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E U R E A U

Report of the Workshop on the Impact of Accidental Pollution on Water Resources

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IMPACT OF ACCIDENTAL POLLUTION ON WATER RESOURCES

PART ONE - INTRODUCTION

1. AIM

To provide guideline principles for preventing and responding to accidental pollution which could affect water resources, intended for (drinking) water production.

2. SCOPE

Article 19 of the Draft Framework Directive for Community Action in the Field of Water Policy states that Member States shall ensure that action is taken to prevent or reduce the impact of accidental pollution incidents. Annex VII, concerning River Basin Management Plans also states that these shall cover a.o. "a summary of the measures taken to prevent or reduce the impact of accidental pollution incidents".

In this document only the administrative and technical measures are considered. The environmental consequences of accidental pollution are not addressed in this document as the main objective is safeguarding water supply.

It should be noted that although pollution is usually caused as a result of an accident, it can also be caused by a deliberate discharge of pollutants to a water resource which could affect a drinking water.

Natural hazards - like droughts and floods - are not considered in this document, as the emphasis is on discharges. Nevertheless they can heavily impact on water supplies and are therefore worthy of attention. Especially droughts in some southern member states, where the climate becomes more arid, reoccurring droughts have become a grave concern, not only because of the lack of water, but also because of water quality effects, f.i. increasing salinity.

Although the hydraulic timescales of rivers, lakes and reservoirs, and groundwater are very different, the underlying principles of risk assessment, prevention and management are very much the same. Therefore, these actions will be dealt with in an integrated manner.

By far the most important is to prevent accidents happening which comes from risk assessment and preventative measures being in place. If they do happen, response

plans must be in place to minimize the impact, in order to guarantee the uninterrupted supply of (drinking) water.

The original draft of this document has been developed by a group of representatives of Eureau and National Administrations. This draft has been discussed during a workshop in Brussels, 27-29 January 1999, with participation of representatives of DG XI, governments, industry, agriculture and water supply. The suggestions and recommendations of this workshop have been incorporated in this final document, dealing with water supply impacts. However, it was strongly felt this was only a first step and that there was a need for a more general guidance document, dealing with (environmental) impacts of accidental pollution on aquatic ecosystems. It was also indicated that the document did not focus on the role of other actors like rescue services and fire brigades and that these should be included in an integrated approach to accidental pollution incidents.

PART TWO - PREVENTION

Prevention of accidental pollution relies on 2 basic principles:

- hazard and risk assessment by the responsible (water) authorities of all activities which could lead to accidental pollution;
- application of principles of good practice by all sectors, whose activities might cause accidental pollution.

3. PREVENTION - HAZARD AND RISK ASSESSMENT

a) Definitions

- **Hazard** Something with the potential to cause harm;
- **Risk** The likelihood that the harm from a particular hazard will occur with the extent of risk representing the number of people who might be exposed and the consequences to them.

b) Pollution Risk

The underlying elements of all source protection with respect to accidental pollution is:

Pollutant - Path - Target

A true risk only exists where the path is such that an identified pollutant will reach a target in a form which can cause harm.

c) Principles of Risk Assessment

Know your catchment

- To identify the hazards that exist in the area of concern (as defined by the river basin, catchment or groundwater protection zone) as far as possible using existing information, in particular from:
  - i) Land use in catchment;
  - ii) Industrial sites;
  - iii) Urban areas
- To assess the consequences of pollution from hazard taking into account the adverse impact on water treatment set out in paragraph 6. The assessment shall be for each contaminant for each industry and land use and recorded in an inventory of potential pollutants from different sources. If possible, high, low and medium risk categories should be distinguished.

Know your water resource

- To examine the time of travel:
  - i) For groundwaters, the path through the unsaturated and saturated zones taking account of chemical reactions;
  - ii) For rivers, downstream flow and pollutant behaviour;
  - iii) For lakes and reservoirs, the retention and residence time including wind-generated flow and short-circuiting.

In case of large(r) resources it is recommended to develop a practical model which describes pollutant transport and behaviour as a function of the hydrological properties of the water resource system.

