3

Mount Victoria

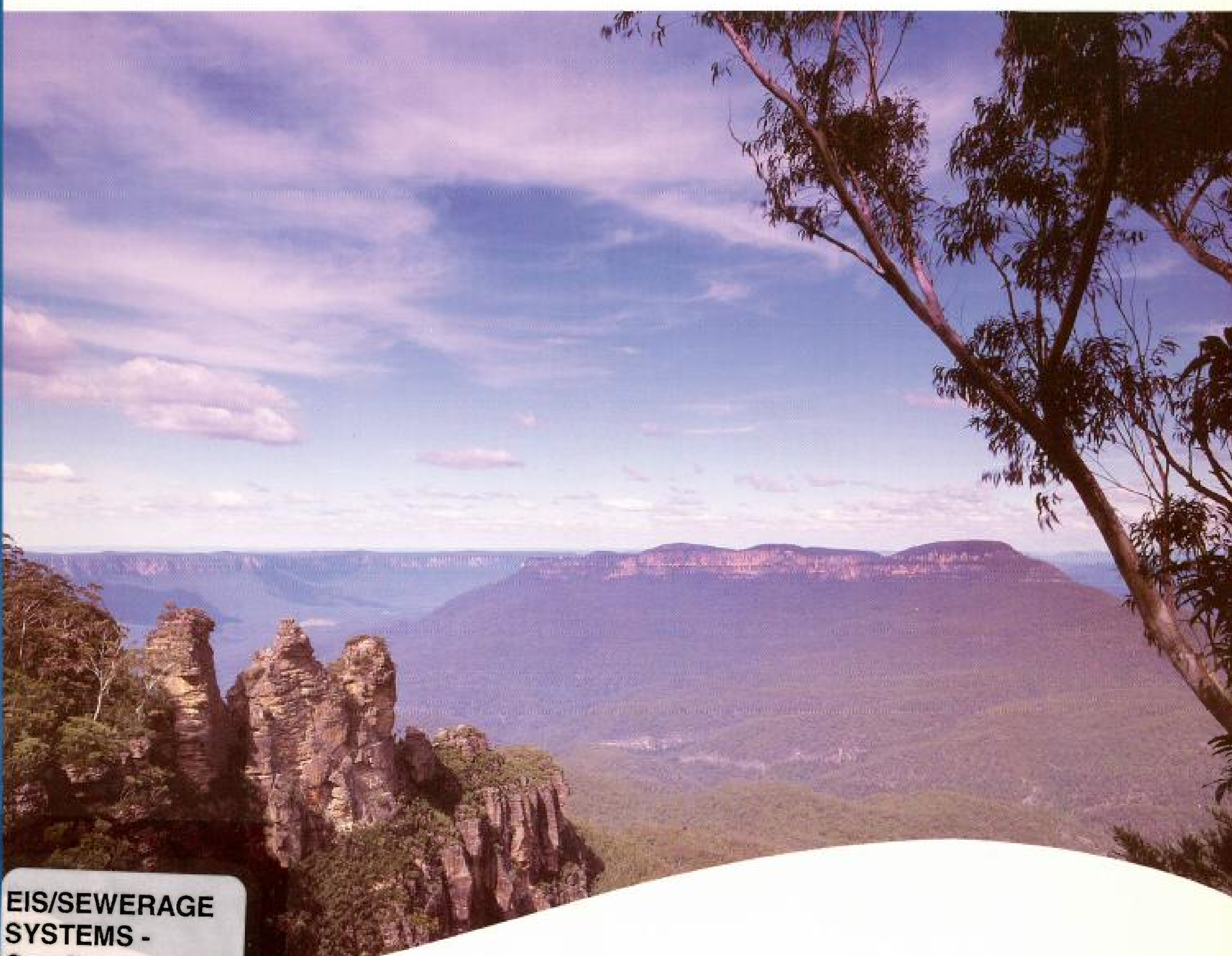
# Licensing Sewerage Overflows

ENVIRONMENTAL IMPACT STATEMENT – JUNE 1998

Blue Mountains Geographic Area

## Volume 3

# Mount Victoria





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## Licensing Sewerage Overflows – Environmental Impact Statements

# Document Hierarchy

Sewerage Overflows Licensing Project
Environmental Impact Statement

# Volume 3

# Mount Victoria Sewerage System Overflows



JUNE 1998



Sydney WATER

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# Volume Summary

## Background

As part of its wastewater business, Sydney Water has applied to the EPA for licences for overflows from its 27 sewerage systems. These licences will set performance standards and pollution reduction targets for Sydney Water to meet in the future. The sewerage overflow Environmental Impact Statements (EISs) are part of the process of obtaining a licence for operation of each sewerage system. A key outcome of the EISs will be licences that include agreed improvement programmes. Engineering works associated with infrastructure improvements will be subject to project specific impact assessment at the time of their implementation as appropriate.

The EIS includes five levels of documentation to describe the problems, impacts and solutions associated with sewerage overflows, as follows:

1. Volume 1 - Sydney Wide Overview
2. Volume 2 - Blue Mountains Geographic Area
3. Volume 3 - Separate system documents for Mount Victoria (this volume), Blackheath and Winmalee sewerage systems
4. Appendices
5. Methods.

Overflows are defined for the purpose of the EISs as all liquid discharges from either designed overflow structures or non-designed locations within the sewerage system, all odour discharges from the sewerage system and partially treated (ie. partially disinfected flows greater than 150 cfu per 100 millilitres) wet weather sewage treatment plant (STP) discharges. Discharges from STPs are currently licensed by the EPA.

Overflows from the Mount Victoria sewerage system are defined for the purpose of the EISs as all liquid discharges from either designed overflow structures or non-designed locations within the sewerage system. The components of the sewerage system which have been identified as causing overflows to the surrounding environment include wet weather overflows from the reticulation system due to capacity problems, partially treated sewage treatment plant (STP) discharges, chokes, sewage pumping station (SPS) failures, exfiltration (leakage from the sewerage system) and odours. The EPA currently licenses the treated effluent discharges from the Mount Victoria STP. Partially treated STP discharges in excess of the full treatment capacity are included as overflows for the purpose of this impact assessment.

The Mount Victoria sewerage system is the smallest of the three systems in the Blue Mountains GA. Based on computer modelling of the system it is estimated that there are six wet weather overflow events per ten years from the Mount Victoria sewerage system, which at a total volume of 1.3 ML per ten years, contributes less than one per cent of the average annual wet weather overflow volume from the Blue Mountains GA of 623 Ml per ten years.

The Mount Victoria sewerage system provides tertiary treatment to flows of up to 0.36 ML/day. Partially treated STP discharges occur when the full treatment capacity is exceeded. Modelling suggests that partially treated STP discharges occur 60 times in ten years from the sewerage system. These overflows are considerably more frequent than wet weather overflows from the rest of the sewerage system. Based on modelling, Mount Victoria STP (the smallest STP in the Blue Mountains GA) contributes 37 ML of partially treated STP discharge over ten years to the Blue Mountains GA.

During intense rainfall, the full treatment process train operates at full capacity but excess flows receive a reduced level of treatment. At such times, pathogens are the only pollutants from overflows which significantly contribute to waterway pollution. Therefore, an STP discharge is defined as an overflow if its faecal coliform density exceeds 150 cfu per 100 millilitres because then the objective of maintaining recreational water quality may be compromised. Modelling suggests the volume of partially treated STP discharges is 30 times in ten years from the sewerage system. These overflows are marginally more frequent than wet weather overflows from the rest of the sewerage system.

Overflows can occur in dry or wet weather due to chokes in the sewerage system. These can be caused by roots, broken pipes and other obstructions. Suburbs have been ranked by choke density on a system basis as either high, medium or low compared to the Sydney wide average. Mount Victoria has a low choke density, with no recorded repeat chokes.

The Mount Victoria sewerage system has been identified as being of medium exfiltration potential, from the monitoring and modelling of sewer leakage from reticulation. Further investigation is recommended to identify the extent of this overflow type.

There were an estimated six documented overflow events due to failures in the one SPS in the system during 1996/97. In addition overflows at the pumping station have been caused by wet weather flows in excess of the pumping station capacity.

There has been one odour complaint received in the past year and hence there is not perceived to be a significant odour problem in the Mount Victoria sewerage system.

The permanent population growth in the Mount Victoria sewerage system is expected to be significant with a predicted increase from 550 people in 1991 to 1542 by the year 2021. This represents an annual average growth rate of 3.5%. This growth will potentially increase the occurrence of overflows due to the increased demand on the sewerage system if no augmentation or rehabilitation of the sewerage system is undertaken.

#### Environmental Impacts

The Mount Victoria sewerage system is located in both the Blue Mountains receiving environment zone (REZ) and the Lake Burragorang REZ. The system area is flanked by Blue Mountains National Park on the eastern side and the Lake Burragorang water catchment on the western side. The streams in the Blue Mountains REZ drain either north and east into the tributaries of the Grose River or west into Lake Burragorang REZ incorporating the Coxs River and its tributaries. Rivers in the Lake Burragorang REZ flow into Lake Burragorang which is a principal source of Sydney's water supply.

All waterways within the Blue Mountains National Park are classified as Class P (Protected Waters) in accordance with the *Clean Water Regulations 1972*. The immediate receiving waters of the sewerage overflows are generally Class C (Controlled Waters) and drain into either Class P or Class S (Specially Protected) Waters. The requirements for protection of Classified Waters apply to sewerage overflows, although new legislation requires issues such as the quality of the receiving environment and the degree of urban encroachment to be considered in determining water quality requirements.

Other environment protection goals for the Mount Victoria sewerage system have been determined by the Hawkesbury-Nepean Catchment Management Trust, Blue Mountains City Council and other community groups. These goals primarily relate to the protection of aquatic and terrestrial ecosystems but also include the protection of water quality for drinking water supplies.

The potential impacts of sewerage overflows on the aquatic environment have been assessed based on actual monitoring data and water quality modelling. The assessment indicates the potential for impacts at a regional as well as a local level. At a regional level overflow events have a minor impact when compared with other polluting events such as stormwater and STP dry weather discharges. However, it is recognised that minor impacts do contribute to the overall cumulative impact on the Blue Mountains GA in terms of water quality, ecology and public health related effects. At a localised level overflow events are more significant with a potential to impact upon water quality, ecology and public health over a confined area. These localised impacts are considered significant due to the high environmental quality of the Blue Mountains area and the high community importance placed on preservation of this area.

Sensitive areas identified within the vicinity of the Mount Victoria sewerage system include threatened species habitat, the Blue Mountains National Park, Classified Waters, "Environment Protection" and "Residential Bushland Conservation" zones, and community lands. In addition the Grose River catchment has been nominated as a Wilderness Area. These areas require a high level of protection to satisfy community expectations for the quality of the Blue Mountains, legal requirements(especially for the protection of classified waterways and drinking water supply) and the principles of Ecologically Sustainable Development.

Impacts on the socio-economic environment as a result of sewerage overflows include reduced recreational value and the presence of litter which is unacceptable to the community. Uses of the waterways include primary and secondary contact recreation and drinking water supplies. These activities allow a pathway for human exposure to occur. However, the results of ecological and human health risk assessment undertaken for the project did not indicate a potential risk to human health as a result of incidental water ingestion.

The modelled wet weather overflows and overflows from the SPS, have been ranked to provide an estimate of the significance of environmental impacts potentially arising from overflow events. The overflow ranking provides a comparison with results in a Sydney-wide context and allows for prioritisation of abatement works. The overflow types in the Blue Mountains GA are amongst the highest ranked (high potential risk of environmental impact) Sydney wide due to the high environmental sensitivity of the region. For Mount Victoria sewerage system, on a Sydney wide basis the wet weather overflow ranking and SPS ranking are relatively low (21 and 44 respectively), however Mount Victoria STP is ranked equal first for partially treated STP discharges.

#### Proposed Solution

A standardised level of overflow performance, known as the minimum performance objectives, has been adopted as the starting point for evaluation of overflow abatement options. Strategies have been developed to meet the minimum performance objectives, as well as additional abatement of overflows above the minimum performance objectives where there is some justification to protect sensitive areas within the Mount Victoria sewerage system.

The long term water quality goal identified for this area is the protection of water catchments supplying potable water storages which include Lake Burragorang.

Water quality modelling of the Grose River has identified that the major sources of pollution are from stormwater (urban and rural runoff) and STP dry weather discharges. At a regional level the removal of all wet weather overflows from the model does not result in any significant water quality improvements compared to the minimum performance objectives abatement level. However, results of a cost-benefit analysis undertaken by Sydney Water indicate that an overflow containment of between ten and 20 events in ten years is considered most beneficial. Thus, due to the high environmental sensitivity of the Blue Mountains and the NSW community's expectations for the environmental quality of the area, the one year containment level has been generally selected for the Blue Mountains GA (ten events in ten years for system overflows). However, due to the existing high standard of containment within the reticulation system, and the fact that the STP discharges into Fairy Dell Creek which is a Class P waterway, the level of partially treated STP discharges is reduced to match the wet weather system overflow performance, which is six events in ten years.

These levels are therefore recommended as the preferred overflow abatement strategy for the Mount Victoria sewerage system. This means a maintenance of six overflow events in a ten year period, for wet weather reticulation overflows, and from 60 events to six events in a ten year period for partially treated STP discharges. The strategies also recommend the upgrading of SPS and maintaining the current levels of chokes and odour. With exfiltration, however, further investigations are needed to identify the extent of the exfiltration in the system.

The Best Management practices utilised by Sydney Water will continue to be updated and implemented for the system as part of the overflows management program and the continuous improvement process. Additional monitoring has been recommended to better characterise the locations and extent of impacts from overflows, and allow for improved definition of overflow abatement strategies thus providing for rapid mitigation.

Implementation of the preferred option is expected to cost $0.91 million for the Mount Victoria sewerage system over the time period from 2006 to 2010, with all SPS upgrades expected to be completed by 2005.

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# Chapter 1

# Introduction

# Synopsis

As part of its wastewater business, Sydney Water has applied to the EPA for licences for overflows from its 27 sewerage systems. The licences will set performance standards and pollution reduction targets for Sydney Water to meet in the future. The sewerage overflow Environmental Impact Statements (EISs) are part of the process of obtaining a licence for operation of the sewerage system.

This EIS includes five levels of documentation to describe the problems, impacts and solutions associated with sewerage overflows, as follows:

1. Volume 1 - Sydney Wide overview
2. Volume 2 - Blue Mountains Geographic Area (GA)
3. Volume 3 - Mount Victoria sewerage system overflows (this volume)
4. Appendices
5. Methods.

Volume 2 describes the overflows in the Blue Mountains GA, including the extent of the overflow problem, the environmental impacts, proposed solutions and environmental benefits resulting from the preferred solution for the GA. Volume 3 (this volume) describes the specific solutions developed for each sewerage system located within the Blue Mountains GA (Winmalee, Blackheath and Mount Victoria).

In this EIS, all liquid and odour discharges from the Mount Victoria sewerage system and partially treated wet weather sewage treatment plant (STP) discharges are considered to be overflows. All flows from the STP, including partially treated flows, are currently licensed by the EPA.

This volume provides the background to the assessment of the overflow problem, the associated environmental impacts and the preferred overflow abatement strategies for the Mount Victoria sewerage system.

# 1. Introduction

## 1.1 Background

As part of its wastewater business, Sydney Water has applied to the EPA for licences for overflows from its 27 sewerage systems. These licences will set performance standards and pollution reduction targets for Sydney Water to meet in the future. The sewerage overflow Environmental Impact Statements (EISs) are part of the process of obtaining a licence for operation of the sewerage system. A key outcome of the EISs will be licences that include agreed improvement programmes.

The NSW Government's Waterways Package commits the Government to addressing the problems of sewerage overflows across Sydney Water's areas of operations. The Waterways Package establishes a plan of action which includes proposals for reducing overflows. Sydney Water's overflows licensing Environmental Impact Statements (EISs) form an important part of this package.

The Sydney Water Corporation has three equal objectives: to protect the environment, to protect public health and to be a successful business,. Overflows are just one element of Sydney Water's wastewater system. Sydney Water's vision for sustainable waste water management, including the reduction of sewerage overflows, is outlined in WaterPlan 21 (Sydney Water 1997). As part of this plan, an outcome of these sewerage overflow EISs will be licences that include improvement programmes. Engineering works associated with the programmes will be subject to project specific impact assessment at the time of their implementation as a second stage environmental impact assessment.

This is the third volume in this EIS. Volume 1 describes the Sydney-wide overflow abatement program and provides information on the genereic considerations and methodology that form the licensing project. It summarises the performance, impacts, proposed solutions, costs and benefits for Sydney Water's 27 sewerage systems and outlines the prioritisation process for implementation of the plan.

Volume 2 provides the background to the EISs and describes and assesses the environmental impacts of overflows in the Blue Mountains Geographic Area (GA). Volume 2 also contains information regarding the relative contributions of overflows in the GA. It proposes overflow abatement strategies for the Blue Mountains GA which are based on an appropriate response to the assessed impacts of sewerage overflows on the environment of the Blue Mountains.

This volume (Volume 3) describes the Mount Victoria sewerage system, the extent of overflows from that system and the abatement strategy required to meet the preferred overflow abatement option for the Blue Mountains GA.

Additional details of the methods used during the preparation of the EIS documentation including sewer modelling, water quality modelling and overflow ranking are described in the Methods Volume. All reference data and information used to support Volumes 1, 2 and 3 are included in the Appendices Volume.

## 1.2 Purpose and content of volume 3

This volume assesses overflows from the Mount Victoria sewerage system. System-specific strategies comprising a range of actions, which are realistically achievable and affordable, are developed to meet the Blue Mountains GA overflow abatement objectives identified in Volume 2. It is important to note that improved overflow performance is the principal objective defined for this EIS.

Volume 3 includes:

1. a description of the Mount Victoria sewerage system
2. a description of the extent of the overflow problem from this system in Chapter 2

3. a description of the extent of the overflow problem related to the Mount Victoria sewerage system in Chapter 3
4. an analysis of options, strategies and possible actions to achieve the strategies to meet the preferred abatement option, as proposed in Volume 2, in Chapter 4
5. a description of the environmental benefits of the preferred strategy, in Chapter 5.

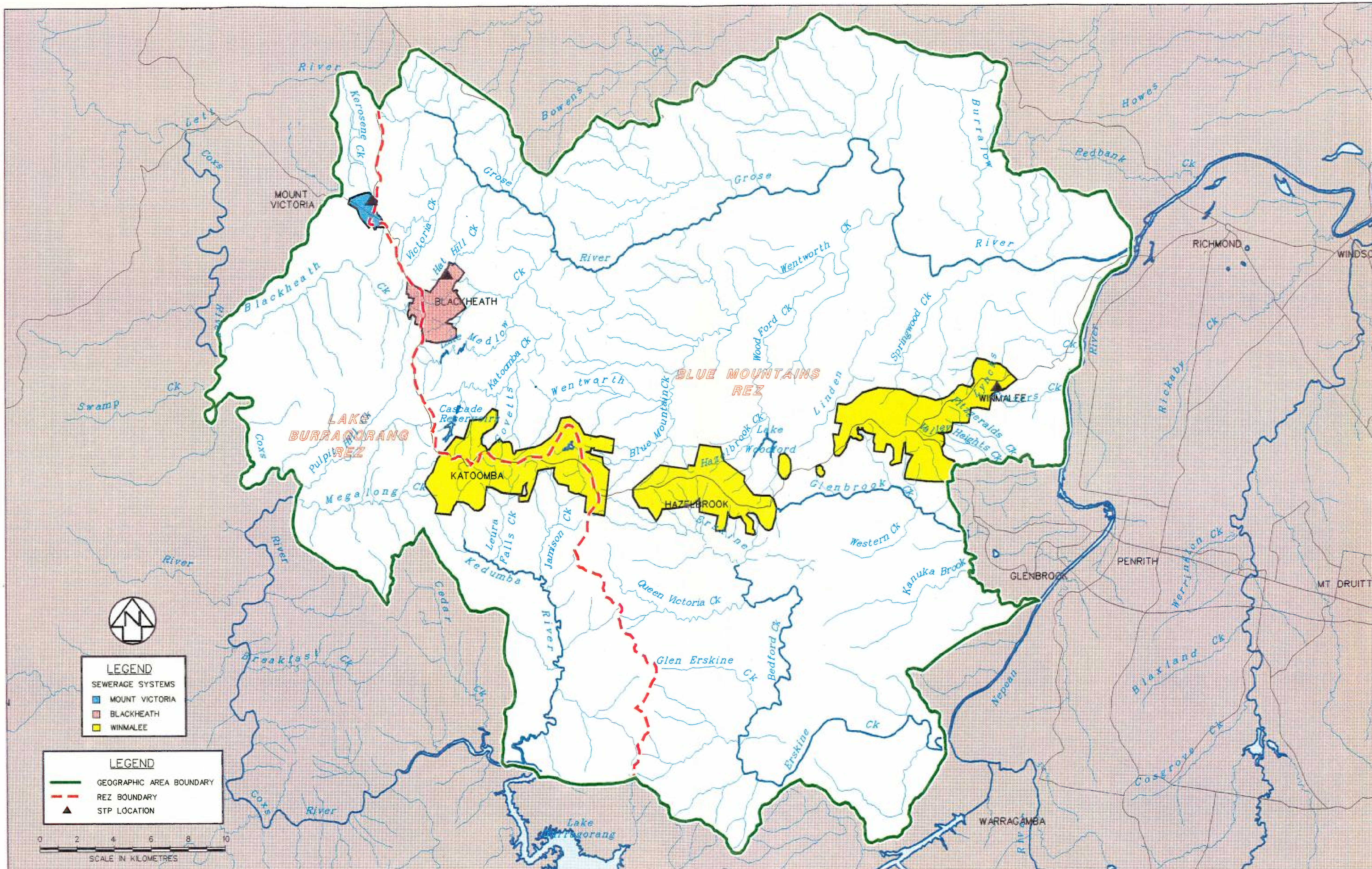
## 1.3 The study area

The area served by the Mount Victoria sewerage system consists of all the areas from which sewerage flows via the reticulation system and trunk sewers to the Mount Victoria STP for treatment. The Mount Victoria sewerage system lies within the catchments of the Coxs River and Grose River and serves the residential and business areas of Mount Victoria. The Mount Victoria sewerage system serves an area of 73 ha, most of which is comprised of residential areas. The permanent population served by the sewerage system is estimated at 550 (refer to Table 2.2, Volume 2).

The two Receiving Environment Zones (REZs) for overflows from the Mount Victoria sewerage system are the Blue Mountains REZ (Grose River and tributaries, and Glenbrook and Erskine Creeks to the confluence with Western Creek) and Lake Burragorang REZ (Coxs River and tributaries and Kedumba River and tributaries to the inlet of Lake Burragorang). Both REZs are considered to be sensitive environments for overflow events due to their high environmental quality.

There are also a number of ares within the area served by the Mount Victoria sewerage system including remnant bushland, threatened species habitats, residential areas, National Park and some waterways which for the purpose of this project have been categorised as "sensitive areas".

The study area and the boundaries of each sewerage system in the Blue Mountains GA and the REZs are shown on Figure 1.1.

