DEFRA
Department for
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Groundwater Protection Code:

Petrol stations and other fuel dispensing facilities involving underground storage tanks

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APPENDICES

CHAPTER 1

Purpose of the Code

This section explains:

- **what the code is;**
- **why it is important; and**
- **who the code is aimed at.**

Nature of the code

1.1 This code provides a source of advice on how to protect groundwater when storing liquid hydrocarbons in underground storage tanks (USTs), or when carrying out associated activities. It is an approved code under Regulation 21 of the Groundwater Regulations 1998 and applies in England and Wales but not in Scotland.

1.2 The code outlines operational and management practices relevant to USTs and related facilities which are necessary for groundwater protection. Whilst engineering is equally important, guidance on this is available elsewhere, for example in the APEA/IP and HSE publications referenced in this code.

1.3 The storage of liquified natural gas or liquefied petroleum gas is outside the scope of this code though some of the general principles in this code may apply. Similarly the code does not cover storage of hydrocarbons in above ground tanks. The code is not intended to replace existing codes or guidance covering, for instance, health and safety issues, but to complement them.

1.4 When deciding whether to serve a notice under the provisions of the Groundwater Regulations, the Environment Agency will consider whether or not the guidance in the code has been, or is likely to be followed.

1.5 The principles of groundwater protection, as set out in the code, will continue to apply until the code is revised or revoked. The technical references, and references to legislative regimes, are for guidance purposes only and could be subject to change. Users of the code will therefore need to keep abreast of technical and legislative developments subsequent to the date of this code.

Legal requirement to protect groundwater

1.6 Groundwater is a valuable resource which, once polluted, is difficult and expensive – sometimes impossible – to clean. For this reason there are UK and EC laws to protect it.

1.7 Petroleum hydrocarbons are serious pollutants. Anyone allowing them to pollute groundwater or surface water risks penalties under the Groundwater Regulations 1998 and the Water Resources Act 1991 along with significant remediation costs.

1.8 Pollution risks may arise from either above ground or below ground storage of hydrocarbons and from associated activities such as delivery and fuel dispensing. The Control of Pollution (Oil Storage)(England) Regulations 2001 and its accompanying guidance are aimed at preventing pollution of water sources from above ground storage tanks. Protection of water sources from underground storage tanks (USTs) is primarily covered by the Groundwater Regulations 1998. The Environment Agency has powers under those Regulations to prohibit, or control, any activity – including the storage of hydrocarbons – which may risk polluting groundwater. The Agency also has powers to prosecute where pollution has occurred.

1.9 The release of petroleum hydrocarbons also poses a risk of fire or explosion, and if hydrocarbons are allowed to come into contact with water pipes they can directly contaminate drinking water supplies. Such matters are subject to other legislative regimes and guidance. More detailed information on the Regulatory Framework is given at Appendix 1 and useful guidance and publications are given at Appendix 6.

Who the code is aimed at

1.10 This code is relevant to any facility which stores petroleum hydrocarbons (eg petrol, diesel, heating fuel, waste oils) in underground storage tanks and contains advice specifically aimed at the following persons:

- the owners of UST facilities;
- the operators or UST facilities;
- persons involved in designing and constructing UST facilities; and,
- persons involved in decommissioning UST facilities.

1.11 Further advice on relevant facilities is given in Appendix 2.

CHAPTER 2

Using the Code

This section explains:

- **how the code applies to different types of facility;**
- **the four key elements necessary to ensure groundwater protection; and,**
- **how to demonstrate compliance with the code.**

Using the code appropriately for a particular UST facility

2.1 This code applies to a wide range of facilities, and the appropriate degree and means of environmental protection will vary for each individual facility. In determining what is required for any individual facility, it is necessary to take into account the following:

- the environmental setting of the facility;
- the age of the facility;
- the storage and throughput volumes of the facility;
- practical engineering options and control mechanisms; and
- the likely costs and benefits of upgrading the facility.

2.2 Whilst the best practicable environmental option should be adopted for a particular facility, it is not expected that all facilities would meet, or need to meet, the highest degree of engineering design or operational and management systems, particularly where the surrounding environment is not sensitive.

2.3 It is not practical for the code to be a prescriptive list of procedures to be followed in all cases. Instead, the philosophy adopted in the code is to provide a framework, the scope of the various elements of which can be adjusted to reflect the size, type and environmental context of individual UST facilities.

Four key elements necessary to ensure groundwater protection

2.4 In order to protect groundwater from potential pollution as a result of loss of product, the following four key elements should be implemented:

- the preparation of a suitable ***Environmental Risk Assessment***;

- the provision of appropriate ***Engineering Requirements***;
- the implementation of appropriate ***Managements Systems and Controls***; and,
- the preparation of suitable ***Emergency Plans and Procedures***.

2.5 These four elements are a basic part of good practice. The issues associated with each of them are summarised in this section. Further supporting information is provided elsewhere in this code and in the referenced documents and suggested additional reading.

2.6 The four key elements apply to UST facilities at all stages of their lifetime, from initial design to ultimate decommissioning. The sources of risk and the methods of managing it will vary slightly for differing stages. Sections 3, 4 and 5 of the code highlight the issues that need to be considered in addressing the four elements during the following stages of the lifetime of a UST facility:

- commissioning;
- operation; and,
- decommissioning.

2.7 In order to follow the code, an operator should take into account the guidance contained in this section and whichever of Sections 3 to 5 are appropriate. Where an operational facility is being upgraded, it is also necessary to consider whether this will involve any issues highlighted with regard to commissioning or decommissioning.

(I) ENVIRONMENTAL RISK ASSESSMENT

2.8 Preparation of an appropriate environmental risk assessment is important for ensuring that risks to groundwater, and suitable protection measures, are properly identified. One of the main considerations in following the code will be the preparation of an appropriate risk assessment. This risk assessment should be prepared in accordance with the general guidelines set out in Appendix 3 of the code and should take into account the specific risk issues highlighted in Sections 3, 4 and 5. A risk assessment should be prepared not just for operational facilities, but also as part of the design and planning process for new facilities, and prior to any decommissioning works. A discussion of risk assessment procedures is included in Appendix 3.

2.9 The risk assessment should not be seen as a 'once and once only' process, but should be re-addressed at regular intervals, and revised to take into account any significant changes to the site engineering and operation, and any alteration to the environmental context of the facility. With regard to the latter, an example would be development on adjacent land; this could result in the provision of additional migration pathways and receptors.

2.10 The risk assessment should highlight any significant risks to groundwater, and indicate the optimum engineering and operational control systems required to mitigate the identified risks. This should include the most suitable means of checking for leakage and preventing corrosion failure.

2.11 From a practical point of view, an environmental risk assessment would be expected to identify all environmental impacts, not just those to groundwater. This would include impacts to surface waters and soils, and the potential for the generation of hydrocarbon vapours.

2.12 The findings of the risk assessment should be used to draw up a risk management action plan for the facility. This action plan should outline the engineering and operational control measures that are required to protect groundwater. This action plan should differentiate between risks which warrant immediate attention and those that can form part of a longer term improvement programme.

2.13 In determining risk management measures, preference should always be given, if possible, to risk avoidance rather than risk control. For example, risk avoidance would be placing activities with a high potential to pollute groundwater above low vulnerability strata. Risk control, for example, would involve appropriate containment for a tank installed in an environmentally sensitive location, or improved standards of engineered containment.

2.14 The risk assessment will form a vital part of the development of an environmental management system (EMS) for an operational facility and the risk management action plan should be included as part of the EMS.

(II) ENGINEERING REQUIREMENTS

2.15 The risk assessment process will indicate the optimum engineering measures for environmental protection that would be accepted at a UST facility. It would be expected that new facilities would implement these requirements in full. Typically the stringency of engineering measures will increase with increasing groundwater sensitivity. A discussion of specific issues associated with the commissioning of new facilities is contained in Section 3. In assessing whether engineering standards comply with the code, use should be made of appropriate HSE and industry guidance. Appropriate guidance is contained in relevant APEA/IP(1) and HSE publications(2,3).

2.16 It might not always be practical for existing operational facilities to implement retrospectively the engineering requirements (identified from the risk assessment) in full. Where economic reasons are the main factors preventing immediate upgrades, it would be expected that operators should develop a plan to phase in improvements over a realistic and acceptable period.

2.17 If significant changes are proposed to an existing facility (e.g. the installation of new tanks or pipework) it would be expected that the requirements highlighted by the risk assessment would be adopted at that time.

2.18 In situations where there is an on-going leak, the necessary remedial engineering measures must be undertaken within a very short timescale.

2.19 Whilst the use of leakage detection controls is seen primarily as an operational matter, the installation of such measures is related to the engineering of a facility. As for other engineering measures, the leakage controls identified by the risk assessment would be expected to be installed in any new facility. For existing facilities, it might not be possible to retro-fit some of the more sophisticated systems to existing tanks and pipework. However, operators would be expected to adopt the best practicable leakage detection option that is appropriate for the environmental setting of the facility; this is most likely to be a type of sensitive wetstock monitoring. Further information on the types of leakage detection systems available is summarised in Appendix 4. Under no circumstances should a situation be allowed to develop because indications of leakage are ignored as false alarms.

(III) MANAGEMENT SYSTEMS AND CONTROLS

2.20 Whilst adherence to engineering good practice is necessary, it is ultimately the use and maintenance of engineering issues which will dictate their effectiveness. Therefore appropriate management systems and controls should be developed and correctly implemented. This is of particular relevance to operating facilities, although management of closed facilities will also need to ensure that they are not presenting an unacceptable risk to groundwater. The issues associated with management systems and controls are discussed in Section 4. Section 5 discusses those associated with the decommissioning of facilities.

2.21 One of the main means of showing that a facility is being operated in an environmentally responsible manner would be the incorporation of the operational control procedures outlined in Section 4 in an Environmental Management System (EMS) for the facility. The main elements of an EMS should include:

- Establishing an environmental policy
- Planning the implementation of the policy
- Implementation and operations
- Checking and corrective action
- Management review

2.22 In addition to including details of operating procedures, an EMS should include details of training and emergency response procedures. Plans for upgrading the engineering requirements of the facility should also be included in any EMS.

