Economics and Industry Standing Committee

BELLEVUE HAZARDOUS WASTE FIRE INQUIRY

VOLUME ONE

Report No. 1

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BELLEVUE HAZARDOUS WASTE FIRE INQUIRY

VOLUME ONE

Report No. 1

Presented by:
Tony McRae, MLA
Laid on the Table of the Legislative Assembly
on 13 December, 2001

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COMMITTEE TERMS OF REFERENCE

On 29 May 2001, the Legislative Assembly established the Standing Committee on Economics and Industry.

The functions of the Committee are to review and report to the Assembly on: -

- the outcomes and administration of the departments within the Committee's portfolio responsibilities;
- annual reports of government departments laid on the Table of the House;
- the adequacy of legislation and regulations within its jurisdiction; and
- any matters referred to it by the Assembly including a bill, motion, petition, vote or expenditure, other financial matter, report or paper.

At the commencement of each Parliament and as often thereafter as the Speaker considers necessary, the Speaker will determine and table a schedule showing the portfolio responsibilities for each committee. Annual reports of government departments and authorities tabled in the Assembly will stand referred to the relevant committee for any inquiry the committee may make.

Whenever a Committee receives or determines for itself fresh or amended terms of reference, the Committee will forward them to each standing and select committee of the Assembly and Joint Committee of the Assembly and Council. The Speaker will announce them to the Assembly at the next opportunity and arrange for them to be placed on the notice boards of the Assembly.

INQUIRY TERMS OF REFERENCE

In line with her statement to the Legislative Assembly on 2 May 2001, the Minister for the Environment and Heritage wrote to the Economics and Industry Standing Committee on 12 June 2001, requesting that the Committee give consideration to conducting an inquiry into the fire emergency of 15 February 2001 at the hazardous waste facility at Bulbey Street, Bellevue.

At a meeting on 13 June 2001, the Committee resolved to conduct the inquiry. On 20 June 2001, the Committee resolved to adopt the following inquiry Terms of Reference:

That the Committee examine, report and make recommendations on -

1. the role of relevant government agencies and relevant Ministers of the Crown in:

   (a) approving the treatment and storage of waste at the site; and

   (b) regulating waste treatment at the site, including monitoring and enforcement measures;

2. the nature and quantities of non-compliant materials stored at the site;

3. the response of relevant government agencies to the incident on 15 February 2001 and the post-crisis management;

4. the regulation, storage and disposal of hazardous waste in Western Australia, the extent of past and current operations and alternatives available; and

5. any other matters deemed relevant by the Committee.

CHAIRPERSON'S FOREWORD

I am pleased to present to the Legislative Assembly of the Parliament of Western Australia, the first report of the Economics and Industry Standing Committee. This report is based on the Committee's inquiry into a fire that occurred at the Waste Control Pty Ltd hazardous waste and solvent recycling facility on Bulbey Street, Bellevue on 15 February 2001.

The hazardous nature and impact of the fire emergency was such that a request for an inquiry into the incident was referred to the Economics and Industry Standing Committee. The Committee resolved to conduct the inquiry and adopted Terms of Reference that covered a range of issues including the regulation, storage and disposal of hazardous waste in Western Australia.

The fire at Waste Control was one of the largest hazardous materials fire experienced by the emergency services in Western Australia. Hazardous waste management and fires of this nature represent a problem for many countries in that modern governments are confronted with reconciling competing demands for industrial development and the protection of the natural and social environment. There exists no easy solution to this challenge.

In the incident at Bellevue, the combustion of stored toxic waste together with flammable material contributed to the creation of a toxic plume. The plume had the potential to cause a range of health impacts and a number of fire-fighters and residents exposed to the smoke plume experienced nausea, sickness and anxiety.

Activities to suppress the fire lasted for more than two days, and were taxing on both human and physical resources. Career and volunteer fire-fighters responded to the fire emergency and police evacuated approximately 50 local residents.

The ferocity of the fire destroyed the majority of chemicals stored on the site. The fire also burnt bushland down to the Helena River. Toxic fumes were discharged into the atmosphere. Residue from the fire landed in surrounding areas and covered buildings and vehicles in the vicinity that subsequently had to be decontaminated. Public health concerns were raised about a range of experiences of exposure to contaminants emanating from the fire.

This volume is the first resulting from the Committee's inquiry and deals specifically with the fire emergency and the health concerns arising from the incident. The short and long term health effects of the potential exposure have been assessed by State Government and independent public health experts. The development and maintenance of a public medical register is recommended by the Committee.

Volume Two of the Committee's report, expected to be tabled in 2002, will investigate and report on the approval, operation and regulation of the Bellevue site, as well as a range of systemic issues relating to hazardous waste management.

I thank my fellow Committee members for their individual and collective contributions to this report. In particular, I would like to thank the Committee's staff for their professional work and responsible attitude. I commend Melina Newnan, the Principal Research Officer, and Research Officers Liz Kerr and Alf Opie. I thank and congratulate the staff for their considerable dedication and commitment to the work of the Committee.

I commend the report to the House.

TONY McRAE, MLA
CHAIRPERSON

ABBREVIATIONS AND ACRONYMS

"ACE"	Alliance for a Clean Environment
"BA"	Breathing apparatus
"CNS"	Central nervous system
"CSO"	Crown Solicitor's Office
"CTS"	Cleanaway Technical Services
"DEP"	Department of Environmental Protection
"DEWCEP"	Department of Environment, Water and Catchment Protection
"DME"	Department of Minerals and Energy
"DMPR"	Department of Minerals and Petroleum Resources
"FCO"	Fire Control Officer
"FESA"	Fire and Emergency Services Authority
"HAZMAT"	Hazardous Materials
"HEAT"	Hazardous Emergency Advisory Team
"HDWA"	Health Department of Western Australia
"IC"	Incident Controller
"IMT"	Incident Management Team
"NOS"	Not otherwise specified
"PCBs"	Poly-chlorinated biphenyls
"NHMRC"	National Health and Medical Research Council
"PCE"	Perchloroethylene also known as Tetrachloroethylene
"SVBB"	Stoneville Volunteer Bushfire Brigade
"Worksafe"	Worksafe Western Australia
"WRC"	Water and Rivers Commission

GLOSSARY

"Committee"	Means the Economics and Industry Standing Committee
"Corrosive Substances"	Substances that by chemical action, will cause severe damage when in contact with living tissue, or, in the case of leakage will materially damage, or even destroy, other goods.[1]
"Dangerous Goods	Means a substance or article that is prescribed to be dangerous goods.[2]
"Discharge"	In relation to waste or other matter, includes deposit it or allow it to escape, or cause or permit it to be, or fail to prevent it from being discharged, deposited or allowed to escape.[3]
"Environment"	Means living things, their physical, biological and social surroundings, and interaction between all of these.[4]
"Flammable Liquids"	Liquids, or mixtures of liquids that give off a flammable vapour at temperatures of not more than 60.5 C, closed cup test, or not more than 65.6 C, open cup test, normally referred to as the flash point.[5]
"Flammable Solids"	Substances liable to spontaneous combustion and substances that in contact with water emit flammable gases.
"Hazard"	A source of potential harm or a situation with a potential to cause loss.
"Pollution"	Means direct or indirect alteration of the environment - (a) to its detriment or degradation; (b) to the detriment of any beneficial use; or (c) of a prescribed kind.[6]
"Prescribed premises"	Prescribed premises are premises engaged in certain activities listed in Schedule 1 of the *Environmental Protection Regulations 1987.*
"Risk"	The change of something happening that will have an impact upon objectives. It is measured in terms of consequences and likelihood.
"Toxic Substances"	Substances liable either to cause death or serious injury or to harm human health if swallowed or inhaled by skin contact.[7]

1 Australian Dangerous Goods Code, Sixth Edition, Vol 1, National Road Transport Commission, 1998, p 23.
2 Section 7 *Explosives & Dangerous Goods Act 1961*.
3 Section 3 *Environmental Protection Act 1986*.
4 *Ibid.*
5 Australian Dangerous Goods Code, *Op Cit.*
6 Section 3 *Environmental Protection Act 1986*.
7 Australian Dangerous Goods Code, *Op Cit.*

"Waste"	Includes matter –
	(a) whether liquid, solid, gaseous or radioactive and whether useful or useless, which is discharged into the environment; or
	(b) prescribed to be waste.[8]
"Waste Control"	Means Waste Control Pty Ltd.

"Department of Environmental Protection":

At the time of the fire on 15 February 2001, the Department of Environmental Protection (DEP) was a key regulatory arm of government responsible for several aspects of waste management in Western Australia. Since that time the DEP has been amalgamated with the Water and Rivers Commission to form the Department of Environment, Water and Catchment Protection (DEWCP).[9]

"Department of Minerals and Energy":

The Department of Minerals and Energy (DME) is now part of the Department of Mineral and Petroleum Resources (DMPR).

However, for the purpose of this report and in keeping with historical records, the Committee will make reference to the former DEP and DME when necessary.

"Health Department of Western Australia":

Recent Machinery of Government reforms to the public sector has resulted in a name change from the Health Department of Western Australia (HDWA) to the Department of Health (DOH). However, for the purpose of this report and in keeping with historical records DOH will herein be referred to as HDWA.

8 Section 3 *Environmental Protection Act 1986*.

9 DEP submission to the Economics & Industry Standing Committee, 30 July 2001, p 1

EXECUTIVE SUMMARY

This is the first volume of the report of the Economics and Industry Standing Committee on its inquiry into the Bellevue waste facility fire of February 2001. The report considers the fire emergency and the health concerns that arose from the incident.

Chapter One provides the background, framework and parameters of the report including reference to issues that will form the basis of the second volume of the Committee's report to be tabled in Parliament during 2002.

The report provides details of the company, Waste Control Pty Ltd, and the material or waste stored at the premises. It also describes the toxicology of some of the chemicals stored or processed at the Waste Control site during the period of its operation.

The agencies that were closely involved with the site at the time of the fire emergency and subsequently included: Fire and Emergency Services Authority of Western Australia (FESA); Health Department of Western Australia (HDWA); Department of Environmental Protection (DEP); Water Corporation; Water and Rivers Commission (WRC); and Department of Minerals and Energy (DME).

This report describes the general sequence of agency responses to the fire emergency with general detail of actions taken and decisions made in response to the fire emergency. The Fire-plan, Emergency Services Manifest, fire classification, the cause of fire, impact of fire on surrounding areas, decontamination/clean-up of the site and the effects of the smoke plume are also discussed.

The Committee has given priority in this report to consider the short and long term health effects of the fire in the light of concern amongst the community, fire-fighters and the general public regarding potential health impacts associated with the fire. The report agrees with expert witness advice that the significance of toxicity and its health effects is directly proportional to the length of exposure to a range of contaminants. This advice was obtained from toxicologists including an independent expert.

The Committee found that the Department of Health should develop, implement and maintain a medical register of individuals who were exposed to the effects of the fire. The medical register needs to contain evidence of a person's exposure to the effects of the fire emergency, including any pre- and post-exposure to potentially hazardous material.

This Committee concludes that there is little likelihood of long term risk to the health of fire-fighters and residents living near the site of the fire.

FINDINGS

Finding 1

The Committee finds there exists a degree of understandable concern amongst some members of the community and fire-fighters regarding potential health impacts associated with the fire emergency.

