NSW GOVERNMENT Public Works Advisory

EUROBODALLA SHIRE COUNCIL'S SEWERAGE SCHEMES

POLLUTION INCIDENT RESPONSE MANAGEMENT PLAN

April 2020

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eurobodalla shire council

Document Control

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Foreword

This Pollution Incident Response Management Plan (PIRMP) has been prepared to assist staff in the management of pollution incidents at Eurobodalla Shire Council's sewerage schemes including sewage treatment plants (STPs) and the sewer reticulation systems. Details for each STP and associated reticulation system are documented in different chapters in the PIRMP.

The plan ensures that, where possible, pollution incidents are avoided, but if they do occur, they are managed appropriately to minimise the effects on the environment and to human health.

The objectives of this PIRMP are:

- to communicate in a timely manner and with sufficient detail about a pollution incident to relevant authorities and people outside the facilities who may be affected by the impacts of the pollution incident;
- to minimise and control the risk of any pollution incident occurring at the facilities by identification of risks and the development of planned actions to minimise and manage those risks; and
- to ensure that the plan is properly implemented by trained staff, identifying persons responsible for implementing it, and ensuring that the plan is regularly tested for accuracy, currency and suitability.

This PIRMP addresses the requirements under the POELA Act 2011.

This management plan is to be reviewed and updated annually by the Water and Sewer Operations Engineer (WSOE).

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Five (5) PIRMPs were developed for each sewerage scheme in Eurobodalla Shire Council (ESC) in 2013. The previous PIRMPs have been reviewed and updated to capture changes which have occurred since 2013 and integrated into this PIRMP to cover all of ESC's sewerage schemes.

The PIRMP covers the following schemes;

- Batemans Bay
- Moruya
- Tomakin
- Tuross
- Narooma

The essence of the PIRMP is the communication protocols are defined in dealing with pollution incidents of:

- Major Sewage Treatment Plant Bypass;
- Threatening Major Sewer Surcharge; and
- Minor Sewer Surcharge.

The following three figures show the communication protocols for each event.

Figure S - 1: Major Sewage Treatment Plant Bypass

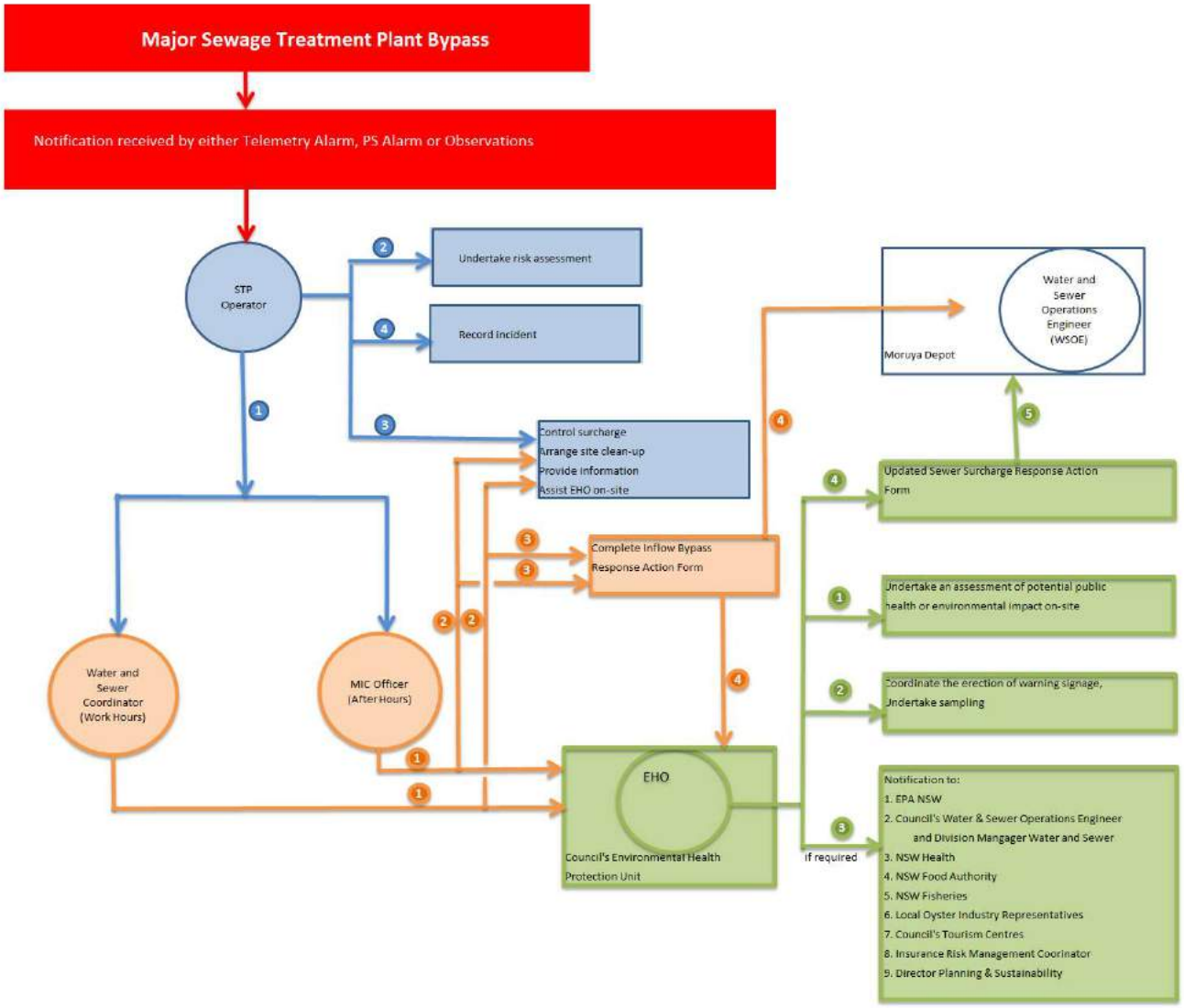


Figure S - 2: Major Risk Incident, Causing or Threatening Material Harm, for Sewer Surcharge

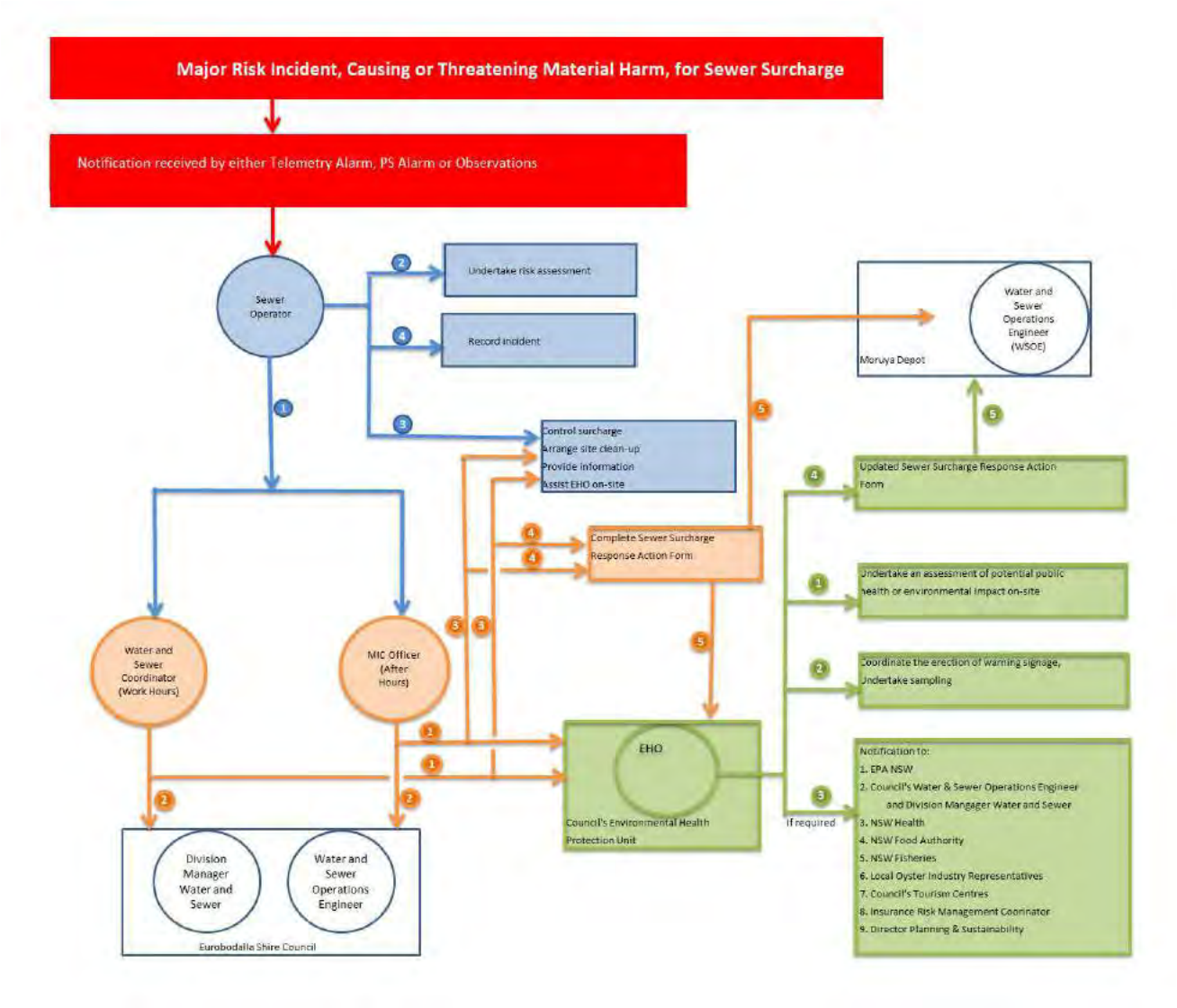
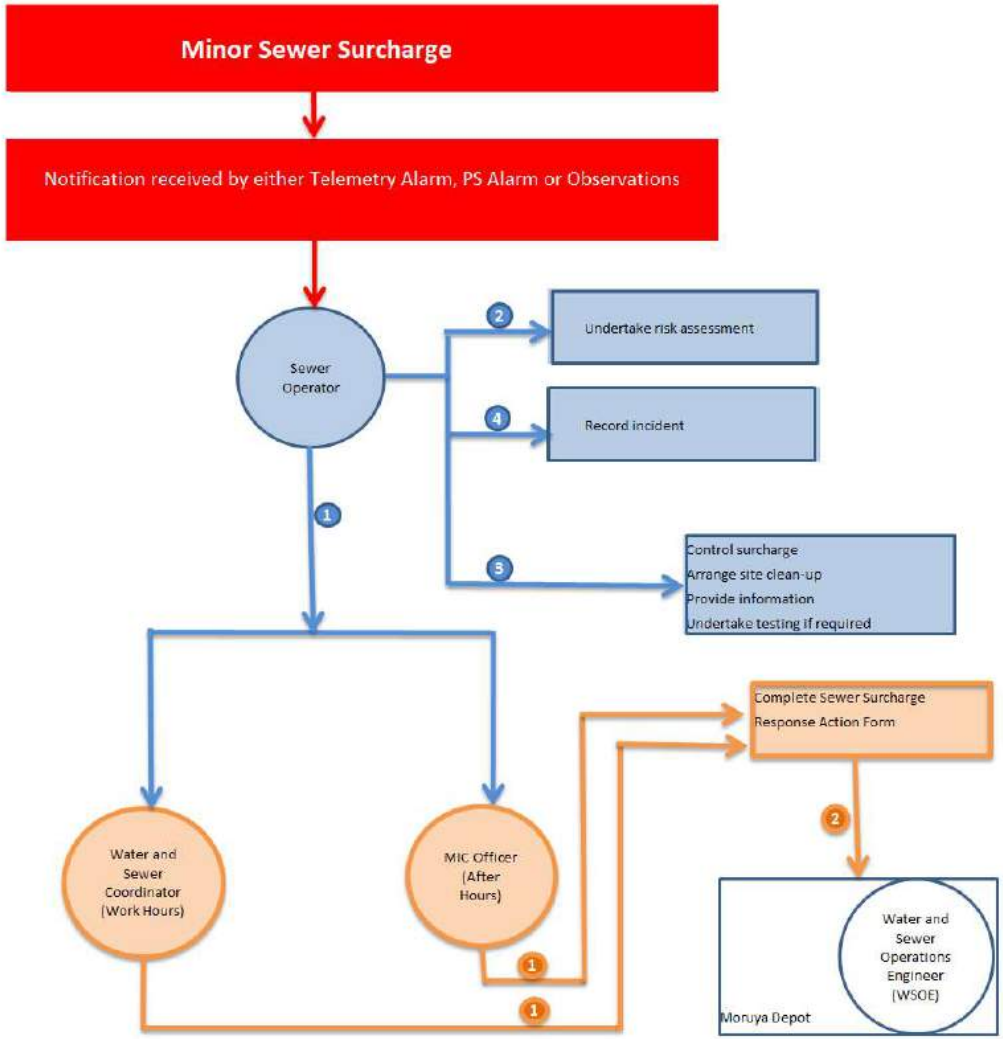


Figure S - 3: Minor Sewer Surcharge



2 Introduction

Five (5) PIRMPs were developed for each sewerage scheme in Eurobodalla Shire Council (ESC) in 2013. Those PIRMPs have been reviewed and updated to capture changes which have occurred since 2013 and integrated into this PIRMP to cover all of ESC's sewerage schemes.

