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POURPOSE OF THIS POLICY AND SUPPORTING TECHNICAL GUIDELINES

The purpose of this document is to:
- identify industry best practice for managing sewer overflows;
- promote efficiencies that arise by standardised applications processes and assessment processes.

SCOPE

These policy and technical guidelines address the management of sewer overflows to minimise the occurrence of and environmental impacts from overflows of sewage.

STRUCTURE AND USE OF THIS DOCUMENT

This document has four parts as follows:
- qldwater Guidance: this section provides background information about this policy and technical guidelines. It describes the purpose and use of this document. This is for the information of local governments who are considering using qldwater's Policy and Supporting Technical Guidelines,
- Policy: a ready-to-adopt policy outlining a Water Service Provider’s rationale and objectives (performance criteria) for managing sewer overflows and refers to the supporting technical guidelines for technical details.
- Supporting Technical Guidelines: this document provides technical guidance on management of sewer overflows. The guidelines are separate from the policy to allow more frequent review and updating of the technical-details provided.
- Emergency Response Manual: This document provides a template for developing an Emergency Response Manual which can be adapted and modified to suit each WSP’s requirements.

How this document might be used.
- Any local government that presently has no policies or guidelines for sewer overflows may take the two functional sections of this document (Standard Policy and Supporting Technical Guidelines) and adopt them as the WSP’s documents. These documents have been designed to enable ready adoption by a WSP with only minor customisation. For example this would involve inserting WSP name, ensuring that appropriate authorities and responsibilities have been allocated, completing relevant sections of the Emergency Response Manual, and ensuring that appropriate training has been carried out. Many WSP’s will prefer to review the content of the Policy, Technical Guidelines and Emergency Response Manual to ensure that they align with WSP’s other policies, guidelines and specifications.
- Some local governments may already have a guiding policy but may use the Supporting Technical Guidelines to make it easier for WSP staff to undertake the necessary works.
- Some local governments may choose to update the technical content of their existing policy or guidelines using these documents which have been based upon best industry practice.
DEVELOPMENT OF THIS DOCUMENT

In developing this document we thank all WSPs that have provided information and feedback and in particular:

- Cairns Regional Council Water and Waste;
- Carpentaria Shire Council;
- Ipswich Water;
- Mackay Regional Council;
- Fitzroy River Water, Rockhampton Regional Council;
- Sunshine Coast Water;
- Townsville Water.

Documentation provided by WSPs has been referenced where appropriate. An initial draft of the document was circulated to a number of WSPs for comment. We thank all those who have input to the preparation of this document, including the authors, Water Strategies and Parsons Brinckerhoff.

DISCLAIMER AND COPYRIGHT

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Queensland Water Directorate (qldwater) is a business unit of the Institute of Public Works Engineering Australia Queensland Division and is an initiative of:
Citation
This policy shall be known as the {Insert name of the Water Service Provider} “Sewer Overflow Policy”.

Background
Under the Environmental Protection Act 1994 (EP Act), a development approval and registration certificate is required to operate sewage treatment works (environmentally relevant activity 15). The definition of sewage treatment works includes pump stations and ancillary works. Sewage infrastructure is normally designed to overflow as a safety feature. This reduces backups and overflow at random locations and it thus minimises health risks as overflows are at controlled locations. Overflows can occur in both dry and wet weather conditions due to a variety of causes. Historically, development approval conditions for the discharge of untreated sewage from pump stations and overflow structures to the environment have been explicitly authorised under defined circumstances such as:
- Excessive rainfall;
- Power failure;
- Accidental damage to, or failure of, pump station or ancillary equipment; and
- Other emergencies.

DEFINITIONS
Refer Appendix 1 for definitions.

Purpose
The purpose of this policy is to:
- Provide guidance to Water Service Providers in order that they meet the “general environmental duty” in regard to management of sewer overflows; and
- Raise the awareness of Water Service Provider’s employees regarding their obligations and duties in regard to management of sewer overflows.

Legislative basis
The Department of Environment and Resource Management (DERM) has advised that development approvals issued by DERM will no longer contain authorisation for sewage overflows. The regulation of sewage overflows will instead be managed using alternate sections of legislation, such as those that outline the offences causing unlawful material environmental harm or unlawful serious environmental harm (EP Act ss 436-438).

The EP Act provides a defence (s 436(2)) for such offences if the environmental harm occurs as a result of lawful activity and the operator complied with the general environmental duty (GED). Where this occurs the environmental harm is lawful.
Reference is also made to Clause 164 of the Water Supply (Safety and Reliability) Act 2008, which states that the “service provider must, to the greatest practicable extent, ensure that the infrastructure can deal with the service requirements of all premises in the service area.”

Scope of the policy
This policy applies to overflows that may occur from sewage pump stations, overflow structures and other ancillary works in sewage networks as a result of:

- Excessive rainfall;
- System blockages;
- Power failure;
- Accidental damage to, or failure of, pump station or ancillary equipment;
- Planned shutdown of equipment; or
- Other emergencies.

Commencement date
This policy commences on {Insert Date} and will apply until {Insert Date}

PERFORMANCE CRITERIA
Table 1 identifies the performance criteria and acceptable solutions for sewer overflows.

Table 1 Sewer Overflows Performance Criteria

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>Acceptable Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>To practice “due diligence”, A1 Clearly defined accountabilities. Structured system planning and record keeping for sewer system and overflows. Asset maintenance program in place. Risk assessment and mitigation evaluation carried out. Training program for relevant staff implemented.</td>
</tr>
<tr>
<td>P2</td>
<td>To have contingency plans in place, A2 Complete the attached Emergency Response Manual which contains templates for the following information which is required under the EP Act. Incident Response Plans in place. Remediation and clean-up plans in place for areas affected by sewer overflows. Methodology is in place to investigate the cause of overflows, initiate preventative measures, and measure and report on the effectiveness of the preventative measures.</td>
</tr>
<tr>
<td>P3</td>
<td>To ensure that responsibilities and authorities have been properly allocated and appropriate training has been carried out for all relevant personnel, A3 Responsibility and authority matrix developed and all relevant persons have been properly trained.</td>
</tr>
</tbody>
</table>
GENERAL PROVISIONS

9.1 Technical Guidelines
The technical guidelines (“Sewer Overflows – Supporting Technical Guidelines”) have been developed for this policy to help ensure that decisions are consistent and in line with the policy intent. The technical guidelines may be amended from time to time. They are intended as a guide only.

9.2 Enforcement Guidelines
DERM has advised that to maximize the protection from prosecution in the event of an overflow that the following steps should be undertaken:

- Have contingency plans in place;
- Practice “due diligence”;
- Comply with statutory instruments;
- Once environmental harm becomes apparent to the WSP, either through voluntary audit or any other means, DERM should be notified immediately of the environmental harm; and
- With the notification, the WSP must give formal notice to DERM that it intends to appropriately deal with the harm.

9.3 Have contingency plans in place
The WSP should establish contingency plans which should include:

- A 24/7 emergency response plan for overflow events;
- Remediation and clean-up plans for areas affected by sewer overflows; and
- Suitable methodology to investigate the cause of overflows and to initiate preventative measures and to measure and report on the effectiveness of the preventative measures.

The WSP shall ensure that adequate resources are available to carry out the necessary works.

9.4 Practice “due diligence”
The WSP shall practice “due diligence” in the management of the sewer system. This will involve ensuring that appropriate risk management principles have been applied to:

- The design and operation of the sewer system to minimise the potential harm that might result from sewer overflows;
- Determining the environmental values of the receiving environments in relation to existing and planned infrastructure location; and
- Minimizing community exposure to overflows and potential health impacts.

Implementation of “due diligence” principles will require application of appropriate organisational management to enable:

- Proper planning, review and construction of new works;
- Delivery of appropriate training for the necessary people likely to be involved;
- Maintenance of records relating to the system and relating to overflow events; and
- Setting in place appropriate procedures for notifications should an event occur, and ensuring that those notifications take place.

