Assess water resource availability and target management priorities
PM9	Develop tool for assessing the extent to which barriers impede migration of a wide range of species
	Measures under consideration in Ireland
AB1 / AB2 / AB7 / AB9	Manage water demand through measures such as: implementing water conservation programmes, supporting voluntary initiatives such as water conservation and rainwater harvesting schemes, reducing leakage and unaccounted for water in distribution systems and establishing water metering and water charging programmes for residential users
AB14	Direct development to areas where capacity exists and restrict development if abstraction already at capacity
AB10	Reduce abstraction demand, e.g. reduce leakage and unaccounted water, modify plumbing codes to support conservation, daily metering of abstracted volumes, implement small schemes with smaller demand
AB8	Increase the water available in the catchment through: promoting reduction and/or infiltration of runoff (for example sustainable drainage schemes—SuDS); reuse of grey water or treated wastewater effluent
AB4	Examine compensation flow requirements on regulated rives and maintain minimum flow or flow variability, where applicable
AB6	Develop water budgets
AB11 / AB12 / AB13	Implement schemes in priority areas including considering reducing current abstractions by; altered abstraction timing, conjunctive use, additional storage
AB8	Consider alternative sources

Table 10 Summary of Northern Ireland Assessment Process

Source Plan	Assessed?	Key Sector	Additional Measures		Overall Impact	Mitigation Measure Recommended
NI	√	Collection and Treatment of Sewage	WW8:	Review consent conditions to ensure adequate controls and emission limits are set to achieve new water quality standards in receiving waters. Further development of mathematical models to examine cumulative impacts of discharges at a catchment scale. Detailed analysis to support the review of the consents for sewer systems and to address the volume spilt from overflows in urban areas.	+	Yes
NI	X					
NI	X		WW9:	Review the environmental investment required after 2015, prioritise environmental problems and develop indicative lists.	+	Yes
NI	X	Industry and Other Businesses	IND1:	Implement management controls as they become available, e.g. new or improved guidance, new or revised legislation or regulations, codes of practice These may include: proposed Environmental Impact Assessment (Fish Farming in Marine Waters) Regulations (NI) Introduction of codes of practice for potentially polluting activities and consideration of a system of Generally Binding Rules (GBR)	+	
NI	√		IND2:	Develop oil storage regulations to reduce pollution impacts	+	No
NI	√		IND3:	Achieve compliance with discharge consent / licence standards to reduce inputs at source	+	Yes
NI	X		IND4:	Compile an inventory of management best practice and reduce peat usage	+	Yes
NI	X		IND5	Further research into diffuse pollution modelling	+	Yes
NI	√		IND6	Improve point source discharge controls after examination of the cumulative impact of discharge consents at a catchment scale	+	Yes
NI	X	Waste	OP1:	Implement management controls as they become available, e.g. new or improved guidance, new or revised legislation or regulations, codes of practice These could include: EU Mining Waste Directive Planning Policy Statement 19 on Planning Minerals Contaminated Land Regulations and Guidance		
NI	√		OP2:	Reduce pollution arising from waste management, e.g. use of Site Waste Management Plans, proper disposal of construction, demolition and electrical wastes, segregated collection	+	Yes

NI	√		OP3:	Introduce a Quality Protocol for the production of aggregates from inert waste to prevent water pollution from contaminated material	+	No
NI	√		OP4:	Reduce illegal disposal of waste	+	Yes
NI	√	Agriculture	AG2:	Adoption of Best Management Practices to reduce phosphorus inputs, e.g. use of feedstuffs designed to minimise phosphorus in excreta	+	No
NI	X		AG7:	Identification of regions where diffuse pollution problems are most severe		
NI	√		AG8:	Increase participation in rural environmental protection schemes / other agri-environment schemes particularly in priority catchments (Ire) and focus advice and regulatory action in areas where there is a lower uptake in agri-environment schemes (NI)	+	Yes
NI	X		AG10:	Examine commercial/technical proposals that have the potential to bring about significant reduction in the phosphorus surplus		
NI	√		AG11:	Phosphorus balances on individual holdings to be introduced on a phased basis	+	No
NI	√	Collection and Treatment of Sewage	UP4:	Change current policy and guidance to improve existing controls and modify development control and enforcement practices to reflect restrictions if required.		
NI	√		UP5:	Reduce loading by introduction of phosphate free detergents	+	No
NI	√		UP7:	Following mapping of vulnerable areas, where water quality is threatened alternate treatment options, such as providing mains sewers or tank maintenance programmes, may be investigated	+/-	Yes
NI	X		UP9:	Consideration of grants to improve private sewage discharges		
NI	X		UP10:	Identify areas where there are potential constraints on development and address these		
NI	X	Forestry	F1:	Implement management controls as they become available, e.g. new or improved guidance, new or revised legislation or regulations, codes of practice These could include: Improved guidance based on scientific research for highly sensitive areas (e.g. Pearl Mussels) Development of maps indicating where forests should be developed taking account of sensitive and protected areas		
NI	X		F20:	Assessment – Assess operations posing a significant threat to water quality on a whole catchment basis		

NI	X	Marine Morphology	PM1:	Implement management controls as they become available, e.g. new or improved guidance, new or revised legislation or regulations, codes of practice These could include: Review of existing legislative controls on physical modifications to surface waters Development of a protocol for maintenance dredging Implementation of a new marine licencing regime and marine planning system under the (draft) UK Marine Bill Adoption of operational protocols for impoundments		
NI	X	Freshwater Morphology	PM3:	Complete further surveys on all water bodies following review of morphology classification results		
NI	X	Marine Morphology	PM4:	Carry out SEA of tidal energy reserves		
NI	√	Freshwater Morphology	PM6:	Channelisation impact remediation schemes, such as re-meandering of straightened channels, reconstruction of pools, substrate enhancement, removal of hard bank reinforcement/revetment or replacement with soft engineering solution	–	Yes
NI	√		PM7:	Stabilisation of river banks	+	Yes
NI	√		PM9:	Strategically appraise significant barriers to fish (and invertebrate) movement to inform the development of a programme including, where appropriate, the installation of new fish passes or the upgrading of existing passes and the removal of blockages	–	Yes
NI	X	Abstraction and Flow Regulation	AB1	AB1: Assess water resource availability and target management priorities		
NI	X		AB3:	Address data limitations and additional monitoring needs, e.g. monitor abstraction and compensation flows, assess ecology impacts associated with hydrologic changes		
NI	√		AB5:	Assess compliance of monitored abstractions and compensation flows with licence conditions	+	Yes
NI	X	Urban Development	UB1:	Development of draft strategy Managing Stormwater		
NI	X		UB2:	Manage misconnections through development of a strategy		
NI	X		UB3:	Education and awareness on applicability of SUDs		

NI	X		UB5: Develop an extended regulatory tool kit		
NI	X		UB7: Develop a diffuse pollution screening and modelling tool to assess diffuse loads and allow for prioritisation of new actions		
NI	X		UB8: Promote and adopt good practice with respect to storage, use and disposal of hazardous chemicals		
NI	X	Alien Species	Amendments to the Wildlife Order (NI) 1985 Maritime Ballast Water Convention NIEA Natural Heritage Grant Aid Programme Develop risk assessments and contingency and management plans for species that are established or are likely to become established Develop sectoral codes of practice Education and awareness programmes		
NI	X	Fisheries	Commercial Fishing Regulations, e.g. further restrictions on licensed commercial salmon fishermen, prohibition of the sale of rod caught salmon Angling Regulations, e.g. catch and release, use of barbless hooks, early closures and shortened season European Fisheries Fund Grants Advice, education and training Protection and restoration of salmon habitats, e.g. develop further conservation and management targets and CMPs for specific rivers, complete DNA based study to determine genetic structure of salmon populations		

APPENDIX TO CHAPTER 9

Assessment

It should be noted that in the following assessments the term Appropriate Assessment refers to the assessment process as specified in Article 6 of the Habitats Directive. This starts with screening to determine whether a likely significant impact from the plan/programme is expected to occur to a Natura 2000/Ramsar site as a result of activities in/adjacent to/in the catchment of a Natura 2000/Ramsar site. If, in accordance with AA guidance (guidance produced by the EU, DEHLG in Ireland, and NIEA in Northern Ireland), it can be shown that there is no potential for impact at the screening stage, no further assessment may be required. However when the plan/programme being screened lies within or adjacent to a Natura 2000/Ramsar site then such a determination must be made in consultation with NPWS/NIEA. If the plan/programme is within the catchment (surface and groundwater) of a Natura 2000/Ramsar site, such consultation with NPWS/NIEA is only necessary for those water dependent Natura 2000 sites which are listed in the WFD Register of Protected Areas.

Assessment: Wastewater (NI: Collection and Treatment of Sewage / Urban Development)

	WW1	WW2	WW6	WW7	WW10	WW11	WW12	WW13	WW14	WW16	Cumulative Impact
Objective 1 (BFF)	+/-	+	+	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-
Objective 2 (P)	+	+	+	+	+	+	+	+	+	+	+
Objective 3 (HH)	+	+	+	+	+	+	+	+	+	+/-	+
Objective 4 (S)	+/-	+	+	+	+/-	+/-	+/-	+/-	+	+	+/-
Objective 5 (W)	+/-	+	+	+	+	+	+	+	+	+	+
Objective 6 (AQ)	+/-	0	+	0	+	+	+	+	0	+/-	+
Objective 7 (CC)	+/-	0	+	0	-	-	-	-	0	+/-	-
Objective 8 (MA1)	0	0	0	0	0	0	0	0	0	0	0
Objective 9 (MA2)	+	+	+	+	+	+	+	+	+	+	+
Objective10 (MA3)	+/-	+/-	+	+/-	+/-	+/-	+/-	+/-	+/-	+	+/-
Objective11 (MA4)	+	+	+	+	+	+	+	+	+	+	+
Objective 12 (CH)	0/-	-	0	0	0/-	0/-	0/-	0/-	0/-	0/-	0/-
Objective 13 (L)	0/-	0	0	0	0	0	0	0	0	0/-	0

***Key**: BFF – Biodiversity, Flora and Fauna; AQ – Air Quality; C – Climate; MA – Material Assets; L – Landscape; P – Population; HH – Human Health; S – Soils; CH – Cultural Heritage*

*See **Table 8.3** for further details on the contents of these alternatives*

Discussion of Assessment

WW1 relates to reducing loading on WWTP / WWTW by concentrating on inputs. This will have direct positive impacts for wastewater treatment plants / works by improving capacity and efficiency in existing plants. This alternative will have consequent indirect positive impacts on water, biodiversity, soils and human health by reducing pressure on the current infrastructure. However, limiting disposal of liquid wastes, landfill leachate, sludges, etc. to WWTP / WWTW will require alternative disposal. This may include options such as incineration, which would have potential indirect negative impacts for water and biodiversity (cooling waters), air quality and climate (energy use) as well as biodiversity, soils, cultural heritage and landscape where new facilities are required. Direct negative impacts will be experienced by operators producing polluting matter as use of alternative disposal methods or a shift in the quantity or quality of the matter produced will require additional costs to implement. Other options include recycling of sludge to agriculture for use as fertiliser, but this may impact negatively on soil quality as a result of increased

levels of contaminants in the soils. This also has the potential to reduce the quantity of mineral fertiliser used (and therefore the energy required to produce and emissions generated to import it) which will have indirect positive impacts for air quality and climate. The use of under-sink disintegrators in Ireland and Northern Ireland is limited to date compared to other countries such as the United States. Ireland and Northern Ireland have tended to favour a more European model based on composting; however, as people become more aware of other options this is a pressure that may grow in the future. Discouraging the increase of organic wastes from this source will reduce the load entering these facilities, allowing more efficient use of the system and reducing the potential for odours. Fats, Oils and Greases (FOG) also have the potential to negatively impact on the operation of existing plants causing scum build-up and blockages, creating odour nuisance and increasing the Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) of wastewater. Reducing inputs of FOG will improve existing infrastructure efficiency, which will have direct positive impacts for existing WWTP / WWTW and indirect positive impacts generally for the environment. The Appropriate Assessment has concluded that reducing nutrient loads will improve water quality and reduce the impacts of eutrophication. Elevated levels of nutrients can give rise to unnatural levels of food supply for certain bird species; reduced nutrient loads may lead to a situation where the composition of the flora and fauna may return to a more natural and sustainable level. This alternative has the potential for medium to long-term impacts, as further investigations will be required to implement specific measures.