Consequence analysis in case of a pollution incident

- To consider the probability that a contaminant(s) will reach an abstraction and breach drinking water standards or surface water directives.

  This includes the probability of each contaminant:
  - i) Spilling, (ie not retained in a secure area);
  - ii) Not being diluted or reduced in an unsaturated zone;
  - iii) Not being diluted or reduced in an aquifer.
- To identify the magnitude of consequences should a breach occur.

  The magnitude is envisaged to be a function of:
  - i) Identification of consequences;

ii) Assessment of importance associated with the realization of consequences, f.i. the number of people who could be affected and/or the toxic properties of the contaminant(s) involved;

iii) Mitigating factors, (f.i. removal of hazard, alternative source, treatment capacity, ability to cease abstraction for a period of time).

- To finalize the assessment with a result that suggests:
  i) Further assessment;
  ii) A specific action;
  iii) No further action.

d) Source of Pollutants

The following sources should be considered for potential hazards:

Man Made Hazards	**Natural hazards**
• Places of industrial activity, including abandoned sites;	Floods;
• Waste storage sites;	Earthquakes;
• Agriculture and horticulture;	Earth slides;
• Urban areas (storm water);	
• Community land use activities (pesticide use);	Fires;
• Sites which use radioactive sources;	Drought.
• Transport accidents;	
• Fuel storage and pipelines;	
• Explosions and resulting fires;	
• Mining operations;	
• Deliberate discharges and vandalism.	

e) Type of Pollutants

A variety of pollutants can impact on abstractions, including:

• Toxic material	f.i.	Spillage, road accident or fire.
• Organic material	f.i.	Sugar, which could impact on treatment processes such as disinfection.
• Microbiological	f.i.	Farm waste discharge, storm overflows.
• Taste causing chemicals	f.i.	Chlorophenolic compounds or fuel oils which can have a taste threshold well below levels of toxicological concern.
• Radioactive sources		
• Algal nutrients		

4. PREVENTION - PRINCIPLES OF GOOD PRACTICE

Preventative measures and preparatory actions with respect to accidents shall meet the following basic principles:

a) General

Where activities can have an impact on a body of water, the appropriate care necessary shall be taken to prevent contamination of the water or other detrimental change in its properties. For this, defining of principles of good practice is not enough. Their application by communities, industry, agriculture and transport is highly dependent on awareness. All parties concerned should realize their importance in preventing unintended contamination of water resources.

For big(ger) sites the responsible authorities should develop a regulatory framework, in which risk assessment and preventative measures are part of the licensing procedures. For small industries and farmers the approach should be based on cooperation in partnerships with all parties concerned. To promote understanding guidelines should be simple and practical. Education and training programs are essential parts for acceptance and successful implementation of preventative measures.

b) Industry

As a rule any site or pipeline handling substances which constitute a hazard to water and especially to water supplies shall be designed and operated in such a way that these substances cannot cause pollution. However, it should be remembered, that no containment is absolute.

- Any storage facilities shall be leakproof, stable and sufficiently resistant to mechanical, thermal and chemical influences.
- If leaks occur in any part of a site which has contact with substances constituting a hazard to water, they shall be recognizable in a quick and reliable way.
- Leaking substances constituting a hazard to water shall be identified, retained and recycled or properly disposed of. This includes water used for fire-fighting purposes.
- Appropriate containment areas should be designed to contain the substances in the event of any leak. As a minimum these shall be:
  - No drainage facility;
  - Made of impervious materials;
  - Able to contain more than the volume of liquid in the area.

  If the containment area is underground it shall be:

- Regularly inspected;
- Maintained;
- Double wall construction should be considered.

Know your drains

Drains provide a pathway to carry away different types of (waste) water. It must be ensured that only suitable effluent enters the appropriate drains. Drains should be colour coded to indicate the type of drainage.

