SWAN RIVER TRUST

Swan–Canning Cleanup Program

Swan–Canning Industry Survey

Draft Report

Pilot Survey Findings

A supporting document to the Swan–Canning Cleanup Program Action Plan

December 1999

WATER AND RIVERS COMMISSION

Acknowledgments

The Swan River Trust acknowledges the participation and efforts of the following members of the Industrial Wastes Audit Task Group (now known as the Swan–Canning Industry Working Group):

Phil Oorjitham, Mike Woods, Mark Street	City of Melville
Peter Morrison, Les Evans	City of Canning
Glenn Sargeson, James Riley, Binh Luong	City of Bayswater
Ross Wells, Mark Bishop, Belinda Laing–Hughes	City of Gosnells
Maurice Ferialdi, Evan Brown, Kevin Davidson	Belmont City Council
Neil Duffin	City of Stirling
Peter Male	Shire of Swan
Ken Goldsworthy, Erina Stazzonelli, Maria Hatgivasilou	Town of Bassendean
John Nicolson	Eastern Metropolitan Regional Council
Annette Latto, Adam Parker	Department of Environmental Protection
Stephen Wong, Phyllis Graham, Allan Pastega, Lucy Sands	Water and Rivers Commission
Louisa Barnacle	Swan River Trust

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Foreword

The health of the Swan River is something that should concern all West Australians.

As our population continues to increase, so do the pressures on our city's beautiful waterway. We need to keep a close watch on actions and activities on and near the river to ensure it is preserved for future generations.

While environmental awareness is increasing, we continue to hear all too often of chemical and oil spills and other pollution risks to the valuable Swan River environment.

This industry survey is one step in the effort to reduce these risks.

I thank the hundreds of operators — from nurseries and printers to automotive and plastics industries — who took the time to be a part of this important survey.

It is also pleasing to see that this survey has shown an increasingly collaborative approach between private industry, local government and State government agencies.

While this survey highlights several alarming practices that need addressing — such as the disposal of industrial effluent in stormwater drains — the survey process itself and the resulting recommendations should raise awareness of what the risks are and instigate change among industry owners and workers.

I encourage all small industry owners and employees to consider how they can reduce pollution risks in the workplace, and I thank those who have shown in this survey that they are already operating in an environmentally responsible way.

Dr Kim Hames, MLA

Water Resources

December, 1999

Dr Kim Hames, Stephen Wong WRC, Peter Morrison City of Canning, Louisa Barnacle SRT and Geoff Totterdell Chairman SRT Board. Demonstrating the database to be used for surveys, monitoring and reporting at the Swan-Canning Industry Survey launch in 1997.

Summary

The Pilot Survey involved on site inspection and assessment of more than 550 light industrial premises to determine what current practices are in place for chemical storage and bunding, waste management, wastewater management, stormwater management, emergency management and general management practices. The survey also assessed the extent to which current industrial practices pose a threat of pollutants entering the Swan–Canning river system. Of the total surveyed premises, 522 were available for analysis[1].

The surveys were undertaken by local government Environmental Health Officers, Water and Rivers Commission and Swan River Trust Officers.

The recommendations of this report provide a two year strategy to reduce the pollution risk of light industries in the Swan–Canning catchment. A Technical Report on the Pilot Survey is nearing completion.

How to make submissions

The Swan River Trust and the Swan–Canning Industry Working Group would like to know what you think about this report and two year strategy for preventing pollution from light industrial premises in the Swan–Canning catchment.

This is an opportunity to provide information, express an opinion, suggest alternatives or propose other management options. Your comments will be taken into account when writing the final Report.

All comments must be made in writing.

To ensure your comments are as effective as possible:

- Make them clear and concise;
- List your points in the same order as in this report;
- Suggest alternatives or what you would like done;
- Be specific when your comments relate to a particular point.

Deadline

Comments should be sent by 31st March 2000 to:

River Manager

Swan River Trust

PO Box 6740, Hay Street East

EAST PERTH WA 6892

[1] This total did not include industry types with fewer than 10 premises surveyed, or those surveyed for trial purposes.

Recommendations

1. **Develop a framework to facilitate local government management of local light industry pollution issues.**

- Provide appropriate statutory powers to local government to manage local pollution issues. (**SRT, LG**, DEP, HDWA, WAMA, DLG)
- Establish statutory mechanisms for local government to register industries not registered or licensed by the Department of Environmental Protection to monitor establishment, operations and closure of light industries. (**SRT, LG**, DEP, HDWA, WAMA, DLG, WC)
- Define the future industrial waste management roles of government agencies. (**SRT**, LG, WRC, DEP, WAMA, DLG, WC, HDWA)
- Establish custodial funding and management arrangements for the industry database. (**SRT**, WRC, LG, WAMA, DEP)
- Continue representation in the Swan–Canning Industry Working Group to ensure continued development of communication links between stakeholders and facilitate implementation of the recommendations of the Report. (**SRT, LG,** WRC, DEP, IA, WAMA, DLG, WC)
- Continue development of industry survey protocols, data management, monitoring and reporting. (**SRT**, LG, WRC, DEP, WAMA)

2. **Develop and implement a communication and marketing strategy to support the Swan–Canning Cleanup Program Action Plan.**

    - Seek endorsement of the recommendations of the Report from participating local governments and State agencies and a commitment to continuing participation in light industry water pollution risk management. (**SRT**, LG, WRC, DEP, WC)
    - Provide briefings to and seek endorsement of the Report from affected industry bodies. (**SRT**, LG)

3. **Promote Best Management Practice in pollution prevention as the preferred approach to managing environmental risks.**

- Develop and provide training and support mechanisms for stakeholders in the area of light industrial water pollution risk management. (**SRT**, DEP, WRC, IA)
- Develop an information awareness package targeted at business managers and industrial organisations to promote cleaner production (waste reuse/ recycling/ reduction), improved industrial waste management practices and operator training. (**SRT**, WRC, HDWA, DEP, LG)
- Provide guidelines for industry to facilitate the development of Best Management Practices (BMPs) for spill management, emergency response procedures, chemical, waste materials storage and promotion of connection to sewer where available. (**DEP**, WRC, LG, HDWA, DME, IA).

