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Control of water pollution from construction sites

Guidance for consultants and contractors

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Summary

This guidance document provides practical help for consultants and contractors on how to plan and manage construction projects to control water pollution. It has seven main chapters.

1. Benefits and obligations
2. Water pollution from construction
3. Legislative framework
4. Construction contracts
5. Managing water pollution from construction
6. Water management techniques
7. Summary and recommendations

This document is intended as a user-friendly guide, a reference book and a training aid. It reinforces and builds upon the principles relating to the control of water pollution from construction sites developed in previous CIRIA publications.

Control of water pollution from construction sites. Guidance for consultants and contractors

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Reader interest	**Classification**
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The target audience

Environmental issues arise throughout a construction project. People working in construction have to be aware of their environmental obligations and the benefits that good practice will bring at every stage from the initial feasibility studies through to design, construction planning and the actual works on site. As the environmental issues differ at each stage, the approach to resolving them may also differ accordingly.

This guidance document provides help on environmental good practice for control of water pollution arising from construction activities. It is intended for use by:

- project promoters
- site managers
- site engineers
- site foremen and site supervisors
- project managers
- contract supervisors/resident engineers.

It is relevant to all organisations represented on a construction site, whether as a promoter, designer, main contractor or a subcontractor.

The consequences of environmental planning, or lack of planning, by people involved in the early stages of a project's development can have a profound effect on the ability of the site staff to meet their obligations. Due to this, other construction professionals should seek to understand the site environmental good practice presented in this guidance document. These include:

- construction planners within contractors' main offices
- contractors
- project managers
- project directors
- designers
- clients
- construction managers
- planning supervisors and principal contractors.

Much of the advice contained in this guidance document is based on practices that have been carried out on construction sites for many years, but many of the ideas are recent. Therefore it is a guidance document for all levels of construction experience, from the young site engineer to the experienced site manager.

How to use this guide

This book has been designed so that it is not necessary to read it from cover to cover to find the required guidance. However, the control of water pollution on construction sites relies on a planned and integrated approach. For readers not familiar with the key issues, limited reading of specific topics within this guidance document may not provide all the necessary information to plan ahead and avoid water pollution. Therefore, it is suggested that a reader new to the concepts of water pollution control should read the complete guidance document before concentrating on the specific methodologies outlined in Section 6. A brief description of the contents of each section is given below.

Section 1 introduces the reader to the importance of taking water quality issues into consideration as part of the construction process.

Section 2 provides the reader with an introduction to the properties of natural water-bodies, types of common pollutant associated with construction sites and their sources, transportation and impact.

Section 3 outlines the legislation that relates to the control of water pollution on site and highlights some key health and safety issues.

Section 4 reviews commonly used construction contracts and outlines their deficiencies and benefits in preventing water pollution.

Section 5 tackles management issues and outlines how good site management can prevent pollution.

Section 6 describes common site activities and identifies how they can result in water pollution. Methods to modify these activities and to treat water pollution on site are also contained within this section.

Section 7 provides conclusions and recommendations arising from "Control of water pollution – guidance for consultants and contractors" (CIRIA Research Project RP585).

Section 8 contains references used within the guidance.

Section 9 contains a list of documents for further reading.

Figures, photographs, case studies and site procedures have been included throughout the document to help illustrate the written text. These are included to demonstrate how good practice may be applied on site and also to illustrate how poor practice can result in pollution incidents and subsequent prosecution.

Good/bad practice is clearly indicated in photographs and case studies by "happy/sad face" icons.

The glossary contains some of the most commonly used terms relating to water quality and related construction site activities.

Coverage of this guide

This guide addresses water quality issues from the inception of a construction project through to the completion of the construction stage and beyond into decommissioning. The book describes the sources and movement of water through a construction site, along with the types of water pollution typically associated with site activities. It defines the chemical properties of natural waterbodies and commonly encountered indicators of water pollution. It looks at the way in which environment regulators categorise the severity of pollution incidents and details the legislative framework controlling water quality. It also describes the associated health and safety issues.