2.23 The presence of an accredited EMS is one of the most important indications of compliance. There are cost implications in the production and implementation of an accredited EMS and, a fully accredited EMS might not be appropriate for some small scale facilities. Nevertheless, it could be expected that the main components of a system would be in place, even if not constituting a formal EMS.

2.24 As discussed with regard to engineering requirements, the operator of a UST facility will need to demonstrate that means are in place to identify and respond to leakage or potential leakage as soon as possible. The requirements for a leak detection system would be part of the output from the risk assessment process. A further discussion of leak detection systems is contained in Section 4 and Appendix 4.

2.25 Records should be kept to prove that the leak detection system is being operated and maintained properly. It should also be demonstrated that the system is being monitored regularly and in an appropriate manner, and that response procedures are in place in the event that leakage is detected.

2.26 An important part of any management system is training. Staff Training needs should be identified and up-to-date records kept of that provided. Training is discussed further in Appendix 5.

(IV) EMERGENCY PLANNING AND PROCEDURES

2.27 In the event of a loss of product, or other emergency, the environmental impact can be minimised if appropriate action is taken. The best way of ensuring this is for each facility to draw up its own Pollution Incident Response Plan (PIRP). Indeed, the preparation and regular review of such a plan is normally required as part of any accredited EMS. Regular procedural drills can be carried out to familiarise staff with the drills and to test their effectiveness. To a large extent, the Pollution Incident Response Plan will contain much of the same information as an emergency plan for fire risk.

2.28 Guidelines on how to draw up a pollution incident response plan are outlined in the Environment Agency's Pollution and Prevention Guidelines PPG21[(4)]. General guidance on spillage control methods is contained in PPG22[(5)]. Set out below is a brief summary of the type of information which should be included in a Pollution Incident Response Plan. Although the use of generic response plans can be helpful, facilities must develop response plans which are site specific.

2.29 Based on the advice in PPG21[(4)], as a minimum, a typical Pollution Incident Response Plan should include the following:

- emergency contact details (e.g. Fire Brigade, Environment Agency, specialist contractors, water companies [for both supply and foul drainage] etc);
- product inventory and site layout plan;
- site drainage plan;
- emergency procedures;
- location of emergency response equipment (e.g. fire extinguishers, absorbents, emergency bunding, temporary fencing etc);
- location of buried services, including water supply pipes.

Environment Agency Emergency Number: 0800 80 70 60

2.30 In developing emergency procedures, separate procedures should be prepared for large scale incidents and small scale incidents. Typical large and small scale incidents are listed in the box below. Large scale incidents could also present a high risk of fire and explosion and emergency procedures must be integrated with those for health and safety issues. Advice on the fire and explosion risks associated with large scale incidents and emergency response procedures is contained in a document issued by Gwynedd Council following the Bontddu incident[(6)] in which petrol leaking to ground resulted in an explosion.

Typical large scale incidents:

- catastrophic or significant failure of underground tanks;
- split hose during delivery;
- product appears off-site.

Typical small scale incidents:

- small spillage during uncoupling of delivery hose;
- small spillage at dispenser;
- leak from vehicle fuel tank.

2.31 The Pollution Incident Response Plan should contain a variety of procedures for dealing with potential pollution incidents identified as typical for that specific facility. The plan should also include for the disposal of wastes (including liquids) which may arise from an pollution incident and the subsequent containment and clean up.

In planning for large scale emergency incidents the PIRP should include:

- procedures to prevent/minimise the spread of product (i.e. the use of bunding, closing the interceptor outfall etc);
- procedures to prevent fire and explosion (e.g. isolate/switch off electrical equipment);
- procedures to prevent the further loss of product (e.g. uplifting product from a leaking tank);
- procedures to ensure the health and safety of the general public and surrounding area (e.g. use of temporary fencing, evacuation of nearby properties etc);
- procedures to protect drinking water supply pipes;
- clean-up procedures.

2.32 In the case of a large scale incident involving considerable loss of product, the PIRP might only be able to ensure that environmental impact is minimised, and not achieve a full clean-up of lost product. In such cases, a longer term remediation strategy will be required.

2.33 Copies of the Pollution Incident Response Plan should be kept not only on-site, but also at convenient off-site locations which allow rapid access. It might also be useful to provide copies to the Fire Brigade, Environment Agency, and other regulatory authorities. Facilities which employ specialist contractors to deal with incidents should consider lodging copies with these contractors. A list of all persons/organisations holding the PIRP should be held and kept up-to-date. If there are any changes in the retained contractors the PIRP should be issued again.

2.34 All incidents that have the potential to cause damage to the environment should be recorded in site records, and taken into account when updating the facility's risk assessment. (Several UK petrol station retailers also undertake routine investigations of petrol filling sites. This information – eg borehole logs, depth to groundwater, previous quality monitoring – should be centrally stored and accessible by staff and specialist contractors and should be made available (eg on a central server) out of hours). Records should also be kept of actions undertaken in response to an incident. If any incident results in the loss to ground of other than insignificant volumes of product the local Environment Agency should be informed. This will allow the Environment Agency to make decisions on the need for any action that is necessary to minimise environmental damage. Contact numbers for the individual Environment Agency Offices are provided at the end of this document. For environmental emergencies, or where the relevant individual in a local Environment Agency office cannot be contacted quickly, you should use the Environment Agency's emergency number.

2.35 Notification of incidents to the Environment Agency should occur in conjunction with, and not instead of, the necessary notifications to the Petroleum Licensing Authority and the local Environmental Health Department. For some facilities, it might also be necessary to inform the Health and Safety Executive (HSE). However, for major incidents where there is a serious risk of fire or explosion, the priority must be to make immediate contact with the Fire and Police Services.

Demonstrating that this code is being followed

2.36 In summary, in order to demonstrate that the code is being followed, documentary evidence should be available to indicate that all four of the key elements of the code have been addressed. In addition, it will be necessary to show that, not only have the key elements been addressed, but that they have been done so in a manner that is appropriate to the facility and in accordance with accepted good practice. It will also be necessary to demonstrate that the integration between engineering and operational controls is sufficient, given the environmental setting.

2.37 In particular for operational facilities, a willingness to follow the Code of Practice can be demonstrated if an appropriate environmental management system (EMS) is in place and if records detailing leak detection and environmental monitoring are readily available for inspection.

2.38 Annex 1 contains a series of example checklists. These checklists highlight various issues to be taken into account both in implementing the Code of Practice and in ensuring that it continues to be followed. The checklists are not exhaustive, but do provide an illustration of what needs to be taken into consideration.

Key factors in **demonstrating that the code is being followed** during the commissioning, operation and/or decommissioning of UST facilities are:

- A **Risk Assessment** process should be used to identify site specific risks and to indicate the appropriate engineering and operational controls required to protect groundwater.
- The **Engineering Measures** identified by the risk assessment should be implemented as soon as reasonably possible.
- **Management Systems and Controls** should be in place, including the keeping of records regarding site operation, and including leak detection and environmental monitoring.
- **Emergency Plans and Procedures** must be in place, including an appropriate Pollution Incident Response Plan which should form part of the environmental management system.

CHAPTER 3

Commissioning of Facilities

This section explains:

- **general planning issues;**
- **risks to groundwater during design and construction;**
- **good practice when commissioning UST facilities; and,**
- **operational measures which should be developed when commissioning UST facilities.**

Scope of this section

3.1 This section focuses primarily on new facilities, but the principles involved are equally applicable to major refurbishments of existing facilities, and to a large extent to minor upgrades. Hence most of the guidance in this section will also apply to operational facilities.

Planning Issues

3.2 The construction of new facilities, and any significant alteration of existing facilities, will be subject to the granting of planning permission by the local planning authority (LPA). As part of this process, the LPA will require the applicant to consider the environmental context of the facility and its potential environmental impact and is likely to require the submission of an environmental risk assessment. The LPA will normally consult the Environment Agency with regard to any applications that have the potential for significant environmental impact, including on water resources.

3.3 The Environment Agency has prepared a Policy and Practice for the Protection of Groundwater[7] which would be relevant to any UST development. UST developments which present an unacceptable risk to groundwater resources, in particular those above sensitive aquifers or in proximity to specific receptors, would be at greatest risk of running counter to this policy.

3.4 It is possible that one of the conditions of granting planning permission for a UST facility would be that the Planning Authority would wish to approve the development proposal to ensure that there is no significant risk to groundwater. The LPA may seek advice from the Environment Agency on measures to protect controlled waters. In the event that the Agency considers that the conditions imposed by the LPA are insufficient, it has a range of powers available to it, including those under Regulation 19 of the Groundwater Regulations 1998, to minimise the risk to groundwater.

Risks to groundwater during design and construction

3.5 Whilst no loss of product can occur during the design and construction of a facility, failure to consider potential environmental risks at this stage of the process could ultimately result in a significant pollution incident.

DESIGN

3.6 Assuming that the construction of a facility gains planning permission, it is important that it is designed in a manner that will reduce the potential for groundwater pollution. Factors which should be taken into account include the general site location, geology, hydrogeology (local and regional), proposed site layout, and equipment requirements. All of these issues should have been addressed in a risk assessment.

Factors which should be considered during the design of a UST facility in order to minimise risk to groundwater include:

- Are the proposed tanks and pipework appropriate for the environmental setting of the site?
- Do ground conditions require any specific foundation type?
- What is the depth to groundwater?
- Are ground conditions likely to result in corrosion of below ground construction materials?
- Are there any specific risks resulting from site layout?
- Where will surface water drain to?

3.7 Generally, the site layout should be designed to minimise health and safety risks. It is necessary to ensure that this does not result in an unacceptable risk to groundwater.

