SOUTH WESTERN RIVER BASIN DISTRICT

Literature review

Dangerous Substances Usage Programme of Measures Study

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in association with

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Revision Control Table

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A	Issued to Dangerous Substances Steering Group	KR	FM/GG	GG	Jan 2007
B	**Ciaran O'Donnell and Conor Cleneghan comments incorporated**	**KR**	FM/GG	**GG**	**June 2007**

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Abbreviations

BOD	-	Biochemical Oxygen Demand
CEC	-	Council of the European Communities
CIRCA	-	Communication & Information Resource Centre Administrator
COMMPS	-	Combined Monitoring-based and Modelling-based Priority Setting
CSO	-	Central Statistics Office
CTC	-	Clean Technology Centre
DAF	-	Department of Agriculture and Food
DEFRA	-	Department of Environment, Food and Rural Affairs (UK)
DG	-	Directorate General
DG Env	-	Directorate General Environmental
DSD	-	Dangerous Substances Directive (76/464/EEC)
DSDD	-	Dangerous Substances Daughter Directives
EPA	-	Environmental Protection Agency
EQS	-	Environmental Quality Standards
ERTDI	-	Environmental Research Technological Development and Innovation
GIS	-	Geographical Information Systems
GSI	-	Geological Survey of Ireland
IPPC	-	Integrated Pollution Prevention Control
MS	-	Member States
MTBE	-	Methyl tert butyl ether
NACE	-	Classification of Economic Activities in European Community
NI	-	Northern Ireland
NS Share	-	North South Share
PAH	-	Polycyclic Aromatic Hydrocarbons
PCB	-	Polychlorinated Biphenyls
PCS	-	Pesticide Control Service
PIN	-	Pollution Index Number
POMS	-	Programme of Measures and standards
PS	-	Priority Substances
PHS	-	Priority Hazardous Substances
RIA	-	Regulatory Impact Assessment
RoI	-	Republic of Ireland
RBD	-	River Basin District
RBMP	-	River Basin Management Plan
SEPA	-	Scottish Environment Protection Agency
SERBD	-	South Eastern River Basin District
SI	-	Statutory Instrument
SWRBD	-	South Western River basin District

WFD	-	Water Framework Directive (2000/60/EC)
WWTW	-	Waste Water Treatment Works
UCD	-	University College Dublin
UKSIC	-	United Kingdom Standard Industrial Classification
UKWIR	-	United Kingdom Water Industry Research
UNEP	-	United Nations Environmental Programme

Glossary

Dangerous Substances Directive (76/464/EEC) List 1 Substances- list of substances selected mainly on the basis of their toxicity, persistence and bioaccumulation

Dangerous Substances Directive (76/464/EEC) List II substances: substances which have "*deleterious effect upon the aquatic environment"*
Note: Directive 76/464/EEC has been consolidated has Directive 2006/11/EC

Dangerous Substances Daughter Directives:
The Daughter Directives include:

- Directive on Discharges of Mercury from the chlor-alkali electrolysis industry (82/176/EEC).
- Directive on Discharges of Cadmium (83/513/EEC).
- Directive on Discharges of Mercury from other sources (84/156/EEC).
- Directive on Discharges of Hexachlorocyclohexane (84/491/EEC).
- Directive on Discharge of List I Substances (Directive 86/280/EEC as amended by Directives 88/347/EEC and 90/415/EEC).

Good status: means the status achieved by a waterbody when both its ecological status and its chemical status are at least 'Good'

NACE Code: Classification of Economic Activities in the European Community

Priority Hazardous Substances: According to the Water Framework Directive 2000/60/EC 1 (WFD), priority hazardous substances are defined as those among the priority substances that are toxic, persistent and liable to bio-accumulate, and other substances which give rise to equivalent level of concern (Definition, Article 2.29 and 2.30, WFD).

Priority Substances: are substances identified in accordance with WFD Article 16(2) and listed in Annex X (33 Substances). Among these substances there are 'priority hazardous substances' which means substances identified in accordance with WFD Article 16(3) and (6) for which measures have to be taken in accordance with Article 16(1) and (8).

Programme of Measures: protection measures designed to meet the aims of the WFD

Priority Action Substances is a term applied by the National Dangerous Substances Expert Group to the following substances: Annex X (WFD) and Annex IX (WFD- relating to the Dangerous Substances76/464/EEC Daughter Directives).

Relevant pollutants: are specific synthetic and non synthetic substances (not on priority action list) whose presence may lead to a risk of Irish waters failing the objectives of the WFD

Water Framework Directive: Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

Water Policy Regulations: Irish Statutory Instruments which support the WFD, EC Water policy Regulations (S.I No. 722 of 2003) and EC Water Policy Regulations (Amendment) (S.I. No. 413 of 2005)

1.0 Introduction

The Water Framework Directive (WFD) 2000/60/EC, introduced in December 2000 is the most significant piece of water-related legislation in Europe to date. The WFD was transposed into Irish law by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003).

Previous water related legislation has been fragmented but the WFD takes a more co-ordinated and holistic approach. The WFD's main objective is to achieve at least good status in all waters by 2015. Good surface water status requires both good chemical status and good ecological status.

Chemical status is determined by reference to substances identified in Annex IX, priority substances listed in Annex X of the WFD and the relevant pollutants indicated in Annex VIII.
Ecological Status is determined by:

- Biological quality elements; and
- Chemical and physico-chemical elements supporting the biological elements e.g. thermal, oxygenation and nutrient conditions and chemical pollutants extracted from the universe of substances listed in Annex VIII: and
- Hydromorphological elements supporting the biological elements e.g. flow regime, morphology.

Both ecological and chemical status are determined by reference to chemical substances.

The definition of "Dangerous Substances" incorporates all of the following groups and was adopted from the Discussion Document produced by the National Dangerous Substances Expert Group

- Priority Substances are substances identified in accordance with WFD Article 16(2) and listed in Annex X (33 Substances). Among these substances there are 'priority hazardous substances' which means substances identified in accordance with WFD Article 16(3) and (6) for which measures have to be taken in accordance with Article 16(1) and (8).

- Priority Action Substances is a term applied by the National Dangerous Substances Expert Group to the following substances: Annex X (WFD) and Annex IX (WFD- relating to the Dangerous Substances 76/464/EEC Daughter Directives).

- Relevant (or Specific) Pollutants are specific synthetic and non synthetic substances (not on the priority action substance list) whose presence in Irish waters may lead to a risk of failing the objectives of the WFD.

The Characterisation report submitted to the European Commission under Article V of the WFD highlighted knowledge gaps. These gaps in information will need to be filled to establish the status of water bodies and to develop River Basin Management Plans (RBMP) containing a programme of measures for reporting to the European Commission in 2010. The Programme of Measures and

Standards (POMS) studies were established to fill the knowledge gaps identified by the Characterisation report. The Dangerous Substances Usage POMS study is one of 13 national POMS studies. The Characterisation report highlighted that detailed quantification of dangerous substances presence and loads were not available. Further study on the usage of Dangerous Substances in Ireland is required to fill the data gaps.

Under the WFD a Dangerous Substances Screening Programme has been carried out. The screening programme has involved investigative monitoring of water, sediment and biota for dangerous substances. The purpose of the screening programme is to assess if substances on the EU priority lists and candidate lists developed by the dangerous substances Expert Group are detected, to obtain concentration data for these substances and to compare these against suitable benchmarks. The Dangerous Substances Usage POMS study will complement the Dangerous Substances Screening Study. The Dangerous Substances Usage study includes gathering information on the specific sources of the substances listed in Annex X and IX as well as those found in the screening study. The Dangerous Substances Usage study will highlight substances discharged to the environment that may have been found in the water/sediment or biota samples in the Dangerous Substances Screening Programme. The Dangerous Substances Usage study may also highlight substances discharged that were not found in the screening study.

1.1 Objectives of Dangerous Substances POMS study

The key objectives of the Dangerous Substances Usage POMS study are summarised as follows:

- To establish (via literature review and examination of Irish datasets) the dangerous substances likely to arise in Irish water bodies due to particular human activities.
- To provide information and/or tools for the ongoing collation of the pressures and sources of dangerous substances in Irish water bodies.
- To establish a framework for the licensing and control of dangerous substances discharges
- To optimise the design of the facility (i.e. point source) and status monitoring programmes to be established in accordance with Article 8 of the WFD.

The focus of the Dangerous Substances usage study is on industrial use of dangerous substances. It is also proposed that the study will develop inventories of dangerous substances in use in forestry, agriculture and aquaculture.

2.0 Objectives and structure of the literature review

The literature that has been reviewed for this Dangerous Substances Usage POMS study is from national studies, UK/SEPA studies and European guidance. The studies are related to the use of dangerous substances by industries, agriculture, aquaculture, transport networks etc. The studies were collated by the consultants and from the advice given by the dangerous substances expert group. The studies reviewed identify the likely sources of dangerous substances from anthropogenic activities. The objective of this literature review is to establish possible sources of dangerous substances. Some of the reports examined have associated tools and methods of determining dangerous substances sources. These tools and methodologies will be examined taking into account their relevance to the dangerous substances POMS study.

Structure of Literature Review

- **The literature review notes the dangerous substances related legislation and guidance and the associated documents.**
- **The main part of the literature review is divided into the different sources of use, the first being industry, then agriculture, domestic and service sector use, municipal sources, fisheries and marine, transport networks, diffuse sources and mines and contaminated lands. For each of the sources of dangerous substances the relevant literature is discussed and its applicability to Dangerous Substances Usage POMS study is presented in a box at the end of each section.**

3.0 Legislation review

The Dangerous Substances Regulations (S.I. No. 12 of 2001) prescribe water quality standards in respect of 14 dangerous substances in surface waters. The substances concerned include pesticides (atrazine, simazine, tributyltin), solvents (dichloromethane, toluene, xylene) metals (arsenic, chromium, copper, lead, nickel, zinc) and other substances (cyanide, fluoride). These substances addressed by the Dangerous Substances Regulations have a high priority internationally and are likely to be in use or present in Ireland. The substances were prioritised taking into account their toxicity, persistence and bioaccumulation. The regulations state that local authorities must report to the EPA the measures taken to achieve compliance with Dangerous Substances regulations. Water quality targets set in the Regulations must be met by 2010 and, where the existing condition of waters does not meet a particular standard, there must be no disimprovement in water quality in the meantime. New licences granted by the EPA and local authorities must reflect the prescribed standards, and existing licences must be reviewed.

Other Irish Legislation covering dangerous substances discharges are the Local Government (Water Pollution) Act 1977 and Local Government (Water Pollution) (Amendment) Act, 1990. The WFD was transposed into Irish legislation by the European Communities (Water Policy) regulations 2003, (S.I. No 722 of 2003).

3.1 European Legislation and Relevant Implementation documents

Table 3.1.Indicates the Legislation documents that have been reviewed to date.

Table 3.1: Legislation documents that have been reviewed to date

Legislation Number	Legislation	Author
3.1	Dangerous Substances Directive 76/464/EEC. This Directive has been consolidated as 2006/11/EC	Council of the European Communities, 1976
3.2	Commission Communication to the Council of 22 June 1982)	Council of the European Communities, 1982
3.3	Dangerous Substances Daughter Directives	Council of the European Communities
3.4	Decision 2455/2001/EC establishing the list of priority substances	Council of the European Communities, 2001
3.5	Priority Substances Commission Proposal (Com (2006)397)	Council of the European Communities, 2006

3.1 Dangerous Substances Directive 76/464/EEC

The Dangerous Substances Directive (76/464/EEC) aimed to eliminate, or to reduce, pollution of water by certain dangerous substances listed in the Annexes of the Directive (Council of the European Communities, 1976). The Directive requires that Member States take the appropriate steps to eliminate pollution to inland surface water, territorial waters, internal coastal waters and ground water by the dangerous substances in List I of the Annex and to reduce pollution of the said waters by the dangerous substances in List II of the Annex.

In 1980 the protection of groundwater was taken out of 76/464/EEC and regulated under the separate Council Directive 80/68/EEC *on the protection of groundwater against pollution caused by certain dangerous substances*.

The Council Directive 76/464/EEC will be integrated in the Water Framework Directive. Article 22 together with Article 16 of the Water Framework Directive (2000/60/EC) set out the transitional provisions for the existing Directive on discharges of certain dangerous substances (76/464/EEC). In summary, the provisions are as following:

- Article 6 (list I substances) was repealed with the entry into force of Directive 2000/60/EC;
- List of priority substances has replaced the 'candidate list I' of 1982;
- 'Rest' of 76/464/EEC including the emission reduction programmes will be still in place until 2013 (transition period);
- Review of WFD Annex IX Directives within 2 years after entry into force of Directive 2000/60/EC

3.2 Commission Communication to the Council

In 1982 the Commission communicated to the Council a list that included 129 substances (Council of the European Communities, 1982). Three more substances were subsequently added to that list. The eventual total of 132 substances was considered by the Commission as potential List I substances under the DSD. Of the 132, eighteen substances were subsequently the subject of the Dangerous Substances Daughter Directives

3.3 Dangerous Substances Daughter Directives

The "Daughter Directives" regulate further List I substances by establishing emission, limiting values and water quality objectives. The Daughter Directives are based on Article 6 of Council Directive 76/464/EEC. The Daughter Directives cover eighteen of the List I substances in five specific directives.

The Dangerous Substances Daughter Directives are:

- Directive on Discharges of Mercury from the chlor-alkali electrolysis industry (82/176/EEC)
- Directive on Discharges of Cadmium (83/513/EEC)
- Directive on Discharges of Mercury from other sources (84/156/EEC).

- Directive on Discharges of Hexachlorocyclohexane (84/491/EEC)
- Directive on Discharge of List I Substances (Directive 86/280/EEC as amended by Directives 88/347/EEC and 90/415/EEC

These Directives were the first mandatory minimum requirements for an approach based on best technical means (later BAT).

These directives are to be repealed with effect from the 22 December 2012 in accordance with the new Priority Substances directive as proposed through COM(2006) 397.