Finding 2

The Committee finds there exists a low probability of medium to long term serious or chronic health effects to the fire-fighters and residents exposed to the fire or plume.

RECOMMENDATION

Recommendation

The Committee recommends that the Health Department of Western Australia develops, implements and maintains a medical register of individuals who were exposed to the effects of the fire emergency. The register needs to:

- contain evidence of exposure to the effects of the fire emergency; and
- include any pre and post-incident exposure to potentially hazardous materials.

MINISTERIAL RESPONSE

Standing Order 277(1) of the Standing Orders of the Legislative Assembly states that:

> *A report may include a direction that a Minister in the Assembly is required within not more than three months, or at the earliest opportunity after that time if the Assembly is adjourned or in recess, to report to the Assembly as to the action, if any, proposed to be taken by the Government with respect to the recommendations of the committee.*

The Economics and Industry Standing Committee therefore directs that the Minister for Health respond accordingly.

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND TO THE INQUIRY

A fire occurred at the Waste Control Pty Ltd[10] hazardous waste and solvent recycling facility on Bulbey Street, Bellevue at approximately 11.00 p.m. on Thursday 15 February 2001. The facility was estimated to have been storing up to 500,000 litres of chemicals and toxic solvents, largely those used in the motor vehicle and dry-cleaning industries.

Several fire service units, including some volunteer fire brigades, responded to the fire emergency. Police evacuated over fifty (50) local residents.

The Minister for the Environment, the Hon. Judy Edwards, MLA, wrote to the Economics and Industry Standing Committee (the Committee) on 12 June 2001 requesting that the Committee conduct an inquiry into the incident at Bellevue. The Committee formally resolved on 13 June 2001 to conduct the inquiry and adopted the inquiry Terms of Reference on 20 June 2001.

The Committee advertised that an inquiry would be held and called for public submissions.[11] For the purposes of this report, the fire that occurred at the Bellevue hazardous waste facility on 15 February 2001 will herein be referred to as the fire emergency.

1.2 FRAMEWORK OF THE REPORT

The Committee had initially intended to table a single report addressing all the Terms of Reference. However, due to the volume of evidence and the complexity of the issues that require in-depth analysis, the Committee resolved to present the report in two volumes.

Volume One deals generally with the fire emergency and more specifically with the health concerns arising from that incident. Volume Two will deal with the remaining Terms of Reference for the inquiry.

1.3 REPORT PARAMETERS

The Committee has received forty (40) submissions. Stakeholders include individuals and groups from within the Bellevue community and surrounding areas, industry representatives and the relevant agencies. Community concerns in relation to the fire emergency and the health impacts are addressed in this report.

Volume One considers the impact of the fire on public health. Volume Two will provide an objective analysis of the sequence of events and performance actions and strategies of the various government agencies.

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10 Waste Control Pty Ltd was also known as Hazardous Waste Solutions at the time of the fire emergency.

11 Advertisement calling for submissions appeared in the *West Australian* newspaper on Saturday 23 June 2001 and in Community Newspapers, namely the *Echo* and the *Midland Kalamunda Reporter*.

1.4 ISSUES ARISING FROM THE FIRE EMERGENCY

Based upon evidence, submissions, research and Government agency documentation, this report lists potential issues arising from the fire emergency. Issues to be considered by the Committee in its continuing work on this inquiry and in the Volume Two report on this work, scheduled for presentation to the Parliament in the autumn session of 2002, include:

- the role of the relevant government agencies in the response to the fire emergency;
- the role of Ministers of the Crown in site regulation;
- inter-agency cooperation and communication;
- whether the public interest was served by permitting Waste Control Pty Ltd to continue operating despite breaches of licence conditions and legislation that extended over a period of years;
- the role of Hazardous Emergency Advisory Team (HEAT) in a hazardous materials emergency;
- adequacy of regulations;
- planning/local council issues;
- environmental, health and safety risk assessment and management; and
- alternatives to material waste treatment and the management of waste.

CHAPTER 2 THE AGENCIES

2.1 BACKGROUND

This section of the report provides an overview of the agencies involved with the site at the time of and following the fire emergency. Agencies involved with the site prior to the fire emergency will be examined in greater detail in Volume Two of this report.

2.2 HAZARDOUS EMERGENCY ADVISORY TEAM (HEAT)

Emergency management and response for all hazardous materials is established under Policy Statement No. 7 *WA Emergency Management Arrangements* in the Western Australian Hazardous Materials Emergency Management Plan (WESTPLAN-HAZMAT) prepared by Fire and Emergency Services Authority (FESA).

This plan provides for the establishment of a Hazardous Emergency Advisory Team (HEAT) to assist the designated Incident Controller and consists of core and non-core members. Core HEAT includes representatives from:

- Fire and Rescue Services of WA;
- WA Police Service;
- Department of Minerals and Energy; and
- Department of Environmental Protection.

Non-core HEAT members consists of representatives from:

- Health Department;
- Worksafe WA;
- Water & Rivers Commission; and
- Water Corporation.

Non-core HEAT members are only required to attend an incident when specifically requested.[12]

HEAT assists with the management of a HAZMAT emergency through the identification of the hazardous materials and the provision of technical advice. It advises on the nature of hazards to people and the environment, the need for evacuation, resources required for the clean-up of an incident and appropriate clean-up procedures and disposal methods.

[12] Western Australian Hazardous Materials Emergency Management Plan, WESTPLAN-HAZMAT, Fire & Emergency Services Authority, Perth, WA, pp 19-22.

Upon notification of a HAZMAT emergency, the HEAT proceeds to the HEAT meeting room at FESA House, Perth. HEAT members may also decide to attend the incident scene in their advisory capacity.

2.3 FIRE AND EMERGENCY SERVICES AUTHORITY

The Fire and Emergency Services Authority of Western Australia (FESA) provides the Western Australian community with a range of emergency services. FESA was established as a statutory government authority on 1 January 1999. FESA is responsible for the administration of the *Fire and Emergency Services Authority of Western Australia Act 1998* with functions relating to the provision and management of emergency services. These functions include providing Ministerial advice on policy issues, developing plans for and providing advice on the management and use of emergency services.

The Chief Executive Officer of FESA is responsible for overall leadership, policy and strategic planning and works with the FESA Board of Management to oversee the strategic direction and operations and functions of the organisation. A cross-section of volunteers, the general public and local government form the FESA Board.

2.4 HEALTH DEPARTMENT OF WESTERN AUSTRALIA

The Health Department of Western Australia (HDWA) has a large regulatory function and administers the *Health Act 1911*, the *Poisons Act 1964*, the *Radiation Safety Act 1975* and a number of other Acts and associated Regulations. Environmental Health Services, a branch of the Public Health Division is the key arm of HDWA in relation to the Waste Control site. Environmental Health Services works in concert with local government, which performs many of the services defined under the *Health Act 1911* with a focus on disease prevention and management.

HDWA is represented on the Hazardous Emergency Advisory Team (HEAT) as part of its public health responsibilities outlined within WESTPLAN – HAZMAT. Part of the role of HDWA is to provide expert advice to the HEAT on perceived risks to public health resulting from hazardous materials emergency and to advise of measures to minimise the health risks and effects of that hazard.

2.5 DEPARTMENT OF ENVIRONMENTAL PROTECTION

The Department of Environmental Protection (DEP) is, *inter alia*, responsible for administering the *Environmental Protection Act 1986* (EP Act). The Act is designed to prevent, control and abate environmental pollution so that the environment is conserved and enhanced. The EP Act is supported by the *Environmental Protection (Liquid Waste) Regulations 1996*, which apply to the production, collection, storage and disposal of liquid waste.

The relationship between the DEP and Waste Control will be examined further in Volume Two of the Committee's report.

2.6 WATER CORPORATION

The Water Corporation was established in 1996 under the *Water Corporation Act 1995* and operates under a 25-year licence issued by the Office of Water Regulation.

The Water Corporation's involvement in the Waste Control site was one of approving the treatment and disposal of wastewater collected from the site.

2.7 WATER AND RIVERS COMMISSION

The Water and Rivers Commission (WRC) manages the water resources and waterways of Western Australia and now forms part of the Department of Environment, Water and Catchment Protection (DEWCP).

WRC involvement in the fire emergency was largely confined to activities during and after incident. This included WRC representation on the HEAT team, a preliminary investigation of the Waste Control site to determine groundwater contamination and interpretation of the relevant data for the DEP.[13]

2.8 DEPARTMENT OF MINERALS AND ENERGY

The Department of Minerals and Energy (DME),[14] is *inter alia*, responsible for the administration of the *Explosive and Dangerous Goods Act 1961*. The Act provides for the control and regulation of explosives and dangerous goods in order to reduce the risk of danger to public safety and gives comprehensive powers to the Chief Inspector and Inspectors including requirements relating to licensing, inspections and notification.

Dangerous goods subject to the Act include petrol, diesel, cylinder gases, LP gas, chlorine gas, ammonia, oxidising agents, poisons, corrosive substances and other flammable and combustible liquids.

DME initiated prosecution of Waste Control for pre-incident breaches of the *Explosives and Dangerous Goods Act 1961* in *State Crown Solicitor v Waste Control Pty Ltd.*[15] The relationship between DME and the operations of Waste Control will be examined further in Volume Two of this report.

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13 DEP submission, *Op Cit*, p 13.

14 Now the Department Mineral and Petroleum Resources.

15 State v Waste Control Pty Ltd, Transcript of Proceedings, Court of Petty Sessions of Western Australia, Midland on 19 April 2001.

CHAPTER 3 MATERIALS AT THE SITE

3.1 COMPANY BACKGROUND

Waste Control Pty Ltd operated a waste collection/recycling facility for industrial waste at 1 Bulbey Street, Bellevue. The company was established in 1989 to complement the liquid waste regulations that were being introduced at the time.[16]

The Bellevue premises was first licensed in January 1990. It was licensed to operate as a chemical recycling and waste treatment facility, including the storage of dangerous goods, by the Department of Environmental Protection (DEP) and the Department of Minerals & Energy (DME) respectively.

The company was originally incorporated in Western Australia as Austech (Australia) Pty Ltd, and subsequently incorporated as Waste Control Pty Ltd, trading as Hazardous Waste Solutions.

Waste Control Pty Ltd took over management of the Bellevue premises in 1993 and continued the waste collection and recycling activities involving flammable liquids, toxic solid wastes, solvents, corrosive substances and heavily contaminated water.

Waste Control was placed into liquidation on 7 June 2001. The affairs of the company are being administered by Ferrier Hodgson of Perth, Western Australia.

For the purposes of this report the Company will herein be referred to as Waste Control.

3.2 WASTE STORED

Waste Control collected industrial wastes from a number of sources. Waste collected included solvents from the dry-cleaning, printing and motor repair industries and also some hazardous waste such as pesticides and acids.

Waste Control held a dangerous goods storage licence issued under the *Explosives and Dangerous Goods Act 1961*[17] authorised by DME for the storage of a wide range of dangerous goods. The most recent DME renewal notice for the license to store dangerous goods at Waste Control provided for the storage of:

- Flammable Liquids;
- Toxic Solid Waste;
- White Spirits/Water Emulsions;
- Paint Thinners;
- Waste Water;

[16] Dr Jeffrey Claflin, State v Waste Control Pty Ltd, Transcript of Proceedings, Court of Petty Sessions of Western Australia, Midland on 19 April 2001, p 17. & HDWA letter to Water Authority, 11 December 1989.