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# SEWERAGE OVERFLOWS LICENSING PROJECT
# BLUE MOUNTAINS GEOGRAPHIC AREA

FIGURE 1-1
THE STUDY AREA

Sewerage Overflows Licensing Project
Environmental Impact Assessment

Volume 3: Mount Victoria Sewerage System Overflows

# Chapter 2

## System Performance

# Synopsis

This chapter describes the Mount Victoria sewerage system, its current condition and performance. The components of the Mount Victoria sewerage system which have been identified as causing overflow problems to the surrounding environment include wet weather overflows, partially treated STP discharges and overflows due to SPS failures.

Under existing conditions, hydraulic modelling predicts that there are six wet weather overflow events in ten years from the Mount Victoria sewerage system and the modelled volume of discharge is estimated to be 1.0 ML over a ten year period, which is relatively small compared with other systems in the GA and the Sydney region.

The Mount Victoria STP provides tertiary treatment up to 0.24 ML/day. Flow greater than this occur during wet weather and will receive partial treatment. This is predicted to occur 60 times in ten years with a partially treated discharge volume of 37 ML in ten years.

Overflows also occur in dry and wet weather due to blockages or chokes in the sewerage system caused by roots, broken pipes and other obstructions. Suburbs have been ranked by choke density on a system basis as either high, medium or low compared to the Sydney-wide average. Mount Victoria has a low rate of chokes which compares favourably with the overall performance Sydney-wide.

Mount Victoria is identified as having moderate potential exfiltration which will be investigated as part of the ongoing infiltration/exfiltration (I/E) program.

In 1996/97, six SPS failures resulted in overflows occurred from the single SPS in the Mount Victoria sewerage system. This is considered to be a high rate of overflows compared to the Sydney-wide average.

Only one odour complaint was recorded in the Mount Victoria sewerage system which is below the Sydney-wide average.

The area served by the Mount Victoria sewerage system is expected to experience a high annual average growth rate of 3.5% over the 30 year period. The Mount Victoria sewerage system can cope with the increased sewage and flows, however unless wet weather abatement strategies are introduced there is predicted to be an increase in the number of overflow events from six in ten years to ten in ten years, and a small increase in the total overflow volume in 2021.

Chapter 3 of this volume describes the impacts of overflows from the Mount Victoria sewerage system on the environment.

# 2. System performance

## 2.1 Current system overflows

Mount Victoria sewerage system construction commenced around 1969 and incorporates the Mount Victoria STP located on Wentworth Avenue, Mount Victoria, and a single carrier (SCMV3). The locations of the STP and the carrier are shown on Figure 2.1. Sewage is collected and transported to the STP via approximately one kilometre of gravity sewers which have a diameter of 300 mm or larger, with the balance of the reticulation system comprising pipes with diameters less than 300 mm.

There is one submersible type sewage pumping station (SPS 882) in the Mount Victoria sewerage system, which pumps sewage directly to the sewage treatment plant (STP) at Mount Victoria. Breakdowns at the pumping station are identified by signals from the telemetry system, that activates alarms in the regional operations centre when there is a pump malfunction, power failure, overflow or other failure.

A comparison between the infrastructure of the Mount Victoria sewerage system, with the total infrastructure of the Blue Mountains GA and the total Sydney Water sewerage system, is shown in Table 2.1. As indicated in Table 2.1, the area of the Mount Victoria sewerage system represents approximately 1% of the total area served by the Blue Mountains GA.

**Table 2.1 - Comparison of the Mount Victoria sewerage system, the Blue Mountains GA and Sydney Water's total sewerage system**

| Description | Mount. Victoria | Blue Mountains GA | Total Sydney Water |
|---|---|---|---|
| System area (ha) | 73 | 6,182 | 187,121 |
| Permanent population served | 550 | 42,012 | 3,884,212 |
| Length of main sewers > 300 mm (km) | 1 | 109 | 2,497 |
| Length of reticulation sewers < 300 mm (km) | 10 | 553 | 18,966 |
| Total length of sewers (km) | 11 | 662 | 21,463 |
| Number of SPS | 1 | 69 | 642 |
| Number of designed overflows | 0 | 49 | 3,109 |

There are no known designed overflow structures in the Mount Victoria sewerage system. Figure 2.2 shows the overflow pathway from the SPS and the STP. The ultimate receiving waters for this sewerage system are the Grose River and its tributaries (including Victoria Creek) in the Blue Mountains REZ and the Coxs River and its tributaries (including Fairy Dell Creek, Fairy Bower Creek, Kerosene Creek and the River Lett) in the Lake Burragorang REZ. Effluent from the STP discharges to Fairy Dell Creek (refer to Figure 2.1).

Overflows from non-designed locations can occur anywhere in sewerage systems in dry or wet weather conditions. Wet weather overflows are caused usually from insufficient system capacity to take the increased flows due to wet weather infiltration, while dry weather overflows generally result from failure of system components. Typical failures causing dry weather overflows are chokes (blockage) of pipes, failure of the SPS and cracked or loose pipes and joints allowing the sewage to escape into the ground (exfiltration).

Examples of overflows from non-designed locations include sewerage discharges from access chambers, leakage of sewage through cracks in sewer pipes and joints (exfiltration), and odour emissions via liquid overflow discharges and odour emissions due to non-liquid discharges (usually caused by excessive residence time of the sewage).

An SPS may overflow in dry weather due to power loss or operational failure, or in wet weather, due to insufficient capacity to deal with volumes created by infiltration of both stormwater and groundwater flows.

The Mount Victoria STP currently services a permanent population of 550 and has a nominal design capacity to service a population of approximately 1000. Mount Victoria STP provides tertiary sewage treatment by a Pasveer Ditch which provides nitrification, partial denitrification, suspended solids removal and biological oxidation of organic matter, ultra-violet disinfection and sand filtration. Flows up to 0.24 ML/day receive full treatment.

During heavy rain, sewage treatment plants have to handle much large flows than in dry weather and can sometimes only partially treat the wastewater before discharging it. At such times pathogens are the only pollutant types from overflows which significantly contribute to waterway pollution. Accordingly, a partially treated sewage treatment plant discharge is defined to be a sewerage overflow if its faecal coliform density exceeds 150 cfu per 100 millilitres because then the objective of maintaining recreational water quality criteria may be compromised. Disinfection to 150 cfu per 100 millilitres can be termed "full disinfection".

Water quality modelling (refer to Section 3.3.4, Volume 2) suggests that during wet weather, STP discharges are not a significant source of nutrients, with the majority of nutrients deriving from stormwater runoff within the catchment.

Section 2.4.2 includes further discussion on the extent of these types of overflows within the Mount Victoria sewerage system.

A storm holding pond is provided to assist in increasing the capacity of the plant in wet weather. The pond capacity is 185 kL. All flows retained by these ponds are returned to the equalisation basins for full treatment.

## 2.2 Condition of the Mount Victoria sewerage system

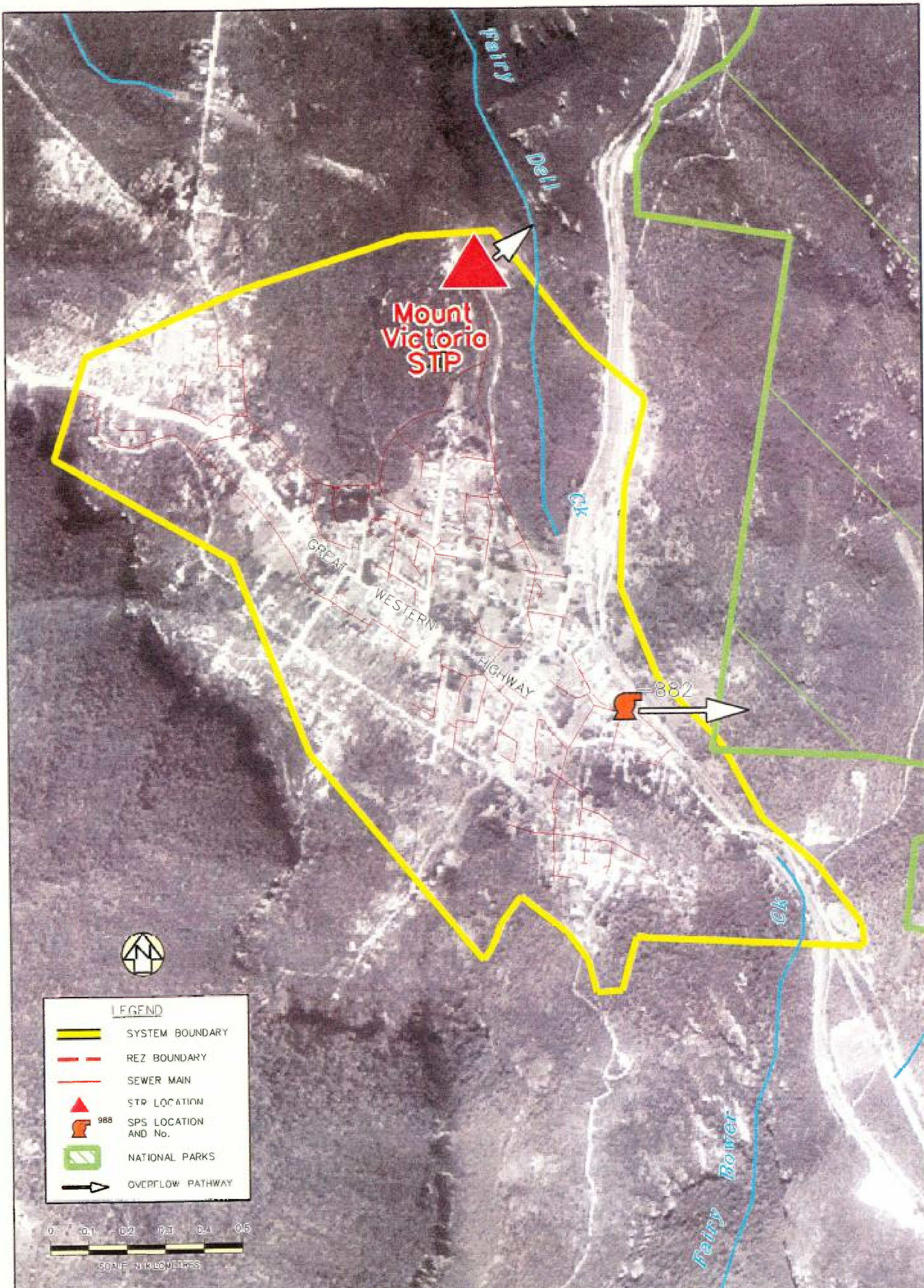
### 2.2.1 Pipes and access chambers

Trunk carriers in the Mount Victoria sewerage system are relatively new (1969 - 70) and are generally in good operational condition, however an estimated 6.2% of rainfall in the catchment finds its way into the sewerage system via cracked pipes, dislocated joints and poorly sealed access chambers (Sydney Water 1997b).

An inflow/infiltration source detection program in the Blue Mountains identified the main faults being cracked, fractured and broken pipes and pipe joints, and obstructions to flow by roots, rocks and other debris with 35% of access chambers also being identified as inflow and infiltration sources. No hydrostatic testing (pressure tests for sewer pipes integrity) was conducted on sewers in the Mount Victoria sewerage system.

In 1991, the Clean Waterways Program initiated by Sydney Water, established a Closed Circuit Television (CCTV) inspection program and strategy. The objective was to determine the structural condition of the trunk sewers with a view to developing a comprehensive renewal and rehabilitation program. Results of the inspection program carried out to date, including the type of work required to correct the faults detected, indicate that relatively few require attention to reduce leakage from the system and inflow to the sewer (three sections lined, one section cleared). Some were major blockages where up to 50 to 95% of the pipe cross section was affected.

No traversable sewers (ie. sewers which can be physically entered and inspected by maintenance crew) exist in Mount Victoria sewerage system. Reticulation sewers are generally inspected by CCTV as a




| | | |
|---|---|---|
| Sydney WATER<br>SYDNEY WATER CORPORATION LIMITED | SEWERAGE OVERFLOWS LICENSING PROJECT<br>MOUNT VICTORIA SEWERAGE SYSTEM | FIGURE 2-1<br>MOUNT VICTORIA<br>SEWERAGE SYSTEM |

result of known or recurring problems. In situ relining of some sections of the Mount Victoria Carrier, by inserting plastic liner to existing sewers, has been carried out under routine maintenance programs.

### 2.2.2 Sewage pumping station

The pumping and storage capacity of SPS 882 is shown in Table 2.2. Storage capacity of an SPS is dictated by the time available after a failure, for maintenance personnel to arrive on site and address the fault, before overflow occurs. In the Blue Mountains, it was determined that, the desired storage capacity to prevent overflows is four hours. SPS 882 has a storage capacity of over 20 hours in peak dry weather flow.

**Table 2.2 - SPS pumping and storage capacity**

| SPS No. | Storage Capacity (hrs @PDWF) | Pumping Capacity (L/s) | Peak Dry Weather Flow (L/s)* |
|---|---|---|---|
| 882 | 20.1 | 4.9 | 4 |

Note: *Peak dry flows were estimated from catchment size.

SPS 882 has on-line telemetry which activates an alarm in the regional operation centre when a pump fails or other faults occur. There is no provision for plug-in generator as a backup in case of power failure. SPS 882 has two pumps one of which is a stand-by pump.

During 1994, Sydney Water conducted an operational performance assessment to determine the reliability, serviceability, suitability and physical/operational condition of SPS equipment including pumps, motors, valves, power supply, telemetry, unit control and procedural control instructions and overflows (Water Board 1994a). Both mechanical and electrical components of SPSs are important as failures of either component type may lead to the occurrence of overflows. Telemetry system performance is important as it activates alarms in the regional operations centre when a failure occurs at a pumping station.

Common faults detected by the performance assessment of sewerage systems included unsatisfactory telemetry, unit and procedural control, chokes, pumps, and power supply at SPS 882. SPS failures are discussed further in Section 2.4.5.

An SPS ranking method was developed as part of this project to assist with the assessment of overflows caused by SPS failures. The method calculates ranking scores for both individual SPSs and REZs, and ranks the SPSs and REZs in order of these scores. The SPS and REZ ranking scores are based on consideration of the factors which affect the need for SPS remediation; the quality of the SPS infrastructure, the nature of the overflow problem and environmental consequences of an overflow event. In the Mount Victoria sewerage system, SPS 882 has a good performance record and received a low ranking. This is mainly due to its significant capacity to contain an overflow associated with operational failure at this SPS within the response time.

## 2.3 Sewage characteristics

### 2.3.1 General sewage characteristics

Raw sewage consists of the combined discharge from industry, commerce and domestic residences. In addition, raw sewage may contain groundwater and stormwater which can infiltrate and inflow into the sewerage system. Generally, raw sewage contains about 99.9% water and 0.1% solids (Sydney Water 1994b). Sewage can contain not only organic wastes but large amounts of chemicals and nutrients and the quantities of these constituents will vary considerably depending upon the usage of the area. For example, raw sewage sourced from a purely residential area will have a significantly different make-up to sewage sourced from an industrial area, which is likely to have a higher concentration of chemicals and metals.

Chemicals in sewage can be derived from non-point sources, such as the use of pesticides and fertilisers within the area served by the sewerage system, infiltrating through groundwater or from point sources such as discharges of industrial effluent to the sewer. Sydney Water cannot directly control the quantities of chemicals entering the sewer through non-point sources. However, Sydney Water controls point sources of chemicals through a Wastewater Source Control Policy, which is based on a system of trade waste agreements with commercial and industrial customers who discharge effluent to the sewerage system. These trade waste agreements specify the volume, concentration and mass of different substances in commercial and industrial effluent that may legally be discharged to the sewer.

Trade waste dischargers are divided into four categories for the purpose of licence agreements:

1. *category one* - commercial establishments producing residential-type substances in their trade wastewater systems
2. *category two* - operating small businesses producing low annual mass loads of residential type substances and low daily mass loads of non-residential-type substances
3. *category three* - all customers whose discharge cannot comply with the conditions relating to categories 1 or 2, and whose trade wastewater is treated at a Sydney Water STP providing the equivalent of primary or advanced primary sewage treatment
4. *category four* - all customers whose discharge cannot comply with the conditions relating to categories 1 or 2, and whose trade wastewater is treated at a Sydney Water STP providing the equivalent of secondary or tertiary sewage treatment.

Sydney Water's Source Control Policy has traditionally focused on the loads and concentrations of particular substances entering STPs and the ability of the STP to reduce these loads to acceptable levels before discharging to receiving waters. Dischargers are therefore required to treat their waste streams to an acceptable level prior to discharge to the sewers. However, the concentrations of trade waste substances at the STP have been fully diluted by all of the waste water flowing through the system.

There are no industrial areas in the Mount Victoria sewerage system and all licensed trade waste dischargers are category one. The main substances discharged were ammonia, BOD, grease, nitrogen, phosphorous and suspended solids.

### 2.3.2 Dry weather sewage characteristics

Sewage characteristic data is described in 10, 50 and 90 percentile values (ie. 10, 50 and 90% of samples analysed yielded values less than or equal to that listed). The dry weather characteristics of conventional sewage parameters are presented in Table 2.3.

**Table 2.3 - Mount Victoria conventional sewage parameters**

| | 10 Percentile (mg/L) | 50 Percentile (mg/L) | 90 Percentile (mg/L) |
|---|---|---|---|
| pH | 6.8 | 7.2 | 7.6 |
| Ammonia ($NH_3$) | 34.1 | 40.2 | 49.2 |
| BOD[1] | 154 | 222 | 500 |
| Total Phosphorus (TP) | 9.3 | 12.5 | 18.2 |
| Total Kjel. Nitrogen (TN) | 49.0 | 61.8 | 84.2 |
| Suspended Solids (SS) | 89 | 208 | 498 |

Note: Sewage samples collected at STP inlet twice during current year.
1. Biochemical Oxygen Demand

Data from existing effluent sampling programs for Operating Licence compliance purposes have been used to characterise the magnitude and variability of chemicals in sewage discharges (Sydney Water 1995b). At Mount Victoria STP, raw sewage sampling has been conducted at the inlet twice per year. The sewage characteristics are typical of a catchment of predominantly domestic use.

### Chemicals in sewage

Sewage in the Mount Victoria catchment contains a wide range of chemical compounds. Data collected by Sydney Water shows that all polyaromatic hydrocarbons (PAHs) with the exception of fluorene, napthalene and total PAHs were present in concentrations less than the analytical detection limits. The concentration of fluorene, napthalene and total PAHs are all lower than the (ANZECC) Acceptance of Trade Wastes (Industrial Wastes) 1992 guideline of five mg/L for PAHs. The monocyclic aromatic compounds present in sewage samples in concentrations greater than the analytical detection include O-xylene, phenol and toluene. All these compounds were lower than the 100 mg/L guideline for the (ANZECC) Acceptance of Trade Wastes (Industrial Wastes) 1992.

The organochlorine pesticides 4,4-dDT, aldrin, beta and delta BHC, endosulfan, dieldrin, heptachlor, heptachlor epoxide and theoxychlor were present above analytical detection limits in one or more samples analysed. The concentrations of these pesticides were below the one mg/L guideline for the (ANZECC) Acceptance of Trade Wastes (Industrial Wastes) 1992.

No organophosphate pesticides were recorded above the analytical detection limit. The halogenated aliphatic compounds chloroform and dichloromethane were detected in concentrations above detection limits but were below the five mg/L guideline value for the (ANZECC) Acceptance of Trade Wastes (Industrial Wastes) 1992.

All metals analysed with the exception of arsenic, nickel and selenium were recorded above analytical detection limits. Petroleum hydrocarbons were present in most sewage samples analysed by were recorded at concentrations lower than the 30 mg/L guideline value specified by the (ANZECC) Acceptance of Trade Wastes (Industrial Wastes) 1992.

### Bacteriological quality

Bacteriological properties of sewage are commonly measured by monitoring densities of faecal coliforms and *Clostridium perfringens*. Monthly sewage samples were collected from the inlet at Penrith STP which is the closest STP to this system with reliable data collected on the bacteriological properties of sewage. It is likely that the bacteriological properties of the Penrith STP inflows will be representative of the sewage quality in Mount Victoria. These samples were analysed for faecal coliforms (cfu/100 mL) and *Clostridium perfringens* (cfu/100 mL). A summary of the median and 90 percentile concentrations for faecal coliforms and *Clostridium perfringens* are provided in Table 2.4.

**Table 2.4 - Bacteriological sewage parameters (Penrith STP)**

| | Median Concentration (cfu/100 mL) | 90 Percentile (cfu/100 mL) |
|---|---|---|
| Faecal coliforms | $1.2 \times 10^7$ | $1.6 \times 10^8$ |
| *Clostridium perfringens* | $1.3 \times 10^5$ | $4.4 \times 10^5$ |

Note: 23 samples collected on a monthly basis at inlet to Penrith STP.

Source: Water Board, 1994a.

### 2.3.3 Wet weather sewage characteristics

Sydney Water has conducted an ecological and human health risk assessment study (ERA) for wet weather sewerage overflows at eleven sites within Sydney Water's area of operation (refer to Appendix C, Volume 2). The sewerage overflows were characterised by analysing for a range of chemical parameters as listed in Table 2.5. Preliminary study results have indicated that concentrations of most of the chemicals analysed varied little between the eleven wet weather overflow sites monitored within Sydney Water's area of operations.

These results have been used to indicate the quality of wet weather overflow discharges in the Mount Victoria sewerage system. The wet weather overflow discharge characteristics of the sewerage overflow sites are shown in Table 2.5, together with the average dry weather sewage characteristics in the Mount Victoria sewerage system. Due to limited data available on influent sewage at Mount Victoria STP, the average collective wet weather characteristics from Winmalee, Blackheath, North and South Katoomba STPs are also used for comparative purposes as they are likely to be similar to Mount Victoria.

The concentration of wet weather parameters measured at Winmalee, Blackheath, North and South Katoomba STPs inlets are generally within the range of wet weather overflow characteristics measured at the ERA monitoring sites, with the exception of ammonia and phosphorus (dry and wet weather) and BOD (dry weather).

**Table 2.5 - Wet Weather sewage quality**

| Parameter | Range of Wet Weather Overflows Characteristics for monitored sewerage overflow sites [1] | Wet Weather Sewage Characteristics Identified at Winmalee, Blackheath, North and South Katoomba STPs Inlets in May 1990 | Average Dry Weather Sewage Characteristics in Mount Victoria Catchment [2] |
|---|---|---|---|
| Conventionals | | | |
| Ammonia (mg/L) | 0.003 - 15.5 | 40 | 40.2 |
| BOD (mg/L) | 0 - 141- | 120 | 222 |
| Suspended Solids (mg/L) | 2 - 1570 | 1780 | 208 |
| Total Phosphorus (mg/L) | 0 - 6.9 | 7.6 | 12.5 |
| Metals | | | |
| Total Aluminium (µg/L) | 0.005 - 84.6 | 0.3 - 1.1 | 0.6 |
| Total Chromium (µg/L) | 0.002 - 0.043 | 0.002 - 0.01 | 0.003 |
| Total Copper(µg/L) | 0.0004 - 2.956 | 0.04 - 0.16 | 0.06 |
| Total Iron (µg/L) | 0.005 - 41.7 | 0.95 - 2.1 | 0.8 |
| Total Lead (µg/L) | 0.0003 - 2.16 | 0.01 - 0.03 | 0.02 |
| Total Mercury (µg/L) | 0.00005 - 0.0087 | 0.0003 - 0.0005 | 0.0005 |
| Total Zinc (µg/L) | 0.005 - 2.281 | 0.03 - 0.20 | 0.17 |

Note: 1. Sites sampled as part of the Ecological Human Health and Risk Assessment study
2. Dry Weather Quality included in the Table for comparison purposes only

Source: Sydney Water ERA Database - Samples from 11 overflow sites for Ecological Human Health and Risk Assessment study

As shown in Table 2.5, the wet weather concentrations for BOD and total phosphorus are approximately half the average dry weather concentrations whereas ammonia concentrations do not appear to decrease during wet weather flow. Suspended solid concentrations in wet weather were significantly higher than those of dry weather. In wet weather, most metal concentrations were lower than the average concentrations in dry weather. This is likely to be due to the dilution effects of wet weather infiltration.