WW2 focuses on sustainable planning practices which ensure that adequate wastewater treatment is available before giving planning permission for future development. This alternative will have direct positive impacts for population by ensuring sustainable development. It will also have indirect positive impacts for water quality, biodiversity, soil and human health through reduced intensity of development in areas with insufficient capacity. Potential direct negative impacts are likely for economic resources attempting to locate or expand in areas with insufficient capacity. However, indirect positive benefits would also be expected for existing economic activities that may be currently impacted by poor water quality, e.g. tourism, and which will benefit from improved water quality. Limiting development in areas currently over capacity will have a positive impact on existing WWTP / WWTW by reducing the cumulative ongoing pressure. Potential indirect negative impacts are likely in relation to cultural heritage if traditional industries are curtailed due to insufficient capacity in particular areas. The Appropriate Assessment has concluded that WW2 will have an overall positive affect if whole catchment loadings are considered as part of the planning process. This alternative could have effect from the short-term onward if controls are imposed on planning applications from the date of plan adoption.

As with similar alternatives for other key pressures, education campaigns in WW6 will have an overall positive impact on the environment by raising awareness of the issues and providing opportunities for individuals and businesses to become part of the solution. Prevention of pollution or limiting the amount of pollutants entering wasterwater treatment facilities will have direct positive impacts for wastewater infrastructure and indirect positive impacts on the environment generally, and may reduce expenditure on pollution clean up and treatment. No negative impacts are anticipated. Impacts from this alternative can be effective in the short-term and beyond as education will be the building block for all the measures that follow.

WW7 will also have an overall positive impact on the environment by providing a simple and straightforward alternative in which individuals and businesses can take part. As with any change in product use there may be cost implications to individuals; however, this alternative would be expected to have a direct positive impact on wastewater treatment facilities by reducing phosphorous at source, thereby improving efficiency of treatment. This in turn will have indirect positive impacts for water and biodiversity by decreasing eutrophication, and returning surface and groundwaters to a more natural state. Reducing the levels of phosphorous entering waterbodies will reduce weed and aquatic plant growth, as well as reducing the risk of potential toxicity to fish and other aquatic life. It will increase dissolved oxygen in the waterbody to the positive benefit of the natural system. The Appropriate Assessment has concluded that this alternative will have positive impact in terms of EU protected habitats and

species and that where elevated levels of nutrients have resulted in un-naturally high levels of food for certain bird species, reduced nutrient loads may lead to a situation where the composition of the flora and fauna will return to a more natural and sustainable level.. Further indirect positive impacts are anticipated for soils and human health, as less phosphorus will be released to surface and groundwaters.

WW10, WW11, WW12 and WW13 all relate to secondary and tertiary treatment options. Increasing the level of treatment will have direct positive impacts on material assets by providing for upgrades to existing water management infrastructure. The alternative will have indirect positive impacts for water quality, biodiversity, soils and human health by improving the quality of the effluent leaving the facility. Reducing the nutrient load entering waterbodies will reduce weed and aquatic plant growth, as well as reducing the risk of potential toxicity to fish and other aquatic life. It will increase dissolved oxygen in the waterbody to the positive benefit of the natural system. The Appropriate Assessment has concluded that reduced nutrient loads may improve water quality and reduce the impacts of eutrophication, with a higher standard of treatment particularly important for protected areas with more stringent objectives, e.g. freshwater pearl mussels or hard water lakes. The removal of elevated levels of nutrients currently providing an unnatural level of food supply for certain bird species, may cause the composition of flora and fauna to return to a more natural and sustainable level. Altering nutrient load from treatment plants may therefore indirectly impact on biodiversity by altering the existing food web dynamics of the receiving environment. Upgrade of existing plants and provision of UV treatment will contribute to sustainable development by ensuring adequate water and wastewater infrastructure and will also have indirect positive impacts by protecting the economic water resource as well as those sectors dependent on it. In particular, this alternative will have indirect positive impacts for designated bathing and shellfish waters. Potential negative impacts are possible if additional landtake is required for existing plant upgrades or provision of new plants. This could result in indirect negative impacts on biodiversity, soils, and cultural heritage, if sited inappropriately. Additional costs are also likely to upgrade systems to secondary and tertiary treatment. In all cases additional energy may be required, with a potential negative impact on climate through emission of CO_2. Impacts from these alternatives are likely to be delivered in the medium to long-tern horizon, as planning permissions may be required.

Relocation of discharge points in alternative WW14 will have direct positive impacts on water quality and aquatic biodiversity by ensuring discharges are directed to waterbodies with sufficient carrying / dilution capacity to reduce negative impacts on the water environment. There will be an overall improvement to the quality of aquatic biodiversity, flora and fauna if relocated away from sensitive/protected habitats and species. Indirect negative impacts are possible if the point of discharge is relocated without consideration of terrestrial habitats and species or cultural heritage. The Appropriate Assessment has recommended that implementation of this alternative should be prioritised in catchments containing sensitive/protected areas. WW14 will also have potentially positive direct impacts on wastewater treatment infrastructure by improving its overall function and also indirect positive impacts on economic activities such as tourism and angling, which are dependant on good water quality.

The use of community digestors in alternative WW16 to dispose of sludges would result in a direct positive impact to soils and an indirect positive impact to water quality, aquatic biodiversity and human health, due to the reduction in need to dispose of sludges using alternate methods, e.g. landspreading. The use of digestors to treat sludges would produce methane (CH_4), a GHG, thereby resulting in negative impacts to climate. However, this could be offset by capturing methane for re-use as fuel as suggested in the proposed alternative. After treatment the remaining digestate will require disposal, with associated negative impacts to air quality resulting from transport. If additional landfill capacity is required to dispose of this waste, potential indirect negative impacts to biodiversity, cultural heritage and landscape could occur if the additional landfill facilities are sited inappropriately. Incineration is also possible and this would have indirect negative impacts on air quality and climate as well as potential human health issues. In addition, construction of the digestors could result in indirect impacts to biodiversity and cultural heritage, if they are sited in sensitive locations. An Appropriate Assessment would be required for any new infrastructure to determine if there would be potential impacts on

EU designated sites. WW16 will also have potentially positive direct impacts on wastewater treatment infrastructure by improving its overall function and also indirect positive impacts on economic activities such as tourism and angling, which are dependant on good water quality.

Cumulative Impact

Negative cumulative impact was registered for climate in relation to the wastewater alternatives. While additional levels of treatment will undoubtedly improve water quality and contribute significantly to sustainable development in the RBD, there will be increased energy costs associated with treating more wastewater to a higher standard. This energy will potentially give rise to GHG emissions, which will contribute to climate change. This cumulative impact could be mitigated by a commitment to source additional energy requirements from renewable sources. This will be dependent on availability of renewable energy sources. Cultural heritage has also been recorded as negative / neutral based on possible impacts associated with new or relocated infrastructure. Consideration of the wider environment prior to siting new infrastructure will greatly reduce this potential cumulative impact.

Mitigation

WW1 should be accompanied by an education and awareness campaign for householders and commercial premises dealing with under-sink disintegration and FOG.

WW1 will require project level Appropriate Assessment if alternative facilities for treatment of waste are constructed e.g. incinerator.

WW2 will need to link to the development planning process, e.g. by including a requirement to address watewater capacity as part of the scope in any accompanying SEA for development plans.

WW2 will need to consider whole catchment loading.

WW10, WW11, WW12 and WW13: Negative impacts on climate associated with GHG emissions related to additional energy requirements for WW10, WW11, WW12 and WW13 should be offset by use of renewable energy sources or similar.

WW10 / WW11/ WW12: If these alternatives involve the building of a new plant or an extension to an existing plant an Appropriate Assessment will be required. Prior to any proposals for a new plant, further investigation will be required to show that a new plant will have the desired improvements in water quality for which it is being built.

WW10/ WW11/ WW12/ WW16: If additional landtake is required for these alternatives, environmental studies will be undertaken to assess the impact on the environment.

WW14: An Appropriate Assessment will be required for WW14 to demonstrate that the relocation will not negatively impact on protected areas.

WW16: An Appropriate Assessment will be required for WW16 to demonstrate that any new infrastructure will not negatively impact on protected areas.

Assessment: Industrial Discharges (NI: Industry and Other Businesses)

	IND2	IND3	IND4	IND6	IND7	IND8	Cumulative Impact
Objective 1 (BFF)	+	+	+	+	+	+ / -	+
Objective 2 (P)	+	+	0	+	+	+	+
Objective 3 (HH)	+	+	+	+	+	+	+
Objective 4 (S)	+	+	+	+	+	+	+
Objective 5 (W)	+	+	+	+	+	+	+
Objective 6 (AQ)	0	0	+/-	+ / -	0	0	-
Objective 7 (C)	0	0	+/-	+ / -	0	0	-
Objective 8 (MA1)	0	0	0	0	0	0	0
Objective 9 (MA2)	0	0	0	+	+	+	+
Objective10 (MA3)	+ / -	+ / -	-	+ / -	+ / -	+ / -	+ / -
Objective11 (MA4)	+	+	+	+	+	+	+
Objective 12 (CH)	0	0	+/-	0	0	-	-
Objective 13 (L)	0	0	+	0	0	0	0

***Key**: BFF – Biodiversity, Flora and Fauna; AQ – Air Quality; C – Climate; MA – Material Assets; L – Landscape; P – Population; HH – Human Health; S – Soils; CH – Cultural Heritage*

*See **Table 8.4** for further details on the contents of these alternatives*

Discussion of Assessment

There will be overall positive impacts from developing oil storage regulations in IND2. Where regulations can reduce the risk of a pollution event, they will have a direct positive impact to groundwater and soils and indirectly to surface water, biodiversity and human health, which interact with these environmental elements. This alternative also has an indirect positive impact on material assets as it protects the water resource for the enjoyment of all. However, indirect negative impacts may arise for targeted actives, as regulations may require investment in improved storage or may limit storage options in high-risk areas. The positive effects of this alternative are anticipated be to realised in the medium to long term as regulations will have to be drafted and agreed at government level following stakeholder consultation.