3.8 When assessing foundation requirements, it is necessary to consider both the physical (engineering) properties and the corrosion characteristics of the ground (see paragraph 3.18). Advice on assessing corrosion characteristics is contained in Appendix 3.

CONSTRUCTION

3.9 Loss of product could arise during the operation of the facility as a result of inadequate construction methods. Incorrect construction could result in unsealed joints or areas of potential future weakness.

Factors during construction that might influence the future integrity of an operational UST facility include:

- tank and pipework handling;
- ground preparation;
- installation procedures;
- incorrect site layout and set-up;
- supervision and quality control;
- commissioning procedures.

Good practice when designing and constructing a UST facility

3.10 The main guidance document on the construction and operation of petrol filling stations has been HS(G)41[2]. Most aspects of this document have been replaced by APEA/IP 1999[1]. However, HS(G)41[2] is still relevant with regard to the day-to-day management of sites. In addition, there are a number of occasional circulars (PETELS) which update the above guidance (see Appendix 6).

3.11 The risks to groundwater presented as a result of the commissioning phase of a UST facility are addressed primarily through the correct engineering design and appropriate quality control during construction itself.

3.12 When designing the facility, strong preference must be given to hazard avoidance rather than risk management, i.e. avoid the problems in the first place rather than attempt to control them via engineering and operational solutions.

3.13 The extent of risk management required will be more stringent as the environmental sensitivity of the location of a facility is increased. For example the degree of engineered protection is likely to be greater for sites located above major aquifers supporting significant potable water abstractions.

ENGINEERING DESIGN

3.14 The engineering issues which should be addressed during the design of a UST facility can be summarised as falling into the following broad categories:

- design and construction of storage tanks (including any secondary containment);
- design and construction of pipework and pipe trenches;
- design and construction of corrosion prevention systems:
- design and construction of fuel delivery and dispensing systems;
- design and construction of delivery facilities (e.g. overfill prevention, drainage of tanker standing area);

- design and construction of site drainage systems; and
- design and construction of leak detection & environmental monitoring systems:

3.15 A summary of the good engineering design is given in Appendix 4. The use of leak detection and environmental monitoring is discussed further in Section 4 and Appendix 4.

CONSTRUCTION QUALITY CONTROL

3.16 The safest designs and procedures can be of no consequence if the subsequent works are not carried out in the appropriate manner. Good quality construction is essential, and should only be carried out by competent persons. Strict quality assurance (QA) during construction should be maintained. Rigorous inspection and checking of a completed storage system is vital.

3.17 Prior to placement in the ground, all tanks and pipework must be handled in accordance with manufacturer's instructions and kept in a safe environment to avoid damage to the tank due to punctures and any damage to protective coatings etc. Care must also be taken to prevent damage during installation. In reality, it is often difficult to prevent damage to protective coatings during construction, and such coatings should not be relied upon as the sole means of preventing corrosion. Other measures would include effective leak detection systems and, where appropriate, cathodic protection.

3.18 Good foundations are required. In addition to their physical competency, founding strata must be assessed for its corrosion characteristics, which might affect structural integrity of below ground equipment. Not only should the potential for corrosion of metals be considered, but also the potential for sulphate to cause deterioration of below ground concrete. Corrosion issues are more likely to be significant on brownfield sites where made ground is present.

3.19 All excavations should be level and compacted to form sound founding strata and prevent potential differential settlement which may damage tank structure and pipework. The ground preparation should be appropriate to the type of tank and pipework being installed. For example, GRP tanks should be underlain by a selected backfill or cushioning material, to prevent puncturing when filled with product. With regard to the pipework, care must be taken to ensure that joints are correctly formed and sealed to prevent leakage.

Issues to consider at commissioning stage

3.20 The commissioning of a facility is the stage when appropriate operational control measures should be developed.

3.21 Prior to the facility becoming operational, appropriate measures include should be taken to ensure that all valves, fill pipes, vent pipes etc are readily identifiable and cannot be confused; this should also include monitoring wells where installed. The importance of operational control measures is outlined further in Section 4 of the code.

3.22 Prior to operation the following checks should be carried out:

- testing of manhole chambers for integrity;

- drainage systems, including separators, to be completed and tested;
- separators to be charged with water to make them operational;
- electrical and other ducts sealed;
- emergency equipment to be installed and operational;
- tanker stands and forecourt areas to be complete;
- all tanks, pipework and dispensers to be tested, as appropriate to demonstrate their integrity and safety. On facilities storing petrol, such testing would be required prior to granting of a petroleum storage licence. Certificates relating to this testing should be kept on site for inspection by all relevant regulatory authorities.

CHAPTER 4

Operation of Facilities

This section explains:

- **operational activities which pose a risk to groundwater;**
- **factors which need to be considered during each operational activity; and,**
- **good practice for general operational control procedures, product loss detection and maintenance.**

Scope of this section

4.2 This section has been written primarily with regard to petrol filling stations but the risks that could arise from other types of facilities are generally similar. Facilities would be expected to be in line with relevant aspects of this section, though some of the issues covered may not apply in all circumstances. Further information concerning the operation of facilities, and the risks arising from operations is contained in APEA/IP 1999[1], HS(G)41[2], PETEL 65/34[8] and Environment Agency[9].

Operational activities which pose a risk to groundwater

4.3 During the operation of a UST facility, release of petroleum hydrocarbons can occur not just from the storage tank itself but also from ancillary equipment and during the movement of product to and from the storage facility. The release of product could occur during any of the following activities:

- delivery;
- storage;
- dispensing;
- drainage; and
- maintenance and repair.

4.4 The degree of risk to groundwater posed by the release of product during these activities will depend on the engineering and operational control measures in place, and on the location of the facility.

(I) DELIVERY

4.5 Spillages might occur during delivery of product to a UST facility. These range from minor loss during uncoupling of delivery pipes to major loss, for example a split hose or leaking offset fill pipework. Particular care is needed when the person responsible for the delivery is unfamiliar with the UST facility.

Factors to be considered in assessing the potential risk to groundwater resulting from the possible loss of product during delivery include:

- Does the site have a separate tanker stand area?
- Will the site drainage system capture any delivery point spill and is the capacity of the interceptor sufficient?
- Are there overfill prevention systems?
- Are the delivery pipes clearly labelled?
- Are the correct delivery procedures being followed?

(II) STORAGE SYSTEMS

4.6 Failures in the integrity of the tanks and associated pipework could result in a significant loss of product. Older tanks are most likely to be single skinned and constructed from steel. The integrity of the tanks could also be compromised by damage or corrosion. This could occur where tanks are at shallow depth (i.e. where there is insufficient protection from traffic), or have not been installed in such a way as to prevent settlement. Similarly, damage could occur if bricks or timber are left in excavations prior to tank installation. The degree of risk is increased further if storage tanks are located below groundwater level; and thus this practice is strongly discouraged.

Factors to be considered in assessing the risk to groundwater as a result of the possible loss of product from storage tanks include:

- What is the age of the storage tanks and pipework?
- Where is groundwater in relation to the base of the tanks?
- What type of ground are the tanks installed in?
- What type are the storage tanks and pipework (i.e. single or double skinned)?
- Which types of materials the tanks and pipework are constructed from?
- How were the tank and pipework installed?
- Is there a potential for damage to have occurred to the tanks and pipework?
- Has corrosion protection of tanks and pipework (e.g. cathodic protection) been used?

(III) DISPENSING

4.7 During dispensing, loss of product can occur either from the pipework connecting USTs to the dispensing system, or during the dispensing process. Fuel is transferred from USTs to the dispenser by means of either a suction or a pressure system. The potential for leakage is increased with the number of joints along pipework. A particular risk is posed in situations where spillage is likely to be directly to the water environment, e.g. during refuelling of boats.

4.8 There are both disadvantages and advantages associated with the use of pressure and suction systems. The most significant difference is that if there is a leak in a line, a greater volume of product could be lost over a given time period from a pressure system. A pressure system does, however, have an advantage in that leaks are usually detected at an early stage, and it is possible to fit the system with an automatic shut down system.

4.9 During the dispensing process itself, there is potential for spillage to occur. While modern pumps on retail filling stations are fitted with nozzle shut-off valves, this will not necessarily be the case on all UST facilities. A significant loss of product could occur if a dispensing system is accidentally left open. A similar situation could occur in the event of vandalism. Operators should ensure that adequate measures are taken to prevent unauthorised access (e.g. vandals) and that pumps and valves are closed or locked when not in use.

Factors to be considered in assessing the risk to groundwater as a result of the loss of product during dispensing include:

- Do the dispensers conform to modern standards?
- Are the dispensers fed by a suction or a pressure system?
- Can vehicles be refuelled within the site area?
- Are the dispensers regularly calibrated and serviced?
- Are the dispensers fitted with nozzle shut-off valves?
- Are pumps (on suction system) fitted with under pump check valves?
- Is there security against damage or vandalism?

(IV) DRAINAGE

4.10 A significant risk to groundwater can occur if appropriate surface and subsurface drainage is not incorporated into the design and construction phase of the facility. The drainage system should to be designed to convey all potentially contaminated water and spills of fuel to suitable collection or containment points for disposal or treatment. The petrol interceptor should discharge to a foul sewer: prior approval should be sought for this from the sewerage undertaker.

Factors to be considered in assessing the risk to groundwater arising from on-site surface water drainage systems include:

- What is the classification and vulnerability of the underlying aquifer?
- Where does the site discharge waste materials/effluents?
- Are there any soakaways on-site? (and, if so, should they be decommissioned)
- Where are the nearest water supply boreholes (public and private)?
- Is the drainage intact and does it effectively deal with fuel spills?
- Does the drainage cover the whole site?
- Is the forecourt oil/water separator clean and functional and maintained to ensure effectiveness, and where does it discharge to?
- Are appropriate dispensing and monitoring procedures employed?
- What is the age and condition of the drainage system?
- What is the linkage between drains and receptors?
- Do any vehicle washing facilities drain through a separate dedicated system?