In using this report you should be clear about the limits of the scope of the guidance provided. In particular:

- it is not a health and safety manual
- it should not replace contact with regulators
- although it gives an overview of legislation, detailed guidance should be sought from the company's environmental representative (or external specialists) or legal advisers
- in all instances, when dealing with the issues covered do not take action beyond your expertise. If in doubt, seek specialist advice.

The guide is generally relevant for all types of contract conditions – traditional, design-and-build, design–build–finance–operate (DBFO) and partnering. With some types of contract the contractor carries the risk of cost or programme delays caused by unexpected events or occurrences relating to water quality issues. It is the contractor's responsibility to be aware of the relevant issues and to manage the site effectively to avoid damage to the aquatic environment. If in doubt, seek guidance from your company's environmental representative, an environmental consultant or environment regulator.

Regional differences in legislation

This book provides guidance to consultants and contractors on the control of water pollution from construction sites. It sets out generic good practice and procedures for controlling water pollution on construction sites in the United Kingdom. The generic good practice and procedures are generally appropriate for use in England, Wales, Scotland and Northern Ireland. The reader should note that there are regional legislative or regulatory variations; attention is drawn to some of the most relevant of these in the text. However, anyone intending to implement the good practices and procedures set out in this book should ensure that the work complies with these regional variations in legislation. The local regulator will be able to advise on these matters.

Any reference to the environment regulator should be read to include:

- Environment Agency (with jurisdiction over England and Wales)
- Scottish Environment Protection Agency (SEPA)
- Northern Ireland Environment and Heritage Service
- Department of Public Services in Jersey and Guernsey.

At the time of printing the main telephone numbers for the environment regulators are:

Environment Agency, Head Office, Bristol	01454 624 400
SEPA, Head Office, Stirling	01786 457 700
Environment and Heritage Service, Environmental Protection, Belfast	01232 254 754

Further information, including published documents, can be obtained from the websites of the above organisations:

England	www.environment-agency.gov.uk
Wales	www.environment-agency.wales.gov.uk
Scotland	www.sepa.org.uk
Northern Ireland	www.ersni.gov.uk

Relationship to other CIRIA guidance

CIRIA has produced three key publications that establish the environmental issues to be addressed at all stages of construction:

- *Environmental good practice on site* (C502, 1999, ISBN 0 86017 502 2), with an associated poster, *Our environment matters* (C502P) and companion pocket book, *Environmental good practice – working on site* (C503, 1999, ISBN 0 86017 503 0).
- *A client's guide to greener construction* (SP120, 1995, ISBN 0 86017 423 9).
- *Environmental handbook for building and civil and engineering projects*.
  Part 1, Design and specification (C512, 2000, ISBN 0 86017 512 X)
  Part 2, Construction phase (C528, 2000, ISBN 0 86017 528 6)
  Part 3, Demolition and site clearance (C529, 2000, ISBN 0 86017 529 4).
  Together, the three volumes constitute an updated and expanded version of CIRIA publications SP97 and SP98 (both published in 1994 and no longer available).

These key publications outline the issues, principles and legislation that should be adopted to improve environmental performance in the construction industry. We list below other CIRIA publications of particular relevance:

- *Building a cleaner future* (SP141V, 1996). A joint CIRIA and Environment Agency pack that includes a training video, booklet and poster
- *Waste minimisation and recycling in construction – a review* (SP122, 1995, ISBN 0 86017 428 X)
- *Waste minimisation in construction – site guide* (SP133, 1997d, ISBN 0 86017 482 4). This outlines current good practice in site waste management and contains information on reducing wastage of raw materials, and reusing and recycling waste materials
- This publication is also contained within *Waste minimisation and recycling in construction – training pack* (SP148, 1998, ISBN 0 86017 488 3), which also includes a video, overheads and disk copies of the pack's documents
- *The Observational Method in ground engineering – principles and applications* (R185, 1999, ISBN 0 86017 497 2). This is specifically relevant to minimising waste in ground engineering and to optimising design to foresee problems on site
- *Managing materials and components on site* (SP146, 1998, ISBN 0 86017 481 6). This is a CIRIA site guide that provides practical guidance for site managers, site engineers and supervisors on how to manage materials and components effectively
- *Sustainable urban drainage systems – design manual for Scotland and Northern Ireland* (C521, 2000, ISBN 0 86017 521 9)
- *Sustainable urban drainage systems – design manual for England and Wales* (C522, 2000, ISBN 0 86017 522 7)
- *Sewerage system management – scoping study* (PR67, 1998, ISBN 0 86017 867 6). This report outlines the issues that need to be addressed to achieve efficient and effective management of sewerage systems
- *Environmental issues in construction – a desk study* (PR73, 1999, ISBN 0 86017 873 0). This report reviews published research and the response of the construction industry to environmental issues