Sites in water supply areas should take particular account of these guidelines. Waste water effluents which constitute a hazard to water shall be minimized by means of the best available techniques as a measure of prevention.
Sites shall be checked regularly by their operators and additionally by independent experts. Each site shall have operating instructions for maintenance, an alarm plan and an effluent quality monitoring program.
The use of water, especially the discharge of substances into surface water or groundwater and the use of facilities which use substances constituting a hazard to water require an official permit.
A check list for Industry is at Annex A.

c) Agriculture

Pollution on farms can arise from many different sources. Silage, slurry, fuel oils, pesticides, fertilizers and dirty water all have the potential to contaminate water and lead to pollution. To prevent pollution, the following guidelines should be followed:

- Farmers should use fertilizers, including manure, and pesticides in line with "good expert practice";
- The developers of pesticides should consider the effect of the product on the environment;
- Animal waste shall be handled and stored correctly;
- Containers of fertilizer and pesticides shall be cleaned or disposed of in a safe way.

It is essential that farmers have knowledge of these guidelines and know how to apply them in their own specific conditions. Therefore advice, education and training is paramount for their implementation and this should be an obligation of water authorities and suppliers in catchments where agriculture is a potential pollution source. Although conditions may differ, it is apparent that most of the guidelines for agriculture also apply to horticulture.
A check list for Agriculture is at Annex B.

d) Transport

- Where new transport systems (road or rail) are proposed, consideration should be given to these guidelines.
- In shipping the discharge of bilge oil, ship waste and toxic paint should be reduced. Deliberately discharge of bilge oil can be reduced greatly by bilge-receiving ships coming alongside. The risk of accidents should be reduced by raising safety standards to suit modern technology. Legal provisions concerning the transportation of dangerous goods shall be observed and monitored.
- Warning signs on waterways should indicate the use of water for drinking. Double walled ships carrying substances liable to create pollution f.i. oil, should be considered;
- In groundwater capture areas protection zones should be indicated by warning signs with telephone number.

e) Communities and the general public

Urban areas have increasingly become a source of accidental pollution. Among the many activities responsible are

- Use of weed-killers on hard surfaces;
- Fuel storage and handling by garages and the general public;
- Solvent use and spillage in (dry) cleaning activities.

Heavy rainfall causing run-off and storm water overflow or even flooding may aggravate the situation. Also here awareness raising by education is a task of authorities and water suppliers and most of the guidelines as given under agriculture are applicable.

f) Warnings

- In order to be able to warn water supply organizations and other water abstractors the following shall immediately be notified to the responsible authority:
  - Accidents in facilities for handling substances which constitute a hazard to water;

  or

  - Accidents in connection with the transportation of dangerous goods;

  This will minimize the impact of accidental pollution accidents which can cause a contamination of surface water or groundwater.

PART THREE - MANAGEMENT OF POLLUTION INCIDENTS

When an accident occurs it is necessary to judge how serious the situation is or can become. In case of life-threatening situations rescue services and fire brigades play a vital role. However, the scope of this document restricts itself to the consequences of pollution of a water resource.

In the first place it must be decided whether the situation only needs vigilance or that measures should be taken, in other words whether it is an accident which needs crisis management or not. It is impossible to give general guidelines because of the very large variety of possible circumstances. At least one criterion is whether the contamination might cause a breach in drinking water standards. For surface water there is an additional criterion, whether one or more parameters are going to exceed the obligatory standard(s) in the surface water directive.

For international rivers like the Rhine and the Meuse sets of alarm values have been developed for all parameters which can be considered relevant for potential accidental pollution. When any such alarm value is exceeded, this always leads to integrated action to deal with the consequences for water supply.

In the management of pollution incidents two basic elements can be distinguished:

- Availability of a response plan with detailed procedures for handling pollution incidents.
- Guarantee of continuity of water supply either by additional treatment in case of minor pollution or by use of alternative supplies in case of major pollution.