Irish regulations were made to transpose the Dangerous Substances Daughter directives into Irish national law these include:

- S.I. No. 245 of 1994. Local Government (Water Pollution) Act 1977 and 1990 (Control of ECD, TRI, PER, and TCB Discharges) Regulations, 1994
- S.I. No. 43 of 1994. Local Government (Water Pollution) Acts 1977 and 1990 (Control of Carbon Tetrachloride, DDT, and Pentachlorophenol Discharges) Regulations, 1994
- S.I. No. 348 of 1993 Local Government (Water Pollution) Acts 1977 and 1990 (Control of Aldrin Dieldrin, Endrin, Isodrin, HCB, HCBD and CHCl3 Discharges) Regulations, 1994
- S.I. No. 55 of 1986. Local Government (Water Pollution) Act 1977 (Control of Hexachlorocyclohexane and Mercury Discharges) Regulations, 1986
- S.I. No. 294 of 1985. Local Government (Water Pollution) (Control of Cadmium Discharges) Regulations, 1985

3.4 Decision 2455/2001/EC establishing the list of priority substances

Article 16 of the Water Framework Directive (2000/60/EC) sets out a "Strategy against pollution of water". Article 16 outlines the steps to be taken. The first step of the strategy was the establishment of a list of priority substances to become Annex X of the Directive.

The preparation of the priority list included a procedure called COMMPS (Combined Monitoring-based and Modelling-based Priority Setting) which was developed to identify the substances of highest concern at Community level. Decision (2455/2001/EC), which established the list of priority substances, was adopted on 20 November 2001.

3.5 Dangerous Substances Commission Proposal (Com (2006)397)

Under WFD Article 16 requirements the Commission adopted a proposal (Com (2006)397) for a directive setting environmental quality standards for the priority substances was adopted in July 2006. The standards set out by this directive must be achieved by each Member State by 2015. The proposed directive will repeal the existing daughter directives. The 41 substances or substance groups for which the proposed directive sets concentration limits include 33 'priority substances' and a further eight substances covered by existing legislation on dangerous substances in water. After the proposal is

approved by the European Council and Parliament it will be made law. Irish legislation may need to be made to transpose the directive into Irish law.

Applicability to Dangerous Substances Usage POMS study

- **Article 6 of Directive 76/464/EEC (relating to the List I substances), was repealed on the 22nd of December 2000, the date of entry into force of the WFD.**
- **List of priority substances has replaced the 'candidate list I' of 1982;**
- **Review of WFD Annex IX Directives within 2 years after entry into force of Directive 2000/60/EC**
- **The remainder of the Directive 76/464/EEC including the emission reduction programmes shall not be repealed until 13 years after the date of entry into force of the WFD.**
- **During the 13 year transition period (2000-2013) Member States are required to continue to comply with both the WFD and the DSD requirements.**
- **Provisions for the 13 year transition period are set out in WFD Article 22(2) and (3). These provisions state that the list of Priority Substances will be replaced by that in Article 16 of the WFD. The methods of implementation of the directive 76/464/EEC(Article 7) will be replaced by those set out in the WFD relating to identification of pollution problems, the development of standards and adoption of measures**
- **Irish Dangerous Substances Legislation will have to be reviewed to implement some of the findings of the Dangerous Substances Usage Study.**
- **The development of new standards for dangerous substances will be transposed into National Law. There are currently 30 toxicant standards being proposed under the WFD implementation in Ireland. The accepted standards will be transposed into Irish Law and this will result in the repeal or amendment of the Dangerous Substances Regulations (S.I. No. 12 of 2001). WFD general components standards are also being developed at a national level and these will include standards for phosphorus which will result in the repeal or amendment of the Phosphorus Regulations. (S.I No. 258 of 1998)**
- **The proposed Priority Substances directive will repeal the existing daughter directives. The 41 substances or substance groups for which the proposed directive sets concentration limits include 33 'priority substances' and a further eight substances covered by existing legislation on dangerous substances in water. The proposal requires approval by the European Council and Parliament before being made law. In the interim period the monitoring and analysis that takes place should be in accordance with the WFD.**
- **Irish regulations will have to be made to transpose the Proposed Priority Substances Directive into Irish law.**

Table 3.2.Indicates the relevant implementation documents that have been reviewed to date.

Table 3.2: Relevant implementation documents that have been reviewed to date

Document Number	Document	Author
3.6	Inventory and Tracking of Dangerous Substances Used in Ireland and development of measures to reduce their emissions/losses to the environment	Clean Technology Centre, 1999.
3.7	Socio- Economic Impacts of the Identification of Priority Hazardous Substances under the WFD 2000	Risk and Policy Analysts, 2000
3.8	CIS- IMPRESS Guidance	CIS Working Group 2.1 IMPRESS, 2002
3.9	Pollution Reduction Programmes in Europe. Updated report on the assessment of programmes under Article 7 of Directive 76/464/EEC. Part of the project 'Transitional Provisions for Council directive 76/464/EEC and related directives to the WFD 200/60/EC.	Directorate General for Environment, 2003
3.10	Achievements and obstacles in the implementation of Council Directive 76/464/EEC on aquatic pollution control of Dangerous Substances (1976-2002). Part of the project 'Transitional Provisions for Council directive 76/464/EEC and related directives to the WFD 200/60/EC.	European Commission-Environment B.1, 2003
3.11	Substance Source Screening Sheets	Directorate General for Environment,2004a
3.12	Substance Measures Sheets	Directorate General for Environment, 2004b
3.13	Identification of Priority Hazardous Substances. Informal Background Document Related To The Commission Documents On Priority Substances Identification Of Priority Hazardous Substances. Review of 14 substances listed in Decision 2455/2001/EC to be evaluated in the framework of article 16(3) of Directive 2000/60/EC	Directorate General for Environment, 2005b
3.14	Identification of Priority Hazardous Substances. Informal Background Document Related To The Commission Documents On Priority Substances Identification Of Priority Hazardous Substances. Review of 14 substances listed in Decision 2455/2001/EC to be evaluated in the framework of article 16(3) of Directive 2000/60/EC. Data Annex	Directorate General for Environment, 2005c
3.15	Concept paper on the control of emissions, discharges and losses of priority substances and priority hazardous substances in the framework of article 16 of Directive 2000/60/EC (Water Framework Directive)	Directorate General for Environment, 2005a
3.16	Assessing economic impacts of the specific control measure for priority substances and priority hazardous substances regulated under Article 16 of the Water framework Directive	ECOLAS, 2005
3.17	Dangerous Substances National Implementation Report	EPA, 2006
3.18	Commission Staff Working Document-Impact Assessment – Proposal for a Directive of the European Parliament and of the environmental quality standards in the field of water policy and amending Directive 2000/60/EC	Commission of the European Communities, 2006

3.6 Inventory and Tracking of Dangerous Substances Used in Ireland and development of measures to reduce their emissions/losses to the environment

This study collected data regarding substance usage in Ireland by a review of (Clean Technology Centre, 1999). :

- IPPC license and pollution emission registers

- Classification ,packaging and labelling regulations database;
- Customs and excise databases;
- Central Statistics Office datasets; and
- Pesticide Control Services database

The CTC study also consulted a group of experts and as a result produced guidance for 22 substances, which were identified as relevant in Irish waters. These substances were all included in the dangerous substances screening programme. The information on the usage of dangerous substances is being examined as part of the development of the risk assessments. The Best Environmental Practice measures will also be examined for the development of measures under the Dangerous Substances usage POMS study. The substances prioritised by this report are listed in Annex 2.

3.7 Socio- Economic Impacts of the Identification of Priority Hazardous Substances under the WFD 2000

This study was carried out in 2000 to assess the socio-economic impacts of identification of the priority hazardous substances on a qualitative basis (Risk and Policy Analysts, 2000). The study highlights that under the WFD priority hazardous substances may be considered for restrictions in terms of their use rather than the substances themselves. The report sets out a baseline of the priority substance usage. This baseline gives the general usage for the priority substances and is a good indication of where the substances in question are in use. The report notes that it may be as important to investigate alternative chemical techniques for use of dangerous substances rather than a complete elimination of use of dangerous substances. Annex A of the Socio Economic document sets out main uses of dangerous substances. This information is being used when assessing the questionnaire results and developing the associated risk assessments.

3.8 CIS IMPRESS Guidance for the analysis of Pressure and Impacts in accordance with the Water Framework Directive

The guidance set out in the IMPRESS document for the Article 5 Characterisation is relevant for the bottom up Dangerous Substances study and the development of new risk assessments and the updating of the Article 5 risk assessments. The IMPRESS guidance states that the WFD implementation must "aim to progressively reduce pollution by priority substances and cease or phase out emission, discharges and looses of priority hazardous substances" (CIS Working Group 2.1 IMPRESS, 2002). The approach proposed for identification of dangerous substances in Irish surface waters through the sampling programme is in accordance with the IMPRESS guidance. The development of the terms of reference of the Dangerous Substances usage study took into account the IMPRESS guidance. The IMPRESSS guidance stated that the Characterisation analyses will be used in:

- *Targeting the monitoring programmes required under Article 8, so that they provide suitable information for validating the analyses and assessing the effectiveness of the programmes of measures;*
- *Setting objectives. The analyses will help identify water bodies for which the application of heavily modified water body designations under Article 4.3, extensions to the timetable under*

Article 4.4, less stringent objectives under Article 4.5 or exceptions from the obligation to prevent deterioration in status under Articles 4.6 and 4.7 may be appropriate; and

– *Designing targeted and proportionate measures to achieve the Directive's objectives, in accordance with Article 11;"*

These objectives were considered when developing the aims of the Dangerous substances study as the gaps that were left from the Article 5 characterisation are required to be filled to meet this guidance and the dangerous substances study will go towards developing fulfilling these aims in relation to dangerous substances.

3.9 Pollution Reduction Programmes in Europe. Updated report on the assessment of programmes under Article 7 of Directive 76/464/EEC. Part of the project 'Transitional Provisions for Council directive 76/464/EEC and related directives to the WFD 200/60/EC.

This report deals with the implementation of the dangerous substances directive across Europe and gives the situation until September 2002 (Directorate General for Environment, 2003). The report collated information on the progress with implementation of the DSD across the member states. The report highlights that a case against Ireland in relation to the implementation of the DSD is ongoing. The report highlights the main industrial sector discharging List II substances (based on the available information from member states). The only information available for Ireland in this spreadsheet is that Phosphorus is discharged from waste treatment industries. The data for the other member states suggests that discharges from the chemical, metals and waste treatment are the most likely sources of List II substances. This information is being examined to verify the data gathered from the questionnaires and used for the development of the dangerous substances risk assessment.

3.10 Achievements and obstacles in the implementation of Council Directive 76/464/EEC on aquatic pollution control of Dangerous Substances (1976-2002). Part of the project 'Transitional Provisions for Council directive 76/464/EEC and related directives to the WFD 200/60/EC.

This report states that there is no actual evidence that usage reductions have been obtained since the implementation of the DSD; however there is indications of reduction in usage in certain substances as a result of the introduction of marketing usage and restriction or bans at community level (European Commission- Environment B.1, 2003). This report investigated the achievements and obstacles in the implementation of the DSD. The lessons learned from the implementation of the DSD have already been incorporated in the development of the WFD. The report highlights the fact that the DSD will not be repealed until 2013 and that compliance with the requirements of the directive is conditional for an effective implementation of the WFD. This report gives some information as examples of the impact of the implementation of the DSD. This study has information on particular catchments, such as the River Danube, Po and Rhine.

3.11 Substance Source Screening Sheets and 3.12 Substance Measures Sheets

These reports outline the basic approach used to identify significant sources, pathways and potential emission controls for the Priority Substances (PS) and the Priority hazardous substances (PHS) (Directorate General for Environment, 2005a). The process of development of pollution control

measures for PS and PHS in accordance with Article 16 of the WFD includes the development of inventories of PS and PHS, along with examining existing control measures and relevant sources. The Dangerous Substances Usage POMS Study is preparing inventories of PS, PHS and Relevant Pollutants. Substances source screening sheets (Directorate General for Environment, 2004a) and substance measures sheets (Directorate General for Environment, 2004b) are available for all Priority Substances on the CIRCA website. http://forum.europa.eu.int/. The substances measures sheets investigate existing and future controls for priority substances under the WFD. The substances source screening sheets categorise different sources or pathways for each of the priority substances by using the following categories.

- Category 1: The available information indicates that the source/pathway contributes to the concentration of the substance in the aquatic environment, which may lead to a risk of failing to meet the objectives of the WFD.
- Category 2: All other sources and pathways that have not been identified as Category 1or 3, in particular those where insufficient information is available.
- Category 3: The available information shows that the source/pathway does not have a potential for the release of the substance directly or indirectly to the aquatic environment.

The potential sources/pathways of individual priority substances are identified in these sheets, with categorisation according to their likelihood of leading to failure of WFD objectives. These source and measures sheets are being examined when developing national GIS layers and inventories of dangerous substances.

3.13 Identification of Priority Hazardous Substances

European Implementation documents on Priority substances have been produced as part of the WFD by the Directorate General (DG) for Environment on Priority substances.

The Commission identified Priority Hazardous Substances and set out the criteria for their selection (Directorate General for Environment, 2005b). Detailed reports for each of the Priority Hazardous Substances were prepared and the technical background information on the evaluation process for their selection. These reports give good background information on the Priority Hazardous Substances and the concerns associated with each substance. The substances are examined under headings of:

- toxicity,
- persistence and
- liable to bio-accumulate.

3.14 Identification of Priority Hazardous Substances. Data Annex

This data annex gives the data behind the report on the identification of the Priority Hazardous Substances (Directorate General for Environment, 2005c). The information on this report is mainly toxicity information on the Priority Substances. The report looks at the following substances:

- Diuron
- Endosulfan

- Anthracene
- Naphtalene
- Octylphenol
- Di (2-ethylhexyl)phthalates (DEHP)
- Trichlorobenzenes (TCB)
- Lead

For each of these substances the report gives the common use of the substance. This information is being used when developing the risk assessments.

3.15 Concept paper on the control of emissions, discharges and losses of priority substances and priority hazardous substances

The basic approach used to identify significant sources, pathways and potential emission controls for the priority substances and priority hazardous substances - including phase-out cessation requirements were examined in a concept paper on the control of emissions, discharges and losses of priority substances and priority hazardous substances (Directorate General for Environment, 2005a). An overview of already existing pollution control measures for priority substances in the EU was also provided.

