EXPERT GROUP ON LEAD IN SILVERMINES COUNTY TIPPERARY

INTERIM REPORT

Environmental Protection Agency

Establishment
The Environmental Protection Agency Act, 1992, was enacted on 23 April, 1992, and under this legislation the Agency was formally established on 26 July, 1993.

Responsibilities
The Agency has a wide range of statutory duties and powers under the Act. The main responsibilities of the Agency include the following:

- the licensing and regulation of large/complex industrial and other processes with significant polluting potential, on the basis of integrated pollution control (IPC) and the application of best available technologies for this purpose;

- the monitoring of environmental quality, including the establishment of databases to which the public will have access, and the publication of periodic reports on the state of the environment;

- advising public authorities in respect of environmental functions and assisting local authorities in the performance of their environmental protection functions;

- the promotion of environmentally sound practices through, for example, the encouragement of the use of environmental audits, the setting of environmental quality objectives and the issuing of codes of practice on matters affecting the environment;

- the promotion and co-ordination of environmental research;

- the licensing and regulation of all significant waste disposal and recovery activities, including landfills and the preparation and periodic updating of a national hazardous waste management plan for implementation by other bodies;

- implementing a system of permitting for the control of VOC emissions resulting from the storage of significant quantities of petrol at terminals;

- implementing and enforcing the GMO Regulations for the contained use and deliberate release of GMOs into the environment;

- preparation and implementation of a national hydrometric programme for the collection, analysis and publication of information on the levels, volumes and flows of water in rivers, lakes and groundwaters; and

- generally overseeing the performance by local authorities of their statutory environmental protection functions.

Status
The Agency is an independent public body. Its sponsor in Government is the Department of the Environment and Local Government. Independence is assured through the selection procedures for the Director General and Directors and the freedom, as provided in the legislation, to act on its own initiative. The assignment, under the legislation, of direct responsibility for a wide range of functions underpins this independence. Under the legislation, it is a specific offence to attempt to influence the Agency, or anyone acting on its behalf, in an improper manner.

Organisation
The Agency's headquarters is located in Wexford and it operates five regional inspectorates, located in Dublin, Cork, Kilkenny, Castlebar and Monaghan.

Management
The Agency is managed by a full-time Executive Board consisting of a Director General and four Directors. The Executive Board is appointed by the Government following detailed procedures laid down in the Act.

Advisory Committee
The Agency is assisted by an Advisory Committee of twelve members. The members are appointed by the Minister for the Environment and Local Government and are selected mainly from those nominated by organisations with an interest in environmental and developmental matters. The Committee has been given a wide range of advisory functions under the Act, both in relation to the Agency and to the Minister.

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INTERIM REPORT

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INTERIM REPORT

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ABBREVIATIONS

DAFRD	Department of Agriculture, Food and Rural Development
DED	District Electoral Division
DELG	Department of Environment and Local Government
DMNR	Department of Marine and Natural Resources
EPA	Environmental Protection Agency
GSI	Geological Survey of Ireland
IAG	Inter-Agency Group
IGS	Implementation Group for Silvermines
MWHB	Mid-Western Health Board
NTCC	North Tipperary County Council
TMF	Tailings Management Facility

GLOSSARY OF TERMS

Bio-availability

The process resulting in the difference between oral intake of a contaminant and the uptake into the blood (or lymph) stream. Bio-availability is composed of four processes: 1) ingestion of soil, dust and foodstuffs containing contaminants; 2) release in the gastrointestinal tract and availability for absorption (bio-accessibility); 3) intestinal absorption; 4) liver passing metabolism.

Pedological Processes

Soil forming processes which are mainly responsible for the development of distinct horizons in the soil profile. These processes involve the redistribution of materials within the soil profile and the addition to, and loss of material from, the developing soil.

Water hardness

Hardness is a natural characteristic of water which can enhance its palatability and consumer acceptability for drinking purposes. Originally taken to be the capacity of a water to destroy the lather of soap, hardness is now determined by measuring the concentration of calcium and magnesium in water. Total hardness is taken to comprise the calcium and magnesium concentrations expressed as mg/l calcium carbonate ($CaCO_3$).

UNIT OF MEASUREMENT

Stream sediments: concentration of lead in sediments is expressed as milligrams per kilogram (mg/kg) on a dry weight basis.

Surface water: concentration of lead in surface water is expressed as micro-grams per litre (µg/l).

CHEMICAL FORMULAE

$CaCO_3$	Calcium carbonate
Pb	Lead
PbS	Lead sulphide
$PbSO_4$	Lead sulphate

1 CONTEXT

1.1 Introduction

Cattle deaths from lead poisoning in early 1999 on a farm adjacent to the Gortmore Tailings Management Facility (TMF) in Silvermines, Co. Tipperary resulted in the activation of a Protocol for collaboration between public agencies dealing with issues such as human and animal health and the environment entitled *" Protocol for the Investigative Approach to Serious Animal / Human Health Issues"* (EPA *et al.*, 1997). This protocol for investigating serious animal and human health problems was agreed between the Department of Agriculture, Food and Rural Development, the Department of Health and Children, the Department of Environment and Local Government, Teagasc and the Environmental Protection Agency.

Tailings Management Facility at Gortmore

An Inter-Agency Group (IAG) was established to conduct an investigation into the presence and influence of lead in the Silvermines area. The IAG made 39 recommendations in relation to human health, animal health, food safety, soils, environment and rehabilitation of mine workings in the area. These findings were published in June 2000 in the Inter-Agency *Report of the Investigation into the Presence and Influence of Lead in the Silvermines area of County Tipperary* (Department of Agriculture, Food and Rural Development, 2000).

The IAG investigation and subsequent work of the Implementation Group for Silvermines (IGS) covers an area of approximately 23 square kilometres. This area was delineated using the results of a geochemical mining survey undertaken in 1963 with farm boundaries and District Electoral Divisions (DEDs) superimposed onto the map. Work to date has focused primarily inside this area as indicated in Figure 1.1.

Recommendation Number 39 of the report recommended that as a matter of priority, an Expert Group, to include international experts, should be established to formulate guidelines applicable to Ireland on the management of lead in the environment. The conclusions of the Expert Group should be available to, and should inform the work of, the Implementation Group for Silvermines (IGS) which was established in

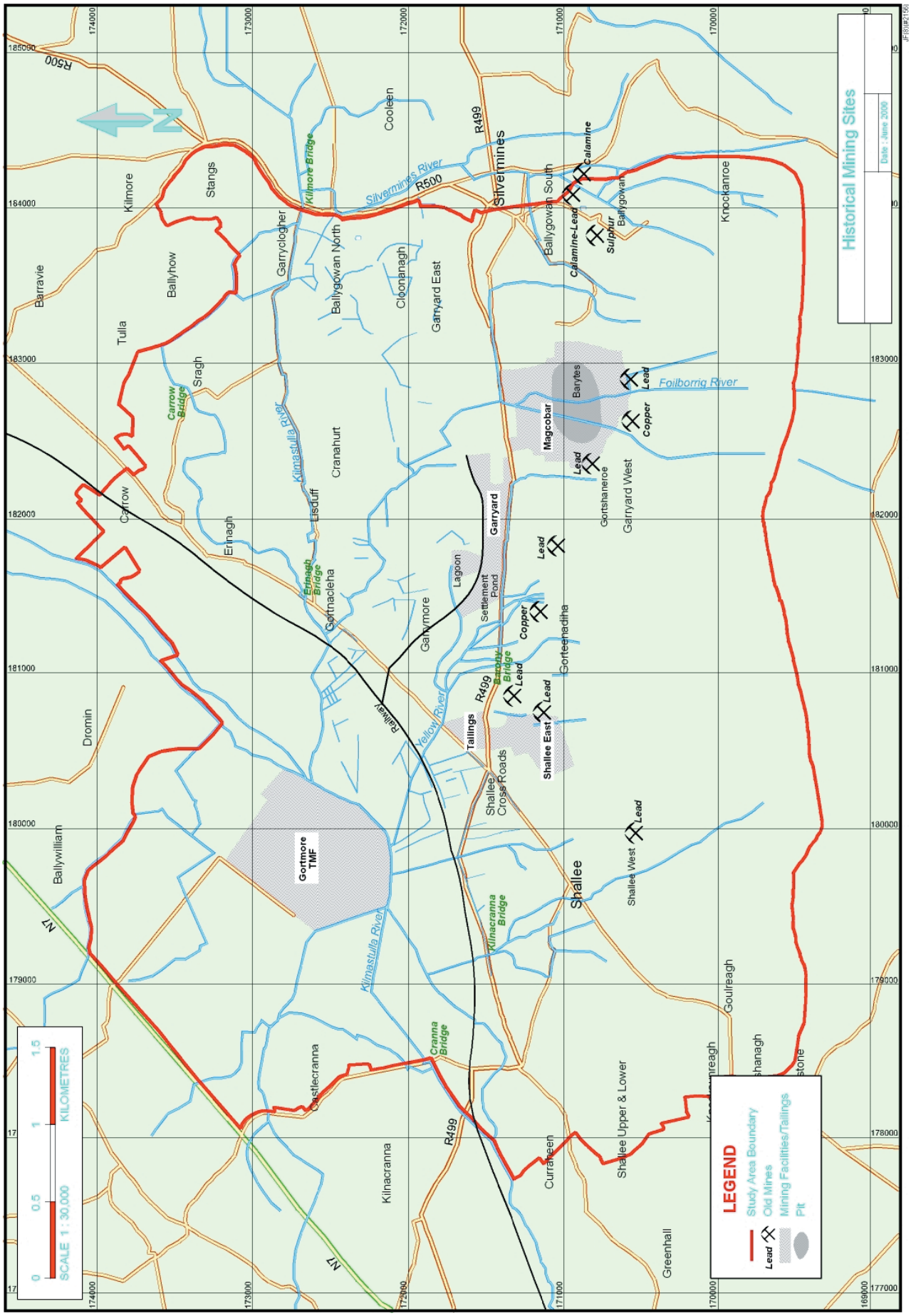


Figure 1.1: Area covered by Inter-Agency Investigation

December 2000 to implement the recommendations contained in the IAG report.