[17] Section 45A *Explosives & Dangerous Goods Act 1961*.

- Toluene;
- Mixed Flammable Solvents; and
- Corrosive Substances.[18]

The company was licensed by the DEP as a "prescribed premises"[19] under the *Environmental Protection Act 1986.*

While the company had the capacity to recycle some of the waste it collected, much of the waste was stored on the premises as a backlog. During court proceedings against the company in April 2001, it was stated:

> *In 1999, approximately 2000 205-litre drums of waste dating back up to 10 years were held on the premises. The manner of storage of much of this waste did not comply with the requirements of the Dangerous Goods Act and the Explosives and Dangerous Goods Handling and Storage Regulations 1992.*[20]

The question of storage and compliance issues will be addressed in Volume Two.

Waste Control was the sole repository in Western Australia for perchloroethylene waste sludge derived from the dry-cleaning industry at the time of the fire emergency.

3.3 MATERIAL STORED AT THE PREMISES

Waste Control was required to maintain an up-to-date manifest of all chemicals on site as a condition for the grant of its licence from the DEP.[21] A supplementary condition in the year 2000 license was for a list to be provided to the DEP. However, the DEP did not receive a copy of the manifest of chemicals stored at the site.

The Committee was unable to obtain a comprehensive list of chemicals and their specific volumes known to be at the site on the day of the fire emergency.

3.3.1 Mercury

Early information received by personnel attending the fire emergency indicated that there may have been a quantity of mercury consumed or affected by the fire. Committee investigations revealed that there was a small amount of waste mercury present at the site, stored in a laboratory that was not involved in the fire.[22]

In evidence, the DEP confirmed that a small quantity of mercury was in the facility's laboratory and had not been consumed in the fire.[23]

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18 DME Renewal Notice – License to Store Dangerous Goods, S013578, 17 December 2000.

19 "Prescribed premises" are premises engaged in certain activities listed in Schedule 1 of the Environmental Protection Regulations 1987.

20 State v Waste Control Pty Ltd, Transcript of Proceedings, *Op Cit*, p 3.

21 Western Australia Environmental Protection Authority Licence Number: 6113/5 issued 7 August 2000, Condition G5, p 3.

22 Ms Rachel Irvine-Marshall, Transcript of Evidence, 31 August 2001, p 4.

23 Mr Fred Tromp, Director, Resource Science, DEP, Transcript of Evidence, 6 September 2001, p 27.

Information on the materials gathered from departmental records of the relevant agencies and other sources suggests that the materials stored at the Waste Control site, but not necessarily present at the time of the fire, includes the following:

Table 1

Range of chemicals believed to be stored at Waste Control site over the period of its operation:

Acetone	Low level radioactive tracer materials (eg from universities)
Acrylic thinners	Methyl Ethyl Ketone
Ammonia	Methyl Ethyl Ketone Peroxide
Batteries (NiCad and lead)	Mixed oxidisers
Caustic (Sodium hydroxide)	N-Butanol
Copper Sulphate	Nitric Acid
Degreaser	Oils (eg transmission oil)
Diisobutyl ketone	Organic peroxide Type F
Epoclean	Oxidising agent (solid)
Ethanol	Paint and paint thinners
Ethyl Acetate	Perchloroethylene/Tetrachloroethylene
Flammable Organic solvents/liquids	Pesticide
Formaldehyde	Refrigerant gases
Formalin	Shell – X55
Fuel	Sodium Aluminate
Furax (from fire fighting)	Sodium Hypochlorite
Grease/fats mixed with water	Solvent 10, 13 and 43
Gun wash	Strontium Chromate
Heavy metals including mercury	Sulphuric Acid
Hydrochloric Acid	Tars
Hydrogen Peroxide	Teric DN9
Hypochlorite solutions	Toluene
Isopropyl Alcohol	Turpentine & Turpentine substitute
Laboratory chemicals (mixed type, small amounts)	White Spirit
Light machine oil	Xylene[24]

Supplementary evidence provided to the Committee indicated that prior to the fire at Waste Control the DEP was unaware of the existence of mercury at the site. The above list focuses on material known to have been stored in drum storage area over the period of facilities operations. It was this storage area that was involved in the fire on 15 February 2001.

[24] DEP file records L/230/89 Vol. 4, 27 February 2001.

3.4 DANGEROUS GOODS CLASSIFICATION

Waste Control commissioned HMS Consultancy Pty Ltd to conduct an audit of the site for the purpose of assisting the company to attain compliance with the *Explosives and Dangerous Goods (Dangerous Goods Handling & Storage) Regulations 1992*. During inspections of the Waste Control site, the consultant inventoried the material present on the site.

The consultant was required to identify the generic class of all substances rather than the specific individual substances. This task was carried out between 12 January 2001 and 1 February 2001, approximately two weeks prior to the fire emergency and the results are shown in Table 2

Table 2

Classes of substances held at Waste Control site as at 1 February 2001:

Classification	Substance
Class 3 Flammable Liquids	Flammable Solvents Paint Thinners White Spirit Turpentine Paint Methyl Ethyl Ketone Toluene Flammable Liquids not otherwise specified (N.O.S.)
Class 6 Toxic Substances	Perchloroethylene
Class 5 Oxidising Substances & Organic Peroxides	Hydrogen Peroxide Methyl Ethyl Ketone Peroxide
Class 8 Corrosive Substances	Corrosive Liquid N.O.S Acids Corrosive Liquid N.O.S Alkaline Industrial Lead Acid Batteries Hypochlorite Solution
Combustible Substances	Waste Oil Oils various

Goods that are considered 'dangerous' are assigned to a Class according to the most significant risk presented by the goods as determined by the criteria set out in United Nations recommendations. In some instances dangerous goods may also be assigned a Subsidiary Risk, if the goods present risks in addition to those denoted by class.[25]

In addition to the assignment of dangerous goods to a Class and Subsidiary Risk, dangerous goods (other than dangerous goods of Class 1, 2 and 7) are assigned to Packing Groups, according to the degree of risk the goods present during transport:

- I denoting great danger;
- II denoting medium danger; and
- III denoting minor danger. [26]

[25] Appendix Five of this report provides details of dangerous goods classification.

[26] Australian Dangerous Goods Code, Sixth Edition, Volume 1, January 1998, Requirements and Recommendations, pp 19-26.

3.5 TOXICOLOGY

The following is a brief toxicological description of some of the chemicals known to have been stored or processed at the Waste Control site during the period of its operation. The information has been drawn from The Merck Index, a reference tool for chemicals, drugs and biological substances.

3.5.1 Perchloroethylene

Perchloroethylene (PCE) is also known as Tetrachloroethylene. It is used primarily as a dry-cleaning agent, an industrial solvent for fats, oils, tars, rubber and gums, and a metal degreasing agent.

Epidemiological studies of dry-cleaning workers have found increased incidences of excess of lymphosarcomas, leukemias, lymphomas, and cancers of the skin, colon, urogenital tract, lung larynx and urinary bladder.

PCE is listed as exhibiting the following potential symptoms of over exposure:

- Irritation of eyes, nose and throat; nausea; flushing of face and neck; vertigo, dizziness and incoordination; headache, somnolence; skin erythema; and liver damage. [27]

International regulatory agencies consider that, although the human epidemiological studies suggest a possible association between long term exposure to PCE and increased incidences of cancers, they have regarded the evidence as inconclusive as workers were also exposed to petroleum solvents and other dry-cleaning agents as well as PCE. [28]

3.5.2 Xylene

Xylene is regarded as a flammable liquid and potential symptoms of acute over exposure by inhalation are:

- Flushing and reddening of the face, a feeling of increased heat as a result of dilation of superficial blood vessels, disturbed vision, dizziness, tremors, salivation, cardiac stress, drowsiness, incoordination and staggering gait, central nervous system (CNS) depression, confusion and coma.

Symptoms of chronic inhalation exposure may include:

- Respiratory irritation, CNS excitation followed by CNS depression, paraesthesia, tremors, apprehension, impaired memory, weakness, nervous irritation, vertigo, headache, anorexia, nausea, flatulence, anaemia, mucosal haemorrhage.

Aspiration into lungs may cause chemical pneumonitis, pulmonary edema and haemorrhage.

[27] The Merck Index, Twelfth Edition, 1996, p 1571.
[28] Health Department, File 01-06170, folio 83.

Direct contact may cause eye irritation, conjunctivitis, cornea burns, skin irritation and dermatitis due to defatting action.[29]

3.5.3 Acetone

Acetone is regarded as volatile, highly flammable liquid.

Potential symptoms of over exposure are:

- Irritation of eyes, nose and throat, headache, dizziness and dermatitis[30]

3.5.4 Methyl Ethyl Ketone

Methyl Ethyl Ketone is regarded as a flammable liquid.

Potential symptoms of over exposure are:

- Irritation of eyes and nose, headache, dizziness and vomiting.[31]

3.5.5 Ethanol

Ethanol or ethyl alcohol is regarded as a flammable liquid and used mainly in alcohol beverages in suitable dilutions.

Potential symptoms of over exposure are:

- Nausea, vomiting, flushing, mental excitement or depression, drowsiness, impaired perception, uncoordination, stupor, coma and death.

3.5.6 Ethyl Acetate

Ethyl Acetate is a volatile, flammable liquid. Potential symptoms of over exposure are:

- Irritation of eyes, nose and throat, narcosis and dermatitis.

3.5.7 Isopropyl Alcohol

Isopropyl alcohol is a flammable liquid. Potential symptoms of over exposure are:

- Mild irritation of eyes, nose and throat, drowsiness, dizziness and headache and dry cracking skin.

[29] The Merck Index, *Op Cit*, pp 1722-1723.
[30] *Ibid*, p 12.
[31] *Ibid*, p 1037.

3.5.8 Toluene

Toluene is a flammable, refractive liquid, readily absorbed by inhalation, ingestion and somewhat by skin contact. Direct contact may cause severe dermatitis due to drying and defatting action. It may present a lung aspiration hazard if ingested. Potential symptoms of acute over exposure by inhalation may include:

- Local irritation and CNS excitation and depression.

Low concentration exposures may result in:

- Transitory mild upper tract irritation, mild eye irritation, lacrimation, metallic taste, slight nausea, hilarity, lassitude, drowsiness and impaired balance.

High concentration exposures may cause:

- Paraesthesia, vision disturbances, dizziness, nausea, headache, narcosis and collapse, death from respiratory failure, or sudden ventricular fibrillation.

Chronic over exposure by inhalation has been associated with hepatotoxicity and nephrotoxicity.

Symptoms following chronic inhalation involve severe muscle weakness, cardiac arrhythmias, gastrointestinal and neuropsychiatric complaints.[32]

The issue of exposure to chemical substances will be discussed further in Chapter Five of this volume.

[32] *Ibid,* p 1626.