3.16 Assessing economic impacts of the specific control measure for priority substances and priority hazardous substances regulated under Article 16 of the WFD

This study examines the economic effects that the measures proposed for priority substances and priority hazardous substances will have. This study again highlights the gaps in information for PS and PHS across Europe. The study notes that the measures to reduce diffuse sources at source are often the most cost effective. This will be important to note for the development of measures for the dangerous substances study. The report highlighted the following industries as likely sources of priority substances.

- Chemical
- Metal
- Refineries
- Wastewater treatment
- Plastics manufacturing

All of these industries were contacted through the dangerous substances usage questionnaire in relation to their dangerous substances use except for the wastewater treatment. Wastewater treatment is being examined by the Municipal and Industrial Regulation programme of measures study. The report also gives information on the current emission situation from member states. The information was compiled through a questionnaire. The results of this questionnaire show the following substances in the largest quantities in the emissions

- Benzene
- Cadmium and its compounds
- 1,2 Dichloroethane
- Dichloromethane

- Lead and its compounds
- Mercury and its compounds
- Nickel and its compounds
- Nonylphenols
- Trichloromethane

This study indicates that the inventories developed will be used to measure the progress made with implementing phasing out or halting of pollution from dangerous substances.

3.17 Dangerous Substances Regulations National Implementation Report

The Dangerous Substances Regulations (S.I. No. 12 of 2001) prescribe water quality standards in respect of 14 dangerous substances in surface waters. The substances concerned include pesticides (atrazine, simazine, tributyltin), solvents (dichloromethane, toluene, xylene) metals (arsenic, chromium, copper, lead, nickel, zinc) and other substances (cyanide, fluoride). The first National Implementation Report on Dangerous Substances Regulations was published by the EPA in January 2007 (Environmental Protection Agency, 2006).

The National Implementation report has been prepared from information and water quality data submitted by local authorities in their Measures and Implementation reports submitted under the Dangerous Substances regulations. The report found that with the exception of tributyltin (TBT) (used as an antifouling agent), the majority of exceedances detected related to either historical mining activities or are due to the geology of an area contributing to naturally elevated levels of heavy metal in surface waters. The report highlighted that the monitoring data available was limited in terms of monitoring frequency and coverage and the monitoring takes a risk assessment approach. Most of the exceedances reported were related to the heavy metals zinc, copper, chromium and lead. For each of the 14 dangerous substances (i.e. pesticides (atrazine, simazine, tributyltin), solvents (dichloromethane, toluene, xylene) metals (arsenic, chromium, copper, lead, nickel, zinc) and other substances (cyanide, fluoride)) the report gives a summary of the monitoring carried out and the pressures that resulted in exceedances. The identification of pressures is a useful source of information for the Dangerous Substances Usage study as it suggests sources of contamination from the information gathered from the Local Authorities. The report also gives information on the measures being applied and proposed by each Local Authority.

3.18 Commission Staff Working Document-Impact Assessment – Proposal for a Directive of the European Parliament and of the environmental quality standards in the field of water policy and amending Directive 2000/60/EC.

The impact assessment acknowledges that there is a considerable gap in information available on priority substances across Europe (Commission of the European Communities, 2006). The report also notes that the pollutants that are an issue now are different from the 1970-1980s and that every year new substances are being found in aquatic ecosystems. This is important to note when developing measures as part of the dangerous substances study. The impact assessment gives major uses or

emission sources for each of the 33 priority substances (Annex 2). These sources and emissions are quite general but will be useful for the development of the risk assessments and linking the priority substances with sources. This report again shows that the preferred principle will be to control the sources of the priority substances rather than treatment at end of pipe.

Applicability to Dangerous Substances Usage POMS study

- **The CTC inventory contains information on the usage of dangerous substances that is being examined as part of the development of the risk assessments. The Best Environmental Practice measures will also be examined for the development of measures.**
- **The DG ENV report on the assessment of the DSD 76/464/EEC highlights the main industries discharging List II substances. Information from other MS on their List II discharges will be used to check the questionnaire results.**
- **DSD 78/464/EEC will not be repealed until 2013 and compliance with the requirements of the directive is conditional for an effective implementation of the WFD.**
- **Common uses given for PHS in the data annex of the Identification of PHS will be examined**
- **The DG Substance source screening sheets are being examined when developing national GIS layers and inventories of dangerous substances. The measures will be examined for the development of measures to implement the WFD.**
- **The CIS IMPRESS guidance has been taken into account when developing the risk assessments**
- **The pressures identified by the National Implementation report are being used for the development of the Dangerous Substances Risk Assessments**
- **The Socio Economic impacts of the PHS gives main uses of PHS that will be investigated**
- **The document assessing economic impacts of the specific control measure for the PS and PHS regulated under Article 16 of the WFD highlights the industries likely to be sources of PS and PHS, these industries were contacted in relation to their dangerous substances usage for this study.**
- **The Commission document on the impact of the PS directive highlights the major uses of the PS.**

4.0 Sources of Dangerous Substances Documents

4.1. Industrial usage

Table 4.1.Indicates the Industrial Use documents that have been reviewed to date.

Table 4.1: Industrial Use documents that have been reviewed to date

Document Number	Document	Author
4.1	Production, Usage and Likely Sources to the Environment of WFD Priority Substances in Scotland	SEPA, 2003
4.2	Industry profiles: Contaminated Land and Liabilities Division.	Department of Environment (UK), 1996
4.3	Dioxin and furan emissions to air, land and water in Ireland for 2000 and 2010	Hynes *et al*, 2002
4.4	The Environment Agency Regulatory Impact Assessment	Department of the Environment, Food and Rural Affairs (UK), 2002

4.1 SEPA Production, Usage and Likely Sources to the Environment of WFD Priority Substances in Scotland

A SEPA project focused on improving the understanding of the production, usage and likely sources to the environment of priority substances in Scotland (Scottish Environmental Protection Agency, 2003). This information will assist SEPA in identifying those water bodies which are at risk from these substances and will form the basis for the assessment of the pressures and impacts on the environment due to the presence of these substances. This report will be used by SEPA in the establishment of WFD monitoring networks and the implementation of longer term regulatory control measures.

The report collates information regarding the substances and their sectors into a series of worksheets. These were designed to be used by SEPA as a tool to assess usage patterns and occurrence of priority substances across Scotland - these worksheets are useful when looking at Irelands use and production of priority substances. (Appendix 1) The data gives a distribution of the industries in Scotland and chemicals most likely used by those industries. Relevant industrial sectors were identified and for each a methodology of assessing the relative risk to water bodies due to priority substances was created. It was noted from this study that the sectors that are of most economic significance were found not necessarily to be those of most concern with respect to their contribution of the priority substances. This study gives information on the possible sources of priority substances and the risk associated with each industry. This study gives a thorough investigation of priority substances but it does not give any information on the risk or use of substances such as some of the pesticides e.g. MCPA, Mecoprop and Paraquat, endocrine disrupting substances and all those substances that are referred to as relevant pollutants. The SEPA study uses trade associations to link industries that do not have an IPPC licence but may be of importance when investigating dangerous substances use. The SEPA study breaks

industries down into sectors (using the UKSIC format) and gives the possible priority substances that would be used in association with that industrial sector. The SEPA study produced a risk assessment from the information collated. The risk assessment methodology ranks risk related to the primary route to the environment for the industry for each substance. For companies where the primary route was to water, the number of employees in the company was used as an indication of the size of the company and the risk involved. Evidence of phasing out of the use of a substance in industries was also taken into account when producing the risk assessment and given a low risk. A similar risk assessment may be possible for Ireland for dangerous substances.

Applicability to Dangerous Substances Usage POMS study

- **Recommendations for further study were given in the SEPA study, one of these recommendations suggests that the means for accessing IPPC information centrally would facilitate easier access to information and allow SEPA to readily assess the details held within sectors and for specific sites. It is intended under the Dangerous Substances POMS study to do this by making the AER data available electronically.**
- **The SEPA report also suggests that further investigation should be carried out into the use of dangerous substances in the chemical industry. A questionnaire on the use of dangerous substances has been sent out by the EPA as part of the Dangerous Substances POMS study. This will give a better understanding of industries in Ireland and their use of dangerous substances.**
- **The SEPA study gives the possible priority substances that would be used in association with industry sectors and the risk associated with each industry**

One important conclusion that the report found was that the majority of the priority substances, if present, are of medium risk across the identified sectors. It is likely that they are related to specific activities within the sector. This will be important to note when developing measures related to priority substances.

The report finds that the sector that poses the highest risk for the widest range of substances is the chemicals industry. Apart from the chemicals industry the highest risk of pollution to water by priority substances is from

- Pulp, Paper & Printing;
- Textiles, Apparel & Leather;
- Metal & Metal Products and the
- Electrical & Instrumentation industries.

This is being compared with the results of the questionnaire as they are collated. This SEPA study will be relevant to the Irish situation in most aspects. There are many similarities between the Irish and Scottish industrial sectors. This study divides industries into 12 rather general sector types that would be relevant to the Irish situation. The response from the questionnaires and IPPC licence information will be used to relate the risk applied in this study to the Irish situation. The SEPA study highlights

dentists, hospitals and dry cleaners as potential sources of priority substances. These service industries generally discharge to the environment via sewers.

4.2 DEFRA Industrial profiles

The DEFRA industrial profiles (Department of Environment, 1996) give information on the possible contamination that related to different industries. These reports were commissioned and carried out with land contamination as the focus and therefore are not directly related to the WFD. However the information given in these profiles contains information on the activities, processes and waste management that are associated with each industry. Appendix 3 gives the list of industries that are profiled. For each industry that is profiled a list of potential substances that may be found as contaminants associated with the industry was provided. These substances were tabulated into a spreadsheet. This spreadsheet is being compared with the results of the POMS study dangerous substances questionnaire. This spreadsheet is being examined for running the risk assessment for dangerous substances. There are two approaches that can be taken for accessing information from the DEFRA spreadsheets

- A search for a substance can be done which provides a list of the industries the substance is used by.
- A risk type approach can be taken and a search by industry type provides the substances that are used for that specific type of industry
-

Applicability to Dangerous Substances Usage POMS study

- **The DEFRA spreadsheet compiled from the industrial profiles follows the breakdown to industrial sectors that are adhered to in the profiles. The dangerous substances questionnaire is based on the breakdown of industries using NACE codes as a basis. These two methods of placing industries into sectors although similar have their differences. It should however be possible to compare the results from the questionnaire returns and the DEFRA spreadsheets. Combining the results from the questionnaire and the DEFRA spreadsheets will give a good indication of the substances lost from in industries in Ireland.**

4.3 Dioxin and furan emissions to air, land and water in Ireland for 2000 and 2010

An inventory of dioxins and furan was prepared for the year 2000 and a projected inventory for the year 2010 (Hynes *et al,* 2002). These inventories were prepared using the United Nations Environmental Programme (UNEP) standardized toolkit (Appendix 1) for identification and quantification of dioxin and furan release. One of the purposes of this study was to investigate the effects that might occur from the development of thermal treatment and other industrial plants. The study identified the principle sources of dioxin emissions to air, land and water in Ireland. For water there is only small quantities of data available so estimated emission are given.

Applicability to Dangerous Substances Usage POMS study

- **The study estimated that for water the two sources of dioxins to water were from waste incineration and landfill. This should be taken into consideration when linking the screening study results to the sources of dangerous substances.**

4.4 Regulatory Impact Assessment

The Environment Agency Regulatory Impact Assessment (RIA) investigates the costs arising from the implementation of the WFD focusing on priority substances (Department of the Environment, Food and Rural Affairs, 2002). The report highlights that the WFD will result in a cessation of discharges, emissions and losses of priority hazardous substances, and the progressive reduction of pollution by priority substances. This report highlights that the costs arising from the reduction of priority substances use will fall on specific sectors rather than on businesses in general.

It will be important to ensure that the measures for individual substances are proportionate to the risks posed by the individual activities which depend on them or produce them unintentionally. Appropriate derogations might be applied where risks are low. There are high costs associated with cessation where no alternatives are available and where releases are unintentional. Release of priority substances may be as a result of their production and use, there are also other releases however. Other releases (sometimes insignificant) may occur unintentionally as by-products from the production of other socio-economically useful products or activities. Alternatively they may be present in the aquatic environment as a result of natural processes. Any derogation applied must be justified in the context of WFD Article 4.

This study gives a risk assessment for each of the priority substances. The options for measures for priority substances are discussed in this report. The report states that the cessation of use of a substance might be the only effective means of achieving a cessation of discharges, emission and losses. However, operators faced with the costs associated with such elimination of a substance may feel this is an inequitable requirement if their process has and would not result in any (significant) release of the substance in question to the aquatic environment.

However a cessation of discharges of priority hazardous substances which were selected as a result of their properties of persistence, bioaccumulation and toxicity and other potentially harmful effects (e.g. endocrine disruptors) might be considered as appropriate in that future generations would be protected from the risks posed by such substances and their accumulation in the environment. Any derogation applied must be justified in the context of WFD Article 4!

It is proposed that the following industries would be affected by the elimination or cessation of priority substances discharges, emissions and losses:

- the chemical industry, in particular organo-chlorine processes;

- the metals and mining industries (including aluminium, stainless steel, plating and ore processes);
- textiles;
- wood treatment and forestry;
- PVC manufacture;
- Pesticides production and use in farming;
- Processes relying on the burning of fossil fuels;
- iron, steel and coke production.
- adhesives production
- aerosol production
- paint stripping sectors

The risk assessment gives possible sectors which use priority substances and examines the risks posed by these substances. The risk assessment focuses on the likely costs associated with the control of priority substances. The risk assessment is limited for each substance as it is based on the costs of controls rather than the impact on water quality. This type of risk assessment may be something that will be required to be carried out for Ireland.