1.2 Establishment of Expert Group

The first meeting of the Expert Group for Silvermines was held on the 27th and 28th June 2001 and the second meeting was held on the 11th and 12th December 2001. The Expert Group consists of international experts and national representatives from various government departments, agencies and North Tipperary County Council.

International Experts

- Professor Brian Davies, BSc, PhD, C.Chem., F.R.S.C., Professor of Geological Sciences, School of the Environment, Clemson University, South Carolina, USA.

- Dr Frank Swartjes, BSc, PhD, Head of the Expert Group for Risk Analysis in relation to soil quality, National Institute of Public Health and the Environment, Netherlands.

- Professor Iain Thornton, PhD, DSc, FGS, Professor of Environmental Geochemistry, Imperial College of Science, Technology and Medicine, London, UK.

Representatives from Government Departments and Agencies

Ms. Marie Sherwood, EPA (Chair)
Ms. Jane Brogan, EPA
Dr. Matt Crowe, EPA
Dr. Kevin Kelleher, MWHB
Dr. Dave McGrath, Teagasc
Mr. Jimmy McLaughlin, DAFRD
Mr. David Moore, DELG
Mr. Marcus O'Connor, NTCC
Dr. Pat O'Connor, GSI

1.3 Terms of Reference and Objectives

Terms of reference were drawn up for the Expert Group. The main objectives for the Expert Group were set out in the Terms of Reference and are as follows:

1. To recommend appropriate standards for lead and other relevant metals in environmental media including soils, sediments, surface waters, groundwaters and air. The Expert Group should review best international practice for the management of lead in the environment, with particular reference to the type of conditions that exist in the Silvermines area i.e. relatively high natural levels of lead and releases into the environment as a result of mining activities.

2. To formulate appropriate guidelines on the use and application of the standards, taking into account the relative risk of the various pathways by which humans and animals become at risk from lead and other relevant metals. These guidelines will advise on appropriate mitigation measures to reduce the risks to children, adults and animals from lead and other heavy metals in the environment.

3. To assess the current monitoring programme being undertaken in the Silvermines area and advise on any alterations, additions etc., that may be required to the monitoring programme. Where gaps in information are identified, the need to undertake research in the Silvermines area should be examined and the type of research required should be specified.

2 METALLIC TRACE ELEMENTS IN SOILS

2.1 Introduction

This section presents some background information on typical heavy metals concentrations in soils both in Ireland and abroad together with information on lead content of soils in the Silvermines area. This serves to illustrate the unique nature of mining areas such as Silvermines which have high naturally occurring levels of metals.

2.2 Trace elements in soil

Trace elements are elements which occur in soils or plants in very small concentrations and some of these elements can adversely affect humans, crops and animals. The trace element content of a soil depends initially on the nature of its parent material. As the soil matures and ages, leaching and nutrient cycling through plants will cause some elements to be concentrated in specific soil horizons while others will be lost progressively in drainage water. Concurrently, elements will be gained by soil through pollution, from natural sources such as deposited dust, volcanic emissions and from drainage water received from higher elevations (Wild, 1988).

The total contents of trace elements in relatively young soils in cool temperate regions are related primarily to the geological nature of the rocks from which their parent materials are derived. In such soils, the normal pedological processes have brought about little or no depth differentiation in the total contents of trace elements within the soil profile. High concentrations of some trace elements, particularly the non-essential trace elements, such as lead, cadmium and arsenic can adversely affect crops and human and animal health. Elevated concentrations of non-essential trace elements can arise due to natural sources or through pollution.

An international review of elemental constituents of soils which was published in 1982 gives range and mean values for trace elements in soils from analysis of soils undertaken throughout the world. This information was compiled and a simple arithmetic mean was calculated from unscreened data for each trace element in soils (Bowen *et al.*, 1982). A summary of the results for cadmium, copper, lead, zinc and arsenic is provided in Table 2.1.

Table 2.1: Range and mean concentration of heavy metals in unpolluted soil

Element	Number of samples	Range (mg/kg)	Mean (mg/kg)
Cadmium	1642	< 0.005 - 4.67	0.62
Copper	7819	20 - 100	25.8
Lead	4970	< 1.0 - 888	29.2
Zinc	7402	1.5 - 2,000	59.8
Arsenic	1193	0.1 - 194	11.3

After Bowen *et al., 1982*

A statistical survey of soil data from England and Wales indicated that the normal lead content of surface (0-15cm) soils lies between 15 and 106 mg/kg, with a geometric mean of 42 mg/kg (Davies, 1983). This study concluded that uncontaminated soils are unlikely to contain more than 110 mg/kg of lead (dry weight) and that the average soil lead concentration in England and Wales is 42 mg/kg (dry weight).

Data on trace element concentrations in Irish soils is relatively limited. Sources of trace element concentrations in Irish soils include information from An Foras Talúntais and Teagasc. Table 2.2 provides

a summary of some of this work for lead.

Table 2.2: Summary of lead concentration in Irish soils

Source of information	No of samples		Landuse	Lead (total concentration) mg/kg
McGrath, Teagasc, 1995	41	Mean	Agriculture	25.8
		Mean	Urban amenity	355
		Mean	Town garden	302
		Mean	Suburban garden	33
		Mean	Industrial	48.6
McGrath, Teagasc, 1998	231	Mean	Pasture	30.0
	30	Mean	Tillage	30.3
	26	Mean	Forest	38.1
	8	Mean	Peat bog	17.6

As can be seen, soil lead concentrations in rural areas of Ireland range from 17.6 mg/kg to 38.1 mg/kg, which are similar to concentrations measured in soils in other countries.

As part of the IAG investigation which commenced in the Silvermines area in 1999, Teagasc initially undertook an exploratory soil sampling programme taking 29 soil samples from agricultural areas. The mean soil lead concentration for these samples was 1136 mg/kg with a range of 50 to 3,650 mg/kg. Following on from that, a more extensive soil sampling programme was undertaken with 218 samples taken from agricultural areas. The mean soil lead concentration from these samples was 782 mg/kg with a range of 25 to 14,842 mg/kg. Figure 2.1 illustrates soil lead concentrations in the soil samples taken by Teagasc in the Silvermines area. Both surveys carried out by Teagasc in the Silvermines area indicated that soil mean lead concentrations in the area were significantly higher than in other areas surveyed throughout Ireland.

This concentration of lead in soils is not unexpected due to the high natural geological occurrence of lead in the area and the level of historical mining activities that has taken place there. The relatively high concentration of lead in the soils, when compared to typical agricultural land in Ireland, serves to illustrate the unusual nature of the Silvermines area and other similar areas throughout Ireland where mining of metals has occurred.

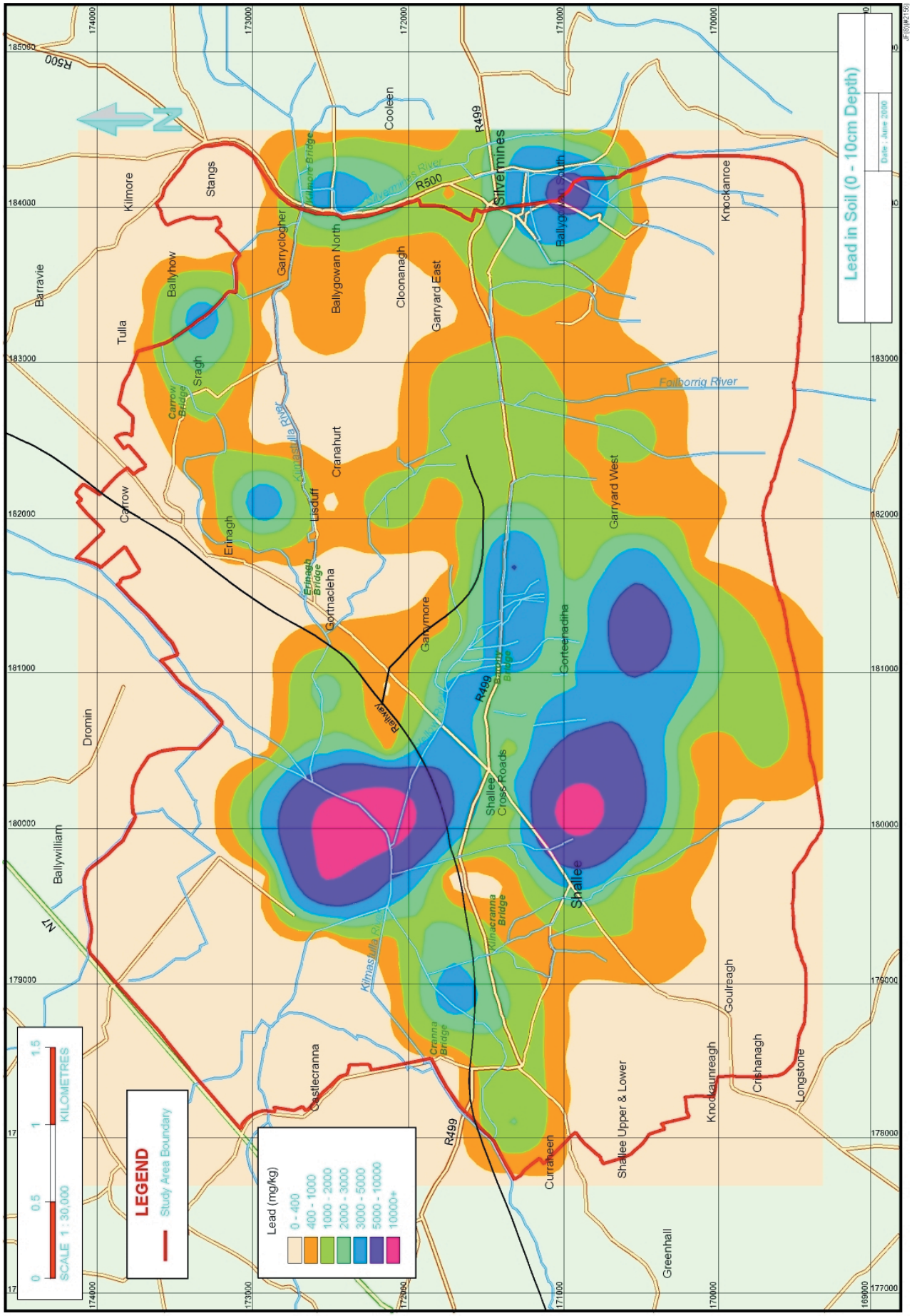


Figure 2.1: Lead in Soils in the Silvermines Area (includes TMF at Gortmore)

2.3 Soil standards for heavy metals in soil (Use of Sewage Sludge Regulations)

The Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 1998 (SI No. 148 of 1998) prescribe standards for the use of sewage sludge in agriculture. The Regulations give effect to Council Directive 86/278/EEC on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture. Part 1 of the Schedule to the Regulation specifies maximum values for concentrations of heavy metals in soils. Sewage sludge cannot be used on land where the concentration of one or more heavy metals exceeds the values specified in the Schedule.