- CIRIA also produced a comprehensive 12-volume reference set on *Remedial treatment for contaminated land* (SP101–112):
  Volume I Introduction and guide (SP101, 1998, ISBN 0 86017 396 8)
  Volume II Decommissioning, decontamination and demolition (SP102, 1995, ISBN 0 86017 397 6)
  Volume III Site investigation and assessment (SP103, 1995, ISBN 0 86017 398 4)
  Volume IV Classification and selection of remedial methods (SP104, 1995, ISBN 0 86017 399 2)
  Volume V Excavation and disposal (SP105, 1995, ISBN 0 86017 400 X)
  Volume VI Containment and hydraulic measures (SP106, 1996, ISBN 0 86017 401 8)
  Volume VII Ex-situ remedial methods for soils, sludges and sediments (SP107, 1995, ISBN 0 86017 402 6)
  Volume VIII Ex-situ remedial methods for contaminated groundwater and other liquids (SP108, 1995, ISBN 0 86017 403 4)
  Volume IX In-situ methods of remediation (SP109, 1995, ISBN 0 86017 404 2)
  Volume X Special situations (SP110, 1995, ISBN 0 86017 405 0)
  Volume XI Planning and management (SP111, 1995, ISBN 0 86017 406 9)
  Volume XII Policy and legislation (SP112, 1998, ISBN 0 86017 407 7).

Further details on the above and other CIRIA publications can be obtained from: 6 Storey's Gate, Westminster, London SW1P 3AU; Tel: 020 7222 8891; fax: 020 7222 1708; email: enquiries@ciria.org.uk; or visit the CIRIA website at www.ciria.org.uk.

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List of site procedures

The following site procedures relate to preventing water pollution on a major road scheme that crosses several watercourses and Sites of Special Scientific Interest (SSSIs). These are examples only, and any site procedures drawn up should take into account the local environment and constraints required by the environment regulator. These procedures would not replace any standard site procedures relating to health and safety or operating equipment.

Site procedures should be considered "controlled documents" and should be distributed to identified people and locations. They should not be copied indiscriminately. The benefit of tight control is that, when a procedure is changed, the location of all earlier copies is known and they can be withdrawn from circulation before the new procedure is issued. This should prevent staff from working with obsolete versions of site procedures.

All site procedures should be numbered and dated (for example Site Procedure 1 Issued 01/01/2000) and all revisions to them should be numbered and dated (for example SP1 Revision A 01/06/2000). The procedure should identify the contractor responsible for the site and the name of the site to which it relates. Site procedures should also be given authority by containing the signature of the person responsible for the site activities, for example the project manager. Most importantly, lack of compliance with procedures should be seen as a serious breach of site security, and appropriate disciplinary action should be taken to prevent it recurring.