IND3 requires the enforcement of existing discharge consent and license standards. Similar to IND2, this alternative is likely to result in overall positive impacts to water (direct), and also to biodiversity, soils, human health and the water resource (indirect). However, indirect negative impacts are anticipated in relation to some economic activities, which may be targeted by such enforcement. Additional costs may be incurred in order to upgrade / replace existing treatment systems or alter management practices to meet standards. However, it is noted that where these discharge consent / licence standards are not currently being achieved, the operator is in breach of licence conditions and would be required to rectify this situation regardless of the enforcement measures under the RBMP and POMs. As this alternative is based on enforcement of existing consent / licensing systems, this could result in relatively short-term improvements which, with adequate resourcing, will also have long-term effects.

While the first aspect of IND4 (compilation of an inventory of best management practices) is not expected to result in significant environmental impacts, the second (reduction in peat usage) could. A reduction in peat usage would be expected to result in overall direct positive impacts on water quality and soils as well as terrestrial biodiversity associated with this habitat. In addition, indirect positive impacts to aquatic biodiversity would be expected due to improved water quality. A reduction in peat usage would require replacement of peat being used for fuel with an alternate energy source; the impacts associated with this on air quality and climate would be related to whether this was replaced with renewable energy sources or other fossil fuels. The cost of changing from peat to an alternate fuel would be expected to result in indirect negative impacts to current users; the speed at which this

alternative is implemented would determine if these are short, medium or long term impacts. Peat is also used for a variety of other uses by both individuals and at a commercial scale, the degree of reduction will determine whether there are negative economic impacts to these users as well.

IND6 is likely to require upgrade of systems and changes in current management practices for industry. Introducing BAT will have a direct positive impact on material assets by way of upgrades and improvements to the industrial sector. BAT for industrial discharges will reduce the risk of pollution to water and aquatic biodiversity (including protected sites), thereby directly impacting positively on these environmental receptors. This alternative will also have indirect positive impacts for soils, human health and the water resource (MA4). However indirect negative impacts are anticipated to material assets (MA3) as a result of cost implications. It is not clear from the alternative what BAT will be considered; therefore, a potential indirect negative impact has been recorded for air quality and climate change, as introducing BAT may result in emissions to air. It is anticipated that impacts associated with this alternative will occur in the medium to long term, as it will require review and implementation phases.

IND7 tackles the issue of cumulative impacts from numerous point source discharges. By taking a catchment level approach rather than a localised approach, a more realistic existing impact scenario will be available, thus focussing improvements. This alternative will have overall positive impacts for environmental receptors, including water and aquatic biodiversity (direct) and in addition is likely to have direct and indirect positive impacts on material assets by providing upgraded water infrastructure (MA2) and protecting the water resource (MA4). The Appropriate Assessment has concluded that catchment nutrient budgets should be prepared and emission limits set accordingly to take account of the specific requirements/objectives of protected areas. This may have a positive result for EU protected sites, as this should produce a realistic assessment of a catchment and therefore help to avoid impacts. Human health and soils are all likely to experience indirect positive benefits from this alternative. However, additional costs may be incurred by some economic sectors as a result of necessary improvements or changes to existing practices resulting in some indirect negative impacts for material assets (MA3). It is anticipated that impacts associated with this alternative will occur in the medium to long term, as it will require review and implementation phases.

IND8 will require potential relocation of discharge points to reduce pressure on water bodies. Changing the location of a discharge may provide greater opportunity for immediate dilution, if greater water volume or faster flow is available, reducing the residence time in the water body. Relocating discharges to locations which are better suited to achieving compliance with existing standards / licence conditions is expected to reduce the effect of discharge on water quality leading to direct positive impacts for water and aquatic biodiversity, although the Appropriate Assessment indicates that this will only be the case if the relocation site is away from sensitive habitats / species. Positive impacts are also likely for soil, human health and other biodiversity dependent on aquatic species or habitats for survival as these receptors may all be indirectly affected by the discharge of regulated and unregulated compounds. Again the positive impacts to biodiversity will be dependent on the proximity of the relocation site to sensitive habitats / species. Relocation has the potential to also have direct negative impacts on cultural heritage if the relocation point is poorly sited, impacting on known / unknown archaeology. Short-term negative impacts are also likely on economic activity as a result of relocation costs.

Cumulative Impact

Overall the cumulative impact of implementing all of the proposed industrial alternatives will be positive. For MA3, impacts to economic activity register a positive / negative cumulative assessment. This relates to potential positive impacts for economic sectors reliant on good water quality (residential, service, tourism, angling, etc.), compared to the negative impacts experienced by industries required to improve discharges. This could require operational and process changes to achieve targets. Potential negative impacts have been recorded for air quality and climate change, as introducing BAT may result in emissions to air. Likewise, relocation of discharge points has the potential to have negative impacts on cultural heritage if the relocation point is poorly sited, impacting on known / unknown archaeology and architectural heritage.

Mitigation

IND3. It is important to ensure the environmental quality standards that are set for receiving waters are achieved. Particular attention should be placed on discharges to EU protected areas in case a licence requires more stringent standards.

IND6. Once clarified, BAT should be reviewed in the context of impacts to air quality and GHG emissions.

IND7. Catchment nutrient budgets should be prepared and limits set according.

IND8. A cultural heritage assessment will be required for all proposed relocation options.

IND8: Areas containing sensitive habitats and species should be avoided. An Appropriate Assessment will be required to determine impacts on protected areas from relocation.

Assessment: Other Point Sources (landfills, quarries, mines and contaminated lands) (NI: Industry and Other Businesses / Waste)

	OP2 / OP4	OP3	OP5	OP6	Cumulative Impact
Objective 1 (BFF)	+	+	+	+	+
Objective 2 (P)	+	+	+	+	+
Objective 3 (HH)	+	+	+	+	+
Objective 4 (S)	+	+	+	+	+
Objective 5 (W)	+	+	+	+	+
Objective 6 (AQ)	+ / -	+	+/-	-	+/-
Objective 7 (C)	+ / -	+	+/-	-	+/-
Objective 8 (MA1)	0	0	0	0	0
Objective 9 (MA2)	0	0	0	0	0
Objective10 (MA3)	0	+/-	0	-	+/-
Objective10 (MA4)	+	+	+	+	+
Objective 11 (CH)	0	0	+/-	0	+/-
Objective 11 (L)	+	0	+/-	0	+/-

***Key**: BFF – Biodiversity, Flora and Fauna; AQ – Air Quality; C – Climate; MA – Material Assets; L – Landscape; P – Population; HH – Human Health; S – Soils; CH – Cultural Heritage*

*See **Table 8.5** for further details on the contents of these alternatives*

Discussion of Assessment

OP2 and OP4 both relate to prevention of improper disposal of wastes. These are broadly positive alternatives, which are in keeping with the objectives of the Waste Management Legislation in Ireland and Northern Ireland. In particular, the prevention of incorrect disposal of waste will be a positive measure for EU protected areas. Proper plans and disposal mechanisms should limit the incidence of disposal in remote areas and within EU protected areas. Positive impacts of note will be the direct impact on soil and groundwater quality, direct positive impacts on terrestrial biodiversity (particularly protected habitats and species), landscape and on surface water where runoff is causing pollution to surrounding water bodies. Indirect positive impacts from proper disposal of waste material will also be likely for human health, the wider catchment and aquatic biodiversity. A minor indirect negative impact is noted for air quality and climate from the possibility of increased waste collection and disposal, requiring more transport and more treatment although it is recognised that prevention of illegal disposal of waste will also reduce the potential for burning waste which currently contributes to air quality and climate impacts.

OP3 recognises the benefits of reuse of wastes. However, if unsuitable materials are used in the production process the impact on the receiving environment can be negative. This protocol encourages re-use but provides a quality approach which provides a uniform control process for producers and ensures the end user receives a quality managed product which conforms to agreed standards. This alternative will have overall positive impacts on the environment, although some changes in the types of materials used may be required and this could negatively impact on aggregate producers in the short to medium-term as new practices are implemented. However, by adapting to this type of protocol now, the long-term sustainability of the aggregate industry is likely to be protected.

The speed of implementation of remediation projects in OP5 will dictate whether impacts will occur in the short-medium or medium-long term. There will be direct and indirect positive impacts for biodiversity as remediation offers opportunities for habitat rehabilitation, restoration and creation. Local projects could work with other similar habitat types in an area to create ecological networks to the benefit of flora and fauna. The Appropriate Assessment has noted that this alternative should consider protected area requirements/ impact on protected areas as one of the criteria for prioritisation. There will be direct positive impacts on soils and groundwater. Any alternative that

targets soil pollution will gradually give rise to improved soil quality and function. The export of contaminated soils for treatment could negatively impact on air quality and climate as a result of transport related emissions; however, on-site remediation would reduce the need for this and is in keeping with the objectives of the National Hazardous Waste Management Plan (Ire). There will be indirect positive impacts on air quality and water, and as a consequence on human health, related to improved water quality and reduced exposure to airborne pollution associated with containment. Remediation has the potential to indirectly impact on cultural heritage and landscape. Positive impacts would be expected if remediation considers the whole landscape; however, negative impacts are possible if specific local measures do not account for the receiving environment.

OP6 would be expected to result in similar impacts as in OP5, with the proper disposal of dredged harbour material resulting in direct positive impacts to water and aquatic biodiversity. However, if the removal of dredged material requires transport to locations further in distance than in previous instances negative indirect impacts to air quality, climate and material assets (MA3) may occur. Proper disposal of dredged harbour material implies that the disposal sites will be appropriately located to avoid indirect negative impacts to biodiversity, population, cultural heritage, landscape and human health; therefore, no further negative impacts are expected to occur.

Cumulative Impact

The overall cumulative impact of applying all of the diffuse and point sources will be positive. The potential negative cumulative impact relating to air quality and climate would be the result of transport related emissions. The effects of remediation works on the wider environment, in particular material assets, landscape and cultural heritage could also have a cumulative effect. If a holistic approach is taken to remediation, such cumulative impacts will not be significant.

Mitigation

OP2 and OP4: A programme of education and awareness is needed to tackle improper and illegal disposal of waste to support these alternatives. The Appropriate Assessment has recommended a campaign to reduce the illegal disposal of waste, as this would have particular benefit for protected areas, which tend to be remote rural areas, e.g. bogs, used for illegal disposal of unwanted materials.

OP5: Remediation of site and containment options will need to be inclusive and linked to risk assessment to look at all pathways for contamination, not just water.

OP5: Remediation needs to look at the whole receiving environment, not just water. Remediation projects will need to work with Biodiversity Action Plans (national and local). Local projects could work with other similar habitat types in an area to create ecological networks to the benefit of flora and fauna.

OP5: Project level Appropriate Assessments will be required for activities under this alternative.

OP5: On-site treatment of contaminated soils should be considered to reduce negative impacts to air quality and climate from transport related emissions.

OP6: Appropriate Assessment will be required for activities under this alternative.