Applicability to Dangerous Substances Usage POMS study

- **The Environment Agency RIA gives possible sectors which use priority substances and examines the risks posed by these substances, it is limited in its use though as it is cost based. The report highlights the industries that will be affected by measures**

Applicability to Dangerous Substances Usage POMS study – Summary

- **The SEPA study gives the possible priority substances that would be used in association with industry sectors and the risk associated with each industry (Appendix 1). The report finds that the sector that poses the highest risk for the widest range of substances is the chemicals industry. Apart from the chemicals industry the highest risk of pollution to water by priority substances is from Pulp, Paper & Printing; Textiles, Apparel & Leather; Metal & Metal Products and the Electrical & Instrumentation industries. This is being compared with the results of the questionnaire as they are collated.**
- **The DEFRA spreadsheets compiled from industrial profiles are being used in association with the results from the dangerous substances questionnaire to assign chemical use with industry type.**
- **The Dioxins and Furans study estimated that the two sources of dioxins to water were from waste incineration and landfill.**
- **The Environment Agency RIA gives possible sectors which use priority substances and examines the risks posed by these substances, it is limited in its use though as it is cost based.**

4.2. Agriculture

Table 4.2 indicates the Agricultural related documents that have been reviewed to date.

Table 4.2: Agricultural documents that have been reviewed to date

Document Number	Document	Author
4.5	Pesticide Usage in Northern Ireland –Arable Crops	Withers *et al,* 2004
4.6	Pesticide Usage Survey, RoI –Grasslands and Fodder Crops	Department of Agriculture and Food, 2003
4.7	Pesticide Usage in Northern Ireland –Grassland and Fodder Crops	Withers *et al,* 2003
4.8	Pesticide Usage in Northern Ireland - Vegetable Crops	Kearns *et al,* 2004

These four studies are produced in the same format. The pesticide studies are part of a cyclical programme of surveys to examine pesticide usage in all sectors of agriculture and horticulture. Northern Ireland has been publishing these studies since 1989. The Republic of Ireland studies were first published in 2003. The surveys are now aligned with a corresponding Northern Ireland and Republic of Ireland study.

A different licensing system of pesticides applies in Northern Ireland than in the Republic of Ireland. This will result in differing usage patterns of pesticides and it will be noted when using the information for Northern Ireland pesticide use as representative of the Irish situation.

4.5 Pesticide Usage in Northern Ireland –Arable Crops

The Arable Crops Study Northern Ireland (Withers *et al,* 2004) was produced by the Agriculture and Food Services Centre of the Northern Ireland Department of Agriculture and Rural Development. This is the eighth survey of pesticides usage products on arable crops in Northern Ireland. Information from 293 holdings on all aspects of their pesticide use was collated. The 293 holdings cover 24% of the total area of the arable crops grown in Northern Ireland. From the results of the surveys the data was adjusted to provide estimates for the total pesticide usage in Northern Ireland for Arable crops. The crops grown that were surveyed included barley, wheat, oilseed rape, peas and beans, triticale and potatoes. The surveys show that 82% of the total area of arable crops is treated with pesticides. The survey breaks the pesticide usage down into the different crops. The total quantity for each pesticide type used for the different arable crops is given. The estimated area and quantities of arable crop treated with the different pesticides is calculated for Northern Ireland. This study noted an increase recorded in the use of insecticides (57%) in terms of area of arable crops treated which was mainly due to increased applications of the pyrethroid insecticides, principally lambda-cyholothrin, esfenvalerate, deltemethrin and cypermethrin along with the organophosphate, chlorpyrifos. A decrease in the

weight of pesticide used was noted - this reflects the relatively low dose rates of current pesticide applications. (Appendix 2).

Applicability to Dangerous Substances Usage POMS study

- **This study is being used for the development of agricultural inventories of pesticides for agriculture in the Republic of Ireland.**
- **More information is required on the cropping regimes of farm land. The cropping regimes and where these substances are in use is a necessary source for the development of pesticide inventories and the development of new GIS layers.**
- **The fifty most extensively used active ingredients are provided, prioritised by area treated and weight used (Appendix 2). These lists are being used as substances associated with Arable Farming in the Republic of Ireland. The Department of Agriculture and Food is currently drafting a report on Arable Crops pesticide usage in the Republic of Ireland from a similar survey.**

4.6 Pesticide Usage Survey, RoI –Grasslands and Fodder Crops

The Pesticide usage Survey report for the Republic of Ireland which covers Grassland and Fodder Crops (Department of Agriculture and Food, 2003) was published by the Department of Agriculture and Food (DAF) Pesticide Control Service (PCS). This study involved surveying 679 farm holdings about their pesticide use. The holdings were stratified by region and size and then chosen to represent holdings for the following crops: maize, fodder beet, arable silage, Swedes/turnips and kale/rape. Data was collected during personal interviews during which a questionnaire was completed. Estimates of national plant protection product use, as with the Northern Ireland studies, was derived from the sample data using factors calculated from the ratio of area of crop sampled to the national crop area within each region. Herbicides were found to be the most widely used pesticides type in this survey. MCPA, glyphosate and mecoprop –P were used extensively. Use on grassland constituted 82% of the weight of active substances applied. Grassland accounted for 98.9% of the total area of grassland and fodder crops in the country. Over 90% of the grassland received no overall treatments. This should be taken into account when producing inventories of pesticide use as the results from this study although useful are for a small proportion of the national farm lands.

Similarly to the Northern Ireland studies the results for this study were divided and presented as pesticide use for each crop type.

Applicability to Dangerous Substances Usage POMS study

- **The most significant information for the Dangerous Substances Usage study is the results which show the areas (in spray hectares) and the quantities (in kilograms) treated by each active substance or active substance combination**
- **This information is being used to develop agricultural inventories of pesticides for the Dangerous Substances Usage Study. There is however still a gap in information in the locations of use of these pesticides. The Department of Agriculture and Food will provide information on agricultural landuse. Alternatively it is proposed that the cropping regimes that are required to be kept by each farm holding under the Nitrates regulations (European Communities Good Agricultural Practise for Protection of Waters Regulations S.I. 378 of 2006) may be used.**
- **The thirty most extensively used active ingredients are provided, prioritised by weight used. (Appendix 2)**

4.7 Pesticide Usage in Northern Ireland –Grassland and Fodder Crops

The Grassland and Fodder Crops survey carried out by the Department of Agriculture and Rural Development is the fourth study on grassland and fodder pesticide usage to be carried out in NI (Withers *et al*, 2003). The survey comprises of 307 farm surveys. The 307 farms surveyed cover 2% of the total grassland and fodder in NI. The survey noted that the area covered by grassland and fodder has increased over the last decade. There has also been an increase in the area of crops receiving pesticide treatment. Herbicides were found to be the most commonly used pesticide in NI for grassland and fodder crops. 84% of the area treated was treated with herbicides. Other pesticides used were seed treatments, fungicides, insecticides and growth regulators. The formulation of fluroxypyr/triclopyr was the most frequently used herbicide, principally applied to the first-cut of grass silage. The main reason given for herbicide applications was to control docks (Rumex spp.). A total of seventy products comprising forty five active ingredients were recorded in use in this survey.

Applicability to Dangerous Substances Usage POMS study

- **The thirty most extensively used active ingredients used on Grassland and Fodder Crops are highlighted, prioritised by area treated and weight used. (Appendix 2)**
- **The information is being used to develop agricultural pesticide inventories**

4.8 Pesticide Usage in Northern Ireland - Vegetable Crops

The Pesticide Usage Survey also published by the Department of Agriculture and Rural Development Northern Ireland on pesticide use on Vegetable Crops (Kearns *et al,* 2004) is of a similar format to the previous studies. This is the fourth survey of pesticide usage on outdoor vegetables carried out in Northern Ireland. This study took 92 farm holdings into account. Comparing the results from the 1999 Vegetable Crops study with this study it was noted that the pesticide treated area increased by 8%

while the weight of the pesticide active ingredient remained similar to the 1999 results. Trifluralin was the herbicide/ desiccant active ingredient most commonly applied to vegetable crops.

The Department of Agriculture and Rural Development Northern Ireland have published other similar studies since 1989. In 2003 Hardy Nursery Stock Crops and Protected Ornamental Crops studies were also published. These and other earlier studies published in Northern Ireland may be reviewed at a later date. The other Northern Ireland Pesticide usage surveys published reports are listed in Appendix 4.

These pesticide surveys for Northern Ireland and the Republic of Ireland are useful for the Dangerous Substances Usage study for the development of the agriculture inventories. It is necessary to get more information on the locations of types of crops. There are many more pesticide usage studies for Northern Ireland than for the Republic of Ireland as the Department of Agriculture and Food has just recently started publishing these pesticide usage studies. It may be necessary to use the information from the Northern Ireland studies as representative of the situation in the Republic of Ireland in the interim period before the Republic of Ireland reports are published.

Applicability to Dangerous Substances Usage POMS study

- **The fifty most extensively used active ingredients used on Vegetable crops are highlighted, prioritised by area treated and weight used. (Appendix 2)**
- **The information is being used to develop agricultural pesticide inventories**

Applicability to Dangerous Substances Usage POMS study- Summary

- **The most significant information for the Dangerous Substances Usage study is the results which show the areas (in spray hectares) and the quantities (in kilograms) treated by each active substance or active substance combination. This information is being used to develop agricultural inventories of pesticides for the Dangerous Substances Usage Study. There is however still a gap in information in the locations of use of these pesticides. The Department of Agriculture and Food are providing GIS information on agricultural landuse.**
- **The thirty most extensively used active ingredients are provided for each of the reports, prioritised by area treated and weight used. (Appendix 2). These lists of extensively used active substances are being used as substances associated with the particular type of farming in Ireland**

4.3 Domestic and Service sector use

Table 4.3 indicates the Domestic and Services use related documents that have been reviewed to date.

Table 4.3: Domestic and services that have been reviewed to date

Document Number	Document	Author
4.9	Priority Substances in WWTW: Urban catchment study and assessment of diffuse inputs.	Ross *et al,* 2004
4.10	The Environment Agency Regulatory Impact Assessment	Department of the Environment, Food and Rural Affairs (UK), 2002
4.11	Substance Source Screening Sheets	Directorate General for Environment,2004a
4.12	Substance Measures Sheets	Directorate General for Environment, 2004b
4.13	Discharges of Copper, Zinc and Lead to water and soil –analysis of the emission pathways and possible emission reduction measures	Hillenbrand *et al,* 2005

4.9 Priority Substances in WWTW: Urban catchment study and assessment of diffuse inputs.

Domestic use of dangerous substances is difficult to quantify. Dangerous substances are used as detergents, flame retardants in furniture and garden pesticides. Dangerous substances are also known to be used in the service sector. Little information or data is available on these sources of dangerous substances. An urban catchment study and assessment of diffuse inputs was carried out by UK WIR (Ross *et al*, 2004), which gives information on the dangerous substances used domestically. The study is a detailed investigation of an urban catchment and a literature review. The study examines an old and a new housing estate, a town centre and a light industrial estate in order to establish the presence and origins of priority substances present in sewage. This report gives an indication of the priority substances used domestically and commercially by light and service industries. The results obtained in this UK WIR study were compared with average results found from a literature review of similar studies. These comparisons give information on the priority substances that have been found in sewage. This UK WIR study also gives a good indication of the difference in priority substances found between new and old housing and the possible sources of the priority substance. The study analysed the contribution of runoff contributions for the catchment in question. The report found little or no contribution of priority substances in sewage from runoff. A summary of the sources of dangerous substances from the catchment study is provided in Appendix 2.

4.10 The Environment Agency Regulatory Impact Assessment

The Environment Agency Regulatory Impact Assessment notes that the pesticides chlorpyrifos. atrazine and simazine are used in addition to agricultural use, in a range of home and garden uses (Department of the Environment, Food and Rural Affairs, 2002). This use of pesticides in home and gardens will be noted when developing measures for these priority substances.

4.11 Substance Source Screening Sheets and 4.12 Substance Measures Sheets

Substances source screening sheets (Directorate General for Environment, 2004a) and substance measures sheets (Directorate General for Environment, 2004b) gives some information on the usage of priority substances and priority hazardous substances through discharge in sewage effluent as a result of the household and consumer use. The South Western River Basin District Municipal and Industrial POMS study are investigating the dangerous substances associated with municipal discharges. The substance source and measures and the information from the Municipal and Industrial POMs will give some information on the use of dangerous substances associated with household use.

4.13 Discharges of Copper, Zinc and Lead to water and soil –analysis of the emission pathways and possible emission reduction measures

This report is related to a study carried out in Germany and it shows possible sources of copper, zinc and lead in water and soil (Hillenbrand, *et al*). The report highlights household plumbing, open application in the building trade and vehicles such as through brake pads and tyres. This information will be taken into account. The report also gives guidelines for the building trade to reduce emissions of the metals examined. The report will be examined when developing measures.

Applicability to Dangerous Substances Usage POMS study-Summary

- **The catchment study and screening programme give information on the domestic and services industries use of Dangerous Substances- these sources are being used when running the risk assessment.**
- **The source and substance measures sheets give information on domestic usage of the Priority substances. This information will be taken into account when developing measures.**
- **The RIA gives three Priority Substances that are used in homes and gardens. This information will be taken into account when developing measures.**

4.4 Municipal Sources

Table 4.4 indicates the Municipal Sources documents that have been reviewed to date.

Table 4.4: Municipal Sources that have been reviewed to date

Document Number	Document	Author
4.10	Screening Study and Literature review of the quantities in sewage, sludge and effluent	Bowen *et al,* 2004
4.11	Treatment options and potential costs for Priority Substances in WWTW	Ross *et al,* 2004

4.10 Screening Study and Literature review of the quantities in sewage, sludge and effluent

The UK WIR studies on priority substances trace organics and diffuse pollution is a screening study and literature review of quantities in sewage sludge and effluent (Bowen *et al,* 2004). Crude sewage was analysed at 30 WWTW across England for priority substances. The results give an indication of

what priority substances may be present and in what quantities in influent at WWTW. The report also gives possible sources and analytical issues and capabilities for the substances found in the 30 WWTW. The methods of exclusion of substances and prioritisation of substances from this study was used by the South Western River Basin District (SWRBD) Industrial and Municipal Regulations POMS study in their analysis of the substances to be tested at WWTW under the WFD monitoring.