2.1 Scope of the PIRMP

The scope of this PIRMP is as follows:

- Description and likelihood of hazards
- List of pre-emptive actions to be taken to minimise potential effects and minimise harm to persons on the premises
- Provision of an inventory of pollutants
- List of the required safety equipment ESC carries
- List of the important contact details
- Provision of a communication strategy for ESC to use when communicating with neighbours and the local community
- Maps showing the location of the scheme components
- Actions to be taken during or immediately after a pollution incident
- Staff training and ongoing review of the PIRMP

2.2 Structure of the PIRMP

The PIRMP covers ESC's sewerage schemes, comprising the sewage treatment plants (STPs) and their associated sewer reticulation systems. The common elements and principles applicable to all the plants and sewer systems are documented in the front of the PIRMP and details specific to each scheme are detailed in separate sections of the plan.

3 Context of the Assessment

3.1 Background

The *Protection of the Environment Legislation Amendment Act* (POELA) 2011 requires Council to prepare, keep, test and implement a pollution incident response management plan for each environmental protection licence that it holds.

The objectives of these plans are to:

- communicate in a timely manner and with sufficient detail any pollution incident to relevant authorities and people who may be affected by the impacts of the pollution incident;
- minimise and control the risk of any pollution incident occurring at the facilities by requiring identification of risks and the development of planned actions to minimise and manage those risks; and
- ensure that the plan is properly implemented by trained staff, identifying persons responsible for implementing it, and ensuring that the plan is regularly tested for accuracy, currency and suitability.

The NSW EPA defines a "pollution incident" as follows;

> *"* an incident or set of circumstances during or as a consequence of which there is or is likely to be a leak, spill or other escape or deposit of a substance, as a result of which pollution has occurred, is occurring or is likely to occur. It includes an incident or set of circumstances in which a substance has been placed or disposed of on premises, but it does not include an incident or set of circumstances involving only the emission of any noise."

A pollution incident is required to be notified if there is a risk of "material harm to the environment", which is defined in section 147 of the POEO Act as:

> "(a) harm to the environment is material if:
>
> (i) it involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial, or
>
> (ii) it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000 (or such other amount as is prescribed by the regulations), and
>
> (b) loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment."

Industry is required to report pollution incidents *immediately* to the EPA, NSW Health, Fire and Rescue NSW, SafeWork NSW and the local council. "Immediately" has its ordinary dictionary meaning of promptly and without delay. These strengthened provisions will ensure that pollution incidents are reported directly to the relevant response agencies so they will have direct access to the information they need to manage and deal with the incident as soon as practicable.

3.2 Council Commitment

Eurobodalla Shire Council is committed to protecting the health of the public, the environment and its workers. This commitment has been formalised and is contained in Council's Annual Reports and Council's charter which is shown below.

Local Government Act - Council's Charter

The Local Government Act contains a Charter for Local Government which describes the approach to supplying services and activities. It charges local government with a number of responsibilities:

- to provide directly or on behalf of other levels of government, after due consultation, adequate, equitable and appropriate services and facilities for the community and to ensure that those services and facilities are managed efficiently and effectively;
- to exercise community leadership;
- to exercise its functions in a manner that is consistent with and actively promotes the principles of multiculturalism;
- to promote and to provide and plan for the needs of children;
- to properly manage, develop, protect, restore, enhance and conserve the environment of the area for which it is responsible, in a manner that is consistent with and promotes the principles of ecologically sustainable development;
- to have regard to the long term and cumulative effects of its decisions;
- to bear in mind that it is the custodian and trustee of public assets and to effectively account for and manage the assets for which it is responsible;
- to engage in long-term strategic planning on behalf of the local community;
- to exercise its functions in a manner that is consistent with and promotes social justice principles of equity, access, participation and rights;
- to facilitate the involvement of councillors, members of the public, users of facilities and services and council staff in the development, improvement and co-ordination of local government;
- to raise funds for local purposes by the fair imposition of rates, charges and fees, by income earned from investments and, when appropriate, by borrowings and grants;
- to keep the local community and the State government (and through it, the wider community) informed about its activities;
- to ensure that, in the exercise of its regulatory functions, it acts consistently and without bias, particularly where an activity of the council is affected; and
- to be a responsible employer.

3.3 Regulatory and Formal Requirements

The regulatory and formal requirements applicable to the Council's sewerage schemes are shown in **Table 3-1**. These legislative and licensing requirements, and guidelines are to be met to ensure the protection of environmental and public health and to satisfy work health and safety (WHS) requirements. This management plan addresses how these requirements are to be met.

Table 3 - 1: Formal and Regulatory Requirements

Parameter	Instrument	Responsible Agency
Overall Scheme Operation	Water Management Act 2000	NSW EPA
	Local Government Act 1993	Department of Planning, Industry and Environment (DPIE) – Water, DLG
	Protection of Water Catchments	Southern Rivers Region Catchment DPIE - Water
	Marine Parks Act 1997	Marine Parks Authority
Public Health	Part 2 General public health; Part 9, Division 1 Public health officers of Public Health Act 2010	NSW Health
Environmental Health	S116 Leaks, spillages and other escapes; S120 Prohibition of pollution of waters 142A Pollution of land; Part 5.7A Duty to prepare and implement PIRMP of Protection of the Environment Operations Act 1997 Protection of the Environment Legislation Amendment Act 2011 Environment Protection Licence	NSW EPA
WHS	*Work Health and Safety Act 2011* (WHS Act) and the WHS Regulations.	SafeWork NSW
Plumbing	All pipe work associated with recycled water schemes is to be installed in accordance with AS/NZS 3500 (Plumbing and Drainage Code: Standards Australia 1996-2003)	Eurobodalla Shire Council

The Division Manager Water and Sewer (DMWS) for Eurobodalla Shire Council is responsible for the review and evaluation of this plan and for meeting the regulatory and other requirements.

4 Roles, Responsibilities and Contact Details

4.1 Stakeholder Responsibilities and Engagement

Council has committed to operating its STPs and collection systems in a responsible manner. Effective stakeholder engagement is necessary to fulfil this commitment. ***Table 4-1*** presents the stakeholders involved in the operation of the STPs and collection systems, sets out their roles and the communication expected to occur to achieve safe operation of the plants and collection systems. Further information on the operation of the system and communication protocols is addressed later in this plan.

Table 4 - 1: Stakeholder Responsibilities and Engagement

Stakeholder	Responsibility	Communicates with	Reason
Eurobodalla Shire Council Division Manager, Water and Sewer	Overall responsibility	Water and Sewer Operations Engineer	Overall Management of Sewerage Schemes
Eurobodalla Shire Council Water and Sewer Operations Engineer	Overall scheme operation/ responsibility	Water and Sewer Coordinators Water and Sewer Operators STP Operators	Management of operations staff
		NSW Health	Health advice, reporting incidents
		NSW EPA	Reporting on Licence compliance, reporting incidents
		Local Community	Advice where required during incidents
		SafeWork NSW	Reporting of injuries and accidents where required.
		Local Catchment Authority	Reporting of spills
		Local Oyster Growers Coordinator	Reporting of spills
		NSW Food Authority	Reporting of spills
	Updates and audits PIRMP	Water and Sewer Coordinators Water and Sewer Operators STP Operators	Management of operations staff
	Ensures staff are inducted and trained appropriately	Water and Sewer Coordinators Water and Sewer Operators STP Operators	Management of operations staff
Eurobodalla Shire Council Environmental Health Officer	Environmental compliance. Emergency response.	Water and Sewer Coordinators Water and Sewer Operators STP Operators Water and Sewer Operations Engineer	Monitoring for environmental compliance to Council, collecting samples, testing, assessment and reporting during incidents.

Stakeholder	Responsibility	Communicates with	Reason
Eurobodalla Shire Council Water and Sewer Coordinator	Management of scheme operation and maintenance, emergency response	STP Operator Water and Sewer Operators	Management of operations staff, reporting issues regarding operation, maintenance and compliance to Council and resolving site issues.
Eurobodalla Shire Council Operators and W&S crews	Day to day operation of STP and sewage collection systems, response to emergencies	Water and Sewer Coordinators and Environmental Health Officer	Communicates issues regarding operation, maintenance and compliance
Police /Fire brigade/HAZMAT/ Ambulance/ SES	Response to emergencies	Eurobodalla Shire Council Water and Sewer Operations Engineer Water and Sewer Coordinator	Response to spills, injuries, accidents

4.2 List of Contact Details

The contact details of the stakeholders are listed below in ***Table 4-2***.

Table 4 - 2: Stakeholder Contact Details

Name	Position and Organisation	Phone
Eurobodalla Shire Council	The after-hours contact number	1800 755 760
	Council during business hours	4474 1000
	Division Manager Water and Sewer	4474 7458 0419 588 681
	Water and Sewer Operations Engineer	44741312 0447 440 296
	NSW EPA	131 555
	Southern NSW Local Health District Queanbeyan	1800 662 167
	Water in NSW	(02) 9338 6600
	Local Oyster Growers Coordinator	Clyde(0409778178,0428695287) Moruya(0402371217),Tuross(44739187) Tomaga(0405596131),Wagonga(0428671640)
	NSW Food Authority	1300 552 406
Bernie Barnes	Department of Industry - Water – WWTP operation	0429 604 409
Emergency Services	Police, Fire Brigade, Ambulance, Hazmat	000
HAZMAT		000
Poisons Information Line		13 11 26

Rural Fire Service		000
State Emergency Service		000

4.3 List of Council Contact Details

The contact details of Council shall be prepared.

4.4 Council Procedures for Contacting Staff to Respond to a Possible Incident

For incidents occurring during work hours:

- All SPS and STP telemetry alarms received by a Telemetry Operator;
- Telemetry Operator will SMS/phone/radio to STP Operator on duty.

For incidents occurring outside work hours:

- All SPS and STP telemetry alarms received by a Telemetry Operator
- The Telemetry Operator will convey the message to the appropriate On-Call Operator, who will then respond in accordance with the Call out Code.

All works are undertaken to comply with the relevant Safe Work Method Statement(s) and appropriate action report forms are completed.

5 Communicating with Neighbours and the Community

To determine the appropriate communication strategy for an incident, the incident needs to be categorised. Once categorised, the prescribed communication strategy can be deployed.

5.1 Incident Classification

- **Minor Risk Incident for Sewer Surcharge**: managed by routine procedures/work practices.
    - Incident affects small area only AND
    - Incident is easy to clean up without additional assistance AND
    - There is no risk of material harm to humans or the environment.
- **Major Risk Incident, Causing or Threatening Material Harm, for Sewer Surcharge:** further investigation may be required and assessment of management options; in the short term, operations and maintenance adjusted to reduce the consequences, likelihood and exposure.
    - Incident affects more than one property OR
    - There is a risk of pollution or material harm to the environment BUT
    - Clean up can be completed without assistance AND
    - There is no danger to humans.
- **Major Risk Incident for STP Inflow Bypass:** further detailed investigation and assessment of management options are required; immediately review and adjust operations and maintenance to reduce the consequences, likelihood and exposure; clean-up and notification procedures become high priority.
    - Potential or actual harm to humans and the environment AND/OR
    - Assistance is required with clean up from other agencies

The following examples are shown;

- Minor Risk Incidents for Sewer Surcharge – incidents with a low risk to public health and the environment such as;
    - Reticulation system blockages
    - Short term power failure or electrical failure
    - Minor spills to the ground
- Major Risk Incident, causing or threatening material harm, for Sewer Surcharge - an incident with a medium risk to public health and the environment such as;
    - Major spills to the ground and or to a sensitive environment
    - Sewage spills to a waterway
    - Extended power failure
- Major Risk Incident for STP Inflow Bypass - an incident requiring emergency services to be called with a high risk to public health and the environment such as;
    - Major sewage spill to a sensitive waterway (oyster lease present)
    - Extended power failure during wet weather
    - External disasters/ incident causing significant damages to sewerage infrastructures (eg bush fire, major flood, vehicle accident, earthquake, etc.)

