Fiskville

Understanding the Past to Inform the Future

Report of the Independent Fiskville Investigation

June 2012

Evidence provided to the Environment and Natural Resources Committee of the Victorian Parliament - Fiskville Inquiry 3 June 2015

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Overview

- Report structure
- Key limitations
- Terms of Reference – brief review
- Conclusions
- Recommendations

Report Structure

- Executive Summary
- Part One - Context
  - Ch 1 Introduction
  - Ch 2 Methodology
  - Ch 3 Background
- Part Two - Addressing the Terms of Reference
  - Ch 4 Introduction to the Terms of Reference
  - Ch 5 Acquisition, Nature and use of Materials
  - Ch 6 Contaminants and Contamination
  - Ch 7 Exposure of People to Materials
  - Ch 8 Buried Drums
  - Ch 9 Management Response
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- Part Three – Conclusions and Recommendations
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- Appendices

Key Limitations (page 30)

Key limitations include:

- The administrative nature of the Investigation, and therefore the lack of ability to compel witnesses or documents
- The short time frame for the Investigation relative to its complexity
- The scale and complexity of the document search required
- The large, sensitive interview program undertaken
- Seeking to reconstruct events and practices which occurred over the past forty years
- The lack of documentation of informal and historical practices
- The challenge for witnesses to recall matters that happened so far in the past.

Ch 5 (ToR 1a) Materials

- Will never know exact nature of drummed material – see Table 5.2 p. 59
- Greatest risk associated with unknown materials in drums (solvents, paints, etc.) – see Table 5.3 p. 61
- Key risk factor – manual handling of drums and contents
- Foams – AFFF (Aqueous Film Forming Foam) and AR-AFFF (Alcohol Resistant AFFF) – use continued for four years post NICNAS 2003 recommendation against use in training

Table 5.3
pp. 61-62

Table 5.3 Flammable and Combustible Materials Used at Fiskville
A Qualitative Assessment of the Components of Risk

Material	Physical Form	Hazardous Properties	Constituents	Management		Intrinsic Hazard	Likelihood of Exposure Due to Management
				Storage	Handling		
Petrol	Liquid	Flammable - low flash point >40°C vapour/air mixtures explosive toxic via inhalation and ingestion [but "not particularly toxic"[1]] possible carcinogen - International Agency for Research on Cancer (IARC) Group 2B[2]	Complex mix of aliphatic and aromatic C_4-C_{12} hydrocarbons, including benzene which is a carcinogen and possible mutagen Composition varies with crude oil source and manufacturing process Tetraethyl lead - an organo lead compound used as an octane enhancer in petrol banned in Australia in 2002	Principally in bulk (AST & UST), some limited drum storage	Reticulated supply; limited manual handling	Low	Low
Diesel	Liquid	Flammable - flash point >52°C Vapours may be violently reactive with air Under normal conditions of storage, handling or use as fuel, diesel should not present a hazard to health providing excessive skin contact is avoided[3][4] IARC has evaluated diesel fuels as being not classifiable as to their carcinogenicity to humans (Group 3)[5]	Complex mix of hydrocarbons - composition varies with source of crude oil but generally aliphatic C_9-C_{21} with up to 21% aromatics Numerous additives	Principally in bulk (AST & UST), some limited drum storage	Reticulated supply; limited manual handling	Low	Low
Used lubricating oil	Liquid	Combustible - flash point >215°C but this will be reduced if contaminated with fuel or solvent Mineral oils [including lubricating oils] are known to be human carcinogens based on sufficient evidence of carcinogenicity from studies in humans.[6]	Complex mixture of paraffinic, naphthenic and aromatic petroleum hydrocarbons. Composition varies depending on composition of the original oil and the degree of degradation Will have contained a range of additives such as antioxidants (phenols) and viscosity improvers.	Principally in bulk - some drums	Principally reticulated; limited manual handling	Low-Moderate	Low
Various hydrocarbon fluids- incl avgas, kerosene and other aviation fluids	Liquid	re kerosene: flammable - flash point 38°C - 62°C Vapours may be violently reactive with air[4] Toxic by inhalation and ingestion but "is not particularly poisonous [and] the acute health risks involved in handling and using kerosene are minimal, provided that the product(s) are used in accordance with current safety practices"[4] IARC concluded that there was inadequate evidence to classify kerosene as a human Carcinogen[4]	re kerosene: mixture of C_9 - C_{16} hydrocarbons produced by the distillation of crude oil.	Drums	Manual	Low	High

Table 5.3(cont.)