Assessment: Agriculture

	AG1 / AG3	AG2	AG4 / AG6	AG5	AG8	AG9	AG11	AG12 / AG13	Cumulative Impacts
Objective 1 (BFF)	+/-	+/-	+/-	+	+	+	+/-	+	+
Objective 2 (P)	+/-	+	+/-	+	+	+	+	-	+
Objective 3 (HH)	+	+	+	+	+	+	+	+/-	+
Objective 4 (S)	+	+	+	+	+	+	+	+/-	+
Objective 5 (W)	+	+	+	+	+	+	+	+	+
Objective 6 (AQ)	+/-	-	+/-	+/-	0	+/-	+/-	-	-
Objective 7 (C)	+/-	-	+/-	+/-	0	+/-	+/-	+/-	-
Objective 8 (MA1)	0	0	0	0	0	0	0	0	0
Objective 9 (MA2)	0	0	0	0	0	0	+	-	0
Objective10 (MA3)	-	-	-	-	-	-	+ / -	-	-
Objective11 (MA4)	+	+	+	+	+	+	+	+	+
Objective 12 (CH)	0	0	0	0	+	0	0	-	0
Objective 13 (L)	0	0	0	0	0	0	0	-	0

***Key**: BFF – Biodiversity, Flora and Fauna; AQ – Air Quality; C – Climate; MA – Material Assets; L – Landscape; P – Population; HH – Human Health; S – Soils; CH – Cultural Heritage.*

*See **Table 8.7** for further details on the contents of these alternatives*

Discussion of Assessment

A large portion of the phosphorus reaching inland waterways and causing eutrophication can be traced to agricultural sources both organic (animal wastes) and anthropogenic (chemical fertilisers). In addition to farmyard sources and fertiliser use, pressures have been identified in relation to sedimentation and nutrient enrichment associated with direct access by farm animals to water bodies. AG1 and AG3 will restrict this access and will therefore have a permanent, direct positive impact on water quality, which could be realised in the short to medium term. Fencing will have direct positive impacts on riverbank vegetation and the soil environment by reducing animal traffic (erosion and / or compaction). In addition, fencing will reduce the direct addition of nutrients and / or pathogens to the water body by farm animals. This will be particularly important for protected species such as the Freshwater Pearl Mussel, which are sensitive to sedimentation and enrichment pressures. Buffer strips will also prevent soil erosion adjacent to rivers and will contribute to the interception of both pathogen and nutrient enrichments from farm sources in surface water runoff. As a result, both of these alternatives would result in indirect positive

impacts on aquatic flora and fauna due to improved water quality, though the direct impacts to riverside biodiversity will be dependent on the management of the buffer strips as bird species, such as corncrake and chough, require artificial management of lands to survive and could be negatively impacted if such management was to cease. The Appropriate Assessment has also identified the need for management of these areas to reduce the potential for invasion by alien species. The Appropriate Assessment has also noted that these alternatives measure should target nutrient hot spots i.e. standard buffer widths should not be used, and these should be designed to cover variable source areas.

Both of these alternatives would indirectly contribute to protecting the economic value of the water resource, due to improvements in water quality; however, AG1 and AG3 will result in some loss of productive land from agricultural units and/or reduction in access to water for livestock, which may lead to indirect negative economic impacts for the farming sector. Removal of land from agricultural production could also lead to reduced production capacity, potentially increasing the need to import food. This would indirectly impact on air quality and climate in the medium to long term through increased transport related emissions from food imports. Indirect, medium to long term negative impacts on population are also possible if increased imports are required to satisfy local demand for basic foodstuffs.

AG2 will involve changes in management practices for farmers. It is not clear if AG2 will be a voluntary alternative; however, it is recognised that the BMP options chosen would likely be site specific to reflect the cumulative effect of a type of farming (e.g. poultry) combined with other source factors such as available phosphorous inputs into the water body, slope of the land, etc. This alternative will have indirect positive impacts to water quality by reducing phosphorous enrichment in soils and thus the risk of eutrophication, as confirmed by the Appropriate Assessment; however, the time scale for these impacts to occur is uncertain. Immediately after implementation, a reduction in phosphorous use could reduce cumulative loads; however, achievement of phosphorous balance may only occur in the medium to long term. The positive indirect impact on water quality would lead to secondary positive impacts to aquatic biodiversity and human health. However, changing the availability of phosphorous may also result in indirect negative impacts on aquatic biodiversity currently present in these phosphorous rich systems. The resultant change in aquatic species composition could then have secondary effects throughout the food chain that has developed around these phosphorous rich waterbodies. The implementation of BMP may include changes to feedstuffs designed to minimise phosphorus in excreta or changes to how or when manure fertiliser is applied to the land, e.g. ploughed in immediately. In the medium term, this will have indirect negative impacts on individual farming operations, where such management changes have additional cost implications during change over; whether these impacts are temporary or permanent is dependent on the extent of the change required. Where BMP require removal of excess manures for disposal in localities without nutrient surpluses, this could give rise to indirect negative impacts to farm enterprises in terms of additional transport costs and the potential need for additional storage. Increases in transport would also result in indirect negative impacts on air quality (odour, transport related emissions) and climate (transport related emissions).

AG4 and AG6 will restrict / reduce agricultural intensity. Both alternatives will reduce the requirement for application of fertilisers and pesticides, reducing nutrient and chemical inputs to soils, and thus pollution of water bodies. A reduction in stocking density would also reduce nutrient inputs to soil, while a reduction in land reclamation would lead to reduced levels of drainage and silt run off where land is being reclaimed for agricultural activities. This is considered a permanent, direct positive impact to soils and an indirect, positive impact to water quality. This positive impact to soils could occur in the short term, depending on how quickly the programme is implemented. However, impacts to water quality would likely take longer to realise, as existing nutrient and pesticide soil reserves would need to cycle through the system. Positive impacts to water quality would then result in secondary impacts to aquatic biodiversity and human health. The requirement for lower fertiliser / pesticide use and reduced stocking density also have the potential to indirectly and positively impact climate change through reduced GHG emissions from the production and transport of fertiliser / pesticide and from livestock, e.g. methane.

The Appropriate Assessment has identified that these alternatives would be most effective where intensive activities are currently occurring in unsuitable catchments, e.g. where soils are inappropriate or where groundwaters are vulnerable. It has also identified that the spraying of set aside lands with pesticides could result in negative impacts to biodiversity, while leaving a proportion of farm land uncultivated or put to non-agricultural use for a period of time can lead to changes in habitat types and associated changes in biodiversity, flora and fauna, which could be both positive or negative depending on how the land is managed. Less intensive use of agricultural land, e.g. lower stocking density and land set aside, will require some reduction in productivity from agricultural units; this is considered a direct, negative impact of these alternatives. Also, lower output of "home-grown" products could potentially lead to increased import costs, indirectly impacting on air quality and climate (transport related emissions) and on the economy generally. Indirect negative impacts on population are also possible if increased imports are required to satisfy local demand for basic foodstuffs.

AG5 relates to nutrient management planning. Direct positive impacts to soils and indirect positive impacts to water quality from this alternative will also result in indirect positive impacts to aquatic biodiversity and human health. As nutrient management planning will result in more efficient use of slurries, this will reduce the need to import fertilisers, which would have indirect positive impacts in relation to air quality and climate (reduced transport). However, this may be offset by indirect negative impacts to air quality and climate associated with tankering nutrient surplus between farms. This alternative would likely result in costs to farmers, resulting in a direct negative impact. The Appropriate Assessment has identified the need for farm level nutrient management to be linked to whole catchment nutrient budgets, with consideration of both imports and exports from the farm, in order for this alternative to be effective.

AG8 offers probably the most fundamental approach to tackling agricultural pressures on water quality on a farm-by-farm basis. Increased participation in agri-environment (NI) / rural environmental protection schemes (Ire) should be linked to a well-rounded information and advice campaign which has prevention first, followed by correct treatment and disposal as core themes. Like AG4 and AG6, this alternative has the potential to directly impact on economic productivity of intensively managed farms if they need substantial changes in management practices. However, this alternative does have the potential to have a direct positive impact on soils and water quality and indirect positive impacts aquatic ecology and human health. This alternative also contributes to the sustainable use and protection of the economic water resource for all. Participation in these schemes also has the potential to directly impact on cultural heritage in a positive manner, as such schemes can foster the continuation of farming methods in areas where these activities are culturally connected to the land. The Appropriate Assessment has identified that by their voluntary nature it is difficult to achieve consistent and application of these schemes. It is recommended that guidance and advice related to participation in these schemes should be produced and disseminated in a consistent manner to address these limitations.

AG9 would require changes to current farm management practices and upgrade of management systems. The associated cost of these could have a direct negative impact on the economic viability of individual farm operations. As with the other alternatives, the direct positive impacts to soils will be experienced, as will indirect positive impacts to water quality, aquatic biodiversity and human health. If removal of farm wastes is required under AG9 indirect negative impacts to air quality and climate may occur due to increased transport emissions. The Appropriate Assessment has noted that if grants are made available, these must be linked to the availability of appropriate receptor sites and not represent an increased risk to water quality.

AG11 requires individual holdings to achieve a phosphorous balance. This will result in indirect positive impacts for water quality in the medium to long term as a result of reduced diffuse losses of phosphorous from soils. It will also have indirect positive impacts for biodiversity and human health. However, achieving phosphorous balance will require significant changes in some cases to existing farm operations. This is likely to result in direct negative impacts on the agricultural sector, in particular the pig and poultry sectors, which generate high levels of excess phosphorous as a result of animal excreta. Indirect

negative impacts to biodiversity are possible due to reductions in phosphorous entering surface waters. Changes to existing food web dynamics could have negative impacts not only on flora and fauna directly dependant on existing levels of phosphorous, but also on higher order herbivores / carnivores reliant on these flora and fauna. This would particularly be the case for birds. Indirect impacts may also occur in relation to air quality and climate as achieving phosphorous balance may only be feasible with reduced intensity, which would lower emissions from livestock (indirect positive impacts on climate) or require transport of manures for disposal elsewhere (indirect negative impacts on air quality and climate). In areas where phosphorous is not limiting and there is already excess built up in the soil, significant cost savings can be expected with reduced use of mineral phosphorous fertilisers. Reduction in the use of fertilisers will have indirect positive impacts on climate, due to reduced energy use for production and reduced GHG emissions associated with transport. AG2 will complement this alternative.

As with the other alternatives for agriculture, the direct positive impact to soils from AG12 / AG13 will also result in indirect positive impacts to water quality, aquatic biodiversity and human health. Movement of surplus nutrients between farms, and possibly administrative areas, may result in cross contamination and / or spread of disease, which may be difficult to track. This potential for spread of disease would have indirect negative impacts on human health and also direct impacts on the health of livestock on recipient farms. In addition, the movement of slurries could result in other impacts in the areas it is being moved to. Due to the potential negative impacts in other areas the Appropriate Assessment has identified that this alternative should be subject to assessment prior to implementation and considered as a short-term alternative only. The transport required to move the surplus nutrient would also result in transport related emissions, impacting indirectly on air quality and climate, particularly where source and destination sites are widely located. The use of digestors to treat nutrient surplus would produce methane (CH_4), a GHG, thereby resulting in negative impacts to climate. However, this could be offset by capturing methane for re-use as fuel. After treatment the remaining digestate will require disposal, with associated negative impacts to air quality resulting from further transport. If additional landfill capacity is required to dispose of this waste, potential indirect negative impacts to biodiversity, cultural heritage and landscape could occur if the additional landfill facilities are sited inappropriately. Incineration is also possible and this would have indirect negative impacts on air quality and climate as well as potential human health issues.