5.2 Notification Process

The following incident notification process will be undertaken for the identified incident levels;

- **Minor Risk Incident for Sewer Surcharge**
  - The sewer operator will
    - report MINOR incidents to the Water and Sewer Senior Operator on completion or ASAP,
    - control surcharge (if it can be done safely).
  - The Water and Sewer Senior Operator will
    - complete sewer surcharge response action form,
    - submit the form to Water and Sewer Senior Technical Officer.
- **Major Risk Incident, Causing or Threatening Material Harm, for Sewer Surcharge – Notifiable**
  - The sewer operator will
    - report a MAJOR RISK incident, causing or threatening material harm, for sewer surcharge to the Water and Sewer Coordinator/ After-hours MIC Officer **IMMEDIATELY,**
    - undertake risk assessment,
    - record incident,
    - control surcharge, and
    - provide assistance to EHO on-site.
  - The Water and Sewer Coordinator/ After-hours MIC Officer will
    - report a MAJOR RISK incident, causing or threatening material harm, for sewer surcharge to the Environmental Health Officer **IMMEDIATELY,**
    - report to Water and Sewer Operations Engineer, Division Manager Water and Sewer,
    - Provide assistance to sewer operator to control sewer surcharge,
    - Complete sewer surcharge response action form,
    - Submit the form to Water and Sewer Senior Technical Officer.
  - The Environmental Health Officer will
    - undertake an assessment of potential public health or environmental impact on-site and collect samples,
    - report SIGNIFICANT OR HIGH RISK incidences **IMMEDIATELY** to EPA,
    - Also report incidents to the following authorities where applicable:
      - Council Senior Management Group,
      - If public affected call NSW Health,
      - Local oyster industry representatives,
      - NSW Fisheries,
      - NSW Food Authority, and
      - Insurance risk management coordinator.
    - Update and complete sewer surcharge response action form,
    - Submit the form to Water and Sewer Senior Technical Officer.

- **Major Risk Incident for STP Inflow Bypass- Notifiable**
    - The STP operator will
        - report SIGNIFICANT OR HIGH RISK incidents to the Water and Sewer Coordinator **IMMEDIATELY,**
        - undertake risk assessment,
        - record incident,
        - control STP inflow bypass, and
        - provide assistance to EHO on-site.
    - The Water and Sewer Coordinator will
        - report a MAJOR RISK incident to the Environmental Health Officer **IMMEDIATELY** and notify emergency services if required,
        - Provide assistance to STP operator to control STP inflow bypass,
        - Complete STP inflow bypass response action form, and
        - Submit the form to the Environmental Health Protection Unit and Water and Sewer Senior Technical Officer.
    - The Environmental Health Officer will
        - undertake an assessment of potential public health or environmental impact on-site and collect samples,
        - report SIGNIFICANT OR HIGH-RISK incidences **IMMEDIATELY** to:
            - EPA,
            - Council Senior Management Group,
            - If public affected call NSW Health,
            - Local oyster industry representatives,
            - NSW Fisheries,
            - NSW Food Authority, and
            - Insurance risk management coordinator.
        - Update and complete sewer surcharge response action form, and
        - Submit the form to Water and Sewer Senior Technical Officer.

This procedure will form part of the operator training and awareness.

Incident reporting includes communicating the incident and also documenting the incident.

5.3 Workplace Incidents

The following incidents and injuries must be reported to SafeWork NSW:

- Notifiable incidents involving a fatality or a serious injury or illness,
- Notifiable incidents involving a fatality or serious injury or illness to other people at your workplace,
- Notifiable incidents that present a serious risk to health and safety at your workplace (dangerous incidents), and
- Other incidents involving an injury or illness where workers compensation is payable.

5.4 Investigation of Incidents and Emergencies

Following any incident or emergency situation, including any “near misses”, an investigation will be undertaken by Council’s Environmental Health Officer and all involved staff debriefed to discuss performance and address any issues or concerns.

The investigation will consider factors such as:

- What was the initiating cause of the problem?
- How was the problem first identified or recognised?
- 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?

5.5 Communication Protocols - Diagrams

The communication protocols are defined in dealing with pollution incidents of:

- Major Sewage Treatment Plant Bypass;
- Major Risk Incident, Causing or Threatening Material Harm, for Sewer Surcharge; and
- Minor Sewer Surcharge.

The following figures show the adopted communication protocols.

Figure 5 - 1: Major Sewage Treatment Plant Bypass

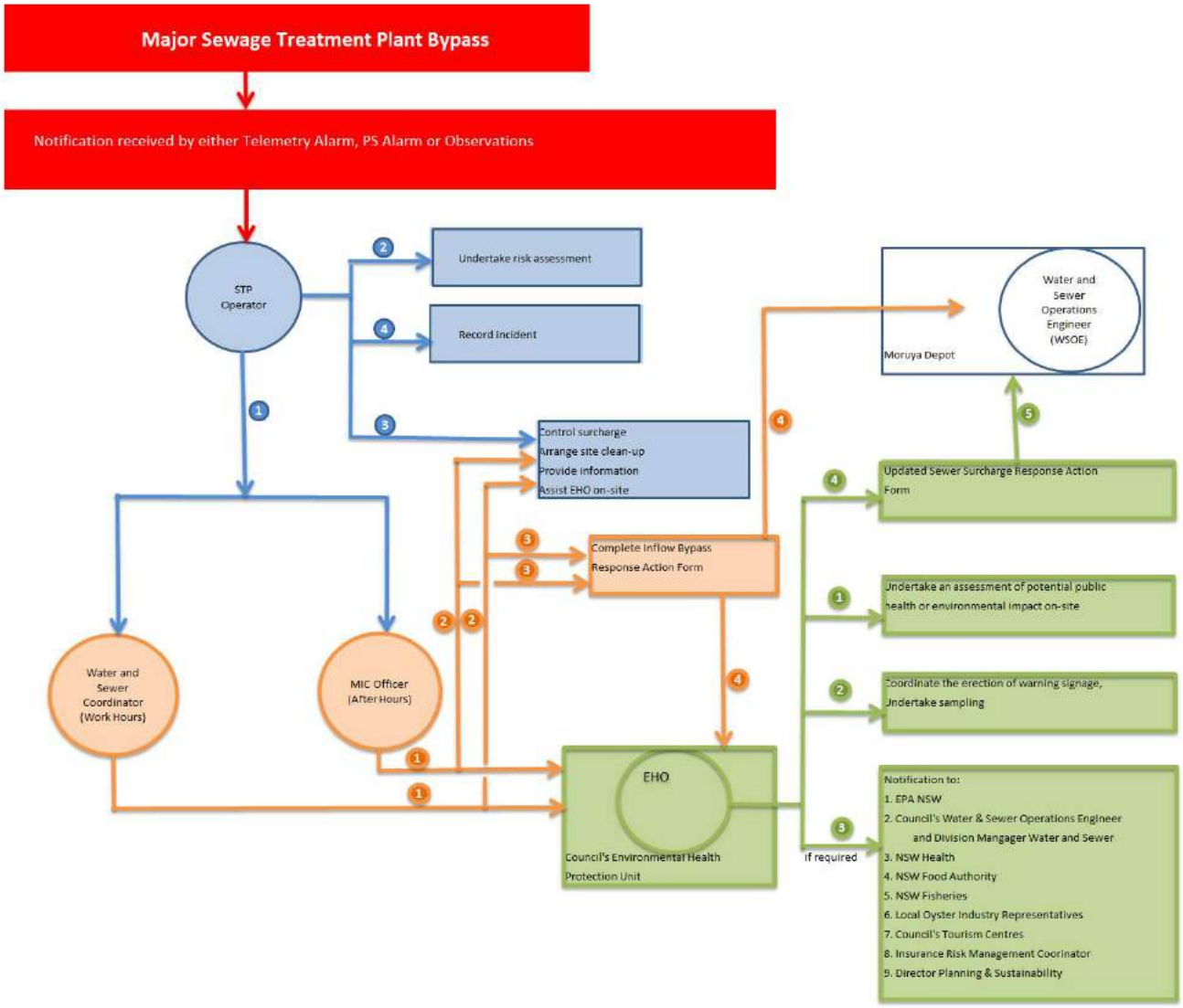


Figure 5 - 2: Major Risk Incident, Causing or Threatening Material Harm, for Sewer Surcharge

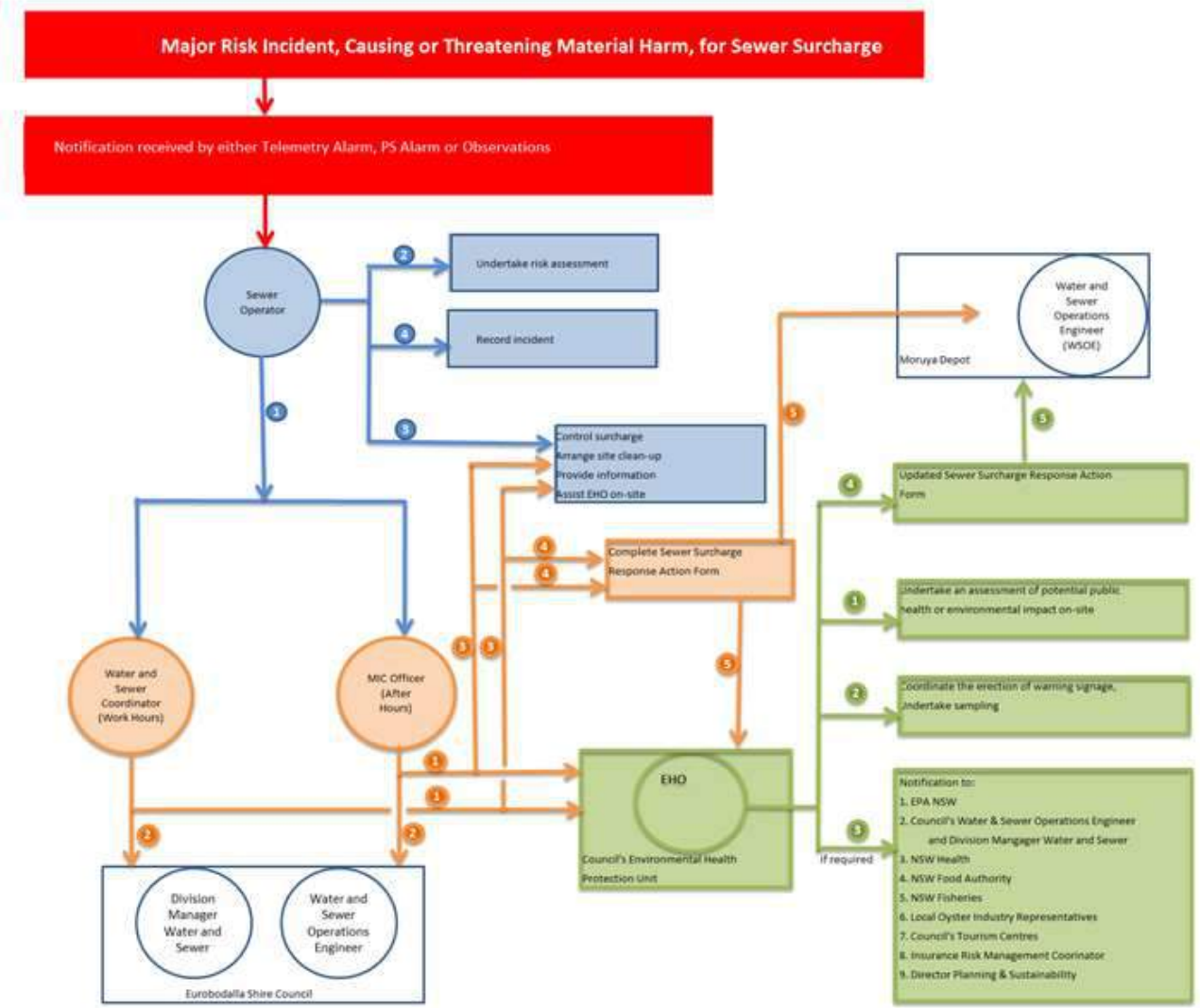
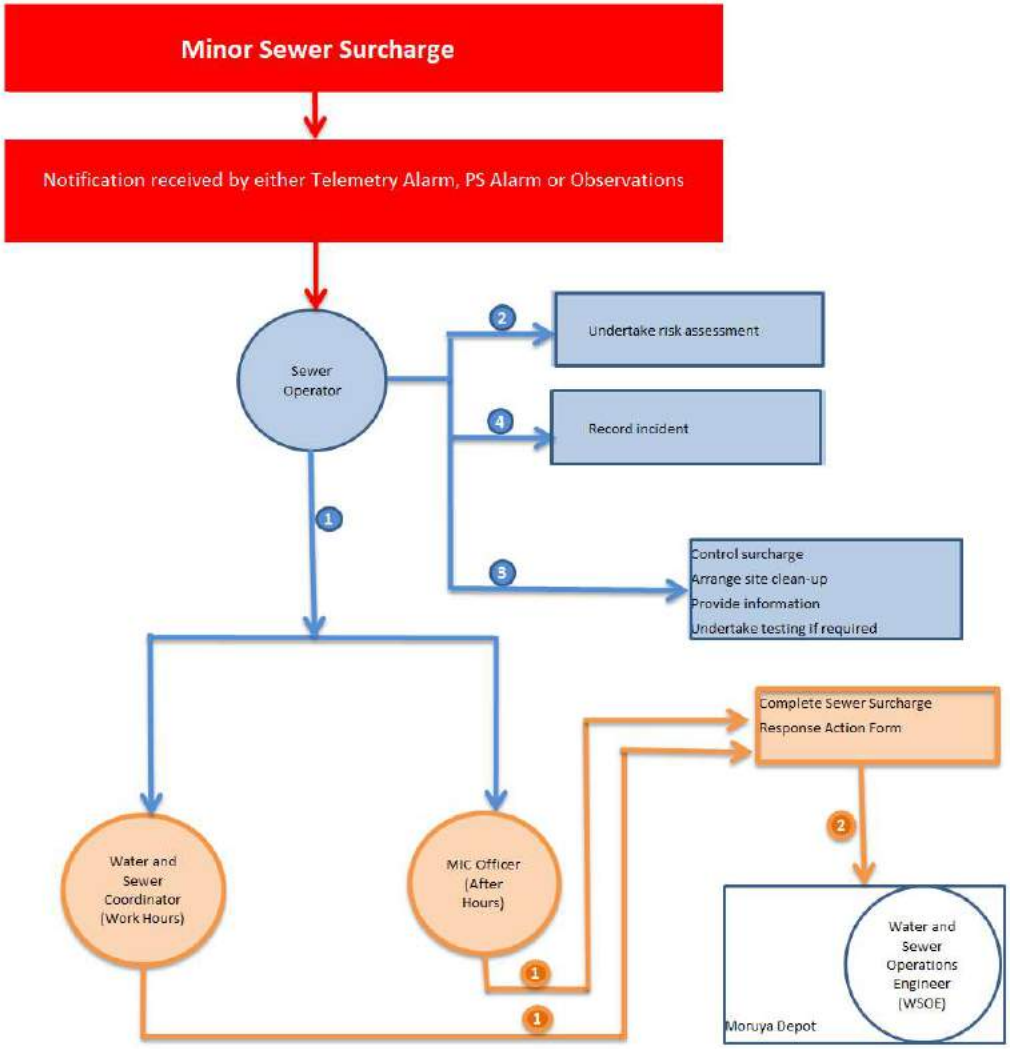