Material	Physical Form	Hazardous Properties	Constituents	Management		Intrinsic Hazard	Likelihood of Exposure Due to Management
				Storage	Handling		
Solvents	Liquid	Flammability varies but it is reasonable to assume that most solvents supplied to Fiskville would have been flammable or at least readily combustible Toxicity variable - some eg benzene highly toxic and are therefore no longer used as solvents. Many organic solvents are known carcinogens, including various chlorinated solvents used in industries such as dry cleaning	Very widely but relevant classes include: aliphatic hydrocarbons eg hexane cyclic hydrocarbons eg benzene aromatic hydrocarbons eg toluene and xylene aldehydes eg furfural ketones eg acetone (not all of the above have been reported as having been received at Fiskville)	Drums	Manual	Moderate - High	High
Paint thinners	Liquid	See organic solvents	Includes individual solvents such as toluene acetone and proprietary mixtures of various solvents	Drums	Manual	Moderate	High
Paint (oil based)	Liquid	Combustible - high flash point (60°C - 90°C) See organic solvents	Solvents such as naptha, toluene and xylene are used to keep the solids in oil based paint in suspension. While lead was phased out or banned in paint in the late 1970s, the pigments in oil based paints may still contain some heavy metals	Drums	Manual	Low	High
Wood	Solid	Hazards associated with combustion products rather than with raw material	Copper, chromium and arsenic in treated timber Formaldehyde in various types of composite timber products, particle board, etc	NA	Manual	Low	Very Low
Tyres	Solid	Hazards associated with combustion products rather than with raw material	Natural and synthetic rubber, carbon black, silica, sulfur, zinc oxide, anti-oxidants	NA	Manual	Low	Very Low
LPG	Liquefied gas	Fire and explosion hazard: forms a flammable mixture in air in concentrations between 2% and 10% Can cause severe cold burns in liquid form Vapour acts as an asphyxiant at very high concentrations	Mixture of hydrocarbon gases propane and butane	Bulk	Reticulated	Low - Moderate	Very Low

Ch 6 (ToR 1c) Contaminants (1)

- Broad areas of concern (actual and potential)
  - Petroleum hydrocarbons (certain)
  - Persistent organics such as
    - PCBs (possible but unlikely)
    - Dioxins and furans (certain)
    - Chlorinated pesticides (possible but unlikely)
    - Chlorinated solvents (likely)
    - Foam breakdown products Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA) (certain)
  - Metals
    - Copper and zinc (natural)
    - Chromium and arsenic (from burning CCA treated timber) (possible)

Ch 6 (ToR 1c) Contaminants (2)

- Contamination Levels (Golder Associates)
  - Soil
    - PFOS marginally > human health criteria for indust land – soil composting area
    - 3- & 4- methylphenol (solvents) > ecological criteria – prop storage area
    - Overall – results do not indicate potential for adverse impact on health or environment
  - Surface water – Lake Fiskville
    - Copper and zinc > ecological criteria (probably natural background)
    - PFOA and PFOS > human health criteria (> 2 litres/day consumption)
  - Surface Water – Dams 1 - 4
    - TPH > human health criteria
    - PFOA and PFOS > human health
    - Appropriate OHS procedures already employed

Ch 6 (ToR 1c) Contaminants (3)

- Sediment – Lake Fiskville
  - All analytical results < human health criteria
  - Dioxins and Furans > ecological criteria – *criteria are conservative and an exceedence of this type does not necessarily demonstrate evidence of an adverse impact to aquatic life* (Golder Associates)
- Sediment – Dams 1 – 4
  - All analytical results < ecological criteria (industrial land use)
  - Dams 1 & 2 - TPH and PFOS > human health criteria
- Groundwater – not found

- Offsite contamination
  - Air – smoke – v low risk
  - Surface water – despite dioxin and furan levels in L. Fiskville – offsite risk very low due to dilution and detention in environmental sinks e.g. sediment
  - Groundwater – unknown but likely to be low risk

Ch 7 (ToR 1d) Exposure (1)

- Relevant materials
  - Liquid flammables – esp. contents of drums
  - Foams containing PFOS and/or PFOA
  - Combustion products (esp. fine particles)
- Hierarchy of relative risk of exposure (Table 7.1 p. 96)
  - PAD operators – high (chemicals)
  - Instructors (full time) high (smoke, foam, fire water)
  - Instructors (part time) medium (smoke, foam, fire water)
  - Trainees low (smoke, foam, fire water)
  - Other employees and residents very low (smoke)
  - Others smoke (negligible)