9.5 Comply with statutory instruments
All procedures and systems that are established by the WSP should be in compliance with issued development approvals and environmental protection policies.
9.6 DERM notification and dealing with environmental harm

Once environmental harm becomes apparent, either through voluntary audit or any other means, DERM should be notified immediately of the environmental harm.

Notification procedures, including identification of “trigger” events, should have been established by the WSP.

Performance indicators and assessment and reporting methodologies and procedures, should also have been established by the WSP. This will include auditing procedures and procedures for review and correction of an overflow event.

9.7 Further information

For further information please contact {Insert the titles of the relevant Water Service Provider Officers}.
### APPENDICIES

#### APPENDIX 1 – DEFINITIONS

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attending officer</strong></td>
<td>The senior officer who attends the site to inspect the overflow and investigate the corrective actions.</td>
</tr>
<tr>
<td><strong>Aquatic ecosystems</strong></td>
<td>Any environment that is permanently or regularly inundated with fresh or saline water.</td>
</tr>
<tr>
<td><strong>Contained spill</strong></td>
<td>An event in which sewage spills or leaks from sewage infrastructure but is limited to a controlled area.</td>
</tr>
<tr>
<td><strong>Design sewer overflow location</strong></td>
<td>Designated point or points where sewage may overflow from the sewerage system. The general principle of such overflows is to control the points of discharge from sewer systems to less sensitive environments.</td>
</tr>
<tr>
<td><strong>Dry weather flow</strong></td>
<td>The flow carried by a sewer system during dry weather.</td>
</tr>
<tr>
<td><strong>Effluent</strong></td>
<td>Treated wastewater flowing out of a treatment plant or treatment process.</td>
</tr>
<tr>
<td><strong>Emergency Response Manual</strong></td>
<td>A manual containing the Operational Response Plans, the Remediation and Clean-up Plans and Improvement and Overflow Abatement Plans.</td>
</tr>
</tbody>
</table>
| **Environmental harm**            | Any harm, or potential harm to the environment or the amenity of the environment. Environment in this context means land, air, water, organisms and ecosystems and includes human-made or modified structures or areas; and the amenity values of an area. Environmental harm may be caused by an activity:  
  - Whether the harm is a direct or indirect result of the activity; or  
  - Whether the harm results from the activity alone or from the combined effects of the activity and other activities or factors. |
| **Environmental values**          | Values or uses that are important for a healthy ecosystem or for public benefit, welfare, safety or health, and may require protection from the effects of pollution, waste discharges and deposits. Several environmental values may be designated for a specific water body. |
| **General Environmental Duty**    | A person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm (the **general environmental duty**). |
| **Incident Supervisor**           | The supervisor or nominated person who is responsible for supervising the overflow incident.                                              |
| **Infiltration**                  | The ingress of groundwater into a sewer system.                                                                                         |
| **Inflow**                        | The entry of water into a sewer resulting from rainfall.                                                                                    |
| **Overflow**                      | A discharge of sewage from the sewerage system.                                                                                           |
**Partially contained overflow**
Where an overflow has been contained to a specific area but some of the spill escaped outside of this area.

**Rising main**
A pressure pipe used to transfer sewage from a pump station to a manhole or gravity sewer.

**Sewer**
Refers to the system of pipes, manholes, pump stations and other ancillary components or structures used to transfer sewage from individual households to sewage treatment plant.

**Spill**
A discharge of sewage at some location in the sewer system. A spill could occur from a broken pipe or an overflow from a manhole or other structure or an overflow pipe.

**Uncontained overflow**
An overflow that has not been contained and has the potential to cause environmental harm.

**Water Service Provider**
The {Insert name of Water Service Provider} is a designated WSP under the Water Act 2000 and is a provider of water and sewerage services to a community.

**Wet weather flow**
The flow carried by a sewer system during wet weather. It includes inflow/infiltration.

* These terms also have statutory definitions under the EP Act.

## APPENDIX 2 - REFERENCE DOCUMENTS

### Relevant Policies/Legislation
- Environmental Protection Act 1994
- Framework for managing sewerage infrastructure to reduce overflows and environmental impacts, ecoaccess.
- Water Act 2000 –Strategic asset Management Plan (SAMP)
- Plumbing and Drainage Act 2002

### Related documents
- Emergency Response Manual (insert Water Service Provider name)
SEWER OVERFLOW

SUPPORTING TECHNICAL GUIDELINES
1. SUPPORTING TECHNICAL GUIDELINES

The Supporting Technical Guidelines have been developed to ensure that Water Service Provider’s decisions are consistent and in line with the intent of the Water Service Provider Sewer Overflow Policy. The technical guidelines may be amended from time to time. They are intended as a guide only.

The guidelines go hand in hand with an Emergency Response Manual Template that can be used by service providers to develop their own manual for responding to Sewer Overflows, which includes templates for: Operational Response Plans, documenting sewerage network information, authorities during emergencies, reporting procedures, notifying authorities and general procedures for emergency response. Water Service Providers may use these technical guidelines to populate the emergency response manual, and tailor it specifically to their system and their organisation.

There are six primary objectives of implementing these guidelines.

- To reduce the impacts of overflows on the environment and the community.
- To assist water service providers to meet their general environmental duty as required under DERM’s licensing “Framework for managing sewerage infrastructure to reduce overflow and environmental impacts.”
- To reduce the number of overflows that occur from the sewerage system.
- To provide an easily accessible information source for use in the event of a discharge from a design overflow point.
- To guide WSP’s in developing an Emergency Response Plan.
- To provide an Emergency Response Manual Template that WSP’s may use to develop their own plans.

2. WHAT CAUSES SEWER OVERFLOWS

Sewer overflows can be caused by the following:

- Infiltration/inflow into sewers;
- Inadequate storage volumes and response times to alarms at pumping stations;
- Failing alarm systems at pumping stations;
- Failed rising mains or sewers;
- Sewers with insufficient capacity to convey the design flows;
- Inadequate operations and maintenance of sewerage systems;
- Root ingress into sewers or manholes blocking flow;
Poor sewerage system planning, including not accounting for the impact of new connections on the downstream sewer system capacity; and
Poor sewer design standards and construction specifications and inspection procedures of new sewers.

3. IMPACTS OF SEWER OVERFLOWS

Sewage consists mainly of water but it carries numerous disease causing organisms called “pathogens” including bacteria, viruses, parasitic organisms (protozoa), intestinal worms (helminthes), moulds and fungi. These pathogens may cause diseases ranging in severity from mild gastroenteritis with stomach cramps and diarrhea to potentially life-threatening ailments such as cholera, dysentery, hepatitis and severe gastroenteritis. The impact on human health will depend on the duration of exposure to the sewage and the concentration of pathogens. People can be exposed to these pathogens through direct contact, eating shellfish harvested from areas contaminated by sewage, inhalation or skin exposure or through contamination of drinking water supplies.

As well as pathogens, sewage contains a range of environmental pollutants including sediments which cause turbidity, nutrients such as carbon, nitrogen and phosphorus which can cause excessive growth of plants and blue green algae, toxicants including metals, pesticides and commonly used chemicals which can be toxic to fish and other aquatic life. Gross pollutants may also be present such as plastic and paper products which can harm plants and animals and are visually unattractive.

4. REDUCING THE LIKELIHOOD OF SEWER OVERFLOWS

Sewer overflows can be reduced by a combination of operations and maintenance practices and structural measures. These include:
- Cleaning and maintaining sewer systems;
- Evaluating the condition of the existing sewer system and repairing or replacing any defective components;
- Reducing inflow/infiltration by identifying and repairing defective sewers, manholes and house connections;
- Upgrading sewers, pumping stations and sewage treatment plants to ensure that wet weather flows can be accommodated;
- Providing emergency storage at pumping stations and stand-by power for operating pumps during mains power failure; and
- Appropriately designing new systems.

Sewer overflows can occur in wet and dry weather.

5. MANAGING SEWER OVERFLOWS

Water Service Providers are obliged to have emergency relief plans in place that contain the organisation’s methodology for responding to all sewage overflow incidents. These plans are important for demonstrating due diligence under the DERM framework. The plans will address responses to:
- Incidents occurring during and after business hours,
- Wet weather overflows from design overflow locations,
- All other sewerage overflows on land and in aquatic ecosystems.
The following Emergency Relief Plans are required under the DERM Framework.