**Summary of sewage characteristics**

The results of the testing of raw and treated sewage for both wet and dry weather conditions indicate the following:

1. STP dry and wet weather discharges are well within operating licence conditions
2. Raw sewage tested for a range of chemicals of potential concern, indicated low or undetectable levels of these chemicals reflecting the predominantly residential nature of the Mount Victoria sewerage system.
3. Wet weather characteristics of raw sewage are generally within or lower than the average results of the Sydney wide ERA study into sewerage overflows with the exception of ammonia, phosphorous and BOD.

The ERA study concluded that the potential risk to ecological and human health from wet weather sewerage overflows is negligible.

## 2.4 Extent of the overflow problem

The extent of the wet weather overflow problem in the Mount Victoria sewerage system has been determined largely from the results of sewer modelling and gauging data, and from discussions with system operators. Historical records of events for all other types of overflows have also been examined for the most recent information. The incidence and magnitude of all types of sewerage overflows in the Mount Victoria sewerage system are discussed in the following sections.

### 2.4.1 Wet weather overflows

As discussed previously, wet weather overflows have been defined, for the purposes of this EIS, as those overflows caused by excess infiltration/inflow to the sewerage system. This definition of wet weather overflows is compatible with the assumptions of the hydraulic sewer model of the Mount Victoria sewerage system developed for this project (Sydney Water 1997b). It should be noted, however, that overflows during wet weather conditions may be caused by a combination of these and other factors, such as partial pipe blockage, and that it may be difficult to isolate a single causal factor.

The performance of the Mount Victoria sewerage system during wet weather conditions, including the frequency and volume of wet weather overflows and the percentage of rainfall ingress to the sewers, was determined using the MOUSE sewer models which are detailed in Appendix A. The entire Mount Victoria system, comprising 11 km of pipes and a pumping station, was modelled as a single flow gauge catchment (node). The calculated overflows are summarised in Table 2.6.

**Table 2.6 - Modelled individual wet weather overflow summary for the 10 year time series model.**

| Location | Modelled Overflow Node | Type of Overflow | Number of Events in ten years | Total Duration in ten years (hrs) | Total Volume in ten years (ML) |
|---|---|---|---|---|---|
| Mount Victoria Catchment | 871010 | Reticulation* | 6 | 77 | 1.3 |

Note: * Reticulation overflow - overflow occurs at non-designed overflow point

Source: Sydney Water 1997b

The wet weather sewerage system performance is defined by rainfall events over a ten year period (January 1985 to December 1994). During this period a total of 610 discrete rainfall events occurred and these events were run through the model to determine the frequency, volume and duration of overflows from the single node. Only 1% of the rainfall events resulted in an overflow.

As the system was modelled as a single node, it is not possible to identify the actual locations of the overflows. The six events predicted are referred to as reticulation overflows and can occur anywhere within the system.

The system performance was also assessed over the modelled ten year period to determine the yearly variation in overflow performance. Table 2.7 provides a summary of these results from the ten year time series modelling.

**Table 2.7- Modelled yearly wet weather overflow summary for the Mount Victoria sewerage system**

| Year | Rainfall events | No. of overflow events | Total duration (Hrs) | Total volume (ML) |
|---|---|---|---|---|
| **1985** | 51 | 0 | 0 | 0 |
| **1986** | 61 | 1 | 39 | 1.0 |
| **1987** | 65 | 0 | 0 | 0 |
| **1988** | 39 | 2 | 19 | 0.2 |
| **1989** | 73 | 0 | 0 | 0 |
| **1990** | 68 | 1 | 9 | 0.05 |
| **1991** | 57 | 0 | 0 | 0 |
| **1992** | 68 | 2 | 10 | 0.05 |
| **1993** | 61 | 0 | 0 | 0 |
| **1994** | 47 | 0 | 0 | 0 |
| Total | **610** | **6** | **77** | **1.3** |

Inflow and infiltration (I/I) to the sewerage system during wet weather are the major causes of wet weather overflows. The sewer modelling indicates that approximately 6.2 % of rainfall can enter the sewerage system (refer to Section 2.2.2). The rainfall ingress is dependent upon a number of system area variables including age and extent of deterioration of the sewerage system, size of area served and the area response to rainfall (based on vegetative cover, degree of saturation of the soil, soil type etc.). The overflow is dependent upon many factors apart from rainfall including rainfall intensity, degree of saturation of the soil, STP capacity and the storage capacity of trunk sewers and carriers.

Due to model limitations, the results should be regarded as minimum overflow frequency indicators. Refer to Section 4.1.1 for further details on wet weather overflows.

### 2.4.2 Partially treated sewerage discharged from STP

A partially treated STP discharge occurs during wet weather when the hydraulic or treatment capacity of the STP is exceeded. STP discharge flows will be highly diluted with stormwater. Hence the concentration of pollutants is low and the environmental impact minor, as compared to more major pollutant sources such as urban stormwater runoff and STP dry weather discharge.

The Mount Victoria STP will provide a continuum of sewage treatment so that the performance of the plant in all conditions is aimed at meeting the conditions of the receiving environment. In this regard, the objectives of the operation of the STP is as follows:

1. During dry weather, the full treatment train must operate to the highest possible treatment level for the best water quality achievable.
2. During normal rainfall events, the capacity of one or more components of the treatment train may be at full capacity. However, disinfection and dilution along with fine screening will be provided as a minimum treatment.
3. During intense rainfall events, all components of the full treatment train are likely to be at full capacity. However, effluent fine screening and partial disinfection will be provided as a minimum treatment. Sewage will be highly diluted.

At all flows, the STP processes the influent to a quality suitable for discharge of the effluent to Fairy Dell Creek under the control of an EPA licence.

Raw sewage inflow volumes into Mount Victoria STP may vary quite significantly during the year, mainly due to seasonal variations associated with high tourist numbers during holiday periods and at weekends. Flows at the STP are monitored. The daily dry weather flow for the year 1990 has varied from a maximum of 0.4 ML/day to a minimum of 0.06 ML/day (Sydney Water 1995a).

The Mount Victoria STP was designed to provide full treatment, including disinfection, to flows of up to 0.24 ML/day. A storm pond is provided to assist in the containment of wet weather flows over 0.24 ML/day. If the capacity of the storm pond (185kL) is not exceeded, all flows are returned to the treatment units to receive full treatment. Flows greater than the capacity of the storm ponds are regarded as partially treated STP discharges. The biological reactor limits the flow receiving full treatment even though the disinfection capacity is 0.36 ML/day.

Sydney Water has decided that partially treated sewerage treatment plant discharges should receive at least full disinfection to less than 150 cfu per 100 millilitres up until the first system overflow discharges. This is the adopted base case abatement level, which may be improved upon should environmental or other requirements deem it necessary.

Sewerage treatment plants are designed to receive flows from small storms and still fully treat and disinfect wastewater within the limits imposed by their discharge licences. Flows above these levels are experienced for about two to six per cent of the time, or about eight to 20 days per year. Disinfection, as currently designed, is less effective at such high flow rates, and faecal coliform levels rise sharply above the acceptable limit of 150 faecal coliform units per 100 millilitres.

Figure 2.2 shows the treatment process train.

**Figure 2.2 - Mount Victoria STP treatment process train**

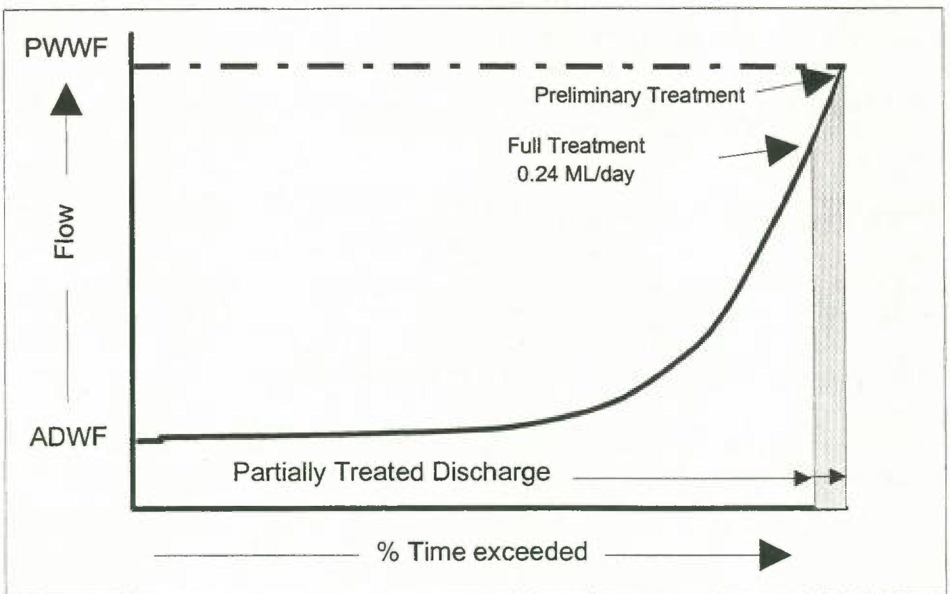



Table 2.8 summarises the existing plant performance with respect to overall levels of treatment.

**Table 2.8- Summary of existing treatment levels for Mount Victoria STP**

| Level of treatment | Flow able to receive level of treatment | Comments |
|---|---|---|
| Preliminary | flow up to 3.4 ML/day | Flows receive screening |
| Full (Secondary) | flow up to 0.24 ML/day | Flows receive full treatment except under emergency conditions outlined in the EPA licence. |

Source: Sydney Water 1997a

A program of monitoring the quality of sewage effluent from the authorised discharge point at the outlet of the Mount Victoria STP is required as part of the current STP license conditions. The standard for effluent from the STP to be achieved under the current license conditions together with the 50 and 90 percentile values for effluent quality from the plant are shown in Table 2.9. The results indicate that the effluent quality targets of the STP are being achieved.

**Table 2.9 - Mount Victoria licence conditions and STP effluent quality**

| Parameter | 1997/1998 licence conditions | | STP plant effluent 1995/96 | |
|---|---|---|---|---|
| | 50 percentile (mg/L) | 90 percentile (mg/L) | 50 percentile (mg/L) | 90 percentile (mg/L) |
| NFR | 15 | 30 | 16.5 | 27.5 |
| BOD | 15 | 30 | 12.0 | 18.2 |
| $NH_3$ | 5 | 15 | 2.2 | 3.4 |

Source: EPA 1997; Sydney Water 1997c

Table 2.10 indicates the wet weather modelling predictions for STP partially treated discharges.

**Table 2.10 - Wet weather modelling of STP partially treated discharges**

| Location | Number of partially treated STP Discharges/10 years | Partially treated discharge Duration/10 years | Partially treated discharge Volume/10 years | % of total partially treated discharge in the Blue Mountains GA |
|---|---|---|---|---|
| Mount Victoria | 60 | 4650 Hours | 37 ML | 0.08 |

## 2.4.3 Surcharges due to chokes

Sydney Water records customer complaints of overflows relating to chokes. The number of chokes recorded has remained relatively constant in Mount Victoria sewerage system

In order to allow identification of the areas worst affected by chokes the number of chokes has been calculated on a per suburb basis. In addition, to allow a reasonable comparison between suburbs, the number of chokes has been "normalised" into chokes per 100 km of sewer as a measure of choke density.

Sydney Water has ranked suburbs throughout its area of operation in order of choke density on a system basis, and these have been grouped into one of three categories:

1. low = up to 60 chokes/100 km
2. medium = 61 - 180 chokes/100 km
3. high = more than 180 chokes/100 km.

The choke density in each suburb will be used in conjunction with other information to priorities subsections of the sewerage system for rehabilitation.

The Mount Victoria sewerage system has a "low" choke density.

**Recurring choke problems**

A recurring choke is considered to have occurred when two chokes occurs at the same location in the space of six months, or three chokes occur at the same location in the space of two years. There have been no reported recurring choke problems in the Mount Victoria sewerage system.

Refer to Chapter 3 for further details of impacts of overflows caused by chokes.

### 2.4.4 Exfiltration

Exfiltration is the leaking of sewage from the sewerage line into the adjacent ground, thereby potentially impacting upon groundwater and eventually potentially leaching into nearby watercourses. Exfiltration is predominantly a dry weather occurrence (as during wet weather infiltration into the pipes from saturated ground is the more likely occurrence) and can occur through damaged and cracked pipes and joints.

Sewerage system sub-catchments where infiltration or exfiltration may be occurring can be identified by comparing sewage ADWF data to expected sewer flows based on water consumption data. The quarterly sewer ADWF is calculated from recorded sewer flow data for each gauged sub-catchment while the expected sewer flow is calculated from metered water consumption per property. This method was also used to identify candidates for the infiltration/exfiltration (I/E) rehabilitation program. The Mount Victoria catchment has been assessed as having moderate exfiltration potential and hence requiring further investigation of potential I/E rehabilitation.

Areas with exfiltration problems may also be identified by examining water quality monitoring data such as faecal coliform levels in nearby water courses during dry weather. There is currently no dry weather water quality data available for the Mount Victoria sewerage system. Further investigation will be required to determine and define the extent of exfiltration problems in the Mount Victoria sewerage system.

Refer to Chapter 3 for further details on impacts of overflows caused by exfiltration.

### 2.4.5 Overflows caused by SPS failures

There is one SPS (SPS 882) in the Mount Victoria sewerage system which has a standby pump and generous storage capacity. An emergency plan exists for the SPS, but has no provision for connecting a portable generator. In the last year , Sydney Water's system managers estimated that SPS 882 had overflowed six times due to SPS failure. This suggests that improvements in the identification of SPS failures (eg. reviewing adequacy of telemetry systems to SPS 882) are required.

Consultation with the Blue Mountains City Council revealed that lightning strikes are a significant problem in the Blue Mountains with respect to sewerage overflows as they can cause electrical failures at pumping stations which then lead to overflows.

Refer to Chapter 3 for further details on impacts of overflows caused by SPS failures.

### 2.4.6 Odours

Emissions of sewage odour may cause customer complaints if they occur from overflows close to residential areas, vent shafts near residential properties or at private rising mains discharging into access chambers.

Sydney Water records customer complaints of odours. One (1) odour complaint was received in the Mount Victoria sewerage system in the current year. This low level of complaint indicates that odours are not likely to be a major problem.

Refer to Section 4.1.6 for further details on impacts of odours.

## 2.4.7 Summary of system performance

The extent of the overflow problem in the Mount Victoria GA is summarised in Table 2.11.

**Table 2.11 - The extent of the overflow problem in the Mount Victoria sewerage system**

| Overflow Category | Measure | Performance |
|---|---|---|
| Wet weather modelled overflows | % rainfall events resulting in wet weather overflows | 1% |
| | % inflow catchment with rainfall ingress > 10% | 0 |
| | Number of overflow events in 10 years | 6 |
| | Modelled overflow volume in 10 years (ML) | 1 |
| | Number of modelled overflows discharging directly into sensitive areas in 10 yrs [1] | all |
| | Highest risk ranked reticulation overflow (against all Sydney-wide) [1] | Mount Victoria |
| | Number of STPs in geographic area | 3 |
| Partially treated STP discharge | Number of partially treated STP discharges in 10 years | 60 |
| | Volume of partially treated STP discharges in 10 years (ML) | 37 |
| Surcharges (Chokes and dry weather overflows) | Number and proportion of suburbs in "Low" category [1] | 1 (100%) |
| | % of properties not affected by surcharges | 99.30 |
| | Any trunk sewer capacity < 2 x PDWF (Yes/No) | no |
| | SPS Pump Capacity | |
| | % with capacity < 2 x PDWF | no data |
| | % with capacity 2 - 4 x PDWF | no data |
| | % with capacity > 4 x PDWF | no data |
| SPS Failure | Total number of overflows from SPSs (96/97) | 6 |
| | Number of SPSs with detention time < than response time | none |
| | Number of SPSs without alternative power supply | 1 |
| | Number of SPSs without standby pumps | none |
| | Identify highest risk ranked SPS [1] | n/a |
| Exfiltration | Number and proportion of potential "high" exfiltration sub-catchments | 0/1 |
| | Number and proportion of potential "Medium" exfiltration sub-catchments [1] | 1/1 |
| | Number and proportion of sub-catchments where exfiltration potential is unknown | 0/1 |
| Odours | Total number of odour events leading to complaints (1996/7) | 1 |
| | Suburb with highest number of odour complaints [1] | n/a |
| Notes | 1.Only one STP, SPS & catchment/ reticulation node was modelled for this system<br>Modelled node comprised entire catchment with one STP and SPS | |

## 2.5 Existing overflow management practice

Management practices used in the Mount Victoria sewerage system are similar to those used in other sewerage systems operated by Sydney Water, as described in Chapter 2, Volume 1. New technologies and methods are constantly being investigated to improve and update the systems to current standards.

The management of overflows will focus on problem areas, identified as causing significant impact on the environment. These overflows will be prioritised and targeted for abatement or control. Partially treated STP discharges currently account for the majority of overflows in the Mount Victoria sewerage system.

In comparison to other sewerage systems within the Blue Mountains GA, the Mount Victoria sewerage system is considered to be in good condition and does not require specific management practices other than those currently being conducted.

Sydney Water is implementing a continuous improvement process based upon compliance with long term Sydney Water operating objectives and the USEPA Combined Sewer Overflow Control Policy which is considered as indicative of World Best Management Practices. This improvement process is described in detail in Volume 1.

## 2.6 Effects of growth

The previous sections described the extent of the Mount Victoria sewerage system overflows for existing conditions. As the population of the Mount Victoria sewerage system catchment increases, the frequency and volume of overflows is likely to increase, particularly in the case of overflows influenced by system capacity, if no abatement options are implemented. This section describes the effect of catchment growth on the Mount Victoria sewerage system overflows in terms of predicted system performance for the year 2021.

The small township of Mount Victoria is expected to experience a substantial growth from 550 people in 1991 to 1,542 by the year 2021. This represents an increase of approximately 3.5% per annum which is significant within the region as it is higher than the estimated 1.14% and 1.07% annual growth rates in New South Wales and Sydney, respectively, in the recent 1991 - 1996 period (ABS, 1997). Due to limitations arising from the natural environmental and physical constraints in the locality, particularly the National Park boundaries, the topographic characteristics, and the associated planning policies, the population increase will be mostly absorbed into areas which are already zoned for residential uses. Increases in population will also occur as a result of infill development occurring in existing residential areas and identified residential investigation areas. Seasonal population increases will also occur at peak tourist and visitor times throughout the year. Frequent population influxes will also occur during weekends.

The potential rise in residential and visitor populations is likely to increase the occurrence of overflows discharging into the Blue Mountains REZ and Lake Burragorang REZ due to increased flow in the sewerage system, unless the system is augmented.

Population figures for the system have been modelled based on the estimated permanent population in the system to the year 2021. Accordingly, the figures do not include allowance for seasonal /tourist/ peak period flows. Higher seasonal/tourism population peaks in Mount Victoria are anticipated to have the potential to cause a significant increase in wet weather overflow frequency.

#### Future Wet Weather Overflow Performance

The 2021 performance of wet weather overflows has been modelled using the previous population growth estimates (Sydney Water, 1997b). The model assumes that stormwater ingress performance will be maintained for existing catchment areas but there will be an increased dry weather flow component as a result of population increase. New sewerage pipes that will be constructed to accommodate the population growth are assumed to have 2% rainfall ingress which will contribute to the total wet weather flow for the existing system and to the STP. This figure is low compared with the estimated 6.2% ingress of the current system, as new sewers will be better performing.

The 2021 system performance is summarised in Table 2.12. The number of wet weather overflow events in 2021 is predicted to increase to ten from six events in ten years and the overflow volume is expected to increase to 1.9 ML (from 1.3 ML) in ten years with no overflow abatement in the Mount Victoria sewerage system. The STP will undergo capacity augmentation for future conditions which is outside the scope of this assessment.

**Table 2.12 - Wet weather overflow performance for future (2021) conditions for the Mount Victoria sewerage system without any overflow abatement.**

| Location | Modelled overflow node | 2021 without any overflow abatement In 10 years | |
|---|---|---|---|
| | | **No. of incidents** | **Volume (ML)** |
| Mount Victoria catchment | 871010 | 10 | 1.9 |
| TOTAL | | **10** | **1.9** |
| Partially treated STP discharges | | 330# | 5.5# |

Note: #STP will undergo capacity augmentation for future conditions which is outside the scope of this assessment. Without this augmentation overflows will be higher.

Source: Sydney Water Product Planning, 1997, Sydney Water Utilities Planning 1997

Sewerage Overflows Licensing Project
Environmental Impact Assessment

Volume 3: Mount Victoria Sewerage System Overflows

# Chapter 3

# Environmental Impact of Overflows

# Synopsis

The assessment of overflow impacts is focused primarily on issues that affect large areas of a catchment, or are of catchment-wide concern. Localised impacts are considered only where they affect areas which have been identified as 'sensitive' because of their ecological status, human uses, or cultural values. Overflows are considered to have negligible impact on noise, traffic and land use zoning, although impacts which may occur through the implementation of overflow control strategies will be considered in the second stage environmental impact assessment (EIA) prior to any construction.

The assessment of overflow impacts has been carried out in consideration of environmental objectives recommended by Catchment Management Committees (CMCs) and Community Reference Groups (CRGs). The primary objectives for water quality in the area served by the Mount Victoria sewerage system are potable water quality and ecosystem protection.

The impacts on the environment of overflows from the Mount Victoria sewerage system do not appear to be significant on a catchment-wide basis although some localised impacts may occur. This is largely due to the small size of this sewerage system and the dominance of other influences on water quality in the area. The major sources of pollution in the area are runoff from urban areas and STP effluent.

The terrestrial impacts due to overflows appear to be minor except for potential weed infestation of remnant riparian vegetation and sensitive areas such as sedge swamps and wetlands, as most of the overflows discharge directly to waterways.

Sensitive areas with high biodiversity and community value have been identified to determine if greater overflow containment is warranted to protect their ecological status and value. These include National Parks, classified waters, threatened species habitat and the proposed Grose Wilderness area.

Although impacts of overflows from the Mount Victoria sewerage system are considered to be minor compared to other sources of pollution, a high level of protection is required due to the sensitivity of the area. Chapter 4 describes the proposed strategy for overflow abatement in the Mount Victoria sewerage system. This strategy focuses on protection of sensitive areas and the community's expectations for the environmental quality of the area.