4. **Establish environmental systems to prevent pollution.**

- Develop a simplified environmental management system to assist industry in resource use reduction, waste minimisation, reuse/recycling, pollution prevention and cleaner production. (**SRT**, WRC, LG, DEP, IA)
- Develop and implement strategies to prevent contamination of stormwater systems. (**SRT**, WRC, LG, WC, DEP).
- Provide priority support to develop simplified environmental management systems to high risk industry groups including automotive industries, vehicle depots, nurseries and cleaning services. (**SRT**, WRC, DEP, LG).

5. Increase industry participation in the adoption of simplified environmental management systems as part of their operational processes

- Involve industry bodies as partners in the development of Best Management Practices in light industry water pollution risk management. (**SRT**, WRC, DEP, LG, IA).
- Provide industry with information on pollution prevention equipment and waste treatment and management technologies. (**SRT**, WRC, DEP, IA).
- Investigate various incentives and mechanisms to encourage and give recognition to industry adoption of environmental management systems. (**SRT**, WRC, LG, DEP, DLG, WAMA, IA).

The first agency listed in brackets following recommendations is the lead agency, with the others seen as having a responsibility for or role in working on the various issues.

Abbreviations

DEP	Department of Environmental Protection
DLG	Department of Local Government
DME	Department of Minerals and Energy
HDWA	Health Department of Western Australia
IA	Industry Associations
LG	Local Government
SRT	Swan River Trust
WAMA	Western Australian Municipal Association
WRC	Water and Rivers Commission
WC	Water Corporation

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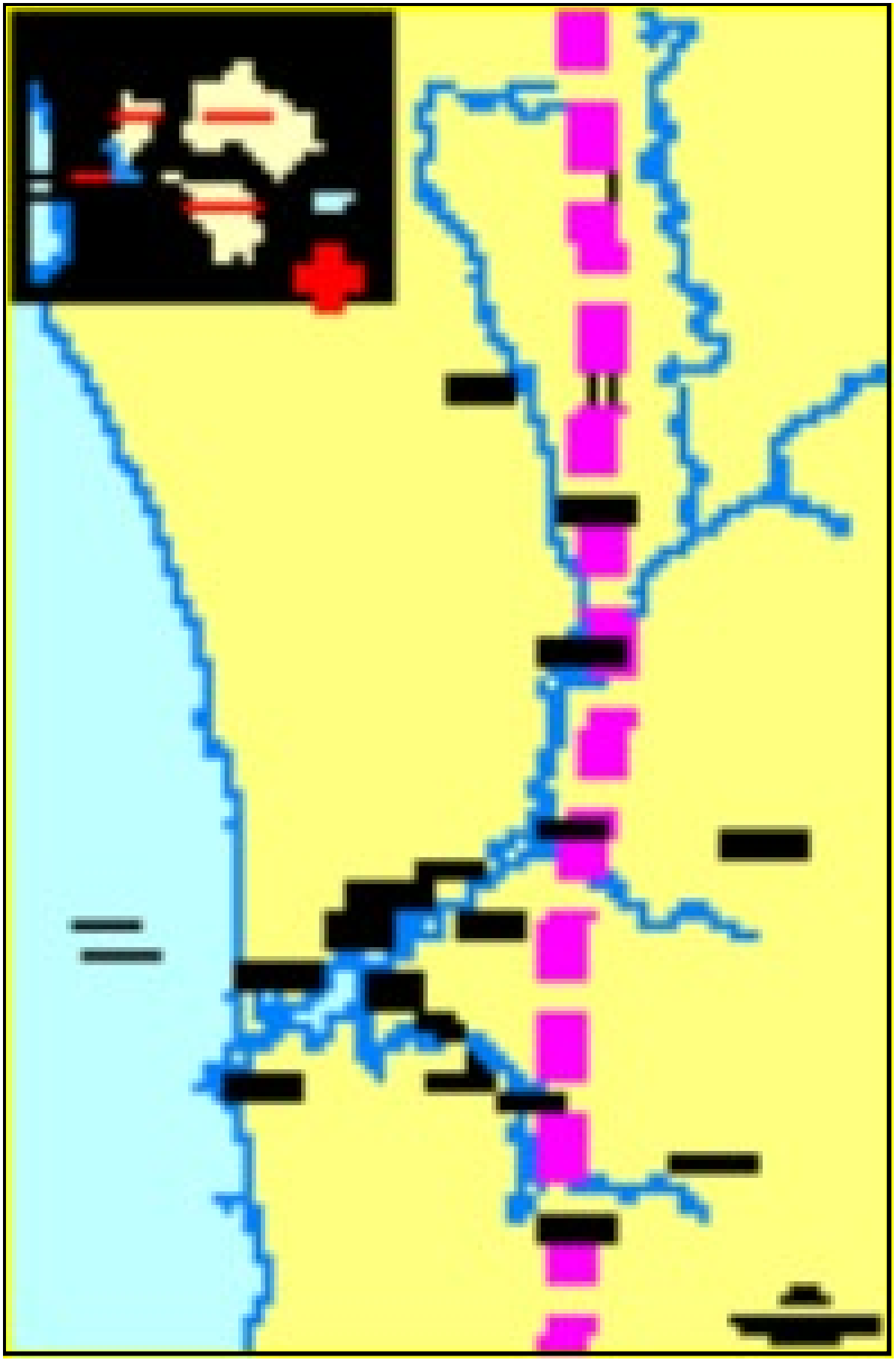

Figure 1. The Swan–Canning system locality map.

1. Introduction

The Swan and Canning river system has played an important role in the development of the Perth metropolitan region since the early eighteen hundreds. The intense development undertaken in the catchment over recent decades has seen a gradual decline in the river's health.