5. RESPONSE PLAN WITH PROCEDURES FOR DEALING WITH ACCIDENTS

In dealing with an accidental pollution, an effective warning system is paramount. This warning system shall be applied to the whole water source, with special attention on the abstraction zones for drinking water production. The abstraction source could be a river, a lake or an aquifer. In the case of a river basin, the main rivers and important tributaries shall be considered. Where potential abstraction water crosses regional or national boundaries, warning systems shall be interconnected and mutual assistance provided upon request. Cooperation in this field between nations is very important, as the water quality in a downstream country is very much dependent on activities in the upstream state(s).

a) Warning Systems

An efficient warning system shall be based on the following framework:

- A well organized communication center;
- A comprehensive list of people or institutes to be warned, with a subdivision depending on the nature and importance of the accident;
- A list of specialists to be consulted in the case of uncommon accidents;
- A well documented database with information about the contaminants that could affect the drinking water;
- A catalogue of possible measures to be taken in the function of single polluting component or a group of substances;
- Practical models to predict the time of travel of the pollution along the waterway.

b) Information Sources

Information about accidental pollution can be generated by the following channels:

- Information given by the person which caused the accident;
- Direct observation of the accident by controlling authorities;
- Registration of abnormal measures values in permanent monitoring stations located on critical points;
- Notification of observable abnormalities (f.i. fish kills, oil films, abnormal smells) by organized patrol tours or by members of the population.

c) Monitoring Stations

In the whole context of warning and alarming, continuous monitoring stations play an important role. They could easily be realized on rivers and small lakes while monitoring of aquifers and large lakes is more complicated. In order to be effective these stations have to be equipped with the following tools:

- Automatic sampling devices;
- General measuring equipment for analysis of common water parameters;
- Adequate biomonitoring systems covering a broad range of contaminants;
- Good transmittance devices to generate alarms in the communication centers.

For each parameter measured an indication value and an alarming value have to be fixed. Both exceedences are communicated to the water suppliers. Only in the case of breaching an alarm level is the alerting of identified people or institutes compulsory.

d) Message Recording

All messages sent to the communication center shall be passed by voice and be confirmed in writing. In all permanent communication centers that can receive messages and additional information about accidental pollution, a log book shall be available (possibly on electronic support). In that log book the following information shall be mentioned:

- The sender of the message;
- Date and hour of receipt of the message;
- Date and hour of alarming the concerned services;
- Name(s) of person(s) warned in the concerned services;
- The particularities of the incident;
- Immediate actions that have been taken.

e) Exercises

In all warning systems, the throughflow of the messages has to be regularly checked by organized pollution warning (Polwarn) exercises which take into account all possible scenarios. These exercises shall ensure the functionality of the procedures to gain confidence in incident management and to remove errors.

f) Emergency Procedures and Crisis Management

In every water production center, a Crisis Management Plan shall be available. That plan has to be revised once a year and is composed of standard emergency procedures that allow the concerned people to deal with an emergency case needing only minimal headquarters assistance.

In the case of a disaster in the area of water source, being abstracted for drinking water production, a Crisis Management Team shall be composed by all groups that are involved in coping with the consequence of the accident, including:

- The instances that caused the accident;
- The water supply companies affected by the consequences of the accident;
- The authorities that are qualified for dealing with the matter.

This team is organized in such a way that it has an overview of the whole situation far beyond the limited scope of the operational response. It has also to supervise the different parties concerned to ensure that they take their proper responsibilities as described below:

- The provokers of the accident shall manage all the circumstances that have led to the accident and have to provide all relevant information;

- The water supply companies shall take all measures to minimize the direct consequences of the accident for the water production;
- When necessary, additional sampling and measuring programs should be carried out to determine the gravity of the incident and to follow the course of the contaminant(s).

g) Public relations

- It is paramount that the water supply company maintains a good relationship with its customers, because confidence lost is not easily rewon;
- Therefore water companies and/or authorities shall provide all means for giving the necessary and correct information to the public;
- For this it is necessary to have a well-developed communication plan with informed spokespersons being available for communication with the media.

h) Aftermath of an Incident

In all systems, sufficient attention has to be paid to the aftermath of the accident. This implies the following actions:

- To verify that the accident site is free of pollution;
- To follow up the pollution residues in the polluted water bodies;
- To notify the concerned people that the accident is closed;
- To review and identify lessons learned from the incident and where appropriate inform others.