1. Emergency Response Plans
   a. Incident response plan
   b. Remediation and clean-up plan

2. Investigation and improvement plan

Section 3 of the Emergency Response Manual contains Templates for the Above Plans. The Emergency Response Manual also contains forms in Appendix G that field officers may use to document responses to Emergencies in accordance with the plans.

Under the EP Act, DERM must be notified immediately of any incident involving environmental harm and measures taken to appropriately deal with it. The Emergency Response Plans contain procedures for notifying DERM if environmental harm becomes apparent.

Figure 5 in Section 3 of the Emergency Response Manual outlines the process for Reporting incidents to DERM. Appendix G of the Emergency Response Manual contains a notification form that may be populated to report incidents and Appendix H contains Templates for Quarterly Reporting and submitting a Voluntary Environmental Management Plan.

The WSP should also have in place procedures for identifying the needs for maintenance and enhancement. This might be by means of an Improvement Plan or Overflow Abatement Plan.

6. DUE DILIGENCE

The DERM Framework requires WSP’s to practice “due diligence” in responding to and managing sewage overflow. Due diligence, in this instance is separated into several categories as follows:

- Risk principles – managing risk in designing and managing the sewerage system;
- Organisational management – creating structures and accountabilities in the organisation;
- Mapping and design – identified as a key tool in identifying potential spills and reacting to events;
- New wastewater connections – clear requirements for constructing and testing new systems to ensure the system isn’t overloaded;
- Wastewater system operations – operating procedures to reduce inputs;
- Wastewater system maintenance – including preventative, corrective and emergency maintenance; and
- Monitoring of key system elements and discharges.

WSPs can demonstrate that due diligence has been practised by addressing the points raised in Sections 6.1 to 6.9.

The checklist in APPENDIX 1 lists specific “due diligence” requirements under each heading in the DERM Framework. Measures are suggested alongside each requirement that may be used to demonstrate compliance. Most due diligence measures are already regulated under statutory instruments, or in developing the emergency response manual. WSP’s should complete the checklist as part of the preparation process.
6.1 Organisational Management
It is important that the WSP operational staff have clearly defined accountabilities relating to:
- Wastewater system planning;
- Acceptance of new connections to the system;
- Appropriate training for operators and maintenance personnel;
- Preparation and implementation of an overflow abatement plan;
- Maintenance of records relating to overflows;
- Notifications to DERM and any other relevant authorities, sensitive downstream users, and the public as appropriate in the event of serious overflows;
- Clean-up of any overflows;
- Accessibility of sewer system plans.

6.2 Sewer System Planning
Appropriate wastewater system planning is an important component of effective wastewater system management. Assessment of the sewer network should be carried out for peak wet weather flows for existing development and planned growth in development. For the existing development the sewer choke points can be identified. The needs for additional sewer mains, pump stations and rising mains can then be identified in order to meet existing development and future growth. A staging plan can be developed to ensure that the system is not overloaded at any time.

For existing systems it is important that peak wet weather flows for the sewer system are assessed from actual flow records. This can be done by review of inflow records into the wastewater treatment plant or by review of hours run meters for pumping stations. Further accuracy can be obtained by installing flow monitoring gauges in the sewer system. Interrogation of this data during wet weather events will enable estimation of peak instantaneous and peak daily wet weather flows although it is noted that the peak wet weather flow is usually measured as a daily flow and will be different to the peak instantaneous flow.

6.3 Record keeping
As a minimum requirement the WSP should have up to date plans of their existing sewer systems which show all overflows and overflow points. This needs to be updated as new works are added.

Other records should include the maintenance history of the system. These records should be based on inspection reports and should include information on when elements of the system were inspected and what, if any, maintenance was performed. Significant maintenance issues must be reported to management. In larger systems, this information can be included in a GIS system or some electronic format.

The records should include details of all recorded overflows and the resulting actions taken consequent to the overflow. All relevant policies and procedures should be maintained in accessible folders and updated where changes are made.

Data sheets should be prepared for each overflow in the system. Data sheets may include photographs of the site, locality and layout plans, and other relevant information describing how to manage any overflow from that particular site.
Guidance for the preparation of data sheets for sewer overflows is included in the Emergency Response Manual which is available as a separate document.

6.4 Review of New Connections
The design of all new connections should be reviewed to ascertain the locations of any overflow points in the new area of development. Increases in flow from upstream sources can overload the system downstream resulting in overflows at low points. In addition, upstream connections can be affected if the system is backed up due to downstream constrictions.

To complement suitable system planning for new developments, it is important that the WSP has in place clear requirements for the design, construction, inspection and testing of new systems. It is important that the WSP does not accept new connections that are substandard or overload the sewer system.

The WSP should avoid or minimise the introduction of new overflows to the sewer system and overflow design should be based on best practice for the development under consideration and should reference “Guidelines for Wastewater Systems – Wastewater System Overflows”, Chapter 8, NWQMS (June 2002).

6.5 Wastewater system audits and identification of overflow points
It is necessary to establish all sewer overflow points and to identify the conditions under which overflows occur. It is also necessary to identify the type of overflow (i.e. overflow pipe in pump station or weir in manhole etc) and the location of the outfall point. This should be shown on a site plan showing the point of overflow and the point of discharge and the location of any streams or watercourses.

6.6 Monitoring of overflow points
The extent of monitoring will depend on the size and sophistication of the system. At the simplest level monitoring would involve inspections of overflow points following high rainfall events to ascertain if there have been any spills. At a more sophisticated level, the overflow manholes will be fitted with level gauges which will be monitored remotely via a SCADA system with alarms automatically sent to operators.
6.7 System Maintenance and emergency facilities

Maintenance of sewer systems to minimise overflows is an important component of the asset maintenance program. Poor maintenance of pumps and electrical equipment will lead to equipment failure and the potential for sewer overflows. Equally, poor maintenance of sewer systems can lead to the similar outcomes due to blocked or broken pipes and manholes.

Maintenance activities can and should incorporate:
- Preventative maintenance;
- Corrective (or reactive) maintenance; and
- Emergency maintenance.

Preventative maintenance – These are scheduled activities, including routine inspection, which are performed before failure of the asset. Obviously this extends the equipment life, reduces overall maintenance cost and increases system reliability. Where appropriate preventative maintenance can be scheduled using a risk-based approach, considering factors such as consequences of an overflow, the age of the asset, sewer main diameter, the likelihood of the overflow, sensitivity of the receiving environment, and the adequacy of the maintenance program. Some preventative maintenance activities are listed below in order of the importance of that activity in maintaining the sewer system in good order (ASCE, 2004):

- Cleaning of pipes and root removal;
- Wastewater system rehabilitation;
- Pump station maintenance;
- Inspection using closed circuit television (CCTV);
- Flow monitoring;
- Manhole inspection;
- Relief sewer construction
- Smoke testing; and
- Private sector inspections.

Wastewater system rehabilitation may include removal of blockages (e.g. tree roots), sewer flushing to remove accumulated sediment, chemical cleaning to reduce root infestation, repair of sewers by grouting, lining or replacement of defective pipe sections or repair of manholes (e.g. concrete repair, lining with urethane, epoxy resin or cementitious material).

Pump station maintenance may include inspection of telemetry and instrumentation systems, checking of valves and penstocks and level control devices, mechanical and electrical inspections, removal of sediment/grit accumulated in the wet wells and cleaning of the wet wells so that the build-up of grease and fat does not interfere with level control devices, as this can cause pump failures and trigger overflow.