Glossary

Abstraction licence	Licence from a competent authority to remove a fixed volume of water from natural waterbody (surface and groundwater).
Algae	Simple plants ranging from single cells to large plants.
Ammonia	A water-soluble chemical compound, produced by the decomposition of organic material. Ammonia affects the quality of fisheries and the suitability of abstractions for potable water supply. Used as a water quality indicator. Ammonia is a List II substance (see below).
Aquifer	A sub-surface zone or formation of rock or soil containing a body of groundwater.
Archaeology	The study of historic remains, often by excavation.
Benthic	Pertaining to the bed of a river or other body of water.
Bentonite	A colloidal clay, largely made up of the mineral sodium montmorillonite, a hydrated aluminium silicate.
Biodegradable	Capable of being decomposed by bacteria or other living organisms.
BOD	Biochemical oxygen demand is the measure of the concentration of biodegradable organic carbon compounds in solution. Used as a water quality indicator.
Brownfield site	A site that has been previously developed.
Bund	A barrier, dam or mound usually formed from earthworks material and used to contain or exclude water (or other liquids) from an area of the site.
Caisson	A cylindrical or rectangular ring wall usually formed from pre-cast concrete segments and used for excluding water or supporting soft ground in deep excavations.
Casing	An impervious, durable pipe placed in a borehole to prevent the walls of the borehole from collapsing, and to seal off surface drainage or undesirable water, gas or other fluids, and prevent their entrance into such an excavation.
CDM	Construction (Design and Management) Regulations (1994), which emphasise the importance of addressing health and safety issues at the design phase of a construction project.
COD	Chemical oxygen demand is the measure of the amount of oxygen taken up by chemical oxidation of a substance in solution. Used as a water quality indicator.
Cofferdam	A temporary dam, usually of sheet piling driven into the ground to exclude water and provide access to an area that is otherwise submerged or waterlogged.
Cone of depression	A depression in the groundwater table shaped like an inverted cone that develops around a well from which water is being withdrawn.

Construction cycle	The sequence of events or activities carried out in the development of a construction project.
Contaminated ground	Ground that has the presence of such substances which, when present in sufficient quantities or concentrations, are likely to have detri-mental effects on potential targets.
Controlled waters	Almost all natural waters in the UK are controlled waters. They include rivers, streams, ditches, ponds and groundwater. The Environment Agencies are charged with responsibility for policing controlled waters. The Environment Act 1995 defines the term.
Cyprinid fishery	Waters in which coarse fish (those belonging to the Cyprinidae, or other species such as pike, perch and eel) are found.
Detention pond/tank	A pond or tank that has a lower outflow than inflow. Often used to prevent flooding.
Dewatering	The removal of groundwater/surface water to lower the water table.
Diffuse pollution	Pollution that does not rise from an easily identifiable source (such as an effluent discharge pipe). Usually refers to runoff or leaching from land.
Discharge area	An area in which there are upward components of hydraulic head in the aquifer. Groundwater flows towards the surface in a discharge area and may escape as a spring, seep or baseflow, or by evaporation and transpiration.
Discharge consent	Permission to discharge effluent, subject to conditions laid down in the consent, issued by the relevant environment regulator.
Dissolved oxygen (DO)	The amount of oxygen dissolved in water. Oxygen is vital for aquatic life, so this measurement is a test of the health of a river. Used as a water quality indicator.
Drawdown	The distance between the static water level and the surface of lowered water level.
Drainage well	A well used to drain excess water into an aquifer.
Dust	Airborne solid matter up to about 2 mm in size.
Duty of care	The implication of the duty of care is that toxic materials are monitored and administered by an appropriate system each time they pass from one individual to another, or from one process to another. Important information regarding the nature of the material and any appropriate emergency action should also be passed on.
Ecology	All living things, such as trees, flowering plants, insects, birds and mammals, and the habitats in which they live.
Ecosystem	A biological community of interacting organisms and their physical environment.
Environment	Both the natural environment (air, land, water resources, plant and animal life), and the habitats in which they live.