4.11 Treatment options and potential costs for Priority Substances in WWTW

Treatment options and potential costs for priority substances in WWTW were examined by UK WIR (Ross *et al,* 2004). Possible treatments of WFD priority substances are presented. Similar treatments of priority substances may be included in the River Basin Management Plans (RBMP). This study also investigates the fate of priority substances in Waste Water Treatment Works (WWTW) which is important for the Dangerous Substances Usage POMS study as a high proportion of the known dangerous substances are discharged to either municipal or industrial WWTW for treatment. There are two models used to evaluate the fate of substances in WWTW i.e. Henry's constant and the Biodegradation rate constant (Appendix1). Substances are ranked in relation to their presence in WWTW and their potential concern, which is the amount of potential extra treatment that may be required. The potential scenarios of treatments required for priority substances under the WFD are noted. These potential scenarios are financially based so have limited use for the Dangerous Substances Usage Study.

Applicability to Dangerous Substances Usage POMS study

- **The methods of exclusion of substances and prioritisation of substances from the Screening Study and Literature review of the quantities in sewage, sludge and effluent was used by the South Western River Basin District (SWRBD) Industrial and Municipal Regulations POMS study in their analysis of the substances to be tested at WWTW under the WFD monitoring**
- **The ranking of substances in WWTW highlights substances that are important when developing measures.**

4.5 Fisheries/Marine

Table 4.5 indicates the Fisheries/Marine documents that have been reviewed to date.

Table 4.5: Fisheries/Marine documents that have been reviewed to date

Document Number	Document	Author
4.12	Marine Institute Guidelines for the Assessment of Dredge Sediment Material for Disposal in Irish Waters	Cronin *et al,* 2006
4.13	Status of Irish Aquaculture 2003	Parsons,2004
4.14	Status of Irish Aquaculture 2004	Parsons *et al*,2005

4.15	Freshwater Farming in Ireland a technical guide and discussion for the efficient use of water	Department of the Marine and Natural Resources, 2001
4.16	CSO Fisheries Statistics	CSO, 2003
4.17	Dangerous Substances Usage In Finfish Aquaculture	Marine Institute, 2007

4.12 Marine Institute Guidelines for the Assessment of Dredge Sediment Material for Disposal in Irish Waters

The guidelines for the assessment of dredge sediment for disposal in Irish waters (Cronin *et al,* 2006) gives information on the nature of the problem of dredge sediment and the possible sources of contamination of dredge sediment. Marine sediment acts as a sink for anthropogenic contaminants. The possible sources of these contaminants are marine traffic, industrial wastewater and historically poor environmental management. Contaminants in sediment can act as a source of long term environmental pollution. Typically, the most important contaminants associated with dredged material include organotin compounds, heavy metals, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) and oils. The dredge sediment guideline gives possible sources of each of these substances. The report also reviews the current Irish situation in relation to dumping of dredge sediment. These new guidelines suggest what an application for a dredge sediment permit should include, giving the parameters that the dredge sediment should be tested for. A spreadsheet has been developed in association with these guidelines for dredge sediment. The dredge sediment spreadsheet was developed to form part of an application for a dredge sediment dumping application. Data from all the existing permits were recorded into the dredge sediment spreadsheets by the SWRBD team. This information is being inputted by the Marine Institute, to form a database of information on the contaminants found in dredge sediment.

The dredge sediment guideline gives a table of information on the incidence of detection of organochlorine pesticides in Irish sediments. (Appendix 2). This information is being used for running the dangerous substances risk assessment for the marine waterbodies. Guidance levels are also set for each parameter tested in dredge sediment analysis.

4.13 Status of Irish Aquaculture 2003 and 4.14 Status of Irish Aquaculture 2004

Reports have been reviewed on the state of Irish aquaculture (Parsons *et al*, 2004 and Parsons, 2005). The report provides useful reference material for the industry, trade customers, investors, researchers and interested parties. These reports are a good source of information on aquaculture in general. There is information on the contaminants found in shellfish. The results for 2004 are consistent with those from previous years and are evidence of the continued clean, unpolluted nature of Irish shellfish and shellfish producing waters. Residue monitoring is also carried out by the Marine Institute. The residue monitoring would give an indication of the quality of water in the shellfish areas. The focus of the residue monitoring is to ensure that finfish are fit for human consumption and therefore it is not an exact indication of the use of dangerous substances. The Marine Institute have been commissioned by

the SWRBD Dangerous Substances Usage study to carry out a study into the use of dangerous substances in aquaculture. These reports may be useful for this aquaculture study.

4.15 Freshwater Farming in Ireland a technical guide and discussion for the efficient use of water

Information on freshwater farming in Ireland is available from the Freshwater Farming in Ireland a technical guide and discussion document for the efficient use of water. (Department of the Marine and Natural Resources, 2001). This study gives a good indication and explanation of the practices that are involved in freshwater aquaculture. This study does not give indication of the dangerous substances used but does give information on the industry itself and the processes involved in it.

4.16 CSO Fisheries Statistics

The CSO Fisheries Statistics (CSO, 2003) gives trends in fishery over a number of years. The data presented in this report is for 2002. It shows a continued increase in aquaculture in relation to the monetary value and weight of fish produced.

4.17 Dangerous Substances Usage in Finfish Aquaculture

This report was produced by the Marine Institute in response to the lack of information available on the use of dangerous substances in aquaculture (Marine Institute, 2007). The report was covers the following areas:

- Review of dangerous substances relevant to aquaculture
- A list of licences for fish farms and an indication of which are believed to be currently active
- Assessment of total quantities of relevant treatments prescribed for 2004-2006
- A short overview of the regulatory system

The information from this report was compiled by the veterinary practise that provides veterinary services to the majority (90-95%) of the finfish farms in Ireland. The report states that the use of chemicals in finfish aquaculture can be grouped as follows:

Use of chemicals in finfish aquaculture can be grouped as follow

- Medicinal treatments (these may be bath or in-feed treatments)
- Antifoulants used on equipment (nets, cages)
- Anaesthetics
- Feed additives (e.g. zinc, dyes)
- Others (e.g. Disinfectants, detergents)

Other substances are discharged in fish waste or uneaten feed, for example

- nutrients associated with waste,
- contaminants associated with feed.

The primary medicinal treatments used in aquaculture are

- Antibacterial agents
- Antifungal agents

- Antiparasitic treatments (e.g. Sea lice treatments)

The report gives the list of finfish farms licensed and active in Ireland. It gives the medicines and disinfectants used in finfish aquaculture. The report importantly gives figures for the quantities of the substances used and the quantities of active ingredient used. The report also gives information on how the medicines and the detergents are used. An inventory of dangerous substances related to finfish aquaculture is being developed with the information that is in this report. The data on the percentage of active ingredient and quantities of medicines and disinfectants used in finfish aquaculture are being used for the development of the aquaculture inventories. (Appendix 2)

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- **A spreadsheet has been developed in association with the guidelines for dredge sediment. Data from all the existing permits were recorded into the dredge sediment spreadsheets by the SWRBD team. This information is being inputted by the Marine Institute, to form a database of information on the contaminants found in dredge sediment. This information is being used when developing the dangerous substances risk assessments.**
- **The information from the aquaculture report will go towards developing an inventory of dangerous substances associated with aquaculture**

4.6 Transport network

Table 4.6 indicates the Transport network documents that have been reviewed to date.

Table 4.6: Transport network documents that have been reviewed to date

Document Number	Document	Author
4.17	Scope of transport impacts on the environment	O'Mahony *et al,* 2002
4.18	Impact Assessment of Highway Drainage on Surface Water Quality	Bruen *et al,*2006
4.19	The runoff of the Polycyclic Aromatic Hydrocarbons on Road Surface	Kawara *et al,*2003
4.20	Fisheries Guidelines for Local Authority works	Department of the Marine and Natural Resources,1998

4.17 Scope of transport impacts on the environment

This project included a review of international literature on the environmental impacts of the transport sector and on the integration of environmental considerations into transport planning and operations. Ten topic areas were identified these were as follows: air pollution, waste from the transport sector, eco-audits, strategic environmental assessments, economic instruments, land use, public awareness, natural heritage, public transport and information technology.

Transport networks are a possible source of dangerous substances that are considered by the dangerous substances usage POMS study. Runoff from road networks is an important source of dangerous substances. The disposal of old vehicles may also be polluting (O'Mahony *et al,* 2002) and should be considered when running the dangerous substances risk assessment.

4.18 Impact Assessment of Highway Drainage on Surface Water Quality

An ERTDI research project lead by UCD on the impact assessment of highway drainage on water quality was carried out. The study is locally relevant for the Dangerous Substances Usage Study. (Bruen *et al,* 2006). This study involved carrying out analysis on the runoff from highways. The analysis carried out included some dangerous substances; the study is therefore an important source of recent data and information on the impacts of run off from roads for the dangerous substances POMS study. The study highlights that in the last 20 years the road building programme has increased in intensity and the length of dual carriageway/motorway, vehicle ownership and traffic density has increased dramatically. Dual carriageways/ motorways were investigated. 15 sites were examined for this study with flow and physical/chemical analysis being carried out at each site. At these sites the impacts of runoff on the sediment, vegetation, macroinvertebrates and fish in the receiving waters were assessed. These 15 sites were a prelude to selecting 3 sites for detailed monitoring. The treatment options were investigated at three more detailed investigation sites. Various treatment methods are discussed and assessed. The treatment options may form part of the measures resulting from the Dangerous Substances POMS study. These treatment options include French drains and constructed wetlands/swales. Runoff from roadways are known historically to contain road de-icers, nutrients, heavy metals, polycyclic aromatic hydrocarbons, (PAHs), volatile organic compounds such as benzene, toluene, ethylbenzene, xylene and methyl tert-butyl ether (MTBE). Heavy metals are persistent constituents in highway run-off. Metals such as lead, cadmium, copper, aluminium, iron, nickel, zinc, chromium and manganese are some of the ones most frequently reported and come from the wear and tear of vehicle parts. For example, tyre wear is a source of zinc and cadmium. Brake wear is a source of copper, lead, chromium and manganese. Engine wear and fluid leakages are sources of aluminium, copper, nickel and chromium. Vehicular component wear and detachment are sources of iron, aluminium, chromium and zinc.

The study showed that in sediment the contaminants have been found in river sediments near road drainage outfalls. However, away from the outfalls, no consistent pattern of statistically significant changes between sediments upstream and downstream of the outfall was observed except in one location. Heavy metals were found in the tissue of vegetation near road drainage outfalls. However, away from the outfalls, no consistent pattern of statistically significant changes between vegetation or macroinvertebrate fauna, or fish upstream and downstream of the outfall was observed. One of the major difficulties that this study found was that most sites were already impacted by upstream nutrient/organic pollution making it extremely difficult to isolate any possible effects of the road run-off from other pollution effects.

It was noted however that on sites where run-off was removed by French drain systems, there was a significant risk of the contamination in road run-off being trapped by adjacent soils. Investigation of 12-year-old sites on the M4 near Maynooth showed heavy contamination (PAHs and heavy metals) of soil adjacent to the road. Groundwater was not investigated as part of this study.

The study highlighted that the motorway drainage was based on hydraulic considerations with little emphasis on the quality of the drainage water and the impacts it may have on the water quality of the receiving waters. There is no programmed inspection and maintenance programme in Ireland. Drainage systems are cleaned 'as required' due to blockage of pipes and flooding of road surface. Analyses of the run-off waters showed that contaminants include suspended solids, heavy metals, hydrocarbons including PAHs, chlorides, nitrates and phosphorus. However, no MTBE was detected in the samples analysed.

4.19 The runoff of the Polycyclic Aromatic Hydrocarbons on Road Surface

PAH's in runoff were found to be decomposed by solar radiation on motorways (Kawara *et al,* 2003). These PAHs are associated with vehicle exhaust, lubricating oils, and atmospheric depositions. Rainfall washes these dusts and associated PAHs into the receiving waters. Part of the emitted PAHs from automobiles is decomposed on the road surfaces by solar radiation before runoff.

4.20 Fisheries Guidelines for Local Authority works

The Fisheries guidelines for Local Authorities works give some information on the possible measures that could be put in place to prevent pollution of waterways by dangerous substances from Local Authority works (Department of the Marine and Natural Resources, 1998). These local authority works include road construction and maintenance. The report makes recommendations to assure that pollution from local authority works is limited. These guidelines suggest that roads should not be built within 50metres of rivers or streams if possible (where necessary soakaways or settlement ponds should be installed to reduce runoff). Precautions with fuel and lubricants should be followed to prevent direct pollution or indirect pollution through spillage to drains, in particular oil spillage on roads should not be washed into drains. Concrete/cement washing near drains or water should be avoided. Precaution should also be followed during storage and use of fuels and chemicals. These substances may be of use in engineering or amenity works and are harmful to fish. Careful planning and good housekeeping should reduce the risks caused by fuel oils and lubricants, chemical weedkillers and heavy runoff from works.

The guidance proposes that:

- storage tanks should be bunded
- maintenance and refuelling should be carried out at least 50metres from water
- prepare and store chemicals at least 50metres from water
- do not apply chemical weedkillers within 10metres of a watercourse or lake unless they are approved for use in or near watercourses
- chemical weedkillers must be used in accordance with manufacturers instructions

- clean out equipment at least 50metres from water and dispose of washwater off site safely
- runoff from works should be ponded and settled before discharge to water.

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- **Analyses of the run-off waters showed that contaminants include suspended solids, heavy metals, hydrocarbons including PAHs, chlorides, nitrates and phosphorus. However, no MTBE was detected in the samples analysed. Lead, cadmium, copper, aluminium, iron, nickel, zinc, chromium and manganese are some of the substances most frequently reported heavy metals from road runoff. Treatment options such as French drains and Constructed Wetlands/Swales may be considered at a later stage. The fisheries guidelines will be noted when developing measures.**

4.7 Diffuse Sources

Table 4.7 indicates the Diffuse Sources document that has been reviewed to date.

Table 4.7: Diffuse Sources document that has been reviewed to date

Document Number	Document	Author
4.21	Non- Agriculture Diffuse Pollution Substances and Impact Matrix Methodology and User Guide	Harris *et al,* 2006

4.21 Non- Agriculture Diffuse Pollution Substances and Impact Matrix Methodology and User Guide

The DEFRA study on Non-Agricultural Diffuse Pollution – Substances and Impact matrix (Harris *et al,* 2006) is a useful source of information for the dangerous substances usage study. The report investigates diffuse pollution information sources and collates information on the sources and pathways of the diffuse pollutants. The study focuses on unregulated, non-agricultural diffuse pollution sources. The study groups sources of diffuse pollution in five primary sources.