Corrective (or reactive maintenance) - This relates to the use of the asset until it fails and then requires repair or replacement. Corrective maintenance is a general term that may include repairing damaged sewer pipes, patching and plugging leaks, re-setting or replacing manholes and covers, and other repairs related to the wastewater system. An important element of a corrective maintenance program is the definition of the problem so that the corrective solution can be developed. A good starting point is an Overflow Abatement Plan (refer Section 9.4).
**Emergency maintenance** – This is a form of corrective maintenance that is applied to a critical asset that has failed, resulting in a risk to human health or the environment. Effective emergency maintenance requires a rapid response to mitigate damage to the environment and property, and to limit exposure to the public. Since reaction time is a critical element it is necessary that the WSP develops emergency plans and maintains staff and equipment on call to deploy on short notice.

6.8 **Training and Education**

An important aspect of organisational management is training of all staff who may be involved in an overflow incident. This should include all staff who may be involved in some part of the process. People who will require training will most likely include Customer Service Staff who receive and record details of incidents, management personnel who may be involved in the process and operational personnel who may be involved in any inspection or clean-up work. A review should be carried out to ascertain whether any external parties who may be involved in the process should also be included in the training program.

Training should include operations and maintenance and system planning, inspection procedures for new connections and overflow emergency response. It should also highlight individual responsibilities and outline resources available to assist individuals to carry out their roles. Multi-skilling of staff will mean that the effectiveness of operations and maintenance activities are not compromised when personnel are away or ill. Refresher training is also desirable to ensure that skills and knowledge are not lost over time.

6.9 **Due Diligence Checklists**

There are two checklists provided in the Appendices to this document that will enable WSP’s to document “due diligence” in relation to preventing and managing sewerage infrastructure (Appendix A) and due diligence in relation to investigating and managing sewer overflows (Appendix B). Suggested methods for demonstrating compliance are included in this checklist.

7. **NOTIFICATIONS**

DERM must be notified immediately of all overflows that involve or are likely to involve environmental harm where:

- The release poses a threat to public health;
- There is an observable environmental impact (e.g. fish kill, distress to wildlife, marine plants or other aquatic life);
- The release has generated, or is likely to generate, community reaction. Community reaction (e.g. circumstances where DERM would normally be consulted and it would be beneficial for DERM to have information about the release); and/or
- The release occurs in dry weather and is in excess of 10,000 Litres.

DERM notification should be as follows:

- Immediate notification on the Pollution Hotline (1300 130 372);
- Formal written notification of the environmental harm, (e.g. The DERM Notification Form which is included in the Emergency Response Manual, provides a template for this notification); and
- Formal written details of the event, following the event (a template for this notification, the Release Notification Form, is included in the Emergency Response Manual).
DERM must also be notified in a quarterly summary of the following events even if environmental harm does not, or is not likely to occur:

- Wet weather releases not defined as major; and
- Dry weather releases in excess of 5,000 Litres.

In addition to DERM notifications it is important that those people and organisations that may be affected by the overflow are also notified as soon as the extent of the likely impact of the overflow has been assessed.

Details of the relevant notifications should be provided in the Operational Response Plans. These plans identify the persons responsible for notifications and the timing requirements for such notifications. Notifications will include both persons within the WSP and external to the WSP.

8. MANAGEMENT OF INCIDENTS

Any environmental harm, property damage or other problems caused by an overflow must be remediated. This will involve four basic steps:

1. Identification of the area(s) affected.
2. Removal of wastewater and solids to the maximum amount possible.
3. Washing of the spill area to dilute any remaining wastewater, especially where there is the potential for high public exposure. Note that if town water is used for flushing, consideration needs to be given to the potential impacts on the environment from using chlorinated water.
4. Disinfection of high public exposure areas to reduce the risk to human health.

Cleaning may require the removal of all pollutants to an acceptable level including sediments and gross solids. Any structures or ground damaged by erosion or other effects of the overflow must be repaired.

Clean-up must not involve any harmful activities such as hosing down gross solids and other pollutants into stormwater drains or aquatic environments, the over use of disinfectants or the use of environmentally damaging disinfectants.

Water quality sampling may be required to:

- Evaluate the impact of any overflow on the receiving environment and to ascertain the extent of the overflow;
- To determine the remediation measures required to manage the overflow; and/or
- To identify when the clean-up has been successfully completed.
Water quality sampling procedures are in Appendix F of the Emergency Response Manual.

Records must be kept of all actions undertaken to manage the response and minimise environmental harm. On completion of the clean up all relevant parties will need to be notified that the clean-up is completed. Following the clean-up of the overflow, the cause of the overflow must be investigated. When the cause has been determined reasonable actions must be implemented, consistent with the level of risk, to prevent the recurrence of the event.

9. CONTINGENCY PLANS

Contingency plans should include emergency response plans as follows:

- Operational Response Plans which will include an Incident Response Plan and a Remediation and Clean-up Plan; and
- Investigation and Improvement Plan.

Contingency plans are provided in Section 3 of the Emergency Response Manual

9.1 Incident Response Plans

The development of Incident Response Plans should be regarded as a priority action. Potential incidents and emergencies should be defined and response plans should be developed and documented in advance to respond to any events.

Plans should be developed in communication with relevant regulatory authorities and other key agencies, and should be consistent with existing government emergency response arrangements. In an emergency situation there will not be sufficient time to establish the trust and confidence of other parties who may be required to assist in an emergency and so plans should be prepared when adequate time can be devoted to the task.

The key areas to be addressed in an Incident Response Plans are:

- Response actions, including monitoring requirements;
- Authorities and responsibilities of personnel who will be involved in any response including those external to the organisation; and
- Communication protocols and strategies, including notification procedures (internal, regulatory, media and public).

Employees should be trained in emergency response to ensure that they can manage any potential incidents effectively. Incident Response Plan should be regularly reviewed and training implemented in the use of the plan.

Communication protocols should include appropriate procedures for notifying emergency personnel and other essential personnel. Such notifications should be done irrespective of the time that advice is received (including out of hours and public holidays) and irrespective of the manner in which it is received whether it is by phone call, emergency alarm, internal notification or whatever other means that may be possible.

In developing Incident Response Plans it will be desirable to develop strategies for managing overflows from pump stations or manholes that have the potential to overflow. These strategies would normally be developed as part of the investigations for a Sewer Overflow Abatement Plan (Refer Section 9.4). For example some overflow events will be due to mechanical failure of pumps or power failure. The response will be to replace or repair the pump in the case of
mechanical failure or to provide an emergency power source by way of a portable generator in the case of electrical failure. Containment of the overflow may be possible by use of a portable pump or by pumping the sewage into a tanker for disposal at another point in the sewer system.

There may be some events that are caused by broken or damaged pipes in which case the problem can be solved by shutting down the system temporarily and repairing the pipe. Some events may simply be due to heavy rainfall overloading to the sewer system. In such cases it will be difficult to contain the overflow until such time as flows have subsided. The Improvement Plan would normally identify the urgent need for system upgrading in such instances.

Where it is anticipated that the event may be prolonged, the plan needs to provide guidance on how the situation will be managed up until the overflow can be brought under control. The strategies could include the notification of people likely to be affected by the overflow and the provision of warning signs at key locations. In some instances it may be possible to pump the overflow into tankers and transport it to another location where it can be safely discharged into the sewer.

In assessing the tanker option it will be necessary to assess the benefits of tankering against the risks that the tanker drivers may be subjected to by way of contact with the sewage and the risks associated with accessing the tankers to a suitable point for pumping the sewage into the tanker. The benefits of removing the sewage from the site will depend on the nature of the catchment and the receiving stream. Factors that would need to be considered are:

- The potential environmental and health impacts of the overflow;
- The flow rate from the point of overflow and the likely dilution in the receiving stream; and
- The number of tankers required and the accessibility of the site.

Guidance is provided in the Emergency Response Manual regarding a method of assessing the suitability of using tankers to contain overflows.

Following an incident, an investigation should be undertaken and debriefings should take place with all involved staff to discuss performance and to enable any issues of concern to be identified. Factors to be considered in investigating an incident should include the following:

- What was the initiating cause of the problem?
- How was the problem first identified or recognized?
- What were the most critical actions required?
- What communication problems arose and how were they addressed?
- What were the immediate and longer-term consequences?
- How well did the protocol function?