Table 2.3 gives the limit values for heavy metals in soils above which sewage sludge cannot be applied to agricultural land.

Table 2.3: Limit values for the concentration of heavy metals in soil

Heavy metal	[1] Maximum values mg/kg of dry matter
Cadmium	1.0
Copper	50
Nickel	30
Lead	50
Zinc	150
Mercury	1.0

As can be seen, the limit value for lead in soil is 50 mg/kg, which is considerably lower than the mean concentration of 780 mg/kg for lead in soils recorded by Teagasc in the Silvermines area. This again, illustrates the unusual nature of areas such as Silvermines, where mining for heavy metals has occurred or where significant geological deposits of heavy metals exist.

[1]Where the pH of the soil is consistently higher than 7, the values set may be exceeded by not more than 50%, provided that there is no resulting hazard to human health, the environment or, in particular groundwater.

3 REVIEW OF THE IAG REPORT

The starting point for the work of the Expert Group was the IAG report on the presence and influence of lead in the Silvermines area of Co. Tipperary. The general view of the Expert Group and in particular the international experts was that the work undertaken by the IAG was comprehensive and covered a broad range of important issues, thereby providing a sound foundation upon which the Expert Group could frame its work. **The Expert Group agrees with the conclusion in the IAG report that the Silvermines area is a safe place in which to grow up, live and work, provided that certain precautions are taken by public agencies, other interests, and local people themselves.**

Children from the Silvermines National School playing on the rehabilitated school playing area

The Expert Group for Silvermines undertook a review of the following guideline values contained in the IAG report. These guideline values are currently used by the various agencies and departments involved in the Silvermines area as part of the overall active management programme that exists in the area.

1. Soil lead value of 2,000 mg/kg as the guideline for "active management" of lead in the environment to protect human health and in particular children;

2. Soil lead value of 1,000 mg/kg as the threshold value below which toxicity problems are unlikely to occur in grazing animals;

3. Lead in drinking water intended for human consumption – current statutory value of 0.05 mg/l (SI No. 81 of 1988);

4. Lead in air – standard recommended is the TA Luft standard for lead in deposited dust of 250µg/m²/day;

5. Lead in human foodstuffs – statutory values for lead in Ireland in foodstuffs of 2 mg/kg for vegetables, meat, liver and kidney and 1 mg/kg for milk and milk products (SI No. 44 of 1972);

6. Lead in human blood - 10 µg/dl as a safety threshold for the concentration of lead in human blood; and

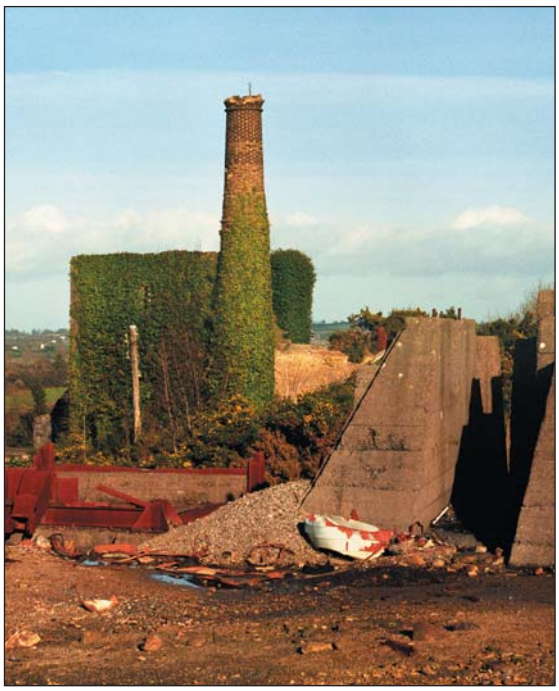
7. Lead concentrations in cattle blood – normal range 0 to 1.2 µmol/l (or 0 – 25 µg/dl).

Ewes and lambs grazing on spring grass

4 APPROACH OF THE EXPERT GROUP

4.1 Introduction

The Expert Group considered the various approaches to developing guideline values and concluded that a *precautionary* approach should be adopted due to the absence of sufficiently robust information to warrant a *risk assessment* approach. The Expert Group stressed that guideline values specified by it for soil and sediment are specifically related to old mining areas such as the Silvermines area where there is a natural geological occurrence of high lead content that has been released into the environment by natural processes and by mining activities. The Group also stressed that guideline values for soil and sediment



Old chimney stack at Shallee mine site

Garryard mine site with tailings lagoon

Open pit at Magcobar mine site

recommended by it should be used in the overall context of an active management programme. They should not be used in isolation of such an active management programme.

The Expert Group considered the impact of both European Community and national legislation on the on-going management of the environment in the Silvermines area. The legislation considered by the Expert Group included:

- 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;
- Dangerous Substances Directive - Council Directive of 4 May 1976 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (76/464/EEC) and associated regulations e.g. Water Quality (Dangerous Substances) Regulations, 2001 (SI No. 12 of 2001);
- Drinking Water Directive - Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption and associated regulations e.g. European Communities (Drinking Water) Regulations, 2000 (SI No. 439 of 2000);

- Groundwater Directive – Council Directive of 17 December 1979 on the protection of groundwater against pollution caused by certain dangerous substances (80/68/EEC) and associated Regulations;
- Commission Regulation (EC) No 466/2001 of 8 March 2001 setting maximum levels for certain contaminants in foodstuffs;
- Waste Directive - Council Directive of 15 July 1975 on Waste (75/442/EEC) and Hazardous Waste Directive – Council Directive of 12 December 1991 on Hazardous Waste (91/689/EEC); and
- Landfill Directive - Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste.

4.2 Water Framework Directive

The Water Framework Directive (2000/60/EEC) came into force on 22nd December 2000 and establishes a strategic framework for managing the water environment of the European Community. Member states have three years to transpose the Directive into national legislation. The Water Framework Directive establishes a common approach to protecting water resources and setting environmental objectives for all waters including groundwaters, rivers, lakes, canals, reservoirs, estuaries and coastal waters. The Directive aims at maintaining and improving water quality within the European Community by setting objectives for all waterbodies requiring at least 'good status', 'no deterioration' and 'restoration' where necessary.

The River Basin District (RBD) will be the main unit for managing the water environment and a single River Basin Management Plan (RBMP) must be produced for each RBD. Identification and analysis of the pressures and impacts on the water environment is required in the preparation of a RBMP and will determine what measures need to be taken in order to achieve 'good status'. For surface waters 'good status' includes good chemical and ecological status and for groundwater includes good chemical and good quantitative status.

The waters in the Silvermines area will ultimately be managed by the relevant competent authority under a river basin management plan with the objective of achieving good water status. However, waters in the area have been influenced by both the natural geological conditions of the area and past mining activities. The Water Framework Directive provides for this by stating " *in cases where a body of water is so affected by human activity or its natural condition is such that it may be unfeasible or unreasonably expensive to achieve good status, less stringent environmental objectives may be set on the basis of appropriate, evident and transparent criteria, and all practicable steps should be taken to prevent any further deterioration of the status of waters".*

4.3 Dangerous Substances Directive

Under the Dangerous Substances Directive Member States are required to take appropriate steps to eliminate pollution of waters by List I substances listed in the Annex to the Directive and to reduce pollution of waters by List II substances also listed in the Annex. List I includes cadmium and its compounds. List II substances include metalloids and metals such as lead, zinc, arsenic and copper. The Dangerous Substances Directive will remain in force until 22nd December 2013, when it will be repealed by the Water Framework Directive.

The Water Quality (Dangerous Substances) Regulations, 2001 (SI No. 12 of 2001) were enacted on 1st

July 2001. The Regulations transpose certain requirements of the Dangerous Substances Directive into national legislation. They prescribe water quality standards in relation to specified List II substances including lead, zinc and arsenic, in surface water e.g. rivers, streams etc. The Regulations require that the annual mean concentration of certain substances are not exceeded and the standard specified for fresh waters depend upon hardness of water measured in mg/l $CaCO_3$.

Where the existing condition of a water body does not meet a specified standard in relation to a substance there should be no disimprovement and compliance with the specified standard should occur no later than 31st December 2010 or by 31st December 2015 for specific cases.

However, in common with the Water Framework Directive, exemptions are provided for in the Regulations. Article (9) (2) states that " *a specified standard shall not apply in relation to a water body where the Agency [Environmental Protection Agency] is satisfied that the water body is so permanently affected by naturally occurring conditions or by past human activity that compliance with that standard is not feasible or would be disproportionately expensive".*

4.4 Drinking Water Directive

The objective of this Directive is to protect human health from the adverse effects of any contamination of water intended for human consumption by ensuring that the water is wholesome and clean. The Directive came into effect on the 25th December 1998 and specifies quality standards in relation to drinking water. This Directive replaced Council Directive of 15 July 1980 relating to quality of water intended for human consumption (80/778/EEC). The European Communities (Drinking Water) Regulations 2001 (SI No. 439 of 2000) transposed the Directive into national legislation and shall come into operation on 1st January 2004. When these Regulations come into force on the 1st January 2004, the current regulation i.e. European Communities (Quality of Water Intended for Human Consumption) Regulations, 1988 (SI No. 81 of 1988), will be revoked.