These five primary sources of diffuse pollution are

- sewage,
- sediment,
- industry,
- transport and
- abandoned mines.

The study highlights the activities that are sources of diffuse pollution, the key pollutants, impacts and contribution to total impact. The major non-agricultural pollutants are noted to be solvents, phosphates, priority substances, ammonia, faecal pathogens, BOD, acidity, hydrocarbons and metals. The study matrix is presented in two parts; "Data" worksheets which set out briefly the pathways between the pollution source and the receiving aquatic receptor and a set of further information worksheets which add details to the pollution pathways and impacts. Possible uses of this matrix include:

1. To support national policy decisions

2. To inform local regulatory decisions
3. To supply information to members of industries

Applicability to Dangerous Substances Usage POMS study

- **The DEFRA matrix gives potential usage of substances for priority substances, pesticides hydrocarbons and heavy metals; this is being used to either assign use of substances to particular activities or to assign a potential use to a substance found to be present in the screening programme.**

4.8 Mines and Contaminated Lands

Table 4.8 indicates the Mines and Contaminated Lands document that have been reviewed to date.

Table 4.6: Mines and Contaminated Lands documents that have been reviewed to date

Document Number	Document	Author
4.22	Project proposal: Characterisation of historic mine sites in Ireland and their environmental risks	Environmental Protection Agency and Geological Survey of Ireland, 2006
4.23	EPA Register of Former Mine Sites	Grennan, 1996
4.24	A country wide report on contaminated sites in Ireland	Brogan *et al,* 1999

4.22 Project proposal: Characterisation of historic mine sites in Ireland and their environmental risks

A proposal for a study carried out by the GSI and the EPA jointly was reviewed. This proposal is to investigate historic mine sites in Ireland (Environmental Protection Agency and Geological Survey of Ireland, 2006). A systematic and consistent approach to the remediation, rehabilitation and long-term management of historic mine sites in Ireland in compliance with current and upcoming national and EU legislation is being developed. The potential impacts of historic mine sites in Ireland on the environment and human and animal health, and human safety are being reviewed and documented. This EPA/GSI proposal states that an inventory of historic mine sites will be prepared. From this updated inventory of sites up to 20 historic mine sites will be prioritised under this project for further investigation. The investigations to be carried out will include chemical analysis of a range of representative samples from each mine site as appropriate e.g. soils, surface water, stream sediment, mine wastes (including tailings). The results of this analysis and the investigations will be presented in digital or GIS format and will be used for the development of a risk assessment. This information when it is available will be used for the development of the dangerous substances risk assessment. The risk assessment from this study is not due to be published until November 2007 however.

4.23 EPA Register of Former Mine Sites

In the interim period, before the EPA/GSI risk assessment for historic mine sites is developed, a register of former mine sites produced in 1996 may be used for the risk assessments (Grennan, 1996). This register is a useful source of information if the data is not available in time from the historic mine study. The study gives information on the type of minerals that were mined at each site and the history of the mine. The register assigns a Pollution Index Number (PIN) to each site. The PIN is a type of ranking of potential pollution from each historic mining site. The register also gives the principal source of pollution at the site if it is known and additional information which is useful when linking dangerous substances to their sources. Although this register was completed in 1996 the information is still relevant as the register is of historic mine sites. Some remediation may have been carried out at the sites on the register but this information should be made available as the EPA/GSI study and risk assessment progresses.

4.24 A country wide report on contaminated sites in Ireland

A country wide report on contaminated sites in Ireland was produced in 1999 (Brogan *et al*, 1999) which was used for running the Article 5 risk assessments. This report is generally concerned with soil contamination; however it highlights possible sources of dangerous substances found in Ireland. The report on contaminated sites presents the historical industries that may have contaminated soil.

The industries that contaminated soil were

- old gasworks,
- waste disposal,
- mining sites.

At mining sites the associated tailings ponds are also likely to have contaminated the soil. The report estimates the number of industrial activities that may pose a risk to soil and groundwater (for historical and active sites) and gives a summary of IPPC activities where contamination or potential contamination has been identified (Appendix 3). This information will be re-examined when rerunning the dangerous substances risk assessments.

Applicability to Dangerous Substances Usage POMS study

- **The information when it is available from the GSI/EPA study will be used for the development of the dangerous substances risk assessment. In the interim the register of historic mine sites are being used.**

5.0 Conclusions

The majority of the studies investigated are UK based. The UK based information and tools are being examined and methods are being developed to apply the UK data and information to the Irish data sets. Using the UK information for Irish data sets may be problematic and may increase the margin of error. The industrial sectors of importance and domestic use of dangerous substances are similar in Ireland and the UK. The NI pesticides usage studies are being used as indicators of the use of pesticides in the Republic of Ireland in the interim until the Republic of Ireland reports become available. The NI pesticide reports are being used to prepare the agricultural inventories. The matrix on the diffuse pollution and the DEFRA spreadsheets are being used in conjunction with the screening study results and the sources of substances are being used when running the risk assessments for dangerous substances. The DEFRA spreadsheets and matrix are being compared with the results from the questionnaire sent out to IPPC licence holders.

Domestic sources and service sector usage data is difficult to quantify. The information from the UKWIR catchment study gives information on the substances that are associated with domestic use. There is also some information available on the source screening and measures sheets for the priority substances associated with domestic use. Quantifying the domestic and service sector use of dangerous substances will be problematic at this stage. The WFD monitoring has commenced and the Dangerous Substances monitoring will start in the coming months. The data from this monitoring will give information on the quantities of dangerous substances in Ireland's waterbodies, Under new regulations being made by the DEHLG, licences for wastewater treatment plant discharges and storm overflows will set mandatory emission limits and specify monitoring requirements to achieve new quality standards in receiving waters. The system will be administered by the EPA. Other local authority discharges containing dangerous substances, which may require licensing, are being studied. Information will be collated under these new regulations that will go towards quantifying the domestic and service sector use of dangerous substances.

In June 2007 a new European regulatory framework for the Registration, Evaluation and Authorisation of Chemicals (REACH) set up a registration system for chemical usage. Chemicals identified under REACH will be assessed for the risks they pose to human health and the environment. It will be administered by the Health and Safety Authority, supported by the EPA. Under the REACH directive inventories of chemicals will be developed. The information from this directive will also go towards quantifying the use of dangerous substances from the different sectors.

The historic mine sites register is being re examined as an indication of possible pollutants and risks involved with mine sites. The GSI/EPA study will not be complete by the time the risk assessment is run. It is important to keep it in mind for further developments in dangerous substances management.

The Marine Institute are currently carrying out a study to prepare an inventory of dangerous substances used in aquaculture. There is information available on the state of the aquaculture in Ireland. Limited information is available on the use of dangerous substances in aquaculture so therefore the Marine Institute inventories are significant to the Dangerous Substances risk assessments. The dredge sediment spreadsheets prepared form the dredge sediment applications will also be an essential part of the risk assessments.

The Commission substance source sheets provide information on likelihood of Priority Substances coming from IPPC and non-IPPC industries these along with the information from the questionnaire that has been sent to IPPC licence holders will be examined when developing measures for the dangerous substances usage study. The systems of licensing and authorisation need to be updated and extended to cover the new range of substances and the activities discharging these substances.

The literature review suggests methodologies and highlights matrices/tools that are useful in the risk assessments for dangerous substances. They are also an important source of data for the dangerous substances inventories. The literature review highlights suggestions and procedures mentioned that will be examined when developing measures for the River Basin Management Plans.

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Appendix 1

Tools for use by Dangerous Substances Usage POMS study

(a) Industrial Use

Table 1.1: SEPA Production, Usage and likely sources to the environment of WFD Priority Substances in Scotland Spreadsheets (Scottish Environmental Protection Agency2003)

Substance	Sector											
	Ship Activities	**Wood & Wood Products**	**Pulp, Paper & Printing**	**Textiles, Apparel & Leather**	**Chemicals**	**Plastics & Rubber**	**Petroleum Products**	**Electricity Generation**	**Metal & Metal Products**	**Electrical & Instrumentation**	**Agriculture - Washing**	**Agriculture – Crop Application**
Number of Sites	66	506	577	289	332	150	20	14	1526	499	32	n/a
%-total	2%	13%	14%	7%	8%	4%	<1%	<1%	38%	12%	1%	n/a
1,2-Dichlorethane					M (2)							
Alachlor											L	
Anthracene	L	L		M (1)	M (3)		L	L	M (6)	M		
Atrazine											M	L
Benzene	L				H (7)		L (1)	L				
Cadmium	M (6)		M (7)	M (2)	M (3)	M (4)	M (5)	H(7)	M (4)	M (17)		
Chlorfenvinphos				L							L	L
Chlorpyrifos				L	M						M	H
DEHP			M (14)	M (2)	M (2)	M (6)				M (1)		
Dichloromethane					M (5)	M(2)			M (1)			
Diuron	M				M							
Endosulfan		L		L							M	
Fluoranthene	L	L			M (3)		L		M (6)			
Hexachlorobenzene					L			L	L			

Substance	Sector											
	Ship Activities	**Wood & Wood Products**	**Pulp, Paper & Printing**	**Textiles, Apparel & Leather**	**Chemicals**	**Plastics & Rubber**	**Petroleum Products**	**Electricity Generation**	**Metal & Metal Products**	**Electrical & Instrumentation**	**Agriculture - Washing**	**Agriculture – Crop Application**
Hexachlorobutadiene					L							
Isoproturon					L						M	H
Lead	M (6)		M(7)	M (2)	M (3)		L(1)	H (7)	M (9)	M (22)		
Lindane		L (3)		L	L							L
Mercury		L	M(7)		M (6)		L	H (7)	M	M (7)		
Naphthalene	L	L			M (3)		L	L	M (6)			
Nickel	M (6)		M(7)		M (5)		M (5)	H (7)	M (17)	M (3)		
NP/NPE			L	L (1)	M (3)	M (2)	M (4)		L	L		L
OP/OPEs			L(3)		M (6)		M (4)					
PAHs	L	L			M(2)		L	L	M (6)			
Pentachlorophenol		L (1)	L	L(1)	L							
Pentachlorobenzene											L	L
PeBDE				L	L							
SCCPs			L	L	L		M (4)		M (16)			
Simazine					L						M	M
TBT compounds	M (6)	M (7)	L	M				H (7)				
Trichlorobenzene		L		L	L (2)				M (2)	M (1)		

Substance	Sector											
	Ship Activities	**Wood & Wood Products**	**Pulp, Paper & Printing**	**Textiles, Apparel & Leather**	**Chemicals**	**Plastics & Rubber**	**Petroleum Products**	**Electricity Generation**	**Metal & Metal Products**	**Electrical & Instrumentation**	**Agriculture - Washing**	**Agriculture – Crop Application**
Trichloromethane			M (11)	M (1)	M (9)	M(4)			M (1)			
Trifluralin					L						M	H

The risk allocation signifies the following:

- Blank cell: The substance is not identified as being associated with the sector
- "L" indicates a low risk of either the substance being used in the sector or released into the receiving water.
- "M" indicates a medium risk based on the likely release to the receiving water; however the sector comprises small or medium sized users.
- "H" indicates a high risk: This is where the substance is known to be used by or discharged from the sectors of concern or sites tend to be the larger facilities.

(b) Industrial Use

Dioxins and Furans UNEP tool kit (Hynes *et al,* 2002)
There are five steps included in the application of the UNEP toolkit, namely:

1. Apply screening matrix to identify main source categories.

2. Check sub-categories to identify existing activities and sources in the country.

3. Gather detailed information on the processes and classify processes into similar groups by applying the standard questionnaire.

4. Quantify identified sources with default/measured emission factors.

5. Apply nationwide to establish a full inventory, and report results using guidance given in the standard format

(c) Municipal Use
Models used to evaluate the fate of substances in WWTW (Ross *et al*, 2004)

Henrys constant

Background

Henry's law states that the "partial pressure of component I in the gas phase is proportional to its mole fraction in the liquid phase". The constant of proportionality is the Henry's constant. It provides an indication of whether or not a substance is more likely to partition into the air or effluent phase. The higher the value, the more likely it is to be air stripped from an effluent. Henry's constant typically increases with temperature, passing through a max and declining at higher temperatures.

Method of Calculation

Common methods for the determination of Henry's constant are the use of vapour pressure and solubility data, the direct determination of the concentration of the substance in the air and in the water in a system at equilibrium and the measurement of relative changes in concentration within one phase, while affecting a near equilibrium exchange with the other phase.

The octanol-water partitioning coefficient, Log Kow

Background

Log Kow is a measure of the equilibrium concentration of a compound between octanol and water, and indicates the potential for partitioning into organic matter (i.e. a high Log Kow indicates that a substance will preferentially partition into sludge rather than effluent). Log Kow is inversely related to the solubility of a substance in water. Values of Log Kow are unitless, and are usually measured at room temperature. The effect of temperature on Log Kow is not great, usually in the order of 0.001 to 0.01 units per degree. Measured values for log Kow range from -3 to 7. It is frequently possible to estimate log Kow with an uncertainty (i.e. method error) of no more than 0.1-0.2Log Kow units.

Method of Calculation

The substance in question is added to a mixture of octanol and water whose volume ratio is adjusted according to the expected value of Kow. Very pure octanol and water must be used, and the

concentration of the solute in the system should be less than 0.01mol/L. The system is shaken gently until equilibrium is achieved (15 min to 1 hr). Centrifugation is generally required to separate the two phases, especially if an emulsion has formed. An appropriate analytical technique is then used to determine the solute concentration in each phase. A rapid laboratory estimate of Kow may be obtained by measuring the retention time in a high-pressure liquid chromatography system; the logarithm of the retention time and the logarithm of Kow have been found to be linearly related.