Appropriate documentation and reporting of the incident should also be undertaken. If necessary, amendments to existing protocols may be necessary.
Response to complaints from the public is an integral part of the necessary protocols. It is important that reports of complaints and/or incidents are dealt with correctly and the protocols should address the following:

- Incident/complaints communication response and notification protocols;
- Responsibilities;
- Investigation and action; and
- Overview of the incident.

A sample Incident Response Plan is included in the Section 3.1 and 3.2 of the Emergency Response Manual, with a detailed description of each plan included in Section 4

9.2 Remediation and Clean-up Plans
The Remediation and Clean-up Plan should describe the dispatch procedures for both during and outside normal business hours. The Plan should outline the essential activities to be carried out for any remediation and clean-up and identify the procedures required for different types of overflows such as a land spill, a water body spill and a stormwater spill. It should outline measures to be taken to contain the overflowing sewage and recover where possible sewage which has been discharged. This could include removal by tankers or pumping to a downstream manhole. It should specify when disinfection should be carried out and where and when water sampling is required.

A sample Remediation and Clean-Up Plan is provided in a flowchart in Section 3.1 of the Emergency Response Manual with a detailed description included in Section 4.2

9.3 Improvement Plan
An Improvement Plan may be focused on an individual problem area or on the overall system. The plan should address identified needs for maintenance and enhancement.

Actions in Improvement Plans should be prioritised relative to the risk that has been identified. For instance, short-term improvements might include actions such as increased monitoring at overflow points, increased surveillance of the system or increased staffing. Long-term actions could include upgrading of the wastewater treatment plant, provision of emergency storage’s at pump stations or sewer system upgrades. The Improvement Plan should be endorsed by senior management.

Improvement Plans should include objectives, actions to be taken, accountability, timeliness and reporting. Implementation of Improvement Plans will often have significant budgetary, regulatory and pricing implications and may therefore require detailed assessment, cost-benefit analysis and careful prioritisation in accordance with the outcomes of a risk assessment. Implementation Plans should be monitored to confirm that improvements have been made and are effective.

A sample process for investigating sewage spills and implementing improvements is included in Section 3.2 of the Emergency Response Manual.
9.4 Overflow Abatement Plan

For more advanced and larger systems Overflow Abatement Plans may be used to provide a more holistic overview of the system performance under dry and wet weather conditions. An Overflow Abatement Plan could cover the entire system or major catchments and would normally include:

- A statement of the objectives;
- An analysis of the existing system performance;
- A risk analysis; and
- The identification and evaluation of mitigation measures.

For small schemes this does not need to be a voluminous document and may be done in stages.

Appendix E provides more information on Overflow Abatement Plans.

10 RISK ASSESSMENT AND MITIGATION

A tool for assessing risk of overflows from Sewerage Pump Stations is provided in Appendix D of these Technical Guidelines. This tool may be used to populate the template in Appendix B of the Emergency Response Manual.

10.1 Risk Analysis

Risk analysis can be used to evaluate the potential risk of overflows occurring in different parts of the system. The risk analysis will enable ranking of the parts of the system with the highest risk and will help prioritise efforts for resourcing and funding for improvements.

This involves identification of issues that may impact the likelihood or severity of sewage overflows from the system. The severity of an overflow will be affected by: the quality and quantity of wastewater, the time and duration of the overflow, and the characteristics of the receiving environment. These aspects must therefore be considered in the risk assessment.

A risk based approach based on AS/ANZ 4360 Risk Management Standard is provided in Appendix C. This approach is based around an assessment of likelihood and consequence for each overflow location. The approach can be used to prioritise management actions to reduce risk.

The first step is to identify factors contributing to overflows in the system and investigate the opportunities to manage them. Potential factors include:

- Inflow/infiltration which may be investigated through a specific inflow and infiltration study;
- Hydraulic Capacity issues - a review sewer sizes and pumping stations through planning including hydraulic modelling;
- Emergency Storage Facilities - review stand-by, back-up facilities or emergency storages at pumping stations;
- Alarm System - review of alarm systems and remote monitoring facilities; and
- Operations and Maintenance Procedures.
There are many options available to Water Service Providers to reduce risks from sewerage overflows once they are fully understood. Examples of actions include:

- Improvements to telemetry and alarm systems;
- Improvements to operating and maintenance procedures;
- Improvements to record keeping procedures;
- Routine clean-out of pipes;
- Sealing of maintenance or access chambers;
- Maintenance to prevent or minimise deterioration of sewer lines;
- Sewer main repairs in high inflow/infiltration areas;
- Replacement of existing sewers or provision of new sewers where there are capacity constraints;
- Shutting off or redirecting some overflows;
- Provision of stand-by pumps;
- Provision of additional spare parts;
- Provision of emergency power or emergency storage;
- Program to study and reduce inflow and infiltration into the sewer system;
- A review of stand-by, back-up facilities or emergency storages at pumping stations;
- A review of alarm systems and remote monitoring facilities; and
- A review of operations and maintenance procedures.

10.2 Assess Public Health and Environmental Impacts

Public health and environmental impacts are assessed at three levels.

1. High Level Planning: When looking at the sewer network, assessment will be across the whole area served by the system (or by individual catchments for large systems) to gauge the impact of uncontrolled and unexpected overflows from the reticulation system;

2. High Risk Overflow Locations: When looking at the designed overflow points and pumping stations, assessment in the vicinity of the overflow points, to assess the local impact and provide upfront information to field staff on the risks associated with the area.

3. Emergency Response: During an emergency event, field staff will reassess the consequences of the spill.
It is important that each level of Risk Assessment is documented and retained. The following table describes the output for each assessment and where it is applied in the Operational Response Plans.

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>DESCRIPTION</th>
<th>OPERATIONAL RESPONSE PLANS</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Level Planning</td>
<td>Considers the whole system to identify and control areas from which overflows are likely to occur.</td>
<td>Identification of high risk areas and pump stations. Option to Populate Appendix A in the Emergency Response Manual to prioritise pump stations based on risk during wet weather events.</td>
</tr>
<tr>
<td>High Risk Locations</td>
<td>Considers the impacts of overflows occurring from pumping stations and high risk areas through planning.</td>
<td>Assessment of risks of overflows from high risk locations documented in Appendix B of the Emergency Response Manual.</td>
</tr>
<tr>
<td>Emergency Response</td>
<td>Considers the impacts of sewage spills during emergency events. This may draw upon outputs from 1 &amp; 2, or may require an independent assessment.</td>
<td>Field staff will assess the risk on site to determine the appropriate management/mitigation measures. Records will be maintained in the Overflow Report Form, or through DERM notification (refer to Appendix G of the Emergency Response Manual).</td>
</tr>
</tbody>
</table>
11. GUIDE FOR COMPLETING THE EMERGENCY RESPONSE MANUAL

These notes should be used in conjunction with the Emergency Response Manual Template to complete an Emergency Response Manual for a specific agency. The notes provide additional information and guidance for completing the template and are structured to follow the template.

11.1 Authorities during emergencies

This section defines responsibilities of key personnel responding to sewerage incidents. To complete this section you will need to:

1. Nominate staff or roles qualified to undertake the responsibilities listed,
2. Provide contact details for office hours and after hours where required
3. Ensure all information is regularly updated

A template is provided in the Emergency Response Manual for recording this information.

This information will be stored in the Emergency Response Manual by populating Table 2 in Section 2 with relevant information for your organisation.

11.2 Sewerage Network Plans

Information such as sewerage network plans will be readily available and should be included in the manual. For other items, such as the environmental risk assessment of overflow locations, further work will be required.

This information will be stored in Appendix B of the Emergency Response Manual.

11.3 List of Pump Stations

This list will be used to locate pump stations and provide high level details for emergencies. The list should include the pump station name and location. It may also contain information regarding telemetry, capacity, storage, alarm system.

This information will be stored in Appendix A of the Emergency Response Manual.

11.4 Environmental risk assessment of overflow locations

This table will contain the results of an environmental risk assessment of overflow locations. The purpose of the risk assessment is to determine the likelihood and consequence of spills occurring from designated overflow locations.