Recent events demonstrate the significant environmental risks associated with chemical storage as well as the importance of training and prompt emergency response. A pesticide spill into the Swan River near Belmont Park racecourse (November 1997) resulted in thousands of fish being killed in the first few days[2], and several petrol and oil spills have occurred from riverside premises including yacht clubs and jetties.

Detection of river sediment contamination around old industrial sites such as the East Perth Gasworks Plant and the State Engineering Works and Fertiliser Plant at McCabe Street in North Fremantle (1993–1997) illustrates the long–term impact of inadequately regulated heavy industries.

Historically, significant achievements have been made in reducing pollutants entering the Swan and Canning river system. The Department of Environmental Protection now regulates heavy or noxious industries to eliminate or reduce pollution. Many heavy industries are no longer located in the catchment or near to the rivers. Heavy industry is required to dispose of wastewater to sewer, a licensed wastewater contractor or licensed to discharge to the environment by the Department of Environmental Protection. Another factor reducing pollutant loads to the rivers has been the closure of shoreline landfill sites.

Control of pollution is the Department of Environmental Protection's responsibility as demonstrated in its role in reducing contamination caused by heavy industry. However, since the clean–up of heavy industry, numerous small discharges of pollutants from light industry remain a significant potential source of pollutants entering the waterways that needs to be addressed. Historically, the Department of Environmental Protection has focussed resources on managing larger point sources of pollution and thus most light industries are not regulated.

This report focuses on positive actions required for pollution prevention in general management practices of light industries for the Swan and Canning rivers and their catchment. A large number and variety of light industries are resident in the catchment. Many are located close to the rivers and valued wetlands. Steps identified for light industry water pollution risk management are contained in the Recommendations of the Report and aim to protect the waterways by:

- Preventing discharge of contaminated wastewater or stormwater to the stormwater system or groundwater.
- Preventing accidents that may cause spills of pollutants.
- Planning for containment and clean up of accidental leakage and spills.
- Changing behaviour of light industry to reduce the risk of water pollution.

1.1 Background

The Swan–Canning Industry Survey was initiated jointly by local governments and the Swan River Trust in late 1996 to find out whether light industry was likely to be contributing pollutants to our rivers. The Pilot Survey — undertaken in 1997 and 1998 — provides a qualitative assessment of the risk of industrial activities (environmental aspects relating to water pollution) impacting on the receiving environment– our rivers and groundwater. Refer to Table 1 for a list of the industry groups and those industry types included within them.

The Industrial Wastes Audit Task Group (the Group, now known as the Swan–Canning Industry Working Group) was established in August 1996 as a part of the Swan–Canning Cleanup Program. The Group was formed to redress the issue of point and diffuse–source pollutants entering the Swan–Canning system from non–prescribed[3] industrial premises. The approach of

[2] As reported in The West Australian, November 21.

[3] Industries of a specified scale that are known to pollute are prescribed by the Department of Environmental Protection.

the Group was to involve as many stakeholders as possible throughout the Pilot Survey and work together to identify and solve issues.

The Group began with representatives from the Cities of Melville, Canning, and Bayswater, the Shire of Swan, Water and Rivers Commission and the Swan River Trust. The Group later grew to include the Cities of Stirling, Gosnells and Belmont, the Town of Bassendean and the Department of Environmental Protection. Key industry organisations helped in promoting the project and distributing information to members.

Dr Kim Hames Minister for Water Resources, Mayor Peter Passeri City of Belmont and Geoff Totterdell Chairman SRT Board at the 1997 launch.

1.2 Survey aim

The Pilot Survey aimed to assess the environmental risk associated with light industrial activities to the Swan and Canning river system and to provide a strategic approach for local government to minimise those risks through a planning, educational and legislative processes.

1.3 Objectives

The short–term objective of the Pilot Survey involved documentation of site details and industry information and analysis of results to assess risks to water resources. This was achieved by:

- Developing a 'user–friendly' light industry water pollution risk survey, procedure and information storage system for use by local government and other government agencies[4].
- Undertaking audits of a representative sample of light industrial premises.
- Identifying the current industry knowledge base on various environmental issues including recycling, liquid and solid industrial waste disposal, stormwater systems and environmental awareness.
- Identifying existing industrial practices in regard to chemical storage and bunding, waste management and emergency preparedness.
- Identifying a range of pollutants related to non–prescribed industrial operations.
- Assessing the pollution risk to water resources from various light industrial activities.

1.4 Where to from here

The Pilot Survey was important to document current practices for several reasons. The process heightened awareness and knowledge of industrial practices that may potentially pollute. The Pilot Survey results may be used as a baseline of data from which to monitor change. The data will be entered in a web based database for ongoing tracking of changes both in industry groups and individual premises. The Pilot Survey developed the survey process and demonstrated its effectiveness.

The Recommendations of this report provide a two year strategy for the Group to implement. This includes ongoing surveys, developing self management tools, targeting priority practices and industry groups, training, coordination of activities between agencies as well as education and awareness raising.

[4] Please contact the Swan River Trust for detailed information.

Table 1. Premises surveyed in the Pilot Survey

Industry group	Number of premises surveyed	Industry type
Automotive industries	160	• Heavy/light mechanical workshops • Radiator repairs • Panel beaters • Car wash/car spa • Motor reconditioning • Spray painters • Service station
Engineering/ Manufacturing	95	• Welding works • Metal finishing • Pottery good manufacturing • Furniture manufacturing
Printing	40	• Photographic shops/developers • Printers • Paint shops
Chemicals/pesticides	36	• Chemical blenders • Chemical storage • Pest control operators
Nursery	24	• Nurseries • Garden supplies
Food processing	20	• Food processing/manufacturing • Fruit and vegetables • Poultry, fish, dairy products
Storage	19	• Storage warehouses
Air–conditioning/ refrigeration	15	• Air–conditioning, Refrigeration repairs
Vehicle depot	23	• Vehicle depot • New/used car dealers
Plastic industries	18	• Plastic processing
Pool suppliers	15	• Pool product suppliers
Cleaning service	13	• Carpet cleaners • Commercial cleaners • Dry cleaners • Car detailers
Building supplies	19	• Hardware • Building suppliers
Recyclers	13	• Scrap metal merchants • Vehicle wreckers • Recycling depots for glass, plastic, paper or cardboard
Animal industries	12	• Kennels, veterinary, dog spa, etc
TOTAL	**522**	