6. WATER TREATMENT OPTIONS AND ALTERNATIVES SUPPLIES

a) Continuity of Supply

Faced with accidental pollution the water supplier shall be able to guarantee the continuity of drinking water distribution. There are two means available to achieve this:

- Treat the pollution in case of a minor incident;
- In case of grave pollution which cannot be eliminated, have raw water or treated water storage capacity for use during the time of passage of the pollution or use alternative resources.

All measures shall be taken in close consultation with the responsible health authorities. Where possible, pressure should be retained in the distribution system for hygiene and firefighting purposes. This will also prevent pollutants entering the system.

b) Treatment Possibilities

The following principles apply to the treatment of pollution:

- Identification of the pollutants:
  - Access to library information;
  - Laboratory organized for emergency measures;
  - Quantitative analysis methods for the most generally found potential pollutants;
  - Rapid screening techniques covering a wide range of products (chromatography linked to mass spectrometry, toxicity tests, carbon analysis, etc.).
- Rapid batch tests to evaluate additional treatment options:
  - Superdosing of "standard' reagents used in drinking water production treatment plants (coagulant, oxidants, ozone, chlorine, etc.);
  - Crisis reagents: high adsorption powdered activated carbon, oxidant coupling (hydrogen peroxide and ozone), oil absorbents.
- Standby treatment facilities:
  - Aeration for solvent removal;
  - Dosing equipment for crisis reagents.

These preliminary tests allow an evaluation of treatment capacities and thresholds above which treatment is no longer possible. This procedure can be speeded up, when simulation models are available to predict treatment effectiveness.

c) Other options

The levels of contamination attained during accidental pollution incidents may be very high and incompatible with any treatment or superdosing. In this case, it is necessary to have an emergency system which has one or more of the following elements:

- A mobile back-up emergency treatment facility (in case of small systems);
- An interconnected network with other drinking water treatment plants;
- Raw water storage reservoirs allowing the treatment plant to be isolated as the pollution passes by (incl. a pre-reservoir to minimize contamination of the main reservoir);
- Treated water storage to be able to meet the requirements of consumers for as long as possible whilst the treatment plant is shut down;
- Possibility to lower the production of the plant.

On receipt of a pollution warning and before the pollution reaches the water intake point, the treatment plant's production should be increased to fill the

treated water storage, whilst at the same time, raw water reserves are brought up to their full capacity.

d) Additional options for groundwater resources

The above mentioned procedures mostly apply to surface water resources. In case of groundwater pollution some additional methods are available to prevent the contaminant(s) to reach the abstraction point:

- The sealing of underground layers to contain the pollution;
- Groundwater abstraction or infiltration of water to influence the direction of flow to prevent contamination of the abstraction zone;
- Neutralization of strongly acid or alkaline compounds;
- Excavation from the soil and disposal of the pollutant(s);

It is clear that the two methods mentioned last already have the character of re-habilitation.

e) Concluding remark

In many cases accidental pollution is caused by spills of fuel oils. There seems to be a trend from large(r) spills of toxic materials to small(er) spills of taste and odour substances. This runs parallel to pollution incidents in big river systems becoming less frequent, so that more attention should be paid to incidents in small (groundwater) supplies.

7. REHABILITATION TECHNIQUES

When an accident with substances constituting a hazard to water has occurred, it is important to identify the characteristics of the event through investigation and knowledge of the polluting substances.

Investigation with vulnerability maps should be considered, f.i. topographical, geological, groundwater.

a) Rapid Site Investigation and Identification of Pollutants

The following points should be considered:

- When and where did the accident occur?
- Site description at the time of the accident;
- Identify substances that have been released, note international code used for transport of chemicals;
- Estimate volume or mass of released substances;
- Point of entry to watercourse, aquifer or lake;
- Distance to abstraction point for water supply/water protection area.

b) Spreading of Pollutant

The following points should be considered:

- Survey the dispersion of the pollutant;
- Determine the risk of the substances to catch fire or release gas;
- Remove sources of lightning and ventilation (where appropriate);
- Determine the need for cooling systems;
- Determine possibility and need to contain the pollutant;
- Determine need to seal the pipes for storm drainage or sewage use.

c) Rehabilitation Techniques

There is only limited experience with rehabilitation of water resources. Cleaning operations after oil pollution seem to be most frequent.