CHAPTER 4 THE FIRE EMERGENCY

4.1 INTRODUCTION

FESA Communications Centre (Comcen) received the first of a number of 000 calls pertaining to the fire at Waste Control at 10.59 p.m. on 15 February 2001. Mr Nick Devine, fire-fighter and Director of Operations gave evidence that:

> *Two calls came in simultaneously on 000, at 22.59 hours. The first one was a call to a fire in Wells Street, maybe a tree or the cement works. The other call was a factory fire in Wells Street. The third call, at 23.00 precisely, was to a major chemical fire in Irwin Street.*[33]

The Communication Systems Officers initiated mobilisation of resources to a property fire and career fire-fighters from Midland and Bassendean Fire Stations turned out at 22:59:43 hours to the Waste Control site.[34]

In addition to Fire and Emergency Services employees and volunteers, other agencies attending the scene included Police and ambulance services and officers from the Department of Environmental Protection and Department of Minerals and Energy.

4.2 THE FIRE - INCIDENT PERIOD

Incidents are graded on a scale from First Alarm Structure Emergency to Sixth Alarm Structure Emergency, the latter being the highest level of support where substantial resources are required for complex incidents or for protracted periods, where six or more pumping appliances are necessary.[35]

The Officer-in-Charge of the Midland crew made the customary initial assessment of the incident and immediately upgraded the incident from a Second Alarm property fire to a Third Alarm property fire, effectively increasing the number of pumping appliances required at the incident.

The fire in the drum storage area was well established when the first crews arrived at the site. The Committee was advised by a FESA representative that when the Midland Brigade arrived at the scene:

> *They saw explosions and drums flying all around the place [and] were in some fear for their safety.*[36]

The Bassendean crew responded shortly thereafter and came across a property where drums had landed, which resulted in the fire spreading beyond the Waste Control site. These brigades took immediate action to contain the fire they encountered near the Waste Control site.

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33 Mr Nick Devine, FESA, Transcript of Evidence, 5 September 2001, p 6.
34 FESA, Bellevue Hazmat Fire Operational Analysis, June 2001, pp 8-9.
35 FESA Standard Operational Procedure No.1, *Mobilising*, 27 March 2001, pp 6-13.
36 Mr John Truswell, FESA, Transcript of Evidence, 31 August 2001, p 5.

The first of a number of FESA senior officers arrived at the site at 23.41 hours to assess the situation and to implement command and control structures. The first Incident Management Team (IMT) was formed under the Incident Control System structure.[37]

The DEP, the Police and Dr Jeffery Claflin, the proprietor of Waste Control, were available at the Forward Control Point. At approximately midnight, District Manager Edward Brooks of FESA met with Dr Claflin to ascertain the goods stored on the premises and was advised that there were 300,000 litres of white spirits, paint thinners, paints and mixed liquids and 30,000 litres of perchloroethylene.

District Manager Russell Stevens of FESA later confirmed with Dr Claflin that there were approximately 1,600 drums mainly involving Class 3 flammable products including white spirits and thinners and passed this information on to the HEAT team.[38]

Intelligence communication from the site was limited in the early stages of the fire emergency and the IMT focussed on the Waste Control site. At 00.30 hours (12.30 am, Friday 16 February) the Incident Controller initiated sectorisation of the fire area, - that is, the site was divided into smaller, manageable sections controlled by a Sector Commander to increase command and control functions.

The Waste Control site was established as Sector 1, while Sector 2 consisted of the salvage yard, wood yard and industrial area in the Military Road vicinity.[39]

The IMT then made a number of strategic decisions in relation to Sector 1 - the most significant of these being to let the fire burn freely to consume the flammable liquids in the drums and to concentrate on cooling the exposures to on-site property directly threatened by the fire, such as the house/office and laboratory/sea container.

Fencing and strong winds hampered fire-fighters in Sector 2, where efforts were concentrated in and around the various buildings and property in the industrial yards. Sector 2 fire fighting teams were also hampered by limited water supply due to high usage in Sector 1.

The Sector 2 fire then jumped Military Road, began burning in an industrial auctioneer's yard and moved towards a brickworks. Sector 2 was then extended to encompass these fires which were contained and monitored throughout the night.[40]

4.3 FIRE-FIGHTERS

Midland Fire Brigade was the first to attend the fire, followed by seventeen other metropolitan brigades. The Darlington Volunteer Bush Fire Brigade was the first of the volunteer brigades to attend. Later the Glen Forrest, Mt Helena and Stoneville Volunteer brigades were activated to assist with the fire.[41]

The FESA Comcen received a number of calls reporting various fires in and around the vicinity of the Waste Control site in the first hours of the fire emergency. Most of the Fire and Rescue

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37 FESA, Bellevue Hazmat Fire Operational Analysis, *Op Cit*, p 15.
38 FESA, Sequence of Events, Incident Number: 18921, 17 February 2001, p 2.
39 FESA, Operational Analysis, *Op Cit*, pp. 5-16.
40 *Ibid*, p 18.
41 G Jones, Stoneville Volunteer Bushfire Brigade, Transcript of Evidence, Friday 10 August 2001, p 6.

Services fire fighting efforts were directed at the chemical fire and surrounding area while bush fire volunteers were called in to extinguish subsequent adjacent grass and bush fires.[42]

The Committee was advised that:

> *There were 30 volunteer bush fire-fighters involved at the Bellevue fire. Some of those were from Kalamunda, Swan and Mundaring. There were about 14 or 15 from Mundaring and four of them were from [the Stoneville] brigade.*[43]

Grass and bush fires continued to burn at 02.51 hours, leading the IMT to further sectorise the fire. Consequently, a third sector was established to cover the grass and bush fires and a senior manager was requested to attend sector three.[44]

Some of the fires in sector three were burning in inaccessible land and on the river flats. As a result these fires were left to burn until they reached roads or firebreaks where they could then be extinguished.

FESA estimate that for the first six (6) hours of the incident, 3.6 megalitres of water were applied using ground monitors, the aerial appliance and hand lines held by fire-fighters.[45]

FESA advised that all fires had been contained by approximately 04.30 hours on 16 February 2001 with two hot spots remaining at the site. Fire crews remained at the fire emergency until approximately 16.40 hours on Saturday, 17 February 2001.

4.4 HAZARDOUS EMERGENCY ADVISORY TEAM (HEAT)

The HEAT was paged at approximately 23.40 hours on Thursday, 15 February 2001 to assemble at FESA House in Hay Street, Perth under State Emergency Management Committee arrangements as part of WESTPLAN-HAZMAT. HEAT's role was to provide the IMT with guidance for the management of hazardous materials and to lessen the impact of the event on the community and the environment.[46]

HEAT assembled with representatives from FESA Fire Services, Police, DEP, DME, Health Department, Water and Rivers Commission and the Water Corporation, with the Fire Services representative as the HEAT Manager. A HEAT Intelligence/Liaison Officer from the Fire Services was directed to the incident to maintain communications and information between the HEAT and the IMT. FESA indicated that the main focus of the HEAT team was on the management of environmental issues from the water run off and the smoke plume.

FESA records indicate that, at 00.37 hours on 16 February 2001, information gathered from Dr Claflin on the materials stored at the site was passed on to the HEAT. However, communication difficulties were experienced between the fire ground and the HEAT.[47]

The HEAT disbanded at approximately 04.30 hours on 16 February 2001.

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42 FESA Health Report, Bellevue Chemical Fire, 25 July 2001, p 3.
43 G Jones, *Op Cit,* p 8.
44 FESA, Operational Analysis, *Op Cit*, p 19.
45 *Ibid*, p 21.
46 *Ibid*, p 15.
47 FESA, Sequence of Events, Incident Number: 18921, 17 February 2001, p 2.

4.5 FIRE-PLAN

The Midland Fire Station had developed a fire-plan in the event of a fire at the site. It comprised a map of the site showing the entry and exit gates, the position of fire hydrants and sprinkler systems, details of any fuel storage and gas cylinders. The documents are located in a red canister outside the front gate of the premises.

The plan was such that any agency attending the scene could gather the information and respond accordingly.

The plan outlined a method of combating the fire indicating some details of the chemicals held on site for the purpose of fire control strategies. In a section entitled 'Risk Analysis', the following notes were included:

> *Various flammable & Toxic liquids stored in the drum storage area and throughout the yard. In Office Laboratory there are various highly dangerous chemicals, eg. Potassium Cyanide, Sodium Azide, Mercury (60kg), Phosphorous & Sodium. (+ Others)*
>
> *Firefighting advice from Brigade Chemist: Fire in Drum – If safe to do so fight fire using foam while cooling exposures.*
> *Storage Area: - Make an aggressive attack to keep fire to a small area*
> *Fire in Office Area – B.A[48] is essential due to hazard presented by Mercury vapours keep everyone not wearing B.A clear of incident.*
>
> *Fight fires as normal but exercise great care during salvage work & while blacking out.*[49]

The Committee questioned why the Midland Brigade did not immediately access the aforementioned fire-plan that was located in a red canister attached to a gate at the premises.

Mr Russell Stevens, a FESA District Manager, advised the Committee that the fire-plan was obtained by the Senior Officer at the scene on or near 00.30 hours. According to Mr Stevens, the fire-plan had not been obtained prior to this as the Midland Brigade had completed the plan and already had knowledge of the site. Mr Stevens stated:

> *The object of placing the pre-plan in the canister is so that when fire services are mobilised, appliances could be called that are not located at Midland and would not be intimately involved with this site.*[50]

The rationale behind this reasoning was that if a unit unfamiliar with the site were to attend, they would be in a position to access a layout of the premises and the classification of materials stored therein.

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48 Breathing Apparatus.
49 Fire Services of Western Australia Operational Pre-Plan, 1 August 1999.
50 Mr R Stevens, FESA, Transcript of Evidence, 5 September 2001, p 8.

4.6 EMERGENCY SERVICES MANIFEST

Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992 required Waste Control to maintain a manifest of dangerous goods stored at the site. Regulations state that:

> *An occupier or licensee of premises on which dangerous goods are stored shall maintain a manifest of dangerous goods stored at the premises in accordance with the Guidance Note for Emergency Services Manifests issued by the National Occupational Health and Safety Commission.*[51]

The Emergency Manifest was required to have been stored with the fire-plan, indicating the category or class of hazardous substance, the product name, and the quantity and location of goods stored at the site.

It has been established that the Emergency Manifest was not in the canister on the night of the fire emergency. However, the fire-plan that was accessed at approximately 00.30 hours held sufficient information to allow the fire personnel knowledge of what types of chemicals were stored at the site.

The DME held a copy of an Emergency Plan prepared by Waste Control dated 1993. The DME advised the Committee that the regulations do not provide a requirement for the plan to be updated within a set period and provided to the agency. However, the operator of Waste Control was requested by the DME to ensure that the Emergency Plan was in accordance with regulations in August 1999. It is apparent that an updated plan was not submitted to the DME.[52]

4.7 FIRE CLASSIFICATION

The classification of the fire emergency as a flammable fire or structural emergency rather than it being declared a HAZMAT incident resulted in confusion about the type of fire volunteers who were being requested to attend.

Concern has been raised by a volunteer bush fire brigade over the communication relayed to crews responding to the fire emergency. The Committee was advised by the Stoneville Volunteer Bushfire Brigade (SVBB) Captain, Mr Greg Jones, that they received a message at 4.14 am:

> *Request for two fast attacks for mop up, go to bridge on Military Road, Bellevue …*[53]

The Stoneville Fire Control Officer (FCO) then rang the FESA Comcen and asked for the background on the fire. The FCO was advised that it was a factory fire that had escaped into bushland.