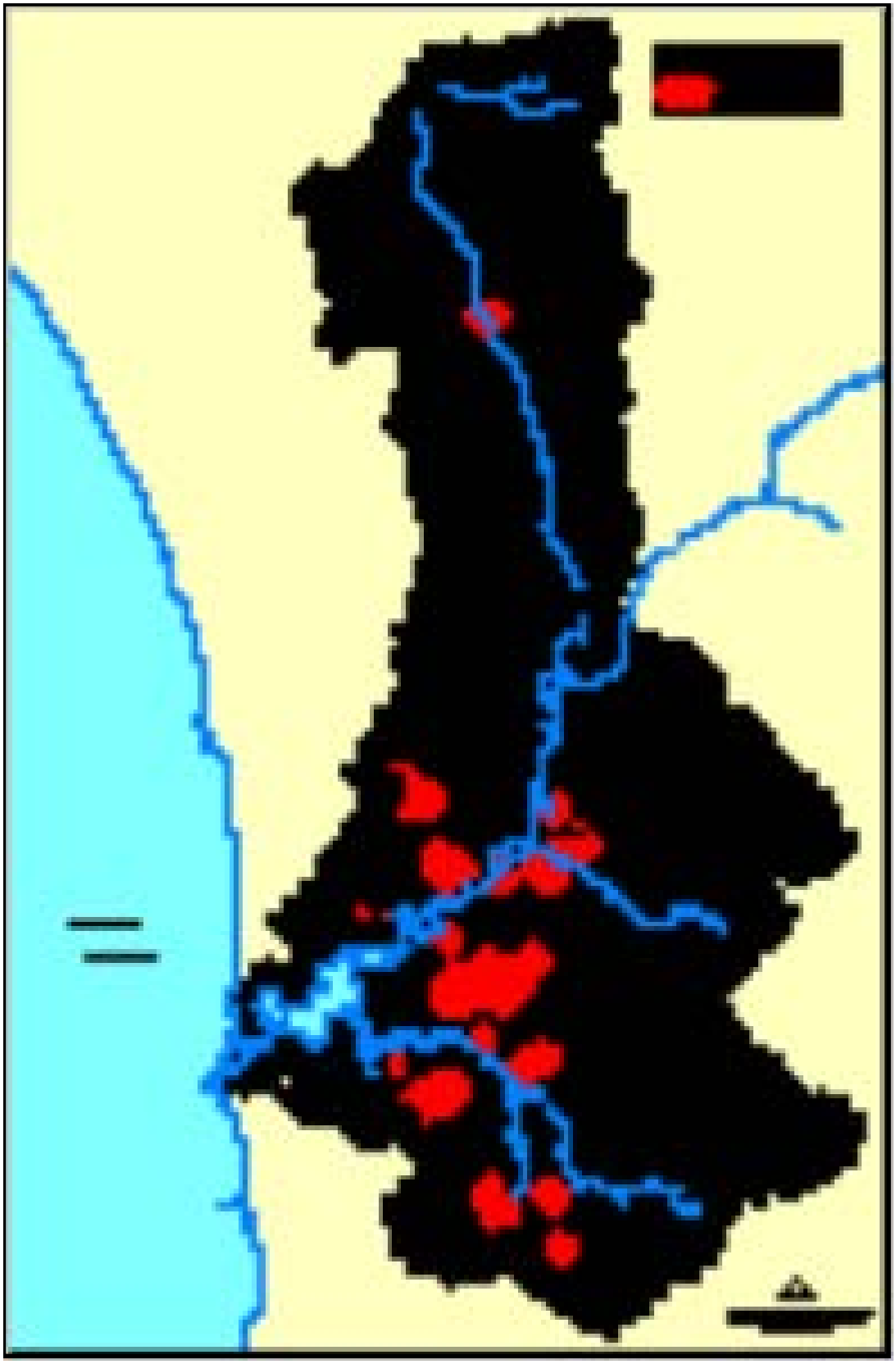

Figure 2. Industrial areas of the Swan–Canning system

The industrial precincts outlined indicate areas where heavy and light industrial practices occur exclusively. However, nutrients and pollution can enter watercourses, including drains from light industrial premises throughout the catchment. Data courtesy Ministry for Planning, 1998.

2. Survey findings

Six factors were identified as contributing to the environmental risk of a light industrial operation. Data collected and analysed were centred on questions relating to each of the six factors below:

- Chemical type, storage method and bunding
- Waste management
- Wastewater management
- Stormwater management
- Emergency management
- Management practices.

2.1 Chemical type, storage method and bunding

Inappropriate management of chemicals, such as storage on unsealed surfaces (floors) and poor housekeeping practices, increases environmental risk. Such aspects need to be assessed according to chemical type and then managed to reduce the potential for contamination of the receiving environment. This can be especially apparent when an industry intends to cease or expand its operations.

Chemicals in common use, such as solvents, can stay in the environment for over 50 years. Some chemicals may, in sufficient quantity, kill fish and invertebrates. They can also build up in the food chain and have a longer term impact.

2.1.1 Chemical storage

The survey responses indicate that hydrocarbon fluids (16%) and solvents (18%) are the most commonly stored chemicals.

Chemical blenders and automotive industries are the main industry groups that store significant quantities of chemical compounds such as organic solvents, hydrocarbons (and their derivatives), metallic compounds, inorganic salts and alkaline cleaners.