Figure 5 - 3: Minor Sewer Surcharge

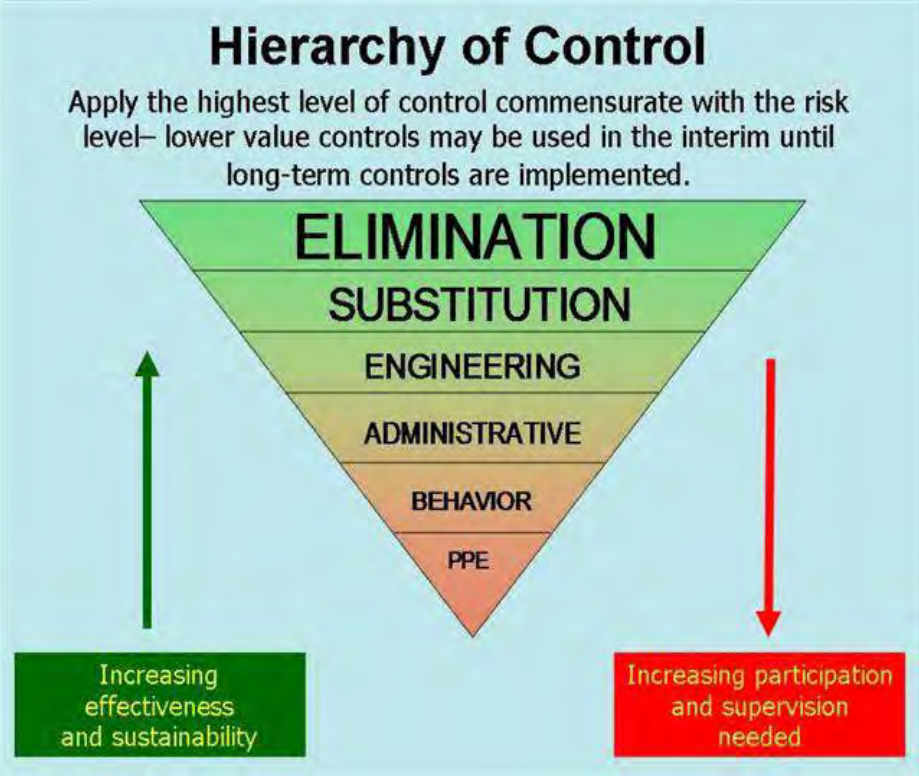


6 Preventative Actions to be Undertaken

The preventative actions or measures to manage and minimise the risk to human health and the environment involve a hierarchy of controls approach. The hierarchy of controls, in order of preference, are as follows ***(Figure 6-1)***:

- Elimination
- Substitution
- Engineering means
- Administrative
- Personal protection equipment (PPE)

Figure 6 - 1: Hierarchy of Control



These are readily broken down to the following classification of management strategies:

- Appropriate design of the facilities;
- Appropriate operation and monitoring; and
- Appropriate education and training.

The identified current preventative actions are shown in this section.

6.1 Reticulation System

Reticulation system overflows can principally occur from five main causes. They are:

- Power/mechanical failure at pumping stations;
- Reticulation system blockage/leakage;
- Rising main breakage (leaks or major failure); and
- Excessive inflows.

6.1.1 Gravity Sewer System

Overall the Council's reticulation systems are in a good condition and have sufficient capacity for detention of sewage within the reticulation system and sewage pumping stations. The number of overflows or incidents per kilometre of pipeline per year would be considered low by industry standards. Council uses water jetting equipment (***Figure 6-2***) to clear blockages. Blockages in reticulation mains occur infrequently. The main cause is tree root intrusions but can also occur due to foreign objects lodging in the pipelines.

Council records indicate, apart from minor seepages due to blockages in pipelines, few major overflow events (ie Tuross SPS No.1, etc.) have occurred in the reticulation system in the recent past.

Council will respond to overflows once notified. The Water and Sewer Operators have a tablet with the reticulation layout included. This aids in pinpointing problems and for isolating upstream mains and SPS.

Unusual excessive inflows (> design peak wet weather flow (PWWF)) may occur during extreme flood events if reticulation manholes become inundated and the inflow is greater than the pumping station capacity.

Other possibilities for sewer overflows include illegal connection of storm water pipes and low-lying gullies or boundary traps.

Figure 6 - 2: Water Jetter Stored at Batemans Bay STP

6.1.2 Rising Mains

Rising main breaks can either cause small or large leaks. Small leaks are difficult to identify but cause little damage. Large breaks are detected from the sudden rise in pump efficiency and drop in operating amps. This will trigger a telemetry alarm and action to be taken. Council's operators would stop the pumps, contain any spill and call in a pumper truck to empty out the rising main so the main can be prepared. Rising main breaks are rare.

6.2 Pumping Stations

The likelihood of overflows from SPSs can be minimised by the provision of the following;

- Adequate pumping capacity
- Reliable power supply.
- Emergency power generation (portable diesel generator).
- Ability to store 8 hours ADWF flows before an overflow occurs.
- Ability to detect and respond to abnormal operating conditions via telemetry system and visual alarm light (flashing) in the events of power failure, pump failure, etc.
- Availability of standby pumps (duty/ standby operation).
- Provision of Sykes pump bypass in case of all pumps failure.
- Control arrangement.
- Spare infrastructure available.
- Implementation of effective emergency plan/operational procedures for attending to failure and breakdown within the system.
- Flood protection.

6.2.1 Adequate Pumping Capacity

All of the SPSs within the Council's Sewerage Scheme have sufficient pumping capacity for present and projected future requirements by provision of variable speed pumps, dual speed pumps and fixed speed pumps.

6.2.2 Reliable Power Supply

Council has a relatively reliable power supply. Generally power outages have been less than 4 hours in duration. While not common, power failures of extended duration are possible, but are usually planned outages.

6.2.3 Emergency Power Generation

In case of power failure each SPS has a generator connection point. This allows Council to connect one of its diesel generators ***(Figure 6-3)*** to the SPS SCA to operate the pumps. The Water and Sewer Operator will look up the SPS details, and the appropriate generator will be dispatched.

Figure 6 - 3: Diesel Generators Stored at Batemans Bay STP

6.2.4 Provision of Emergency Storage

A sewerage system must have sufficient capacity to store sewage, which continues to flow from the catchment during extended mechanical breakdowns or electrical failures. Each of the SPSs is designed to have 8 hours of ADWF emergency storage from the inflows from its immediate catchment.

6.2.5 Telemetry System

All the SPSs in Council's Sewerage Schemes are monitored via a telemetry system. Level sensors and a multi-sensor ***(Figure 6-4)*** are installed in each of sewage pumping station and connected to Council's telemetry system. Instances of power outages, mechanical failure, and high level alarms are transmitted to the 24 hour Telemetry Operator, who notifies the Water and Sewer Operator (during business hours) or the on-call operator outside business hours, for subsequent immediate attention.

A visual alarm light ***(Figure 6-5)*** is installed on the top of SPS switchboard to show flashing light when SPSs failure.

Figure 6 - 4: Typical ESC SPS Level Sensors and Multi-sensor Arrangement

Figure 6 - 5: Typical Installation for Visible Alarm Light

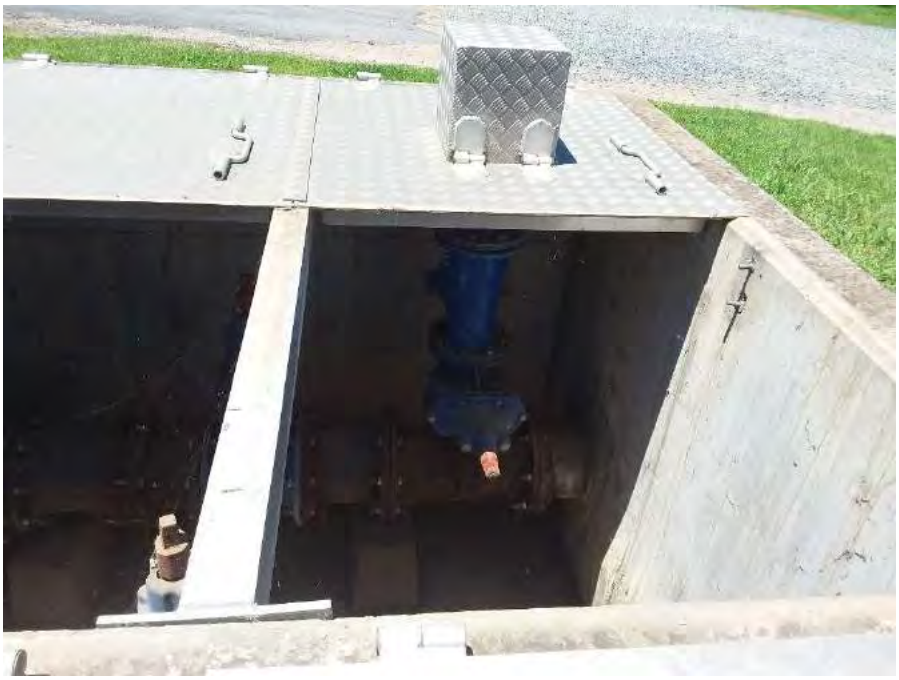
6.2.6 Standby Pumps

All SPSs have duty and standby pumps installed (100%). If the duty pump fails, the standby pump will operate automatically.

6.2.7 Sykes Pump Bypass

A Sykes pump is used when all pumps in a SPS fail, the sewage in the pump well is pumped into a rising main via Sykes pump and bypass connection (Bauer type) ***(Figure 6-6)*** in order to reduce possibility of sewage overflowing from the SPS.

Figure 6 - 6: Typical Installation for Sykes Pump Bypass



6.2.8 Control Arrangement

If a SPS is overflowing, its upstream sewage pumps in the SPS will be shutdown automatically to prevent further overflowing in the SPS. This control arrangement can also be done manually.

6.2.9 Spare SCA and Pumps

Council has a spare SCA which can be used at some SPS should a catastrophic failure occur at an SPS. Council also has a range of spare submersible sewage pumps ***(Figure 6-7)*** which can be used at SPS should a pump failure occur at an SPS. The spare pumps are stored at the different STPs.

Figure 6 - 7: Spare Pumps Stored at Tomakin STP

6.2.10 Response Times to Abnormal Operating Conditions

Council has advised that the response time for Operator attendance to any abnormal operating condition would generally be less than one hour at all times.

6.2.11 Flood Protection

SPS in flood prone areas have been protected by lifting the SCA above the 1 in 100 ARI flood level and sealing the SPS well covers.

6.3 Sewage Treatment Plant Overflows

The Council has five (5) STPs and a small reed bed treatment plant. All STPs have the capacity to treat design inflows to meet EPA licence requirements. All STPs have a SCADA system and a telemetry system installed. This means that the STP is monitored continuously. Alarms triggered by the SCADA system will alert the Telemetry Operator who will then alert the STP Operator by SMS/Phone/Radio. The STP Operator would then respond to the alarm by attending the STP. The STP Operators live locally to the STP which provides ready response to any treatment problem events.