Cumulative Impact
Overall the cumulative impact of the alternatives proposed for agriculture will have neutral to positive impacts on the receiving environment. Cases where negative impacts have been identified are air quality (AQ), climate (C) and material assets (MA3). The potentially negative impacts to air quality and climate are principally related to transport of materials as a result of changes to nutrient planning. Co-ordination and cooperation between farms could offset some of this negative impact. Other negative impacts in this regard relate to possible final treatment and disposal options such as digestors and incineration. The negative effects on climate relate to the release of GHG and energy use. Some of this can be offset by use of renewable energy sources and capture of CH_4 for reuse as a fuel source. The other negative cumulative impact relates to increased operational costs associated with implementation of the proposed alternatives. In some cases compensation may be available (e.g. loss of land); however, it is recognised that in many cases the improvement will be borne by individual farm owners and mitigation for income loss will not be available.

Mitigation
AG1 and AG3: It is recommended that compensation be linked to annual upkeep of fences and management of buffers to ensure the ongoing benefit of these alternatives. **AG1 and AG3:** Appropriate guidance is required for implementation of these alternatives to prevent indirect impacts to biodiversity. **AG1 and AG3:** An Appropriate Assessment will be required. **AG3:** A management plan for buffer strips and set aside will be required to ensure there are no detrimental impacts on locally important flora and fauna. These plans should be farm specific to take account of the locally sensitive biodiversity. **AG4:** An Appropriate Assessment will be required if a land use change is proposed in a protected area. **AG6:** Set aside of lands shall only be implemented in combination with appropriate guidance for agricultural lands within or adjacent to protected areas (spraying of pesticides is the key concern). **AG6:** An Appropriate Assessment will be required. **AG8:** It is recommended that an information and advice campaign targeted at farmers should be implemented on a national scale. This should focus on prevention first followed by BMP as core themes. It will be important that adequate consideration is given not just to water and biodiversity but also soils and cultural heritage, as a narrowly focussed approach may lead to indirect negative impacts on these areas. It is also recommended that information campaigns highlight best practice in the sector in order to demonstrate that an economically viable farming operation is possible within such schemes. Opportunities for agri-tourism should also be highlighted as a way to supplement farm income while protecting the environment. This guidance shall also include information relating to implementation in areas protected for biodiversity. **AG9:** An Appropriate Assessment will be required.

AG12: A system of cooperation between farms at the local level would mitigate some of the impacts associated with tankering**,** including the need to move material over a large area (mitigation of air quality and climate impacts) and provision of numerous small storage areas (mitigation of landloss).

AG12: This alternative should be qualified and should only be considered as a short-term alternative as this does not resolve the issue with the pressure. An Appropriate Assessment is also recommended for the relocation area.

AG13: Methane gas, resulting from use of digestors to treat nutrient surplus, should be captured and re-used as a fuel source to offset impacts to climate associated with generation of greenhouse gas. The resultant digestate should only be disposed of in licensed landfill facilities. Should new landfill facilities be required, the siting of these should be subject to Environmental Impact Assessment.

AG13: An Appropriate Assessment will be required for any new facility. This alternative should only be implemented in areas when the intensity of farming is currently high, and should not be used as a method to allow further intensification of farming in protected areas.

Assessment: Wastewater from Unsewered Properties (NI: Collection and Treatment of Sewage)

	UP1	UP2	UP4	UP5	UP7	UP8	UP11	Cumulative Impacts
Objective 1 (BFF)	+	+	+	+	+ / -	+ / -	+ / -	+
Objective 2 (P)	+	+	+	+	+ / -	+ / -	+ / -	+
Objective 3 (HH)	+	+	+	+	+ / -	+ / -	+ / -	+
Objective 4 (S)	+	+	+	+	+	+	+	+
Objective 5 (W)	+	+	+	+	+	+	+	+
Objective 6 (AQ)	0	0	0	0	+/-	+ / -	+	+ / -
Objective 7 (C)	0	0	0	+	-	-	-	-
Objective 8 (MA1)	0	0	0	0	0	0	0	0
Objective 9 (MA2)	+	+	+	+	+	+	+	+
Objective10 (MA3)	-	0	-	0	+ / -	+ / -	+ / -	-
Objective 11 (MA4)	+	+	+	+	+	+	+	+
Objective 12 (CH)	0 / -	0 / -	0 / -	0	0 / -	0 / -	0 / -	-
Objective 13 (L)	0	0	0	0	0 / -	0 / -	0 / -	0/-

***Key**: BFF – Biodiversity, Flora and Fauna; AQ – Air Quality; C – Climate; MA – Material Assets; L – Landscape; P – Population; HH – Human Health; S – Soils; CH – Cultural Heritage*

*See **Table 8.8** for further details on the contents of these alternatives*

Discussion of Assessment Table

UP1, UP2 and UP4 address the impacts from unsewered properties at the earliest pre-planning stage when significant reduction of risk can be achieved by ensuring that systems are correctly located and are designed to achieve the intended treatment levels. Amendment of building regulations to include codes of practice and requirements for certification of on-site systems will have direct positive impacts on the soil and water environments by reducing cumulative pressures from new unsuitable systems being commissioned once the regulations are passed, in the short to medium term. All three alternatives are heavily reliant on the planning consent system for success, and as with several of the "reduce" alternatives, the consistent implementation of these alternatives will be dependent on the awareness and understanding of the regulations by individuals and administrators / planners.

Reduced risk of pollution from poorly planned and / or designed systems will also have indirect positive impacts for biodiversity, human health and population through improved water quality. The installation of on-site systems in a consistent manner, and in line with a code of practice and an enforcement system will ensure that the intended level of treatment is achieved, contributing positively to sustainable development. The expected improvement in water quality resulting from these alternatives could have significant positive cross-sector impacts, for instance, in terms of water dependent sectors such as tourism, which depend on good water quality both for consumption and recreational uses (e.g. bathing water, fisheries).

However, there may also be indirect negative impacts from a social and / or economic development perspective if soilwater conditions cannot support new on-site treatment systems even with engineered solutions. This may also result in indirect negative impacts to cultural heritage, particularly in rural areas where generations of the same families may have lived and where further individual residential development may no longer be allowed due to existing environmental conditions. The impacts from these alternatives are expected to occur in the medium to long term due to the time it will take to amend current policy/regulations and implement the changes.

The increased use of phosphate-free detergents which would be expected to accompany implementation of alternative UP5 would result in a direct positive impact in terms of water quality and an indirect aquatic biodiversity impact through reduced eutrophication of water bodies. In

general, an indirect positive impact across most of the other environmental topics is also likely. In particular, an indirect positive impact to human health would be expected due to the reduction in potential for eutrophication, which could impact on availability of water supplies. Biodiversity may also be indirectly impacted as changes in nutrient composition of some waters could result in a change in species composition, and thus the food chain, where phosphorus is currently abundant. Whether this would be a negative or positive impact is dependent on the current species composition.

It should be noted that phosphate-free detergents are currently available for purchase from some retailers. The effectiveness of this alternative would be directly related to whether an awareness programme is instituted in parallel to educate the public on the benefits of using phosphate-free products. As with any change in product use there may be minor cost implications to individuals; however, these may be offset by the reduction in requirement for new infrastructure to deal with existing nutrient loads from unsewered properties. This alternative has the potential to result in positive impacts in a relatively short timeframe, if consumer behaviour can be altered through education.

UP7, UP8 and UP11 are broadly similar in that they are aimed at addressing pressures on water quality associated with unsewered properties during the post-planning phase, i.e. existing houses. These alternatives would result in immediate direct positive impacts on water and soil quality upon implementation and indirect impacts on aquatic biodiversity and human health. Whether these alternatives would result in short-term or medium-term impacts would depend on how quickly the schemes are rolled out, though long-term positive impacts would be expected as more areas are targeted and remedial actions carried out. These alternatives will be particularly important in relation to those waterbodies containing Freshwater Pearl Mussels. The significant impacts on water quality associated with on-site wastewater treatment systems in terms of nutrient enrichment and eutrophication give rise to problems for these and other aquatic species that require clean water for survival. It should be noted that indirect negative impacts on biodiversity are also possible as changes in nutrient composition of some waters could result in a change in species composition, though the Appropriate Assessment notes that the return of surface and groundwaters to a more natural state as existed pre phosphate products would be considered a positive impact.

These three alternatives would also have direct positive impacts on the provision of water management infrastructure; however, the application of UP11 could be limited as it may be difficult and/or costly to achieve connection to the municipal systems over large areas with scattered development. UP11 could be more applicable in areas on the fringes of urban areas, which have experienced recent residential growth without the matching investment in wastewater infrastructure. Alternately, projects under UP8, such as tank maintenance programmes, could be more appropriate in more rural areas with scattered development. These alternatives would also have an indirect positive impact in terms of water as an economic resource as they each protect water quality from degradation.

The provision of connection to the municipal system and/or the requirement to institute programmes, such as tank maintenance, are likely to have cost implications at the local authority and individual level, depending on how the schemes are rolled out. In addition, connection of additional houses to the municipal system could require upgrades to the wastewater treatment facilities in areas where these are already at capacity. This could have indirect impacts on air quality and climate due to the increased demand for treatment resulting from increased fuel usage as well as an increase in the amount of sludge requiring disposal. The amount and type of emissions would depend on the process used for sludge disposal, e.g. landfill, incinerators or digestors. Increases in sludge disposal resulting from tank maintenance could also result in increased emissions to air due to the need to transport sludges (e.g. CO_2 and NO_x), particularly if individual property owners do not coordinate collection, as well as from the disposal itself. However, indirect positive impacts to air quality would occur more locally in areas where nuisance odours are reduced following proper maintenance or removal of on-site systems. There is the potential for indirect negative impacts to human health to arise if increased land spreading of sludges occurs without the proper guidance. In addition, the need to construct new facilities to deal with increased demand on municipal wastewater treatment facilities could result in indirect negative impacts to biodiversity, landscape and cultural heritage if these are not sensitively sited.

In the context of encouraging sustainable development, the provision of municipal sewage connections may result in indirect negative impacts as it could encourage further development in rural areas that may not be served by other links, such as public transport; however, it could be considered beneficial in the context of economic activity (Objective MA3) as it may remove an existing barrier to development of housing in these rural areas.

A further element to any alternative requiring increased tank maintenance would be education of owners of on-site systems, as surveys suggest that many people are not aware of the ongoing maintenance required for on-site treatment systems.

Cumulative Impacts

Overall the cumulative impact of the alternatives proposed for unsewered properties will have a neutral to positive impact on the receiving environment. Cases where negative impacts have been identified are air quality (AQ), climate (C), material assets (MA3), landscape (L) and cultural heritage (CH).