Mr Jones indicated that based on the advice received by the FCO:

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51 Regulation 4.28 (1) of the *Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992.*

52 Mr Malcolm Russell, Director, Explosives and Dangerous Goods Division, DME, Letter to the Committee, 9 November 2001, p 1.

53 G Jones, *Op Cit*, p 4.

> *…we decided to let the team leader and the rostered team go without either the FCO or captain because of the experience they would gain…..had it been any more serious than that, either one or both of us would have attended the fire.*[54]

The Committee questioned the SVBB as to whether they would have used different equipment had they known they were dealing with a chemical fire, to which Mr Jones indicated that they would not have attended the fire at all.[55]

The Committee questioned FESA representatives as to why the site was not declared a HAZMAT incident when the first crews arrived at the fire emergency. FESA advised that within the fire services in FESA, there is not a HAZMAT fire classification. Mr Nick Devine told the Committee that:

> *Our investigations revealed that we do not believe a HAZMAT fire classification is available in Australia at this time.*[56]

The Committee identified the following issue:

There was a lack of clarity in communication between the Comcen and the volunteer brigades attending the fire emergency. Furthermore, there existed a degree of confusion in regards to the classification of fire incidents involving hazardous materials. This issue will be developed further in Volume Two of this inquiry.

4.8 CAUSE OF FIRE

The Arson Squad of the Western Australian Police Service investigated the fire. The Committee has been advised that, due to the hazardous nature of the site, a proper scene examination and the origin and cause of the fire could not be established. As a result, the actual cause of the fire has not been determined.[57]

Due to the ferocity of the fire destroying whatever evidence there might have been, the cause of the fire is unlikely ever to be determined. Furthermore, the clean-up of the site immediately following the fire removed any evidence the Arson Squad may have used to determine the cause of the fire.

The Committee was advised during the course of hearings that:

> *… at about 10 o'clock at night people were seen on the premises before the fire started and half an hour after they left, the place went up in flames.*[58]

The Committee was advised that persons were seen leaving the premises and getting into a car.[59]

The Committee was also advised that:

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54 *Ibid*, p 5.
55 *Ibid*, p 4.
56 Mr N Devine, *Op Cit*, 5 September 2001, p 7.
57 Letter from Western Australian Police Service, Crime Investigation Support, 7 September 2001.
58 C Stewart-Robinson, Bellevue Residents and Ratepayers Association Inc, Transcript of Evidence, Friday 10 August 2001, p 6.
59 *Ibid*.

> *… the Fire Department stated that they knew of no way that the fire could have started by itself.*[60]

The police constable at the scene on the evening of the fire, spoke to a male person who claimed to be an employee of Waste Control with full knowledge of the chemicals stored on the site. This person disappeared shortly thereafter, and inquiries by the police revealed he was not an employee of Waste Control. Despite media appeals by the police, this person's identity remains unknown.[61]

4.9 IMPACT OF FIRE ON SURROUNDING AREA

The Waste Control premises was substantially damaged by the fire, with the exception of the office building, front entrance to the property and the laboratory, which was a recycled sea container. The fire also burnt bushland down to the Helena River. The fire caused toxic fumes to be discharged into the atmosphere and contaminated liquid, mainly fire wash water, to run down drains that led to the Helena River. During the fire emergency the DEP installed bunding close to the site and drains were blocked in an effort to prevent contamination of the Helena River.

Analysis of run-off water and contaminated soil showed the presence of contaminants including perchloroethylene and heavy metals.

The DEP alerted the Water and Rivers Commission and the Swan River Trust of the potential for pollution to the river. The Swan River Trust later took samples of the Helena River to confirm whether there were any obvious impacts to the ecosystem. The DEP advised the Committee that:

> *The results from the survey were that there were no impacts. Subsequently the Water and Rivers Commission installed bores near to the Helena River to confirm that [there was no impact on the ecosystem].*[62]

Residue from the fire landed in surrounding areas and covered buildings and vehicles in the vicinity of the site. Contaminated water flowed from the site to the low-lying area to the east of the premises where soil was contaminated. All of the off-site soil contamination in the drains and the dampland below the Roe Highway was removed for disposal.[63]

Air quality sampling undertaken at various locations after the fire revealed concentrations below international guideline values. Samples of dust and debris were collected from buses, fences, buildings and property in the vicinity of the Waste Control site. Minor concentrations of heavy metals were identified, although within safe limits.[64]

Dust monitoring found concentration of metals within acceptable limits. The Water and Rivers Commission drilled a number of bores at the south-western boundary of the site and found minor levels of perchloroethylene contamination. In evidence Dr Stephen Appleyard stated:

> *We looked for gross contamination which would have indicated a potential for contamination to go deeper and enter our Leederville aquifer…We had some concerns about the impact on*

60 Bellevue Residents & Ratepayers Association Inc, Submission to the Economics & Industry Standing Committee, 24 July 2001, p 4.
61 Letter from Western Australian Police Service, Crime Investigation Support, 7 September 2001.
62 Sharon Clark, DEP, Transcript of Evidence, 6 September 2001, p 28.
63 Cleanaway Technical Services, Waste Control Fire Clean-Up Operations Environmental Sampling & Methods, Bellevue WA, May 2001, p.7
64 State v Waste Control Pty Ltd, Transcript of Proceedings, *Op Cit*, p 14.

the deeper aquifer so the next step was to let a contract for deeper investigations.[65]

Dr Appleyard advised the Committee that the groundwater contamination at the site would have resulted from a long history of chemical handling at Waste Control, rather than as a result of the fire emergency.

The DEP have engaged an environmental consulting firm to test and report on groundwater contamination beneath the site. The purpose of this exercise is to evaluate the nature and possible extent of contamination beneath the site, including an analysis of samples from bores previously installed by the Water and Rivers Commission outside the site boundary. The report is expected to be released in January 2002.

4.10 DECONTAMINATION/CLEAN-UP OF WASTE CONTROL SITE

DEP soil sample analysis and sampling of the Bellevue fire site and adjacent areas including damp land near the Helena River and a stormwater channel adjacent to the Bellevue Primary School revealed:

- contamination by fire wash water in surface soils; but
- no heavy metals or organics including pesticides and PCB's.

Air sampling of the plume migratory route revealed no polyaromatichydrocarbons and heavy metals above unacceptable limits. Dioxins were within acceptable levels for a residential area. Samples were taken from the site, then at 250 metres, 500 metres and up to 2 kilometres distance downwind in the Swan River area near the foreshore in close proximity to the Swan River Trust building. In addition, sampling of the Helena River by the Swan River Trust revealed no impact on the ecosystem. [66]

Cleanaway Technical Services (CTS) was contracted by DEP to clean-up the Waste Control site and adjacent affected areas. The main objective of CTS's involvement was:

- to clean-up soil and other contamination and remove remaining wastes in order to render the area safe for reoccupation by residents and business. The clean-up occurred over the period 17 February to 31 March 2001; and
- to identify the extent of significant pollution and take preventative action to limit further spread of contaminants to surrounding areas.

4.10.1 Scope of Work

CTS, in consultation with DEP, agreed that the scope of work was to include:

- collection of water and soil samples for hazard identification as specified by DEP;
- evaluation of environmental impact in consequence of surface contamination;

65 Dr Stephen Appleyard, Water & Rivers Commission, Transcript of Evidence, 5 September 2001, pp 2-3.
66 Sharon Clark, DEP, *Op Cit,* p 28.

- collection of swab samples from adjacent properties;
- recording of contaminants in soils, water and air; and
- results of the analysis.[67]

4.10.2 Results

Areas with the potential for risk to ecological and environmental health were decontaminated by removal of soil, debris and water, particularly in the dampland below the Roe Highway and storm water channel close to the Bellevue Primary School. The excavated areas were confirmed to be free from contamination by validation sampling and analysis and backfilled with clean, imported material.

Samples from adjoining and nearby properties revealed the presence of heavy metals in the condensate from the fire with an absence of hydrocarbons. Affected areas were decontaminated using high-pressure water cleaning with only traces of heavy metals detected from the cleaned surfaces.

Neighbouring properties, drains, roads and verges were also decontaminated. The condition of soil within the site, and the possible contamination of groundwater beneath the site and in areas previously monitored outside the site, is to form the subject matter of a report to be completed during January 2002.

4.11 EFFECTS OF SMOKE PLUME

Computer modelling (*Ausplume*) of the likely airborne behaviour of the plume was carried out to estimate likely impacts and to assist in determining where samples should be taken. The modelling carried out was the best estimate of the plume, and was based on a number of assumptions as well as meteorological data from Perth Airport and a DEP monitoring station.

The model has been criticised for, *inter alia*, failing to provide details of the assumptions supporting the model. It is alleged that the Ausplume modelling conducted by the DEP as to the extent of the toxic plume was deficient. In their submission to the Committee, the Alliance for a Clean Environment (ACE) state that:

> *It is possible that this model has underestimated the fire plume by 50% as some estimates of the quantity of chemicals involved in the fire are as high as 1,000 000 litres.*[68]

However, all evidence received by the Committee indicates that the maximum quantity of chemicals at the site was approximately 500,000 litres and possibly as little as 300,000 litres.

An assessment of the downwind impact of the plume indicated that potential pollutants of concern[69] were considerably diluted as the plume migrated downwind. None of the DEP air quality stations in areas affected by the plume indicated any unusual level of monitored air pollutants.[70]

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67 Cleanaway Technical Services, *Op Cit.*, pp 1-28.

68 The Alliance for a Clean Environment, submission to the Economics and Industry Standing Committee, 8 August 2001, Chapter 2, p 8.

69 Such as heavy metals, polycyclic aromatic hydrocarbons and dioxins.

70 Department of Health, Preliminary Analysis of Bellevue Fire Plume, 15-16 February 2001, File 01-06170, Folio 164.

Prevailing winds for the duration of the fire were predominantly from the east/north-east direction with the average wind speed ranging between 4 and 11 knots (0.1 and 0.3 meters per second.)[71] This resulted in the smoke plume migrating in a south-westerly direction away from residential areas.

The Committee notes that had the wind speed, and direction changed on the night of the fire emergency, a larger number of the local population would have been affected.

4.12 EFFECTS OF FIRE ON CHEMICALS ON SITE

The Committee was advised that the temperature of the fire was 1100-1200 degrees centigrade with a heat output of 20-40 megawatts. Perchloroethylene decomposes when exposed to temperatures in excess of 400–500 degrees centigrade.[72]

In the fire, the flammable liquids, combustible and other chemicals would have been burned and broken down during the fire, with release into the atmosphere of normal fire by-products, such as carbon dioxide, water, carbon soot and carbon monoxide and irritant by-products such as hydrochloric acid.

Chemicals that did not fully burn would have contributed chemical vapours and gasses to the smoke.

[71] Bureau of Meteorology, Perth Metropolitan Area Weather Report for: 15 – 16 February 2001.

[72] Professor J Spickett, Director Research, Development and Graduate Studies, Division of Health Services, Curtin University of Technology, Report 26 October 2001.