The environmental risk assessment may be undertaken through a full environmental audit of the sewerage system that examines sewerage surcharge locations in modelling, and relates this information to the receiving environment of the designated overflow location. Alternatively, the Desktop Environmental Audit of Designated Overflow Locations (refer Section 8 – Risk Assessments at Overflow Locations, in the Sewerage Incident Emergency Response Manual) may be used to prioritise risks at pump stations.
The desk top audit considers:
  - the receiving environment including waterways and residential areas
  - pump station size
  - storage at pump station
  - environmental values

From this, each station is assigned an Environmental and Residential Risk Rating between 1 and 6. High, moderate and low risk overflow locations can be defined.

This information will be stored in Appendix B of the Emergency Response Manual.

11.5 Benefit/Impact Study of Tankering Wet Weather Flows

Using tanker trucks to avoid or reduce overflows is a standard mitigating measure for some service providers in the Emergency Response. Tankering may give significant benefits in instances where small volumes of undiluted water overflow to high risk areas. However, where large volumes of diluted effluent is involved, there may be minimal benefits. These benefits should be weighed up against the risks of tankering to determine whether tankering is the best remediation measure.

A desktop study of the benefits of tankering during wet weather events may be conducted to identify:
  - Environmental and residential impacts of spillage;
  - Capacity of pump stations and assumed dilution during wet weather overflows;
  - Risks of tankering including workplace health and safety considerations; and
  - Priority of stations for tankering.

The outcome of this study will be to identify:
  - Pump stations where tankering is likely to provide benefits;
  - Pump stations where tankering may provide benefits for consideration after tankering at priority stations; and
  - Pump stations where tankering is unlikely to provide benefit.

This information will be fed into Environmental Risk Assessment and Tankering Options in the ERM.

This information may be stored in Appendix A or B of the Emergency Response Manual depending on the location of the overflow.

11.6 Technical data sheets for overflow locations

The data sheets provide technical information required to operate and manage overflow points during an emergency. One data sheet should be developed for each overflow location. Data sheets may include the following information and will be contained in the ERM:
  - Photograph
  - Locality and layout plans
  - Other relevant information including a description of how to operate/remediate the overflow.
This information will be stored in the Emergency Response Manual by completing the template in Appendix D for each overflow location.

REFERENCES

ASCE 2004, Sanitary Sewer Overflow Solutions, American Society of Civil Engineers EPA Cooperative Agreement CP-828955-01-0, April 2004

Guidelines for Wastewater Systems – Wastewater System Overflows”, Chapter 8, NWQMS (June 2002).


APPENDIX A  STATUTORY COMPLIANCE

Compliance with the following statutory instruments will aid in preventing and managing sewage spills.

Table A-0-1  STATUTORY COMPLIANCE INSTRUMENTS

<table>
<thead>
<tr>
<th>Statutory Instrument</th>
<th>Relevant Requirements</th>
</tr>
</thead>
</table>
| Strategic Asset Management Plan (SAMP) | Performance indicators for effective transport of waste:  
  ‣ total sewage overflows;  
  ‣ sewage overflows to customer property;  
  ‣ odour complaints;  
  ‣ response/reaction time to incidents for the effective transport of waste;  
  ‣ Continuity in the long term of sewerage services;  
  ‣ sewer main breaks and chokes; and  
  ‣ sewer inflow/infiltration. |
| SAMP Annual Report           | ‣ Annual reporting of the Performance Indicators stated above. |
| DERM/EPA Licence             | ‣ EPA licence conditions for a Sewage Treatment Plant. |
# APPENDIX B

## TABLE A-2  DUE DILIGENCE CHECKLIST OF MEASURES FOR PREPARING FOR OVERFLOWS

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>Methods for demonstrating compliance</th>
<th>ER Manual Reference</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Contingency Plans</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
> Staff adequately trained. | 3.1 | | |
| 2  | Remediation and Clean-up Plan | > Suitable staff available 24/7.  
> Emergency equipment and materials procured and available. | 3.2 | | |
| 3  | Investigation and Improvement Plan | | | | |

### Sewer System Planning

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>Methods for demonstrating compliance</th>
<th>ER Manual Reference</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
| 4  | System has been designed to minimise potential harm resulting from overflows. | > Wastewater Planning Study has been prepared in accordance with NRM Guidelines and is reasonably up to date.  
> The system is designed taking into account the most recent data on population loadings and peak wet weather flows and if this information is not known there is a strategy in place to address deficiencies identified.  
> Infiltration strategies have been developed where appropriate and programs are in place. | | | |
| 5  | Minimise community exposure to overflows and potential health impacts. Identify high risk areas for sewerage surcharges | > High risk sewerage surcharge locations identified through sewerage modelling and/or identifying sites where multiple overflows have occurred.  
> High Risk Surcharge Locations Register completed and up to date.  
> Technical Data Sheets for each high risk surcharge point completed and up to date in the Emergency Response Manual | Appendix D | | |

### Organisational Management
<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>Methods for demonstrating compliance</th>
<th>ER Manual Reference</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
| 6  | Have clearly defined accountabilities for managing and responding to sewerage overflows. | Accountabilities for the following are clear.  
  › Responding to Emergency Events and defining authorities during emergencies.  
  › Wastewater Planning – e.g. Wastewater Planning Study developed in accordance with DERM Planning Guidelines for Water Supply and Sewerage.  
  › A standard procedure for accepting new connections into the system (specified in the Town Plan).  
  › Maintaining a register of all overflow events.  
  › Ensuring accessibility of sewer system plans.  
  › Notifications to DERM and other personnel/organisations.  
  › Clean-up of any overflows.  
  › Preparation and implementation of Improvement & Overflow Abatement Plans. | Section 2.0  
  & Appendix G | Yes | |
| 7  | Records of the sewerage system, its performance and history are maintained, available and regularly updated. | Up to date plans of sewerage system available to staff responding to sewage overflow (these may included in the Emergency Response Manual).  
  › Data sheets for each identified overflow point are up to date and available.  
  › Records of all overflow events are up to date and available.  
  › Relevant policies for overflow events are up to date and available. | Appendix C  
  Appendix D  
  Appendix H | |
| 8  | WSP has adopted a standard for new wastewater connections to avoid overloading the sewerage system. | Approved planning, design and construction standards are available for designers and developers including inspection and testing procedures (including procedures to be followed in the event of a non compliance).  
  › Internal procedures in place for checking the impact of new connections on the sewerage system. | -  
  - | |

**Record Keeping**

**Review of New Connections**
<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>Methods for demonstrating compliance</th>
<th>ER Manual Reference</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Wastewater System Audits and Identification of Overflow Points</strong></td>
<td></td>
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</tbody>
</table>
| 9  | Overflow Points identified and data sheets prepared. High risk overflow points identified. | This information will be developed by planning staff and will be summarised in the Emergency Response Manual for field staff to draw upon during emergencies. The following planning activities are recommended:  
  - Overflow points identified and data sheets prepared and complete. This may be by way of field inspections but it could also involve hydraulic modelling of the system to identify overflow points;  
  - High risk overflow points identified taking account the nature of the catchment and receiving stream, the likely frequency of overflow and the volume of sewage that could be potentially discharged;  
  - Records maintained and available for all overflow points; and  
  - Records maintained and available of sewerage system performance (i.e. overflow points recorded, sewer main chokes and breakages recorded). | Appendices A, B, C, D |     |    |
|    | **Monitoring of Overflow Points**                                            |                                                                                                                                                                                                                                                                                             |                    |     |    |
| 10 | Monitoring system in place.                                                   |  
  - Overflow points monitored after major wet weather events by inspection and record of inspections available.  
  - Telemetry system installed for high risk locations. Note it is important that permanent records of overflow events are available for each monitored site as some systems delete records after a certain period. |                    |     |    |
|    | **System Maintenance and Emergency Facilities**                               |  
  - A preventative maintenance program is in place and maintenance records are available for: mains flushing, manhole inspections, pump station inspections |                    |     |    |
<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>Methods for demonstrating compliance</th>
<th>ER Manual Reference</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(mechanical and electrical), SCADA system inspections and CCTV inspections. Corrective maintenance is undertaken as required and maintenance records available. Emergency maintenance is undertaken as required and maintenance records available.</td>
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</tr>
</tbody>
</table>

**Training and Education**

12  Training of all staff involved in management of sewer overflows.  
    + Training programs prepared and records are maintained to ensure relevant staff receive appropriate training for responding to and managing overflows.