The survey identified seven industry groups that use and store a large range of chemical compounds and their derivatives. The seven industry groups are as follows:

- Engineering/manufacturing (welding, metal finishing)
- Chemical industries (blenders, storage facilities, pool product suppliers)
- Pesticides (pest control operators)
- Nurseries (including garden supplies)
- Printers (including photographic processors)
- Automotive industries (mechanical repairs, panel and paint, radiator repairers etc)
- Cleaning services (car detailers, carpet cleaners, commercial cleaners).

Chemicals are stored, most commonly, within a fully-enclosed building (67%). Tank–type storage (above and below ground) accounts for 17% and open storage[5] on sealed surfaces 11%. Use of open storage on unsealed surfaces, use of bulk bins and elevated bulk storage together accounted for only 5% of all storage methods.

Although the majority of enterprises stored chemicals within fully enclosed buildings, this does not mean that those buildings were designed or suitable for chemical storage. The use for storage of unroofed areas on either sealed or unsealed surfaces is of concern.

2.1.2 Bunding

Bunding, or a bunded compound, is a containment barrier to keep spilt chemicals from dispersing or draining away from the place of storage. Bunding may be permanent, such as brick or concrete, or temporary/emergency, made from plastics or fibreglass. Bunding is necessary in many circumstances because of the possibility of leakage as well as spillage. Bunding specifications have become standard criteria for regulatory compliance, particularly where bulk or assorted hazardous chemicals are stored.

The study showed that in a high percentage of premises store a range of chemicals without bunding. The industry groups who commonly lack bunding include pool suppliers (93%), automotive industries (75%), engineering type operations (67%) and vehicle depots (81%). The highest percentage groups who have

[5] 'Open' storage refers to exterior or outside areas.

bunding are chemical pesticides (61%) and plastics industries (22%).

The absence of bunding from storage facilities in these premises is of concern because accidental spillage or leaks with this type of operation is a common occurrence.

2.2 Waste management

Industrial activity produces wastes[6] that may be solid, liquid or gaseous. In WA each person creates on average about 1.4 tonnes of solid waste a year[7]. Waste generation from industrial operations has become a major environmental issue for regulatory agencies as well as the community, particularly the management of industrial wastes that may pose significant environmental and health risks.

2.2.1 Waste production

The proportional distribution of the main waste types was found to be: containers / boxes / packaging (17%), metals/metal sludge (20%), paper (13%), plastics/rubber (12%), hydrocarbons/oil (19%), timber products (7%), solvents (6%) and batteries (6%).

The percentages are based on the frequency of the production of the waste types and not the waste quantity.

2.2.2 Quantity of waste produced and disposed

There were large differences between the amount of waste generated and the amount recorded as disposed of off site.

On average, 49% of the solid waste produced was disposed of off–site. In the chemical / pesticide industry only about 4% of its solid waste produced is disposed of off–site. This may reflect some extent of waste reuse or recycling but this possibility has not been validated.

A high discrepancy was found in the figures for liquid waste produced versus the amount disposed. *Except for food processing and printing, liquid waste disposal exceeded between two and thirty–six times the estimated amount of waste produced*. Further investigation is necessary to determine whether the wastes are reused/recycled or disposed of in an acceptable manner.

2.2.3 Waste storage

A factor that contributes to environmental risk is the inappropriate storage of waste, with its potential to have undesirable impacts on surface and ground water. If risks are to be minimised, proper waste storage facilities must be an integral part of the waste management process. This is especially important where waste may be stored for extended periods on the same site, creating the potential for leakage, spillage and accidental discharge to either stormwater or groundwater. Particular examples are automotive industries, nurseries and building suppliers where storage is often outside on unsealed surfaces.

The survey found that waste storage on open sealed or unsealed surfaces accounted for about 18% of storage facilities.

This is a major concern, as such storage methods increase the likelihood of water resource contamination.

It is clear from the data that the bulk bin system (49%) is the most common method of waste storage.

2.2.4 Waste disposal frequency

Based on 88% of total responses, the preferred disposal frequencies are weekly at 40%, monthly at 20% and occasional (more than 31 days) at 33%. Daily disposal accounts for 7%. In most cases weekly waste disposal takes place via local government waste collection services.

2.2.5 Waste recycling and composition

Recycling of waste is a fundamental prerequisite of both cleaner production and pollution prevention. The survey found an average of 70% of operations recycled some of their waste. Recycling occurs in more than 80% of premises surveyed in the following industry groups: plastics industries, airconditioning/refrigeration, recyclers and engineering. Less than 50% of the cleaning services surveyed recycled waste.

Metals are the most commonly recycled products (29%), followed by hydrocarbons (16%), containers (11%), and paper (10%).

[6] Waste refers to solid waste in this report, as separate from wastewater which includes liquid waste.
[7] WA Waste Reduction and Recycling Policy, 1997

2.2.6 Waste recycling methods

Overall, 58% of the industries surveyed recycled waste through designated contractors, 31% reused their waste on site and 9% sold it as by–product.

The large amount of waste sold by recyclers, as by–product (55%) is understandable because they are achieving economies of scale with the quantities of waste available to them, and possibly because they preferentially collect recyclable waste. The next highest results for waste sold as by–products were pool suppliers, vehicle depots, building suppliers and food processors at around 13%–16%. Reuse of waste is highest in nurseries (85%), plastics industries (69%), pool suppliers (50%) and building suppliers (46%).

2.2.7 Other recycling opportunities

There is a need to establish why 76% of respondents said other recycling opportunities were available. This demonstrates that the knowledge of available opportunities to recycle does not always lead to changes in behaviour. Management restraints, difficulties in finding recyclers or inability to get small quantities picked up may all contribute to the discrepancy between knowledge and action.

2.2.8 Recycling information

The overall response for those who required recycling information was about 42%.

The majority of enterprises in three industry groups required recycling information: chemical / pesticides industry (53%), building suppliers (73%) and printing (59%). Building suppliers contribute a large amount of waste to landfill and their interest in recycling is significant.