The Silvermines Public Water Supply Scheme and the Shallee Group Water Supply Scheme comply with the current national drinking water standard for lead; i.e. 50 µg/l. Under the European Communities (Drinking Water) Regulations, 2000, (SI No. 439 of 2000) which will come into force on the 1st January 2004, the standard for lead in drinking water on that date is 25µg/l with a value of 10µg/l to be achieved by 25th December 2013. The Expert Group is examining the implications of this change in standards for drinking water supplies in the area.

4.5 Groundwater Directive

The purpose of the Groundwater Directive is to prevent the pollution of groundwater by substances belonging to the families and groups of substances in List I or List II in the Annex to the Directive and where possible check or eliminate the consequences of pollution which has already occurred. List I substances include cadmium and mercury, while lead, zinc and arsenic are included as List II substances. The Directive requires that Member States prevent the introduction of List I substances into groundwaters and limit the introduction of List II substances.

However, in common with the Water Framework Directive, exemptions are provided for in the Directive. Article 4 (2) states that " *should prior investigation reveal that the groundwater into which the discharge of substances in List I is envisaged is permanently unsuitable for other uses, especially domestic or agricultural, the Member States may authorise the discharge of these substances provided their presence*

does not impede exploitation of ground resource. These authorisations may be granted only if all technical precautions have been taken to ensure that these substances cannot reach other aquatic systems or harm other ecosystems".

It is likely that groundwaters in the Silvermines areas have been influenced by both the natural geological conditions of the area and past mining activities. Part of the on-going work of the Department of the Marine and Natural Resources is to carry out a characterisation study of groundwaters in the Silvermines area which will help evaluate groundwater quality in the area. The study once completed may identify the necessary remedial measures to limit the impact of mining sites on groundwaters in the area.

4.6 Commission Regulation setting maximum levels for certain contaminants in foodstuffs

The Commission Regulation (EC) No 466/2001 of 8 March 2001 sets maximum levels for certain contaminants including lead, cadmium and mercury in foodstuffs and shall apply from 5th April 2002. The Regulation is binding in its entirety and directly applicable in all Member States.

Regulation 466/2001 sets more stringent levels in relation to lead in foodstuffs than previous national Regulations i.e. Health (Arsenic and Lead in Food) Regulations 1972 (SI No. 44 of 1972). This may have implications in relation to milk, meat, edible offal and vegetables produced in the Silvermines area and may also have implications on a national scale. The methodology for sampling and analysis of foodstuffs is set down in Commission Directive 2001/22/EC which specifies the sampling methods and methods of analysis for the official control of the levels of lead, cadmium, mercury and 3-MCPD in foodstuffs. Member States shall bring into force the laws, regulations or administrative provisions necessary to comply with Directive 2001/22/EC by 5th April 2003. The Directive requires that aggregate samples should be taken and then analysed. The Expert Group is seeking to ascertain the implication of these changes for foodstuffs produced in the area.

4.7 Waste and Hazardous Waste Directives

The Waste Management Act, 1996 provides for the transposition of European legislation on waste into Irish law. Council Directive 75/442/EEC on waste, among other things, required the Commission to draw up a list of wastes. This list, which is known as the European Waste Catalogue (EWC), was published as Commission Decision 94/3/EEC. The control and management of hazardous waste is specified in Council Directive 91/689/EEC on Hazardous Waste. In accordance with the Hazardous Waste Directive, a Hazardous Waste List (HWL) was drawn up and published as Council Decision 94/904/EC. The wastes listed in the HWL are those wastes that appear in the EWC which have been deemed to be hazardous.

The EWC/HWL is a harmonised, non-exhaustive list of waste types which has recently been revised and the new EWC/HWL came into force with effect from 1st January 2002.

Wastes arising in the Silvermines area from activities such as dredging works on drains, stream and rivers are now classified under chapter 17 of the EWC/HWL: Construction and Demolition Waste (including excavated soil from contaminated sites). The waste descriptions most relevant are dredging spoil containing dangerous substances (EWC code 17 05 05*[2]) and/or dredging spoil other than those mentioned in 17 05 05* (EWC code 17 05 06). In order to be classified as *hazardous waste*, the dangerous substance must exceed the relevant thresholds as defined in the EWC/HWL and also Directive 67/548/EEC as amended (i.e. Council Directive on the approximation of laws, regulations and

[2]Any waste marked with an asterisk (*) is considered a hazardous waste pursuant to Directive 91/689/EEC on hazardous waste.

administrative provisions relating to the classification, packaging and labelling of dangerous substances). Decisions on whether or not a specific waste type is hazardous or non-hazardous will be determined by analysis of waste types on a case by case basis.

Mine waste and drums dumped at Shallee mine site

4.8 Council Directive on the Landfill of Waste

The primary objective of the Landfill Directive is to prevent or reduce as far as possible the negative effects of landfilling wastes on the environment and human health by way of imposing stringent operational and technical requirements on landfills and waste. The Landfill Directive came into force on 16th July 1999 and Member States were required to bring into force laws, regulations and administrative provisions necessary to comply with the Directive by July 2001.

The Landfill Directive has implications in relation to the disposal of waste in the Silvermines area. Article 5 (3) (a) which prohibits the disposal of liquid wastes into landfill has implications in relation to decisions as to the most appropriate disposal option for some mine wastes and contaminated sediments. However, under Article 3 (2) certain activities and wastes are exempted from the scope of the Landfill Directive. These include the spreading of sludges resulting from dredging operations and similar matter on soils for the purposes of fertilisation or improvement; the deposit of non-hazardous dredging sludges alongside small waterways from where they have been dredged out; and the deposit of unpolluted soil or non-hazardous inert waste resulting from prospecting and extraction, treatment, and storage of mineral resources.

Of most significance, in relation to the on-going management of wastes arising in the Silvermines area is the exemption of the deposit of non-hazardous dredging sludges alongside small waterways, from where they have been dredged out.

5 ACTIVE MANAGEMENT

The IAG Report introduced the term "active management" in relation to the protection of human health and the environment. The Expert Group considers that a comprehensive "active management" programme involving the relevant authorities and the local community is the most effective mechanism for minimising the risk of exposure of children, adults, animals, crops and the wider environment to lead. It also considered that it was important that the term “active management” be clearly defined.

Wellhead of borehole used to monitor groundwater level and water quality, and Bergerhoff gauge used to monitor dust levels, adjacent to TMF at Gortmore

In relation to the protection of human and animal health in Silvermines, "active management" includes:

1. A comprehensive monitoring programme for the area; which includes monitoring of human and animal health, monitoring lead levels in the environment and on-going monitoring of remediated sites;
2. Immediate investigation of any incidents that are likely to give rise to increased risk of exposure to lead by humans and animals;
3. Immediate investigation of suspected lead related animal health problems in the area;
4. Reviewing and updating guidance on measures to minimise lead uptake by humans, animals and plants;
5. Encouraging the active involvement and assistance of the local community in maintaining awareness of the potential risk from lead in the area and preventative strategies that have been put in place;
6. Appropriate dissemination of information to the local community in relation to on-going monitoring and other developments;
7. Minimising disturbance of soils in and around residential houses;
8. Avoiding the disturbance of stream sediments in the area;
9. Covering of bare soils where possible to prevent the exposure of humans, particularly children, and animals to contaminated soils;
10. Avoiding the disturbance of mining wastes; and
11. Encouraging the appropriate management of mining sites and sites with elevated lead concentrations.

The Expert Group noted that there is an effective Community-wide "active management" programme already in place in the Silvermines area, the main objective of which is to minimise the risk to humans and animals of exposure to lead.

Bare areas on the surface of the TMF at Gortmore

6 GUIDELINE VALUES

6.1 Lead in soils

The Expert Group reviewed the guideline value of 2000mg/kg lead concentration in soil above which "active management" of the environment was recommended by the IAG in relation to human health. The consensus of the Expert Group was, that for precautionary purposes and because of lack of information on bioavailability of lead, this value should be reduced to 1,000 mg/kg.

While this guideline value is recommended for the particular conditions present in the Silvermines area, and other similar areas, it should be noted that the Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 1998 (SI No. 148 of 1998) sets 50 mg/kg as the maximum value for the concentration of lead in soils in Ireland. The guideline value of 1,000 mg/kg recommended for the Silvermines area is a reflection of the unusual geological and mining conditions prevalent in the area.

In relation to animal health the Expert Group agreed with the IAG report value of 1000 mg/kg lead in soils as a guideline value below which toxicity problems are unlikely to occur in grazing animals. On farms where lead concentrations in soils exceed 1000mg/kg, good farming practices to minimise the risk of lead ingestion should be implemented with particular attention paid to young animals, which appear to be more susceptible to lead poisoning.

The guideline value of 1000 mg/kg for lead may be revised in the future following further discussions and the availability of information in relation to lead speciation and bioavailability. The current test systems used in Europe to estimate bioavailability display considerable variation and therefore make estimations of bioavailability unreliable. **However, the Expert Group noted that the relatively low levels of blood lead concentrations in adults and children tested during the IAG investigation indicate that lead in the environment is not being transferred to any significant degree into human blood and this is the most effective test of bioavailability.** Low concentrations of lead in adults and childrens blood should reassure members of the Silvermines community in relation to this important matter.