Table 7.1 Qualitative Risk Assessment

p. 96

Table 7.1 Qualitative Assessment of Relative Risks of Chronic Exposure of Various Groups - Fiskville [1971-1999]

Groups	Materials				Overall Risk of Exposure
	Flammable Chemicals	Combustion Products	Foams	Recycled Firewater	
PAD Workers	High	Medium	Low	Low	High[1]
Instructors (full-time)	Low	High	Medium	High	High
Instructors (volunteer and regional staff)	Very Low	Medium	Low	Medium	Medium
Trainees (practical firefighting)	Very Low	Low	Low	Low	Low
Trainees (regional officers - 1970s)	Low	Low	Low	Low	Low
Other employees and residents	Negligible	Very Low	Negligible	Negligible	Very Low
Students and teachers	Negligible	Negligible	Negligible	Negligible	Negligible
Trainees (non-practical firefighting)	Negligible	Negligible	Negligible	Negligible	Negligible
Persons off-site	Negligible	Negligible	Negligible	Negligible	Negligible

Note

1. Based on giving particular weight to the groups' frequent and long-term exposure chemicals via inhalation and absorption.
2. Students who were residents at Fiskville are seen as belonging in the "Other employee and resident group"

Ch 7 (ToR 1d) Exposure (2)

- Incidents
  - only three identified
  - not recorded in OHS system
- Chlorine acute exposure 1976 or 1977
- Acute exposure to unknown chemicals leaking from drum following fire – Dec 1982
- Acute exposure following accidental uncovering of buried drums - 2002

Ch 8 (ToR 1e) Drum Burials (1)

- Small periodic burials
  - Empty or part filled – probably solidified
  - To now disused landfills near SW corner of property
- Mass Burials
  - Late 1970s
    - only one report so uncertain
    - probably to the older of the two landfills
  - 1982-83 burial of fire affected drums
    - Probably 20-30
    - Likely location to north of administration building
    - Most likely still there

Ch 8 (ToR 1e) Drum Burials (2)

- 1983 – 86 Burial of balance of drums not affected by fire
  - Location uncertain but may be in golf course to east of administration building
  - Probably the drums tested by AS James 1988
  - Drums removed in January 1991
- 1983 – 86 Burial of a large number of drums
  - Probably to south of airfield in area now occupied by blue gum plantation
  - Probably empty
  - Location of 2002 acute exposure incident
  - Drums removed 2002
- GPR search – nothing found

Ch 9 (ToR 1b) Management Response (1)

- Chronology
  - 1980 Contaminant concerns – PCBs
  - 1981 - 83 Problems with drums – drum fire and acute exposure incident (Dec 1982)
  - 1987 – 91 Revisiting 1982
  - 1987 – 91 Fiskville Master Plan
  - 1995 – 96 Reports and audits
  - 1996 Management response
  - 1998 – 99 Flammable Liquids PAD redeveloped (incl. fuel storage and water treatment systems)

Ch 9 (ToR 1b) Management Response (2)

- Evaluation of Management Response
  - The Board
    - Representative rather than governance
    - Focused on matters of detail rather than on strategic planning or business planning or on broader HSE concerns
    - Board minutes show no record of Board awareness of 1982 drum fire and associated acute exposure and drum burial until 1991
  - Executive Management
    - Until early 1980's Fiskville OiC reported directly to Chief Officer – thereafter until 1992 to Deputy CO
    - Overall COs and DCOs regularly made aware of issues at Fiskville but no record of notification of the December 1982 fire and acute exposure incident

Ch 9 (ToR 1b) Management Response (3)

- Fiskville Management
  - Frequent turnover
  - Response to HSE issues varied substantially – depending on key individuals and relationships

Conclusions

- ToR 1a Materials
  - Storage and handling of drummed materials clearly unsafe
  - Mitigating factors
    - 1970s and early 1980s
      - common practice
      - limited regulatory framework – nil enforcement;
      - shortage of funds;
      - desire for realism
      - prevailing culture
    - 1990s - none
  - Situation changed markedly post redevelopment of PAD in late 1990s and shift to much greater reliance on LPG
  - Foams – continued use of PFOS and PFOA containing foams despite NICNAS recs

Conclusions (cont.)

- ToR 1c Contaminants
  - On-site
    - TPH and PFOS and PFOA
    - But level of risk to human health and environment low
  - Off-site – low risk (but Dioxins/Furans may be an issue)
  - Main area of uncertainty - groundwater

Conclusions (cont.)