The potentially negative impacts to air quality and climate are principally related to transport of material offsite and the energy requirement for treatment / disposal of material. Co-ordination and cooperation between properties could offset some of these negative impacts. The negative effects on climate relating to the direct release of GHG from energy use during treatment could be offset somewhat by use of renewable energy sources.

The negative cumulative impact for material assets (MA3) relates to increased costs associated with desludging. However, this cost is committed to at design stage of the system as ongoing management is assumed.

In terms of cumulative negative impacts to cultural heritage, these are primarily of two types. The first is the cumulative physical impact on cultural heritage features resulting from the development of wastewater treatment infrastructure; however, avoidance or provision of specific mitigation measures at the project level should reduce the significance of this cumulative impact. The second would be the cumulative impact resulting from potential changes in the composition of rural communities should new generations of families that have resided in areas historically, no longer be able to continue to build individual residences on the family holding. It is recognised that the mitigation for this cumulative impact in many cases would be connection to the municipal system, which may not be feasible in the more rural areas. Cumulative impacts to landscape from development of wastewater infrastructure could also occur.

Mitigation

UP2: The pre-planning process should assess whether an Appropriate Assessment would be required for new development within or adjacent to a protected area.

UP7 and UP8: An education programme should be carried out in tandem with new requirements for tank maintenance, including guidance on disposal of sludges.

UP8: Intelligent transport programmes should be put in place to minimise the amount of emissions associated with movement of sludges from on-site treatment systems.

UP11: Upgraded treatment works should be required to introduce BAT, including the use of renewable energy sources, in order to reduce GHG emissions and others resulting from increased demand for treatment.

UP7, UP8 and UP11: New wastewater treatment infrastructure, including sludge disposal infrastructure, will be subject to environmental assessment at the project level to reduce indirect impacts to biodiversity, landscape, cultural heritage, air quality and climate.

UP7 and UP11: An Appropriate Assessment will be required for new structures.

Assessment: Forestry

	F2	F3	F4	F5	F6	F7	F8	F11	F12	F13	F14	F15	F16	F17	F18	F19	Cumulative impact
Objective 1 (BFF)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+
Objective 2 (P)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Objective 3 (HH)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Objective 4 (S)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Objective 5 (W)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Objective 6 (AQ)	0	0	0	0	0	0	0	+	+	0	0	0	0	0	0	+	+
Objective 7 (C)	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	-
Objective 8 (MA1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Objective 9 (MA2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Objective10 (MA3)	-	-	-	-	-	-	-	0 /-	0 / -	0 / -	0 / -	0 / -	0 / -	0 / -	0 / -	0 / -	-
Objective 11 (MA4)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Objective 12 (CH)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Objective 13 (L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

***Key**: BFF – Biodiversity, Flora and Fauna; AQ – Air Quality; C – Climate; MA – Material Assets; L – Landscape; P – Population; HH – Human Health; S – Soils; CH – Cultural Heritage*

*See **Table 8.9** for further details on the contents of these alternatives*

Discussion of Assessment

F2 to F12 While each of these alternatives outlines a specific action to address a specific impact, e.g. acidification, eutrophication and sedimentation and pesticides, they all involve some type of change in forestry practices.

It is likely to take some time to realise the direct positive benefits of these alternatives to water and soil quality (and indirectly human health and aquatic biodiversity). Reserves of pesticides and fertilisers, acidification of soils and nutrient enrichment are expected to continue to exert an influence on the aquatic and terrestrial environment following implementation of these alternatives; the positive impacts of each would be realised in the long term. In particular, the reduction of planting on peat sites under F5, would be expected to avoid or limit the key pressure (drainage) on these sensitive habitats. Alternative F2 will protect small streams in acid sensitive catchments. If these 1st and 2nd order stream catchments in acid sensitive areas coincide with Freshwater Pearl Mussel

catchments, the Appropriate Assessment has identified that afforestation should be avoided.

In addition, long term, indirect positive impacts on the economic value of the water itself, for example as a habitat for fish in the context of the recreation and tourism sectors, would be expected.

The movement away from monoculture plantations to forests with more structural and species diversity in F3, F6 and F8 could improve these forests as recreational resources. It is currently estimated that forests contribute an economic value of €500m in terms of recreation in Ireland.[1] Therefore, the maintenance and/or improvement of forests as a recreational resource would have a positive, indirect long-term impact on population and human health. These changes in forest structure and species mix would also result in long term, direct positive impacts to terrestrial biodiversity, through the reintroduction of native species, which is would be of benefit to protected areas. The reduction in acidification from alternatives F2 and F4 would be expected to reduce impacts in sensitive upland headwaters, some of which are important for salmon spawning and Freshwater Pearl Mussels.

F2, F3, F4, F5, F6 and F8 would require a change in the composition and/or extent of the forests themselves. In addition to the costs associated with implementing the required changes, these alternatives could result in direct, negative impacts to the viability of the forests as an economic resource, either through reducing the size or area of the plantation or the number of harvestable trees on the plantation. This reduction in the amount of timber produced could also impact on availability of Irish timber products for sale domestically or for export. Similarly, F7 would reduce the amount timber that could be harvested in a given period by reducing the coup size, which may also result in direct impacts in relation to material assets.

The potential for the reduction in forest size or change in composition could affect the carbon dioxide sequestering capacity of existing forest stocks. If the carbon dioxide sequestering capacity is reduced, this could result in indirect negative long-term impacts to climate.

The more holistic approach to forestry embodied in many of these alternatives will result in the greatest benefit to the environment generally and water quality in particular. However, positive impacts may not be felt even in the medium term as the implementation of some of these alternatives, e.g. changing the specific mix on replanting, will require existing crops to mature before this alternative can be implemented. Spatially, the success and impact of some of these alternatives will depend on the age of the forestry resource in a given catchment. In addition, the application of each of these alternatives will need to be considered in its site-specific context to ensure that no indirect impacts to other issue areas result.

F11 requires a reduction in the application of pesticides in the forests themselves. This could be achieved using F12 or F19, both of which would reduce impacts on sensitive aquatic species, such as the Freshwater Pearl Mussel. The practice of pre-dipping of trees prior to planting would be expected to result in short, medium and long-term positive impacts in relation to air quality (and indirectly to biodiversity and human health), as it would decrease the requirement for aerial spraying of pesticides.

F19 would also result in a reduction in chemical pesticide use and therefore would be expected to result in direct positive impacts to water quality and indirect positive impacts to human health and aquatic biodiversity. However, without the detail as to the type of biological control methods that would be used it is unclear as to what the direct impacts of these would be on terrestrial biodiversity. Should non-native species be used, there is the potential for these to compete with native species. Further study would be needed to establish the ramifications of using biological control methods on the existing food web and on native

[1] Economic Value of Trails and Forest Recreation in the Republic of Ireland. September 2005. Coillte and the Irish Sports Council

species.

Each of these alternatives would require a change in management practices from those already being carried out and as such would be expected to result in direct, short term impacts to the cost of forestry management. However, as these alternatives became common practice it would be expected that they would become part of the normal process of forestry management reducing long term cost implications.

F13, F14, F15, F16, F17 and F18 While each of these alternatives outlines a specific action to address a specific impact, e.g. acidification, eutrohophication and sedimentation, they all involve some type of change in forestry practices.

It is likely to take some time to realise the direct positive benefits of these alternatives to water quality and soils (and indirectly human health and aquatic biodiversity). Acidification of soils, nutrient enrichment and sedimentation will continue to exert an influence on the aquatic and terrestrial environment. However, these alternatives are each expected to result in positive impacts in these issue areas in the long term, in addition to long term indirect positive impacts on the economic value of the water itself. In particular, F14 has been identified by the Appropriate Assessment as particularly desirable where afforestation on peat has taken place. Increased residence times and no drainage in some areas would be desirable and should be investigated. The Appropriate Assessment has also identified F16 and F17 as critical alternatives to reduce the impacts of sedimentation, noting that particular attention should be paid to sensitive protected areas, e.g. Freshwater Pearl Mussel, and their watercourses. Alternately, the Appropriate Assessment has identified that the use of basic material under alternative F13 should be avoided in protected areas, particularly in Freshwater Pearl Mussel catchments.

Each of these alternatives would require a change in management practices from those already being carried out and as such would be expected to result in direct, short term impacts to the cost of forestry management. However, as these alternatives became common practice it would be expected that they would become part of the normal process of forestry management reducing long term cost implications.

Cumulative Impacts

Negative impacts have been identified for climate and material assets. Much of this relates to limitations on forestry in sensitive areas. Limiting forestry reduces the potential for carbon sequestration and this could have cumulative, long-term negative impacts on Ireland's and Northern Ireland's climate change commitments. It would also prevent reaching current forestry targets throughout Ireland and Northern Ireland. The economic value of forests is also impacted by restrictions and limitations. In highly sensitive areas, the land considered suitable for forest may be considerably reduced, thereby, reducing direct income from timber related products and secondary income from recreational activity. It will be necessary to review this impact once detailed measures are available.

Mitigation

All: Future guidelines for forestry should be developed through a steering group represented by bodies such as Coillte, the Forest Service (Northern Ireland), the Forest Service (Ireland), National Parks and Wildlife Service, the Central Fisheries Board (Ireland), the Fisheries Conservancy Board (Northern Ireland) the Northern Ireland Environment Agency, and representatives from the relevant planning authorities to ensure that the final guidelines take a holistic approach to the environment which includes biodiversity, landscape, climate and cultural heritage interests. Consideration should be given to identifying and implementing as a priority those alternatives that can be applied to forests only starting or midway through the growth cycle.

F2-F8: It is recommended that prior to any changes in forest size or species mix, a study is carried out to determine the change, if any, in the carbon dioxide sequestering capacity of the forest. Should sequestering capacity be reduced, compensation measures will be required to offset these.

F2: The following change to the language in the Draft POM is required: Avoid afforestation on 1st and 2nd order stream catchments in acid sensitive catchments and in protected areas.

F3: An Appropriate Assessment will be required.

F5: An Appropriate Assessment will be required if a new plantation is proposed to be developed on peat sites or erodible soils in areas or catchments protected for biodiversity (i.e. an SAC, SPA or Ramsar).

F5: Change to the Draft POMs recommended: Eutrophication and Sedimentation - Avoid or limit forest cover on peat sites and on errodable soils.

F13: The following change to the language in the Draft POM is required: Avoid the use of basic material in protected areas, particularly in sensitive freshwater pearl mussel catchments.

F13 and F14: An Appropriate Assessment will be required.

F19: Detailed studies should be carried out prior to the introduction of any non-native species to be used as a biological control method.

F19: An Appropriate Assessment will be required.