4.11 Effluent from vehicle washing facilities contains detergents which will increase the solubility of hydrocarbons. Hence effluent from washing facilities should not pass into the same drainage system as the general surface water but should connect to foul sewer with prior approval of the sewerage undertaker.

(V) MAINTENANCE AND REPAIR

4.12 Significant environmental risks to controlled waters could result during the course of maintenance and repair works undertaken during the lifetime of the storage facility.

Factors to be considered in assessing the risk to groundwater that could occur during maintenance and repair activities include:

- Have the pipelines/tanks been drained sufficiently to minimise the potential for fuel spills to the environment prior to repair works?
- Are procedures in place to avoid accidental damage to tanks and associated pipe work during maintenance works?
- Are procedures and materials in place to deal with any small spillages that occur?
- Are there monitoring and checks in place to ensure that all repairs have been performed to a satisfactory standard?
- Will materials (including waste waters) containing waste fuels, which arise during the course of repair works, be disposed of to suitably licensed waste disposal site?

Good practice for operation, leak detection and maintenance

4.13 Just as the degree of risk to groundwater depends on the engineering and operational control systems, so both are also important factors in mitigating any identified risks. It will not always be practical, or economic, to mitigate identified environmental risks by engineered means alone. Therefore, appropriate risk mitigation measures are likely to require a careful integration of both engineering and operational control systems. As for the commissioning of facilities, the risk management approach is likely to be more stringent as environmental sensitivity is increased.

4.14 Issues associated with engineering standards have been discussed with regard to the commissioning of UST facilities and are not considered further in this section. The important components of appropriate operational control systems include:

- general operational control procedures;
- leak detection and environmental monitoring, and
- maintenance.

4.15 All of the issues highlighted above could be expected to form part of an Environmental Management System (EMS) for the facility. Indeed, all of the above would be required as part of any EMS designed in accordance with ISO 14001[10]. Any EMS would also require the identification of staff training needs and emergency response procedures. Both of these are important in mitigating environmental risks.

4.16 It must be stressed that measures adopted to mitigate risks to groundwater will overlap considerably with those to control fire hazard, and every effort must be taken to ensure that there is full integration between the two. Furthermore, any measures which prevent the significant loss of product will have economic benefits for the operator.

(I) GENERAL OPERATIONAL CONTROL PROCEDURES

4.17 Correct operational procedures form a major part of risk mitigation. If appropriate procedures are developed and followed correctly, not only will the risk of a pollution incident occurring be reduced dramatically, but also the damage caused by an incident can be minimised.

4.18 Significant activities for which the development of operational control procedures should be considered include:

- product delivery;
- dispensing;
- product volume monitoring;
- regular and one-off maintenance activities;

- the control of visiting contractors;
- staff awareness and training;
- response to major and minor spillages; and,
- response to alarms and other indications of leakage.

(II) DETECTING LOSS OF PRODUCT

4.19 Methods for detecting loss of product include leak detection systems and wetstock monitoring, environmental monitoring and integrity testing. Details on the monitoring and testing of USTs can be found in APEA/IP 1999[1] and PETEL 65/34[8].

4.20 On-going automatic leak detection without loss of product is only possible with double skinned equipment – this should provide warning of failure prior to release of product to ground. Wetstock monitoring can take various forms ranging from statistical inventory reconciliation (SIR) to simple manual monitoring using a dipstick. Whilst wetstock monitoring will not detect a leak before product is lost to ground, the more sophisticated systems should provide a relatively rapid indication (i.e. within days) that a leak is occurring. A brief summary of leakage detection and wetstock monitoring systems is included in Appendix 4.

4.21 Environmental monitoring typically utilises boreholes to monitor for the presence of vapours, dissolved product or free phase product. Leakage will only be detected once product has migrated through the ground and reached the boreholes. Depending on the location of the boreholes and the sensitivity and frequency of monitoring, leakage might have been on-going for a relatively lengthy period (i.e. weeks) before being detected by this method. Additionally, there is a risk that, if not located properly, the boreholes could fail to detect a contamination plume. It must be remembered that the boreholes themselves can act as preferential pathways for the migration of pollution into an underlying aquifer. When drilling boreholes on petrol filling stations appropriate methodologies should be used to ensure that any near-surface contamination is not transferred to any deeper aquifers.

4.22 Integrity testing based on pressurising tanks and pipework to detect any leaks or faults is usually carried out before a facility is brought into service. Thereafter integrity testing based on precision tank or line tests is only normally carried out in support of a monitoring system or if a leak is suspected. Integrity testing could include the use of environmental tracers. If integrity testing alone is used to monitor for loss of product, leakage could be on-going for very long periods (i.e. years or decades) before being detected.

4.23 Overall, based on effectiveness, the preferred hierarchy for detecting the loss of product is as follows:

Automatic Leak Detection Systems >Wetstock Monitoring > Environmental Monitoring > Integrity Testing

4.24 On facilities located in environmentally sensitive areas, leak detection controls should be such that any leakage is detected almost immediately that it occurs and before other than a very minor environmental impact occurs. The use of monitoring wells as the sole means of detecting the loss of product should not be relied on.

4.25 The minimum detectable leak that can be identified by the leakage detection system should be considered as part of the environmental risk assessment for the facility.

(III) MAINTENANCE

4.26 A regular maintenance and inspection programme is the most effective method of ensuring that everything is in good working order, and that environmental risk is being managed effectively. Such procedures would be required as part of an EMS in accordance with ISO 14001[10]. The production of method statements and operating procedures for maintenance activities should form part of an EMS, to ensure that work is properly planned and that all changes are adequately documented. It is vital that a detailed plan of works is adhered to when any maintenance or repair work is carried out on an UST or associated pipework.

CHAPTER 5

Decommissioning of Facilities

This section explains:

- **the risks to groundwater when decommissioning; and,**
- **good practice when decommissioning.**

Scope of this section

5.1 Decommissioning activities range from the complete closure and removal of a UST facility as a whole, to the replacement of individual tanks or lengths of pipework. This section indicates how risks to groundwater could occur during decommissioning, and the outlines best practices that should be undertaken to mitigate them.

5.2 In contrast to the risk prevention associated with the commissioning and operation of UST facilities, the type of measures to be adopted during decommissioning are likely to be fairly similar between facilities. However, the scale to which such measures need to be carried out will vary.

Potential sources of groundwater pollution

Factors to be considered in assessing the risk to groundwater during decommissioning activities on a UST facility include:

- Will the proposed decommissioning methods result in the release of product to ground?
- Will any below ground equipment remain after decommissioning?
- Will the proposed decommissioning methods result in product remaining *in-situ* in below ground structures (i.e. tanks, pipework, and drainage)?

If the answer is yes to any of the above, the decommissioning proposals should be re-addressed to determine if it is possible to avoid such.

5.3 During the decommissioning of storage facilities, product could be lost to ground as a result of either deliberate or accidental release during dismantling and removal of tanks and pipework. In addition, a risk could arise off-site if contaminated tanks and pipework are not disposed of in an appropriate manner.

5.4 It would be preferable to remove all redundant tanks and pipework. If tanks are left in-situ, a risk could arise if any residual product remains in the tanks. As the integrity of the equipment would no longer be maintained or monitored, the potential risk posed might be greater than during the operational lifetime of the site.

Good practice when decommissioning USTs

5.5 On closure of a UST facility, works should be undertaken to ensure that the facility will not present an environmental or health and safety risk. Measures should also be taken to ensure that decommissioning of only small parts of a facility do not result in an unacceptable risk.

5.6 Guidance on the current good practice to be adopted during the decommissioning of UST facilities is contained in APEA/IP 1999[1] and PETEL 65/3[11]. Set out below is a brief summary of the most important issues with regard to prevention of pollution to groundwater.

5.7 Any residual product should be removed from the tanks. This process is known as bottoming. Care must be taken to ensure that no product is lost to ground. Following bottoming, the tanks need to be made safe by the removal of any explosive vapours. One method involves filling the tanks with inert gases or water. All tanks must be bottomed and made safe before removal from the ground. Similar methods should be employed prior to removal of pipework.

5.8 As water used for this purpose will become contaminated with the residual product, a risk of contamination of controlled waters could arise if this water is not disposed of in a manner appropriate to the degree of hydrocarbon contamination. Typically this would involve consignment to a suitable waste treatment facility or, possibly, discharge to foul sewer.

5.9 It is normal good practice to remove tanks, pipework and dispensers. If tanks are be left in-situ, they must be made safe. Following bottoming and making safe, tanks should be filled with either:

- a sand and cement slurry;
- hydrophobic foam; or
- foamed concrete.

5.10 Tanks (and associated pipework) that are no longer considered suitable or safe for the storage of petroleum spirit should not be used for the storage of diesel (or other hydrocarbon fractions) without ensuring their integrity.

5.11 Wherever practicable oil/water separators should be removed for off-site disposal. Otherwise they should be filled in a similar manner to tanks. Regardless of the fate of the oil/water separator, all residual liquid and sludge should be removed (for off-site disposal) and all inlet and outlets should be sealed. Any drainage systems that are to remain active, should be modified to ensure that they do not present a significant migration pathway for pollutants to reach groundwater, or other controlled waters.

5.12 If sites are decommissioned temporarily, it is possible to leave product or water in tanks. In this case, all monitoring procedures must be continued as if the facility remained operational. If for any reason monitoring cannot continue, the tanks should be emptied and made safe.

5.13 Persons involved in the decommissioning of a UST facility must be aware of and meet their obligations with regard to waste disposal in accordance with the duty of care imposed by Part II of the Environmental Protection Act (i.e. the current waste management licensing regime in the United Kingdom).

CHAPTER 6

References

The documents listed below have been referenced in the Code of Practice. Details of other documents that provide useful additional guidance are contained in Appendix 6.