An overflow may occur in wet weather conditions. In wet weather, all storm inflows are directed into the inlet works for primary treatment then are bypassed to the storm pond or tertiary pond for storage if required. If these storm detention ponds or tertiary ponds are full then overflows will discharge into an adjacent area or waterway. The overflow will be measured and recorded on the plant SCADA.

The alarms will be populated on the SCADA screen and the message will be sent to STP Operator via paging system when overflowing from the storm pond or tertiary pond occurs.

6.4 Sewage Treatment Plant Chemical Spills

In general, Council's STPs use chemicals such as aluminium sulphate (Alum) and sodium hypochlorite in the treatment process. Chemicals are stored in chemical storage tanks which are placed in bunds as a safety measure to contain any leakages. The bunds are designed to hold more than 100 % of the chemicals stored within the storage tank/s. The bund has a sump in the corner with a manual valve (kept in closed position during standard operation) which allows stormwater to flow to the storm water system as required. A typical arrangement is shown in ***Figure 6-8.***

In the case of a minor spill, the manual isolation valve can be opened for the chemicals to flow to the chemical waste pit or the spilled chemical is retained within the sump. From here it can be removed by truck or pumped back into the treatment process.

Major chemical spills will be retained in the bund, as the isolation valve will be in the closed position. The spilled chemicals would be removed from the bund by a vacuum/sucker truck tanker.

There is no sensor installed inside the bund to monitor leakages from a chemical storage tank, therefore any chemicals spill in the bund area are detected by the Operator's routine checking and inspection of the facilities.

A number of other chemicals, such as gear oils or petrol, are stored on site and used in the maintenance of the facility. These are stored within a chemical storage container, which has an inbuilt bund as shown in ***Figure 6-9.***

A safety shower and eyewash facility are provided in the event of direct human contact with dangerous chemicals. A safety data sheet (SDS) shall be located at the STP office and chemical bund area.

Figure 6 - 8: Typical Chemical Storage Arrangement for ESC STPs

Figure 6 - 9: Typical Chemical Storage Container for ESC's STPs

6.5 Sewage Treatment Plant Emergency Power Generation

ESC STPs are currently being upgraded with a generator connection point and a permanent onsite generator. This will allow Council, once the works are complete, to run the plant or the essential elements of the plant, during a period of power failure.

7 Inventory of Pollutants and Treatment Chemicals

7.1 Inventory of Chemicals

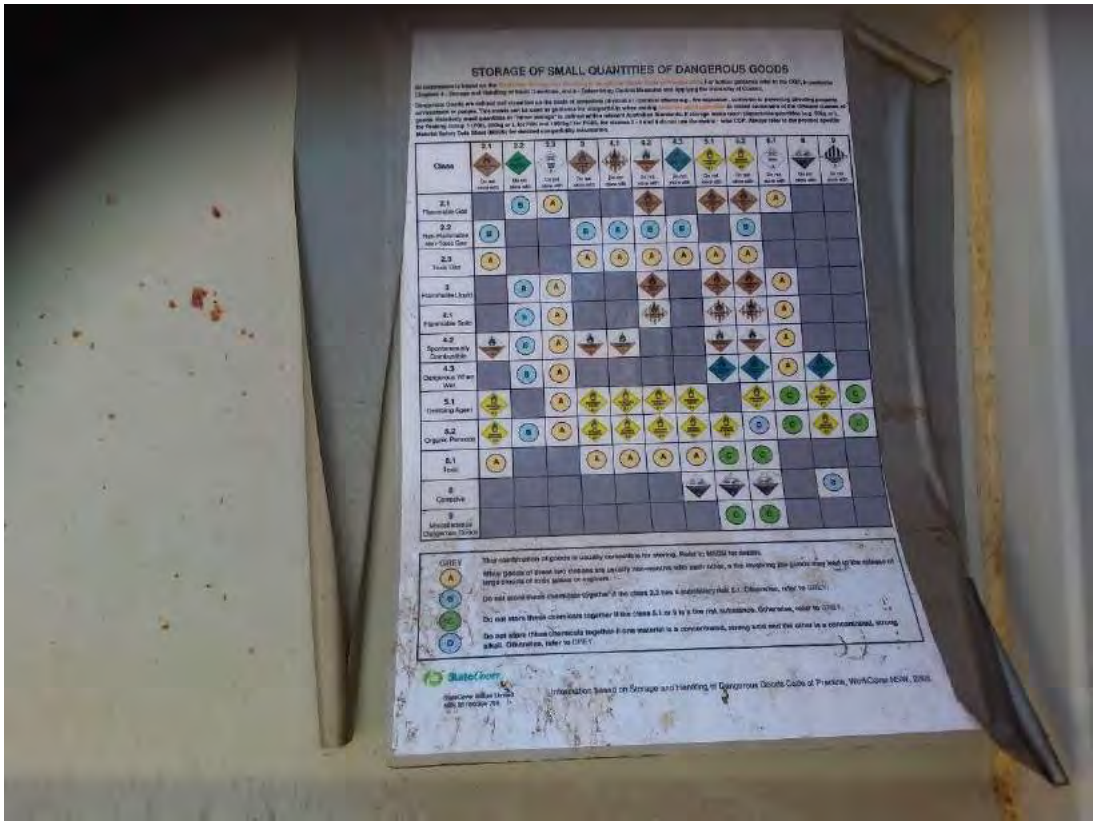
Some chemicals, such as sodium hypochlorite and alum sulphate are used in the treatment process and stored on-site.

The inventory for each STP is shown in Sections 12 to 16.

Their safety data sheets (SDS) are placed in the operation room and chemicals storage area.

Various gear oils or petrol is stored at the STP chemical storage container ***(Figure 6-9)***, and a chart for “storage of small quantities of dangerous goods” is placed on the wall of the container (***Figure 7-1)***

Figure 7 - 1: Chart for Storage of Small Quantities of Dangerous Goods



7.2 Chemical Usage

The usage of chemicals used in the treatment of the sewage is recorded on the logbook at the plant operation room.

7.3 Other Pollutants – Sewage and Effluent

The other potential pollutants are:

- Sewage – within the collection system and at head of the STP,
- Effluent – produced at the STP,
- Sludge (including WAS and stabilised and/or dewatered biosolids) produced at the STP,
- Supernatant – produced at the STP,

- Screenings – produced at the STP inlet works,
- Grit – produced at the STP inlet works, and
- Contaminated stormwater.

8 Safety Equipment

Safety equipment and other devices that are provided on-site will minimise the risks to human health or the environment and contain or control a pollution incident. These will include any PPE, MSDS, monitoring devices, and spill containment facilities/equipment.

8.1 List of PPE Equipment Carried by Operators and Stored Onsite

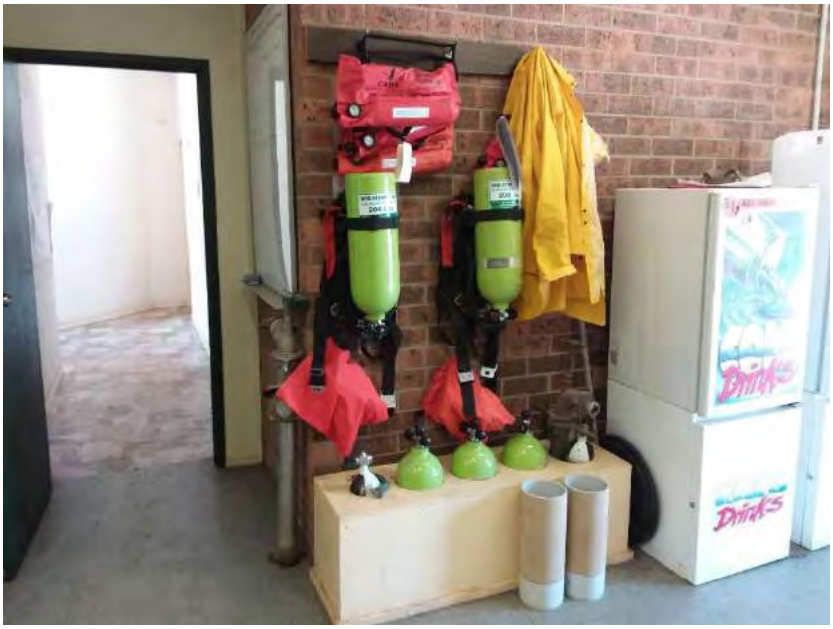
The following PPE safety equipment (***Table 8-1***) is typically provided for each STP:

Table 8 - 1: List of PPE

Personal Protective Equipment	Location	Location
Hearing protection	STP	Operators Truck
Protective gloves	STP	Operators Truck
Dust mask	STP	Operators Truck
Safety glasses	STP	Operators Truck
Self-contained breathing apparatus (SCBA)	Moruya STP	Amenities Building
Safety apron	STP	Operators Truck

The self-contained breathing apparatus (SCBA) for ESC are stored in the Moruya STP ***(Figure 8-1)*** and checked on regular basis.

Figure 8 - 1: SCBAs Stored in Moruya STP



8.2 List of Monitoring Devices

Council's Sewerage Scheme is fully covered by its Shire wide telemetry system. The following ***Table 8-2*** is a summary of the monitoring that occurs at the STP and SPS:

Table 8 - 2: List of Monitoring Devices

System	**Monitoring Devices** and Monitored Systems	Devices Alert
STP	SCADA and telemetry system monitors: • Inlet works, • EA tanks and clarifier systems, • Sludge return, • Reuse pumps, • UV system, and • Chlorination systems.	Telemetry Operator Water and Sewer Coordinator/ Water and Sewer Operator On call STP Operator
SPSs	Telemetry system monitors: • High and alarm levels, • Power failure, • Pump failure, • Motor power, and • Electrical failure.	Telemetry Operator Water and Sewer Coordinator/ Water and Sewer Operator On call Operator

9 Minimising Harm to Persons on the Premises

9.1 Attendance Register

An attendance register is in place at each STP. All visitors must sign in and out of each site.

9.2 Site Induction

Visitors are instructed to report to the site office where they receive plant induction from the STP Operator prior to access to treatment areas of each site.

9.3 Evacuation Procedure

The evacuation procedure is depicted on a plan as displayed in the amenities building/site office.

9.4 Emergency Assembly Point

The emergency assembly point, as indicated on the Evacuation Plan, is located near the entrance to the all STPs and is clearly sign posted on the wall of office.

10 Evaluation, Audit and Review for Continuous Development

10.1 Evaluation and Review

A systematic review of the plan will be undertaken by the Water and Sewer Operations Engineer annually or within one month of an incident occurring at the plant. The evaluation will:

- Assess the relevance of the risk assessment against the current state of the plant,
- Identify any emerging problems and trends,
- Assess the communication between Council, Council's operational staff and regulators,
- Assist in determining priorities for improving procedures,
- Assessment of incidents and responses determined, and
- Determine when and what is to be audited in the next six months.

Evaluation of results described above will be documented and the plan updated.

Evaluation will be reported to Council and stakeholders.

10.2 Auditing

Auditing of the pollutant inventory is to be done annually.

An audit may also be triggered by a significant incident or if the process chemical is changed.

11 Assessment of the Risks

A part of the PIRMP a risk assessment has been undertaken for each scheme. The risk assessment has been based on a site inspection undertaken in 2017 by PWA with ESC staff.

The risk assessment has been undertaken on the following basis;

- Identification of the hazards
- Identification of hazardous events
- assessment of the likelihood of the event and other factors that may increase the likelihood
- assess the impacts
- assess the overall risk.

Shown in **Table 11-1**, **Table 11-2** and **Table 11-3** are the likelihood, impact and risk criteria used in the assessment.

The identified hazard events relating to the STP, SPS and mains are documented in the sections of different STPs in the PIRMP.

Table 11 - 1: Definitions of Likelihood

Level	Likelihood	Description
A	Almost certain	- The event is expected to occur often (several times per year)
B	Likely	- The event will probably occur often (once every 1-3 years)
C	Possible	- The event might occur at some time (once every 3 to 10 years)
D	Unlikely	- The event could occur at some time (once every 10 to 20 years)
E	Rare	- The event may occur only in exceptional circumstances (once every 100 years)

Table 11 - 2: Definitions of Impact

Level	Classification	Description
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 waterways 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 unlikely to drain to a local sensitive environment* and: - Where the overflow reaches waters, the volume of sewage likely to enter the waterways may be 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 the public exposure is minimal given the maximum response time**.
3	Moderate	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 waterways 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 reaches waters, the volume of sewage likely to enter the waterways 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, or shellfish growing area, or protected water bodies, marine parks, ecological communities or conservation areas defined by legal and non-legal instruments, such as local environment plans (LEPs), State environmental planning policies (SEPPs), national parks, and class P or class S waters, or waterways used for primary contact recreation, or a recreational area or other area with high public exposure of associated health risk.