# 3. Environmental impacts of overflows

## 3.1 The sewerage system and receiving environment

The impacts of overflows within the Blue Mountains GA are described in Volume 2 of this EIS. This Volume identifies the key impacts of sewerage overflows within the Blue Mountains and Lake Burragorang REZs, and defines the relative contribution of overflows from the Mount Victoria sewerage system.

The Mount Victoria sewerage system serves the township of Mount Victoria located in the upper Blue Mountains and is the smallest of the three sewerage catchments within the Blue Mountains GA, both in terms of area of catchment and population served (refer to Table 2.1). Approximately 25% of the Mount Victoria sewerage system, including the one SPS within the system, is located in the Blue Mountains REZ. The remaining 75% of the Mount Victoria sewerage system is located in the Lake Burragorang REZ (refer to Figure 2.1).

The Mount Victoria sewerage system serves an area of about 73 ha. Residential, tourism and recreation are the predominant land uses. The population served by the Mount Victoria sewerage system is approximately 550 but it is expected to increase to 1,542 by the year 2021 (refer to Section 2.6).

Primary responsibility for environmental management of the area served by the Mount Victoria sewerage system rests with the Blue Mountains City Council. Environmental management of the area potentially affected by the Mount Victoria sewerage system is also overseen by Sydney Water (Lake Burragorang Special Area) the Blue Mountains Catchment Management Committee and the Coxs River Catchment Management Committee at a local level, and on a regional level, the Hawkesbury-Nepean Catchment Management Trust (HNCMT). The National Parks and Wildlife Service (NPWS) is responsible for management of parks and reserves gazetted under the *NPWS Act, 1974* including the Blue Mountains National Park. The HNCMT and the Blue Mountains City Council (BMCC) have identified goals for protection of the environment in the area and these are discussed in the following Section.

### 3.1.1 Environmental goals

The Blue Mountains is an asset of world class conservation value because of its exceptional natural beauty, biodiversity and wilderness values. Due to its close proximity to the major urbanised area of Sydney, the Blue Mountains provides a valuable wilderness and recreational experience for a large local, regional and international visitor population.

The environmental goals for protection of the aquatic, terrestrial and human environment of the Blue Mountains GA are discussed in Volume 2 (refer to Table 3.1). The HNCMT has divided the Blue Mountains into zones or areas (sub-catchments) in order to define goals for protection of the aquatic environment. The Mount Victoria sewerage system drains into the following aquatic zones (HNCMT, 1997b) and illustrated in Figure 3.1:

1. Grose River Zone - comprising the National Park section of the Grose River Gorge.
2. Blue Mountains Ridge Zone - essentially comprising the urban areas of Mount Victoria through to Emu Plains located along the railway and the Great Western Highway
3. Blue Mountains Urban Impact Areas - located to the south-west of Mount Victoria and west of Katoomba
4. Middle Coxs Pastoral Areas - small areas of irrigated lucerne and other pasture located to the west of Mount Victoria
5. Sandstone Plateau and Escarpment Area - located to the north and south of Mount Victoria and west of Katoomba.

Aquatic environmental goals identified for the area served by the Mount Victoria sewerage system are summarised in the following table and illustrated on Figure 3.1.

**Table 3.1 - Aquatic environment protection goals for the area served by the Mount Victoria sewerage system**

| |
|---|
| Protection of aquatic ecosystems. |
| Protection of human consumers of fish and crustacea. |
| Maintain visual amenity. |
| Primary and secondary contact recreation |
| Protection of drinking water supplies |
| Protection of water supplies for livestock, farmstead and irrigation |
| Protection of industrial water supplies (commercial spring water) |

Sources: HNCMT 1997; Coxs River CMC 1995

Overflow abatement strategies for the Mount Victoria sewerage system will be developed to protect each of these environmental goals (refer to Chapter 4). The primary goal identified for the Blue Mountains GA was potable water quality as it best reflects the desired uses and values of the area (refer to Section 3.1.1, Volume 2).

## 3.2 Overflow impacts

A full description of existing conditions and overflow impacts within the Blue Mountains REZ and the Lake Burragorang REZ is provided in Volume 2 of this EIS. The key impacts, and the relative contribution of Mount Victoria sewerage system overflows to these impacts are described below. Sensitive components of aquatic, terrestrial, and socio-economic environments have been given special consideration in this section. The methods by which environmental impacts were identified, and the limitations of these methods, are presented in the Methods document.

### 3.2.1 The extent of the overflow problem

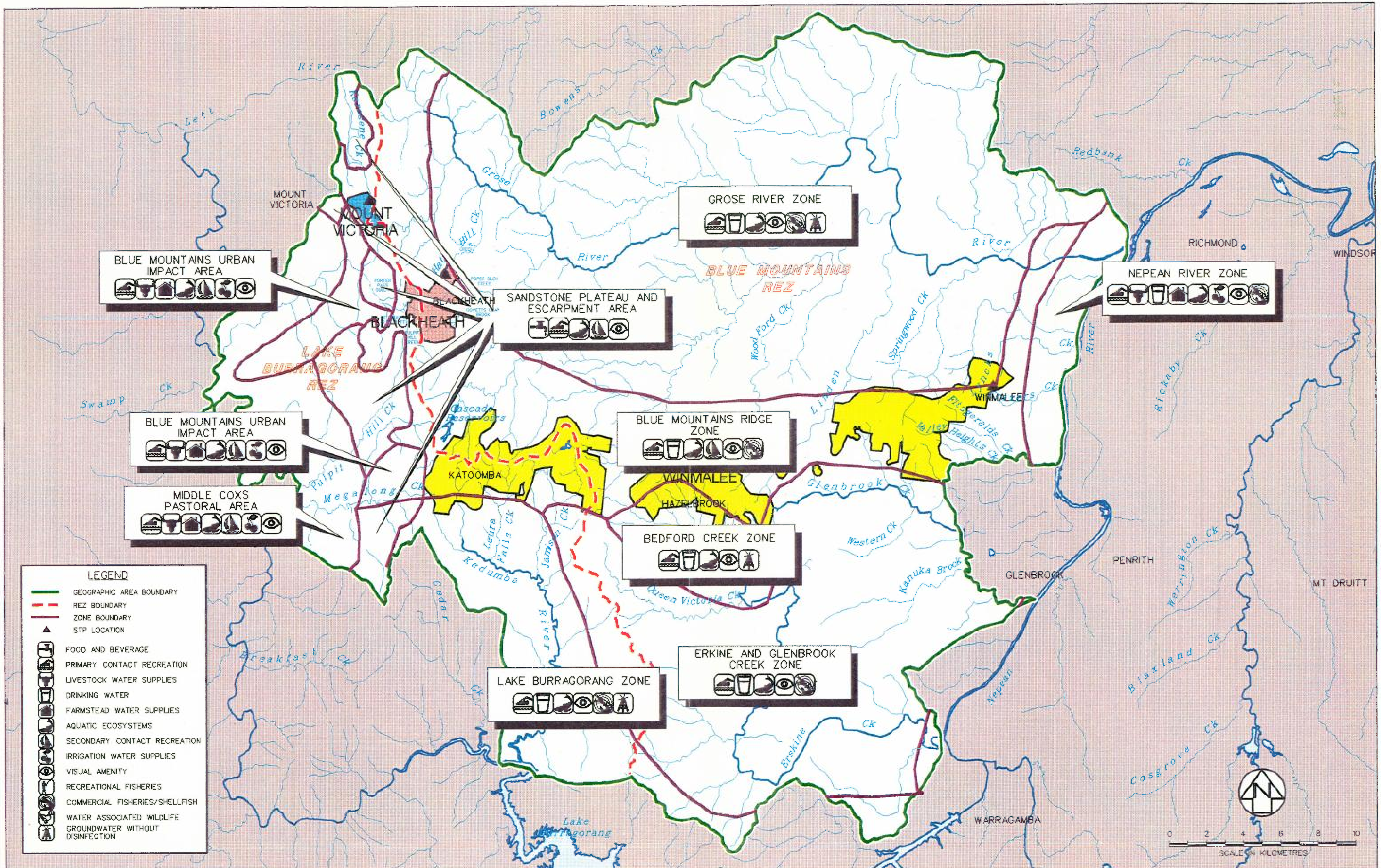
Regional impacts of overflows from the Mount Victoria sewerage system are relatively minor compared to contributions from other sources such as stormwater runoff from urban areas and STP dry weather discharges, both of which can dominate nutrient loads. STP partially treated discharges in wet weather conditions can impact on recreational water quality (i.e. specifically pathogen concentrations)but are generally not a major influence on overall water quality.

On a localised level, overflows due to failure of the system have the potential to cause significant impacts. The most common causes of system failure related overflows, include those due to system overload during wet weather, chokes which can cause system overflows during dry weather, and SPS overload failure.

Sewer modelling indicates that there are currently six wet weather overflow events in ten years from the Mount Victoria sewerage system discharging a volume of 1.3 ML in ten years which is negligible compared to the remainder of the GA (refer to Section 2.4.1).

The modelling indicates that partially treated STP discharges occur at a rate of 60 events per ten years with a volume of 37 ML (in ten years) which is also relatively low (refer to Section 2.4.2).

The number of chokes was assessed to be low and no recurring chokes were recorded in the Mount Victoria sewerage system (refer to Section 2.4.3). The most common cause of chokes is blockage of the sewer carrier by tree roots. A combination of operational failure and wet weather may be the critical circumstances leading to a number of these overflows.

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SEWERAGE OVERFLOWS LICENSING PROJECT
BLUE MOUNTAINS GEOGRAPHIC AREA

FIGURE 3-1
AQUATIC ENVIRONMENT PROTECTION GOALS

Comparison of water consumption data against ADWF has identified the Mount Victoria sewerage system to have a moderate exfiltration potential. Further assessment of exfiltration is required to confirm the extent of this type of overflow problem (refer to Section 2.4.4).

The Mount Victoria sewerage system has only one SPS (SPS 882) and no designed overflow structures. SPS 882 has adequate storage capacity in the event of operational failures such as a mechanical/electrical fault or an interruption to electrical supply (refer to Section 2.4.5).

There has been one odour complaint for the past year in the Mount Victoria sewerage system indicating that odours are not likely to be a significant problem (refer to Section 2.4.6).

The contribution of sewerage overflows relating to the Mount Victoria sewerage system appear to be minor due to the relative small size and amount of infrastructure in comparison to the other two sewerage systems within the GA, Blackheath and Winmalee (refer to Section 2.1).

### 3.2.2 Impacts on the aquatic environment

Waterways affected by overflows from the Mount Victoria sewerage system include the Coxs River and its tributaries (including Fairy Dell Creek and Kerosene Creek) in the Lake Burragorang REZ, and the Grose River and its tributaries (including Victoria Creek) in the Blue Mountains REZ (refer to Figure 2.1). Several other streams are also potentially affected by overflows from Mount Victoria, including the River Lett and Fairy Bower Creek within the Lake Burragorang REZ.

The Mount Victoria sewerage system is bounded to the east by the Blue Mountains National Park. All waters within the Blue Mountains National Park are classified as Class P (Protected Waters). The Coxs River and tributaries are also Class P waters including Fairy Dell Creek. Regulation 8 under the *Clean Waters Act 1970,* prescribes the quality of water which should be met in classified waters (refer to Section 3.3.3 Volume 2). The *Protection of the Environment Operations Act, 1997* has been prepared to replace the *Clean Air Act 1961, Clean Waters Act 1970, Noise Control Act 1975, Pollution Control Act 1970,* and *Environmental Offences and Penalties Act 1989.* The new Act is yet to be proclaimed and therefore compliance with the original Act is still required. The new Act is expected to be proclaimed in mid-1998 (refer to Section 3.3.3, Volume 2). Classified waters are defined as "sensitive areas" for the purposes of this project. Sensitive areas are discussed further in Section 3.3.

The Mount Victoria STP discharges into Fairy Dell Creek and potentially impacts on wetland areas downstream of the confluence of Fairy Dell and Kerosene Creeks (refer to Section 3.3). ADWF from the Mount Victoria STP is 0.14 ML/day. Monitoring data indicates that licence conditions are met (refer to Section 2.4).

Extensive water quality data is not available for this area although water quality monitoring (Water Board 1994) indicates that the Upper Grose River (eg. Victoria Creek) is relatively uncontaminated by nutrients and algae.

During the 1994/1997 period, only one overflow event resulted in a call out by the AWT-EnSight Environmental Response Unit. The Environmental Response Unit is a quick response team which inspects the site of significant overflows and samples the receiving waters to determine the extent of water quality impact and prepares a report on their assessment of the extent of the problem and the further remedial action which should be taken. The unit is called out by Sydney Water system personnel whenever an overflow appears to be significant. The impact on the receiving stream for that event (Fairy Dell Creek) was reported to be minor.

### Contribution of overflows to receiving water nutrient loads

Overflow impacts are difficult to quantify from existing water quality data (refer to Volume 2 Section 3.3.3). To assist with the environmental assessment of overflow impacts and the effect of overflows on the achievement of water quality goals, water quality modelling (AWT EnSight 1997) was undertaken to determine the contribution of overflows to receiving water nutrient loads in the Blue Mountains REZ. Although the Coxs River and other tributaries in the Lake Burragorang REZ were not included in this modelling exercise, the results are likely to be indicative of water quality in the whole Blue Mountains GA due to the similar environmental conditions.

Water quality modelling results indicates that very low load contributions occur from wet weather overflows. The combined wet weather overflow volumes from the Blue Mountains sewerage systems contribute 0.77% of total phosphorus loads and 0.33% of total nitrogen loads to the Blue Mountains REZ which is a relatively insignificant load contribution. The results indicate that sewerage overflows make only a minor contribution to the water quality with the major contributors being STP dry weather discharge and stormwater runoff (AWT EnSight 1997).

A comparison between wet and dry weather overflow contributions to nitrogen and phosphorous loads is given in Tables 3.2 and 3.3 for existing conditions and Tables 3.4 and 3.5 for 2021.

**Table 3.2 - Existing conditions total phosphorous sources**

| Source | Wet weather (tonnes/yr) | Dry weather (tonnes/yr) | Total (tonnes/yr) |
|---|---|---|---|
| Wet weather overflows[1] | 0.14 | No dry weather load | 0.14 (0.8%) |
| Catchment runoff/ baseflow[1,2] | 8.88 | Small component of catchment load source under dry weather conditions. Generally less than 5% contribution | 8.88 (49%) |
| STP discharges[3] | 0.8 | 8.4 | 9.2 (50%) |
| Exfiltration | Exfiltration catchments contribute to wet weather stormwater load - small contribution assumed in wet weather | Exfiltration catchments contribute to dry weather baseflow loads. Unknown contribution to catchment baseflow load. | Unknown |
| Surcharges/chokes | Negligible loads reach waterways, included as component of catchment baseflow load | Negligible loads reach waterways, included as component of catchment baseflow load | Unknown |
| **Total** | **9.82** | **8.4** | **18.2** |

Notes: 1. Wet weather loads as predicted by the water quality model (AWT EnSight 1997)

2. Modelling undertaken provided a total load sourced from the catchment. There is a component of baseflow/point source load in this calculation. Previous modelling undertaken by Sydney Water indicated that this catchment nutrient load is sourced mainly from larger wet weather events and that dry weather source loads are generally less than 5% contribution.

3. Total STP load is estimated from modelling. Dry weather loads are estimated by AWT EnSight.

**Table 3.3 - Future (2021) conditions total phosphorous sources**

| Source | Wet weather (tonnes/yr) | Dry weather (tonnes/yr) | Total (tonnes/yr) |
|---|---|---|---|
| Wet weather overflows[1] | 0.16 | No dry weather load | 0.16 (1.4%) |
| Catchment runoff/ baseflow[1,2] | 8.88 | Small component of catchment load source under dry weather conditions. Generally less than 5% contribution | 8.88 (79.6%) |
| STP discharges[3] | 0.48 | 1.64 | 2.12 (19%) |
| Exfiltration | Exfiltration catchments contribute to wet weather stormwater load - small contribution assumed in wet weather | Exfiltration catchments contribute to dry weather baseflow loads. Unknown contribution to catchment baseflow load. | Unknown |
| Surcharges/chokes | Negligible loads reach waterways, included as component of catchment baseflow load | Negligible loads reach waterways, included as component of catchment baseflow load | Unknown |
| **Total** | **9.52** | **1.64** | **11.16** |

Notes: 1. Wet weather loads as predicted by the water quality model (AWT EnSight 1997)

2. Modelling undertaken provided a total load sourced from the catchment. There is a component of baseflow/point source load in this calculation. Previous modelling undertaken by Sydney Water indicated that this catchment nutrient load is sourced mainly from larger wet weather events and that dry weather source loads are generally less than 5% contribution.

3. Total STP load is estimated from modelling. Dry weather loads are estimated by AWT EnSight.

**Table 3.4 - Existing conditions total nitrogen sources**

| Source | Wet Weather (tonnes/yr) | Dry Weather (tonnes/yr) | Total (tonnes/yr) |
|---|---|---|---|
| Wet weather overflows[1] | 0.54 | No dry weather load | 0.54 (0.3%) |
| Catchment runoff/ baseflow[1,2] | 120.6 | Small component of catchment load source under dry weather conditions. Generally less than 5% contribution | 120.6 (68.7%) |
| STP discharges[3] | 5.2 | 49.4 | 54.6 (31%) |
| Exfiltration | Exfiltration catchments contribute to wet weather stormwater load - small contribution assumed in wet weather | Exfiltration catchments contribute to dry weather baseflow loads. Unknown contribution to catchment baseflow load. | Unknown |
| Surcharges/chokes | Negligible loads reach waterways, included as component of catchment baseflow load | Negligible loads reach waterways, included as component of catchment baseflow load | Unknown |
| **Total** | **126.3** | **49.4** | **175.8** |

Notes: 1. Wet weather loads as predicted by the water quality model (AWT EnSight 1997)

2. Modelling undertaken provided a total load sourced from the catchment. There is a component of baseflow/point source load in this calculation. Previous modelling undertaken by Sydney Water indicated that this catchment nutrient load is sourced mainly from larger wet weather events and that dry weather source loads are generally less than 5% contribution.

3. Total STP load is estimated from modelling. Dry weather loads are estimated by AWT EnSight.

**Table 3.5 - Future (2021) conditions total nitrogen sources**

| Source | Wet weather (tonnes/yr) | Dry weather (tonnes/yr) | Total (tonnes/yr) |
|---|---|---|---|
| Wet weather overflows[1] | 0.85 | No dry weather load | 0.85 (0.3%) |
| Catchment runoff/ baseflow[1,2] | 120.6 | Small component of catchment load source under dry weather conditions. Generally less than 5% contribution | 120.6 (40%) |
| STP discharges[3] | 6.6 | 172.5 | 179.1 (60%) |
| Exfiltration | Exfiltration catchments contribute to wet weather stormwater load - small contribution assumed in wet weather | Exfiltration catchments contribute to dry weather baseflow loads. Unknown contribution to catchment baseflow load. | Unknown |
| Surcharges/chokes | Negligible loads reach waterways, included as component of catchment baseflow load | Negligible loads reach waterways, included as component of catchment baseflow load | Unknown |
| **Total** | **128.1** | **172.5** | **300.6** |

Notes:
1. Wet weather loads as predicted by the water quality model (AWT EnSight 1997)
2. Modelling undertaken provided a total load sourced from the catchment. There is a component of baseflow/point source load in this calculation. Previous modelling undertaken by Sydney Water indicated that this catchment nutrient load is sourced mainly from larger wet weather events and that dry weather source loads are generally less than 5% contribution.
3. Total STP load is estimated from modelling. Dry weather loads are estimated by AWT EnSight.

The water quality modelling data will only be indicative of catchment-wide impacts within the major receiving waterways. Impacts not identified by the modelling may occur within localised areas, particularly within minor tributary streams. The main impact of overflows at the localised level is likely to be a temporary reduction in bacteriological water quality immediately following an overflow event. For this reason, it is important that overflow control strategies take into consideration the total number of overflow events.

In addition, the water quality modelling data does not provide specific information on the impacts of overflows caused by system failures including chokes, SPS failures, and exfiltration. The occurrence and associated impacts of these types of overflows require further investigation.

A comparison of water consumption data against ADWF for the Mount Victoria sewerage system indicates that there is a moderate likelihood of an exfiltration problem. However, the available data is insufficient to determine the effects of exfiltration on water quality.

Sydney Water is currently undertaking water quality sampling and modelling for a number of creeks as part of the studies for the Upper Blue Mountains Sewerage Strategy and associated EIS. The data from this study will assist in further assessing sewerage overflow impacts in the area (refer to Section 3.3.4, Volume 2).

### Ecological and human health risk assessment (ERA)

Sydney Water has undertaken an ecological and human health risk assessment (ERA) for 37 areas potentially impacted by the operation of Sydney Water's sewerage systems. Representative sites have been selected for each GA for the purpose of evaluating the potential impacts of chemical and non-chemical toxicants from wet weather sewerage overflows. In order to assess the contribution of overflow discharge to wet weather receiving water quality, stormwater and STP discharges were also evaluated. In addition to benefits, in terms of risk reduction, from overflow abatement were assessed. The following sites were chosen for the Blue Mountains GA (refer to Figure 3.2, Volume 2).

1. junction of Grose River and Nepean River at Richmond
2. Un-named Creek downstream of Winmalee
3. Hat Hill Creek downstream of Blackheath STP.

A detailed assessment for each of the three sites is given in Volume 2, Appendix C. None of the three sites in the Blue Mountains were in the area served by the Mount Victoria sewerage system however risk evaluation results are consistent among the three sites and considered also to be representative of the Mount Victoria area due to the similar environments. Potential risk to aquatic life from sewerage overflows from the results of the study was found to be negligible. However there was potential risk to aquatic life from exposure to chemicals in stormwater and STP dry weather discharges at all sites. The contribution of sewerage overflows to overall risk is considered minor when compared to potential risks from the stormwater and STP dry weather discharges.

#### Effect of flooding on sewerage system operations and overflows

As discussed in Volume 2, Section 3.3.2, the areas serviced by sewerage systems in the Blue Mountains GA are not flood prone areas, and therefore the affect of flooding on overflows is minor.

### 3.2.3 Impacts on the terrestrial environment

The majority of overflows from the Mount Victoria sewerage system drain to aquatic environments and the impacts on terrestrial environments are therefore likely to be relatively minor. Overflows from the Mount Victoria sewerage system which may affect terrestrial ecosystems are limited to chokes and exfiltration.

The impacts of sewerage overflows on terrestrial fauna during wet weather flows is expected to be minimal. During dry weather flows, the potential impacts of sewerage overflows increases due to the higher concentration of nutrients. Higher concentrated dry weather flows have the potential to contaminate water supplies for terrestrial fauna.

Choke-related overflows and exfiltration within terrestrial areas have the potential to encourage weed growth through soil nutrient enrichment, disturbance of the soil surface, and addition of non-native plant seeds. These effects are likely to be localised, however, and the impacted areas are likely to be small in comparison to habitat ranges for native flora and fauna. Furthermore, other factors such as urban stormwater runoff, conversion of land for housing, and erosion caused by flood flows, are likely to have far greater impacts on terrestrial ecosystems in the Mount Victoria sewerage system than those caused by sewerage overflows.

Sensitive terrestrial environments include the Blue Mountains National Park and habitat of threatened species protected under the *Threatened Species Conservation Act (TSCA) 1995.*

A detailed discussion of impacts on threatened terrestrial flora and fauna is provided in Section 3.3.1 of this volume and Section 3.4 of Volume 2.