Appendix 2

Dangerous Substances in use

(a) General Use

Table. 2.1: The substances selected for development of Best Environmental Practice by the CTC study of dangerous substances used in Ireland, Clean Technology Centre, 1999

- Arsenic
- Cadmium
- Lead
- Mercury
- Organo-tin compounds
- Chlorobenzene
- Dichloroethane
- Nitrobenzene
- Trichlorobenzene
- Trichloroethylene
- Xylene
- Dichlorvos
- Isoproturon
- Mecoprop
- Permethrin
- Simazine
- Trifluralin
- Butylbenzyphthalate (BBP)
- Diethylhexyphthalate (DEHP)
- Nonyl phenol & Nonly phenol ethoxylates (NP & NPE)
- Polycyclic Aromoatic Hydrocarbons (PAHs) as in creosote
- Polybrominated diphenly ethers (PBDEs)

(b) Agricultural Use

Table 2.1: The fifty active ingredients most extensively used on arable crops in Northern Ireland prioritised by area treated (spray-hectares) (Withers *et al,* 2004)

Active ingredient	**Treated area (sp ha)**
Mancozeb	29136
Metsulfuron-methyl	23399
Glyphosate	21879
Epoxiconazole	20341
Fluazinam	16733
Chlorothalonil	14906
Fenpropimorph	11902
Isoproturon	11791
Chlormequat	11557
Lambda-cyhalothrin	11527
Azoxystrobin	10368
Dimethomorph	9645
Cymoxanil	9192
Flusilazole	8874
Esfenvalerate	671
Diquat	7276
Trifloxystrobin	6824
Mecoprop-P	6803
Propamocarb hydrochloride	6629
Tebuconazole	5537
Cyproconazole	5506
Paraquat	5419
Propiconazole	5148
Deltamethrin	4864
Fluroxypyr	4792
Carbendazim	4603
Mecoprop	4447
MCPA	4079
Quinoxyfen	3978
Tribenuron-methyl	3970
Pendimethalin	3761
Kresoxim-methyl	3517
2-chloroethylphosphonic acid	3446
Picoxystrobin	3232
Metribuzin	2924
Thifensulfuron-methyl	2894
Prochloraz	2824
Fluquinconazole	2715
Diflufenican	2482
Ioxynil	2378
Cyprodinil	2290
Bromoxynil	2256
Metalaxyl-m	2249
Triadimenol	2239
Dicamba	2071
Chlorpyrifos	2058
Pyraclostrobin	1958
Trinexapac-ethyl	1947
Cypermethrin	1818
Oxadixyl	1535

(c) Agricultural Use

Table 2.2: The fifty active ingredients most extensively used on arable crops in Northern Ireland in 2004, prioritised in weight (kgs) (Withers *et al,* 2004)

Active ingredient	Quantity (kg)
Sulphuric acid	201,620
Mancozeb	34,691
Glyphosate	17,156
Chlormequat	10,384
Isoproturon	10,159
Chlorothalonil	9,992
Propamocarb hydrochloride	5,799
Mecoprop-P	4,113
Pendimethalin	3,506
1Fenpropimorph	3,147
Paraquat	2,954
Mecoprop	2,556
Metribuzin	2,282
MCPA	2,086
Fluazinam	2,079
Fentin hydroxide	1,976
Diquat	1,954
Azoxystrobin	1,890
Flusilazole	1,671
Epoxiconazole	1,436
Dimethomorph	1,222
Cyprodinil	957
Chlorpyrifos	948
2-chloroethylphosphonic acid	877
Cymoxanil	872
Fluroxypyr	746
Chlorotoluron	668
Trifloxystrobin	666
Tebuconazole	654
2,4-DB	651
Prochloraz	598
Trifluralin	571
Ioxynil	565
Bromoxynil	543
Metsulfuron-methyl	461
Picoxystrobin	440
Propiconazole	353
Kresoxim-methyl	337
Oxadixyl	328
Carbendazim	322
Mepiquat chloride	277
Cyproconazole	254
Quinoxyfen	253
Diflufenican	250
Pyraclostrobin	225
Thifensulfuron-methyl	214
Diclofop-methyl	207
Fenpropidin	207
Dichlorprop	194
Fluquinconazole	175

(d) Agricultural Use

Table 2.3: The thirty active ingredients most extensively used on grassland and Fodder crops in the Republic of Ireland in 2003, prioritised in weight (kgs) (Department of Agriculture and Food, 2003)

Active Substance	Total Kgs
MCPA	221883
Glyposate	93056
Mecoprop-P	74056
Atrazine	24152
2,4-D	23458
Mecoprop	21761
2,4-DB	18761
Triclopyr	11450
Pendimethalin	8253
Chlormequat	7364
Asulum	7354
Dichlorprop	6989
Chlorothalonil	6903
Fluroxypyr	6887
Dicamba	3868
Metamitron	2888
Methiocarb	2007
Tertbutryn	1958
Bromoxynil	1557
Guazatine	1359
Ethofumesate	1130
Epoziconazole	1091
Fenpropidin	1079
Clopyralid	1007
Pyridate	1005
Benazolin(-ethyl)	973
Azoxystrobin	937
Amidosulfuron	920
Terbuthylazine	839
Phenmedipham	758

(e) Agricultural Use

Table 2.4: The thirty active ingredients used most extensively on grassland and fodder crops in Northern Ireland in 2003, ranked by area treated (spray hectares) (Withers *et al,* 2003)

Active ingredient	Treated area (sp ha)
Triclopyr	48904
Fluroxypyr	46279
MCPA	33720
Glyphosate	27411
Mecoprop-P	19796
Dicamba	19252
Mecoprop	13866
Clopyralid	5827
Metsulfuron-methyl	3765
Tebuconazole	2762
Amidosulfuron	2061
Chlormequat	1870
Trifloxystrobin	1604
Cyproconazole	1604
2,4-DB	1528
Atrazine	1342
Benazolin	1166
MCPB	1094
Epoxiconazole	754
Tribenuron-methyl	727
2,4-D	699
Azoxystrobin	652
Cypermethrin	558
Chlorpyrifos	415
Fenpropimorph	415
Linuron	362
Triadimenol	347
Mancozeb	335
Quinoxyfen	250
Carbendazim	250

(f) Agricultural Use

Table 2.5: The thirty active ingredients used most extensively on grassland and fodder in Northern Ireland in 2003, ranked by weight applied (kilogrammes) (Withers *et al,* 2004)**.**

Active ingredient	**Weight (kg)**
MCPA	21036
Mecoprop-P	13933
Triclopyr	13648
Fluroxypyr	11635
Mecoprop	10973
Glyphosate	8739
MCPB	2750
Dicamba	2572
Chlormequat	1369
Atrazine	1271
2,4-DB	991
Clopyralid	675
Tebuconazole	631
Mancozeb	456
Chlorpyrifos	379
2,4-D	304
Trifloxystrobin	283
Azoxystrobin	131
Cyproconazole	121
Benazolin	104
Propyzamide	102
Bromoxynil	73
Fenpropimorph	67
Epoxiconazole	61
Isoproturon	55
Flusilazole	50
Propiconazole	36
Triadimenol	27
Carbendazim	25
Metsulfuron-methyl	21

(g) Agricultural Use

Table 2.6: The fifty active ingredients most extensively used on vegetable crops in Northern Ireland 2004, ranked by treated area (spray hectares) (Kearns *et al,* 2004)

Active ingredient	Treated area (sp ha)
Lambda-cyhalothrin	2,258
Trifluralin	1,002
Linuron	821
Pirimicarb	752
Metazachlor	627
Difenoconazole	564
Azoxystrobin	558
Pendimethalin	453
Tebuconazole	383
Metoxuron	333
Glyphosate	332
Metalaxyl-m	329
Propachlor	260
Ioxynil	171
Dichlofluanid	166
Chlorothalonil	151
Iprodione	125
Paraquat	111
Chlorpropham	102
Pentanochlor	93
Fenpropimorph	92
Chlorpyrifos	88
Metalaxyl	84
Mancozeb	76
Methiocarb	75
Prometryn	68
Thiophanate-methyl	64
Cypermethrin	56
Copper oxychloride	53
Carbosulfan	53
Triazamate	52
Cyanazine	52
Deltamethrin	50
Fosetyl-aluminium	47
Metribuzin	46
Propaquizafop	44
Dimethoate	40
Propyzamide	38
Dimethomorph	27
Tolclofos-methyl	24
Chlorfenvinphos	21
Fluroxypyr	20
Propamocarb hydrochloride	19
Tepraloxydim	18
Chloridazon	13
Diquat	10
Propiconazole	9
Phenmedipham	9
Terbuthylazine	5
Terbutryn	5

(h)Agricultural Use

Table 2.7: The fifty active ingredients most extensively used on vegetable crops in Northern Ireland 2004, ranked by weight (kilograms) (Kearns *et al,* 2004)

Active ingredient	Weight (kilograms)
Propachlor	1,202
Trifluralin	1,004
Metoxuron	710
Linuron	706
Pendimethalin	553
Metazachlor	479
Glyphosate	339
Chlorpyrifos	291
Metalaxyl-m	166
Chlorothalonil	138
Pirimicarb	128
Azoxystrobin	126
Pentanochlor	105
Mancozeb	85
Tebuconazole	82
Fosetyl-aluminium	82
Chlorpropham	69
Fenpropimorph	66
Carbosulfan	62
Prometryn	60
Paraquat	59
Copper oxychloride	53
Iprodione	50
Propyzamide	47
Dichlofluanid	40
Ioxynil	36
Chlorfenvinphos	34
Difenoconazole	33
Lambda-cyhalothrin	28
Thiophanate-methyl	27
Metribuzin	22
Cyanazine	22
Tolclofos-methyl	21
Methiocarb	12
Metalaxyl	11
Dimethoate	10
Propamocarb hydrochloride	8
Chloridazon	6
Terbutryn	5
Propaquizafop	5
Dimethomorph	4
Diquat	4
Phenmedipham	4
Dichlobenil	3
Triazamate	3
Trichlorfon	3
Propiconazole	2
Terbuthylazine	2
Lenacil	2
Simazine	2

(i)Domestic and Services Use:

A summary of the sources of dangerous substances from the catchment study (Ross *et al*, 2004)

Metals

- Metals ubiquitous
- Zinc, Nickel and Lead are present in the same quantities in both new and old housing estates.
- All metals high on Saturday possibly from washing of clothes and cars.
- Higher Cadmium and Copper in new housing estate
- High mean metal concentrations overall, mean increased by peak on Monday morning. Build up of metals leaching from piping and fittings over weekend.
- High Hg potentially from dental practices (in the order of 70% of Hg in sewage sludge)
- Zinc use in personal care products , plumbing and pharmaceuticals makes its presence widespread and variable
- Runoff- concentrations at light industrial sites was higher, increased traffic density in industrial area and a focus of activities such as car maintenance
- First sample taken during rain event had high concentrations of metals, this is related to the increase in suspended solids and the fact that metals adsorb strongly to particulates
- Cu input from domestic sources enters water from domestic pipework especially as a result of dissolution through newly installed copper plumbing
- Zinc associated with numerous sources including roof tiles, galvanised roof drainage, household plumbing as well as household products and cosmetics. Therefore widespread but predominately domestic sources
- Lead plumbing and runoff major source, depending on the age of plumbing and water condition. Soft water being more acidic tends to increase dissolution of Lead. Older the estate more Lead present
- Lead present in runoff water but phasing out of leaded fuel has resulted in a decrease
- Nickel not well documented, suggested link between kettle element leaching in domestic sources
- Domestic sources dominant for all metals except Mercury and Chromium

Solvents and volatile organic compounds

- Chloroform and Dichloromethane found in domestic wastewaters
- Chloroform presence linked to disinfectant by-products
- Benzene in industrial area associated with the use of degreasers and cleaners
- Tetrachloroethene is the predominant solvent used in dry-cleaning, trichloroethene is used in lesser quantities

Nonyphenols (NP), Nonylphenol ethoxylates (NPE) and Linear alkylbenzene suphonates (LAS) -

- NPE's present in car wash detergents, NP's present as impurities of car wash detergents as a result of degradation of ethoxylates
- Highest concentrations were recorded in the first sample after rain, as they are associated with particulate matter
- LAS used in household detergents

Di-(2-ethylhexyl)phthalate (DEHP) and Brominated diphenlyethers (BDE)

- Leaching or breakdown of manmade products, DEHP from the breakdown of plastics and BDE from the breakdown of flame retardants
- DEHP is widespread
- DEHP is found in higher concentrations in new estates suggests leaching from PVC pipes is significant
- BDE source is household upholstery and furniture, the main source being polyurethane foams typically containing between 10% to 30% penta BDE
- Modern manufacturers ceasing to use BDE based flame retardants

Polynuclear aromatic hydrocarbons (PAH)

- Sources are vehicle emissions, engine and other automotive parts washing water being discharged

Dioxins and Furan

- Heavy use of PCP for wood preservation may be responsible for various dioxin and furan isomers in urban runoff.

Polychlorinated biphenyls (PCB)

- In flame retardants, lubricants for treatment of wood, cloth, paper and stabilisers in paints and pigments

Pesticides

- Trifluralin is a professional herbicide applied in horticulture (fruit, vegetables and vineyards) and agriculture (oil seed rape and sunflower and in pre-emergent treatment for wheat, small grains and fodder peas
- Insecticides used for the protection of building material for example roofing and timber

(j) Municipal Use

Ranking of Priority substances in WWTW (Ross *et al*, 2004)

Unknown	**Low Concern**	**Medium**	**High**
PAH	1,2 dichlorethane	Nonylphenol	Cadmium
Chloroalkanes	Aldrin	PeBDE	Copper
HCBD	Benzene		DEHP
Pentachlorobenzene	Carbon tetrachloride		Lead
Anthracene	Chromium		Mercury
Octly Phenol	DDT		Nickel
PCP	Dichlormethane		Zinc
Chlorpyrifos	Dieldrin		
Diuron	Endrin		
Endo-Sulphan- A	Fluoranthene		
Isoproturon	HCB		
Simazine	HCH		
Trifluralin	Isodrin		
Alachlor	Napthalene		
Atrazine	PCB		
Chlorfenvinohos	TCB		
LAS	Tetrachloroethane		
	Trichloroethane		
	Trichloromethane		
	TBT		

(k) Marine /Fisheries Use

Incidence of detection of organochlorine pesticides in Irish sediments (Cronin *et al,* 2006)

Parameter	**No. times OCP detected/no of times analysed**
Aldrin	0/128
α-HCH	0/128
β-HCH	0/128
χ-HCH	15/128
Dieldrin	4/128
Heptachlor	0/128
Heptachlor epoxide	0/128
DDT (op)	0/128
DDE (pp')	15/128
DDT (pp')	0/128
TDE (pp')	0/128
Endrin	0/128
Endosulphan Alpha	0/128
Endosulphan Beta	0/128
HCB	13/128

Examination of data from sediment analyses carried out on samples from Irish ports and carried out on samples from Irish ports and harbours has shown that the majority of organochlorine pesticides (OCPs) examined have not been detected over the last ten years and more. The table above shows the incidence of occurrence of these pesticides.