Assessment: Usage and Discharge of Dangerous Substances (NI: Included in key sectors under Pollution)

	DS3	DS4	DS5	DS6	Cumulative Impact
Objective 1 (BFF)	+	+	+	+ / -	+
Objective 2 (P)	+	+	+	+	+
Objective 3 (HH)	+	+	+	+ / -	+
Objective 4 (S)	+	+	+	+	+
Objective 5 (W)	+	+	+	+	+
Objective 6 (AQ)	+/-	+/-	+ / -	0	+/-
Objective 7 (CC)	+/-	+/-	+ / -	0	+/-
Objective 8 (MA1)	0	0	0	0	0
Objective 9 (MA2)	0	0	+	+	+
Objective10 (MA3)	-	-	-	-	-
Objective 11 (MA4)	+	+	+	+	+
Objective 12 (CH)	0	0	0	0/-	0/-
Objective 13 (L)	0	0	0	0	0

***Key**: BFF – Biodiversity, Flora and Fauna; AQ – Air Quality; C – Climate; MA – Material Assets; L – Landscape; P – Population; HH – Human Health; S – Soils; CH – Cultural Heritage*

*See **Table 8.6** for further details on the contents of these alternatives*

Discussion of Assessment

Dangerous substances can have toxic effects for flora, fauna and human beings that come in contact through media such as water and soil. In some circumstances these substances may bio-accumulate causing cumulative impacts through the food chain. In addition they are often persistent in the environment causing long-term negative impacts.

DS3 targets reduction of pollution at source. Licence reviews to address point discharges may require changes to management practices, entailing additional costs and negatively impacting on economic activity for certain sectors. Licence reviews may require changes in operation of industries to reduce the quantity of water used in processing (inputs) or to reduce the amount needing treatment (output), which would have indirect positive impacts on climate as a result of reduced energy costs associated with treatment. Stricter controls on diffuse discharge may also require alternative disposal options to be implemented with indirect negative impacts on air quality and climate if additional transport is required or alternative methods of disposal result in air emissions. Pollution reduction programmes are likely to lead to improvements in water quality and aquatic biodiversity by reducing chemical pollution to water bodies. This is particularly important in sensitive habitats such as those for the Freshwater Pearl Mussel. The Appropriate Assessment has noted that this alternative must consider protected areas objectives and requirements and prioritise review according to their needs. Indirect positive impacts as a result of reduced pollution are anticipated for terrestrial biodiversity, soil and human health. As these pollutants may remain in the environment for years, existing pollution may cause problems beyond the medium term assessment period (2015); however, reducing the input will have some immediate benefits for these environmental receptors.

DS4 will lead to improvements in water quality and benefits for biodiversity due to reduced

nutrient losses, and reduced diffuse emissions of dangerous substances, such as pesticides and herbicides. This will give rise to an overall positive affect on water quality, biodiversity and soils. Stricter controls on diffuse discharge in DS4 may also require alternative disposal options to be implemented with indirect negative impacts on air quality and climate if additional transport is required or alternative methods of disposal result in air emissions. Currently many diffuse discharges are unregulated and these stricter controls may be difficult to enforce if cause and effect cannot be established.

DS5 will have similar impacts to those already discussed above. It will lead to improvements in water quality and soils with benefits for biodiversity due to reduced dangerous substances concentrations in effluents. In addition, upgrades to treatment facilities may have additional costs to achieve adequate protection; however, this will directly contribute to provision of new and upgraded wastewater infrastructure (MA2).

DS6 will require potential relocation of discharge points to reduce pressure on water bodies. Changing the location of discharge may provide greater opportunity for immediate dilution, if greater water volume or faster flow is available, thereby reducing the residence time in the water body. Relocating discharge points to locations which are better suited to achieving compliance with existing standards / license conditions is expected to reduce the effect of discharge on water quality leading to direct positive impacts for water and aquatic biodiversity; these could be effected in the short-term at specific locations. Indirect positive impacts are also likely for human health and other biodiversity, which may be secondarily affected by the discharge of dangerous substances. Relocation has the potential to have direct negative impacts to biodiversity, cultural heritage if the relocation point is poorly sited, either by impacting on known / unknown archaeology, architectural heritage or sensitive flora and fauna. Indirect negative impacts are also possible for human health if the relocation does not take into account existing populations. Short-term negative impacts are likely on economic activity as a result of relocation costs.

Cumulative Impacts

Cumulative negative impacts are recorded for air quality, climate, material assets and cultural heritage. The changes that may be required to put DS3, DS4, DS5 and DS6 into effect may give rise to additional transport requirements which will contribute to air quality emissions and to transport related GHG emissions. Much of this will depend on the specific methods by which reduction is achieved. Relocation has the potential to have negative impacts on cultural heritage or biodiversity if the relocation point is poorly sited.

Mitigation

DS3 and DS4: Sector specific targeted pollution reduction programmes will need to be developed in the early stages to ensure maximum medium to long-term gains can be achieved.

DS5: An Appropriate Assessment will be required if this alternative would involve the building of a new plant or an extension to an existing plant.

DS6: An Ecological Impact Assessment, Human Health Impact Assessment and a Cultural Heritage Assessment will be required for all proposed relocation options. Sensitive areas should be avoided.

DS6: An Appropriate Assessment will be required.

Assessment: Physical Modifications (NI: Freshwater Morphology/ Marine Morphology)

	PM2	PM6	PM7	PM9	Cumulative Impact
Objective 1 (BFF)	**+ / -**	**+ / -**	**+ / -**	**+ / -**	**+ / -**
Objective 2 (P)	**+**	**0/-**	**0**	**+ / -**	**+ / -**
Objective 3 (HH)	**+**	**0/-**	**0**	**+ / -**	**+ / -**
Objective 4 (S)	**0**	**+ / -**	**+**	**+ / -**	**+ / -**
Objective 5 (W)	**+**	**+**	**+**	**+**	**+**
Objective 6 (AQ)	**0**	**0**	**0**	**0**	**0**
Objective 7 (C)	**+**	**-**	**0**	**-**	**+/-**
Objective 8 (MA1)	**+/-**	**-**	**0**	**-**	**+/-**
Objective 9 (MA2)	**0**	**0**	**0**	**0**	**0**
Objective10 (MA3)	**0**	**+ / -**	**+ / -**	**+ / -**	**+ / -**
Objective 11 (MA4)	**+**	**+/-**	**+**	**+/-**	**+**
Objective 12 (CH)	**0 / -**	**0 / -**	**0/-**	**0 / -**	**0/-**
Objective 13 (L)	**0 / -**	**0 / -**	**0/-**	**0 / -**	**0/-**

***Key**: BFF – Biodiversity, Flora and Fauna; AQ – Air Quality; C – Climate; MA – Material Assets; L – Landscape; P – Population; HH – Human Health; S – Soils; CH – Cultural Heritage*

*See **Table 8.10** for further details on the contents of these alternatives*

Discussion of Assessment

Physical modifications include dams and reservoirs, weirs, river crossings and embankments, marine ports and coastal defences. They represent a key water pressure that has implications for many other SEA issues, particularly material assets. Impacts associated with physical modifications relate to reduction of natural habitat (e.g. through dredging for port development) and alteration of natural habitat (e.g. installation of sea and flood defences and weirs). These modifications can remove the natural pools and shallows needed by fish, reduce suitable habitat and cause changes to natural erosion and sedimentation processes, with some preventing sediments from ultimately reaching estuaries and the shoreline.

PM6 and PM9 offer reduction and rehabilitation approaches to assist in improving water quality impacted by physical modification. For these alternatives, direct positive impacts to water quality and aquatic biodiversity are likely. PM6 will improve rivers previously impacted from these types of works, and this in particular will benefit rivers which were previously straightened, or where habitats for fish spawning were destroyed. This will allow naturalisation of the river channel and re-colonisation of previously unsuitable areas by flora and fauna. PM9 is overall of positive benefit for fish movement in particular, and for the wider biodiversity of surface waters.

For both PM6 and PM9 the potential for negative impacts is dependant on the methodology in which they are implemented. There is a need for a holistic approach to be applied in each of these cases so that implementation does not result in indirect negative impacts in other issue areas. For instance, the removal of barriers may give rise to negative impacts to architecture, archaeology and cultural heritage. Industrial archaeology and cultural heritage features in particular can include old bridges, walls of dams, etc. These features may also form important parts of the landscape and their removal could give rise to further indirect negative impacts on landscape.

In addition, though remediation of channelisation or barriers could be seen to have direct positive impacts to biodiversity, these could in fact result in negative impacts to existing habitats, which

developed as a result of these physical modifications. For example, removal of weirs could lower the water level and affect flow rates, thereby changing the hydrologic regime, which is one of the principal factors influencing the ecology of aquatic ecosystems.

Physical modifications are usually in place to meet a specific need, be it reduction of flood risk, improvement of navigation or provision of renewable energy. The impacts of removing and/or altering these features will need to be considered against the gains in water quality that will be achieved. For instance, the use of renewable energy is a key component in meeting the targets of the Kyoto Protocol, and hydroelectric power stations currently provide some of this resource. The removal of these would have indirect, negative impacts on climate in the absence of provision of energy by replacement renewable energy sources and also on water as an economic resource (MA4). Also, removal of flood defences could result in indirect impacts on human health, population and material assets should flood risks increase. Further, the removal of flood defences may enlarge the floodplain, potentially restricting future development potential. From a recreational perspective the improvement of fishery resources through the removal of impassable barriers represents an economic benefit to this sector.

Impacts are likely to be in the medium to long-term for these alternatives, as further assessment will be required to identify where enhancement schemes are likely to provide the greatest benefit.

PM 2 Similar to the alternatives above, the support of voluntary schemes, such as wetlands and Inter Coastal Zone Management Schemes, is likely to result in direct positive impacts to water and biodiversity and indirect positive impacts to population, climate and human health as wetlands and the coastal zone will be managed more appropriately. However, there is the potential for negative impacts to occur to biodiversity and other resources, such as cultural heritage, if these voluntary schemes are not rolled out in tandem with an educational programme and guidelines for their implementation. As a voluntary alternative with no defined programme or action, it is likely that this alternative will not have the necessary focus and positive impacts associated with it may be confined to the longer-term. The Appropriate Assessment has noted that these types of schemes need to be properly planned and take account of all protected area requirements.

PM 7 will reduce impacts on water and associated flora and fauna from soil erosion caused by over grazing. Though the remediation of overgrazing would be expected to result in fewer negative impacts than the other alternatives discussed above, until more detail is known as to what these remediation schemes would involve it is difficult to determine the types of impacts associated with these schemes. Therefore, it is again recommended that these schemes be carried out using a holistic approach, with consideration of other impacts aside from those associated with water quality. This alternative could give rise to impacts over the shorter-term if implemented quickly.

Cumulative Impact

The proposed alternatives for physical modifications have considerable potential to improve the environment individually or cumulatively if implemented correctly; however, based on the current level of detail available, it is not possible to clearly define the cumulative impact in many cases, The potential for negative impacts from these alternatives is dependant on the methodology in which they are implemented. Possibly the most sensitive environmental receptors to physical modifications will be cultural heritage (many existing cultural heritage features may have archaeological or architectural heritage value), which in turn through their removal may negatively impacts on the landscape. Removing or altering structures may impact habitats and species, which have flourished in areas derived from a physical modification and hence negatively impact on biodiversity. The impacts of removing and/or altering these physical modifications will need to be considered against the gains in water quality that will be achieved. The removal of hydroelectric power stations would have cumulative negative impacts on climate in the absence of provision of energy by replacement renewable energy sources.

Mitigation

PM2: An Appropriate Assessment will be required.

PM6 and PM7: An Appropriate Assessment will be required for remediation schemes.