13  Public education.  
    + Education material is available for the public, and information provided in newsletters or via website regarding illegal stormwater connections and inappropriate discharges to sewerage systems. Customer Service Standards on the WSP Website or in printed material.

**Improvement Plans and Overflow Abatement Plan**

14  Improvement Plans prepared and recommendations implemented.  
    + Improvement Plans for overflow incidents completed.  
    + Recommendations implemented or a program of works in place to ensure that the works are implemented.

14  Overflow Abatement Plan prepared and recommendations implemented.  
    + High risk overflow points identified though historic records of overflow points and by assessing environmental values of the receiving environments for each overflow point and then conducting a risk assessment for each overflow point.  
    + The condition of pump stations and overflow structures are known and recorded.  
    + Infiltration strategies have been developed and programs are in place.  
    + Trade Waste Management Plan or Total Water Cycle Management Plan in place to control wastes entering the sewerage system.  
    + Overflows are detected and reported.  
<pre><code>| Appendices A, B, C, D |
</code></pre>
<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>Methods for demonstrating compliance</th>
<th>ER Manual Reference</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>• The need for installation of remote sensing on components of the system reviewed.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• An audit methodology (i.e. ISO 9000 or 14000) has been adopted to ensure continuous improvement in operations.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Strategies developed for management of high risk overflows and a program in place to carry out identified works/actions.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Strategies developed for management of overflows and a program in place for carrying out identified works/actions.</td>
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</tr>
</tbody>
</table>
APPENDIX C   RISK ASSESSMENT PROCESS

Overflow data will be used as part of a qualitative assessment of the likelihood of overflows occurring, in accordance with Table 10-1. The assessment is usually done on an average annual basis.

Table 10-0-1  Qualitative Measures of Likelihood

<table>
<thead>
<tr>
<th>Level</th>
<th>Descriptor</th>
<th>Example Description</th>
</tr>
</thead>
</table>
| A     | Almost Certain | The event is expected to occur in most circumstances. For example:  
|       |             | - Overflows have occurred numerous times a year; and/or  
|       |             | - Overflow rate is well above benchmark average.       |
| B     | Likely      | The event will probably occur in most circumstances. For example:  
|       |             | - Overflows have occurred a few times a year; and/or  
|       |             | - Overflow rate is above benchmark average.            |
| C     | Possible    | The event is expected to occur at some time. For example:  
|       |             | - Overflows have occurred at least once per year; and/or  
|       |             | - Overflow rate is around the benchmark average.       |
| D     | Unlikely    | The event could occur at some time. For example:  
|       |             | - Overflows have been recorded once; and/or  
|       |             | - Overflow rate is below the benchmark level.          |
| E     | Rare        | The event may occur in exceptional circumstances. For example:  
|       |             | - Overflows have not been recorded; and/or  
|       |             | - Overflow rate is well below the benchmark level.     |

The level of complexity of investigations to assess the risk of overflows will vary, depending on the system size, the consequence and likelihood of the potential hazard, and the resources available to repair any damage or equipment malfunction or mitigate the overflow.

The overflow data and other relevant information can be used as part of a qualitative assessment of the likelihood of overflows for each component, in accordance with the following table. The assessment would usually be done on an average annual basis.

The resulting assessment of the likelihood of overflows can be presented in a table as shown in Table 10.2. For the reticulation system the likelihood could be assessed against an average for the whole system such as “dry weather sewer overflows per 100 km of sewer”.

### Table 10.0-2 Likelihood of Overflows

<table>
<thead>
<tr>
<th>Component</th>
<th>Likelihood of Overflows in dry weather</th>
<th>Likelihood of overflows in wet weather</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catchment 1</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>Catchment 2</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Sewage Pump Station 1</td>
<td>E</td>
<td>D</td>
</tr>
<tr>
<td>Sewage Pump Station 1</td>
<td>D</td>
<td>B</td>
</tr>
<tr>
<td>Designed overflow point</td>
<td>D</td>
<td>C</td>
</tr>
<tr>
<td>Sewage Treatment Plant</td>
<td>n/a</td>
<td>C</td>
</tr>
</tbody>
</table>

In order to assess the potential impacts on public health and the environment it will be necessary to make some assessment of the status of the receiving environment and sources of potential exposure of people to the overflow. This can be done using the best available information and scientific and engineering judgement.

For more complex systems it may be necessary to collect supplementary data on water quality, the aquatic environment and impacted land uses. Additional data that may be collected includes the following.

- Data on peak flow rates from the overflow and likely response time. Peak flow rate information can be calculated by knowledge of the pipe diameter and pressure or water level in the pipe.
- Information on the streamflows of the affected waterways, i.e. water depth and slope.
- Data on water quality in the receiving waters and the aquatic ecosystem.
- Data on groundwater.
- Information on the uses of the affected areas (i.e. bathing, fishing etc).
- Land uses of any affected areas which will be particularly sensitive to overflows.
- Rainfall data.

This information can be used to assess the degree of risk as per Table 10.0.3.
<table>
<thead>
<tr>
<th>Level</th>
<th>Classification</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1     | Insignificant  | The overflow is extremely unlikely to drain to a local sensitive environment* and  
|       |                | ‣ Where the overflow reaches waters, the volume of sewage likely to enter the waterway is insignificant with regard to the volume and flow of receiving waters, or  
|       |                | ‣ Where the overflow reaches land, it is likely to be contained in an area with little chance of public exposure within the maximum response time**. |
| 2     | Minor          | The overflow is extremely unlikely to drain to a local sensitive environment* and  
|       |                | ‣ Where the overflow reaches waters, the volume of sewage likely to enter the waterway is significant with regard to the volume and flow of receiving waters, or  
|       |                | ‣ Where the overflow reaches land, it is likely to be contained in an area where public exposure is minimal given the maximum response time** |
| 3     | Moderate       | The overflow is unlikely to drain to a local sensitive environment* and  
|       |                | ‣ Where the overflow reaches waters, the volume of sewage likely to enter the waterway is significant with regard to the volume and flow of receiving waters, or  
|       |                | ‣ Where the overflow reaches land, it may travel to an area where public exposure is low within the maximum response time**. |
| 4     | Major          | The overflow is likely to drain to a local sensitive environment* and  
|       |                | ‣ Where the overflow reaches waters, the volume of sewage likely to enter the waterway is high with regard to the volume and flow of receiving waters, or  
|       |                | ‣ Where the overflow reaches land, the public exposure risk is likely given the maximum response time**. |
| 5     | Catastrophic   | The overflow is likely to drain to a local sensitive environment* and  
|       |                | ‣ Where the overflow discharges to waters, the volume of sewage likely to enter the waterway is high with regard to the volume and flow of receiving waters, or  
|       |                | ‣ Where the overflow discharges to land, the public exposure risk is high given the maximum response time**. |

* A sensitive environment includes:  
  - A drinking water catchment or domestic groundwater source;  
  - A shellfish growing area;  
  - Protected water bodies, ecological communities or conservation areas defined by legal and non-legal instruments, national parks, world heritage parks etc;  
  - Waterways used for primary contact recreation;  
  - Recreational areas or other areas with high public exposure or associated health risk.  

** Maximum response time should be based on an assessment of the length of time taken for the WSP to detect the overflow, or for the overflow to be reported, and the time taken for the WSP to attend the site and secure against public contact. The WSP should consider how detection will occur and how the detection time can be minimised.
10. Identify Management Actions

Following an assessment of the likelihood of overflows and their potential impacts, a risk analysis can be undertaken to estimate the level of risk, based on the information provided in Table 10.0.4.