Environment regulators	These include the Environment Agency (in England and Wales), the Scottish Environment Protection Agency, the Environment and Heritage Service in Northern Ireland, and the Department of Public Services in Jersey and Guernsey.
Estuary	A semi-enclosed body of water in which seawater is substantially diluted with freshwater entering from land drainage.
Eutrophication	Enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, causing accelerated growth of algae and higher forms of plant life to produce undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned.
Fauna	The animals found in a particular physical environment.
Filter strip	Vegetated area of land used to accept surface runoff as sheet flow from an upstream area.
Flora	The plants found in a particular physical environment
Grip	A small channel cut into the ground on the uphill side of an excavation to lead rainwater clear of it.
Groundwater	The water in the ground.
Grout	A fluid mixture of cement and water of such a consistency that it can be forced through a pipe and placed as required. Various additives, such as sand, bentonite and hydrated lime, may be included in the mixture to meet certain requirements.
Grouting	The operation by which grout is placed.
Gully erosion	The erosion of soils by surface runoff, resulting typically in steep-sided channels and small ravines, poorly consolidated superficial material or bedrock by streams or runoff water.
Hazard	A property, situation or substance with potential to cause harm.
Heavy metal	Loosely, metals with a high atomic mass (sometimes given as metals with an atomic mass greater than that of calcium; Manahan, 1990), often used in discussion of metal toxicity. No definitive list of heavy metals exists, but they generally include cadmium, zinc, mercury, chromium, lead, nickel, thallium, silver. Some metalloids, eg arsenic and antimony, are classified as heavy metals for discussion of their toxicity.
Heritage bodies	These have a general duty to conserve our heritage, to carry out scheduling of historic remains, and to undertake research. They comprise English Heritage, CADW, Historic Scotland, and the Northern Ireland Environment and Heritage Service.
Invertebrates	Animals that lack a vertebral column. This includes many groups of animals used for biological grading, such as insects, crustaceans, worms and molluscs.
Leaching	The process during which soluble minerals may be removed from the soil by water percolating through it.
Leakage	The flow of water from one hydrologic unit to another. The leakage may be natural, as through a semi-impervious confining layer, or manmade, as through an uncased well.

List I substance	A controlled substance as defined under the Groundwater Regulations 1998 and the Dangerous Substances Directive (76/464/EEC). List I substances are considered the most dangerous in terms of toxicity, bioaccumulation and persistence. These controls *prevent* their discharge to the environment. See Section 3.2.2 for list of substances.
List II substance	A controlled substance as defined under the Groundwater Regulations 1998 and the Dangerous Substances Directive (76/464/EEC). They are less toxic than List I substances but are still capable of harm, hence their discharge to the environment is *limited*. See Section 3.2.2 for list of substances.
Macroinvertebrates	Invertebrate animals of sufficient size to be easily visible to the unaided eye and to be retained in a net with a 1 mm mesh.
Macrophyte	Plants easily visible to the unaided eye.
Metalloid	An element with chemical properties that are intermediate between metals and non-metals. They include: boron, silicon, germanium, arsenic, antimony and tellurium. Although not a metal, arsenic is often included in the term "heavy metal" when its toxicity is being discussed.
Mineral solids	Particles transported in water or air that are from entirely mineral (non-organic) origins.
Nature conservation bodies	The four organisations that have regional responsibility for promoting the conservation of wildlife and natural features: Countryside Council for Wales, English Nature, Northern Ireland Environment and Heritage Service, and Scottish Natural Heritage.
Noise	Often defined as a sound that is not desired. Sound is a wave motion carried by air molecules between the source and the receiver, usually the ear.
Nutrient	A substance providing nourishment for living organisms (such as nitrogen and phosphorus).
Organic pollution	A general term describing the type of pollution that, through the action of bacteria, consumes the dissolved oxygen in rivers. The effects of organic pollution are described by the levels of bio-chemical oxygen demand, ammonia and dissolved oxygen found in a waterbody.
Out-turn value	The final or net value.
Pathway	The route by which potential contaminants may reach targets.
Permeability	The property or capacity of a rock, sediment or soil for transmitting a fluid
Point source pollution	Pollution that arises from an easily identifiable source, usually an effluent discharge pipe.
Pollution	The introduction of a substance that has the potential to cause harm to the environment. Pollutants include silty water, oils, chemicals, litter and mud.
Recharge	The addition of water to the groundwater system by natural or artificial processes.