PM6 and PM9: An archaeology, architecture and cultural heritage assessment will be required before removal of any physical modifications with potential for cultural heritage value. Mitigation measures will be in agreement with the relevant authority. This assessment should include reference to cultural heritage in the context of the existing landscape.

PM6: A flood impact assessment should be carried out for all channelisation and barrier remediation schemes to determine whether an increased risk of flooding would occur as a result.

PM7: Any voluntary schemes and/or overgrazing remediation schemes should be rolled out in tandem with an education and guidance programme to ensure that the schemes are carried out in a holistic manner.

PM9: An Appropriate Assessment will be required for impassable barrier remediation schemes.

Assessment: Abstractions (NI: Abstraction and Flow Regulation)

	AB4 / AB5	AB6 / AB7 / AB8	AB9	AB10 / AB11 / AB12 / AB13	AB14	Cumulative Impact
Objective 1 (BFF)	+	+/-	+	+/-	+/-	+
Objective 2 (P)	+	+	+	+	+/-	+
Objective 3 (HH)	+	+	+	+	+/-	+
Objective 4 (S)	+	+	+	+/-	+	+
Objective 5 (W)	+	+	+	+	+	+
Objective 6 (AQ)	0	0	0	-	0/-	-
Objective 7 (C)	+	+	+	-	0/-	+/-
Objective 8 (MA1)	0	0	0	0	0	0
Objective 9 (MA2)	0	+	+	+	+	+
Objective10 (MA3)	+	+	-	+/-	+/-	+/-
Objective11 (MA4)	+	+	+	+	+	+
Objective 12 (CH)	+/-	0/-	0	+/-	+/-	+/-
Objective 13 (L)	0	0/-	0	+/-	0	+/-

***Key**: BFF – Biodiversity, Flora and Fauna; AQ – Air Quality; C – Climate; MA – Material Assets; L – Landscape; P – Population; HH – Human Health; S – Soils; CH – Cultural Heritage*

*See **Table 8.11** for further details on the contents of these alternatives*

Discussion of Assessment

AB4 and AB5 deal with compensation flows, which can be a useful tool to maintain the health of a river and to safeguard downstream users. The Appropriate Assessment has identified this as a desirable alternative, with overall benefits for protected areas. Ensuring minimum flow and flow variability as required, will have a direct positive impact on water and on aquatic biodiversity. Indirect positive impacts are likely for human health and soils. Indirect positive impacts are also expected for population and for material assets including angling and tourism, which depend on flows for fish migration, navigation, water supply, etc. In addition, material assets may also benefit as review of compensation flows can offer opportunities for some protection from the effects of climate change into the future. There is some potential for impacts on cultural heritage if flows are regulated. This impact may be positive where minimum flows keep submerged archaeology from exposure or it could be negative where compensation flows cause damage to riverine or bank side archaeology. The impacts for AB4 and AB5 are likely to be felt in the medium to long term.

AB6, AB7 and AB8 focus on ways to reduce demand while also using currently undervalued resources such as grey water through a reduce, reuse, recycle approach. Lower overall requirement for water from abstraction has many positive knock-on effects for the environment. Less abstraction from domestic and industrial settings will lead to reduced demand for supplies and therefore incidences of over abstraction. This will have direct positive impacts for surface and groundwater and also aquatic biodiversity, which may be under stress from increased low flow periods and changes to the hydrological regime. Water availability is a key driver of development and economic growth; therefore, strategies to reduce consumption would result in less drinking water requiring treatment and consequently less wastewater requiring treatment. This would have indirect positive impacts on climate change as less energy will be required and consequently lower CO_2 outputs would be expected. Also, with lower consumption there will be reduced need to improve and provide more water management infrastructure allowing funds to be redirected to other areas. This would have

indirect positive impacts for population and the economy generally. In the longer term, reduced consumption will improve capacity overall and facilitate continued growth and development in line with government policies, i.e. development strategies. The success of such alternatives will be closely related to education and awareness. Building infrastructure for alternate sources would have the potential to impact negatively on biodiversity as well as landscape and cultural heritage. Elements of AB7 and AB8 could be put in place in the short-term, especially if supported by education and awareness.

AB9 is likely to be the most controversial of the alternatives proposed for abstraction. It has the potential to significantly reduce the volumes of water used and wastewater produced and will have similar positive impacts to AB7 / AB8. The main direct negative impact relates to economic activity, i.e. domestic users. The acceptance of this alternative will be dependent on proper education and awareness to demonstrate how water can be conserved in the home and also on the manner in which metering is developed. It is anticipated that this alternative will require political debate before any concrete actions are taken. Rolling out of metering would also then involve considerable resource input; therefore, it is likely that impacts would not be felt until well into the medium term horizon (i.e. beyond 2015).

Reducing the volume of abstraction (AB10) is anticipated to have direct positive impacts on water quality and aquatic biodiversity by endeavouring to make adequate water available to provide dilution capacity for external inputs to the system; however, improvements will be dependant on local conditions. The Appropriate Assessment has recognised that this alternative would have a particularly positive effect on biodiversity in over abstracted catchments, and should be implemented where over abstraction has been identified. Reduced volumes will have direct positive impacts for biodiversity by reducing the risk to flora and fauna from eutrophication or high levels of dangerous substances in a waterbody. This will also have indirect positive impacts for human health and economic activities reliant on good water quality e.g. tourism, water supply, etc. Reducing volumes may restrict or limit development and this would result in an indirect negative impact to economic development in an area unless additional sources could be identified. AB12 will have similar impacts to AB10 as it reduces the volumes required from a single source. AB11 will also have similar impacts to AB10. It focuses abstraction to periods when the system has adequate carrying capacity. It is likely that this alternative would be used in combination with storage AB13. Positive impacts are anticipated for biodiversity, especially in systems currently experiencing eutrophication. However, provision of storage may potentially indirectly impact positively or negatively on biodiversity and soil depending on the location of storage and the type of storage used, e.g. water towers, degraded wetland areas. Storage also provides opportunities for spread of alien species, e.g. zebra mussel, as water is moved from one location to another. Additional water management infrastructure, e.g. pumping station, piping, etc. would be required with a storage option and this has associated energy costs for additional construction and for the operation, indirectly impacting on climate change. A similar impact would be expected with AB12 conjunctive use. AB12 and AB11 / AB13 offers many benefits in terms of economic activity as they facilitate continued development while working with environmental conditions to reduce impacts. In addition, storage facilities have the potential to have indirect permanent positive impacts on tourism, angling and biodiversity (incorporating landscape and cultural interests if relevant) if the storage can be designed to provide a multi-purpose sustainable resource. Construction impacts associated with the provision of additional infrastructure for storage / conjunctive use will be temporary. In all cases there is potential to indirectly negatively impact on cultural heritage and landscape as a result of siting of infrastructure. Impacts from these alternatives are unlikely before the medium-term horizon and it is likely to take longer to research and implement the changes required.

AB14 has implications for planning and land use. Directing development to areas with adequate capacity and limiting development in areas which have reached capacity will result in positive impacts for water quality by ensuring that the volume of water required to support development is maintained within sustainable limits. This alternative would ensure this factor is taken into account in strategic planning. The drinking water resource should be a critical factor in the location of development; however, it should not contribute to overdevelopment of areas where this resource is plentiful. This will have indirect positive impacts on biodiversity, in particular habitats such as wetlands, which are in

danger of reduced flow or drying out. It will also have indirect positive impacts on the groundwater resource by ensuring that abstractions of this resource do not exceed the recharge potential of an aquifer and possibly lead to lowering the groundwater table or causing salt water intrusion in coastal areas. Directing development to existing urban areas will allow opportunities to rehabilitate brownfield sites with indirect positive impacts on soil as well. Focussing infrastructure will allow for improved services and a more efficient and sustainable water supply if a holistic approach is taken to planning generally. However, directing development may have negative impacts if other associated services, such as public transport and waste, do not also exist. This could have negative impacts on population, human health, biodiversity, economy, air quality and climate. There will be potential negative impacts on economic activities in a given area or region, particularly agriculture, forestry, energy, and drinking water provision, if development is redirected and or restricted. However, by ensuring that the water resource is not compromised by over-abstraction due to development pressure, water dependent economic activities, e.g. tourism and angling, will experience an indirect positive impact. While archaeology and cultural heritage will benefit from indirect positive benefits from reduced pressure associated with over abstraction, e.g. potential exposure of crannogs, as a result of lowering water levels, potential indirect negative impacts may occur where traditional industry or development is restricted or not permitted. This alternative could have relatively short-tem impacts by reducing the cumulative effect from future planning applications.

Cumulative Impact

The implementation of the majority of the abstraction alternatives will result in a positive cumulative impact on the receiving environment; however, some small potential exists for negative cumulative impacts on air quality and climate if all the alternatives were implemented together. This relates to impacts associated with the increased infrastructure required with any option requiring storage or conjunctive use. These impacts would be from the transport and production of materials for infrastructure and also the additional energy costs associated with operation of pumping stations, etc. The GHG emissions associated with construction and operation can be mitigated by a focussed awareness campaign on water use to reduce the volumes used / wasted, followed by leakage improvement and only then looking at new infrastructure. Any new infrastructure, e.g. storage, should source its fuel from renewable sources. The site locations of new infrastructure could potentially impact negatively on cultural heritage and landscape if the sites are chosen poorly. Also, there are potential negative impacts relating to material assets (MA3) and economic activity through water metering and charging programmes, and reducing volumes may restrict or limit development.

Mitigation

AB4: The assessment shall determine whether compensation flow is sufficient to meet the needs of in stream flora and fauna.

AB5: This alternative should take account of the results from AB4.

AB6-8: Although water conservation awareness campaigns have been implemented the message has not hit home for many people. It is therefore recommended that a working group be established to develop tools to promote water awareness and these tools are included in future water awareness campaigns.

AB8: An Appropriate Assessment should be undertaken for any new infrastructure.

AB9: Suitable education and awareness campaigns are recommended to provide residential users with the tools / knowledge to reduce water consumption. It is also strongly recommended that water metering schemes promote conservation.

AB10: An Appropriate Assessment should be carried out.

AB12: An Appropriate Assessment should be carried out.

AB13: Possible storage sites should not impact negatively on sensitive habitats and species. Good quality agricultural land should also be avoided where alternatives exist. Storage options will include proposals for biodiversity enhancement and opportunities for economic benefit e.g. tourism, angling without compromising environmental sustainability. Energy required for pumping stations should be sourced from renewable sources.

AB13: A protocol for prevention of the spread of any alien species shall be developed and agreed with the relevant authority and the relevant fisheries board in advance of any inter-catchment transfers.

AB13: An Appropriate Assessment should be undertaken for any proposed storage facility.

AB14: It is recommended that the Planning Authority, in directing or restricting development take account not only of the water capacity of an area but its wider capacity in terms of cultural heritage, biodiversity and landscape, etc.

AB14: An Appropriate Assessment should be considered for new abstractions in line with the requirements of the Habitats Directive.

All: A focussed awareness campaign on water use will be implemented to reduce the volumes of water used / wasted, followed by leakage improvement and only then new infrastructure. Any new infrastructure e.g. storage should source its fuel from renewable sources.