- ToR 1d Exposure
  - Only PAD operators had a high level of exposure to chemicals (liquid flammables)
  - Only full time instructors had a high level of exposure to combustion products, foams and firewater
  - Trainees – low
  - Others – very low – negligible
  - Acute incidents – very few (3)
  - Overall – cumulative operational exposures expected to be many times exposures during training

Conclusions (cont.)

- ToR 1e Drum burial
  - Full story unlikely ever to be known
  - Certain that two major exhumations of drums and contaminated soil occurred (1991 and 2002)
  - Some drums very likely remain
    - in disused landfills – most likely empty and very low risk
    - Drums involved in1982 fire – likely risk low
    - Residual risk (if any) is to groundwater

Conclusions (cont.)

- ToR 1b Management response
  - For much of the period Fiskville operated with a high level of autonomy
  - Response to concerns raised by Officer Bennett 1987-91 – significant criticisms
    - Failure to obtain expert medical advice
    - Failure to notify other officers involved in the December acute exposure incident
    - Failure to investigate hazards associated with chemicals acquisition, storage and handling at Fiskville and to develop and implement a plan to mitigate such hazards
    - Failure to investigate whether similar acute exposure incidents had occurred.

Conclusions (cont.)

- Response to reports and audits – early to mid 1990s
  - Uncoordinated and highly variable
  - Lack of clear accountabilities and of follow up
  - No development of a systematic approach to HSE issues
  - Change in this area largely driven by small number of concerned staff

Recommendations

- *Recommendation 1*

That soil and groundwater quality be assessed in areas where fuel storage tanks are currently located or have been located in the past both above and below ground.

- *Recommendation 2*

That groundwater investigations be undertaken in the vicinity of: the historical flammable liquids PAD, the fuel mixing area, the historical foam training pits, the prop storage area and the area used to rehabilitate contaminated soils in 1998.

Recommendations (cont.)

- *Recommendation 3*

That further investigation be undertaken into surface waters in and discharging from Lake Fiskville to:

- *better quantify the risk to downstream human health receptors, taking into account downstream dilution and environmental fate and transport mechanisms;*
- *investigate potential sources of PFOA and PFOS discharges to Lake Fiskville and discharging off site, if the potential risk of adverse impact on downstream human health receptors is found to be unacceptable;*
- *collect surface water samples at a representative location to assess whether the reported copper and zinc concentrations are consistent with background levels; and*
- *assess the ecological condition of Lake Fiskville.*

Recommendations (cont.)

- *Recommendation 4*

That any electrical transformers located at any CFA training sties be inspected by an independent hygienist and, if not able to be certified as PCB-free under the National Polychlorinated Biphenyls Management Plan 2003, that it be treated as a Scheduled Waste and disposed of in accordance with the provisions of the Plan.

- *Recommendation 5*

That any subsequent study of possible linkages between exposure of persons to materials such as flammable liquids during training at Fiskville and health effects evaluate the usefulness of the qualitative assessment of relative risk of exposure of different groups developed in Chapter 7.

Recommendations (cont.)

- *Recommendation 6*

That procedures be put in place to protect the health of personnel potentially exposed to waters and sediments in Dams 1 and 2 of the firewater treatment system and, in particular, to manage the risks to individuals who have the potential to come into contact with sediments in the dams during routine maintenance.

- *Recommendation 7*

That soil and groundwater quality be assessed in the following areas that were not examined during the site investigation stage of the Preliminary Site Assessment of Fiskville: (Figure 8.1 refers)

  - *Part of Drum burial Area 1 (south of the Airstrip and south of Deep Creek Road);*
  - *Drum Burial Area 2 (north of the Administration Building);*
  - *Drum Burial Area 3 (east of the Administration Building)*
  - *Historical landfills 1 and 2.*

Recommendations (cont.)

- *Recommendation 8*

That historical landfill 1 which has been disturbed by the construction of a walking track needs to have its extent clearly identified, have an appropriate impermeable and properly drained cap constructed and be revegetated with shallow rooting species that will not compromise the integrity of the cap. This should ensure the safety of any people using the walking track.

- Recommendation 9

That any decision on the future management of historical landfill 2, including possible exhumation of buried drums and further site rehabilitation, await the results of soil and groundwater quality assessment at the site (Recommendation 7).

Recommendations (cont.)

- Recommendation 10

That the site specific recommendations of the Golder Associates' Preliminary Site Assessment – CFA Regional Training Grounds be adopted including recommendations to:

  - *Undertake targeted soil and groundwater investigations at sites where possible sources of contamination have been identified;*
  - *Assess firefighting water quality for contaminants associated with flammable liquids and extinguisher foams;*
  - *Assess water quality where discharges occur to the environment*.