Potentially impacted threatened fauna considered at high risk from sewerage overflows and their status under the *Threatened Species Conservation Act 1995* are listed below:

1. Giant Burrowing Frog (Vulnerable)
2. Golden-eyed Barred Frog (Vulnerable)
3. Red-crowned Toadlet (Vulnerable)
4. Blue Mountains Swamp Skink (Endangered).

Locations at which these species have been sighted have been identified as "sensitive areas" for the purposes of this study. No sightings of threatened flora are recorded by NPWS, however it should be noted that the habitats occupied by these species are likely to be more extensive than indicated by the individual sighting records.

#### Impacts of overflows on soils and erosion

The erodability of soils in the area served by Mount Victoria sewerage system is variable (refer Section 3.4.3, Volume 2). The overflow discharge volumes are relatively low compared to stormwater flows and therefore the potential for erosion due to sewerage overflows is considered to be minor.

### 3.2.4 Impacts on the socio-economic environment

Sewerage overflows may affect socio-economic environments through direct exposure of human populations to overflow discharges, or indirectly through their adverse affects on the biophysical environment. The main impacts on socio-economic environments in the Blue Mountains GA were identified in Volume 2 as follows:

1. risks to human health as a result of exposure to toxicants or pathogens through pollution of water storages or water-based or terrestrial recreation areas
2. potential impacts on recreational values
3. potential impacts on visual amenity of waterways and terrestrial areas
4. potential impacts on community amenity as a result of odour discharges.

#### Risks to human health

The results of the water quality modelling indicated that the contribution of overflows to the faecal pollution in the Blue Mountains REZ was minor relative to STP dry weather discharges and stormwater runoff (Refer Section 3.3.4 and Tables 3.10 and 3.11, Volume 2). The modelling also indicated that removal of all wet weather overflows from catchment inputs would not significantly improve the compliance with water quality criteria for primary contact recreation (AWT-EnSight 1997).

Water supply storages potentially affected by sewerage overflows from the Mount Victoria sewerage system include Lake Burragorang.

In order to ensure full protection of drinking water supply storages Sydney Water enforce a multi barrier approach to catchment protection. This includes a range of measures designed to protect water supplies including:

1. the establishment of exclusion zones
2. distance attenuation (careful siting of storages away from urban areas)
3. water filtration and chemical treatment at water reservoirs.

This system provides comprehensive protection from overflow events which typically result in localised impacts in areas remote from water storages.

Due to the distance between the Mount Victoria sewerage system and Lake Burragorang, and the effect of dilution over this distance, the impact on public health is considered to be negligible.

From the available information on water quality modelling, it is likely that the risk from sewer overflows to catchment water quality is minimal.

An ecological and human health risk assessment (ERA) (Sydney Water 1998) determined the potential health risks associated with incidental ingestion of water from three sample points within the Blue Mountains. This could occur while swimming or undertaking other activities during or shortly after a sewer overflow or stormwater discharge. Potential risks were assessed using short-term drinking water guidelines which protect public health when 1-2 litres/day of water are consumed over several days, and employing a conservative approach assuming no dilution and 100 percent chemical availability.

The ERA found that there was no risk to human health from the incidental ingestion of water while swimming or wading at any of the three sites evaluated in the Blue Mountains GA. While none of these sites were located within the area served by the Mount Victoria sewerage system, the ERA indicates that minimal human health risks occur as a result of overflows (refer to Section 3.5.4, Volume 2 and Appendix C).

#### Impacts on recreational values

Impacts on water-based recreational values are related largely to human health risks from faecal contamination discussed above. Nutrient pollution may also decrease the recreational value of a water body through promotion of nuisance plant and algal growths and eutrophication.

As discussed previously sewerage overflows make only a minor contribution to faecal pollution and nutrient loadings on a regional basis. However localised impacts may be more pronounced particularly during dry weather or in areas with poor drainage.

The impacts of overflows from the Mount Victoria sewerage system on terrestrial recreational values are considered to be minor as the majority of overflows drain to waterways. Localised impacts may occur however as a result of odour emissions or temporary reductions in the water quality of adjacent waterways.

#### Impacts on visual amenity of waterways and terrestrial areas

Sewer overflows may impair the visual quality of the environment by depositing debris and solids within areas frequented by humans such as residential areas, recreation reserves, waterways and tourist sites. They may also impair the visual quality of the environment indirectly by contributing to weed infestation or algal growth around outlet points.

The visual impacts of overflows are generally localised. There is some potential for adverse visual impacts on the urban conservation zone and the bushwalking tracks around Victoria Falls within the Blue Mountains National Park which are visited by numerous tourists each year. However this is unlikely due to the low frequency of overflows in the catchment. Overall, overflows in the Mount Victoria sewerage system are considered to have a low impact on visual amenity in comparison to other sewerage systems in the Blue Mountains.

#### Impacts on community amenity as a result of odours

Odour discharges, when detected, may reduce the amenity of the surrounding area for human occupation and thereby affect a range of human uses including residential, recreational and commercial. There is very little data available concerning the strength of odour emissions from sewerage overflows but odour complaints provide an indication of the impact of odours on community amenity within areas served by a sewerage system.

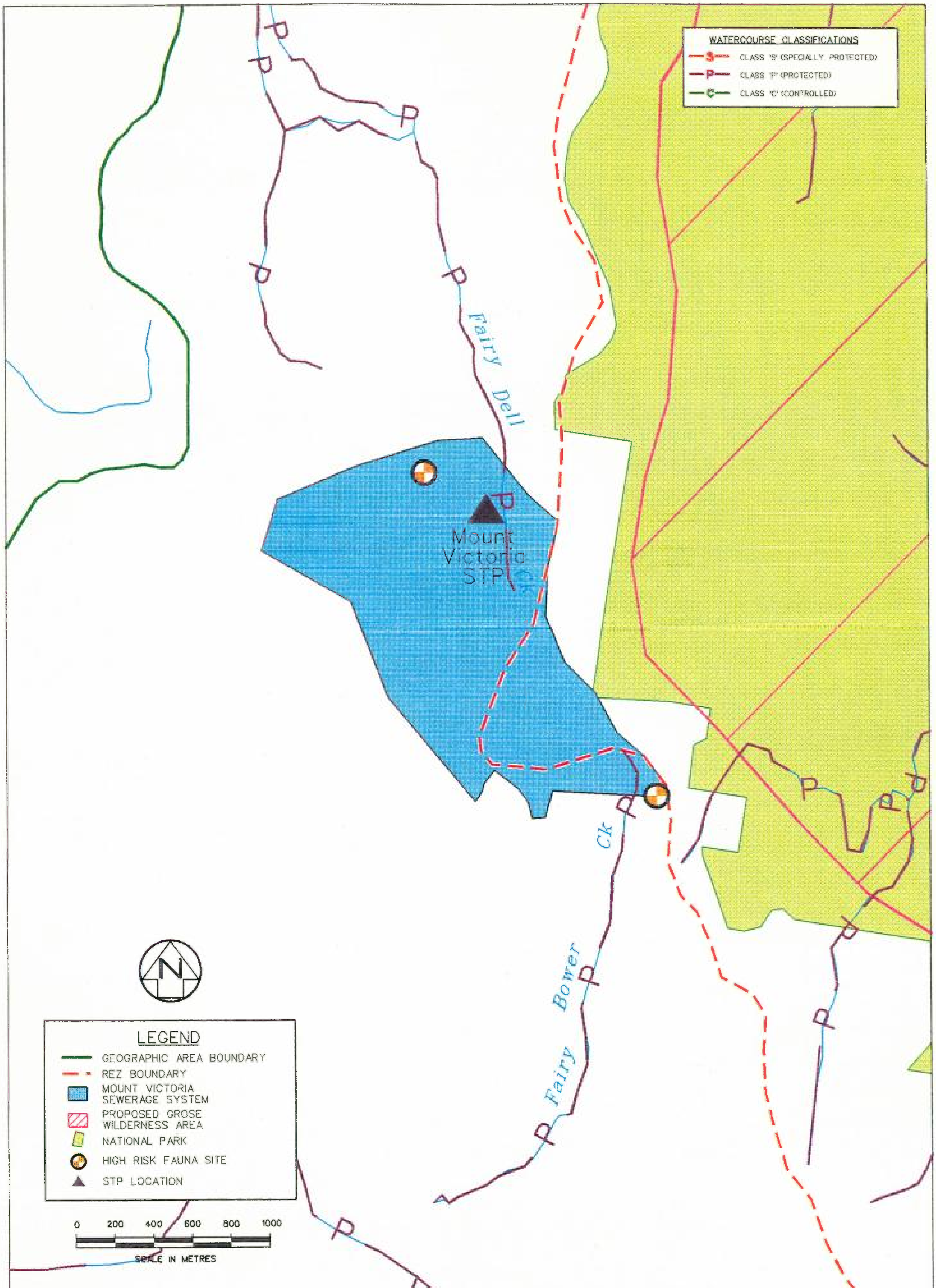
While odour impacts are possible in all liquid overflow conditions, it is clear from historical data that odour complaints in the Mount Victoria sewerage system are rare. Only one complaint was received from the Mount Victoria sewerage system in the current year. It should be noted however, there could be odorous events which may not be reported.

## 3.3 Impacts on sensitive areas

Sensitive areas, in the context of this project, are sites or components of the environment which are considered to be of particular importance because of their ecological, conservation, cultural heritage, recreational, social or commercial values. Examples of areas which may be classified as sensitive are listed in the Methods document. Sensitive areas which have the potential to be impacted by overflows from the Mount Victoria sewerage system are summarised in Table 3.6 and shown on Figure 3.2.

**Table 3.6 - Sensitive areas potentially impacted by overflows within the Mount Victoria sewerage system**

| Sensitive area | Nature of sensitivity | Potential sources of impact* |
|---|---|---|
| Threatened species | 1. Species that are rare, endangered or threatened under the Threatened Species Conservation Act 1995 (refer to Section 3.3.1)<br>Fauna - Red-crowned Toadlet;<br>Flora - *Persoonia acerosa* and *Diuris aequalis* | 1. Exfiltration<br>2. Chokes<br>3. STP bypasses located near threatened species sites<br>4. Wet and dry weather overflows located near threatened species sites. |
| Blue Mountains National Park | 1. Protected under National Parks and Wildlife Act, 1974<br>2. Important flora and fauna habitat (refer to Section above)<br>3. Tourist and recreational value (refer to Section 3.2.4)<br>4. Classified waterways (refer to Section 3.2.2 and below)<br>5. Proposed World Heritage listing (refer to Section 3.3.3). | 1. Exfiltration from sewers bordering National Park<br>2. Chokes<br>3. SPS overflows located near National Park<br>4. STP discharge into National Park<br>5. Wet and dry weather overflows entering stormwater system which drains to National Park. |
| Blue Mountains streams and lakes | 1. Fairy Dell, Kerosene and Fairy Bower Creeks are classified as Class P. Head water of Victoria Creek is Class C and change to Class P upon entering the Blue Mountains National Park. Lake Burragorang is Class S (refer to Section 3.3.3)<br>2. Important aquatic habitats (refer to Section 3.3.1), such as the wetland along Kerosene Creek.<br>3. Tourist and recreational value (refer to Section 3.2.4). | 4. Exfiltration<br>5. Chokes<br>6. SPS 882 overflows into headwaters of Grose River<br>7. STP bypasses discharge into Fairy Dell Creek which flows into Kerosene Creek<br>8. Wet and dry weather overflows entering stormwater system which drains to streams and lakes |
| Environment Protection and Residential Bushland Conservation Zones | 1. Semi-natural bushland areas with environmental significance (refer to Section 3.3.3) | 1. Exfiltration<br>2. Chokes<br>3. Wet and dry weather overflows located near Conservation Zones. |
| Community Lands - Urban Conservation Zone | 1. Environmental and/or recreational value (refer to Section 3.3.3) These include areas such as Mount Victoria Sportsground and Fairy Bower Reserve. | 2. Exfiltration<br>3. Chokes<br>4. Wet and dry weather overflows located near Community Lands. |
| Sydney Water Special Areas - Lake Burragorang Special Area | 1. Protected under the Water Board (Corporatisation) Act, 1994 through Plans of Management (refer to Section 3.3.4) | 1. Exfiltration<br>2. Chokes<br>3. Wet and dry weather overflows located near these Special Areas. |
| Proposed Wilderness Area | 1. Proposed nomination of Grose River Valley, protected under the Wilderness Act 1987 (refer to Section 3.3.3). | 1. Exfiltration from carriers bordering Grose River Valley<br>2. Chokes<br>3. SPS 882 overflows draining to Grose River system<br>4. Wet and dry weather overflows located near Grose River system. |

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MOUNT VICTORIA SEWERAGE SYSTEM

FIGURE 3-2
SENSITIVE AREAS

It is not possible to accurately identify the sources or extent of impact on sensitive areas with the amount of data currently available. Hence a risk management approach has been adopted in order to identify priorities for overflow abatement measures. This is further discussed in Chapter 4.

Sensitive areas have been given special consideration within the EIS process so that options to mitigate impacts on these areas can be incorporated into overflow abatement strategies. Particular attention has been given to the identification and assessment of areas where overflow impacts may constitute a breach of legislation. Sensitive areas include:

1. sites containing species, populations, or ecological communities listed in Schedules 1 or 2 of the *Threatened Species Conservation Act (TSCA) 1995*, or critical habitat for such species
2. sites containing Aboriginal or non-Aboriginal cultural heritage sites or areas containing registered Aboriginal and non-aboriginal cultural heritage items or relics
3. legally protected conservation areas such as National Parks
4. waters classified under the *Clean Waters Act (CWA) 1970* as Class P (Protected) or Class S (Specially Protected)
5. Special Areas for the protection of drinking water supplies.

### 3.3.1 Threatened and vulnerable species

The potential for impacts on endangered or vulnerable species, populations and ecological communities has been assessed as part of this EIS under the requirement of the *TSCA 1995*. Endangered species, population and ecological communities are listed in Schedule 1 of the *TSCA 1995* while vulnerable species are listed in Schedule 2. The NPWS database of rare and endangered flora and fauna has been used to identify the locations where Schedule 1 or 2 species have been recorded in the Mount Victoria sewerage system.

Where potential for overflows to impact on Schedule 1 or 2 species has been identified, overflow abatement actions to eliminate the potential for impact have been incorporated into the abatement strategies (refer to Chapter 4). The need for further overflow abatement to protect endangered and vulnerable species will be evaluated based on the outcomes of performance assessment monitoring.

Threatened species found in the Blue Mountains GA are listed in Volume 2 Appendix D (Aquatic Flora and Fauna) and Appendix E (Terrestrial Flora and Fauna). High risk species are listed in Tables 3.14 and 3.16 of Volume 2. The definition of high and low risk species is defined in section 3.4 of Volume 2.

#### Flora

None of the threatened plant species recorded from the area served by the Mount Victoria sewerage system catchment are considered to be at high risk.

There are other threatened species recorded in the area served by Mount Victoria sewerage system, but these are considered to be low risk, and the impact of overflows on these species is likely to be insignificant.

#### Fauna

The following species listed in Schedules 1 or 2 of the *Threatened Species Conservation Act 1995*, or the critical habitat of high risk species (refer to Volume 2), are considered to be potentially impacted by overflows from the Mount Victoria sewerage system.

1. Giant Burrowing Frog
2. Golden-eyed Barred Frog
3. Red-crowned Toadlet
4. Blue Mountains Swamp Skink

There are other threatened species recorded in the area served by the Mount Victoria sewerage system, but these are considered to be at low risk, and the impact of overflows on these species in unlikely to be significant.

#### Significant habitats

There are several areas in particular which are potentially habitats for threatened species such as the Blue Mountains Swamp Skink. These areas are within areas potentially impacted by sewer overflows in which the impact upon these species could be high.

SPS 882, which is located in Harley Street, could overflow into a railway cutting that subsequently drains into the headwaters of the Grose River. There is an area of Blue Mountains Sedge Swamp located, between Victoria Creek and Fairy Bower Creek, to the east and below SPS 882. It is not known to what extent overflows from this SPS impact on this habitat.

The wetland located on Kerosene Creek could also provide valuable habitat for native flora and fauna and is potentially impacted from partially treated STP discharges flowing into Fairy Dell Creek.

### 3.3.2 Heritage

#### Aboriginal heritage

There are no Aboriginal sites recorded on the NPWS Aboriginal Sites Database (Refer Volume 2, Section 3.6.2 and Appendix G) within the area served by the Mount Victoria sewerage system, although not all Aboriginal sites are catalogued.

#### Non-Aboriginal heritage

There are many non-Aboriginal heritage sites listed within the vicinity of the Mount Victoria sewerage system (refer to Section 3.6.2, Volume 2). There does not appear to be a significant impact from overflows on these listed sites as they are not located directly within the pathway of sewerage overflows.

### 3.3.3 Legally protected conservation areas

Legally protected areas in the vicinity of the Mount Victoria sewerage system include:

1. Blue Mountains National Park
2. Blue Mountains streams and lakes (Classified Waters)
3. Blue Mountains City Council areas zoned “Environmental Protection” and “Residential Bushland Conservation”
4. Community lands
5. Proposed Blue Mountains Wilderness Area
6. Lake Burragorang Specially Protected Area for the protection of drinking water supply.

#### Blue Mountains National Park

The Blue Mountains National Park has been recognised as worthy of World Heritage Conservation Status. The Federal Government is currently considering an application for World Heritage nominated. Because of the very high environmental values required to achieve World Heritage listing, it is recognised that it is important to obtain and maintain ‘high water quality in these streams consistent with the needs for both conservation of aquatic environments and recreational enjoyment’ (Water Board 1991). Discharges from wet weather overflows, SPSs, chokes, exfiltration from reticulation may have potential impacts on the Blue Mountains National Park, mainly at a localised level as modelling suggests little regional effect.

#### Blue Mountains streams and lakes (classified waters)

All waterways affected by sewerage overflows the Mount Victoria sewerage system flow through the Blue Mountains National Park and are all classified under the *CWA 1970*. Detailed definitions of the Classified Waters and Special Areas are contained within Section 3.2.2.

The headwaters of Victoria Creek is outside the National Park boundary and is classified as Class C, Controlled Waters. Upon entering the National Park, the waterway is classified Class P. Fairy Bower, Fairy Dell and Kerosene Creeks, are classified as Class P as they are within the Coxs River catchment of Sydney's drinking water supply (Lake Burragorang).

Lake Burragorang is classified Class S, Specially Protected Waters. The impact of sewerage overflows on Lake Burragorang is considered low as it is a considerable distance (up to 50 kilometres) away from the sewerage system and dilution effects mitigate any associated health effects (Refer Section 3.2.4).

#### Blue Mountains City Council's Environmental Protection and Residential Bushland Conservation Zones

There are several areas zoned "Environment Protection" and "Residential Bushland Conservation" by the Blue Mountains City Council (BMCC) in the area served by the Mount Victoria sewerage system. These areas are zoned BC, RES-BC, REC-EP and EP and identify areas with special significance in the council area and are protected under the current Blue Mountains Local Environment Plan 1991. The potential impacts from sewerage overflows on these areas are from chokes, exfiltration, STP bypasses and SPS overflows.

#### Community lands

Community lands including parks and reserves are protected under a Community Land Plan of Management prepared by the BMCC. They are inclusive of areas such as Mount Victoria Sportsground and Fairy Bower Reserves. Sewerage overflows in the vicinity of these areas have the potential to cause high visual and recreational impacts. Sewerage overflows from chokes and exfiltration, may have potential impacts on these areas.

#### Proposed Wilderness Area

The Grose River Valley has been nominated as a proposed Wilderness Area by the Confederation of Bushwalking Clubs, NSW (refer Figure 3.2 for proximity of proposed Grose Wilderness Area to Mount Victoria). The land in the Grose River Valley is currently being assessed to determine whether it should be identified and declared as the Grose Wilderness under the *Wilderness Act 1977*. It is possible that sewerage overflows may impact the water quality in tributaries of the Grose River, in particular Victoria Creek, which flow into the proposed Wilderness Area. Although localised impacts close to the overflow locations may occur it is likely any impact on the Grose Wilderness Area will be minor due to the distance from the overflow locations. Wet weather modelling also suggests that impacts on a regional basis are minor.

## 3.4 Overflow ranking

### 3.4.1 Introduction

Methods to rank or prioritise overflow problems have been developed to address each of the overflow types identified in Chapter 2. These ranking and prioritisation methods were designed to assist with the comparison of overflow problems across Sydney Water's area of operations.

For wet weather overflows, a ranking method was developed based on the combined assessment of the magnitude of the overflow problem and the sensitivity of potentially impacted environments. This method, referred to as the 'wet weather overflow ranking method', was used to calculate ranking scores for three categories of modelled wet weather overflow:

1. wet weather overflows from designed structures
2. wet weather overflows from reticulation areas
3. partially treated STP discharges.

A similar ranking tool was developed for the assessment of overflows caused by SPS failure. Referred to as the 'SPS ranking method', it was designed to calculate ranking scores for individual SPSs based on the combined assessment of the asset quality, the magnitude of the overflow problem, and the sensitivity of potentially impacted environments.

To address the problems of choke-related overflows and exfiltration, a method was developed for the prioritisation of sewer inflow catchments. This method involved the determination of remediation priority rankings for inflow catchments based on the combined assessment of choke frequency, net infiltration/exfiltration (I/E), percentage rainfall ingress and the presence of sensitive areas.

The assessment of odour problems involved the ranking of sewered suburbs in terms of the frequency of odour complaints relating to sewerage system emissions.

The overflow types are ranked in descending order of the ranking score. The highest ranking is one, which has the highest potential risk. The overflow ranking assessment processes are described further below and full details are provided in the Methods document.

The results of each overflow assessment process have been used to assist with the development of overflow management strategies and the prioritisation of remediation actions (refer to Chapter 4). This section presents the results of overflow ranking and other problem assessment processes for the Mount Victoria sewerage system.

### 3.4.2 Wet weather overflow ranking

The wet weather overflow ranking method calculates ranking scores for modelled wet weather overflow nodes and ranks the overflows in descending order of these scores, within three discrete categories:

1. designed structure nodes
2. reticulation nodes
3. partially treated STP discharge nodes.

Within the Blue Mountains GA, only reticulation nodes and partially treated STP discharge nodes were modelled. Comparisons of ranking and scores should not be made between wet weather overflow categories because of the distinctly different characteristics of the respective overflow nodes.

Reticulation nodes represent a modelled inflow catchment for a sewer reticulation area and discharge data for a node represents the sum of untreated wet weather discharges which may occur anywhere within that inflow catchment. Modelled nodes in the partially treated STP discharge category represent wet weather STP discharges which receive a reduced level of treatment (refer Section 2.4.2).

Wet weather overflow rankings are designed to reflect the magnitude of environmental impacts which could result from a wet weather overflow event. Wet weather overflow ranking scores are calculated as the sum of an overflow score (based on assessment of overflow volume and frequency) and an environmental sensitivity score (based on the potentially impacted environment). The environmental sensitivity score is determined via the assessment and scoring of three component environmental dimensions - aquatic ecosystems, terrestrial ecosystems and human health - and is taken as the highest score obtained for any one dimension.