Recycling	Collecting and separating materials from waste and processing them to produce marketable products.
Redds	Shallow pits excavated by fish in gravel, in which they lay their eggs.
Reduction	Waste reduction has two components: reducing the amount of waste produced, and reducing the hazard of the waste produced.
Reed bed	Area of grass-like marsh plants, primarily adjacent to freshwater. Artificially constructed reed beds can be used to accumulate suspended particles and associated heavy metals, or to treat small quantities of partially treated sewage effluent.
Reuse	Putting objects back into use, without processing, so that they do not remain in the waste stream.
Risk	The chance of an adverse event. The impact of a risk is the combination of the probability of that potential hazard being realised, the severity of the outcome if it is, and the numbers of people exposed to the hazard.
Risk assessment	"A carefully considered judgement" requiring an evaluation of the risk that may arise from the hazards identified, combining the various factors contributing to the risk and then evaluating their significance.
Risk control	The definition of the measures necessary to control the risk, coupled with their implementation; the management of the risk. The risk management process must include the arrangements for monitoring the effectiveness of the control measures together with their review to ensure continuing relevance.
River Habitat Survey	Assessment of the physical qualities of a watercourse that notes any artificial modifications.
Runoff	That part of surface water or precipitation flowing on the ground surface.
Salmonid fishery	Waters in which game fish (such as salmon, trout, grayling and whitefish) are found.
Sedimentation tank/pond	Sedimentation (sometimes called settlement) is a property of a pond or tank – see also **storage pond**, **detention pond** and **stilling pond**.
Sediments	Sediments are the layers of particles that cover the bottom of water-bodies such as lakes, ponds, rivers and reservoirs.
Silt	The generic term for waterborne particles with a grain size of 4–63 µm, ie between clay and sand.
Site of Special Scientific Interest (SSSI)	An area of land or water notified under the Wildlife and Countryside Act 1981 (as amended) as being of geological or nature conservation importance, in the opinion of Countryside Council for Wales, English Nature or Scottish Natural Heritage.
Soil	The terrestrial medium on which many organisms depend, which is a mixture of minerals (produced by chemical, physical and biological weathering of rocks), organic matter and water. It often has high populations of bacteria, fungi and animals such as earthworms.

Special Area of Conservation (SAC)	Established under the EC Habitats Directive (92/43/EEC), implemented in the UK by The Conservation (Natural Habitats etc) Regulations 1994, and The Conservation (Natural Habitats etc) (Northern Ireland) Regulations 1995. The sites are significant in habitat type and species, and are considered in greatest need of conservation at a European Level. All UK SACs are based on SSSIs, but may cover several separate but related sites.
Stilling pond/tank	A pond or tank used to reduce turbulence. The inflow and outflow are equal. Reduced velocity may be required to prevent scouring.
Storage pond/tank	Pond (sometimes called a lagoon) or tank used to hold water, with no outflow.
Sump	A pit that may be lined or unlined and is used to collect water and sediments before being pumped out.
Surface water	Water that appears on the land surface, ie lakes, rivers, streams, standing water, ponds.
Suspended particulate matter (SPM)	Defined as matter (organic and inorganic) in suspension in a natural waterbody which is smaller than 63 µm and which will not pass through a filter of pore size of 0.45 µm.
Suspended solids	General term describing suspended material. Used as a water quality indicator. See also **suspended particulate matter**.
Swale	An open grassed drainage channel in which surface water may be stored or conveyed that can remove some pollutants.
Target (receptor)	An entity (human, animal, water, vegetation or building) vulnerable to the potential adverse effects of a hazard.
Unconfined aquifer	An aquifer where the water table is exposed to the atmosphere through openings in the overlying materials.
Waste	Any substance or object that the holder discards, intends to discard, or is required to discard.
Wastewater treatment works (WWTW)	Installation to treat and make less toxic domestic and/or industrial effluent.
Watercourse	A natural or artificial linear structure that transports water (rivers, canals, culverts etc).
Water table	The point where the surface of groundwater can be detected. The water table may change with the seasons and the annual rainfall.
Well	Any excavation that is drilled, cored, bored, washed, fractured, driven, dug, jetted, or otherwise constructed when the intended use is for the location, monitoring, dewatering, observation, diversion, artificial recharge, or acquisition of groundwater, or for conducting a pumping aquifer test.
Wetland	Flooded area in which the water is shallow enough to enable the growth of bottom-rooted plants.
Wetted perimeter	The length of the line of contact between the liquid and the channel boundary at that section.