More than 60% of premises in the following industry groups did not require additional information on recycling: nurseries, cleaning services, pool suppliers, vehicle depots, recyclers and animal industries.

Some industries are reusing or selling wastes as by–product, and for others the quantity or waste type may not be suitable for local recycling industries.

2.2.9 Waste contractors

The survey found that 78% of light industrial operations use waste contractors. This high percentage is to be expected as contractors have an important role in collecting recyclable products for reuse and recycling. Premises not using waste contractors rely on services provided by the local government for the disposal of their recyclable wastes.

2.3 Wastewater management

Many industries use water in their processes that will eventually require disposal as wastewater[8] to the environment or the sewerage system. Uncontrolled industrial wastewater disposal is considered a threat to the environment. Disposal of wastewater to stormwater drains, to septic systems and to soakage leads to discharge to the receiving environment.

Wastewater produced on site through various processes– such as cleaning parts and washing down process– needs to be appropriately treated before disposal, if it is not recycled or reused. Unfortunately, a common practice revealed by the survey is direct disposal to the environment by using soakage to groundwater, or discharge to stormwater system or in some instances a septic system.

There are several approved wastewater disposal methods[9]. These include, but are not limited to, licensed disposal to sewer, removal by authorised liquid waste contractor and discharge to groundwater (via soakage) following appropriate treatment processes. Approved wastewater disposal methods ensure that environmental values are protected.

2.3.1 Wastewater discharge to groundwater

The survey found that 19% of industrial premises discharge wastewater to groundwater via soakage. The categories of industry most involved in this practice are nurseries (32%), cleaning services (36%) and automotive industries (27%).

The fact that 11% of printers and chemical / pesticides industries discharge wastewater by soakage is of

[8] Wastewater is defined as liquid waste whether useful or otherwise which is a by–product of manufacturing or physiological processes. This includes but is not limited to: sewage; septics; sullage; used oil; washdown, cooling or rinse waters; and spent chemicals eg. coolants, acids.

[9] Department of Environmental Protection

considerable concern because of the nature of the chemicals involved. Further assessment is necessary to evaluate methods for reducing the risks of groundwater contamination.

2.3.2 Wastewater discharge to stormwater

Overall, 16% of premises used the stormwater system to dispose of industrial effluent. The industry groups most involved in this practice are nurseries (32%), vehicle depots (31%), plastics industries (29%) and cleaning services (27%).

Industrial wastewater discharge to the stormwater system is unacceptable, such practices having an immediate and detrimental effect on the flora and fauna of the waterways. These systems are designed to minimise local flooding, not intended to treat or dispose of industrial wastewater.

2.3.3 Wastewater discharge to septic tanks

The survey found that 13% of enterprises discharge their industrial effluent to septic systems. This can cause the failure of the system. Septics rely on microbes to stabilise the organic pollutants and many industrial pollutants can kill them[10].

Industry groups that use septic systems for their industrial effluent disposal include animal industries (40%), recyclers (23%), food processors (18%), and pesticide/chemical industries and automotive industries (both 13%).

2.3.4 Wastewater discharge to sewer

Industry groups prominent in discharge of wastewater to the sewer system are food processors (63%), cleaning services (60%), printing (32%), and the animal industry (22%).

This practice requires a disposal permit issued by the Water Corporation and it is of concern that many of these operations have not obtained such a permit.

[10] Disposal of wastewater to septics is regulated under the Health Act (1911).

2.3.5 Wastewater treatment

Industrial effluent may contain toxic chemical residues and nutrients that can persist in the environment over prolonged periods, causing considerable harm to aquatic organisms. Wastewater treatment is commonly required, either on site or after disposal to a wastewater treatment plant or sewer.

The survey found 50% of the industrial premises do not treat wastewater.

The three major industry groups who treat wastewater are food processors (71%), automotive industries (44%), and the chemical/pesticides industry (37%). This is to be expected for such industrial operations, however the overall percentage of premises with wastewater treatment is small[11].

2.3.6 Wastewater treatment systems

The common wastewater treatment systems employed are petrol/oil separators, chemical dosing plants, neutralisation tanks (pH adjustment), activated sludge processes, sedimentation tanks, grease traps and treatment lagoons.

The most common treatment system is the sedimentation tank (36%) followed by chemical coagulant treatment and neutralisation (both 14%) and oil separator (7%).

2.3.7 Maintenance of wastewater treatment systems

Wastewater treatment systems require regular performance testing and maintenance to minimise failure and inefficiency. Periodical maintenance may include: regular removal of accumulated sludge, sediment deposits, precipitates, floating debris or oils; or regular monitoring of sludge levels, pH or other parameters to avoid breakdown.

Fewer than 5% of the businesses carried out periodical testing and maintenance of their treatment facilities.

[11] Although the examples of industry groups not treating their wastewater range from 20–38% the overall rate for premises from the whole survey pool is 50%. This is due to the numbers of samples within each industry group not being equal (for example, automotive industries had a large sample size).

Vehicle depots (68%) and automotive industries (61%) have the highest percentage of premises not maintaining their wastewater treatment facilities.

This area requires more attention to ensure there is an ongoing commitment to system maintenance.

2.3.8 Disposal of treated wastewater

Treated wastewater may be appropriately disposed of to sewer (with a permit), to ground (providing the treatment process achieves acceptable environmental standards) or to a licensed liquid waste contractor. The survey results indicate a higher percentage of wastewater is disposed of to sewer (38%) compared to other disposal methods such as discharge to groundwater (27%), stormwater (16%) or the septic system (10%).

The survey found 9% of the industries do not know where and how their treated wastewater is disposed of.

2.4 Stormwater management

Uncontrolled industrial wastewater discharge to stormwater systems is a major threat to receiving watercourses. Inappropriate disposal methods can permanently alter the characteristics of natural water-ways and have a detrimental long–term impact on their flora and fauna. Stormwater systems are designed to minimise local flooding and should be free from industrial contamination.