For the Mount Victoria sewerage system wet weather overflow modelling was performed for one reticulation node. The wet weather overflow ranking results for Mount Victoria sewerage system indicates that it was the lowest within the GA area and ranked 21st on a Sydney Wide basis. The results of wet weather ranking for these nodes are summarised in Table 3.7. A complete list of wet weather ranking results for the Mount Victoria sewerage system is provided in Volume 3 Appendix C.

Mount Victoria STP received the highest ranking of the Blue Mountains systems and the highest ranking on a Sydney Wide basis for partially treated STP discharges, due to the potential to impact on classified waters and critical habitats that are protected under the *TSCA 1995*. The receiving waterway (Fairy Dell Creek) is a Class P waterway which is a part of the Coxs River system which eventually flows into Lake Burragorang.

Individual areas were assessed on the potential impact from overflows and flagged as below:

1. threatened species occurring with the boundaries of the impacted ecosystem, and have the potential to be adversely affected by overflows (TSCA1)
2. threatened species occurring with the boundaries of the impacted ecosystem, but have no potential to be adversely affected by overflows (TSCA2)
3. overflows discharging to Class S or P waterways (CSA1)
4. overflows which do not discharge to Class S or P waterways, but which have the potential to adversely impact on Class S or P waterways (CWA2).

Full details of the wet weather overflow ranking method are provided in Attachment D of the Methods document. The complete results of wet weather overflow ranking for the Sydney region are presented in Volume 1 Appendix G.

These wet weather overflow ranking results have been used to assist with the overflow problem definition for the Blue Mountains GA (refer to Section 3.8, Volume 2). Appendix C contains a complete list of scores and the corresponding reasoning for all overflows in the system.

### 3.4.3 SPS ranking

The SPS ranking method calculates ranking scores for individual SPSs then ranks the SPSs in descending order of these scores. SPS rankings are designed to reflect the magnitude of the problem relating to overflows caused by SPS failure.

Where operational failures are predicted to result in overflow, the individual SPS ranking score is calculated as the sum of three scores:

1. an asset score (based on assessment of asset quality and the likelihood of operational failure and overflow)
2. an overflow score (based on assessment of overflow volume and frequency)
3. an environmental sensitivity score (which is determined as described for wet weather overflows in the previous section).

For SPSs where operational failures are predicted to result in overflow, the individual SPS ranking score is calculated as the sum of three scores - an asset score (based on assessment of asset quality and the likelihood of operational failure and overflow), an overflow score (based on assessment of overflow volume and frequency) and an environmental sensitivity score (which is determined as described for wet weather overflows in the previous section).

In addition to the wet weather flagging system, the SPS flagging system also includes the flagging in the following categories:

1. SPSs with no telemetry (T1)
2. SPSs without fail safe 'Above Top Water Level' (AWTL) alarm activation (A1)
3. SPSs with an ineffective contingency plan (C1).

For SPSs where operational failures are not predicted to result in overflow, the individual SPS ranking score is calculated as the sum of the asset score and overflow score only.

Full details of the SPS ranking method are provided in Attachment C of the Methods document and the complete results of SPS ranking for the Sydney region are presented in Appendix G, Volume 1.

The one SPS in the Mount Victoria sewerage system (SPS 882) was ranked 44$^{th}$ out of the 68 SPSs in the Blue Mountains GA. Its low rank is due to the containment provided at the SPS (refer Table 3.8).

### 3.4.4 Prioritisation of sewer inflow catchments in terms of choke and leakage problems

The first step in the process of prioritising sewer inflow catchments involves the determination of inflow catchment classifications for leakage severity based on the combined consideration of percentage rainfall ingress and net I/E. The second step in the process involves the determination of initial inflow catchment rankings based on the combined consideration of leakage severity and choke frequency. The final step in the process involves the modifications of initial rankings based on the presence of sensitive areas.

The inflow catchment priority rankings are designed to provide an indication of the need for remediation and to assist with the allocation of investigation priorities. The priority ranking ranges from one to five with one being the highest priority. Full details of the inflow catchment prioritisation process for choke and pipe leakage problems are provided in Attachment A of the Methods document.

The complete results of inflow catchment prioritisation for choke and pipe leakage problems across the Sydney region are presented in Appendix G, Volume 1.

Within the Mount Victoria sewerage system, there is one inflow catchment which has moderate exfiltration potential, low (up to 10%) rainfall ingress, low choke density and an initial priority ranking of four. In the first instance the extent of the infiltration/exfiltration problem will need to be defined by further monitoring of the areas for water quality impacts. Priorities for remediation will then be able to be applied depending upon the environmental sensitivity of the affected area. These inflow catchment prioritisation results have been used to assist with the overflow problem definition for the Blue Mountains GA (refer to Section 3.8, Volume 2).

### 3.4.5 Odour problem assessment

Sewered suburbs have been ranked in terms of frequency of odour complaints relating to sewerage system emissions. There was one odour complaint recorded in the area served by the Mount Victoria sewerage system, which is considered to be insignificant compared with the rest of the Blue Mountains GA and the Sydney region.

**Table 3.7 - Summary of wet weather overflow ranking results for modelled reticulation areas in the Mount Victoria sewerage system**

| Reticulation Area/Inflow Catchment | | Impacted REZs | Overflow Ranking | | | Scores | | | Flags[2] | Potential to Impact Sensitive Area (Y/N) |
|---|---|---|---|---|---|---|---|---|---|---|
| Model Node Number | Location | | System | GA | Sydney Wide | Overflow Discharge | Environmental Sensitivity | Overflow Ranking Score[1] | | |
| MV | Mount Victoria | Blue Mountains, Lake Burragorang | 1 | 6 | 21 | 2.5 | 48 | 50.5 | TSCA1, CWA1 | Yes |

Note: 1. Wet weather overflow ranking score = overflow score + environmental sensitivity score

2. TSCA1 - The potentially impacted area contains a high risk, threatened and vulnerable flora or fauna species listed under the *TSCA 1995 (refer to Section 3.3.1)*

CWA1 - The reticulation node discharges to a Class S or P waterway

**Table 3.8 - Summary of SPS ranking results for the Mount Victoria sewerage system**

| SPS | Location | Impacted REZs | SPS Ranking | | | Scores | | | | Flags | Potential to Impact Sensitive Area (Y/N) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | System | GA | Sydney Wide | Asset | Overflow Discharge | Environmental Sensitivity | SPS Ranking Score[1] | | |
| 882 | Mount Victoria | Blue Mountains | 1 | 44 | 343 | 12 | 9 | - | 21 | - | No |

Note: 1 SPS ranking score = overflow score + environmental sensitivity score

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# Chapter 4

# System Overflow Management Strategy

# Synopsis

The environmental objectives and values for the Blue Mountains GA identified in Volume 2 have been used to assist in the evaluation and selection of a strategy to protect the Blue Mountains from overflows from the Mount Victoria sewerage system. This chapter describes the actions for the Mount Victoria sewerage system that form part of the overflows strategy for the Blue Mountains GA. Options have been evaluated for each of the five overflow types to ensure an acceptable performance standard is maintained.

The impacts of overflows from the Mount Victoria sewerage system are localised in nature. The overflow abatement strategy is therefore focussed on protection of the identified sensitive areas.

Water quality modelling of the Grose River has identified that the major sources of pollution is stormwater (urban and rural run-off). Modelling has indicated that removal of all wet weather overflows does not result in significant improvement in water quality compared to the minimum performance objectives abatement level (maintaining current system performance).

A preferred wet weather option of ten events in ten years was selected for the Blue Mountains GA. The Mount Victoria sewerage system is currently performing at a higher standard than this option and therefore the current performance will be maintained (base case). Wet weather overflows will be maintained at the existing level of six events in ten years. Structural options for overflow abatement will be assessed as part of the second stage detailed EIA process.

Best Management Practices will continue to be updated and implemented for all sewerage systems as part of the overflows management program and the continuous improvement process. Additional monitoring has been recommended to better characterise the locations and extent of impacts from overflows.

The overflow abatement actions have been integrated to form a management plan for the Mount Victoria sewerage system. Management practices will be updated and implemented as part of the continuous improvement program. The total cost of the management plan is estimated to be $910,000 over the next 25 years.

# 4. System overflow management strategy

## 4.1 Overflow abatement objectives

There are three requirements which define the overflow abatement objectives. They are:

1. long term corporate performance targets, covering the whole of Sydney Water's service area
2. minimum performance objectives (the base case)
3. environmental objectives for the GA, as discussed in Volume 2.

These requirements were applied to each type of overflow, and the most stringent requirements were adopted as abatement objectives for the Mount Victoria sewerage system due to the sensitivity of the area. The contribution of the Mount Victoria sewerage system to achieve the Sydney wide long term performance targets is also discussed.

### 4.1.1 Sydney wide long term performance targets

Sydney Water has adopted long term objectives for the performance of the total sewerage asset across its area of operation, as listed in Table 4.1. Further details are included in Volume 1.

**Table 4.1 - Sydney wide long term performance targets**

| Overflow Type | Long Term Objective |
|---|---|
| Discharge through overflow structures | 80-90% reduction in events per 10 years average across Sydney in wet weather<br>15 discharges per year across Sydney in dry weather |
| Surcharges due to chokes | No internal surcharge due to Sydney Water capacity in wet weather<br>Less than 10 internal surcharges per year due to Sydney Water across Sydney in dry weather.<br>>96% of customers experience no surcharges<br>Individual customers experiencing > two events in six months guarantee no repeat for two years<br>All suburbs are in the low choke category (less than 60 chokes a year) |
| Partially treated STP surcharge | STP discharge will not cause receiving water to exceed swimming criteria in wet weather. |
| Exfiltration | Will not cause dry weather failure of swimming/boating criteria. |
| Odour | eliminate repeat offensive odours |

### 4.1.2 Minimum performance objectives (base case)

The minimum performance objectives for each overflow type are to maintain the current system performance in 2021. In other words, the minimum performance objectives require that growth in the catchment will not cause deterioration in the system performance. The minimum performance objectives for the Mount Victoria sewerage system are shown in Table 4.2.

**Table 4.2 - Compliance of the Mount Victoria sewerage system with minimum performance objectives**

| Overflow type | Minimum performance objectives | Current performance of Mount Victoria sewerage system |
|---|---|---|
| Wet weather overflow | Maintain the number of modelled overflow events per 10 years | 6 |
| Overflows due to chokes | Maintain the number of high choke suburbs | 0 |
| | Maintain the number of medium choke suburbs | 0 |
| SPS failure | Maintain the number of individual SPS overflow events | 6 |
| Exfiltration | Maintain the number of gauging catchments with high likelihood of exfiltration | 0 |
| | Maintain the number of gauging catchments with medium likelihood of exfiltration | 1 |
| Odours | Maintain the number of odour events per sewerage system | 1 |
| Partially treated STP discharges | STP wet weather discharges will receive at least effluent screening and full disinfection for all flows up until the first overflow operates in the system | 60 (base case requires same overflow frequency as reticulation, that is 6 in 10 years) |

### 4.1.3 Environmental objectives

Environmental and overflow abatement objectives have been identified for the Blue Mountains GA in Volume 2 of this EIS. The benefits and costs of additional overflow abatement levels (above the base case) have been evaluated and the most appropriate overflow abatement strategy selected.

The main focus of the environmental objectives discussed in Volume 2 is the adoption of wet weather containment limiting the frequency of wet weather overflows and partially treated STP discharges to ten in ten years. Given the limitations of the predictive modelling and water quality monitoring to date, this objective is considered a precautionary approach with the level of containment being adopted to satisfy community expectations for the environmental quality of the Blue Mountains, protection of drinking water catchments and classified waters and the principles of ESD. The data available suggest that overflows do not cause a significant catchment wide impact, therefore the strategy for the Mount Victoria sewerage system incorporates localised abatement actions.

## 4.2 Objectives for the Mount Victoria sewerage system

This section defines the overflow abatement objectives for each overflow category as required by:

1. the Sydney wide long term performance targets
2. the minimum performance objectives (base case)
3. the outcomes of the assessment of the Blue Mountains GA in Volume 2
4. the protection of sensitive areas
5. and interim programs including the SPS risk reduction program and the I/E program.

### 4.2.1 Wet weather overflows

Modelling indicates that although the Mount Victoria system has the capacity to handle all dry weather flows, the system overflows, on average, six times in a ten year period, (once every 20 months). The wet weather model attempts to quantify the frequency (events/ten years) quantity (volume/ten years) and duration of wet weather overflows and estimate the cost of reducing the frequency of pre-determined containment level (refer to Methods document).

The overflows occur as a result of the high levels of inflow and infiltration during wet weather and insufficient wet weather capacity of the system. Without improvements, the increased loads as a result of population growth in the catchment would increase the number of overflow events to ten in ten years by 2021. To achieve the minimum performance objective (no increase in number of events), system improvements are required (such as I/I reduction).

The minimum performance objectives (to maintain the number of wet weather events at six overflows in ten years), are more stringent than the preferred option for the GA (10 overflows in ten years). As the minimum performance objectives are considered acceptable on an environmental impact basis, this target is therefore adopted for Mount Victoria sewerage system.

### 4.2.2 Partially treated STP discharges

The Mount Victoria STP is located in a sensitive area, and the treated effluent is discharged to Fairy Dell Creek (Class P waterway), a tributary of the Coxs River.

For current containment performance (Chapter 2), all events where less than full treatment occurs are given in Table 2.10, regardless of the disinfection performance. This may considerably overstate the actual number of events when partially treated discharges are deemed to be sewerage overflows (that is when they exceed 150 cfu per 100 millilitres).

Future containment performance goal (Chapter 4) requires that only those events that will exceed 150 faecal coliforms per 100 millilitres will be considered as overflows from STPs. The future containment performance may be achieved by either storage or disinfection.

The minimum performance objectives requirement, to achieve a rate of partially treated STP discharges at six overflows in ten years (the rate of wet weather reticulation overflows), is better than the preferred option for the GA of ten overflows in ten years. The minimum performance objectives target is therefore adopted for Mount Victoria sewerage system. This is a significant reduction of 90% from the current frequency of 60 discharges in ten years.

By achieving a six event per ten year target for partially treated STP discharges and system overflows will mean that partially treated STP discharges will not have an effect on primary recreation criteria due to the low number of occasions that they will occur and their highly diluted state. Other sources such as urban stormwater runoff will still affect these criteria.

### 4.2.3 Surcharges due to chokes

The Mount Victoria sewerage system generally meets all the Sydney wide long term performance targets as follows:

1. internal surcharges - no occurrences of internal surcharges are known
2. the percentage of customers not affected by surcharges (99.8%) is well above the long term objective (96%)
3. individual customers experiencing >two events in six months are guaranteed no repeat in two years. While data is not directly available, it is likely that this target is met in the Mount Victoria sewerage system due to the low rate of chokes
4. the rate of chokes in Mount Victoria is less than 60 chokes per 100 km per year (low rate).

Therefore as the current performance on choke related discharges is good, the future performance should be monitored for appropriate action to maintain this current level.

### 4.2.4 Exfiltration

The Mount Victoria sewerage system was investigated as one inflow catchment in the Sewer Leakage Project. The investigation indicated that Mount Victoria has a moderate potential for exfiltration.

The Sydney wide long term performance target is to avoid failure of swimming and/or boating water quality criteria in dry weather. Further water quality monitoring is required to establish if exfiltration causes an impact on receiving waters. It is recommended that all catchments be placed on the I/E program. If investigations indicate an exfiltration problem, the program will recommend system rehabilitation to ensure that the Mount Victoria sewerage system performs in accordance with the long term performance target.

### 4.2.5 Overflows caused by SPS failures

SPS 882 is predicted to overflow six times per year as a result of a failure (eg. power failure, pump breakdown).

Generally, SPS 882 complies with design criteria currently adopted for new SPSs in the Blue Mountains, except for lack of an overflow structure and provision for connecting a generator. Therefore it is recommended that SPS 882 be modified to incorporate an appropriately designed overflow structure to ensure that overflows are directed to an appropriate location to minimise impact.

### 4.2.6 Odours

The average number of odour complaints in the Mount Victoria sewerage system is for 1996-97 is one per year. The minimum performance objective (base case) is to maintain the number of complaints at this rate. This requirement is more stringent than the Sydney long term performance target (three complaints per year for individual assets). The strategy adopted for odour containment in Mount Victoria is therefore a maximum of one complaint per year.

### 4.2.7 The strategy for the Mount Victoria sewerage system

Table 4.3 summarises the specific strategy adopted for the Mount Victoria sewerage system to meet the above objectives.

**Table 4.3 - Summary of the strategy for the Mount Victoria sewerage system**

| Overflow type | Adopted strategy |
|---|---|
| Wet Weather overflows | Maximum of 6 events in 10 years |
| Partially treated STP bypass | Maximum of 6 events in 10 years |
| Choke related overflows | Maintain chokes at low range |
| Exfiltration | Rehabilitate medium exfiltration catchments to low exfiltration catchments |
| Overflow caused by SPS failures | SPS to comply with design standards for new SPSs |
| Odours | Maximum one odour complaint per year |

## 4.3 Actions to achieve overflow abatement strategy

The abatement of sewer overflow impacts can be accomplished by undertaking a variety of actions such as increasing sewer capacity, relocation of overflow online and offline storage, demand management and inline treatment. For this project, each of these ways has been termed an action. The selected actions make up the strategy for the Mount Victoria sewerage system (refer to Table 4.3) , as described in the following section.

It is important to note that the actions described in this EIS are only indicative of the measures that may be used. These actions will be decided following more detailed modelling and environmental monitoring, with final actions being decided during the second stage Environment Impact Assessment (EIA), which will look specifically at the impacts of implementing structural works arising from the actions selected for specific locations.

Actions fall into three general categories:

1. Detect overflows - improve information on prediction of overflows, impact of overflows and identifying and recording overflows and their impact.
2. Prevent overflows - prevent or reduce the frequency of overflows.
3. Minimise impact - reduce the impact of overflows once they occur.

The proposed actions for each type of overflow are discussed, including reference to the minimum requirements specified by USEPA (USEPA 1996) which is a recognised international benchmark for operation of sewerage systems.

### 4.3.1 Wet weather overflows

Wet weather overflows are surcharges from the reticulation system (including SPSs) due to excess inflow of stormwater and/or insufficient wet weather capacity. Overflows from a SPSs during wet weather are also addressed in Section 4.3.5. Further investigation is required to fully define the extent of impacts, therefore the actions are aimed at improving the data available.

Actions to achieve the wet weather overflow strategy include:

1. Detection of overflows
   - Conducting more comprehensive sewer and water quality modelling. The current sewer modelling (Sydney Water 1997a, 1997b, 1997c) is likely to under-estimate the overflow events because the system was modelled as a single node. In addition, no allowance was made for the significant tourist population during weekends and holiday periods. Additional modelling should include the SPSs, allow for tourist populations and provide more accurate data for water quality modelling such as volumes discharged at specific locations, to better predict the performance of the system.
   - Recording details of overflows in the overflow database. Predictions of overflows from the sewer modelling need to be supported by records of actual overflow events and correlated with actual rainfall events. The actual record of the overflows is required to measure the performance of the system against the adopted strategy.
   - Improving water quality data through additional monitoring and modelling, especially in local streams to identify and evaluate the relative impacts of overflows.
2. Prevent overflow
   - Reduction of overflow frequency by either reducing infiltration and inflow (I/I), increasing the system capacity, providing storage for the excess flow, or a combination of these actions. The actual method will be determined following further data collection and interpretation. The wet weather modelling (Sydney Water 1997a) and subsequent estimates indicate that the cost of reducing the number of overflow events to ten in ten years is in the order of $5.4 million, based on a combination of I/I reduction and increased system capacity.
   - Identifying the impact (if any) of wet weather overflows from private properties. Private sewers (the section of the sewer from the boundary trap to the private residence or commercial/ industrial facility) can contribute some of the inflow and infiltration. It is possible that reducing I/I from private sewers is more cost effective than reducing it from Sydney Water sewers.

     Sydney Water has no authority over the private sewers. It is possible to implement a 'pink slip' system, requiring property owners to carry out a compulsory inspection of their private sewer periodically, or when the property is sold. This would identify is private sewers are a problem. Such an action will require changes to legislation.
   - Augmenting sewers to accommodate growth. Sewer modelling suggests that wet weather overflows will increase from six events in ten years to ten events in ten years by 2021 if the system is not augmented. While remediation works to control I/I will reduce the future flow frequency, it is expected that the system capacity will need to be augmented to allow for population growth in the catchment. The extent of the required augmentation is presently being investigated by Sydney Water.
   - Investigating ways to improve sewer design and installation to prevent I/I in new areas
3. Minimising impact of overflows
   - Continue ongoing improvements on current procedures such as cleaning the site after the overflow event, including removal of visual debris and flushing the area with fresh water.

The actions for addressing wet weather overflows are summarised in Table 4.4.

**Table 4.4 - Actions to detect, prevent and minimise the impact of wet weather overflows**

| Category | Actions | Benefits | Relevant USEPA requirement |
|---|---|---|---|
| Detect overflows | Additional sewer and water quality modelling | More accurate prediction of overflows and their impact | A process must exist for identifying overflows |
| | Improve procedures to record overflows | Confirm modelling results<br>Confirm compliance with strategy | A summary description of known overflow events occurring in the last 24 months<br>Monitoring to effectively characterise overflow impacts and the efficiency of overflow controls |
| | Improve procedures for collection of water quality data | Understand impact of overflows | Monitoring to effectively characterise overflow impacts and the efficiency of overflow controls |
| Prevent overflows | Reduce I/I | Reduce the flow in sewers during wet weather to achieve the adopted containment level | Pro-active maintenance in known problem areas including: proper sealing or maintenance of access chambers, regular maintenance of deteriorating sewers remediation of poor construction a long term replacement or rehabilitation program |
| | Consider options for compulsory inspection of private sewers by property owners | Reduce flow in sewers | As above |
| | Augment system for additional population | Avoid further overloading of the existing system | Maximisation of flow to the STP for treatment |
| | Improve sewer design and installation | Avoid I/I in new areas | Procedures must be developed for new sewer and service lateral installation to the system |
| Minimise impact | Continue containment of overflows | Prevent sewage from reaching water courses | Pollution prevention |
| | Continue cleaning after overflow | Reduce visual impact and risk to public health | Procedures must exist to stop and respond to overflow events |

### 4.3.2 Partially treated STP discharges

Actions to achieve the partially treated STP discharge strategy include:

1. Detection of discharges
   - Monitoring of partially treated STP discharge through the STP Licence. Predictions of overflows from the STP modelling need to be supported by recording actual overflow events. The actual recording of the overflows including disinfection performance of the STP is required as a condition of the STP Licence. The continued monitoring of effluent quality and gauging of flows through the STP will be needed to measure the performance of the system against the adopted strategy.
   - Investigating impact of partially treated discharges on receiving water quality by detailed water quality modelling, to determine what additional containment or disinfection, if any, is required to meet the long term objective of not exceeding swimming criteria in the receiving water.