Chances of rehabilitation improve when the contamination can be contained in a limited area. This specially applies to oil products which subsequently can be removed by absorbents.

The choice of rehabilitation techniques depends on the chemical and physical properties of the polluting substance and position of the substance in the hydro-geological environment (groundwater aquifer, lake or reservoir, river).

Groundwater

Accidental pollution of the subsoil results in a complex situation in which the behaviour of the contaminant(s) is determined by many factors:

- The presence of an unsaturated and saturated zone;
- The geological nature of the different soil-layers:
- The dispersion rate of the contamination as a function of:
  - Groundwater movement;
  - The distribution of the pollutant(s) between water and soil compounds in the solid phase;
  - The density of the pollutants;
- (Bio)degradation.

Methods of rehabilitation of groundwater aquifers which have been applied on a more or less practical scale are:

- Abstraction and treatment of the contaminated water and subsequent re-charge (for water-soluble compounds);
- Excavation and treatment of the soil (for insoluble compounds);
- Neutralization of strongly acid or alkaline compounds;
- Bioremediation with specifically adapted micro-organisms.

Lakes and Reservoirs

Rehabilitation depends on residence time and the characteristics of the pollutant(s). Generally residence times are long, so pollution may longer persist. On the other hand hydrological conditions (less turbulence, thermal stratification) and the presence of multiple outlets for abstraction of water may allow more time for removal mechanisms to occur or for taking in-lake measures.

Some removal mechanisms which improve water quality are:

- Settling of insoluble substances;
- (Bio)degradation;
- Evaporation of volatile substances.

In-lake rehabilitation measures, which can come under consideration:

- Flushing of affected layers, especially under stratified conditions;
- Chemical neutralization or precipitation with f.i. lime, aluminum or iron salts;
- Absorption of floating (oil) layers.

Rivers

Rehabilitation mostly occurs naturally by flushing, depending on flow conditions. This applies to dissolved pollutants but in turbulent rivers also suspended material is transported.
Some experiments have been done to restore polluted sediments:

- By dredging with specially developed dredging equipment for non-degradable contaminants;
- By adding specifically adapted micro-organisms which can breakdown pollutants (bioremediation).

PART FOUR - CONCLUSION

This document reviews the basic issues that need to be considered in drawing up plans to deal with accidental pollution of water resources. Great emphasis is placed on prevention to minimize the risk of accidental pollution occurring. For this, it is necessary to have risk assessment and preventative measures in place. The principles of risk assessment have been identified and the principles of good industrial and agricultural practice are given.

When accidental pollution of a water resource does occur, response plans must be in place to minimize the impact. The essential elements of procedures for dealing with accidents are described. These include the presence of an effective warning system, the role of monitoring stations, the exchange of information and the availability of a Crisis Management Plan containing emergency procedures. Water treatment options and the use of alternative supplies are also considered. Finally an overview of rehabilitation techniques is given.

It is recommended that water authorities, water suppliers, administrators, industries, transport and farmers should consider and implement the guidance in this document. Water suppliers should also seek closer cooperation with civil protection agencies (fire brigades) to benefit from their experience in developing manuals for intervention during (major) accidents. The Civil Protection Unit of DG XI is prepared to assist in promoting cooperation between all parties concerned.

The economic consequences of pollution incident prevention and management have not yet been considered. For small resources the cost could become very high. The necessary level of implementation will therefore be a function of the nature of the water resource and the number of people depending on it for their supply.

ANNEX A

CHECK LIST FOR INDUSTRY

1. YOUR DRAINS

There are three types of drain:

* Soakaway drains which allow (clean) water percolation into groundwater;
* Foul water drains carrying waste away for treatment;
* Surface water drains carrying (clean) water away to the nearest stream or river.

Putting waste into the surface water drain pollutes clean water and must not occur. Only authorized discharges can be made to the foul water drain as in many cases that too can cause pollution.

MAKE SURE THAT YOU KNOW WHICH DRAIN IS ON YOUR SITE.