1. APEA/IP, 1999, *Guidance For The Design, Construction, Modification and Maintenance of Petrol Filling Stations*, ISBN 0 85293 217 0.
2. Health and Safety Executive (HSE), HS(G)41, 1990, *Petrol Filling Stations: Construction and Operation.*
3. Health and Safety Executive (HSE), HS(G)146, 1996, *Dispensing Petrol – Assessing and controlling the risk of fire and explosion at sites where petrol is stored and dispensed as a fuel.*
4. Environment Agency, Pollution Prevention Guidelines, PPG21, *Pollution Incident Response Planning.*
5. Environment Agency, Pollution Prevention Guidelines, PPG22, *Dealing with Spillages on Highways.*
6. Gywnedd Council, October 1998, *Guide for Managing Petroleum Incidents.*
7. Environment Agency, 1998, *Policy and Practice for the Protection of Groundwater*, 2nd edition.
8. Hela Lacots PETEL 65/34, October 2000, *Leak Detection in Tanks and Pipework.*
9. Environment Agency, 1996, *Guidance Manual On Underground Fuel Storage Tank Installation, Environment Agency R & D Technical Report P5* (prepared by Fluor Daniel GTI).
10. International Standards Organisation, ISO 14001, 1996, *Environmental Management Systems – Specification with Guidance for Use.*
11. Hela Lacots PETEL 65/3, April 1996, *Redundant Underground Petrol Tanks Removal and Conveyance of Tanks from Licensed Petroleum Premises. [to be withdrawn shortly – its contents are covered in IP/APEA guidance]*

12 EC, Council Directive 80/68/EEC *on the protection of groundwater against pollution caused by certain dangerous substances.*

13. DEFRA, November 2001, *Guidance on the Groundwater Regulations 1998.*
14. Hela Lacots PETEL 65/44, June 2001, *Modernising Petrol Legislation.*

15 DETR, 2000, *Guidelines for Environmental Risk Assessment and Management.*

16. Institute of Petroleum, 1999, *Guidance Document on Risk Assessment for the Water Environment at Operational Fuel Storage and Dispensing Facilities.*
17. Institute of Petroleum, 2001, *Performance Specification for Underground Pipework Systems at Petrol Filling Stations*, 2nd edition.
18. Environment Agency, Pollution Prevention Guidelines, PPG3, *Use and Design of Oil Separators in Surface Water Systems.*
19. Hela Lacots PETEL 65/45, November 2001, *Petrol Filling Stations Surface Water Drainage: Constructed Wetlands.*
20. Hela Lacots PETEL 65/14, June 2000, Petroleum – *Local Authority Circulars and other Published Guidance Including Codes of Practice.*

APPENDIX 1

Regulatory Framework

The Groundwater Regulations 1998

A1.1 The Groundwater Regulations 1998 came fully into force on 1 April 1999 and completed the transposition of the EC Groundwater Directive[12] into United Kingdom law. The Regulations supplement the provisions of the Water Resources Act 1991. Guidance on the implementation of the Regulations has been issued by DEFRA[13].

A1.2 The purpose of the Regulations is to protect groundwater from pollution by certain listed substances. These substances are defined in Lists I and II of the Directive[12] and the Groundwater Regulations 1998. For List I substances, which include mineral oils and hydrocarbons, measures should be taken to prevent their introduction to groundwater. For List II substances measures should be taken to restrict their introduction into groundwater, so as not to cause any groundwater pollution.

A1.3 In the UK it is an offence to allow List I substances to enter groundwater. The Environment Agency may not authorise direct or indirect discharges which would have this effect except in very rare and specific circumstances. It is also an offence to allow List II substances to enter groundwater without prior investigation and authorisation (containing any necessary pollution prevention conditions) by the Agency. Any disposals, or tipping for the purpose of disposal, to land of listed substances similarly require prior investigation and authorisation by the Agency.

A1.4 A variety of activities utilise List I and II substances, but do not make deliberate discharges to the environment. Such activities do not normally require an authorisation under the Groundwater Regulations. Nevertheless, these activities could result in a non-deliberate or accidental discharge. Regulation 19 provides the Environment Agency with powers to serve notices (‘Groundwater Notices’) to control any activity which might lead to an *indirect discharge* of any substance in List I or the pollution of groundwater as a result of an *indirect discharge* of any substance in List II. These notices can either prohibit the activity or impose conditions under which the activity can be carried out. Failure to comply with such a notice is an offence under Section 85 of the Water Resources Act 1991 (WRA).

A1.5 In considering whether to issue a notice, the Agency would take account of this code of practice, having regard to individual site circumstances, and whether or not the code is being, or is likely to be, complied with. On this basis, therefore, compliance with the code should normally be of assistance in ensuring that the Agency does not need to issue a Prohibition Notice. However, the fact that the code is being followed does not mean that a notice cannot be served, and would not be a defence in respect of the provisions in the Regulations derived from Section 85 of the Water Resources Act 1991. For example, a notice with conditions might be required where UST is in a sensitive location, or where inherent risks need to be managed through conditions designed to prevent groundwater pollution.

A1.6 Additionally, Section 161A of the WRA confers powers to serve “works notices” where it considers water pollution to be likely to occur or to have occurred. The contents of these notices are prescribed in the Anti-Pollution (Works) Regulations 1999. The person on whom the notice is served might be required to carry out specific preventative or remedial works.

A1.7 The storage of mineral oils and hydrocarbons is an activity which might lead to an indirect discharge of a List I substance into groundwater. Therefore, it is subject to control under Regulation 19 of the Groundwater Regulations.

A1.8 Regulation 21 of the Groundwater Regulations 1998 allows ministers to approve codes of practice giving practical guidance to persons engaged in any activity, which could lead to the indirect discharge of certain polluting substances into groundwater.

Other Legislative Controls

A1.9 In addition to general health and safety, and environmental protection legislation, more specific legislation which could be applicable (at the date of this code) to UST facilities includes, at the time of issue of this code:

- The Petroleum (Consolidation) Act 1928
- The Public Health Act 1961
- The Notification of Installations Handling Hazardous Substances Regulations 1982 (SI 1982/1357)
- The Water Industry Act 1991 (and associated regulations)
- The Water Resources Act 1991 (and associated regulations)
- The Carriage of Dangerous Goods by Road Regulations 1996 (SI 1996/2095)
- The Control of Major Accident Hazard Regulations 1999 (SI 1999/743)
- Part IIa of The Environmental Protection Act 1990
- The Anti-Pollution Works Regulations 1999 (SI 1999/1006)
- The Pollution Prevention and Control Act 1999 (and associated regulations)
- The Control of Pollution (Oil Storage)(England) Regulations 2001 (SI 2001/2954)

A1.10 Much of the above legislation covering the storage and handling of petroleum products is due for revision in the near future. This issue is discussed further in PETEL 65/44[14]. This PETEL indicates the commitment of the HSE to the modernisation of petrol legislation. This will include placing workplace storage under new regulations and the introduction of a new enforcement regime for retail petrol stations. Set out below is a summary of the legislative position current at the date this code was drawn up.

A1.11 The storage of petroleum spirit (petrol) is regulated by The Petroleum (Consolidation) Act 1928. This legislation requires the storage of petroleum spirit to be authorised by licence. The unloading of petrol from road tankers at licensed premises is controlled under Regulation 20 and Schedule 12 of the Carriage of Dangerous Goods by Road Regulations

1996. Section 73 of the Public Health Act 1961 places a duty on local authorities to ensure that disused petrol tanks are made safe; this requires that operators notify the local authority when such actions are to be undertaken. The removal of tanks is regulated by the HSE.

A1.12 Petroleum spirit is defined as petroleum which when tested in accordance with the Petroleum Consolidation Act 1928, has a flash point of less than 21°C (APEA[1]). The volatility of diesel and other heavy petroleum fractions are such that they do not qualify for regulation under this act. However, facilities storing diesel etc are subject to more general health and safety legislation regulated by the Health and Safety Executive (HSE) or other enforcing authorities.

A1.13 The issue of licences for storage of petrol is the responsibility of Petroleum Licensing Authorities (PLAs). Petroleum Officers acting for the PLAs have responsibility for the enforcement of licences and regulations. They are empowered to inspect sites and take enforcement action as required. Licences issued by the PLA will include conditions referring to the construction, maintenance and operation of a facility in respect of measures to control risks of fire and explosion; and require that permission be obtained before undertaking any proposed alterations. The PLA is either the Trading Standards Department or the Fire Authority of a County Council or the Trading Standards Department or Environmental Health Department of a Unitary Authority, or the Fire and Civil Defence authorities in former Metropolitan Areas. Statutory harbour authorities are currently the PLA for storage in harbour areas. Fuel storage on MoD sites is licensed by a bulk fuels storage department within the MoD itself.

A1.14 Sites which are subject to the Notification of Installations Handling Hazardous Substances Regulations 1982 (SI 1982/1357) (NIHHS sites) and Control of Major Accident Hazard Regulations 1999 (COMAH sites) are exempt from petroleum licensing, but are subject to regulation by the HSE. Petrol retailers are exempt from regulation under COMAH. Agricultural fuel stores are subject to The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991 (SI 1991/324) (as amended 1997).

A1.15 The Control of Pollution (Oil Storage)(England) Regulations 2001 regulations cover the storage of all oils, including petrol in above ground tanks. These regulations apply to England only; subsequent to the date of this code, similar regulations could be made for Wales. The regulations do not apply to tanks which are wholly underground, but they do apply to tanks which are partly underground.

A1.16 Where the release of product has resulted in the contamination of land, there could be a liability under Part IIa of the Environmental Protection Act 1990 and associated Contaminated Land (England) Regulations 2000 (SI 2000/227) and equivalent legislation in Wales.

A1.17 The Water Supply (Water Fittings) Regulations 1999 (SI 1999/1148) (and amendments) place a duty on water companies to ensure that water supplies are not tainted or polluted on passing through contaminated ground. This includes the protection of drinking water supplies in plastic pipes from percolation through the plastic of hydrocarbons. Water Regulations Advisory Scheme (WRAS) is currently (March 2002) preparing guidance on protecting drinking water supplies passing through contaminated ground.