2. Prevent discharges
   - Provide more storage at the STP to store excess flow for treatment during wet weather. This action is estimated to have a similar cost to disinfection of bypassed flow, but has the potential to provide a higher level of environmental protection, as all flows up to the target of six events/10 years will receive full treatment.
   - An investigation is under way to review long term options for Mount Victoria STP, such as transfer of sewage to Blackheath for treatment. This project is not part of the overflow abatement program and will be funded from other sources.
   - Reduction of infiltration and inflow (as part of actions to reduce wet weather overflows strategy) will reduce the flow into the STP, and reduce partially treated STP discharge frequency.

Actions to address partially treated STP discharges are listed in Table 4.5.

**Table 4.5- Actions to detect and prevent partially treated STP discharges**

| Category | Actions | Benefits | Relevant USEPA requirement |
|---|---|---|---|
| Detect discharges | Record overflow events and disinfection performance | Confirm modelling results | A summary description of known overflow events occurring in the last 24 months |
| | Model impact on receiving waters | Meet Sydney wide long term performance target | Monitoring to effectively characterise overflow impacts and the efficiency of overflow controls |
| Prevent discharges | Provide additional storage at STP | Store excess wet weather flow and provide full treatment after wet weather | Measures to stop and mitigate the impact of overflow events |
| | Reduce flow to STP (part of other strategies, such as I/I reduction) | Reduce flow to the STP during wet weather | Refer to table 4.4 |

### 4.3.3 Surcharges due to chokes

Under normal operating conditions the Mount Victoria sewerage system has sufficient hydraulic capacity to transport both existing and future dry weather flows to the STP. However surcharges from the sewerage system occur during dry and wet weather as a result of chokes.

The Mount Victoria sewerage system has a low density of chokes. It is not proposed to implement improvements to the pipe network in order to reduce chokes. It is proposed, however to improve some of the management systems by applying non-structural actions. The frequency of chokes will be monitored, and if it increases above the low density (more than 60 chokes/100 km per year), pipe rehabilitation may be required.

It is noted that grouting and relining of pipes, that may be adopted to reduce wet weather overflow, will also reduce choke related overflows.

Actions to achieve the choke related overflow strategy include:

1. Detect surcharges
   - Record choke related overflows. This will enable Sydney Water to monitor the performance of the system against the adopted strategy.
   - Continue to improve the methodology for identifying repeat chokes. The Sydney long term objective guaranteeing no surcharges for two years to customers who experienced requires that repeat chokes are monitored.
   - Develop a model for assessing cost and repeat chokes benefits. Develop methodology for identifying the effectiveness and quantifying the cost and benefits of the methods to reduce

chokes, such as proactive root cutting in reticulation pipes, grouting and relining. This will enable Sydney Water to adopt the most cost effective method, and to budget for choke reduction.

2. Prevent surcharges

As Mount Victoria has a low density of chokes, no actions are required to further reduce overflows. The performance of the system will be monitored through the database (item 1.1 above), to ensure it does not deteriorate. Management practices to prevent overflows include:

- Encourage planting of trees with minimal root invasion. Develop community education program on best species to plant. Approximately 90 percent of the chokes are caused by intrusion of tree roots into the sewer. There is an opportunity for long term reduction in chokes by encouraging the public, local council and developers to plant trees with less intrusive root systems.
- Should the choke density exceed 60 per 100 km per year, inspection and proactive root cutting (before they cause overflow) will be adopted to reduce the overflow frequency.

3. Minimise impact of surcharges

- Improve public reporting on chokes. Sydney Water relies heavily on public reporting of chokes, but it is possible that overflows in roads or other public areas may not be reported promptly. An education campaign to encourage the public to report overflows will improve reporting, reduce Sydney Water response time and reduce the impact of overflows.
- Continue with current procedures of containing overflows by bunding the area; returning the sewage to the sewer, and/or pumping the sewage to a road tanker and transporting it to other parts of the system until the choke is cleared.
- Continue with current procedure of cleaning the site after the overflow, including removal of visual solids and flushing the area with fresh water.

The actions are summarised in Table 4.6.

**Table 4.6 - Actions to detect, prevent and minimise the impact of choke related overflows (surcharges)**

| Category | Actions | Benefits | Relevant USEPA Requirement |
|---|---|---|---|
| Detect surcharges | Improve recording of choke related overflows and their impact | Enable assessment of the impact of chokes<br>Ensure that the strategy is met. | A summary description of known overflow events occurring in the last 24 months |
| | Improve methodology for identifying repeat chokes | Meet Sydney wide long term performance target | As above |
| | Develop model for assessing the cost and benefits of options | Enable Sydney Water to prioritise abatement targets | |
| Prevent surcharges | Public education for appropriate tree planting (including Councils and developers) | Long term reduction in root intrusion | |
| | Proactive root cutting in reticulation pipes in areas of high choke rates if chokes exceed 60 per 100 km per year in the future | Reduction in choke incidents | Pro-active maintenance in known problem areas including:<br>regular maintenance of deteriorating sewers<br>remediation of poor construction<br>a long term replacement or rehabilitation program |
| Minimise impact | Improve public reporting | Prompt reporting will reduce the duration and impact of overflows | A process must exist for identifying overflows |
| | Continue with containment of overflow | Prevent sewage from reaching water courses | Pollution prevention |
| | Continue cleaning after the event | Reduce visual impact and risk to public health | You must have procedures to stop and respond to overflow events |

### 4.3.4 Exfiltration

Sydney Water has established an interim infiltration/exfiltration (I/E) program, separate to SOLP, as described in Chapter 4.4. The program is designed to investigate the impacts of exfiltration and options to reduce exfiltration when it is detected.

The two parameters used to assess the performance of the system with respect to exfiltration are the leakage indicator and environmental indicator (of dry weather water quality where available). Table 4.7 shows the process for identifying and developing actions for exfiltration.

The leakage analysis identified the Mount Victoria sewerage system as having moderate exfiltration potential. The limited water quality monitoring data does not indicate pollution by faecal coliform bacteria. The Mount Victoria system therefore falls into category (2) of the action matrix (refer to Table 4.7).

**Table 4.7 - Action matrix for exfiltration**

| Leakage Indicator/ Environmental Indicator | Leakage OK | Leakage analysis indicates exfiltration |
|---|---|---|
| Indicator OK | Category 1<br>No action required - routine review of leakage indicator only | Category 2<br>Undertake routine dry weather sampling if no water quality data available. No further action required if dry weather water quality data complies with water quality objectives |
| Indicator above threshold ie. median > 1000 cfu/ 100 ml - secondary recreation, median > 150 cfu/100 ml - primary recreation) | Category 3<br>Investigation as to source of contamination - Catchment to I/E Program if no other major sources are identified | Category 4<br>Catchment to I/E Program for initial investigation at mini-catchment gauging level |

Actions to achieve the exfiltration strategy include:

1. Detect exfiltration
   - Monitoring of water quality of streams during dry weather to detect exfiltration leakage from nearby systems.
2. Prevent exfiltration
   - If there is evidence from water quality monitoring that exfiltration is impacting on water quality objectives then the section of system will be included on the I/E program on a priority basis across Sydney Water catchments.
3. Minimise impact of exfiltration
   - Actions will arise after investigation through I/E program

The actions are summarised in Table 4.8.

**Table 4.8 - Actions to detect, prevent and minimise the impact of exfiltration**

| Category | Actions | Benefits | Relevant USEPA requirement |
|---|---|---|---|
| Detect exfiltration | Record exfiltration occurrences and other relevant data (eg. water quality) | Enable assessment of the impact of exfiltration. Ensure that the strategy is met | A summary description of known overflow events occurring in the last 24 months |
| | Monitor water quality in local water courses | Identify impacts | A process must exist for identifying overflows |
| Prevent exfiltration | If exfiltration identified (refer to detect exfiltration above), proceed with pipe rehabilitation under the I/E program | Seal pipes to prevent escape of sewage | Pro-active maintenance in known problem areas including:<br>regular maintenance of deteriorating sewers<br>remediation of poor construction<br>a long term replacement or rehabilitation program |
| Minimise impact | Implement actions from I/E program | As above | As above |

## 4.3.5 Overflows caused by SPS failures

In addition to overflows from SPS during wet weather, overflows from SPSs in the Mount Victoria sewerage system are caused mainly from failure of equipment and power interruptions. Insufficient storage capacity and lack of standby pumps in some of the SPSs means that overflows occur before maintenance personnel can arrive on site.

Actions to achieve a reduction in SPS related overflows include:

1. Detection of overflows by
   - Recording overflows caused by SPS failures. This will provide an indication of the environmental impact of SPS failures and enable Sydney Water to monitor the performance of the system.
   - Regularly reviewing the pumping capacity and storage capacity of the SPS, to ensure capacity is adequate, as sewage loadings increase.
2. Prevention of overflows by
   - Provision for connecting a portable generator. Sydney Water uses a portable generator to operate SPSs in case of power interruption, but SPS 882 in Mount Victoria has no provision to connect a portable generator. This is particularly important in the Blue Mountains, where the high potential for lightning strike which can cause power interruptions.
   - Continue with frequent flushing of SPS. Due to the low temperature in the Blue Mountains, grease/fat can accumulate in the SPS and block the pumps which causes overflows. Sydney Water has already adopted maintenance procedures that include frequent flushing of the SPSs in the Blue Mountains to remove the grease/fat. It is recommended that these measures continue.
   - Improve and upgrade telemetry. Sydney Water is in the process of upgrading the telemetry to a SCADA system that will provide reliable information on failures or abnormal conditions, and enable remote control and monitoring of the SPS.
3. Minimising the impact of overflows by
   - Installing an overflow pipe with a litter and grease removal pit at SPS 882. This will direct the overflow away from sensitive areas, with a pit to screen overflow and contain grease and litter, to minimise the visual impact of overflows and improve water quality.
   - Continuing with current procedures of containing overflows by bunding the area; returning the sewage to the sewer and/or pumping the sewage to a road tanker and transporting it to other parts of the system until the problem is fixed.

- Continuing with current procedure of cleaning the site after the overflow, including removal of visual solids and flushing the area with fresh water.
- Regularly updating contingency plans for the SPS. SPS 882 has a contingency plan, that should be updated regularly to ensure that it reflects current practice.
- Advising the public in case of a major overflow that may affect amenity of tourist destinations.

The options to reduce overflows from SPS 882 are summarised in Table 4.9.

**Table 4.9 - Actions to detect, prevent and minimise the impact of overflows due to SPS failures**

| Category | Actions | Benefits | Relevant USEPA Requirement |
|---|---|---|---|
| Detect surcharges | Improve recording of overflows caused by SPS failures and their impact | Enable assessment of the impact of overflows | A process for identifying overflows must exist |
| | | Monitor system performance | A summary description of known overflow events occurring in the last 24 months |
| | Regularly review SPS capacities | Ensure that SPS can transfer flows | |
| Prevent overflows | Install provision for connecting standby generator | Reduce the risk of overflow in case of power interruption | Prohibition of overflows during dry weather |
| | Continue with frequent flushing of SPSs to prevent grease/fat accumulation | Reduce the risk of overflow from grease/fat blocking the pumps | Operation and maintenance programs must be provided for pump stations |
| | Continue to upgrade telemetry | Reduce the risk of overflow | A process must exist for identifying overflows |
| Minimise impact | Install overflow structures and litter and grease pits at SPS 882 | Direct overflow to a point of less impact, and reduce visual impact | Control of solid and floatable materials in overflows |
| | Continue with containment of overflow | Prevent sewage from reaching water courses | Pollution prevention |
| | Continue cleaning after the event | Reduce visual impact and risk to public health | Procedures must exist to stop and respond to overflow events. Measures to stop and mitigate the impact of overflow events |
| | Regularly update contingency plan | Improve response in case of failure | As above. |
| | Inform public of major pollution events | Reduce impact on community | Public notification to ensure that the public receives adequate notification of overflow occurrences and impacts |

### 4.3.6 Odours

Due to the low number of odour complains (one per year), there are no specific engineering works required to reduce odours from the Mount Victoria sewerage system. Odours can only be addressed after a complaint and hence community reporting should be encouraged. Actions to reduce the volume of liquid overflows and chokes will also have a complimentary effect on odour generation. Actions to achieve the odour strategy are:

1. Detection of odours
   - Record odour complaints. Improve methodology of identifying odour complaints related to liquid or non-liquid overflows. This will indicate the impact of overflows and enable monitoring of the performance if the system against the strategy
   - Develop method to identify the effectiveness and quantity costs and benefits of odour reduction methods such as pro-active flushing of sewers to remove fat deposits. This will enable Sydney Water to adopt the most effective action and prioritise odour reduction methods.
2. Prevention of odours
   - If the rate of odour complaints exceeds one per year; methods identified will be implemented

The actions to reduce odours are summarised in Table 4.10.

**Table 4.10 - Actions to detect, prevent and minimise the impact of odour**

| Category | Actions | Benefits | Relevant USEPA requirement |
|---|---|---|---|
| Detect odours | Improve recording of odours and their impact | Enable assessment of the impact of odours | A summary description of known overflow events occurring in the last 24 months |
| | Improve methodology for identifying odours related to liquid and non-liquid overflows. | Ensure that the strategy is met. | |
| | Improve methodology for identifying repeat odour complaints | Meet Sydney wide long term performance target | As above |
| | Develop model for assessing the cost benefits of options | Enable Sydney Water to budget for abatement targets | |
| Prevent odours | Only if complaints exceed one complaint per year in the future: proactive flushing and cleaning in reticulation pipes in areas of high odour incidents | Reduction in odour incidents | Review and modification of pre-treatment requirements to ensure that overflow impacts are minimised |
| Minimise impact | Improve public reporting | Prompt reporting will reduce the duration and impact of overflows | A process must exist for identifying odours |

### 4.3.7 Source control

Reducing water usage and contaminant levels in the sewage would reduce the impact of overflows for all four liquid overflow options (chokes, SPS failure, exfiltration and wet weather overflows). As stated in Section 2.3.1, Sydney Water's Source Control Policy focuses on the loads and concentrations of particular substances entering the STP, and requires waste discharges to treat waste streams to an acceptable level prior to discharge to the sewers. Not only will this benefit the treatment process at the STP but will also mean that the potential toxicity of an overflow could be reduced. Although the Source Control Policy is an existing Sydney Water Policy and not a new action under the SOLP program, the Source Control Program is an integral part of the strategy to abate the environmental impacts of overflows. The actions under this policy which can be adopted as part of the strategy is as follows:

1. Demand management - reduction in water consumption by customers, both residential and commercial (relevant mostly to dry weather overflows). Demand management can reduce the dry weather sewage volume, thus reducing the quantity and impact of overflow, especially during dry weather.
2. Reduction in oil and grease - Sydney Water has focussed on commercial customers to date, but an opportunity exists for an information campaign advising the community of the environmental

impact of oil and grease, and urging residential customers not to dispose of oils into the sewerage system.

3. Reduction in phosphorus - As with oil and grease, Sydney Water is concentrating on trade waste. Reduction in phosphorus in sewage may be achieved through a similar information campaign, and endorsement of low phosphorus detergents.

The source control actions are listed in Table 4.11.

**Table 4.11 - Actions to minimise the impact of all types of liquid overflows**

| Category | Actions | Benefits |
|---|---|---|
| Minimise impact | Demand management | Reduce quantity of overflows, especially in dry weather |
| | Reduce oil and grease in domestic sewage | Reduce impact on waterways of all types of overflows |
| | Reduce phosphorus in domestic sewage | Reduce impact on waterways of all types of overflows |

## 4.4 The integrated strategy to deliver the preferred option

### 4.4.1 Existing overflow abatement program

This section discusses how the proposed strategy integrates with the existing overflow programs (I/E program and SPS Risk Reduction program). These programs of works and investigations by Sydney Water are part of an interim program to abate overflows which are presently being implemented until the SOLP program actions are implemented. These are summarised as follows:

1. Sydney Water is conducting an interim Infiltration/Exfiltration (I/E) program on 31 project areas which have exhibited high faecal bacteria levels and constitute identifiable public health risks. No interim I/E Program project areas have been presently selected in the Mount Victoria catchment for the initial investigations since the catchment is not considered to be a problem area compared to other potential infiltration/exfiltration sub-catchments around Sydney. However if the methods used prove to be efficient in the detection of I/E problems, this methodology can be adopted and customised for use in Mount Victoria.

2. Sydney Water has also initiated an SPS risk reduction program to investigate potential impacts of overflows from SPS failures. The risk assessment includes estimated overflow volume, environmental factors, telemetry, power supply, pump availability, control/redundancy and history of failure. All of Sydney Water's SPSs have been ranked as part of the program and works have been identified to reduce the risk of SPS failures. The SPSs in Mount Victoria have been ranked as high risk due to the sensitive environment and their inadequate standard and are within current works programs for upgrading.

3. Investigations are proceeding to trial a number of innovative "treat/discharge" technologies with private sector technology providers for localised overflow abatement. Potential improvements could be obtained locally, particularly with respect to sensitive areas. These technologies will be evaluated following assessment of their performances for treatment of overflows, and if relevant may be adopted in the Mount Victoria system.

4. A five year capital works program has been developed for all sewerage systems. The program is designed to maintain and upgrade the system assets and is updated annually. Improving the reliability and increasing the storage capacity of the SPSs in Mount Victoria is part of the program. In the longer term, plans are being developed to increase the capacity of the Mount Victoria system to cope with additional loads from population growth in the area and backlog sewer areas. Other works on the capital works program include replacement of old or under-capacity pipes and upgrade of telemetry. Overflow abatement works recommended as part of this process will be

undertaken over the next 25 years according to their priority. Higher priority works will be integrated into the existing five year program.

## 4.5 Summary of actions

The proposed actions for Mount Victoria sewerage system are summarised in Table 4.12.

**Table 4.12 - Summary of preferred actions for Mount Victoria sewerage system**

| | | Actions | | |
|---|---|---|---|---|
| **Overflow type** | **Objectives** | **Detect overflows** | **Prevent overflows** | **Minimise impact** |
| Wet weather overflows | Maximum of 6 events in 6 years | Additional sewer and water quality modelling<br>Investigation of unknown overflows<br>Improve procedure to record overflows[1]<br>Improve procedure for collection of water quality data | Reduce I/I<br>Consider compulsory inspection of private sewers[1]<br>Augment system for growth<br>Improve design & installation[1] | Continue to contain overflows<br>Continue to clean after overflows |
| Partially treated STP discharges | Storage to reduce discharges to 6 events in 10 years | Record partially treated discharges[1]<br>Model impact on receiving waters | Provide storage at STP<br>Reduce flow to STP (I/I reduction) | |
| Choke related overflows | Maintain chokes at low rate | Improve recording[1]<br>Improve repeat choke identification[1]<br>Cost/benefit model[1] | Education on appropriate tree planting[1]<br>Continue inspection and rehabilitation of pipes[1]<br>If chokes exceed low range - proactive root cutting in reticulation pipes | Improve public reporting[1]<br>Inspect non-urban pipe routes<br>Continue to contain and clean-up overflows |
| Exfiltration | Surface water quality suitable for primary/ secondary contact recreations in dry weather | Record exfiltration events[1]<br>Monitor quality in local creeks | Actioned from I/E program | Actions from I/E program |
| Overflow caused by SPS failures | SPSs to comply with Sydney Water design criteria for new SPSs | Improve recording[1]<br>Review capacity | Continue reliability upgrade<br>Continue storage upgrade<br>Upgrade pumping capacity<br>Continue frequent flushing<br>Telemetry upgrade | Install overflow structures with litter/ grease removal<br>Continue to contain overflows<br>Continue to clean up after overflows<br>Update contingency plan<br>Inform public |
| Odours | Maintain low rate of odour complaints per year | Improve data collection[1]<br>Identify odour associated with liquid overflows[1] | Proactive inspection of pipes<br>Proactive flushing and cleaning of reticulation pipes | Improve public reporting |
| All liquid overflows | | | | Demand management[1]<br>Reduce fat & grease[1]<br>Reduce phosphorus[1] |

Note: 1 These actions are likely to be part of Sydney wide program

## 4.6 The proposed management plan

### 4.6.1 Environmental performance monitoring and audit

Procedures are in place to respond effectively to overflow and initiate corrective actions, however, the environmental implication of overflows have not been comprehensively documented. This report has drawn conclusions based on the available information, and finds that impacts from sewerage overflows are minor compared to stormwater and STP dry weather discharges. To ensure this situation continues and to facilitate future planning and system management an Environmental Performance Monitoring and Audit program is proposed.

The environmental monitoring follows a trigger and action system, whereby a trigger is the reception of complaints or identification of an overflow event and an action is the identification of an overflow event to an ecologically sensitive environment.

### 4.6.2 Costing and funding

For further discussion on the environmental monitoring program refer to Volume 2, Section 4.5.3.

Table 4.13 identifies the estimated cost for components of the preferred strategy. The total estimated cost for overflow abatement in the Mount Victoria sewerage system over the next 25 years is $910,000 (based on 1996 costs). This will be funded from Sydney Water's existing rates, rates from new customers and developer charges for new infrastructure.

Only actions specific to Mount Victoria sewerage system, and those directly related to overflow reduction (SOLP) are costed in Table 4.12. Actions that are Sydney wide, and actions that are part of Sydney Water normal operations and maintenance budgets, are not included.

Sydney Water had undertaken a survey to determine the community's willingness to pay for abatement works. Although the costs of the proposed options will primarily be covered by existing rates, the community's acceptance is critical to the successful implementation of the proposed management plan. The community must remain involved in the process so that the significant costs associated with the abatement strategies are justified by the value placed on the receiving environment by the community.

The time frame for the SOLP project covers the period up to 2021. Due to the high environmental sensitivity of the Blue Mountains overflow abatement measures aimed at improved data collection, monitoring and improved management practices will be implemented immediately. Structural works to abate wet weather overflows are programmed for the period 2006 to 2010. All SPS upgrades will be completed by 2005.

Existing management and rehabilitation works such as the I/E program will also assist identifying overflows and prioritising works. It is further recommended that the exfiltration catchments identified in Chapter 2 are added to the infiltration/exfiltration programme already underway.

**Table 4.13 - Proposed abatement measures for the Mount Victoria sewerage system**

| Overflow type | Overflow abatement | Cost ($,000)* |
|---|---|---|
| Wet weather reticulation | Maintain existing containment level of 6 to 10 events in ten years, improve data collection and monitoring, reporting of overflows, water quality and sewer modelling, I/E rehabilitation and overflow clean-up procedures. | 140 |
| Partially treated STP discharges | Increase containment to current sewer reticulation performance 6 events on 10 years, improve data collection and monitoring, reporting of overflows, water quality and sewer modelling, provision of storage at STPs and overflow clean-up procedures. | 140 |
| Surcharges due to chokes | A low rate of chokes (<60 chokes/100 km), improve data collection and reporting, I/E reduction and clean-up procedures, routine monthly inspection of some lines in remote bushland areas. | 40 |
| Overflows from SPS failures[1] | SPS to be upgraded to design standards suitable for the Blue Mountains, improved data collection, reporting and response time, construction of designed overflow structures with litter and grease containment, adequate storage to contain overflows given the proposed maintenance response time of four hours, pump capacity, telemetry and access, overflow clean-up procedures. | 50 |
| Exfiltration | All sewerage system catchments to have a low exfiltration potential, improved data collection and reporting, I/E rehabilitation. | 540 |
| Odours | Suburb to maintain a low rate of complaints, improve data collection and reporting, routine flushing of sewers and SPSs. | |
| **Total** | | **910** |

Note: 1. SPS 882 has sufficient storage and a standby pump, and requires connection to a portable generator and a litter ; grease removal pit

General: There is likely to be some overlap between works required to reduce wet weather overflow (I/I reduction) and works required to reduce chokes and exfiltration. This estimate does not allow for these overlaps

# Chapter 5

# Assessment of Environmental Benefits of the Preferred Strategies

# Synopsis

This chapter describes the benefits gained from implementation of the preferred strategy as described in Chapter 4, and the justification for the overflow abatement strategy for the Mount Victoria sewerage system in terms of biophysical, social, economic and ESD criteria. This volume focuses on the benefits to Mount Victoria sewerage system while the benefits to the Blue Mountains GA are described in Volume 2 of the EIS. The overall benefit to the Mount Victoria sewerage system from implementation of the preferred option is generally ensuring that efforts to protect aquatic and terrestrial ecosystems are being made, particularly as the Blue Mountains is a sensitive area.