CHAPTER 5 HEALTH EFFECTS OF THE FIRE

5.1 INTRODUCTION

Over 350 FESA personnel, including volunteers, responded to the fire emergency and attended the site at some stage throughout the period 15 – 17 February 2001.

Police evacuated over 50 local residents in response to the fire emergency and the immediate area was cordoned off to restrict access and exposure to possible toxic wastes. All businesses in the area were closed from Friday morning to Monday morning.

Several volunteer and professional fire-fighters were treated for toxic exposure with obvious short term symptoms.

5.2 PUBLIC HEALTH ISSUES

The storage of toxic waste and flammable material contributed to the creation of a toxic smoke plume emanating from the premises on the night of the fire emergency. The purported absence of an emergency manifest of material stored on the premises increased the potential risk faced by fire-fighters attending the fire.[73]

FESA advised the Committee that, because the required manifest of inventory stored on the site was absent, only an estimate could be made of what chemicals were involved during the fire. Furthermore, due to the absence of adequate toxicological data[74] for dangerous goods, the emergency services were unable to determine the correct safe evacuation distances required, the appropriate protective clothing to wear or the correct neutralising agents to apply to the run off water.[75]

As the drums on the premises ignited, many exploded and were thrown up to 120 metres in the air with some landing on Roe Highway. Fumes and smoke from the fire posed health risks to persons exposed to them. The plume had the potential to cause a range of health impacts including respiratory distress, headaches, dizziness, eye irritation and nausea.

A number of volunteer fire-fighters who fought a bush/grass fire in the area at the time of the chemical fire were exposed to this smoke plume. The fire-fighters experienced nausea and sickness. They were not wearing breathing apparatus at the time of the exposure.[76]

By the morning of Friday, 16 February 2001, a number of individuals who attended the fire had developed health symptoms including vomiting, nausea and irritation to mucous membranes. Some people showing symptoms at the incident were provided with medical assessment at the Swan Emergency Medical Centre and others sought assessment through their local general practitioners.[77]

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73 State v Waste Control Pty Ltd, Transcript of Proceedings, Op Cit, p 15.

74 Section 23 of the Occupational Health and Safety Act 1984 provides that such data relevant to the safe use, handling, processing, storage, transportation and disposal of [a] substance must be provided (a) when the substance is supplied; and (b) thereafter whenever requested.

75 FESA letter to Crown Solicitors Office dated 23 February 2001 – in file 04103.

76 FESA file, Executive circular No 2/2001.

77 FESA file Briefing Notes, 26 April 2001.

Five volunteer firemen were taken to hospital for tests as a result of exposure but were released within a few hours. One career fireman had slight burns to the face.[78]

5.3 RESPONSE

HEAT commenced an emergency response action plan on 18 February 2001 to address the concerns of local residents and offer advice regarding the environmental and health risks presented by the fire.

This response consisted of a range of environmental testing and advice to residents. FESA also issued a questionnaire to fire and rescue personnel to determine the extent that fumes might have affected members. Blood tests were offered to concerned members, particularly those who exhibited adverse health symptoms.

HDWA released a media statement on Monday, 19 February 2001 advising residents to contact their medical practitioner if they had concerns about their health.

FESA initiated several meetings on Monday, 19 February 2001 to discuss the health implications of the incident. Health professionals were consulted by FESA to discuss appropriate ways of responding to health issues arising out the incident.

Health assessments were arranged through private medical centres and surgeries located throughout the metropolitan area.[79]

Thirty volunteer fire-fighters had blood tests taken as a result of their possible exposure to the potentially toxic by-products of the fire. A further 250 fire-fighters and 70 personnel from other supporting agencies and companies attended seminars arranged by FESA and the Health Department to inform them of their possible exposure to toxic substances.[80]

ACE submitted to the Committee an informal health survey conducted by them between August and September 2001, which aimed to identify and record perceived impacts on the health of households within close proximity to the Waste Control site. Twelve households were involved and three quarters of the people surveyed believed that they had suffered adverse health effects. They also believed that they had not received adequate information about the nature and effects of the fire.[81]

5.4 ALLEGATIONS OF PCBS AND RADIOACTIVE MATERIAL

Immediately after the fire, there were suggestions that Waste Control was illegally storing poly-chlorinated biphenyls (PCBs) and even radioactive materials. No evidence of this was found during DEP's normal inspections or the clean-up analysis performed at the site.

Under the *Radiation Safety Act 1975,* any premises where radioactive materials are stored must be registered and the person who stores the material must be licensed.[82] The premises must meet

78 WorkSafe File Notes.
79 FESA file Briefing Notes.
80 FESA letter to Crown Solicitors Office, *Op Cit*.
81 Barbara Dundas, "Survey of Resident Perceptions of Health changes following the Waste Control Fire at Bellevue", Alliance for a Clean Environment (ACE), September 2001.
82 Part III, *Radiation Safety Act 1975.*

the requirements as specified by the Radiation Health Section of the Health Department of Western Australia. Waste Control was not registered with the Radiation Health Section and no evidence was provided to support the concern of the presence of radioactive material. [83]

A senior physicist from the HDWA Radiation Health Section, Mary Aerts, inspected the site and reported:

> *The dose-rate monitored by the Ludlum read ~ 1.6 to 2.5 mR/h on the x 10 scale. Using the monitor's correction factor of 0.00869 this give 0.14 to 0.22 mGy/h which is within the range of normal background radiation-rate.*[84]

5.5 SHORT TERM HEALTH EFFECTS

FESA employed a toxicologist, Dr Frank Daly, presently a Director of the Royal Perth Hospital Toxicology Poison Centre, to provide expert advice, in response to public health concerns and allegations that various government agency personnel had been exposed to a range of contaminants.

Advice from Dr Daly indicated that the fire-fighters displayed symptoms commonly associated with short term exposure to a range of chemicals. Typical symptoms included sore eyes, coughs, colds, chest complaints, dizziness, nausea and headache. The symptoms manifested themselves as a result of the combustion of hydrocarbons that served to irritate the mucosal membranes.[85]

Mr Michael Jackson, Director, Environmental Health, advised the Committee that the symptoms of short term exposure to chemicals were likely to present themselves in irritation of eyes, skin, respiratory problems, coughing, and shortness of breath. The symptoms would be aggravated where a person suffered from a pre-existing condition such as asthma or some respiratory ailment.[86]

The dose rate caused by exposure to a toxic material and its health effects are regarded as directly proportional to the length of actual exposure. In the case of the Bellevue incident, most exposures were of a relatively short duration, (measured in minutes to hours) which implied no long term health effects.

In evidence before the Committee, Mr Jackson stated that:

> *….many of the chemicals that were present on that site have significant toxic effects when there is an occupational exposure over long periods or when they are ingested or inhaled. There is no question that those are toxic chemicals. However, the results from our monitoring confirm that with the fire the actual time of exposure - it is a short exposure that went for perhaps five days - was relatively small.*[87]

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83 Health Department Western Australia, file 99-06571, folio 200.
84 *Ibid,* folio 126.
85 Dr Frank Daly, FESA, Transcript of Evidence, Wednesday 5 September 2001, p 15.
86 Mr Michael Jackson, HDWA, Transcript of Evidence, Thursday 6 September 2001, p 3.
87 *Ibid,* pp 6-7.

The Committee noted that the symptoms of chemical exposure as indicated by Dr Daly and Mr Jackson were consistent with the Merck Index.[88] The potential symptoms as indexed were consistent with the chemicals alleged to have been present in the fire and plume.

5.6 LONG TERM HEALTH EFFECTS

Dr Peter Di Marco, Principal Toxicologist with HDWA, formulated a medical opinion based on the premise that:

- the site contained chemicals which consisted of approximately 400,000 litres of chemicals, mainly perchloroethylene, white spirits, oxidisers and a small amount of pesticide.[89]
- an inspection and soil analysis by HDWA (Environmental Health) and lead sampling by Cleanaway revealed levels of radiation and lead contamination to be within normal background levels.[90]

Essentially, Dr Di Marco was of the opinion that short term exposure to organic solvents including perchloroethylene, pesticides, oxidisers and possibly lead would not have resulted in any consequential, long term delayed or chronic health effects. Fire-fighters would have been exposed to higher levels of substances in the smoke for a short duration of hours with no long term health effects.

In evidence before the Committee, Dr Di Marco stated that:

> *The nature of the exposure was short term, being at maximum, perhaps 48 hours. The type of exposure that is needed for the development of tumours and cancers in humans could be thought about in terms of months or years. Due to that fact, and because of the likely levels that would have been generated in the plume and the exposure of people, my conclusion was that there would not be any consequential effects with regard to cancer risks for any people who may have been exposed to perchloroethylene from the fire.*[91]

In relation to the question of long term health effects, Dr Di Marco notes that:

> *…..people may have been exposed to the various solvents that were present at the site, which may have volatilised…..Again, my judgement is that there would be is no consequential, long term delayed or chronic health effects from that.*[92]

In evidence before the Committee, Dr Daly pointed out that there was a low probability of significant permanent health effects due to the acute nature of the exposure, that is, short term, large dose exposures. There was no long term, small-dose exposure that is typical of chronic respiratory symptoms or carcinogenesis. [93]

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88 The Merck Index is an authoritative index that lists, *inter alia*, potential symptoms of chemical over exposure.
89 Dr Peter Di Marco, HDWA, Transcript of Evidence, 6 September 2001, p 9.
90 Mr Michael Jackson & Dr Peter Di Marco, HDWA, Transcript of Evidence, 6 September 2001, at pp 3 & 9 respectively.
91 Dr Peter Di Marco, *Op Cit*, p 9.
92 *Ibid*.
93 Dr Frank Daly, *Op Cit*, pp 16 & 19-20.

Utilising two lists which indicated the chemicals present at the site, Dr Daly developed his own 'worse-case scenario' list that included cyanide, lead, phosgene, and mercury.[94] Using a symptom-based approach, Dr Daly was of the opinion that, as no symptoms had declared themselves within 48 hours, particularly for lead and mercury, there was little likelihood of long term health effects.[95]

In summary, Dr Daly was of the view that there was a low probability of long term health effects for the following reasons:

- there was no long term, small dose exposure to the chemicals;
- acute exposure, measured in hours, results in a low probability of significant permanent health effects;
- no person had presented with symptoms which served as an indication that such person had not taken a medically significant dose to cause real concern;
- although 167 fire-fighters had initially requested testing, 115 actually appeared and were tested;
- if cyanide or mercury had been present in the fire or plume, the effects of such chemicals would have resulted in death.[96]

5.7 INDEPENDENT OPINION

The Committee resolved to obtain independent expert advice on the health effects of the fire emergency from the National Health and Medial Research Council (NHMRC). The NHMRC recommended the Committee brief Professor Jeffrey Spickett, Director of Research, Division of Health Services, Curtin University of Technology.

Professor Spickett provided an independent opinion on the potential long and short term effects of exposure to toxic materials. The opinion was based on material supplied by the Committee, in particular, evidence presented in public hearings, the report of Cleanaway Technical Services and his own independent research.