Badly poached soil beside ringfeeder used for outwintering cattle; bare soil increases the risk of exposure to lead

In relation to garden soils, it is very difficult to provide a single safe guideline value for lead. Different plants have different capacities to assimilate metals. Radish *(Raphanus sativus)* is useful as a monitor crop for contaminated soils (Davies, 1992, 1993). Different parts of the plant may contain different concentrations and concentrations vary according to growth stage. For most metals the total soil content is a poor guide to the plant content and some measure of availability must be used. For lead, uptake is probably passive (i.e., it enters the plant by a mass action effect) rather than being metabolically controlled (active transport).

Figure 6.1 illustrates the relationship between total soil lead and lead in radish bulbs and leaves grown in plots in England and Wales (Davies, 1993).

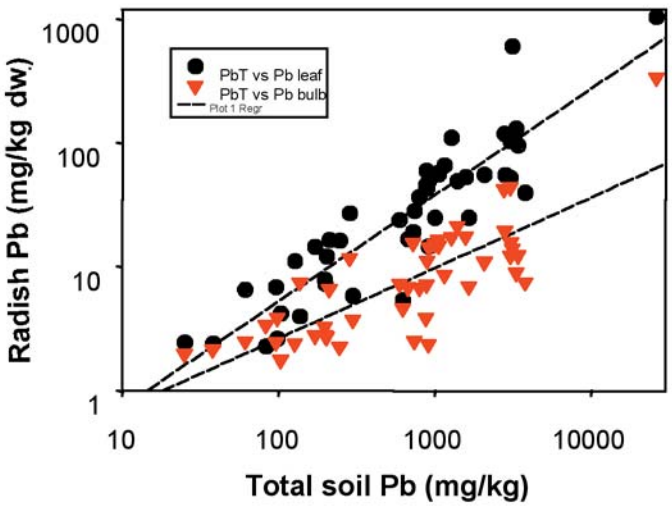


Figure 6.1: Relationship between total soil lead and lead in radish bulbs and leaves

Due to the difficulty in selecting a single guideline value for lead in garden soils the Expert Group cannot recommend a safe guideline value for lead in garden soils. It agrees with the recommendations and guidance contained in the IAG report in relation to the preparation and consumption of locally grown fruit and vegetables in the Silvermines area and considers that following these recommendations is the best way to protect the local community against risk of exposure to lead from garden soil.

6.2 Lead in sediments

In the absence of any reliable data on bioavailability for soils and sediments, the Expert Group considers it appropriate that a similar guideline value should be used for lead in sediments as in soils i.e. 1,000 mg/kg. Above this guideline value, active management should be undertaken in relation to the protection of human and animal health. Animals should not be allowed direct access to water courses where the lead concentration of the sediments is greater than 1,000mg/kg.

6.3 Lead in water

For the purpose of recommending guideline values in relation to water in the Silvermines area, water was considered under two different categories i.e. drinking water and surface water.

6.3.1 Lead in drinking water

The Expert Group noted that the Silvermines Public Water Supply Scheme and the Shallee Group Water Supply Scheme comply with the current national drinking water standard for lead i.e. 50 µg/l (European Communities (Quality of Water Intended for Human Consumption) Regulations, 1988), SI No. 81 of 1988.

Under the European Communities (Drinking Water) Regulations, 2000, (SI No. 439 of 2000) which will come into force on the 1st January 2004, the standard for lead in drinking water from that date is 25 µg/l with a value of 10 µg/l to be achieved by 25th December 2013. The Expert Group is examining the implications of these new standards for drinking water supplies in the area.

6.3.2 Lead in surface water

The Water Quality (Dangerous Substances) Regulations, 2001 (SI No. 12 of 2001) were enacted on 1st July 2001. These Regulations prescribe water quality standards in relation to certain substances in surface water e.g. rivers, streams etc. The substances covered in the Regulations include the metals lead and zinc. The Regulations require that the annual mean concentration of certain substances are not exceeded and the standard specified for fresh waters depends upon hardness of water measured in mg/l $CaCO_3$. The total lead concentration (i.e. dissolved and colloidal/ suspended solids) for water as specified in SI No. 12 of 2001 is:

Water hardness ≤ 100 mg/l $CaCO_3$	5 µg of lead per litre
Water hardness > 100 mg/l $CaCO_3$	10 µg of lead per litre

The water quality standard for lead in surface water is more stringent than the standard for lead in drinking water. This reflects the sensitivity of certain aquatic species to lead in the aquatic environment.

Kilmastulla river which flows along the east boundary of TMF at Gortmore

Where the existing condition of a water body does not meet a specified standard in relation to a substance there should be no further deterioration and compliance with the specified standard should occur no later than 31st December 2010 or by 31st December 2015 for specific cases.

However, an exemption is provided for by Article (9) (2) of the Regulations which states " *a specified standard shall not apply in relation to a water body where the Agency [Environmental Protection Agency] is satisfied that the water body is so permanently affected by naturally occurring conditions or by past human activity that compliance with that standard is not feasible or would be disproportionately expensive"*. This may apply in the Silvermines area, where the lead concentrations in surface waters in the Kilmastulla currently ranges from < 1.0 µg/l to 9.2 µg/l, with an average of 4.9 µg/l. The lead concentration in surface water samples from the Yellow River currently ranges from 13.6 µg/l to 573.8 µg/l, with an average lead concentration of 201 µg/l (sampling period April 2001 to June 2001).

6.4 Lead in dust

The Expert Group approved the use of the German TA Luft Regulations for setting limits for lead concentrations in deposited dust in the external environment. The TA Luft limits for lead, cadmium and thallium in deposited dust are given in Table 6.1.

Table 6.1: TA Luft Limits for metals in deposited dust

Metal	TA Luft Limit in deposited dust
Lead and inorganic lead compounds	250 µg/m²/day
Cadmium and inorganic cadmium compounds	5 µg/m²/day
Thallium and inorganic thallium compounds	10 µg/m²/day

Bergerhoff gauge used to measure the concentration of lead in deposited dust

The Expert Group recommends that internal dust monitoring, both in houses and in the schools, is essential, as internal dust is likely to be the main source of childhood lead exposure. Both concentration and loading should be measured as the latter has in previous investigations been found to be a useful measure of potential exposure.

The Mid-Western Health Board is currently undertaking internal dust sampling in houses in Silvermines village, Shallee and in houses located adjacent to the perimeter of the TMF at Gortmore. Following completion of this work, the Expert Group recommends that the need for further monitoring and the frequency of such monitoring, should be evaluated by the Mid-Western Health Board.

6.5 Lead in blood

6.5.1 Lead in human blood

The Expert Group agrees the use of 10 µg/dl as the current acceptable blood lead concentration. The possible need to revise this downwards is currently being reviewed by the MWHB, who will make a recommendation in relation to it.

6.5.2 Lead in animal blood

In relation to animal health the Expert Group considers 0 to 1.2 µmol/l (25 µg/dl) lead to be the normal range for blood lead concentrations in cattle. Table 6.2 provides an interpretation of blood and tissue lead concentrations in relation to animal health, as presented in the IAG report.

Table 6.2: Interpretation of blood lead concentrations in cattle

Concentration (µmol/l)	Interpretation
0 – 1.2	Normal range
1.2 – 1.7	Elevated but not of clinical significance
1.7 – 2.4	May be associated with signs of toxicity

DAFRD, 2000

6.6 Lead in foodstuffs

Since the publication of the IAG report a new Regulation in relation to the permitted concentration of lead and other contaminants in foodstuffs has come into force i.e. Commission Regulation (EC) No 466/2001 of March 2001, setting maximum levels for certain contaminants in foodstuffs. The Regulation sets maximum levels for certain contaminants including lead. The maximum level for lead in foodstuffs is given in Table 6.3.

Table 6.3: Maximum level for lead in foodstuffs

Product	Maximum level (mg/kg wet weight)
Cows milk	0.02
Meat of bovine animals, sheep, pig and poultry	0.1
Edible offal of cattle, sheep, pigs and poultry	0.5
Vegetables excluding brassica, leafy vegetables, fresh herbs and all fungi. For potatoes the maximum level applies to peeled potatoes	0.1
Brassica, leafy vegetables and cultivated fungi	0.3
Fruit excluding berries and small fruits	0.1
Berries and small fruit	0.2

The Regulation will apply from 5th April 2002. The Expert Group noted the new regulation. The implications of these regulations and associated Directive on sampling and analysis (2001/22/EC) are being considered by the DAFRD.

6.7 Ecological guideline values

The Expert Group discussed the issue of guideline values in relation to ecosystem protection in Silvermines. The Expert Group considered that the decision not to introduce ecological guideline values is justified from an ecological viewpoint, based on the acceptance of an ecosystem which is in equilibrium with the extreme geological conditions in the Silvermines area. Such an ecosystem may be unique with specific fauna and flora and would warrant future assessment and possible conservation. However, from an environmental viewpoint it is important to realise that ecological and enzymatic processes like nitrification and degradation in soils might be hampered in the Silvermines area.

7 GUIDANCE AND BEST PRACTICE

7.1 Human health

The Expert Group discussed the current guidance in relation to human health available to the community of Silvermines. The following guidance is available:

1. Inter Agency Group *Report of the investigation into the presence and influence of lead in the Silvermines area of County Tipperary* published and distributed in June 2000

2. *What every parent should know about lead levels in Children: A Parent's Reference Guide* published by the Mid-Western Health Board and distributed in February 2000. Leaflets were also circulated by the Mid-Western Health Board in 2001 and 2002 on the same topic.