The focus on improving stormwater quality has become an integral part of environmental management because it can significantly reduce impacts on the receiving environment. The preferred approach is to allow adequate holding periods using nutrient stripping ponds or retention basins, appropriate bunding and storage methods, while working towards on-site treatment and design rather than end–of–pipe treatment. Collectively these methods are known as Water Sensitive Urban Design, which is based on the philosophy of stopping pollution at its source or minimising contamination of waterways by preventing pollutants entering stormwater on site or in transit rather than using end–of–pipe controls or treatment.

Best management practices for stormwater include: clean stormwater separation, stormwater treatment, signage for stormwater drains, signage indicating appropriate washdown areas, adequate bunding and on-site detention methods to prevent off–site stormwater contamination from either chemical, raw material or waste storage as well as process activities, accidental spills and leakage.

2.4.1 Discharge of site stormwater from premises

The survey found that stormwater discharge to local stormwater drainage accounts for 54%, compared to 33% via on–site soak wells, 3% to rivers/creeks and 1% to sewer. The high percentage for stormwater drains and soakage are expected, as these are the common disposal methods.

Of concern are the 9% of enterprises that do not know where stormwater from their premises is discharged to.

With certain industry groups, direct discharge of stormwater without pre–treatment is of concern.

2.4.2 Awareness of location of stormwater system

Awareness of the location of the stormwater drainage system can significantly reduce the contamination of surface waters in the event of a chemical spill by enabling quick isolation of the affected part of the system.

Overall, 27% of the premises were not aware of the stormwater system within their operational areas. This lack of knowledge has the potential to cause contamination of stormwater.

Industry groups with poor awareness of stormwater systems include recyclers and nurseries (each group 45%), plastics industry (44%), building suppliers and cleaning services (each group 43%), chemical/pesticides (36%), pool suppliers and vehicle depots (each group 30%).

2.4.3 On–site stormwater treatment systems

Improvement of stormwater quality by treatment involves the utilisation of physical, chemical and biological processes. The siting of an on-site stormwater treatment system is an important consideration in ensuring an effective treatment strategy. Treatment systems include litter traps, gross pollutant traps, swale

drains, oil and grease traps, interceptors and detention basins.

The survey found that 92% of enterprises do not have on–site stormwater treatment facilities. This is of concern considering those industry groups such as automotive industries, engineering works and vehicle depots have caused groundwater contamination in the past[12]. This may indicate that the operators have not given due consideration to stormwater treatment.

Overall only 4% of the premises had on-site stormwater treatment systems.

2.5 Emergency management

Effective emergency management includes staff training, and having in place incident reporting, spill control and emergency response procedures. Spill events can range in severity, and emergency management plans should be developed to prepare for worst case scenarios as well as less severe incidents.

2.5.1 Spill management plans

A spill management plan outlines response procedures in the event of an accidental release of substances that may cause damage to the environment or impair human health and safety.

The high percentage of respondents without plans reflects a lack of the preparedness that could minimise environmental damage if a significant event occurred. The survey found that 82% of the industries do not incorporate emergency management plans into their overall operations, whereas 57% were considered to require them.

The lack of spill management plans is of concern. This area requires urgent attention, particularly as a high proportion of these industries handle large quantities of chemicals.

2.5.2 Emergency contacts

Emergency response procedures should include up–to–date information defining key personnel and other support agencies to be contacted in an emergency. Knowledge of emergency contacts is basic to general occupational health and safety requirements as well as environmental best practice. This approach is consistent with legislative requirements that deal with dangerous goods and occupational health and safety.

The distribution of emergency contact numbers used by the industry groups, based on 76% of all premises surveyed, are: phone 000 (29%), Fire and Rescue (25%), industry safety officer (4%), Police (3%), HAZ–CHEM (2%) and Department of Environmental Protection (1%).

Most industries know of an appropriate contact in the case of emergency. However, 20% of those interviewed believed that they were “not relevant”. This attitude reflects a lack of understanding about basic occupational health and safety requirements and a narrow view of potential environmental damage.

2.5.3 Visible display of emergency contact information

Another factor in emergency preparedness, response and recovery is the visibility and of emergency response contact information in a prominent place. This is particularly relevant to industries that handle large quantities of toxic chemicals.

The survey found 49% of the industries did not display any emergency contact numbers while about 28% displayed emergency contact numbers around the workplace, another 23% displayed the information at locations that were not visible to employees.

2.5.4 Visible display of emergency response plans or procedures

In 3% of the industries emergency plans were visibly displayed. About 11% have emergency plans but do not display them.

To 30% of premises surveyed, concerns of this kind are considered “not relevant” because they do not store or use significant quantities or types of chemicals that require emergency plans to be in place.

2.5.5 Availability of on–site spill clean–up equipment

Immediate availability of spill clean–up equipment and/or materials is vital when dealing with chemical spillage. Common materials used include organic

[12] Hirschberg, 1989, 1991

foams, cellulose fibres, peat moss, sawdust, and clay granules which are applied directly onto the spill to immobilise chemicals by adsorption or absorption.

Overall, 49% of premises surveyed are equipped with on–site spill clean–up equipment. The breakdown includes the chemical/pesticides industry (80%), automotive industries (63%), cleaning services (46%), plastic industries, printers and pool suppliers (each group 45%), nurseries (44%), engineering/manufacturing (36%) and vehicle depots (30%).

2.6 Environmental awareness

Responses to the environmental awareness questions demonstrated that for most issues there was agreement with the statements presented or questions asked. The degree of agreement (whether "strongly agree" or "agree") was the major variation.

Nearly all industry groups "strongly agreed" that *"industrial waste discharged to the ground can leach nutrients and chemicals to groundwater*".[13]

Most industry groups "agreed" that *"nutrients and other chemicals contained in stormwater enter wetlands or the river system".*[14]

This awareness, although encouraging, needs to be translated into appropriate environmental management and behaviour change in many cases.