** Maximum response time should be based on the length of time taken for the licensee to detect the overflow, or for the overflow to be reported, and the time taken for the licensee to attend the site and secure against public contact

Table 11 - 3: Risk Analysis Criteria

Likelihood	**Impacts**				
	Insignificant **1**	Minor **2**	Moderate **3**	Major **4**	Catastrophic **5**
Almost Certain – **A**	Low	Moderate	High	Very High	Very High
Likely – **B**	Low	Moderate	High	Very High	Very High
Possible – **C**	Low	Low	Moderate	High	Very High
Unlikely – **D**	Low	Low	Moderate	High	Very High
Rare – **E**	Low	Low	Moderate	High	Very High

12 Batemans Bay Sewerage Scheme

The Batemans Bay Sewerage Scheme services the townships of Batemans Bay, Catalina, Batehaven, Sunshine Bay, Denhams Beach, Surf Beach, Long Beach and Maloneys Beach, Lilli Pilli and Malua Bay. Batemans Bay is located 278 km south of Sydney. The Batemans Bay STP (***Figure 12 - 1***) is situated at Surf Beach of Batemans Bay and has a design capacity of 27,300 (EP) Equivalent Persons.

12.1 Sewage Treatment Plant and Collection System

The Batemans Bay STP comprises the following treatment /process units and discharges to the ocean via an outfall:

- Inlet works - Inflow reception, screening, grit removal, flow measurement and flow division (currently being upgraded);
- Storm pond and storm return pumping station;
- Continuous extended aeration reactors x 2;
- Clarifiers x 4 (currently being upgraded to 2 small and 1 x large);
- Tertiary filtration;
- Aerobic sludge digester; and
- Sludge dewatering centrifuge.

The Batemans Bay sewerage collection system comprises the following:

- Gravity mains
- Sewage pumping stations (SPS BB01 – BB57)
- Rising mains (from each SPS)

The STP and the collection system operate under Environmental Protection Licence (EPL) No. 1397 granted by the NSW Environment Protection Authority (EPA) that is renewed annually.

Effluent quality limitations on EPA licence is summarized in ***Table 12-1***.

Table 12 - 1: Pollutant List – Sewage and Effluent for Batemans Bay STP

Parameter	Typical Raw Sewage	Effluent (50 percentile) *	Effluent (100 percentile) *
Biochemical oxygen demand (BOD_5)	270 mg/L	< 10 mg/L	< 20 mg/L
Suspended solids (SS)	270 mg/L	< 15 mg/L	<30 mg/L
Total nitrogen (TN)	53 mg/L		
Ammonia	12 mg/L		
Total phosphorus (TP)	11 mg/L		
Oil and grease (O&G)	< 10 mg/L		< 10 mg/L
Faecal coliforms (FC)	1,000,000 cfu/100 mL		
pH	6.5 - 8.5		

* Licence Conditions

Figure 12 - 1: Batemans Bay STP Location

12.2 Types of Pollution Incidents

12.2.1 STP Overflowing or Bypass

The Batemans Bay STP is a large STP, which has a storm pond to store storm water during wet weather conditions. An overflow or bypass may occur when exceptional prolonged wet weather inflows occur, which fills the storm detention pond.

Equipment failure may occur at the plant leading to poor quality effluent being discharged, however, sufficient standby equipment is kept and personnel are available to ensure any failures are rectified quickly

The plant has a SCADA system and a telemetry system. This means that the STP is monitored continuously. Alarms triggered by the SCADA system will alert the Telemetry Operator who will then alert either STP Operator or the Water and Sewer Coordinator by SMS/phone/radio. The Operator would then respond to the alarm by attending the STP. The Operators live locally to the STP which provides ready response to any treatment problem events.

Council is planning to transfer sewage pumped from sewage pumping stations (from BB40 to BB50 &BB53) to the Tomakin STP in 2020 in order to reduce raw sewage inflow loading on the Batemans Bay STP. Council is also undertaking works to increase the capacity of the STSP in 2018-2019. These transfers and upgrade works will lower the risk of STP overflows and bypass.

12.2.1.1 Dry Weather

Generally, unless exceptional circumstances such as malfunction of systems due to mechanical/ electrical failure or blockages occur, overflows or bypasses of poor quality effluent at the STP in dry

weather flow conditions are extremely unlikely as they would likely be contained within the Storm Detention Pond.

The following overflow or bypass events that could occur are shown below. Also shown are the appropriate management strategy to minimise the possible effects;

- Inlet works bypass
  - blocked screens – telemetry alarm, flow to storm pond then return for treatment,
  - screen failure – telemetry alarm, flow to storm pond then return for treatment, use of bypass inlet works (to be provided under the current upgrade),
  - power failure - telemetry alarm, flow to storm pond then return for treatment or use of onsite generator (to be provided under the current upgrade).
- Aeration system
  - aerator system bearing failure - telemetry alarm, Council has spare aerators (ejectors) shown in ***Figure 12-2*** to be used when an aerator bearing failure or for peak flow loading, use of diffused aeration system (to be provided under the current upgrade),
  - power failure - telemetry alarm, pump to storm detention pond then return for treatment or use of onsite generator (to be provided under the current upgrade).
- Clarifier
  - failure of RAS pump - telemetry alarm, settlement by the other clarifier,
  - power failure of RAS pump - telemetry alarm, settlement by other clarifier, pump to storm detention pond then return for treatment or use of onsite generator (to be provided under the current upgrade).
- SCA Failure
  - failure of SCA from fire - segregated boards.

Figure 12 - 2: Ejectors Used in Batemans Bay STP

12.2.1.2 Wet Weather

The STP is designed to treat all inflows with wet weather flows in excess of 3xADWF being diverted to the storm ponds then returned for full treatment after the wet weather event has ended.

If the storm pond is full, the overflow will be discharged to the Ocean via the ocean outfall. A portable overflow measurement meter ***(Figure 12-3)*** will be installed on the spillway to measure these overflows.

Figure 12 - 3: Portable Overflow Measurement Device Used in Batemans Bay STP

12.2.2 Sewage Pumping Station or Manhole Overflowing

Overall the Batemans Bay reticulation system is in a good condition and has sufficient capacity. The number of overflows or incidents per kilometre of pipeline per year would be considered low by industry standards. Council uses water jetting equipment to clear blockages. Blockages in reticulation mains occur infrequently. The main cause is tree root intrusions but can also occur due to foreign objects lodging in the pipelines.

The schematic of Batemans Bay sewerage scheme is displayed on the plant SCADA screen ***(Figure 12-4).***

All SPSs are in a good condition, with each pumping station having the following capacity and control methods to minimise the risk of overflows from a SPS:

- Adequate pumping capacity,
- Reliable power supply,
- Emergency power generation (portable diesel generator),
- Ability to store 8 hours at ADWF flows before an overflow occurs,
- Ability to detect and respond to abnormal operating conditions via telemetry system and visual alarm light (flashing) in the events of power failure, pump failure, etc.
- Availability of standby pumps (duty/ standby operation),
- Provision of Sykes pump bypass in case of all pumps failure,
- Control arrangement,
- Spare infrastructure available,
- Implementation of effective emergency plan/operational procedures for attending to failure and breakdown within the system, and

- Flood protection.

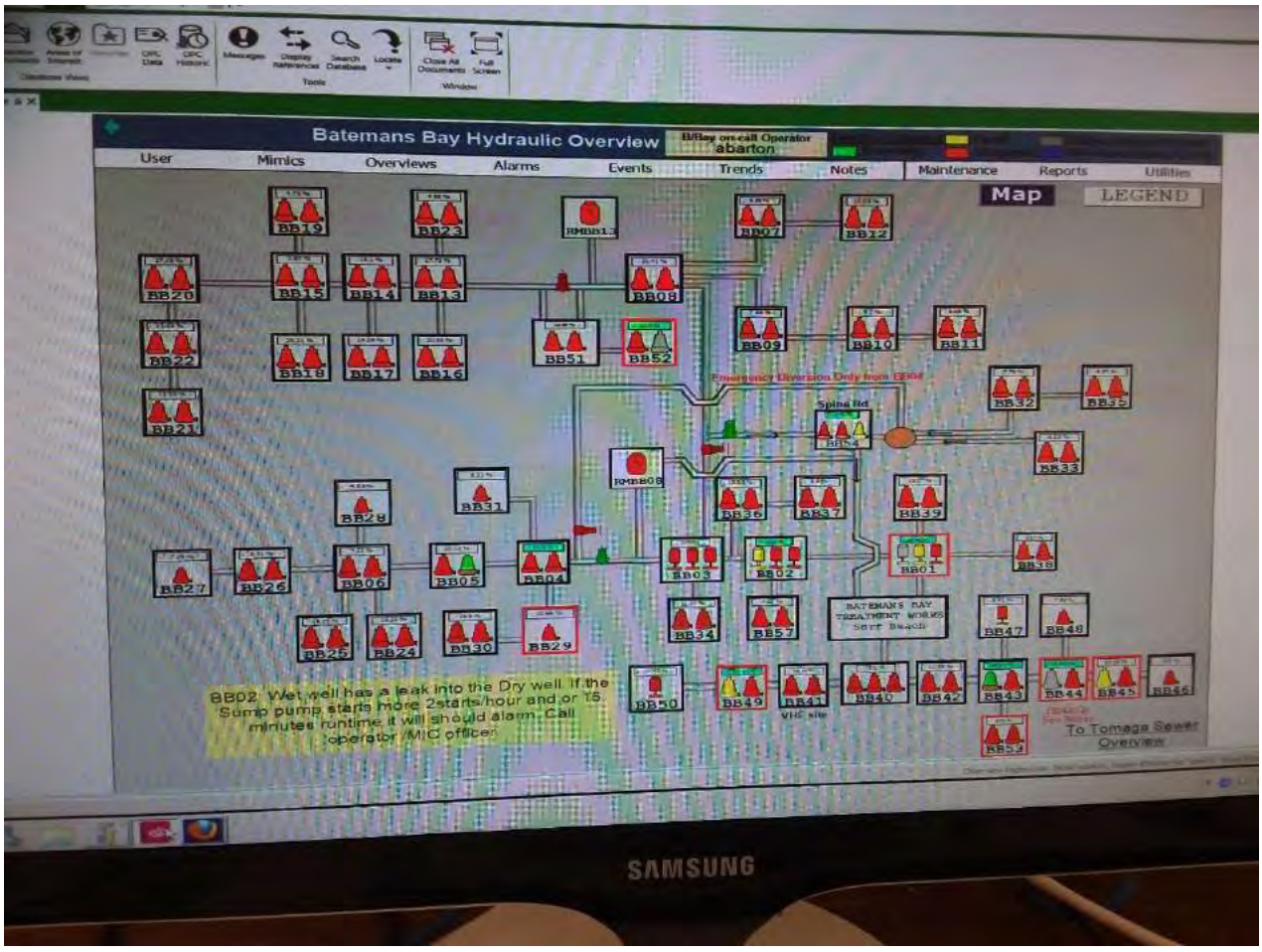
The level sensors are installed in some manholes to provide early warning alarms when sewage in the manhole has the potential of overflowing to a local oyster farm.

Council will respond to overflows once notified. The Water and Sewer Operator now has a tablet with the reticulation layout included. This aids in pinpointing problems and for isolating upstream mains and SPS.

Overflows can also happen during unusual excessive inflows (>PWWF) which may occur during extreme flood events if reticulation manholes are inundated and the inflow is greater than the pumping station capacity.

Other possibilities for sewer overflows include illegal connection of storm water pipes and low-lying gullies or boundary traps.

Figure 12 - 4: Batemans Bay Sewerage Scheme SCADA Screen



12.2.3 Chemical Spill or Leakage

The Batemans Bay STP uses sodium hypochlorite solution for the disinfection of effluent used for reuse at the local golf course. The chlorine storage capacity is 5,000 L. The chemical tank is installed inside a secure bund ***(Figure 12-5)***. Any leakage, breaks or spills from the chemical dosing system will be retained in the bund

There is no alarm to display chemical spills on the plant SCADA and telemetry systems. Detection is dependent on the Operator's routine checking and inspection.

A number of other chemicals are stored on site and used in the maintenance of the facility. These are stored within a chemical storage container which has an inbuilt bund as shown in ***Figure 6-9***.

A safety shower and eyewash facility is provided in the event of direct human contact with chlorine chemicals. Safety data sheet (SDS) shall be located at the STP office and the chemical bund area.

Figure 12 - 5: Batemans Bay STP – Chemical Storage Sodium Hypochlorite

12.2.4 Odour Emission

STP

The odour treatment bioreactor system ***(Figure 12-6)*** is located adjacent to the inlet works to treat foul air collected from covered inlet works and the flow splitter by bio-media, after treatment, treated air is released to air from the top of the bioreactor. The odour bioreactor can treat foul air flow up to 3,600 m^3/hr. An H_2S meter is installed to monitor the odour level in the released air.