Benefits to the aquatic environment as a result of the preferred strategy in Mount Victoria sewerage system are based on compliance with regulatory requirements and satisfaction of community expectations. The water quality modelling indicates that overflow abatement does not translate to improvements in water quality on a catchment-wide basis. However, localised reductions in pollutants loads from overflows is required to protect the quality of the identified sensitive aquatic environments (including water supply areas). The overall risk of overflows is expected to be reduced through the implementation of the continuous improvement process.

Benefits to the terrestrial environment include the reduction of nutrient enrichment of soils and the reduced likelihood of weed introduction in competition with native vegetation around overflow points. Visual amenity and recreational opportunities are also expected to be improved in the vicinity of sewerage overflows. The risk to sensitive local terrestrial environments such as threatened species habitat would be expected to be reduced due to the reduction of nutrient and toxicity impacts in the receiving environment.

Public health benefits are expected to result from the reduced occurrence of overflows in bushland, recreational areas, urban areas and waterways. Human activities such as primary and secondary contact recreation will be undertaken with reduced risk of contact with pollutants from overflows. Legally protected conservation areas will be protected in accordance with Sydney Water's legal requirements.

The preferred strategy for the Mount Victoria sewerage system is required to restrict the number of overflow events to acceptable levels and reduce the risk of local impacts to the biophysical environment. The level of abatement proposed provides a positive net benefit and satisfies community expectations for the environmental quality of the Blue Mountains.

As there is uncertainty about the impacts of overflows, sewerage overflows must be reduced in accordance with the precautionary principle. The preferred option will not perpetuate current conditions or exacerbate conditions for the next generation. The environmental quality of the Blue Mountains area will therefore be enhanced for future generations (principle of inter-generational equity). The impact of untreated sewage discharges in some receiving environments in the Blue Mountains is not ecologically sustainable. In accordance with the principle of conservation of biological diversity, the preferred option includes a program to progressively reduce such overflows and reduce the risk to threatened or valuable habitats.

# 5. Assessment of environmental benefits of preferred strategy

## 5.1 Benefits of the preferred strategies

The preferred strategies for the Mount Victoria sewerage system recognise that:

1. the total extent of environmental impact from sewerage overflows is not fully understood, especially on a localised basis
2. the current impacts on a regional basis are minor compared to the impacts from other sources such as urban stormwater runoff and STP dry weather discharges.

There are, however, many recognisable values in the Blue Mountains that can clearly benefit by the implementation of this strategy. These values include:

1. the environmental sensitivity especially given the proximity of the Blue Mountains National Park
2. Classified Waters protected by legislation under the *Clean Waters Act 1970*
3. high community expectations and the need to protect the values and status of the area
4. valuable wilderness areas
5. areas extensively used for recreational activities
6. legally protected conservation areas.

The preferred strategy therefore adopts a precautionary approach to overflow abatement, implementing actions to minimise sewerage overflows and thereby mitigating potential environmental impacts.

The overflow abatement objective, the preferred strategies for overflow abatement, and the proposed management plan to achieve these objectives are outlined in Chapter 4. The objectives of the preferred strategies consider the environmental goals for Mount Victoria (refer to Section 3.1.1) set by Sydney Water with respect to the protection of drinking water supplies, as well as the Hawkesbury-Nepean Catchment Management Committee Trust, Blue Mountains Catchment Management Committee and Coxs River Catchment Management Committee.

The identified environmental goals are required to meet legislation targets and Sydney Water's long term objectives, its Environmental Plan and ESD Policy Statement (1996).

1. The current wet weather reticulation performance of the Mount Victoria sewerage system exceeds the requirements of the preferred option for the Blue Mountains GA. The preferred strategies include adoption of better than minimum performance objectives for partially treated discharges from Mount Victoria STP (to match wet weather containment in the reticulation) and maintaining the existing wet weather containment.

The first priority is to improve modelling, environment monitoring and data collection. Improved data on performance and impact will be a significant benefit for future planning, sewerage system management, and to prioritise system-wide improvements as policy on these issues can be based on reliable data (refer to Section 4.5.3, Volume 2).

## 5.2 Benefits to the aquatic environment

### 5.2.1 Water quality

Many streams within the vicinity of the Mount Victoria sewerage system are protected through legislation and environmental regulation. One of the legislative requirements for Class P and S Waters dictates that no sewerage overflows are to discharge into these classified waters. These requirements for classified waters cannot be met without exception as it would be unrealistic to expect a sewerage system (especially one that is already established) to be completely free of overflows. As there are classified waters adjacent to the Mount Victoria sewerage system which are potentially impacted from existing sewered urbanised areas, and the Mount Victoria STP currently discharges into Fairy Dell Creek which is a Class P waterway, there will always be a risk of overflows from these systems impacting these waterways. The potential impact to these areas by pollution sources such as stormwater runoffs, however, are likely to have a greater effect upon these waterways than impacts from sewerage overflows.

The results of water quality modelling indicate that sewerage overflows from Mount Victoria sewerage system are not a major source of contamination in waterways, when compared to STP dry weather discharges and urban stormwater runoff. These two sources have had the greatest contribution to the degradation of water quality in Blue Mountains streams.

The preferred strategies for Mount Victoria sewerage system will provide an improvement in the local water quality. The containment options derived from the preferred strategies will mean that through less occurrence of exfiltration and choke events more flow will reach the STP for treatment as well as a significant decrease in the number of partially treated STP discharge events.

The preferred strategy for the abatement of sewerage overflows, as outlined in Chapter 4, will have a beneficial effect on mitigating localised impacts, especially, in primarily smaller and lower flowing creeks and ponds. The abatement of dry weather sewer overflows (ie. surcharges from chokes, SPS failure and exfiltration) will have an even greater benefit as overflows during dry weather potentially have a more significant impact due to less opportunities for dilution and flushing. To achieve a significant improvement in the overall water quality of streams in the area, especially during wet weather, strategies to address other pollutant sources, must be developed in conjunction with the strategies to address and abate the impacts of sewerage overflows. The implementation of measures to improve water quality in stormwater is primarily a local government responsibility and may consist of structural options within stormwater drainage lines, better maintenance and management practices and community education programs.

One of the major benefits, at a local scale, for the Mount Victoria sewerage system is that the level of pathogens discharging into receiving waters will be reduced due to the upgrade of the SPS and the STP. Depending on the outcome of further data collection and interpretation, the efficiency of the SPS will be increased. The upgrading of Mount Victoria STP will significantly decrease the volume of sewage subjected to partial treatment. This will assist in the protection of aquatic habitats, and further assist in compliance with current classified waters requirements and improve the quality of the drinking water supply.

From the above it can therefore be seen that the reduction in overflows in the Mount Victoria sewerage system will benefit water quality in the following ways:

1. improve water quality on a local scale, in terms of the level of pathogens and nutrients

2. improve the level of compliance, with respect to current legislation, in the protection of classified waters and, on a regional scale, Lake Burragorang Special Area.

### 5.2.2 Aquatic ecology

The improved water quality from implementing the preferred strategies will be of benefit to the flora and fauna that use these waterways for habitat and food and water supplies. These potentially include endangered species and ecological communities listed in Schedule 1 or 2 of the *Threatened Species Conservation Act (TSCA) 1995* (refer to Section 3.3). The reduction in overflows within the Mount Victoria sewerage system will benefit aquatic habitats in several ways including:

1. by ensuring that the habitats include good water quality, the reduction in overflows will assist in the maintenance of the habitat in its natural state, thereby providing conditions which will encourage the continued health of flora and fauna communities including those of threatened species
2. water and sediments in the creeks and rivers will receive fewer nutrients, particulate matter and heavy metals. This will discourage the proliferation of weed and algal growth in the riparian environment, reduce the transport of pollutants via particulate matter and reduce the risk of establishing habitats for exotic species
3. the protection of these habitats will encourage maintenance of food sources for native fauna species.

## 5.3 Benefits to the terrestrial environment

Overflow events can affect terrestrial environments, including sensitive sedge swamp and wetland areas, which are habitats for native fauna including threatened species as listed in Schedule 1 and 2 of *TSCA 1995*. The major impacts are likely to be from dry weather overflows caused by system problems, such as chokes, SPS failures and exfiltration, which can discharge undiluted flows to the terrestrial environment (refer to Section 3.2.3).

The implementation of the preferred strategy for Mount Victoria sewerage system for will result in maintaining the current level of wet weather overflow events and significantly reducing the frequency of partially treated STP discharges to the same level as the wet weather overflow (ie. six events/ten years). There will also be a reduction in overflow due to system failure as a result of sewer rehabilitation (I/E program) and SPS upgrade. It will improve the condition of those terrestrial habitats which are currently being impacted by sewerage overflows as these localised environments are generally at a greater risk from dry weather overflows. The reduction in overflows will benefit terrestrial habitats in several ways including:

1. Native plant species can be sensitive to increase in nutrients within the soil. Nutrient enrichment in soils surrounding a sewerage overflow therefore may create an area where weeds can replace native species, leading to a localised loss of bio-diversity. Sewerage overflows can also act as a vehicle for the transportation of exotic seeds into bushland areas. A reduction in overflows, will therefore reduce the propagation of weed growth in natural bushland habitats. This will benefit these areas by maintaining bio-diversity, and food sources and habitats for native terrestrial fauna.

2. A reduction in dry and wet weather overflows into sensitive areas such as sedge swamps and wetlands will benefit native terrestrial fauna which use these areas as a habitat. This includes listed threatened species such as the Red-crowned Toadlet. The benefits include the maintenance of a clean water and food supply.

3. A reduction in overflows will reduce exposure of native fauna to pollutants.

Overflow abatement should be a part of an integrated program of abatement measures. To maximise the benefits from the implementation of the sewage overflow abatement strategy in the Mount Victoria sewerage system, the overflow abatement strategy programs should be complemented by similar programs to address issues such as:

1. contaminants from urban stormwater runoff

2. effects of further urbanisation on loss of bushland areas

3. land erosion and sedimentation of waterways from high surface runoff.

## 5.4 Benefits to the socio-economic environment

The main socio-economic benefits from a reduction in sewerage overflows within the Mount Victoria sewerage system include:

1. Improved protection of waterways designated for a high level of protection, such as drinking water catchments (Class P and S). This is identified as the primary environmental goal for the Blue Mountains GA, which require increased protection of the Class S waterways and the surrounding catchment area. As discussed in Section 5.2, the impact of sewerage on water quality is minor on a regional scale, hence, due to the large distance between the area served by the Mount Victoria sewerage system and Lake Burragorang (up to 50 kilometres), the impact on Lake Burragorang is considered low. In order to ensure full protection of drinking water supply storages, Sydney Water enforces a multi-barrier approach to catchment protection. Refer to Section 3.2.4 for details.

2. An improvement in the visual amenity of the Mount Victoria area. The community places a high value on the Blue Mountains area and the tolerance of anything that would detract from the natural beauty and "wilderness" values of the area is extremely low. Any reduction in deposition of rubbish and floatables from overflows, and the weed infestation associated with regular overflow points will be seen as being a benefit to maintaining the visual amenity of the Mount Victoria area.

3. An increase in the recreational value of the environment. Localised impacts from sewerage overflows will occur to areas used for recreational purposes, such as bush walking and water contact activities. These include the Blue Mountains National Park as well as local parks and recreation fields located within residential areas. Localised effects are usually a result of temporary reductions in the water quality and can be a potential risk to human health through primary or secondary recreational contact. The community will benefit by a minor improvement in the number of days that water quality levels for primary and secondary contact recreation activities in these waterways meet the acceptable standards due to a reduction in bacteriological levels immediately following an overflow event.

4. Meeting the expectations of the community in terms of protection and conservation of the area. The community places a high value on the area and as such would expect that efforts were being made to protect the Blue Mountains environment. The overall benefit to the community will be in improved water quality and continued low numbers of odour complaints, which will result in an improved community value for the environment surrounding the area served by the Mount Victoria sewerage system.

5. Economic benefits from an increase in tourism, as a flow-on effect from the preservation and improvement of the values placed on the visual and wilderness qualities of the Blue Mountains.

## 5.5 Justification of the preferred strategy for overflow abatement

The EP&A Reg 1994 requires that this EIS include the reasons justifying the carrying out of the development or activity in the manner proposed, having regard to the biophysical, economical and social considerations and the principles of Ecologically Sustainable Development (ESD).

The proposed integrated overflow strategies for Mount Victoria sewerage system outline a process of continuous improvements to reduce impacts of wet and dry weather overflows. It proposes to maintain the level of wet weather containment to the current six events per ten years, and reduce the level of partially treated STP discharges to the same level, over the 25 year planning horizon. In addition, due to the high value of the area, it proposes improvements to other types of overflows.

The process of continual improvement will include best management practices and both short and long term strategies that combine both structural and non-structural actions which can be implemented progressively.

The Mount Victoria overflow abatement strategies and the overflows management plan have been developed to meet the targets identified for overflows as part of the overall objective for the Blue Mountains GA. The targets are focussed on the environmental values and uses of the Mount Victoria catchment, the protection of sensitive areas and the maintenance of the principles of ESD. Justification of the overall Blue Mountains GA overflows strategy is discussed in Volume 2, Chapter 6.

Sydney Water is addressing the issue of sewerage overflows simultaneously in the entire Sydney Water area of operation so that overflows can be ranked and compared across areas. This will ensure that the regulator and community are informed about the cost ranges for various levels of overflow containment, and enable Sydney Water to focus its financial resources on areas that will benefit most from higher levels of overflow abatement.

The process of continual improvement will include best management practices and both short and long term strategies that combine both structural and non-structural actions which can be implemented progressively.

The management plan includes a combination of structural and non-structural actions which are listed in Table 4.12. Structural options will be subject to a second stage EIA process which will more precisely define the issues and refine the structural option to improve the abatement potential of the option. Non-structural options are focused on recommended management practice in accordance with USEPA guidelines, (a recognised international benchmark for the operation of sewerage systems), and will be a part of a continuous improvement process.

All of the above structural and non-structural options are designed to:

1. reduce overflow impacts to appropriate levels
2. reduce overflows in a cost-effective manner
3. protect sensitive areas as listed in Section 3.3
4. satisfy the principles of ESD
5. meet legal requirements and Sydney Water's Operating Licence and Environment Plan.

The area surrounding the Mount Victoria sewerage system is considered sensitive with the potential to be significantly impacted by overflow events (refer to Section 3.3). The overflow management plan for the Mount Victoria area is therefore based upon the protection of these highly sensitive areas and the maintenance of the principles of ESD.

Adoption of the Precautionary Principle dictates that due to the limitations of the sewer and water quality modelling there is a need for the implementation of continued and improved modelling in the future. Hence, whilst there is uncertainty relating to the impact of sewerage overflows in both wet and dry weather in the Mount Victoria Sewerage system, the difficulties in evaluating these uncertainties have not precluded an assessment process and the development of abatement strategies.

The Inter-generational Equity Principle is demonstrated by implementing the proposed integrated overflow strategy of the Mount Victoria sewerage system, the condition will actually improve rather than deteriorate in the future. This will ensure that the standards of the system are maintained for the next generation as well as assisting to preserve the environmental quality of the Blue Mountains area for the next generation.

The Conservation of Biological Diversity is demonstrated by the implementation of the proposed integrated overflow strategy, which embraces conservation of biological diversity in all areas of the Blue Mountains by ensuring that a high level of abatement is exercised. This will ensure that threatened or valuable habitats are not affected by overflows.

Economic evaluations of the sewerage overflow abatement measures have been undertaken in accordance with the NSW Guidelines for Economic Appraisal. The findings of these investigations indicated that the cost of the preferred wet weather strategy of six events/ten year containment is justifiable, based upon community expectations and the environmental benefits gained.

In summary, the justification of the preferred strategies for Mount Victoria sewerage system are based on the high environmental values of the Blue Mountains environment and the high community expectation to preserve these values. From the outputs of existing modelling and environmental monitoring data, it is apparent that sewerage overflows have minimal impact on a regional scale. Hence, the precautionary approach of improvement above the minimum performance objective was adopted to all other types of overflow. More modelling and monitoring are needed to further verify whether the levels of abatement are appropriate to mitigate local impacts.

# Chapter 6

# Conclusion

# 6. Conclusion

The information presented in this EIS indicates that sewerage overflows on a regional level have only a minor impact on the area served by the Mount Victoria sewerage system. Overflows from the sewerage system were found to contribute to pollution in the Blue Mountains GA and the contribution was identified to be minor in comparison to that caused by stormwater runoff and STP dry weather discharges.

On a localised level, many sensitive areas in the Blue Mountains were identified as having the potential to be impacted by overflows from the Mount Victoria sewerage system (refer to Section 3.3). These include Classified Waters (specifically Class P and S Waters), the Blue Mountains National Park and threatened species habitat.

The potential for the greatest impacts occurs in smaller streams, wetlands and sedge swamps which can be habitats for native fauna, including some listed in Schedule 1 and 2 of the TSCA, 1995. Dry weather overflows have the potential to create the greatest impacts upon these sensitive areas, as the overflow is not diluted by stormwater prior to discharge into a receiving waterway. The main impact of overflows at the localised level would be a reduction in water quality due to microbiological contaminants and elevated nutrient levels present in raw sewage.

The Blue Mountains is a sensitive environment which must be protected to satisfy legal requirements and community expectations for the quality of the area as well as Sydney Water's corporate objectives. The primary environmental protection goal identified for the streams in the Blue Mountains GA was the protection of potable water quality. This reflects the values placed on the area by the community and the expectation that a high environmental quality will be maintained. In accordance with the principles of ESD, overflow abatement above minimum performance corporate objectives (ie. base case) is recommended. This high level of containment together with an action plan, is designed to detect, prevent and minimise the impact of overflows.

The immediate receiving environment of the Mount Victoria sewerage system is sensitive and requires a strategy to achieve a high degree of overflow abatement. As there is currently a relatively high overflow performance in the Mount Victoria sewerage system, overflow abatement above the minimum performance objective has been selected to reflect the sensitivity, both in environmental and in community values, of the receiving environment.

The minimum performance objective is to maintain overflows at the current performance to 2021. The preferred option for abatement of overflows (ie. above minimum performance objective) in the Mount Victoria sewerage system includes the following:

1. a maintenance of wet weather overflows to six events per ten years
2. a significant reduction in the number of partially treated STP discharges at Mount Victoria of six in ten years
3. to maintain a low density of chokes
4. to gather further information and evaluate appropriate upgrades to address overflows from SPS failures
5. to establish a low rate of exfiltration
6. to maintain a low rate of complaints relating to odour.

Strategies for the abatement of overflows have been determined for each identified overflow. The strategies, each, consists of a series of actions, which are summarised in Table 4.12. Some of these actions are already part of The Sydney Water improvement programs and will be integrated with the additional actions to be included in the overflow abatement program.

The benefits of implementing the proposed strategy includes:

1. maintaining the number of overflow events on present numbers to 2021 even though the population of the area is expected to significantly increase
2. improvement in water quality to benefit
   - aquatic and terrestrial ecosystems
   - primary and secondary contact recreation users
   - visual amenity of the area
   - community value of the area
   - economy of the area through an increase in tourism.
3. maintaining and enhancing the high value that the community places on the Blue Mountains area as a natural "icon", and preserving the "wilderness" qualities of the area.

It should be noted, however, that to ensure that improvements in water quality are achieved, the strategies recommended under this program must be implemented and integrated with other programs of pollution reduction that address pollution of these waterways from other sources such as urban stormwater runoff. This study recognises the lack of accurate data relating to the environmental impact of overflows, thus, methods for overflow data collection and management has been recommended. The proposed database will facilitate future planning and system-wide management (refer to Section 4.5.3, Volume

## 6.1 Proposed timetable for improvements

he year 2021 has been used as the study time-frame boundary. The NSW Government recently announced the $3.01 billion Waterways Package which focuses on waters around Sydney. Included in the package is $1.6 billion for the abatement of sewerage overflows.

The components of the overflow abatement program for the sewerage systems in the Blue Mountains GA will be implemented over the period from 2006 to 2010. The immediate focus of the program is to maintain and improve recommended management practices to reduce overflows caused by system failures. This is expected to be completed by 2005.

Existing maintenance and rehabilitation works such as the I/E program are key components of the overflow management process as they address the cause of the problem, not the effect. Continuous improvement of these management practices will further reduce overflows. It is recommended that the strategy for the Mount Victoria sewerage system be implemented in the short term (within 5 years) due to the requirement for a high level of protection.

The timetable for improvements takes WaterPlan 21 into consideration. WaterPlan 21 sets timetable targets and water quality objectives for 5, 10, 15 and 25 years. The plan targets to eliminate sewage induced algal blooms in the Hawkesbury-Nepean River by 2002.

## 6.2 Actions arising for Sydney Water

Part of the proposed program for overflow abatement will include reporting of the following to the EPA:

1. results of the system performance and environmental indicators monitoring

2. elements of the strategies completed
3. improvement in overflow performance
4. proposed revisions to the remaining strategy components based on results to date
5. proposed revisions to the compliance monitoring program.

The proposed management plan for the Mount Victoria sewerage system is structured around the strategies and actions discussed in Chapter 4 and forms part of the overall preferred overflow abatement option for the Blue Mountains GA. Table 4.12 outlines the actions under the preferred option for the Mount Victoria sewerage system.

Components of the management plan have been selected to achieve a balance between non-structural and structural options that can be implemented progressively over the next 25 years. The proposed management plan is to form part of Sydney Water's total quality assurance system. The immediate focus of the plan is on best management practices to reduce overflows, particularly due to system failures in dry weather.

Many of the recommended management practices have already been adopted by Sydney Water to minimise the frequency and impacts of dry weather overflows. Continuous improvement of these management practices will further reduce dry weather overflows at minimal expense. The delivery timetable for the proposed management plan is outlined in Chapter 4.

An action plan has been recommended to increase the amount and accuracy of the available data on overflows events (refer to Volume 2, Section 4.5.3). The plan includes the following components:

1. regular inspections
2. regular reporting
3. routine monitoring
4. a contingency/response plan
5. requirements for record keeping on overflow incidence, impacts and actions taken.

The additional data derived from the action plan will aid in the future planning and management of the Mount Victoria sewerage system.

It is concluded that the proposed management plan is justified as an appropriate response to mitigating the environmental impacts associated with sewerage overflows from the Mount Victoria sewerage system, and that the environmental, social and economic benefits to the community will considerably outweigh the corresponding costs.

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# References

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