2.7 Water resources pollution risk assessment

The assessment represents a snapshot view gained by the interviewing officer during the site visit. Evaluation of risk used a checklist reflecting the key operational areas. Overall, 81% of the premises were rated as low risk, 17% medium risk and 2% high risk. Those rated as medium risk include pool suppliers (29%), automotive industries (30%), vehicle depots (36%), engineering/manufacturing type industries (19%) and recyclers (17%). The survey found that 14% of vehicle depots were high risk.

The water pollution assessment rating used in this study was subjective and reliant upon the skills, training and experience of the assessment officer. To improve risk assessment skills of officers all interviewers participated in a workshop to prepare them to use the risk rating checklist.

Although the qualitative water resources pollution risk rating indicates a lower than expected pollution risk for selected industry groups, there are concerns about the ability of the less experienced officers to recognise and identify the various environmental considerations. In comparison, the more experienced officers tended to identify and recognise more risks, based on their professional judgments and experience. This is a major factor, which should be taken into consideration for further industry audits. Clearer assessment guidelines need to be established, and it is important that officers take extensive field notes on which further discussion might be based.

[13] Other groups "agreed".
[14] Other groups "strongly agreed".

3. Conclusion

Light industrial operations include a wide variety of typically small businesses and shops such as motor vehicle repairers, panel and paint shops, printers, food processors, service stations and radiator repairers. These industries are generally not regulated by the Department of Environmental Protection and, as small businesses, they often lack the resources and skills to develop appropriate environmental management systems.

The survey identifies the following key issues that should be taken into consideration when planning future directions and actions.

3.1 Chemical type, storage method and bunding

The absence of bunding and the use of unroofed chemical storage on sealed and unsealed surfaces demonstrate a general lack of appreciation of the risk of such chemicals entering and impacting on the receiving environment.

3.2 Waste management

There is generally a great disparity between figures quoted for liquid waste produced and that disposed of. This raises several possibilities:

- Many proprietors didn't really know how much they produced and were guessing
- Estimates were over–cautious and tending to be conservative because the questions related to liquid waste/wastewater pollution
- Licensed proprietors were able to provide liquid waste information according to their licence conditions.

The findings suggest that approximately half the premises surveyed utilise bulk bins as their main method of waste storage. Bin integrity was not assessed as part of the survey, but it is appropriate to note that leaking or defective bins may constitute an environmental risk.

The response to the survey on other recycling opportunities suggests that, although 70% of enterprises recycled some waste, 76% of respondents believed that other recycling opportunities are available. There is a need to establish what these opportunities are and what would lead them to take up those options.

3.3 Wastewater management

Several premises are discharging to sewer without an appropriate wastewater permit issued by the Water Corporation. This has been brought to the attention of the Water Corporation.

Significant proportions of industries do not conduct regular testing and maintenance of their wastewater treatment systems. Experience has shown that the absence of such maintenance will render systems ineffective and therefore increase pollution risk.

Almost one in five of the premises surveyed discharge industrial wastewater to ground via soakage. Another 16% indicated that they used the stormwater system to dispose of wastewater, while 13% were found to use their septic system. This demonstrates a lack of understanding of the relationship between such practices and environmental risk.

It is of concern that a large number of businesses have no knowledge of how their wastewater is treated and/or disposed of. There is a need to develop awareness of best management practices for industrial waste management, including waste minimisation, recycling and disposal.

3.4 Stormwater management

The survey identified only a small number of premises with stormwater treatment systems. This is of concern, as discharge to the stormwater system was found to be a method for at least 57% of premises disposal of wastewater. This figure includes discharges of wastewater, treated wastewater and potentially contaminated stormwater.

The businesses' lack of awareness of the stormwater network within their operational areas is another concern which reinforces the need to promote industry awareness to support the development of environmental management systems.

3.5 Emergency management

A lack of preparedness to respond to accidental spills and leakage is evident in most of the businesses surveyed. Considering that a significant proportion of industries store and use an assortment of chemicals that are toxic to the receiving environment, this is a serious issue.

3.6 Environmental awareness

The fact that the environmental awareness questions were answered in positive terms in nearly all instances indicates that most people understand that pollutants may be leached to groundwater or enter stormwater as a result of industrial activities. Unfortunately, this awareness has not led to appropriate changes in management practices.

This may be due to a lack of resources and skills to manage these issues and the issues being given low priority. All these factors are considered particularly significant for small businesses.

3.7 Pollution risk assessment

The water pollution risk rating conducted during the Pilot Survey indicated that less experienced officers were statistically more likely to assign lower risk ratings than were those with more experience. This demonstrates a need to consider the field experience of officers involved in such auditing programs.

The overall response to the survey questions indicates that automotive industries and vehicle depots are within the higher environmental risk category. They are followed by nurseries and cleaning services. This result indicates a need to develop environmental guidelines for targeted industry groups. Industry participation in developing and adopting these standards is seen as an integral part of the implementation process.

The findings of the Pilot Survey raised management issues that need to be addressed in several areas. Discharge of wastewater to stormwater and groundwater poses a risk to water resources. Discharge of wastewater to septic tanks can cause the failure of the system and increases the risk of faecal and other contaminants entering the environment. Disposal of wastewater to sewer without a Water Corporation permit can compromise the treatment process or may lead to inadequate treatment and risk of contaminants entering the environment. Other findings indicate that systems to prevent contamination from accidental spills are currently inadequate in many premises which also increases environmental risk.

3.8 Solutions

The Pilot Survey has achieved considerable success through a cooperative approach between local and State government agencies and industry associations.

Accomplishments include:

- the development of an industry database for recording and reporting on survey results;
- identification of current practices;
- assessment of the environmental risk posed by a variety of light industrial operations in the Swan–Canning catchment.

The Group strategy for 1999 to 2001 is to implement the recommendations of this report in order to promote pollution prevention in light industries.

The longer–term strategy is for light industry to implement best management practices as the preferred approach to managing environmental risks. Local government will have a set of procedures and the database to monitor changes and performance in the industry scene in their municipalities.

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