Under the current upgrade there will be a second odour treatment bioreactor system to provide additional capacity.

Figure 12 - 6: Odour Treatment Bioreactor System in the Batemans Bay STP

Reticulation System

Odours are prevented by addressing septicity by adding oxygen into the rising main (Figure 12-7).

Figure 12 - 7: Pure Oxygen Used for Odour Treatment in the Batemans Bay Sewerage Scheme

12.3 Risk Assessment – Batemans Bay STP and Collection System

Table 12 - 2: Risk Register for Batemans Bay STP and Collection System

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
	STP								
1	**Sewage**	**Excessive inflows – bypass**	✓	✓	Likely	Wet weather	Minor	Moderate	Storm detention pond provided
2	**Effluent**	**Septage upsets process**	✓	✓	Rare	Toxic waste	Insignificant	Low	No septage receival
3	**Effluent**	**Toxic wastes upsets / kills process**	✓	✓	Rare	Trade waste discharges	Moderate	Low	Trade waste policy. Routine plant monitoring.
4	**Effluent**	**Stormwater inflow to STP causing overflows**	✓	✓	Unlikely		Minor	Low	Plant designed to handle PWWF. All inflows pumped. Telemetry system. Operator attendance within 1 hour. Ranger to close beaches.
5	**Effluent**	**Poor quality - sabotage of plant**	✓	✓	Rare		Minor	Low	Locked gates. Locked building. Telemetry system. Ranger to close beaches.

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
6	**Effluent**	**Poor quality - extended power failure**	✓	✓	Unlikely		Minor	Low	Reliable power system. Long outages would be planned. Units will provide some treatment. Telemetry system. Inlet works bypass to ponds. Ranger to close beaches.
7	**Effluent**	**Poor quality - equipment failure**	✓	✓	Unlikely		Minor	Low	Standby capacity. SPS storage if required. Telemetry system. Operator attendance in less than 1 hour.
8	**Various Chemicals**	**Chemical spill**	✓	✓	Unlikely		Minor	Low	All chemicals are stored in securely bunded areas.
9	**Sludge**	**Spill from drying bed due to heavy rain**	✓	✓	Unlikely	Wet weather	Minor	Low	Bund beds
10	**Stored biosolids**	**Washed off site**	✓	✓	Unlikely		Minor	Low	Bund area
11	**Effluent**	**Fire - switch room**	✓	✓	Rare		Minor	Low	Segregated SCA. Telemetry Fire extinguisher.
12	**Effluent/**	**STP flooded**	✓	✓	Rare		Minor	Low	STP is above flood level

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
	Sludge								
	SPS Near Waterways								
13	**Sewage**	**Overflow to estuary/creek - extended power failure**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Reliable power system. Long outages would be planned. 8 hours at ADWF emergency storage Operator response less than 1 hour. Council has a generator, Sykes pump bypass and SCA have connection points.
14	**Sewage**	**Overflow to creek - extended power failure unplanned**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Reliable power system. 8 hours ADWF emergency storage. Telemetry system. Operator response less than 1 hour Council has a generator, Sykes pump bypass and SCA have connection points.
15	**Sewage**	**Overflow to creek - pump failure**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Duty and standby Pumps - Pumps maintained every 3 years 8 hours ADWF emergency storage Telemetry system. Operator response less than 1 hour.

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
16	**Sewage**	**Overflow to creek - electrical failure**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Telemetry system. Operator response less than 1 hour. Diesel pump and connection point. Spare SCA at depot. 8 hours ADWF emergency storage
17	**Sewage**	**Overflow to creek - flooding of SPS**	✓	✓	Rare	Wet weather event	Moderate	Low	Telemetry system. Operator response less than 1 hour. SCA above 1 in 100 level. 8 hours ADWF emergency storage
	SPS Not Near Waterways								
18	**Sewage**	**Overflow to sensitive area - extended power failure**	✓	✓	Unlikely	Wet weather event	Minor	Low	Reliable power system. Long outages would be planned. 8 hours ADWF emergency storage Operator response less than 1 hour. Council has a generator, Sykes pump bypass and SCA have connection points.
19	**Sewage**	**Overflow to sensitive area - extended power failure unplanned**	✓	✓	Unlikely	Wet weather event	Minor	Low	Reliable power system. 8 hours ADWF emergency storage. Telemetry system. Operator response less than 1 hour

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
									Council has a generator, Sykes pump bypass and SCA have connection points.
20	**Sewage**	**Overflow to sensitive area - pump failure**	✓	✓	Unlikely	Wet weather event	Minor	Low	Duty and standby Pumps - Pumps maintained every 3 years 8 hours ADWF emergency storage Telemetry system. Operator response less than 1 hour.
21	**Sewage**	**Overflow to sensitive area - electrical failure**	✓	✓	Unlikely	Wet weather event	Minor	Low	Telemetry system. Operator response less than 1 hour. Diesel pump and connection point. Spare SCA at depot. 8 hours ADWF emergency storage
22	**Sewage**	**Overflow to sensitive - flooding of SPS**	✓	✓	Rare	Wet weather event	Minor	Low	Telemetry system. Operator response less than 1 hour. SCA above 1 in 100 level. 8 hours ADWF emergency storage
	Gravity System								
23	**Sewage**	**Overflow due to blockage**	✓	✓	Moderate	Wet weather event	Minor	Low	Operator to call in tanker Operator response less than 1 hour Small volumes

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
24	**Sewage**	**Discharge due to pipe break – ground movement/ earthquake**	✓	✓	Rare	Wet weather event	Major	Moderate	Operator to call in tanker Operator response less than 1 hour Small volumes
25	**Sewage**	**Discharge due to pipe break – excavation works**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Dial before dig. Maintain up-to-date plan records.
	Rising Mains								
26	**Sewage**	**Discharge due to pipe break – poor pipe condition or high pressure**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Flow/pump monitoring. Telemetry system.
27	**Sewage**	**Discharge due to pipe break – ground movement**	✓	✓	Rare	Wet weather event	Major	Moderate	Flow/pump monitoring. Telemetry system.
28	**Sewage**	**Discharge due to pipe break – excavation works**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Flow/pump monitoring. Telemetry system. Dial before dig. Maintain up-to-date plans.

12.4 Evacuation Procedure

The evacuation procedure should be depicted on a plan as displayed in the amenities building/site office and reviewed annually by Water and Sewer Operations Engineer.

12.5 Emergency Assembly Point

The emergency assembly point, as indicated on the Evacuation Plan, is located near the entrance to the STP and is clearly sign posted as shown in ***Figure 12-8***.

Figure 12 - 8: Batemans Bay STP Emergency Evacuation Point

13 Tomakin Sewerage Scheme

The Tomakin Sewerage Scheme currently services a total of around permanent population of 6,000 Equivalent Persons (EP) to 10,000 EP at peak. The Tomakin Sewerage Scheme that includes a sewage treatment plant (STP) (***Figure 13-1***) and the collection system servicing the towns of Tomakin, Broulee, Mossy Point and Mogo.

13.1 Sewage Treatment Plant and Collection System

The Tomakin STP comprises the following treatment /process units:

- A balance tank with odour treatment with emergency/storm bypass;
- Inlet works Inflow reception, screening, grit removal, flow measurement, and flow division;
- Continuous Extended Aeration reactor;
- Clarifiers;
- Maturation ponds;
- Sludge Lagoons;
- Mobile dewatering unit (shared with Batemans Bay STP); and
- Sludge storage area.

The Tomakin STP is to be upgraded in the near future. The upgrade will consist of a new inlet works, IDEA reactor/ sludge lagoons and dewatering system, onsite generator and a UV system.

The Tomakin sewage collection system comprises the following:

- Gravity mains;
- Sewage pumping stations (SPS TO1 -TO25); and
- Rising mains (from each SPS).

The STP and the collection system operate under Environmental Protection Licence (EPL) No. 2851 granted by the NSW Environment Protection Authority (EPA) that is renewed annually.

Effluent quality limitations on EPA licence is summarized in ***Table 13-1***.

Table 13 - 1: Pollutant List – Sewage and Effluent for Tomakin STP

Parameter	Typical Raw Sewage	Effluent (50 percentile) *	Effluent (100 percentile) *
Biochemical oxygen demand (BOD_5)	270 mg/L	< 10 mg/L	< 20 mg/L
Suspended solids (SS)	270 mg/L	< 15 mg/L	<30 mg/L
Total nitrogen (TN)	53 mg/L		
Ammonia	12 mg/L		
Total phosphorus (TP)	11 mg/L		
Oil and grease (O&G)	< 10 mg/L		< 10 mg/L
Faecal coliforms (FC)	1,000,000 cfu/100 mL		
pH	6.5 - 8.5		

* Licence Conditions

Figure 13 - 1: Tomakin STP Location

13.2 Types of Pollution Incidents

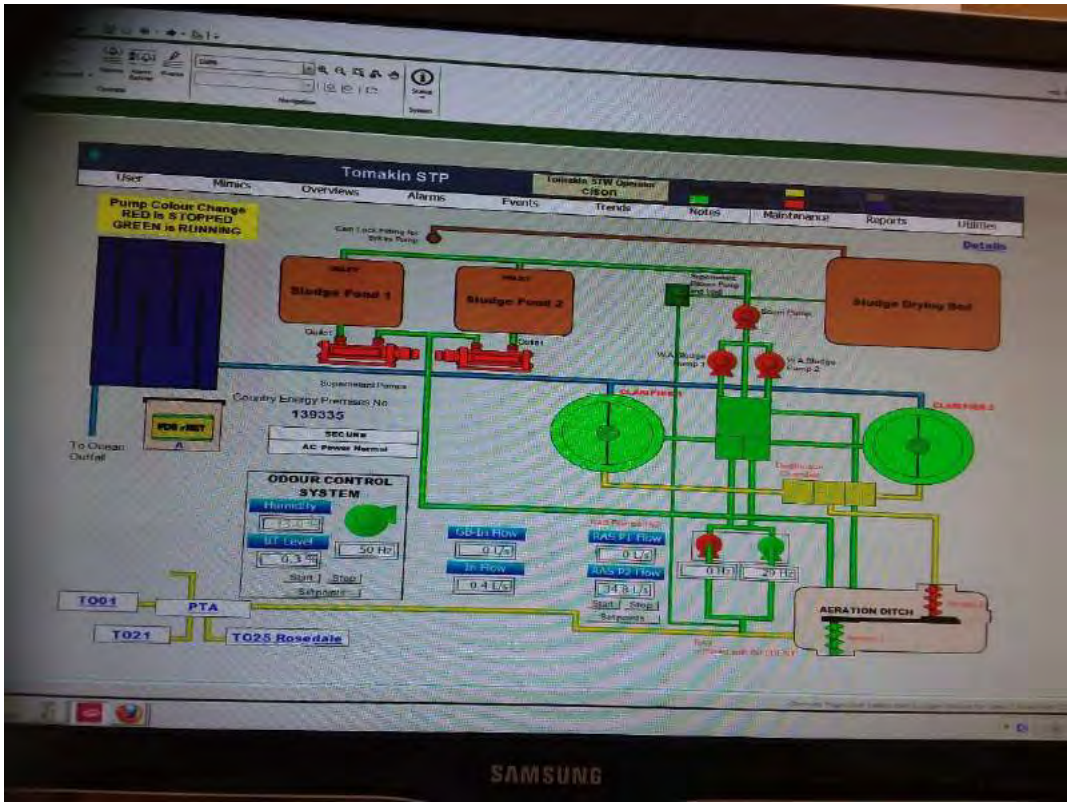
13.2.1 STP Overflowing or Bypass

The Tomakin STP is a reasonably modern STP, which has a tertiary pond to store storm water during wet weather conditions. The overflow or bypass may occur when under exceptional circumstances such as wet weather events or malfunction of systems due to mechanical/ electrical failure or blockages occur.

The plant has a SCADA system and a telemetry system. This means that the STP is monitored continuously. Alarms triggered by the SCADA system will alert the Telemetry Operator who will then alert either STP Operator or the Water and Sewer Coordinator by SMS/phone/radio. The Operator would then respond to the alarm by attending the STP. The Operators live locally to the STP which provides ready response to any treatment problem events.

The general flow schematic of the treatment process in the Tomakin STP is demonstrated on the plant SCADA screen ***(Figure 13-2)***.

Figure 13 - 2: Tomakin STP Flow Schematic SCADA Screen



13.2.1.1 Dry Weather

Generally, unless exceptional circumstances occur, such as malfunction of systems due to mechanical/ electrical failure or blockages occur, overflows or bypasses of poor quality effluent at the STP in dry weather flow conditions are extremely unlikely.