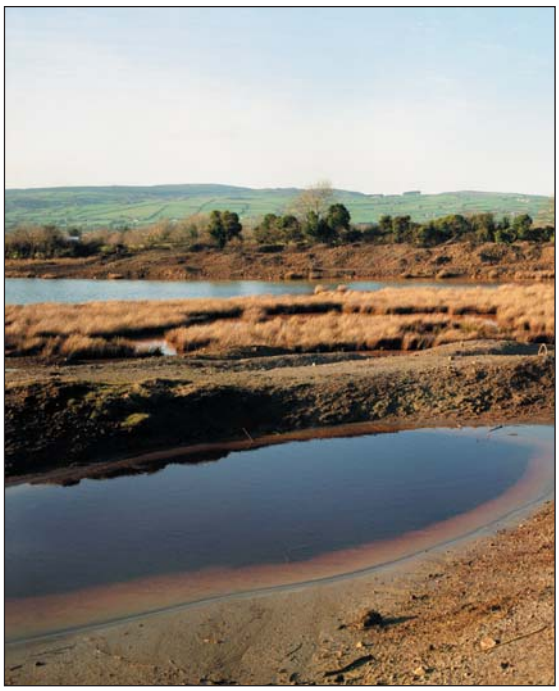
The Expert Group considers that the current guidance in relation to "human" health in the environment of Silvermines is adequate. The education and awareness campaign in the Silvermines area which is implemented by the Mid-Western Health Board should continue. Guidance documents should be reviewed regularly and should take account of human health monitoring results as they become available.

The Expert Group particularly agrees with recommendation number 2 and 27 in the IAG report:

- Recommendation No. 2 - *Children should be discouraged from accessing other areas of high lead content; and*

- Recommendation No. 27 - *To avoid the disturbance of sediments, the rivers and streams in the Yellow river catchment area should not be used for recreational purposes.*

In addition, the Expert Group recommends that North Tipperary County Council erect warning notices on



Tailings pond at Garryard site

Open pit and vegetated tailings at Ballygowan

sections of rivers and streams where it is known that children play to discourage recreational use of these areas.

7.2 Animal health

Teagasc published a guidance booklet on " *Lead and Animal Health"* in March 2001. This was circulated to the farming community in conjunction with individual farm maps which indicate the concentration of lead in farm soils.

The Expert Group reviewed the guidance which is available to the farming community in Silvermines in relation to animal health in the area and considers that the current guidance in relation to animal health covers the majority of issues in the area. The Expert Group stressed the importance of preventing animal access to mine wastes, bare soils and stream sediments. Cattle are inquisitive by nature and frequently consume exposed soil and other unusual materials. Dredged sediments with lead concentration of greater than 1,000 mg/kg should not be spread on adjacent land or be piled unfenced alongside streams and rivers where animals can gain access to the dredgings. Dredged sediments provide a potential source of exposure, irrespective of the chemical and mineral form of the lead.

The Expert Group agrees with the recommendation contained in the IAG report and the Teagasc leaflet *"Lead and Animal Health"* that drinking water for animals should be extracted from streams, preferably from a stretch of stream in which the sediment has comparatively lower lead levels and where sediment disturbance can be avoided. Turbid water (indicating sediment in suspension) should never be used as a water supply for animals.

Cattle exposed to bare soils

7.3 Guidance on sediment disposal

The Expert Group recommends that stream sediments should be sampled and analysed to determine their concentration of lead and other relevant metals before drainage works are undertaken. This is required to determine the most appropriate and safe method of disposal. This is particularly important for sediments

located in the Yellow River catchment area. This recommendation should be reviewed when definitive rehabilitation of the mining sites in the area has taken place.

The Expert Group also recommends that sediments which have a lead concentration greater than 1000 mg/kg should not be disposed of to agricultural land, either along the bank or spread onto adjacent lands. An alternative, safe waste management disposal option will have to be found for sediments where the concentration of lead is greater than 1,000 mg/kg. Where stream sediment of less than 1000 mg/kg is dredged and disposed of to adjacent agricultural land the Expert Group recommends that the ground is rolled after spreading and that the area is not grazed until grass re-growth is greater than 12 cm in height.

The Group also pointed out that sediments, when protected against oxidation are significantly less toxic than when exposed to air and that this should be considered when determining safe disposal options for sediments in the area. The Silvermines ore body consists of pyrite, chalcopyrite, galena and sphalerite, i.e., polymetallic sulphides. The predominant form in the waste is likely to be sulphides together with limestone, dolomite and baryte. On exposure to air the galena (lead sulphide) weathers to the sulphate and reaction with the carbonate rocks may cause the several lead carbonates to form. Each chemical form differs significantly in its solubility in water as indicated in Table 7.1.

The solubility of lead sulphide is negligible. Analysis of soils containing lead mine wastes derived from galena (PbS) in England based on

Stream overgrown with vegetation which requires dredging to reduce risk of flooding

Recently dredged stream with sediment spread on adjacent land. The concentration of lead in the sediment was less than 1,000 mg/kg

Table 7.1: Solubility of various lead compounds

Compound	Solubility Product (K_s)	Sat. Soln. (M)	Sat. Soln. (mg/l)
Lead sulphide (PbS)	27.5	1.78×10^{-14}	3.68×10^{-9}
Lead sulphate ($PbSO_4$)	7.8	1.26×10^{-4}	26.1
Lead carbonate ($PbCO_3$)	13.1	2.82×10^{-7}	56.7×10^{-3}

scanning electron microscopy and x-ray analysis showed the mineral pyromorphite ($Pb_5(PO_4)_3Cl$) to be the principal lead-bearing constituent (Cotter-Howells and Thornton, 1991). This Pb-phosphate mineral is a weathering product of galena and lead carbonate and has a very low solubility and bioavailability. The information on solubility explains why metal polluted stream water can be remediated by passing into artificial wetlands (to force the formation of sulphides) or through a limestone chippings passive treatment plant to precipitate metal carbonates.

The Department of Marine and Natural Resources appointed consultants Steffan, Robertson and Kirsten (SRK) in February 2001 to prepare management and rehabilitation plans for mining sites in the area and any other sites identified during the consultancy that require management. SRK was also asked specifically to address the issue of the safe management and disposal of stream sediment arising from dredging operations in the area. The report from the work of SRK is awaited and the implications of the report for sediment disposal in the Silvermines area will be considered by the Expert Group when it becomes available.

7.4 Guidance on gardening

As stated previously by the Expert Group it is very difficult to define a single safe guideline value for lead in garden soils below which garden crops will not contain excess lead. Different plants have different capacities to absorb metals. The Expert Group therefore recommends that where fruit and vegetables are locally grown for home consumption the guidance given in the IAG report to reduce dietary exposure to lead should be adopted i.e.:

- Thoroughly wash all fruit and vegetables in running water of drinking quality;
- Peel potatoes prior to cooking; and
- Remove the outer leaves of leafy vegetables prior to washing and consumption.

In addition, garden soil fertility levels should be maintained or enhanced where necessary, particularly in relation to adequate lime and phosphorus levels. Phosphate is known to assist in the formation of more inactive forms of lead in the soils and therefore reduces uptake of lead. In addition, increased concentrations of calcium and phosphate in foodstuffs is known to reduce the availability of lead in both humans and animals.

The need to undertake a review of current recommendations in relation to guidance on gardening will be considered by the Expert Group when the results of the garden soil sampling programme become available. Teagasc in conjunction with the Mid-Western Health Board commenced a garden soil monitoring programme in December 2001.

7.5 Guidance on soil disturbance

The Expert Group has considered the requirement for guidance on soil disturbance in the Silvermines area wherever significant soil disturbance takes place. The Group believes it is important to distinguish clearly between short-term exposure to a contaminated soil by an adult workforce and long-term exposure by the young child.

Significant short-term soil disturbance would include:

- digging foundations;
- site excavations;
- top-soil or subsoil removal;
- construction of bridges and culverts;
- field drainage operations; and
- site clearance.

Prior to undertaking any soil disturbance operations in the Silvermines area, the concentration of lead in the soil needs to be determined. A guideline to the possible level of lead in the soil can be determined by reference to the soil lead map which was developed by Teagasc during the IAG investigation (see Figure 2.1). However, as the concentration of lead in soils can vary significantly even within a relatively small area, the Expert Group advises that a specific soil sampling and analysis programme from lead enriched sites should be undertaken, where significant soil disturbance is envisaged, to determine the site specific lead concentration.

The Expert Group recommends the following best practice in relation to soil disturbance:

1. bare areas of soil should be kept to a minimum during soil disturbance operations such as construction works etc.;
2. bare soils on sites should be dampened with water during weather conditions which favour the generation of dust on site;
3. once works have been completed on sites, bare soils should be covered over to minimise the potential risk to human and animal health e.g. sown with grass; and
4. reference should be made to building codes, current planning regulations and health and safety regulations, which would be relevant for example to site workers engaged in site clearance and construction activities.

The Expert Group also recommends that appropriate conditions should be attached to any planning permission relating to developments that require disturbance of soils in the area.

In relation to agricultural land where ploughing and reseeding is required it is important that soil lead and

in particular soil zinc concentrations are determined prior to reseeding as elevated levels may affect germination and establishment of grass. Zinc may affect seedling viability. In addition it is advisable for soil fertility levels to be determined prior to reseeding and that soil fertility levels are maintained or improved where necessary. The Expert Group noted that the IAG investigation found that both soil acidity, which is corrected by the application of calcium carbonate or lime, and phosphorus deficiency were prevalent in the Silvermines area.

The Expert Group recommends the following in relation to ploughing and reseeding where this is to be undertaken:

1. reseed in the Autumn with late diploid perennial rye grass;
2. apply fertiliser based on Teagasc current nutrient advice;
3. roll after emergence;
4. in Spring, if growth is uneven, top herbage, apply fertiliser, roll and take an early silage crop; and
5. after a silage cut is taken, roll, apply nitrogen and allow regrowth for 3 to 4 weeks before grazing.

This guidance should be included in any future revisions of the Teagasc leaflet *"Lead and Animal Health"*.

8 CURRENT MONITORING PROGRAMME

The Expert Group reviewed the current monitoring programme in Silvermines which forms part of an on-going active approach to the management of lead in the environment.

8.1 Human health monitoring

The current monitoring programme in Silvermines monitors lead concentrations in human blood. In addition lead concentrations in drinking water and fruit and vegetables have been monitored and further sampling was undertaken in 2001. The MWHB and Teagasc also carried out a sampling programme in November and December 2001 to determine the concentration of lead in household dust, on hands using hand-wipes and in garden soils.