A1.18 The disposal of any waste materials contaminated with petroleum hydrocarbons is subject to the appropriate waste management legislation, including the Special Waste Regulations

1996 (SI 1996/972) and subsequent amendments. Special wastes include waste liquids from a petrol interceptor.

Integration of the Code of Practice with Existing Regulatory Regimes

A1.19 There will be overlap between the requirements outlined in this Code of Practice and that of the other regulatory frameworks indicated above. There is the potential for other regulatory regimes to require standards of engineering and operation which differ from those required for the protection of groundwater. Under no circumstances should the fact that there is a low risk to health and safety lessen the measures to protect groundwater, or vice versa.

A1.20 The Environment Agency is the main regulator in regard to the protection of the water environment. However, under normal circumstances, the Environment Agency is not the principal regulator for UST facilities. The Environment Agency will become more involved in the event of a pollution incident, or if it is likely that one could occur. In such cases, the Environment Agency will take into account the contents of this code. The main responsibility for regulating day-to-day activities remains with those authorities which are primarily concerned with health and safety issues, i.e. the HSE and Petroleum Licensing Authorities (only for the storage of petrol).

A1.21 One of the main audiences for this code is the operators of retail filling stations. Activities on these facilities are regulated primarily by the PLAs. The Environment Agency will maintain close liaison with the PLAs to ensure that, in discharging their duties, individual petroleum licensing officers continue to be aware of the need to control potential risks to groundwater and the environment in general.

A1.22 Where the requirements of groundwater protection indicate higher standards of engineering or operational control than those necessary for other regulatory purposes, these standards will be enforced by the Environment Agency by means of a Notice issued under the provisions of the Groundwater Regulations, not through the PLA.

A1.23 New facilities, and any significant alteration of existing facilities, will be subject to planning permission by the local planning authority (LPA). Developers should check transport related Planning Policy Guidance notes as well as regional planning guidance and local plans for planning policies relevant to petrol stations.

APPENDIX 2

Facilities to which the Code will be relevant

The most common use of underground tanks for the storage of petroleum products is on petrol retail stations. However, underground storage facilities are also utilised on a variety of other sites, both large and small, including: airports and airfields; farms; industrial, commercial and domestic properties; ports, dockyards and marinas; railway depots; refineries and oil storage depots; retail and non-retail filling stations; scrapyards; telephone exchanges; vehicle fleet depots; and, vehicle maintenance facilities.

Whilst large-scale storage on refineries and distribution or wholesale depots is generally in above ground tanks, underground tanks have been used. For example, use has been made of tanks which, whilst located partially above the original ground surface, have subsequently been covered by earthworks.

Fuels, in particular diesel, are stored for use on farms and in other operations utilising earthmoving and similar equipment (e.g. quarries and landfill sites). In general these operations will be relatively small scale and will utilise above ground tanks. However, for large-scale operations, where it is more economically viable, underground storage facilities might be constructed.

Likewise fuel oil for heating is generally stored in above ground tanks. However, this is not necessarily the case in all instances. It is becoming more common for domestic properties utilising fuel oil to have underground or partially buried storage tanks.

Redundant tanks could be utilised for the storage of a variety of liquids. One potentially significant example could be the storage of waste oils from motor vehicle repair and servicing.

APPENDIX 3

Environmental Risk Assessment for UST Facilities

Introduction to Environmental Risk and Risk Assessment

A3.1 An environmental risk occurs when there is a means by which a hazard (e.g. process, activity or substance) can result in a deleterious impact on the environment surrounding it. That part of the environment which is, or could be, affected is known as a receptor. Receptors include humans, flora and fauna, the built environment and water resources (controlled waters). The presence of a hazard alone does not constitute a risk; a risk is only present if there is a means by which the hazard can impact on the sensitive receptor(s). The connection between the hazard and receptor is known as a pathway, and all three elements together constitute a source-pathway-receptor (S-P-R) linkage.

Source (or hazard): a substance capable of causing pollution or harm.

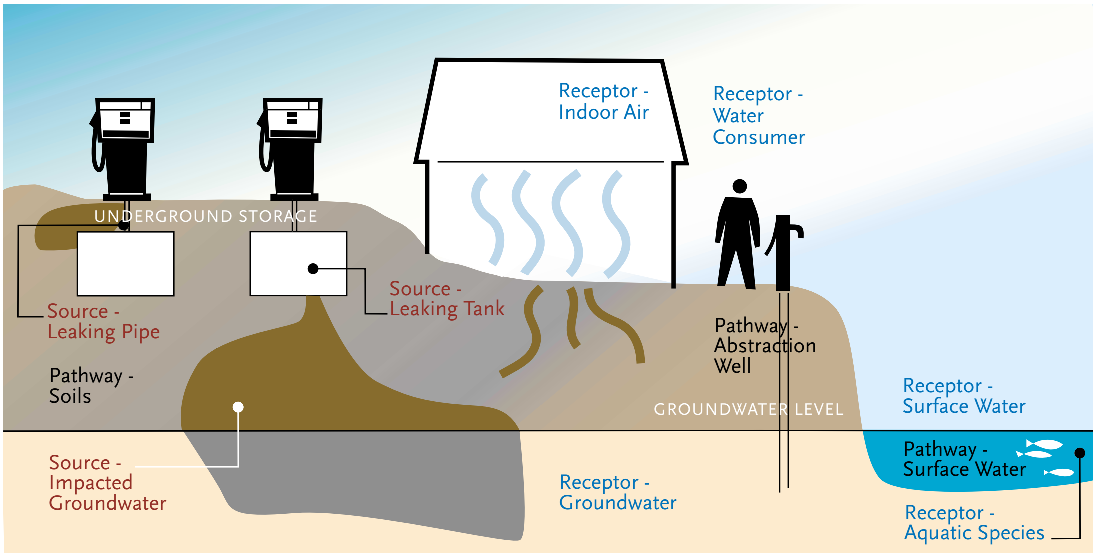
Receptor (or target): something which could be adversely affected by the contaminant.

Pathway: a route by which contaminants can reach the receptor.

A3.2 Environmental risk assessment is the process whereby S-P-R linkages are identified and evaluated. If any of the three elements are absent then there is no complete linkage and thus no unacceptable risk. The magnitude of a risk is a function of the consequences of pollution and the likelihood that such pollution will occur.

A3.3 Figure 1 is a basic representation of the source>pathway>receptor model associated with the operation of USTs.

Figure 1: Source Pathway Receptor Model from an UST Release



A3.4 With regard to UST facilities, the hazard (or source) is the petroleum hydrocarbons stored and handled on the site. For the purposes of this Code of Practice, the receptor of concern is groundwater, and any surface waters which might interact with groundwater.

A3.5 The most important S-P-R linkage is the loss of product that migrates until it reaches the underlying groundwater. On reaching the groundwater, the hydrocarbons will dissolve into the groundwater (dissolved phase contamination). Where relatively large volumes of product are involved, product will form a layer 'floating' on top of the groundwater (free phase contamination). It must be remembered that as well as being a receptor, groundwater can provide a pathway towards other sensitive receptors.

Groundwater Protection

A3.6 The Environment Agency's Policy and Practice for the Protection of Groundwater[7] includes:

- a classification of groundwater vulnerability (as shown on groundwater vulnerability maps); and
- the identification of catchments of large potable supply abstractions (as indicated by groundwater source protection zones).

(The Policy and Practice for the Protection of Groundwater (1998) is due to be updated in the short to medium term. Any reference to the PPPG herein also relates to any subsequent reissued document.)

A3.7 The groundwater vulnerability maps indicate the presence of major, minor and non aquifers, and whether the overlying soils will allow the rapid downward movement of contaminants towards the aquifer. The groundwater protection zones are modelled zones around public water supply abstractions and large abstractions used for other sensitive purposes (e.g. food or drink manufacture). These tools can be used to ascertain if a UST facility is located in an area of high groundwater sensitivity. However, it should be remembered that it is an offence to pollute any groundwater irrespective of its sensitivity.

A3.8 General guidance on the protection of the environment is contained in a series of Pollution Prevention Guidelines (PPGs) produced by the Environment Agency (see Appendix 6)

Risk Assessment Procedure

A3.9 Risk assessment for UST facilities should be carried out using the 'source-pathway-receptor' model to identify significant environmental risks. Guidance on undertaking appropriate assessments is contained in:

- Guidelines for Environmental Risk Assessment and Management, DETR 2000[15].
- Guidance Document on Risk Assessment for the Water Environment at Operational Fuel Storage and Dispensing Facilities, Institute of Petroleum 1999[16].

A3.10 Appropriate assessments would normally be qualitative in nature and should identify the unacceptable risks which require risk reduction. In particular, the assessment should identify the sensitivity of the underlying groundwater resources and take into account the likely influence of the underlying geology on the fate of any product lost to ground. Hydrocarbon fuels present both an environmental risk and a risk of fire and explosion. Thus, with regard to the sources of pollution, an environmental risk assessment would utilise much of the same data required for the assessment of fire risk. Advice on the assessment of fire risk is contained in HS(G)146[3].

A3.11 In addition to current operations, the risk assessment should take into account any future proposals and historic site use. For example, redundant tanks might be present on sites with a long history of use as storage facilities.

A3.12 The purpose of the assessment is to identify potential risks. It should not be necessary to utilise quantitative risk assessment techniques, which use mathematical models to estimate the degree of risk. Such models are more likely to be used in the event of a pollution incident in order to determine the necessary extent of remedial action.

A3.13 The environmental behaviour of any individual hydrocarbon will depend on its chemical and physical properties, in particular its density, solubility and volatility and sorption properties. Petroleum hydrocarbons fractions typically contain a wide range of individual hydrocarbon compounds. Generally, these compounds exhibit similar environmental behaviour and the risks can be considered in terms of certain indicator substance (e.g. BTEX compounds) rather than all the individual compounds present.