The report from Professor Spickett to the Committee indicated that:

- the combustion process of chemicals in a fire and the composition of the end products was considered complex and varied according to temperature, availability of oxygen and other factors;
- the main combustible products were flammable organic chemicals and a large quantity of tetrachloroethylene, the latter chemical decomposing when exposed to temperatures in excess of 400-500 degrees centigrade (pyrolysis). Phosgene, hydrogen chloride and a small quantity of other organic chemicals eventuated as a result of pyrolysis. Evidence suggested that there was little, if any exposure to phosgene which is extremely toxic by acute inhalation exposure;

94 Ibid, p 17.
95 Ibid, p 19.
96 Ibid, pp 16-23.

- if acute exposure to phosgene and/or hydrogen chloride had occurred, symptoms would have manifested themselves at the time of medical examination. The effects of acute exposure were not associated with long term-delayed effects;

- a symptom approach should be adopted to treat exposure to toxic materials;

- it was likely that tetrachloroethylene, not being flammable, was present in vapour form and potentially inhaled by exposed individuals;

- the acute effects of exposure to tetrachloroethylene include eye and nasal inflammation, dizziness, nausea and headache. The International Agency for Research on Cancer classified tetrachloroethylene as Group 2A indicating that the chemical was probably carcinogenic to humans. The viewpoint was based on relatively high exposure levels to animals although there was limited evidence in the case of humans;

- it was unlikely that acute short term exposure to tetrachloroethylene would lead to carcinogenic outcomes;

- the other flammable materials that were likely to be present (xylene, acetate, methyl ethyl ketone, ethanol, ethyl acetate isopropyl, toluene and white spirits) should have been subject to complete combustion and, if some vapour was present, it was unlikely that exposure would have any long term health effects.[97]

The Committee notes that, although Professor Spickett refers to heavy metals being present in swab sampling, the Cleanaway Technical Services report indicates that after high pressure water cleaning of affected surfaces in neighbouring properties only traces of heavy metals were detectable in swab samples taken from the cleaned surfaces.[98] The condition of soil and possible contamination of groundwater will form the subject of an independent report to be presented by URS during January 2002.

In conclusion, Professor Spickett stated that:

> *It is my opinion that it is unlikely that long term adverse health outcomes will occur as a result of the exposures which occurred during this incident. However given that there are uncertainties about exposures it would be highly desirable for a health surveillance program to be established.* [99]

The available evidence and expert opinions of Dr Di Marco, Dr Daly and the independent opinion from Professor Spickett suggests that there has been no long term, small-dose exposure to the effects of the fire or plume which could give rise to serious or chronic health problems.

97 Report, Professor Jeffrey Spickett, *Op Cit.*
98 Cleanaway Technical Services, *Op Cit*, p 28.
99 Report, Professor Jeffrey Spickett, *Op Cit.*

5.8 HEALTH IMPACT ON COMMUNITY – A HEALTH SURVEY

As a consequence of the concern and anxiety of the community following the fire, a survey was commissioned in June 2001 by the Environmental Health Service of the Public Health Division under the auspices of the Commissioner for Health.

The protocol, methodology and objectives of the survey was developed by the Epidemiology and Analytical Services Branch in consultation with stakeholders.

The survey instrument was statistically designed to:

- establish the health status of residents living in close proximity to the fire;
- examine the nature and prevalence of fire-related health effects;
- determine the health effects, if any, of people in proximity to the fire;
- establish the severity and duration of fire-related health effects; and
- report on actions taken by residents both during and after the fire.[100]

A sample size of 1315 individuals was extracted from the 2001 version of the Electronic White Pages covering various densely populated districts[101] within four zones.

Samples were randomly selected from within each of the four zones and the number of completed interviews represented in Table 3 below.

[100] HDWA, Curtin University and University of Western Australia, Community Survey of Bellevue Health Effects, September 2001, p 4.
[101] Also known as collector districts

Table 3

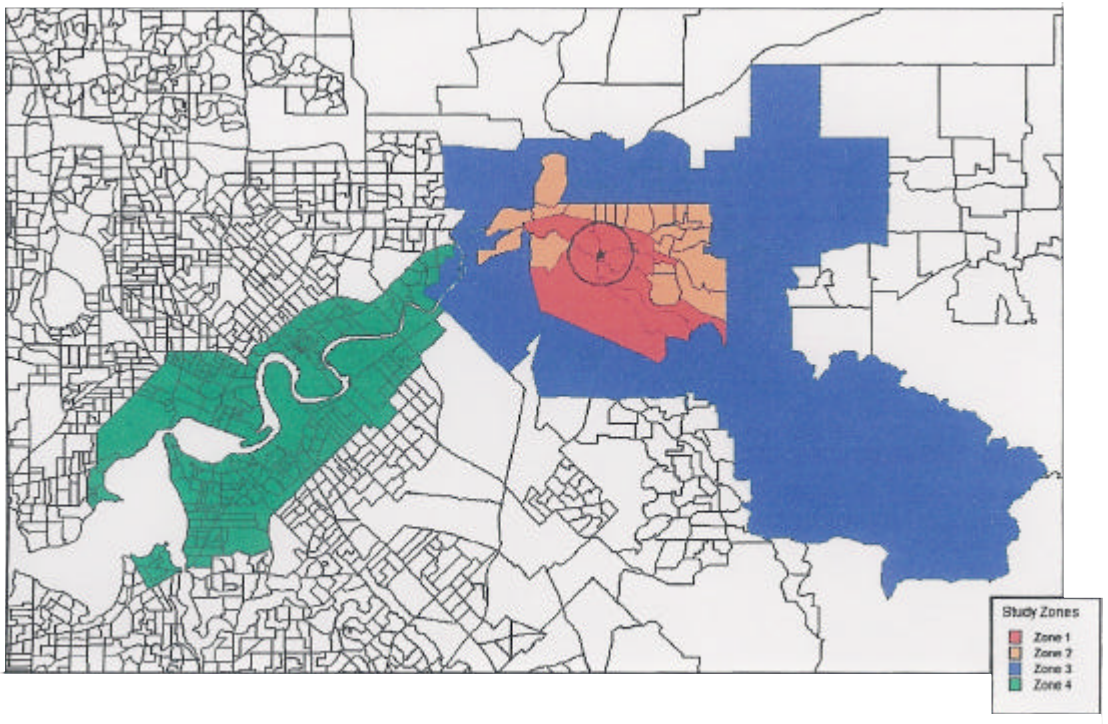
Sample by Location[102]

SAMPLE STRATA	SAMPLE SIZE
Zone 1: Immediately around Bellevue and the site of the fire	175
Zone 2: A set of Collector Districts adjacent to the area of the fire	379
Zone 3: A set of Collector Districts around Zone 2 but not including its parameters	276
Zone 4: Collector Districts following the plume line for 10 ppm concentration of particulars	485
Total	1315

Outlined below is a map of sampling zones used in the Health Survey:

Map 1

Map of Sampling Zones[103]



102 HDWA, Curtin University and UWA, Community Survey, *Op Cit*, p 5.

103 *Ibid.*

- Zone 1 indicates the centre of the fire emergency.
- Zone 2 indicates the area directly adjacent to the fire source.
- Zone 3 indicates the control group, or the area least likely to be effected.
- Zone 4 indicates the area of migration of the smoke plume.

The map represents the eastern metropolitan region of Perth, with the central focus on Midland and surrounding areas.

A letter signed by the Commissioner of Health was sent to all randomly selected households from within each of the zones informing them of the purpose of the survey with an invitation to participate. The survey was conducted as a computer assisted telephone interview with the aid of a questionnaire.

The questionnaire was based on previously validated, reliable and tested questions based on a completed major state health survey conducted in December 2000. Questions were selected on the basis of expected health effects resulting from exposure to a fire of the type experienced at Waste Control.

Typical questions referred to whether individuals had experienced nausea, skin irritation, sore eyes, the duration of the symptoms, what action had been taken by individuals, whether they had been referred to a specialist or gone to hospital or emergency department.[104]

Table 4 below indicates the number of people contacted and includes non-response and refusals.

Table 4

Response Rate

Disposition Codes	Number	Percent
Initial eligible sample	2469	100.0
Refusals	425	18.0
Non-contacts	690	16.1
Business numbers and unused numbers	39	0.3
Completed interview Response rate	**1315**	**63.8**
Participation rate	**1315**	**76.9**

The analysis was conducted using descriptive and inferential tests to determine significant associations. The analysis of data adopted the approach of a case-control study. The inferential analysis of the data suggested that:

- headache and shortness of breath were the two main symptoms associated with proximity to the fire. A sore throat indicated some association with the fire, but was relatively weak;

[104] Ms A Daly, HDWA, Transcript of Evidence, 6 September, p 28.

- headache was largely restricted to the immediate proximity of the fire and was relatively short in duration (approximately 25% of the test sample within zones 1 & 2);
- shortness of breath was more widespread and included areas downwind of the plume (77% of the test sample within zones 1, 2 & 4);
- generally, older people suffered with symptoms of headache that lasted less than one week. One case was referred to a specialist and two people took sick leave from work; and
- mainly older people showed symptoms of shortness of breath that lasted more than one week in duration in approximately two thirds of the cases. Eight per cent of the group was referred to a specialist, one was hospitalised and five took sick leave.[105]

5.9 HEALTH CONCERNS REGISTER

The Committee recognises the legitimate concerns and anxiety of those individuals who were exposed to the chemical effects of the fire and plume and endorses the view held by Dr Daly that a medical register should be developed and maintained.

The register would serve as a formal record evidencing individual health concerns, medical screening details including prognosis and monitoring procedures. The register would constitute a formal documentary record that could be accessed in the event of any future health problems experienced by fire-fighters and attributable to the fire and plume.

Individuals wishing to be included in the register should provide evidence of having attended the incident/fire emergency and/or evidence of exposure to the effects of the fire or plume. The register should include details of an individual's prior and post exposure to potentially hazardous materials of the kind experienced at the fire emergency.

The Committee acknowledges that, as a result of the combustion process, the chemicals may have produced a number of unknown substances that would be present in the smoke plume.[106] This provides added incentive for the development and maintenance of a health register.

The Committee finds that:

Finding 1

There exists a degree of understandable concern amongst some members of the community and fire-fighters regarding potential health impacts associated with the fire emergency.

105 *Ibid*, pp 30-31.

106 HDWA, Submission to the Economics & Industry Standing Committee, 27 July 2001, Attachment 3.

The Committee also finds that:

Finding 2

There exists a low probability of medium to long term serious or chronic health effects to the fire-fighters and residents exposed to the fire or plume.

Recommendation

The Committee recommends that the Health Department of Western Australia develops, implements and maintains a medical register of individuals who were exposed to the effects of the fire emergency. The register needs to:

- contain evidence of exposure to the effects of the fire emergency; and
- include any pre and post-incident exposure to potentially hazardous material.