A third round of human blood lead level screening was undertaken in November 2001 by the MWHB. Blood lead level screening was offered to all pre-school children in the study area and all school children in the five schools in the area. The level of participation in the blood screening programme was good.

Following completion of the 2001 monitoring programme undertaken by the MWHB, the need for continued monitoring will be reviewed by them. Should the blood lead levels continue to be low, the Expert Group considers there is little to be gained from continuing monitoring of lead blood levels, particularly due to the invasive nature of monitoring. The need for monitoring blood levels or the use of hand wipes should, however, be reviewed should an event occur which indicates an increased risk to the community. Results from internal (i.e. vacuum cleaner bags) and external (i.e. Bergerhoff gauges) dust monitoring should identify the need for additional blood monitoring or hand wipe monitoring. Awareness of the potential risk from lead in the environment should be maintained through education and awareness programmes.

Permission to take hand-wipe samples from the children in the five schools who participated in the 2001 blood lead level screening will be sought from parents in January 2002 and undertaken in February 2002. The programme will start with those children in the Silvermines School who participated in the most recent blood lead level screening programme.

The results from the hand wipes should be linked to internal dust monitoring in households and garden soil sampling results. Internal house dust sampling commenced on December 17th 2001, starting with the homes of children in Silvermines School who had participated in blood lead level screening. Parents have been asked to retain a full vacuum cleaner bag of dust for collection and analysis. This will be extended in January 2002 to include children in the Ballywilliam area and homes in and around the TMF.

8.2 Animal health monitoring

Animal health monitoring has been sub-divided into animal health and food safety. In relation to animal health the Expert Group considers that investigation of animal health incidences by the DAFRD, as they arise, is an appropriate approach.

The Expert Group recommends that the on-going monitoring of meat and offal samples from farms in the Silvermines area should continue particularly in light of the recent European Commission Regulation (EC) No 466/2001 of March 2001 setting maximum levels for certain contaminants in foodstuffs. The maximum levels for certain contaminants including lead are more stringent than in previous regulations,

particularly for meat, offal and milk.

8.3 Environmental monitoring

Environmental monitoring, which is currently undertaken in Silvermines, includes:

- analysis of soils and herbage samples taken by Teagasc on farms where outbreaks of lead poisoning have been identified;
- sampling and analysis of surface water and stream sediment from farms and other areas of concern by the EPA and NTCC, as required;
- on-going physico-chemical and biological monitoring of the Kilmastulla and Yellow rivers as part of the national water quality monitoring programme, by the EPA and NTCC;
- external dust deposition monitoring adjacent to the TMF at Gortmore, in Silvermines village and control site, by NTCC;
- sampling and analysis of garden soils by Teagasc;
- household dust sampling and analysis by MWHB; and
- sampling and analysis of soils, stream sediments, surface waters and groundwaters and waste materials by consultants (SRK) employed by DMNR.

The Expert Group agrees with the current environmental monitoring programme for the Silvermines area. In addition, the Expert Group recommends that where a sample is taken, a full suite of analyses should be conducted as the ore body at Silvermines is dominated by sphalerite and galena which can contain cadmium, selenium, silver, mercury, arsenic, copper and antimony[3] .

[3] Cadmium is known for its toxicity. Silver is very toxic to micro-organisms. Where mercury can be methylated (so-called black rivers) a hazard exists. Zinc is phytotoxic and bare areas in and around old metals mines are caused in part by high zinc (other causes being mechanical instability and lack of nutrients nitrogen, phosphorus and potassium). Arsenic is toxic as is antimony.

9 SUMMARY OF RECOMMENDATIONS

The main recommendations of the Expert Group are:

Approach Adopted

1. The Expert Group considered the various approaches to developing guideline values and concluded that a *precautionary* approach should be adopted due to the absence of sufficiently robust information to warrant a *risk assessment* approach. The Expert Group stressed that guideline values specified by it for soil and sediment are specifically related to old mining areas such as the Silvermines area where there is a natural geological occurrence of high lead content that has been released into the environment by natural processes and by mining activities. The Group also stressed that guideline values for soil and sediment specified by it should be used in the overall context of an "active management" programme. They should not be used in isolation of such an "active management" programme.

Active Management

2. The Expert Group considers that a comprehensive "active management" programme involving the relevant authorities and the local community is the most effective mechanism for minimising the risk of exposure of children, adults, animals, crops and the wider environment to lead. It also considered that it was important that the term "active management" be clearly defined.

   In relation to the protection of human and animal health in Silvermines, "active management" includes:

   - A comprehensive monitoring programme for the area which includes monitoring of human and animal health, monitoring lead levels in the environment and on-going monitoring of remediated sites;
   - Immediate investigation of any incidents that are likely to give rise to increased risk of exposure to lead by humans and animals;
   - Immediate investigation of suspected lead related animal health problems in the area;
   - Reviewing and updating guidance on measures to minimise lead uptake by humans, animals and plants;
   - Encouraging the active involvement and assistance of the local community in maintaining awareness of the potential risk from lead in the area and preventative strategies that have been put in place;
   - Appropriate dissemination of information to the local community in relation to on-going monitoring and other developments;
   - Minimising disturbance of soils in and around residential houses;
   - Avoiding the disturbance of stream sediments in the area;

- Covering of bare soils where possible to prevent the exposure of humans, particularly children, and animals to contaminated soils;
- Avoiding the disturbance of mining wastes; and
- Encouraging the appropriate management of mining sites and sites with elevated lead concentrations.

Lead in Soils

3. The Expert Group reviewed the guideline value of 2000 mg/kg lead concentration in soil above which "active management" of the environment was recommended by the IAG. The consensus of the Expert Group was, that for precautionary purposes and because of lack of information on bioavailability of lead in terrestrial soils, this value should be reduced to 1,000 mg/kg.

4. Due to the difficulty in selecting a single guideline value for lead in garden soils the Expert Group cannot recommend a safe guideline value for lead in garden soils. It agrees with the recommendations and guidance contained in the IAG report in relation to the preparation and consumption of locally grown fruit and vegetables in the Silvermines area and considers that following these recommendations is the best way to protect the local community against risk of exposure to lead from garden soil.

Lead in Sediments

5. The Expert Group considers it appropriate that a similar guideline value should be used for lead in sediments as in soils i.e. 1,000 mg/kg. Above this guideline value, active management should be undertaken in relation to the protection of human and animal health.

6. Animals should not be allowed direct access to water courses where the lead concentration of the sediments is greater than 1,000 mg/kg.

Lead in Dust

7. The Expert Group approved the use of the German TA Luft Regulations for setting limits for lead concentrations in deposited dust in the external environment.

8. The Expert Group recommends that internal dust monitoring, both in houses and in the schools, is essential, as internal dust is likely to be the main source of childhood lead exposure. Both concentration and loading should be measured as the latter has in previous investigations been found to be a useful measure of potential exposure. The need for further dust monitoring and the frequency of such monitoring, should be evaluated by the MWHB.

Lead in Human Blood

9. The Expert Group agrees the use of 10 µg/dl as the current acceptable blood lead concentration. The possible need to revise this downwards is currently being reviewed by the MWHB, who will make a recommendation in relation to it.

Lead in Animal Blood

10. In relation to animal health the Expert Group considers 0 to 1.2 µmol/l (25 µg/dl) lead to be the normal range for blood lead concentrations in cattle.

Lead in Foodstuffs

11. The Expert Group noted the new regulations in relation to the permitted concentration of lead in foodstuffs and associated Directive on sampling and analysis (2001/22/EC) are being considered by DAFRD.

Ecological Guideline Values

12. The Expert Group discussed the issue of guideline values in relation to ecosystem protection in Silvermines. The Expert Group considered that the decision not to introduce ecological guideline values is justified from an ecological viewpoint, based on the acceptance of an ecosystem which is in equilibrium with the extreme geological conditions in the Silvermines area.

Guidance on Human Health

13. The Expert Group considers that the current guidance in relation to human health in the environment of Silvermines is adequate. The education and awareness campaign in the Silvermines area which is implemented by the MWHB should continue. Guidance documents should be reviewed regularly and should take account of human health monitoring results as they become available.

14. In addition, the Expert Group recommends that North Tipperary County Council erect warning notices on sections of rivers and streams where it is known that children play to discourage recreational use of these areas.

Guidance on Animal Health

15. The Expert Group reviewed the guidance which is available to the farming community in Silvermines in relation to animal health in the area and considers that the current guidance in relation to animal health covers the majority of issues in the area. The Expert Group stressed the importance of preventing animal access to mine wastes, bare soils and stream sediments.

16. Dredged sediments with lead concentration of greater than 1,000 mg/kg should not be spread on adjacent land or be piled unfenced alongside streams and rivers where animals can gain access to the dredgings.

17. The Expert Group agrees with the recommendation contained in the IAG report and the Teagasc leaflet "Lead and Animal Health" that drinking water for animals should be extracted from streams, preferably from a stretch of stream in which the sediment has comparatively lower lead levels and where sediment disturbance can be avoided. Turbid water (indicating sediment in suspension) should never be used as a water supply for animals.

Guidance on Sediment Disposal

18. The Expert Group recommends that stream sediments should be sampled and analysed to determine their concentration of lead and other relevant metals before drainage works are undertaken. This is required to determine the most appropriate and safe method of disposal.

19. The Expert Group also recommends that sediments which have a lead concentration greater than 1000 mg/kg should not be disposed to agricultural land, either along the bank or spread onto adjacent lands. An alternative safe waste management disposal option will have to be found for sediments where the concentration of lead is greater than 1,000 mg/kg. Where stream sediment of less than 1000 mg/kg are dredged and disposed of to adjacent agricultural land the Expert Group recommends that the ground is rolled after spreading and that the area is not grazed until grass re-growth is greater than 12 cm in height.