Abbreviations

ACOP	approved code of practice
AOD	above ordnance datum
BOD	biochemical oxygen demand
BS	British Standard
CCW	Countryside Council for Wales
CDM	Construction (Design and Management) Regulations (1994)
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CICS	common incident classification system
CIRIA	Construction Industry Research and Information Association
CLR	Contaminated Land Research
COD	chemical oxygen demand
COMA	Control of Major Accident Regulations (1999)
COPA 1974	Control of Pollution Act 1974
COPR	Control of Pesticides Regulations (1986)
COSHH	Control of Substances Hazardous to Health (1988)
CPO	county planning officers
DARD	Department of Agriculture and Rural Development (Northern Ireland)
DBFO	design–build–finance–operate
DC	direct current
DETR	Department of the Environment, Transport and the Regions
DO	dissolved oxygen
DoE (NI)	Department of Environment (Northern Ireland)
EA 1995	Environment Act 1995
ECC	*Engineering and construction contract* 2nd edition (ICE, 1995)
ECS	*Engineering and construction subcontract*
EHS	Environment and Heritage Service (Northern Ireland)
ELO	environment liaison officer
EMS	environment management system
EPA 1990	Environmental Protection Act 1990
FCB	Fisheries Conservancy Board (Northern Ireland)
FEPA 1985	Food and Environment Protection Act 1985
GL	ground level
GQA	general quality assessment

GRP	glass-reinforced plastic
HMIP	Her Majesty's Inspectorate of Pollution (superseded by Environment Agency)
HMS	habitat modification score
HQA	habitat quality assessment
HSC	Health and Safety Commission
IDB	Internal Drainage Board
ICE	Institution of Civil Engineers
IchemE	Institution of Chemical Engineers
ISO	International Standards Organisation
JCT	Joint Contracts Tribunal
LA	local authority
MAFF	Ministry of Agriculture, Fisheries and Food (superseded by CEFAS)
MEL	maximum exposure limit
MSDS	manufacturer's safety data sheet
NRA	National Rivers Authority (superseded by Environment Agency)
NTU	nephelometric turbidity unit
OCP	OFTEC (see below) *Code of practice*
OES	Occupational Exposure Standard
OFTEC	Oil Firing Technical Association for the Petroleum Industry
PPG	Pollution Prevention Guideline
RHS	River Habitat Survey
SAC	Special Area of Conservation
SEPA	Scottish Environment Protection Agency
SPM	suspended particulate matter
SSSI	Site of Special Scientific Interest
SUDS	sustainable urban drainage system
TRRL	Transport and Road Research Laboratory
WA 1989	Water Act 1989
WA(NI) 1972	Water Act (Northern Ireland) 1972
WIA 1991	Water Industry Act 1991
WL	water level
WRA	Water Resources Act 1991 (England and Wales)
WWTW	wastewater treatment works
µm	micron (ie 1×10^{-6} m)
µS	microsiemens (unit of conductivity)

1 Benefits and obligations

1.1 ENVIRONMENTAL AND ECONOMIC BENEFITS

Construction sites have historically contributed significantly to the damage of the aquatic environment. This has resulted largely from fuel oil spills and releases of suspended solids to watercourses. Such uncontrolled activities have caused, for example, the contamination of potable water supplies, kills of fish and invertebrates, obliteration of benthic and bank-side habitats and aesthetic degradation. This book focuses on the potential sources of water pollution from within construction sites and effective methods of preventing its occurrence.

Given current awareness of environmental matters, efforts are being made at all levels within the construction industry to implement general environmental improvements:

1. The boards of construction companies are demonstrating their commitment by preparing environmental policies, and in some cases by introducing environmental management systems, some of which comply with the recognised standards of ISO 14001.
2. Clients are requesting evidence of environmental credentials from contractors before awarding contracts.
3. Various environmental initiatives are already being implemented on site.

However, directed action is still needed to improve the performance of the construction industry with respect to protecting the quality of natural waterbodies (surface water and groundwater). Within the industrial sector, construction contributes the largest number of pollution incidents (Section 2.6, Figure 2.4 and Figure 2.5).