A3.14 However, one of the additives of unleaded petrol MTBE (methyl tertiary butyl ether) is much more soluble and less biodegradable than the other compounds found in petrol and hence it exhibits different environmental behaviour. Thus the potential for individual components of a fuel mixture to display differing environmental behaviour needs to be taken into account. This could apply to any other current or future fuel additives.

Assessing Corrosion

A3.15 Usually the corrosion of buried steel occurs as a result of electrochemical reactions with constituents of the enclosing soils. In order to assess the risk of corrosion failure, it is necessary to ascertain soil conditions such as moisture content, electrical conductivity, pH, sulphide concentration and chloride concentration. This data, once collected, can be analysed using a standard method to determine the probability of a leak caused by corrosion, both at present and in the future. Assessment of corrosion probability will help to decide if urgent action is required, e.g. the fitting of cathodic protection, tank lining or the replacement of a tank.

APPENDIX 4

Summary of Good Engineering Design for UST Facilities

A4.1 Set out below is a summary of design issues that can be used to control risk to groundwater at UST facilities. This summary is based on current guidance and practice.

Storage tanks

A4.2 Storage facilities can make use of different types of USTs, which are listed below:

- single skinned mild steel tanks;
- single skinned glass reinforced plastic (GRP) tanks;
- double skinned steel tanks;
- double skinned GRP tanks;
- double skinned composite tanks.

A4.3 Traditional practice has been to install single skinned steel tanks surrounded by concrete. The concrete is not intended to contain any product lost from the tank, but might delay its release into the surrounding ground if it is not cracked or jointed.

A4.4 Double skinned tanks have an obvious advantage over single skinned tanks, in as much as two walls would have to be breached in order for leakage to occur. Furthermore, the interstitial space can be monitored to provide warning of a leak before product is lost to the environment. Generally, double skinned tanks should be installed on any new or redeveloped sites where groundwater is a resource (e.g. above source protection zones, major aquifers and minor aquifers).

A4.5 Where steel tanks are to be utilised, these should be protected using anti-corrosion paint in conjunction with effective leak detection and, where appropriate, cathodic protection.

A4.6 USTs should be designed, constructed, inspected and tested in accordance with the appropriate British Standards or other international equivalents.

Pipework

A4.7 Dispensing pipework and delivery apparatus are designed to prevent leakage. Historically, pipework has been constructed from steel laid in a concrete surround. Current good practice would be to utilise double skinned pipework. The use of non-metallic pipework is now common. Such pipework should be laid in granular material or sand in order to protect it from damage by larger stones or uneven settlement.

A4.8 Both glass reinforced and plastic pipes have been used. As plastic pipes are permeable to hydrocarbon vapours, it is now common to use pipes manufactured from specially developed thermoplastic composites or plastic/metal composites which are not vapour permeable. Other advantages of composite pipes are flexibility, and a reduced need for joints.

A4.9 Whichever type of pipework is used, the most significant potential points of leakage are joints. Hence, it is strongly recommended that the number of joints is kept to a minimum.

A4.10 Additional information on the choice of pipework is contained in APEA/IP guidance[1]. The Institute of Petroleum have also produced a performance specification for pipework[17].

Dispensing Systems

A4.11 The main issues with regard to dispensers are their location and use, and control systems. The dispenser should be located in such a way that it cannot be easily damaged. Dispensers could be operated by dedicated personnel, or by anyone (i.e. the public at self-service filling stations). Dispensers should be fitted with appropriate nozzle and under pump-valves to prevent uncontrolled release of product.

A4.12 There are a number of British standards related to dispensing systems; these are described further in APEA/IP 1999[1].

Delivery Areas

A4.13 A delivery area should be designed such that there is sufficient room for the delivery vehicles to unload without disturbance. The delivery systems should be designed to prevent spillages and overfilling of tanks. Overfill protection involves limiting the amount of fuel that can be delivered into the storage tank by the use of automatic shut off valves or electronic alarms.

Drainage Systems

A4.14 Drainage systems should be designed such that surface spillages are contained and there is no direct loss to ground or to surface watercourses or soakaways for surface water drainage. Typically, this involves the use of low permeability surfacing in any areas which could be contaminated with product. All surface water run-off from these areas should pass through an oil/water treatment system such as a separator. Advice on the use and design of oil/water separators is contained in Pollution and Prevention Guidelines PPG3[18].

A4.15 The drainage system should be constructed of materials, which are resistant to attack by hydrocarbons. This should include both hardstanding and drainage pipework.

A4.16 Some more recent facilities have made use of constructed wetlands rather than separators. If properly constructed, such wetlands can improve water quality and require less maintenance in the long term than a traditional separator. Constructed wetlands can discharge to either surface water or foul sewer depending on the water quality achieved and the granting of a consent from the appropriate regulatory authority. Advice on the use of Constructed Wetlands is contained in PETEL 65/45[19].

A4.17 Constructed Wetlands make use of bacteria contained in reed beds to degrade hydrocarbons. They must be constructed such that there is complete hydraulic containment of the drainage effluent prior to ultimate discharge of the treated water. To discharge surface water drainage from a UST facility to a naturally occurring wetland would not be acceptable and would be an offence under the Water Resources Act 1990.

A4.18 A further issue could be the potential for any leakage from below ground apparatus to enter the drainage system. This would be best addressed by locating the drainage system so that it is not adjacent to the storage tanks and dispensing pipework.

Leakage Detection and Wetstock Monitoring Systems

A4.19 The main types of leak detection and wetstock monitoring systems can be split into a number of classes numbered from 1 to 7, with decreasing effectiveness. The operation and effectiveness of these systems are summarised in Table 7.1 below.

Table 7.1 Summary of Leakage Detection and Wetstock Monitoring Systems

Class	Equipment Monitored	Method Of Operation	Effectiveness
1, 2 & 3	Tanks and pipework	Monitor interstitial spaces in double skin equipment	Indicates failure before loss of product to environment
4a	Tanks and pipework	Analyses change in tank contents with volume dispensed (automatic monitoring)	Leak is not detected until product is lost to environment
4b(1) & 4b(2)	Tanks	Analyses rates of change in tank contents (automatic monitoring)	Leak is not detected until product is lost to environment
5	Tanks and Pipework	Monitoring wells around storage area	Leak is not detected until product is lost to environment
6	Tanks and Pipework	Manual monitoring of product volumes and sales	Leak is not detected until product is lost to environment
7	Pipework	Measures pressure in pipework	Leak is not detected until product is lost to environment

A4.20 It should be noted that the most effective systems, i.e. those which detect a failure before loss of product into the soil, can only be used in conjunction with double skinned systems. Furthermore, a catastrophic failure could occur before leakage is detected by monitoring wells or wetstock monitoring. Whilst the provision of leakage detection will alert an operator to leakage, or potential leakage, it will not prevent a catastrophic failure.

A4.21 There are a number of potential inaccuracies inherent in product monitoring (i.e. classes 4a & 4b and 6). A result of this is that small scale leakage could go undetected for a considerable period of time, leading to a significant cumulative loss of product to the environment. Third party statistical inventory reconciliation (SIR) as carried out by independent contractors on behalf of facility operators (i.e. classes 4a & 4b) has become an increasingly sophisticated technique which has proved effective at indicating loss of product. Nevertheless, product will have been lost to ground before leakage is identified.

The volume of product lost, and hence the environmental impact, will depend on the period over which SIR is carried out. A significant issue for SIR would be what is considered to be the inherent error in the reconciliation process and whether this could lead to non-identification of leakage. For example, product volume will change with product temperature and if not correctly addressed might lead to false assumptions regarding tank volume. Industry organisations are approaching this issue by means of standard temperature accounting. Whilst SIR can be an efficient technique for detecting loss, manual product monitoring (i.e. class 6) is subject to much greater potential inaccuracies, and thus offers a lesser degree of environmental protection. The latest wetstock monitoring technology uses broadband communications systems to allow continuous remote reconciliation.

A4.22 In wetstock monitoring, errors can arise as a result of miscalibrated dispensers. This can result in the masking of leaks. Therefore, it is important that dispensers are regularly re-calibrated. If they are found to be out of calibration, the potential for a leak to have been masked must be addressed.

APPENDIX 5

Training Requirements and Sources

Introduction

A5.1 As noted earlier in the code, groundwater protection at UST facilities is dependent on both engineering and operational control measures. Assuming that engineered systems are properly installed and maintained, it is the operation of the site that presents the greater risk. Such risks can arise as a result of inadequate training or operator error at a facility. Training requirements would form an integral part of any EMS in place at a facility. The key issues to be addressed by training are:

- an understanding of the need for environmental protection;
- an awareness of the risks posed by a UST facility; and,
- the implementation of risk management procedures and controls.

A5.2 At the time of preparing this code, there are no statutory requirements with regard to training in environmental awareness for personnel designing, constructing, or operating storage facilities. However, there are general legal requirements to provide appropriate and sufficient training to ensure the health and safety of personnel working on or visiting UST facilities. Requirements on the management of health and safety are set out in the Management of Health and Safety at Work Regulations 1999 and other relevant legislation.

General Training Requirements

A5.3 The specific health and safety issues to be addressed on UST facilities is summarised in Appendix 2 of HS(G)146[3]. This guidance indicates that the issues on which training should be provided include:

- on-site hazards and risks;
- risk management measures and procedures;
- emergency procedures;
- control of visiting contractors.

A5.4 All persons working on the site should be given training commensurate with their responsibilities and a record of the training provided maintained. Training should be provided for all new staff, and refresher training provided for existing staff.

Specific Training for Environmental Awareness

A5.5 Most of the issues covered by health and safety training would be equally applicable to environmental protection, and can be readily expanded to cover such. Particular issues which should be covered by training on environmental issues include:

- groundwater (and general) environmental sensitivity;
- the consequences of groundwater pollution;
- facility specific risks;
- facility specific environmental protection measures; and,
- an individual's specific role and responsibility.