2. DELIVERIES

The potential for accidental spillages is greatest during deliveries, so these need to be handled with special care.
Make sure you know who is responsible for supervising deliveries of hazardous substances or raw materials, and that they are in attendance.

If you have a delivery due:

* Check storage tank levels to prevent overfill;
* Make sure storage tanks are accurately labeled with the contents and volume. Automatic systems to prevent overfilling should be considered;
* Remember to keep a stock of absorbent material near the delivery area to mop up any small spillages.

MAKE SURE THAT YOU ARE AWARE OF ALL EMERGENCY PLANS REGARDING ACCIDENTAL SPILLAGES.

3. STORAGE

Most industrial sites keep stores of oil and chemicals which present a major threat to the environment. To minimize this threat:

* Always use appropriate containers for each different material being stored and ensure that containers are sturdy, leakproof and place in sufficiently large containers;
* Make sure any rainwater collecting in storage areas is regularly pumped out;
* Cover all surface water drains with oil separators or interceptors, especially in lorry parking or fueling areas;
* Never allow water containing detergents to drain into oil separators;
* Vandals and thieves can cause serious environmental damage, so make sure that security procedures are always followed and that stores are kept under cover where possible.

4. CLEANING

It is important to realize the potential dangers that cleaning can present to the environment. All cleaning agents are potentially polluting, so make sure that:

* Washing is only done in a confined area which drains to a foul sewer:
* No detergents are ever discharged into surface water drains. This includes detergents described as bio-degradable;
* Yard and parking areas are never washed to a surface water drain.

5. WASTE STORAGE AND DISPOSAL

Hazardous waste, when stored or disposed or incorrectly, can create an environmental disaster. Help prevent that happening by making sure that:

* All waste materials are stored in designated areas, completely isolated from surface water drains;
* Rubbish compactors are covered to prevent a build up of contaminated rainwater. Collected rainwater will be polluted and should always be drained to the foul sewer.

6. EMERGENCIES

However careful you are, there will always be occasional accidents.

* Make sure that you are fully aware of any contingency plans your Company has to deal with environmental emergencies.

ANNEX B

CHECK LIST FOR AGRICULTURE

1. DEVELOP A POLLUTION PREVENTION PLAN

* Recognize and quantify pollution risk activities;
* Identify areas of high pollution risk on the farm;
* Identify local watercourses and drains;
* Minimize and manage all farm waste;
* Be prepared to deal with an accident or emergency.

2. FERTILIZER USE

* Match fertilizer needs accurately to crop requirements and soil conditions;
* Always check weather forecasts and do not over apply;
* Take care to comply with legal requirements for storage, transportation and handling.

3. SILAGE AND EFFLUENT

* Ensure silage effluent cannot drain into watercourses;
* Block off or remove any drains under the silo;
* Regularly check effluent levels;
* Do not store within 10 metres of a watercourse or 50 metres of a reservoir;
* Follow regulation requirements for silage store design.

4. LIVESTOCK AND WASTE

* Avoid livestock entering and polluting watercourses;
* Ensure sufficient waste storage facilities;
* Separate solid and liquid wastes as well as clean and dirty water;
* Do not store slurry within 10 metres of a watercourse or within 50 metres of a reservoir;

* Dispose of carcasses in an approved way;
* Site sheep dipping pens carefully and dispose of sheep dip through recommended routes.

5. PESTICIDE USE

* Always follow product label recommendations for application rates and methods and be sure never to exceed them;
* Allow spray buffer zones adjacent to watercourses and avoid direct pollution through spray drift;
* Take care to comply with legal requirements for storage, transportation, handling and waste disposal;
* Always use sand or inert adsorbent materials to contain accidental spillage;
* Aim to minimize pesticide use.

6. FUEL OILS

* Ensure fuel stores are fully bunded;
* Valves and taps should empty downwards and be lockable;
* Fuel stores should be more than 10 metres away from watercourses and 50 metres away from reservoirs.

7. REVIEW AND UPDATE

* Regularly review pollution prevention plans;
* Continually monitor fertilizer and pesticide requirements;
* Consider new pesticides and techniques which avoid waste and pollution risks.

C O N T E N T S