There are two major incentives for improving performance:

- environmental benefits – protected and enhanced water quality and river habitats resulting from good practice
- economic benefits – avoidance of fines for water pollution incidents and fees for clean-up activities, and lower expenditure on water resources and discharge fees through reduced water usage.

1.1.1 Environmental benefits

More effective water management produces the following benefits:

- reduced damage to the aquatic environment – uncontrolled construction activities can severely degrade natural waterbodies and their associated flora and fauna. Both the design and the site teams are responsible for ensuring that they take all reasonable steps to prevent damage. Directly or indirectly, a well-designed and managed site can even help to improve water quality
- reduced demand for water resources – in some areas of the UK and at certain times of the year, water availability is limited. Some predictions suggest that this situation is likely to worsen. Minimising the use of water on site and recycling water on site where possible will reduce the site's total demand over its lifetime

- reduced degradation of potable supplies – contamination of groundwaters and surface waters used as potable supplies can result in high treatment costs or, in some circumstances, preclude them from being used, temporarily or permanently
- reduced concern of local residents – changes in the aesthetic quality of a waterbody raise concerns from local residents and recreational users. By complaining or taking legal action, local residents may delay a project and increase costs. By informing people of temporary changes in flows or quality resulting from essential activities, disruption to work should be minimised.

1.1.2 Economic benefits

The economic benefits of good water management are undeniably important. Implementation does not need to be costly and sound environmental practice makes good economic sense. The economic benefits resulting from implementation can include, but are not limited to:

- improved opportunities to tender – clients in the UK and the rest of Europe are increasingly choosing contractors that can demonstrate good water quality management. A record of prosecutions will damage a contractor's chances of being invited to tender
- less money wasted on fines – fines for water pollution are increasing, but when legal fees and management time are taken into account, the real cost of a prosecution can be 20 times the amount of the fine levied
- less time and money spent repairing environmental damage – all spillages need to be cleaned up and polluted rivers may need to be restocked with fish. Cleaning polluted groundwater is also very expensive. In many cases clean-up can delay the project's progress and permission to resume construction work will not normally be given until remediation has been completed
- less money lost through wasted water resources – controlled and considered use of clean water on site can reduce purchasing and transportation costs and can minimise fees and environmental problems associated with disposal of contaminated water
- improved environmental performance will result in an improved environmental profile – this will help to establish good relationships with environment regulators and local authorities, helping to ensure that projects run smoothly. It will also assist in developing staff morale and make it easier to recruit and retain good staff.

1.2 ENVIRONMENTAL OBLIGATIONS

In addition to the benefits gained from effective water management, the following legislative and contractual controls demand that good practice be followed:

- *national legislation* – in place to protect both the natural environment and construction sites' neighbours. The Environment Agency in England and Wales, and the Scottish Environment Protection Agency (SEPA) in Scotland, polices legislation such as the Environment Act 1995, the Environmental Protection Act 1990 (UK), the Water Resources Act 1991 (England and Wales) and the Control of Pollution Act 1974 (Scotland). In Northern Ireland the legislative framework is different, and water pollution comes under the Water Act (Northern Ireland) 1972 with subsequent amendments. The Act is enforced by the Environment and Heritage Service of the Department of Environment (Northern Ireland). Other legislation is in place to protect specific features of the environment.

  Under such legislation, sites may be designated and protected by virtue of their ecological, archaeological, geological or geomorphological interest. The legislative framework in the UK is discussed in greater detail in Section 3

- *local control* – under the powers given to them by national legislation, local planning authorities or drainage boards may impose requirements on the control of construction site activities adjacent to waterbodies
- *specification and contract conditions* – these will have been drawn up to address any conditions imposed on the contract through the planning system as well as any commitments made by the developer to the local communities. They may also include provisions made in an environmental assessment for the project. Failure to comply will be penalised through the contract
- *corporate control* – many companies have corporate environmental policies and some may require sites to follow environmental management systems. In addition, there may be a specific environmental plan for a particular project. Most major construction companies have an environmental policy that requires the site to adopt controls to minimise environmental damage.