A5.6 All of the above should be detailed in the environmental risk assessment and risk management action plans for the facilities and form part of any EMS that is in place. These documents should have been read and understood by all personnel involved in the operation of a UST facility. As a minimum all persons involved in the operation of the facility should be aware of the existence of these documents and of the issues detailed in such. (For retail filling stations it could not be expected that this would include members of the general public using a facility as customers.)

Sources of Training

A5.7 Health and Safety training courses and materials are provided by a number of industry bodies including;

- the Association for Petroleum and Explosives Administration (APEA);
- the Forecourt Contractors Safety Association (FCSA)
- the Institute of Petroleum (IP);
- the Motor Industry Training Council (MITC);
- the Petroleum Industry Training Organisation (PINTO); and,
- the Petroleum Retailers Association (PRA).

A5.8 Relevant in-house training courses are also run by the larger oil companies.

A5.9 A number of courses run by these organisations already include, or are planned to include, awareness of environmental protection issuers. Attendance at a suitable course could provide evidence that training requirements are being met.

APPENDIX 6

Useful Guidance

General Industry Related Advice

A6.1 APEA/IP 1999[1] provides advice on engineering issues and contains references to other appropriate standards, codes of practice and guidance.

A6.2 The industry bodies listed in Appendix 5 are valuable sources of advice. The Institute of Petroleum should be able to provide contact details for appropriate people within these organisations. The Institute of Petroleum are located at 61 New Cavendish Street, London W1G 7AR, and can be contacted on 0207 467 7100.

A6.3 The current co-ordinating body for PLAs is the Petroleum Enforcement Liaison (PELG) which is part of the HSE Local Authority Unit Group. A series of guidance circulars known as Hela Lacots PETELS (PETroleum Enforcement Liaison Circulars) are issued on behalf of this body. Whilst intended principally for the dissemination of advice to enforcement officers, these circulars provide useful guidance on health and safety and engineering issues. For example, PETEL 65/14[20] addresses published codes of practice and PETEL 65/34[14] discusses proposed changes to the regulatory regime. Other potentially useful PETELs areeither referenced or listed in Appendix 6. Copies of PETELS can be obtained from the HSE (Local Authority Unit) on 020 7717 6442, or downloaded from the HSE website (www.hse.gov.uk/spd/content/petel).

Advice on Environmental Issues

A6.4 General advice concerning environmental protection is contained in the Environment Agency's Pollution Prevention Guidelines (PPG). A list of potentially useful PPGs is included in Appendix 6. Copies of PPGs are available (free of charge) from Environment Agency local offices, or can be downloaded from the Environment Agency website (www.environment-agency.gov.uk). The website also provides details of other available Environment Agency guidance documents.

A6.5 More specific advice can be provided by local Environmental Protection Officers. Contact detail for local Environment Agency offices are included at the end of this document.

Other Useful Publications

HELA LACOTS PETELS

PETEL 65/29, April 2000, *Petrol Dispensers and ATEX.*

PETEL 65/33, April 2000, *Status of HSE's Guidance Document HS(G)41 Following the Introduction of APEA/IP Guidance Document.*

HSE PUBLICATIONS

Health and Safety Executive (HSE), HS(G)176, *The Storage of Flammable Liquids in Tanks.*

POLLUTION PREVENTION GUIDELINES (ISSUED BY THE ENVIRONMENT AGENCY)

PPG1, *General Guide to the Prevention of Pollution.*

PPG2, *Above Ground Oil Storage Tanks.*

PPG6, *Working at Construction and Demolition Sites.*

PPG7, *Fuelling Stations Construction and Operation.*

PPG8, *Safe Storage and Disposal of Used Oils.*

PPG10, *Highway Depots.*

PPG11, *Preventing Pollution on Industrial Sites.*

PPG13, *High Pressure Water & Steam Cleaners.*

PPG14, *Marinas and Craft.*

PPG 18, *Control of Spillages and Fire Fighting Equipment.*

PPG19, *Garages and Vehicle Service Centres.*

OTHER GUIDANCE

Institute of Petroleum Guidelines for Soil, Groundwater and Surface Water Protection and Vapour Emission Control at Petrol Filling Stations.

ANNEX

Defra Groundwater Protection Code: Petrol Stations and other Fuel Dispensing Facilities involving Underground Storage Tanks

EXAMPLE CODE COMPLIANCE CHECKLIST

I. Defining an Underground Storage Tank Setting

Questions	Yes/No
1. Does a UST exist at the site?	
2. Are the site geology and groundwater/aquifer characterisation documented?	
3. Has the potential for corrosion of below ground equipment and materials been assessed?	
4. What elements of petroleum hydrocarbon handling are involved at the site?	
A. Storage	
B. Pipework between tank and dispensing point	
C. Product dispensing point	
D. Dispensing by trained operators	
E. Dispensing by Retail Consumers	
F. Delivery of product to facility by pipeline from off-site source	
G. Delivery of product to facility by transport vehicle	
H. Transfer of product between tanks	

II. Risk Assessment Checklist

Questions	Yes/No
1. Have all products being stored been identified?	
2. Have all potential release points been identified?	
A. Tanks and their fittings	
B. Pipework	
C. Dispensing equipment	
D. Delivery points (tank access chambers etc)	
E. Delivery areas	
F. Any other	
3. Have all potential receptors been identified?	
A. Groundwater	
B. Surface water	
C. Groundwater abstraction wells	
D. Above ground and below ground occupied spaces	
E. Drinking water supply pipes	
4. Have all potential migration pathways been identified	
A. Surface water drainage	
B. Foul drainage	
C. Underground services	
D. Surface Watercourses	
E. Ground and groundwater conditions	
5. Have risks been identified and prioritised?	

III Risk Management Systems

Questions	Yes/No
1. Is a risk management system in place?	*
2. Have the engineering control measures been identified?	
A. Tank type and construction	
B. Pipework	
C. Delivery systems and areas	
D. Dispensing systems and areas	
E. Drainage systems	
3. Have the operational and management controls been identified?	
A. Leak detection systems	
B. Environmental monitoring programmes	
C. Maintenance	
D. Emergency procedures	
E. Environmental management system (EMS)	
4. Are the systems regularly reviewed?	

*If the answer is 'Yes' continue; if 'No' go to ***IV Risk Management System Development***

IV. Risk Management System Development

Questions	Yes/No
1. Have risks been identified and prioritised?	
2. Have resources been identified to implement a programme of risk management (this can include not only capital improvements but also training and improvement of overall site operational procedures)?	
3. Has a programme been developed for implementation?	
4. Have target dates been set?	
5. Have all responsible parties been informed of the programme?	

V. Risk Management Programme Implementation

Questions	Yes/No
1. Have all responsible parties been informed of the programme?	
2. Have all responsible parties confirmed their commitment to the programme?	
3. Are records being kept of programme implementation elements?	
A. Employee training records	
B. Operational procedures and revisions as necessary	
C. Complete emergency procedures and agency notification requirements	
D. Site maintenance programmes and records of maintenance events	
E. Corrective actions required and follow-up conducted	
F. Capital improvement plans and their implementation	

Glossary

APEA: the Association for Petroleum and Explosives Administration.

Aquifer: geological strata capable of storing and allowing migration and abstraction of groundwater.

Bottoming: the removal of residual product from USTs prior to decommissioning.

BTEX: Benzene, **T**oluene, **E**thylbenzene and **X**ylenes – the main aromatic hydrocarbons present in petrol.

Controlled waters: includes rivers, streams, estuaries, canals, lakes, ponds, ground waters and territorial waters within the three mile coastal limit (*section 104 The Water Resources Act 1991*).

DEFRA: Department for Environment, Food and Rural Affairs.

DETR: Department of the Environment, Transport and the Regions.

Direct discharge: the introduction into groundwater of any substance in List I or List II without percolation through the ground or subsoil (*The Groundwater Regulations 1998*).

DWQS: drinking water quality standard.

EA: Environment Agency.

EMS: environmental management system.

GRP: glass reinforced plastic.

Groundwater: all water below the subsurface of the ground in the saturation zone and in direct contact with ground or subsoil (*The Groundwater Regulations 1998*)

Groundwater Notice: a legally enforceable notice served under Reg19 of the Groundwater Regulations 1998 which prohibits or controls an activity in order to prevent entry of List I substances into groundwater or to prevent the pollution of groundwater by List II substances.

Groundwater Protection Zone: designated zones around public water supply abstractions and other sensitive receptors that signal there are particular risks to the source that they protect.

Hazard: a property or situation that in particular circumstances could lead to harm (*DETR 2000*).

HSE: Health and Safety Executive.

Indirect Discharge: the introduction into groundwater of any substance in List I or List II after percolation through the ground or subsoil.

List I substances: the most harmful substances to the aquatic environment, selected on the basis of their toxicity, persistence and bioaccumulation. (List I is defined in the Schedule to the *Groundwater Regulations 1998*).

List II substances: substances which are less harmful (than those on List I) but which have a deleterious effect on the aquatic environment. (List II is defined in the Schedule to the *Groundwater Regulations 1998*).

MTBE: methyl tertiary-butyl ether – an additive of unleaded petrol used to raise the octane rating.

Petroleum hydrocarbons: chemical compounds containing carbon and hydrogen which are produced by the refining of crude oil and which are generally used as fuels.

PIRP: Pollution Incident Response Plan.

PLA: Petroleum Licensing Authority.

PPG: Pollution Prevention Guidelines.

PPPG: Policy and Practice for the Protection of Groundwater.

Product: generic term within the petroleum industry for hydrocarbon fractions.

Risk: a combination of the probability, or frequency, of occurrence of a defined hazard and the magnitude of consequences of the occurrence (*DETR 2000*).

S–P–R: **s**ource-**p**athway-**r**eceptor linkage used to evaluate environmental risk.

UST: underground storage tank.

WRA: the Water Resources Act 1991.

WRAS: Water Regulation Advisory Scheme

Contact Details for Environment Agency Offices

Environment Agency Offices

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Kingfisher House
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