APPENDIX ONE

BRIEFINGS HELD

Date	Name	Position	Organisation
27 July 2001	Klaus Braun	Risk Management Consultant	ICS Group
27 July 2001	Ray Brown	Industrial Chemist	ALCOA
27 July 2001	Assoc Prof Frank Murray	School of Environmental Science	Murdoch University of W.A.
8 August 2001	Ken Raine	Manager Pollution Prevention Division	DEP
22 August 2001	William Syme	Director	Green Enviro Technologies
22 August 2001	John Hebenton	State Manager	Lurgi Australia Pty Ltd
15 October 2001	Prof Jeffrey Spickett	Director Research Development & Graduate Studies, Division of Health Services	Curtin University of Technology
29 October 2001	Andre Stasikowski	Principal Engineer	Stass Environmental

SITE VISITS AND BRIEFINGS HELD

Date	Name	Position	Organisation	Site
27 July 2001	Dr Jeffrey Claflin	General Manager	Waste Control Pty Ltd	Bellevue Hazardous Waste
27 July 2001	Philip Hine	Assistant Director, Pollution Prevention	DEP	Bellevue Hazardous Waste
27 July 2001	Michael Hansen	State Manager	ERS Australia Pty Ltd	Maddington
27 July 2001	Rachel Irvine-Marshall	Technical Adviser	ERS Australia Pty Ltd	Maddington
27 July 2001	Sean Wilson	Service Manager	ERS Australia Pty Ltd	Maddington
27 July 2001	Robert Goldfinch	Branch Manager	Cleanaway	Brookdale

APPENDIX TWO

WITNESSES TO HEARINGS HELD

Date	Witness	Position	Organisation
10 August 2001	Graeme French	Executive Officer	Environmental Protection Authority
10 August 2001	Ron Jones	Associate Member	Alliance for a Clean Environment
10 August 2001	Jane Bremmer	Secretary	Alliance for a Clean Environment
10 August 2001	Lee Bell	Secretary	Contaminated Sites Alliance
10 August 2001	John Erceg	Manager Development Services	City of Swan
10 August 2001	Patsy Molloy	Convenor	Clean Air Committee
10 August 2001	Greg Jones	Brigade Captain	Stoneville Volunteer Bushfire Brigade Inc
10 August 2001	Michael Warnock	Brigade Fire Control Officer	Stoneville Volunteer Bushfire Brigade Inc
10 August 2001	Michael Bennett	Solicitor	Environmental Defender's Office of WA (Inc)
10 August 2001	Graeme S. Dundas	Member of the Public	
10 August 2001	Charles Stewart-Robinson	President	Bellevue Residents & Ratepayers Association Inc
31 August 2001	Greg Jones	Brigade Captain	Stoneville Volunteer Bushfire Brigade Inc
31 August 2001	Michael Warnock	Brigade Fire Control Officer	Stoneville Volunteer Bushfire Brigade Inc
31 August 2001	Ron Jones	Associate Member	Alliance for a Clean Environment
31 August 2001	Rachel Irvine-Marshall	Industrial Chemist	Former Waste Control staff member
31 August 2001	Michael Hansen	WA State Manager	ERS Australia Pty Ltd
31 August 2001	Peter Di Marco	Principal Toxicologist	HDWA
31 August 2001	Michael Jackson	Director Environmental Health	HDWA
31 August 2001	Lindsay Gillam	HEAT Representative	HDWA
31 August 2001	Alison Daly	Manager Heath Outcomes Assessment	HDWA
31 August 2001	Lindsay Cuneo	Acting Director Planning Development & Special Risks	FESA
31 August 2001	Russell Stevens	District Manager	FESA
31 August 2001	John Truswell	Manager Water Resources & Special Risks	FESA
5 September 2001	Malcolm Russell	Director Explosives & Dangerous Goods Division	Department of Minerals & Petroleum Resources (formerly DME)
5 September 2001	Lawrence Lim	Senior Inspector Explosives & Dangerous Goods	Department of Minerals & Petroleum Resources (formerly DME)
5 September 2001	Dr Stephen Appleyard	Supervising Hydrogeologist	Water & Rivers Commission
5 September 2001	Dr Donald McFarlane	Director Resource Management	Water & Rivers Commission
5 September 2001	John Truswell	Manager Water Resources & Special Risks	FESA
5 September 2001	Nick Devine	Director Operations	FESA
5 September 2001	Phil Cribb	District Manager	FESA
5 September 2001	Russell Stevens	District Manager	FESA
5 September 2001	Bill Forbes	Executive Director Fire Services	FESA
5 September 2001	Kenneth MacKay	Fire-fighter Manager Communications	FESA
5 September 2001	Dr Frank Daly	Senior Toxicologist	Royal Perth Hospital
5 September 2001	Dr Jeffrey Claflin	Director	Waste Control Pty Ltd
6 September 2001	Philip Hine	Assistant Director Pollution Prevention	DEP
6 September 2001	Fred Tromp	Former Director Pollution Prevention	DEP
6 September 2001	Kenneth Raine	Manager Pollution Response	DEP
6 September 2001	Sharon Clark	Environmental Officer	DEP

Date	Witness	Position	Organisation
6 September 2001	Michael Jackson	Director Environmental Health	HDWA
6 September 2001	Dr Peter DiMarco	Principal Toxicologist	HDWA
6 September 2001	Alison Daly	Manager Health Outcomes Assessment	HDWA
6 September 2001	Lindsay Gillam	HEAT Representative	HDWA
6 September 2001	Pierina Otness	Senior Scientific Officer	HDWA
6 September 2001	Hazel Upton	Managing Physicist Radiation Health	HDWA
6 September 2001	Michael Phillips	University Lecturer	Curtin University
6 September 2001	John Erceg	Manager Development Services	City of Swan
6 September 2001	Phil Stjohn	Principal Planner	City of Swan
19 September 2001	Dr Bryan Jenkins	Former Chief Executive Officer	DEP
19 September 2001	Jim Malcolm	Director Waste Management Division	DEP
19 September 2001	Lee Ranford	Former Director General	DME
19 September 2001	Malcolm Russell	Director Explosives & Dangerous Goods Division	DME
24 October 2001	Rodney Mathers	Former Director	Waste Control Pty Ltd
7 November 2001	Dr Bryan Jenkins	Former Chief Executive Officer	DEP

APPENDIX THREE

SUBMISSIONS RECEIVED

No.	Date	Name	Position	Organisation
1	26 June 2001	Warrick Shirreff	Manager	Plastics Developments
2	3 July 2001	Graeme French	Executive Officer	Environmental Protection Authority
3	10 July 2001	John Erceg	Manager Development Services	City of Swan
4	12 July 2001	Prof Jonathan Majer	Head of Department of Environmental Biology	Curtin University
5	24 July 2001	K.M. Gordon	Member of the Public	
6	25 July 2001	Julienne Simpson	Member of the Public	
7	25 July 2001	Charles Stewart-Robinson	President	Bellevue Residents & Ratepayers Association Inc
8	25 July 2001	Mick Warnock	Acting Secretary	Stoneville Volunteer Bushfire Brigade Inc
9	26 July 2001	Royce J White	Member of the Public	
10	26 July 2001	Carol Payne	Proprietor	SPD Woodsupplies
11	27 July 2001	Michael Bennett	Solicitor	Environmental Defender's Officer
12	27 July 2001	G.S. Dundas	Member of the Public	
13	27 July 2001	Patsy Molloy	Convenor	Clean Air Committee
14	27 July 2001	Nigel Ball	Project & Sales Manager WA	Ecotech Pty Ltd
15	27 July 2001	Peter Meyrick	Health Services Manager	City of Armadale
16	27 July 2001	Dr Jeffrey K Claflin	Managing Director	Waste Control Pty Ltd
17	27 July 2001	Ray Brown	Industrial Chemist	Member of the Public
18	27 July 2001	Bob Mitchell	Chief Executive Officer	Fire & Emergency Services Authority of WA
19	30 July 2001	CM & PG Nield	Member of the Public	
20	1 August 2001	Astrid Herlihy	Member of the Public	
21	19 July 2001	J.I. Gill	Managing Director	Water Corporation
22	25 July 2001	Robert Leckie	Former employee	DME
23	31 July 2001	Tim McAuliffe	Director Environmental Regulation	DEP
24	2 August 2001	Christine Hughes	Chairperson	Guildford Association
25	3 August 2001	Klaus Braun	Principal	ICS Group
26	3 August 2001	Peter & Sophia Vlaar	Property owners	
27	6 August 2001	Jim Limerick	Director General	DME
28	6 August 2001	Barbara Dundas	Member of the Public	
29	6 August 2001	S & K Denniss	Member of the Public	
30	8 August 2001	Peter McKenzie	Manager Health Services	Town of Kwinana
31	8 August 2001	Julie Harradine	Secretary	Hazelmere Progress Assoc
32	9 August 2001	Ron Jones Jane Bremmer Lee Bell	Associate Member Chairperson Member	Alliance for a Clean Environment Contaminated Sites Alliance
33	13 August 2001	Dot Hesse	Chairperson	Kwinana Watchdog Group
34	15 August 2001	Robert Griffiths	Coordinator Environmental Planning	Department for Planning & Infrastructure
35	15 August 2001	Frank Murray	Associate Professor School of Environmental Science	Murdoch University

No.	Date	Name	Position	Organisation
36	31 August 2001	Prof Bryant Stokes	Acting Commissioner of Health	Department of Health
37	4 September 2001	Gavin Waugh	Vice President	Safety Institute of Australia WA Branch
38	17 September 2001	Rodney Mathers	Former Director	Waste Control Pty Ltd
39	18 September 2001	Chris Myson	Secretary	Glen Forrest Volunteer Bush Fire Brigade
40	16 October 2001	Barry Coupar	Member	Atlas Site Community Liaison Committee & Mirrabooka Action Group

APPENDIX FOUR

LEGISLATION AND REGULATIONS

Legislation	State (or Country)
Environmental Protection Act 1986	Western Australia
Explosives and Dangerous Goods Act 1961	Western Australia
Fire Brigades Act 1942	Western Australia
Fire & Emergency Services Authority of Western Australia Act 1998	Western Australia
Health Act 1911	Western Australia
Occupational Safety and Health Act 1984	Western Australia
Radiation Safety Act 1975	Western Australia
Western Australian Planning Commission Act 1985	Western Australia

Regulations	State (or Country)
Environmental Protection Regulations 1987	Western Australia
Environmental Protection (Controlled Waste) Regulations 2001	Western Australia
Environmental Protection (Liquid Waste) Regulations 1996	Western Australia
Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992	Western Australia

APPENDIX FIVE

CLASSIFICATION OF DANGEROUS GOODS

Class	Type	Description
1	Explosives	Includes pyrotechnics and explosive substances, except those that are too dangerous to transport or where hazard is appropriate to another class.
2	Gases	Includes compressed, liquefied, refrigerated and aerosol gas.
3	Flammable Liquids	Liquids, or mixtures of liquids that give off a flammable vapour at temperatures of not more than 60.5 C, closed cup test, or not more than 65.6 C, open cup test, normally referred to as the flash point.
4	Flammable Solids	Substances liable to spontaneous combustion and substances that in contact with water emit flammable gases.
5	Oxidising Substances & Organic Peroxides	Substances that may generally by yielding oxygen, cause, or contribute to the combustion of other material.
6	Toxic and Infectious Substances	Substances liable either to cause death or serious injury or to harm human health if swallowed or inhaled by skin contact.
7	Radioactive Material	Any material for which the specific activity is greater than 70 kBq/kg (0.002 µCi/g).
8	Corrosive Substances	Substances that, by chemical action, will cause severe damage when in contact with living tissue, or will materially damage other goods.
9	Miscellaneous Dangerous Goods and Articles	For the purpose of transportation, substances not covered by other classes, including substances that are transported or offered for transport at temperatures equal to or exceeding 100 C in a liquid state or 240 C in a solid state.

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