(l) Marine/Fisheries Use

Percentage active ingredients and quantities of medicines used in finfish aquaculture in Ireland 2004 – 2006 (AR 16 – exceptional temporary license issued by Dept. of Agriculture, cascade – refers to process veterinarians may use under the Animal Remedies Regulations 2005 where there is no authorised animal remedy, MA – marketing authorisation, POM – prescription only medicine, POM (E) – prescription only exempt medicine). (Marine Institute, 2007).

Medicine	**Percentage Active Ingredient**	**Quantity '04 – '06 (litres or kg)**	**Quantity active '04 – '06 (l or kg)**	**Authorisation status***
Alphamax	1	341	3.41	AR16
Betamox LA	15	2.4	0.36	Cascade(full MA for terrestrial animals)
Ektobann	100	177	177	AR16
Excis	1	415.2	4.15	Full MA for salmon – POM (E)

Florocol	50	45	22.5	AR16 & cascade (full MA in UK)
Maracycline	100	2,465	2,465	Full MA for salmon – POM
MS 222	100	159	159	MA pending
Pyceze	50	69	34.5	Cascade (full MA in UK)
Slice	0.2	11,865	23.7	Full MA for salmon – POM
Sulfatrim	50	98	49	License expired and medicine no longer available

The status of all medicines is subject to change but the status of listed medicines at the time of writing is given.

(m) Marine/Fisheries Use

Percentage of active ingredients and quantities of disinfectants used in finfish aquaculture in Ireland 2004 – 2006. (Marine Institute, 2007).

Disinfectant	Percentage Active Ingredient	Quantity '04 – '06 (litres or kg)	Quantity active '04 – '06 (l or kg)
Biosolve	1 - 5	75	3.75#
Buffodine	1	28	0.28
FAM 30	2.75% iodine	100	2.75
Formalin	39	2,050*	799.5*
Halamid	100	540	540
Hydrogen peroxide	35	1500	525
Vetrefoam	1 - 5	5	0.25#
Virkon Aquatic	50	2,250	1,125
Virudine	3% iodine	275	8.25

estimated quantity.
 # percentage active taken at 5%

(n) Priority Substances Major used and problems associated with them (*European Commission*

Name	Major Uses or emission sources	Main problem in the aquatic Environment
Alachlor	Plant protection product (herbicide)	Direct effects on aquatic organisms and increased need/costs for drinking water treatment.
Anthracene	Chemical intermediate, wood preservative (creosote), combustion by-product	Direct effects on aquatic organisms
Atrazine	Plant protection product (herbicide)	Direct effects on aquatic organisms and increased need/costs for drinking water treatment
Benzene	Synthesis of other chemicals	Carcinogenic and (therefore) increased need/costs for drinking water treatment
Brominated diphenylether	Flame retardants	Accumulation in food chain and sediments
Cadmium and its compounds	Batteries, pigments, stabilisers, metal plating, discharges by several industrial sectors	Direct effects on aquatic organisms. Accumulation in food chain and sediments. Contamination of seafood.
C10-13-chloroalkanes	Metal working fluids, flame retardant	Accumulation in food chain and sediments
Chlorfenvinphos	Plant protection product (insecticide)	Direct effects on aquatic organisms and increased need/costs for drinking water treatment.
Chlorpyrifos	Plant protection product (insecticide)	Direct effects on aquatic organisms and increased need/costs for drinking water treatment.
1,2-Dichloroethane	Production of vinyl chloride monomer for PVC production	May affect human health. Increased need/costs for drinking water treatment.
Dichloromethane	Solvent, aerosol, foam blowing agent	Increased need/costs for drinking water treatment.
Di(2-ethylhexyl) phthalate (DEHP)	Plasticiser in soft-PVC	Accumulation in food chain and sediments.
Diuron	Plant protection product (herbicide)	13 Direct effects on aquatic organisms and increased need/costs for drinking water treatment.
Endosulfan	Plant protection product (insecticide)	Direct effects on aquatic organisms and increased need/costs for drinking water treatment.
Fluoranthene	Tar-based paints, creosote, fluorescent and vat dyes	By-product of combustion. Direct effects on aquatic organisms, in particular in sediments.
Hexachlorobenzene	No use in EU but unintentional by-product, e.g. in PVC	Accumulation in food chain and sediments.
Hexachlorobutadiene	No use in EU but unintentional by-product	Accumulation in food chain and sediments
Hexachlorocyclohexane	Plant protection product (insecticide)	Direct effects on aquatic organisms and increased need/costs for drinking water treatment.
Isoproturon	Plant protection product (herbicide)	Direct effects on aquatic organisms and increased need/costs for drinking water treatment.
Lead and its compounds	Batteries, rolled products, compounds, shots, weights, PVC stabilisers and many other products	Direct effects on aquatic organisms.Accumulation in food chain and sediments. Contamination of seafood.
Mercury and its compounds	Batteries, thermometers, tooth filling, chlor-alkali industry	Direct effects on aquatic organisms. Accumulation in food chain and sediments. Contamination of seafood.
Naphthalene	Chemical intermediate, wood preservative (creosote),combustion by-product	Direct effects on aquatic organisms

Nickel and its compounds	More than 300.000 products mainly as alloys, e.g. stainless steel	Direct effects on aquatic organisms.
Nonylphenols	Chemical intermediate, industrial detergent and others	Direct effects on aquatic organisms. Hormone-like effects.
Octylphenols	Similar to nonylphenol	Direct effects on aquatic organisms.
Pentachlorobenzene	Intermediate in the production of quintozene (Plant protection product)	Accumulation in food chain and sediments
Pentachlorophenol	Biocide in wood or textiles	Direct effects on aquatic organisms.
Polyaromatic hydrocarbons	Combustion by-products, metal treatment, wood treatment (creosote) and others	Direct effects on aquatic organisms. Accumulation in food chain and sediments.
Simazine	Plant protection product (herbicide	Direct effects on aquatic organisms and increased need/costs for drinking water treatment
Tributyltin compounds	Antifouling paints of ships	Accumulation in food chain and sediments. Hormone-like effects. Contamination of seafood.
Trichlorobenzenes	Chemical intermediate, process solvent	Direct effects on aquatic organisms. Accumulation in food chain and sediments.
Trichloromethane (Chloroform)	Chemical intermediate, e.g. production of HCFC (blowing agent and refrigerant)	Direct effects on aquatic organisms, in particular in sediments.
Trifluralin	Plant protection product (herbicide)	Direct effects on aquatic organisms and increased need/costs for drinking water treatment.

Appendix 3

Sources of Dangerous Substances

(a)Industrial Use

DOE Industrial Profiles (Department of Environment, 1999)

- Airports
- Animal and animal products processing works
- Ceramics, cement and asphalt manufacturing works
- Asbestos manufacturing works
- Chemical works: coatings (paints and painting inks) manufacturing works
- Chemical works: cosmetics and toiletries manufacturing works
- Chemical works: disinfectants manufacturing works
- Chemical works: explosives, propellants and pyrotechnic manufacturing works
- Chemical works: fertiliser manufacturing works
- Chemical works: fine chemicals manufacturing works
- Chemical works: inorganic chemicals manufacturing works
- Chemical works: linoleum, vinyl and bitumen-based floor covering manufacturing works
- Chemical works: mastics, sealants, adhesives and roofing felt manufacturing works
- Chemical works: organic chemicals manufacturing works
- Chemical works: pesticides manufacturing works
- Chemical works: pharmaceuticals manufacturing works
- Chemical works: rubber processing works (including works manufacturing tyres or other rubber products
- Chemical works: soap and detergent manufacturing works
- Dockyard and dockland
- Engineering works: aircraft manufacturing works
- Engineering works: electrical and electrical equipment manufacturing works including works manufacturing equipment containing PCBs)
- Engineering works, mechanical engineering and ordnance works
- Engineering works: railway engineering works
- Engineering works: shipbuilding, repair and shipbreaking (including naval shipyards)
- Engineering works: vehicle manufacturing works
- Gas works: coke works and other coal carbonisation plants
- Metal manufacturing, refining and finishing works: electroplating and other metal finishing works
- Metal manufacturing, refining and finishing works: iron and steelworks
- Metal manufacturing, refining and finishing works: lead works
- Metal manufacturing, refining and finishing works: non-ferrous metal works (excluding lead works)
- Metal manufacturing, refining and finishing works: precious metal recovery works
- Oil refineries and bulk storage of crude oil and petroleum products
- Power stations (excluding nuclear power stations)
- Pulp and paper manufacturing works
- Railway land

- Road vehicle fuelling, service and repair: garage and filling stations
- Road vehicle fuelling, service and repair: transport and haulage centres
- Sewage works and sewage farms
- Textile works and dye works
- Timber products manufacturing works
- Timber treatment works
- Waste recycling, treatment and disposal sites: drum and tank cleaning and recycling plants
- Waste recycling, treatment and disposal sites: hazardous waste treatment plants
- Waste recycling, treatment and disposal sites: landfills and other waste treatment of waste disposal sites
- Waste recycling, treatment and disposal sites: metal recycling sites
- Waste recycling, treatment and disposal sites: solvent recovery works
- Profile of miscellaneous industries incorporating
    - Charcoal works
    - Dry-cleaners
    - Fibreglass and fibreglass resins manufacturing works
    - Glass manufacturing works
    - Photographic processing industry
    - Printing and bookbinding works

(b) Mines/Contaminated sites

Table3.1: Estimates of the number of industrial activities that may pose a risk to soil and groundwater (Brogan *et al,* 1999)

	Industrial activities that may pose a risk to soil and groundwater	**Estimated numbers of activities**
Historical Sites	Old Gasworks Sites**1**	50 – 80
	Closed non hazardous and hazardous waste disposal sites Pre-1984 1984-1995 1995-May, 1998	 58 124 21
	Closed mining sites - 38 of these sites have tailing ponds Of 128 sites identified in the survey it was estimated that 11 of these (generally large and recently closed) would be considered to have the greatest potential to pollute.	128
	Old fertiliser plants (manufacturing and blending)	4 – 6
	Closed Tanneries	10 – 12
Current operational sites	Existing Local Authority Landfills which are unlined or partially lined (does not include private landfills)	74
	On-site landfill sites under IPPC control	10
	Mining sites in operation	4
	Chemical Industry	150 – 160
	Petroleum Import Terminals (IPIA)**2**	22
	Petroleum retail stations with underground storage tanks (UST)**3** (Estimated 3000 - 3500 retail petrol stations in country with an average of 3 - 5 UST per station)	900 – 1200
	Tanneries	3
	Timber treatment yards (including subversion and diffusion)	150
	Dockyards	14 – 16
	Military sites	1
	Railway depots (freight and passenger)	80 – 100
	Scrap yards and dismantlers	180 – 200
	Airports with maintenance facilities	2
	Total number of industrial activities that may pose a risk to soil and groundwater	**1985 - 2371**

1 In 1897 there were 114 gas companies in existence. In 1932 there were 76 gasworks in existence, 27 in Northern Ireland and 49 in the Republic of Ireland

2 Total refers to oil companies affiliated to Irish Petroleum Industries Association (IPIA). These figures do not include on-site large industrial storage facilities.

3 Of the 3000 to 3500 existing petroleum retail stations, 30 to 35% were constructed prior to the 1979 Dangerous Substances Retail and Private Petroleum Stores Regulations (SI No. 311 of 1979).

(b) Mines/Contaminated sites

Table 3.2: Summary of IPPC activities where contamination or potential contamination has been identified (Brogan *et al,* 1999)

Class of Activity as per First Schedule EPA Act	**Class description**	**Number of IPPC activities indicating contamination or possible contamination of ground and/or groundwater on or under the site**
Class 1	Mineral and other Materials	1
Class 2	Energy	no data set
Class 3	Metals	4
Class 4	Mineral Fibres and Glass	2
Class 5	Chemicals	25
Class 6	Intensive Agriculture	0
Class 7	Food and Drink	4
Class 8	Wood, paper, textiles and leather	9
Class 9	Fossil Fuels	0
Class 10	Cement	0
Class 11	Waste	1
Class 12	Surface Coatings	6
Class 13	Other activities	3
	Total	55

Appendix 4
Other Reports

(a) Northern Ireland Pesticide Usage Survey Published Reports (Withers *et al,* 2004)

Report No.	Report title	Year	ISBN
99	Grassland & Fodder Crops	1989	1-85527-079-X
105	Arable Crops	1990	1-85527 130 3
106	Soft Fruit Crops	1990	1-85527 149 4
109	Vegetable Crops	1991	1-85527 137 0
110	Protected Crops	1991	1-85527 283 0
111	Mushroom Crops	1991	1-85527 150 8
117	Arable Crops	1992	1-85527 193 1
118	Top Fruit Crops	1992	1-85527 194 X
124	Grassland & Fodder crops	1993	1-85527 221 0
131	Forestry	1993	1-85527 282 2
132	Arable Crops	1994	1-85527 314 4
139	Vegetable Crops	1995	1-85527 346 2
140	Mushroom Crops	1995	1-85527 347 0
146	Arable Crops	1996	1-85527 469 8
147	Top Fruit Crops	1996	1-85527 470 1
156	Grassland and Fodder Crops	1997	1-85527 506 6
157	Sheep Treatments	1997	1-85527 425 6
167	Soft Fruit	1998	1-85527 540 6
168	Arable Crops	1998	1-85527 536 8
169	Vegetable Crops	1999	1-85527 561 9
170	Mushroom Crops	1999	1-85527 549 X
177	Arable Crops	2000	1-85527 670 4
178	Top Fruit Crops	2002	1-85527 618 6
194	Arable Crops	2002	1-85527 674 7
198	Grassland & Fodder Crops	2003	1-85527 797 2
199	Hardy Nursery Stock Crops	2003	1-85527 789 1
201	Protected Ornamental Crops	2003	1-85527 739 5
206	Arable Crops	2004	1-85527 833 2