Guidance on Gardening

20. The Expert Group recommends that where fruit and vegetables are grown locally, the guidance given in the IAG report should be adopted; i.e. thoroughly wash all fruit and vegetables in running water of drinking quality; peel potatoes prior to cooking; and remove the outer leaves of leafy vegetables prior to washing and consumption. The need to undertake a review of the current recommendations in relation to guidance on gardening will be considered by the Expert Group when the results of the garden soil sampling programme becomes available.

21. The Expert Group recommends that garden soil fertility levels should be maintained or enhanced where necessary, particularly in relation to adequate lime and phosphorus.

Guidance on Soil Disturbance

22. Prior to undertaking any soil disturbance operations in the Silvermines area the concentration of lead in the soil needs to be determined.

23. The Expert Group advises that a specific soil sampling and analysis programme from lead enriched sites should be undertaken, where significant soil disturbance is envisaged, to determine the site specific lead concentration.

24. The Expert Group recommends the following best practice in relation to soil disturbance:

    - bare areas of soil should be kept to a minimum during soil disturbance operations such as construction works etc.;

    - bare soils on sites should be dampened with water during weather conditions which favour the generation of dust on site;

    - once works have been completed on sites, bare soils should be covered over to minimise the potential risk to human and animal health e.g. sown with grass; and

    - reference should be made to building codes, current planning regulations and health and safety regulations, which would be relevant for example to site workers engaged in site clearance and construction activities.

25. The Expert Group recommends that appropriate conditions should be attached to any planning permission relating to developments that require disturbance of soils in the area.

26. The Expert Group recommends that where ploughing and reseeding of agricultural land is required soil lead and soil zinc concentrations should be determined prior to reseeding. In addition it is advisable for soil fertility levels to be determined prior to reseeding and that soil fertility levels are maintained or improved where necessary.

27. The Expert Group recommends the following in relation to ploughing and reseeding where this is to be undertaken:

    - reseed in the Autumn with late diploid perennial rye grass;
    - apply fertiliser based on Teagasc current nutrient advice;
    - roll after emergence;
    - in Spring, if growth is uneven, top herbage, apply fertiliser, roll and take an early silage crop; and
    - after a silage cut is taken, roll, apply nitrogen and allow regrowth for 3 to 4 weeks before grazing.

Human Health Monitoring

28. Following completion of the 2001 monitoring programme undertaken by the MWHB, the need for continued monitoring will be reviewed by them. Should the blood lead levels continue to be low, the Expert Group considers there is little to be gained from continuing monitoring of lead blood levels, particularly due to the invasive nature of monitoring. The need for monitoring blood levels or the use of hand wipes should, however, be reviewed should an event occur which indicates an increased risk to the community.

29. Awareness of the potential risk from lead in the environment should be maintained through education and awareness programmes.

Animal Health Monitoring

30. In relation to animal health the Expert Group considers that investigation of animal health incidences by the DAFRD, as they arise, is an appropriate approach.

31. The Expert Group recommends that the on-going monitoring of meat and offal samples from farms in the Silvermines area should continue particularly in light of the recent European Commission Regulation (EC) No 466/2001 of March 2001 setting maximum levels for certain contaminants in foodstuffs.

Environmental Monitoring

32. The Expert Group agrees with the current environmental monitoring programme for the Silvermines area. In addition, the Expert Group recommends that where a sample is taken, a full suite of analyses should be conducted as the ore body at Silvermines is dominated by sphalerite and galena which can contain cadmium, selenium, silver, mercury, arsenic, copper and antimony.

10 ADDITIONAL WORK AND RESEARCH NEEDS

The Expert Group was asked to identify any further research needs during its work. However, it is important that where research needs are identified the results from this research must be of practical benefit to the community of Silvermines.

The Expert Group recommends that the following work should be considered:

1. Sampling protocols for soils, sediments and water need to be developed to ensure a consistent approach to sampling. These sampling protocols will be applicable to other abandoned mine sites in Ireland.

2. A further stream sediment sampling and analysis programme be undertaken to provide a more comprehensive picture of lead concentrations in stream sediments in the area. The Expert Group recommends that a river bank sample, a stream sediment sample and a water sample be taken at each sample location. The Expert Group is currently considering whether soil samples from adjacent land should also be taken and if so to what depth. In relation to the on-going management of dredging spoil from streams and drains, the Expert Group considers that it is preferable that sediment sampling and analysis be conducted on a site-specific basis when dredging is planned for a particular stretch of watercourse.

3. A GIS system should be developed for the area which will be used to manage on-going monitoring information obtained from the area.

4. Existing baseline ecological information on the area should be compiled and additional ecological studies in selected parts of the area should be undertaken if required.

11 REMAINING WORK OF THE EXPERT GROUP

The Expert Group considers the following will need to be undertaken prior to completion of its work.

1. Develop guideline values and guidance where appropriate, for other relevant metals.

2. Compile sampling protocols for soil, sediment and water.

3. Review relevant parts of the report commissioned by the Department of the Marine and Natural Resources.

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An Ghníomhaireacht um Chaomhnú Comhshaoil

Bunú
Achtaíodh an tAcht fán nGníomhaireacht um Chaomhnú Comhshaoil ar an 23ú lá d'Aibreán, 1992 agus faoin reachtaíocht seo bunaíodh an Ghníomhaireacht go hoifigiúil ar an 26ú lá d'Iúil, 1993.

Cúraimí
Tá réimse leathan de dhualgais reachtúla ar an nGníomhaireacht agus de chumhachtaí reachtúla aici faoin Acht. Tá na nithe seo a leanas san áireamh i bpríomhfhreagrachtaí na Gníomhaireachta:

- ceadúnú agus rialáil próiseas mór/ilchasta tionsclaíoch agus próiseas eile a d'fhéadfadh a bheith an-truaillitheach, ar bhonn rialú comhtháite ar thruailliú (Integrated Pollution Control-IPC) agus cur chun feidhme na dteicneolaíochtaí is fearr atá ar fáil chun na críche sin;
- faireachán a dhéanamh ar cháiliocht comhshaoil, lena n-áiritear bunachair sonraí a chur ar bun a mbeidh rochtain ag an bpobal orthu, agus foilsiú tuarascálacha treimhsiúla ar staid an chomhshaoil;
- comhairle a chur ar údaráis phoiblí maidir le feidhmeanna comhshaoil agus cuidiú le húdaráis áitiúla a bhfeidhmeannas caomhnaithe a chomhlíonadh;
- cleachtais atá fónta ó thaobh an chomhshaoil de a chur chun cinn, mar shampla, trí úsáid iniúchtaí comhshaoil a spreagadh, cuspóirí cáilíochta comhshaoil a leagan síos agus cóid chleachtais a eisiúint maidir le nithe a théann i bhfeidhm ar an gcomhshaol;
- taighde comhshaoil a chur chun cinn agus a chomhordú;
- gach gníomhaíocht thábhachtach diúscartha agus aisghabhála dramhaíola, lena n-áirítear líontaí talún, a cheadúnú agus a rialáil agus plean náisiúnta bainistíochta um dhramháil ghuaiseach, a bheidh le cur i ngníomh ag comhlachtaí eile, a ullmhú agus a thabhairt cothrom le dáta go tréimhsiúil;
- córas a fheidhmiú a chuirfidh ar ár gcumas astúcháin COS (Comhdhúiligh Orgánacha Sho-ghalaithe) a rialú de bharr cáinníochtaí suntasacha peitril a bheith á stóráil i dteirminéil;
- na rialúcháin OMG (Orgánaigh a Mionathraíodh go Géiniteach) a fheidhmiú agus a ghníomhú maidir le húseaid shrianta a leithéad seo d'orgánaigh agus iad a scaoileadh d'aon turas isteach sa timpeallacht;
- clár hidriméadach náisiúnta a ullmhú agus a chur i ngníomh chun faisnéis maidir le leibhéil, toirteanna agus sruthanna uisce in aibhneacha, i lochanna agus i screamhuiscí a bhailiú, a anailisiú agus a fhoilsiú; agus
- maoirseacht i gcoitinne a dhéanamh ar chomhlíonadh a bhfeidhmeanna reachtúla caomhnaithe comhshaoil ag údarás áitiúla.

Stádas
Is eagras poiblí neamhspleách í an Ghníomhaireacht. Is í an Roinn Comhshaoil agus Rialtais Áitiúil an coimirceoir rialtais atá aici. Cinntítear a neamhspleáchas trí na modhanna a úsaidtear chun an tArd-Stiúrthóir agus na Stiúrthóirí a roghnú, agus tríd an tsaoirse a dhearbhaionn an reachtaíocht di gníomhú ar a conlán féin. Tá freagracht dhíreach faoin reachtaíocht aici as réimse leathan feidhmeannas agus cuireann sé seo taca breise lena neamhspleáchas. Faoin reachtaíocht, is coir é iarracht a dhéanamh dul i gcion go míchuí ar an nGníomhaireacht nó ar aon duine atá ag gníomhú thar a ceann.

Eagrú
Tá ceanncheathrú na Gníornhaireachta lonnaithe i Loch Garman agus tá cúig fhoireann chigireachta aici, atá lonnaithe i mBaile Átha Cliath, Corcaigh, Cill Chainnigh, Caisleán an Bharraigh agus Muineachán.

Bainistíocht
Riarann Bord Feidhmiúcháin lánaimseartha an Ghníomhaireacht. Tá Ard-Stiúrthóir agus ceathrar Stiúrthóirí ar an mBord. Ceapann an Rialtas an Bord Feidhmi úcháin de réir mionrialacha atá leagtha síos san Acht.

Coiste Comhairleach
Tugann Coiste Comhairleach ar a bhfuil dáréag ball cunamh don Ghníomhaireacht. Ceapann an tAire Comhshaoil agus Rialtais Áitiúil na baill agus roghnaítear iad, den chuid is mó, ó dhaoine a ainmníonn eagraíochtaí a bhfuil suim acu i gcúrsaí comhshaoil nó forbartha. Tá réimse fairsing feidhmeannas comhairleach ag an gCoiste faoin Acht, i leith na Gníomhaireachta agus i leith an Aire araon.

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