Table 10.0.4 Level of Risk

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Insignificant</th>
<th>Minor</th>
<th>Moderate</th>
<th>Major</th>
<th>Catastrophic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almost certain</td>
<td>A</td>
<td>Significant</td>
<td>Significant</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Likely</td>
<td>B</td>
<td>Moderate</td>
<td>Significant</td>
<td>Significant</td>
<td>High</td>
</tr>
<tr>
<td>Moderate</td>
<td>C</td>
<td>Low</td>
<td>Moderate</td>
<td>Significant</td>
<td>High</td>
</tr>
<tr>
<td>Unlikely</td>
<td>D</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
<td>Significant</td>
</tr>
<tr>
<td>Rare</td>
<td>E</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
<td>Significant</td>
</tr>
</tbody>
</table>

Proposed management actions can be based on the level of risk identified in the above table. For example:

- **High Risk** – further detailed investigation and assessment of management options is required; immediate review and modification of operations and maintenance is required to reduce the consequences, likelihood and exposure; cleanup and notification procedures become a high priority;
- **Significant risk** – further investigation may be required and assessment of management options; in the short term, operations and maintenance may require review and modification to reduce the consequences, likelihood and exposure;
- **Moderate risk** – medium term assessment of possible management options required;
- **Low risk** – manage by routine procedures/work practices.
APPENDIX D       PUMP STATION RISK ASSESSMENT TOOL

Organisations should assess the risk of overflows at each of their pump stations and develop a list prioritising which station should be attended to first during an emergency.

This considers the likelihood and consequences of overflows occurring from pump stations. It may be used to assess risk for each station and to develop the list of high, moderate and low risk stations.

To assess risk for each station you will need to consider:

- The receiving environment,
- The capacity of the pump station, and
- Storage volumes and downstream flow.

The most important element of this assessment is in determining environmental and social risks. The tool requires these risks to be classified as: significant, moderate or low. To assess the risk associated with the receiving environment the following process should be adopted.

1. Determine the receiving environment. The receiving environment may not always be obvious and a field inspection may be required to identify a stormwater drains, gullies, waterbodies, roads or pedestrian ways that may transfer the spill to another area.

2. Consider the environmental and social risks associated with the areas as per Figure 1 Pump Station Risk Assessment Tool.

The output of this process can be used to populate Table 3.2 in the Emergency Response Manual.
### Figure 1 Pump Station Risk Assessment Tool

<table>
<thead>
<tr>
<th>Receiving environment</th>
<th>Significant Impact</th>
<th>Moderate Impact</th>
<th>Low Impact/No Waterway</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pump station either directly or potentially flows into or may impact a:</td>
<td>Pump station either directly or potentially flows into:</td>
<td>Pump station either:</td>
</tr>
<tr>
<td></td>
<td>- canal, impounded water body, wetland, natural waterway or beach, recreational facility;</td>
<td>- seasonal waterways, stormwater gullies or small creeks of no high environmental value; and/or</td>
<td>- does not flow into a waterbody or waterway and can be contained; or</td>
</tr>
<tr>
<td></td>
<td>- water supply, or natural habitat;</td>
<td>- areas occasionally accessed either by a private owner or member of the public, and no damage has been done to property.</td>
<td>- flows to a contained area, not densely populated or with low public use and spill can be readily contained.</td>
</tr>
<tr>
<td></td>
<td>- a densely populated area;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- area frequently accessed by the public; and/or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- where there is damage to private property.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pump Station Size

<table>
<thead>
<tr>
<th>Pump Station Size</th>
<th>Large (&gt;15l/s)</th>
<th>Small (&lt;15l/s)</th>
<th>Large (&gt;15l/s)</th>
<th>Small (&lt;15l/s)</th>
<th>Large (&gt;15l/s)</th>
<th>Small (&lt;15l/s)</th>
</tr>
</thead>
</table>

### Storage and/or flow-on capacity

<table>
<thead>
<tr>
<th>Storage and/or flow-on capacity</th>
<th>N</th>
<th>Y</th>
<th>N</th>
<th>Y</th>
<th>N</th>
<th>Y</th>
<th>N</th>
<th>Y</th>
<th>N</th>
<th>Y</th>
</tr>
</thead>
</table>

### Pump Station Risk Rating

<table>
<thead>
<tr>
<th>Pump Station Risk Rating</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>5</th>
<th>6</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
</table>

### Pump Station Risk

<table>
<thead>
<tr>
<th>Pump Station Risk</th>
<th>High</th>
<th>High</th>
<th>Mod</th>
<th>Mod.</th>
<th>High</th>
<th>Mod.</th>
<th>Low</th>
<th>Low</th>
<th>Low</th>
<th>Low</th>
<th>Low</th>
<th>Low</th>
</tr>
</thead>
</table>
APPENDIX E  OVERFLOW ABATEMENT PLANS

For more advanced and larger systems Overflow Abatement Plans may be used to provide a more holistic overview of the system performance under wet weather. An Overflow Abatement Plan could cover the entire system or major catchments and would normally include:

- A statement of the objectives;
- An analysis of the existing system performance;
- A risk analysis; and
- The identification and evaluation of mitigation measures.

For small schemes this does not need to be a voluminous document and may be done in stages.

The plan could include the following topics.

Objectives
Where practical, these should be quantifiable objectives, against which the performance of the plan can be measured. Objectives must have regard to:

- Statutory or regulatory requirements;
- Relevant government policies; and
- Ensuring that overflows do not compromise water quality objectives and human health.

Some examples of suitable objectives are:

- The number of wet and dry weather overflow events per year (often measured per 100 km of sewer);
- The average volume discharged during an overflow event;
- The response time to initiation of clean-up activities and for completion of clean-up activities;
- Confirmed sewer chokes attended within a certain period; and
- The number of sewer chokes per 100km of sewer;

Scope
Overflow Abatement Plans may encompass a wide range of issues such as:

- Capital works;
- Training;
- Enhanced operational procedures;
- Communication programs;
- Research and development opportunities;
- Incident protocols;
- Enhancement to policy and wastewater source management objectives; and
- Communication and reporting.

Data Collection
This involves the preparation of a description of the existing nature and conditions of the sewer system infrastructure, and an assessment of the current management processes and organisational arrangements. Data that should be collected and incorporated in the report includes:
The estimated equivalent tenements/population serviced by the sewer system;
- The estimated flows (average and peak dry weather flows and peak wet weather flows);
- Material and age of the sewer pipes including rising mains;
- Sewer and rising main pipe diameters;
- Total length of sewers;
- The locations of any designed overflow or flow relief structures in the network excluding those in pumping stations and a description of the outlet location and destination of the flow; and
- Rainfall data, particularly daily rainfall records.

Other data that will be useful is as follows:
- Average depth of sewers;
- Indicative soil conditions e.g. expansive clays, sandy loam etc; and
- Indicative vegetation characteristics above sewers e.g. grass, deep rooted trees.

Information on sewage pumping stations should include:
- The location of each pumping station;
- The number of pumps and pumping capacity;
- Wet/dry well storage volumes (effective storage);
- Storage times at average dry weather flow;
- Alarm/telemetry details;
- Details of any flow relief or overflow facility, including a description of the outlet location and destination of the flow.

The extent of the information collected will depend on the size of the system, the characteristics of the wastewater and the likelihood and environmental consequences of any potential overflows. Where information is not readily available the available information should be used with a plan implemented to collect the additional essential information.

**Analysis of Existing System Performance**

At a basic level the analysis would involve an assessment of the system performance to determine "problem areas". This information may be obtained from operational staff but it may require further field investigations over a period of time to assess performance under wet weather conditions as well as dry weather conditions.

For expanding areas there will be a need for more detailed planning studies involving system network analysis. This is used to assess the existing loads on each sewer line and the capacity of that line. The sewer lines are then checked for the increased loads due to growth over the design planning horizon.

The planning horizon may vary from ten to twenty years. In many cases the sewers are designed for ultimate catchment loads. This investigation will identify sewers that are currently overloaded and new sewers that will be required to meet current deficiencies and future growth and when they will be required to be constructed.

At a more advanced level, the sewer modeling may include inflow/infiltration analysis of the system to dynamically model performance under rainfall events.