The following overflow or bypass events that could occur are shown below. Also shown, is the appropriate management strategy to minimise the possible effects;

- Inlet works bypass
  - blocked screens – telemetry alarm, flow to the balance tank from which overflows into the tertiary pond, and discharges into Ocean outfall for discharge,
  - screen failure – telemetry alarm, flow to the balance tank from which overflows into the tertiary pond, and discharges into Ocean outfall for discharge,
  - power failure – telemetry alarm, flow to the balance tank from which overflows into the tertiary pond, and discharges into Ocean outfall for discharge.
- Aeration system
  - aerator system bearing failure - telemetry alarm, Council has spare aerators (ejectors) to be used when an aerator bearing failure or for peak flow loading. The treated or partially treated effluent will flow into the tertiary pond,
  - power failure - telemetry alarm, gravity flow to the balance tank to the tertiary pond without treatment.
- Clarifier
  - failure of RAS pump - telemetry alarm, settlement by other clarifier, flow to the tertiary pond,

- power failure of RAS pump - telemetry alarm, settlement by other clarifier, flow to the tertiary pond.

- SCA Failure
  - failure of SCA from fire - segregated boards, flow to the tertiary pond for partial treatment.

13.2.1.2 Wet Weather

The STP balance tank is designed to balance down dry weather flows and small wet weather events to less than 3xADWF for transfer to the inlet works and process reactor. Inflows greater then 3xADWF will bypass the secondary treatment units to the maturation pond.

The SCADA and telemetry alarms will be populated when overflows are discharged into the Ocean outfall.

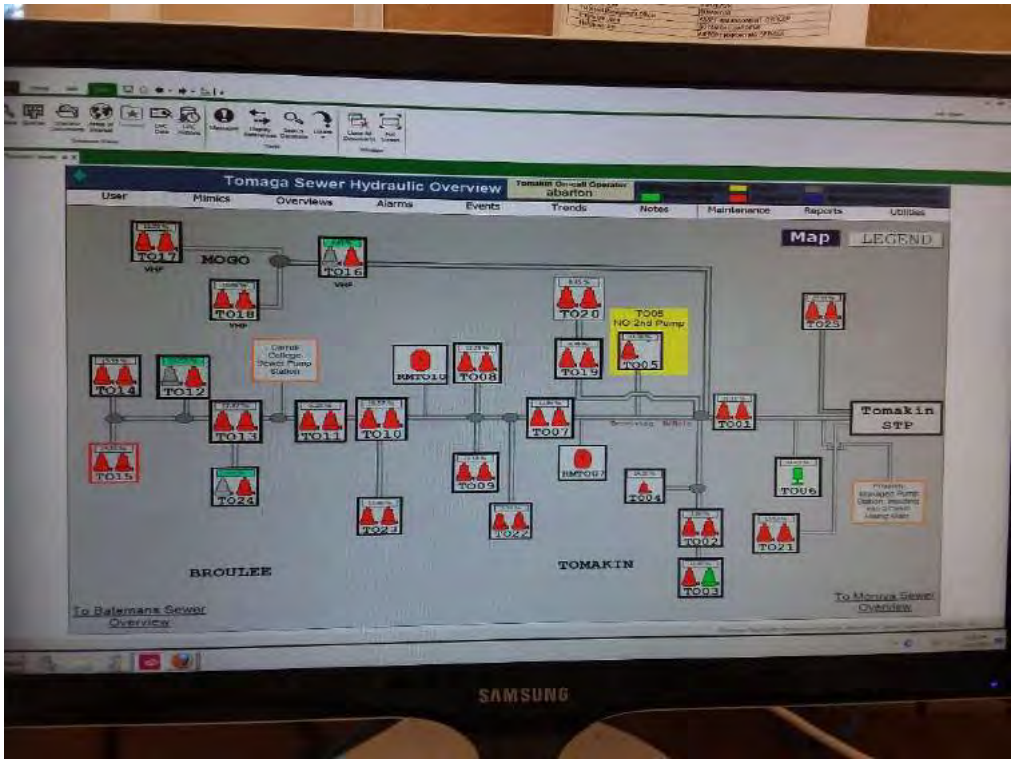
13.2.2 Sewage Pumping Station or Manhole Overflowing

As per the past records kept by Council, apart from minor seepages due to blockages in pipelines, no major overflow events have occurred in the reticulation system in the recent past.

Overall, the Tomakin reticulation system is in a good condition and has sufficient capacity. The number of overflows or incidents per kilometre of pipeline per year would be considered low by industry standards. Council uses water jetting equipment to clear blockages. Blockages in reticulation mains occur infrequently. The main cause is tree root intrusions, but it can also occur due to foreign objects lodging in the pipelines.

The arrangement of all sewage pumping stations (SPSs) in the Tomakin sewerage scheme is displayed on the plant SCADA screen ***(Figure 13-3).***

Figure 13 - 3: Tomakin STP Reticulation Schematic SCADA Screen



All SPSs are in good condition, each pumping station has following capacity and control methods to minimise the overflowing from a SPS:

- Adequate pumping capacity;
- Reliable power supply,
- Emergency power generation (portable diesel generator);
- Ability to store 8 hours ADWF flows before an overflow occurs;
- Ability to detect and respond to abnormal operating conditions via telemetry system and visual alarm light (flashing) in the events of power failure, pump failure, etc.;
- Availability of standby pumps (duty/ standby operation);
- Provision of Sykes pump bypass in case of all pumps failure;
- Control arrangement;
- Spare infrastructure available;
- Implementation of effective emergency plan/operational procedures for attending to failure and breakdown within the system; and
- Flood protection.

The level sensors are installed in some manholes to provide early warning alarms when sewage in the manhole has the potential of overflowing to local waterways which are in proximity to oyster farms.

Council will respond to overflows once notified. The Water and Sewer Operator now has a tablet with the reticulation layout included. This aids in pinpointing problems and for isolating upstream mains and SPS.

Overflows can also happen during unusual excessive inflows (>PWWF) which may occur during extreme flood events if reticulation manholes are inundated and the inflow is greater than the pumping station capacity.

Other possibilities for sewer overflows include illegal connection of storm water pipes and low-lying gullies or boundary traps.

13.2.3 Chemical Spill or Leakage

The Tomakin STP does not use chemicals in the treatment process. A small supply of gear oil and petrol is stored on site in a chemical storage container and is used for the maintenance of the facility.

13.2.4 Odour Emission

STP

The odour treatment bioreactor system ***(Figure 13-4)*** is located adjacent to the sewage balance tank to treat foul air collected from covered balance tank by bio-media, after treatment, treated air is released to air from the top of the bioreactor.

A H_2S meter is installed to monitor the odour level in the released air ***(Figure 13-5).***

Figure 13 - 4: Tomakin STP Bioreactor

Figure 13 - 5: H_2S Monitor Used in the Tomakin STP

Reticulation System

Council uses dosing of pure oxygen (***Figure 13-6***) and calcium nitrate solution (***Figure 13-7***) to reduce septicity. Council has a low rate of complaints due to odour.

Figure 13 - 6: Pure Oxygen Used in the Tomakin Sewerage Scheme

Figure 13 - 7: Calcium Nitrate Used in the Tomakin Sewerage Scheme

13.3 Risk Assessment – Tomakin STP and Collection System

Table 13 - 2: Risk Register for Tomakin STP and Collection System

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Moderate - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
	STP								
1	**Effluent**	**Septage upsets process**	✓	✓	Rare	Toxic waste	Minor	Low	The operator must authorise. Not currently taken.
2	**Effluent**	**Toxic wastes upsets / kills process**	✓	✓	Rare	Trade waste discharges	Moderate	Low	Trade waste policy. Routine plant monitoring.
3	**Effluent**	**Wet weather inflows to the STP causing bypasses and overflows**	✓	✓	Likely	Prolonged wet weather	Minor	Low	Plant designed to minimise bypassing. Bypassed flows to the maturation pond. Telemetry system. Operator attendance within 1 hour.
4	**Effluent**	**Poor quality - sabotage of plant**	✓	✓	Rare		Minor	Low	Locked gates. Locked building. Telemetry system.
5	**Effluent**	**Poor quality - extended power failure**	✓	✓	Unlikely		Minor	Low	Reliable power system. Long outages would be planned. Units will provide some treatment. Telemetry system.

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Moderate - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
									Inlet works bypass to ponds.
6	**Effluent**	**Poor quality - equipment failure**	✓	✓	Unlikely		Minor	Low	Standby capacity. SPS storage if required. Telemetry system. Operator attendance in less than 1 hour.
7	**Sludge**	**Spill from pond due to heavy rain**	✓	✓	Unlikely	Wet weather	Minor	Low	Duty and standby supernatant return pumps. Telemetry system.
8	**Stored biosolids**	**Washed off site**	✓	✓	Unlikely		Minor	Low	Bund area.
9	**Effluent**	**Fire - switchroom**	✓	✓	Rare		Minor	Low	Segregated SCA. Telemetry Fire extinguisher.
	SPS Near Waterways								
10	**Sewage**	**Overflow to estuary/creek - extended power failure**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Reliable power system. Long outages would be planned. 8 hours ADWF emergency storage Operator response less than 1 hour.

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Moderate - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
									Council has generators, Sykes pump bypass and SCA have connection points.
11	**Sewage**	**Overflow to creek - extended power failure unplanned**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Reliable power system. 8 hours ADWF emergency storage. Telemetry system. Operator response less than 1 hour Council has generators, Sykes pump bypass and SCA have connection points.
12	**Sewage**	**Overflow to creek - pump failure**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Duty and standby Pumps - Pumps maintained every 3 years 8 hours ADWF emergency storage Telemetry system. Operator response less than 1 hour.
13	**Sewage**	**Overflow to creek - electrical failure**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Telemetry system. Operator response less than 1 hour. Diesel pump and connection point. Spare SCA at depot. 8 hours ADWF emergency storage

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Moderate - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
14	**Sewage**	**Overflow to creek - flooding of SPS**	✓	✓	Rare	Wet weather event	Moderate	Low	Telemetry system. Operator response less than 1 hour. SCA above 1 in 100 level. 8 hours ADWF emergency storage
	SPS Not Near Waterways								
15	**Sewage**	**Overflow to estuary/creek - extended power failure**	✓	✓	Unlikely	Wet weather event	Minor	Low	Reliable power system. Long outages would be planned. 8 hours ADWF emergency storage Operator response less than 1 hour. Council has generators, Sykes pump bypass and SCA have connection points.
16	**Sewage**	**Overflow to creek - extended power failure unplanned**	✓	✓	Unlikely	Wet weather event	Minor	Low	Reliable power system. 8 hours ADWF emergency storage. Telemetry system. Operator response less than 1 hour Council has generators, Sykes pump bypass and SCA have connection points.

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Moderate - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
17	**Sewage**	**Overflow to creek - pump failure**	✓	✓	Unlikely	Wet weather event	Minor	Low	Duty and standby Pumps - Pumps maintained every 3 years 8 hours ADWF emergency storage Telemetry system. Operator response less than 1 hour.
18	**Sewage**	**Overflow to creek - electrical failure**	✓	✓	Unlikely	Wet weather event	Minor	Low	Telemetry system. Operator response less than 1 hour. Diesel pumps and connection point. Spare SCA at depot. 8 hours ADWF emergency storage
19	**Sewage**	**Overflow to creek - flooding of SPS**	✓	✓	Rare	Wet weather event	Minor	Low	Telemetry system. Operator response less than 1 hour. SCA above 1 in 100 level. 8 hours ADWF emergency storage
	Gravity System								
20	**Sewage**	**Overflow due to blockage**	✓	✓	Moderate	Wet weather event	Minor	Low	Operator to call in tanker and use Jet Flush Units to clear. Operator response less than 1 hour. Small volumes

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Moderate - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
21	**Sewage**	**Discharge due to pipe break – ground movement/ earthquake**	✓	✓	Rare	Wet weather event	Major	Moderate	Operator to call in tanker and use Jet Flush Units to clear. Operator response less than 1 hour. Small volumes
22	**Sewage**	**Discharge due to pipe break – excavation works**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Dial before dig. Maintain up-to-date plan records.
	Rising Mains								
23	**Sewage**	**Discharge due to pipe break – poor pipe condition or high pressure**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Flow/pump monitoring. Telemetry system.
24	**Sewage**	**Discharge due to pipe break – ground movement**	✓	✓	Rare	Wet weather event	Major	Moderate	Flow/pump monitoring. Telemetry system.
25	**Sewage**	**Discharge due to pipe break – excavation works**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Flow/pump monitoring. Telemetry system. Dial before dig. Maintain up-to-date plans.

13.4 Evacuation Procedure

The evacuation procedure should be depicted on a plan as displayed in the amenities building/site office and reviewed annually by Water and Sewer Operations Engineer.

13.5 Emergency Assembly Point

The emergency assembly point, as indicated on the Evacuation Plan, is located near the entrance to the STP and is clearly sign posted as shown in ***Figure 13-8***.

Figure 13 - 8: Tomakin STP Emergency Evacuation Point

14 Moruya Sewerage Scheme

The Moruya Sewerage Scheme services the townships of Moruya and Moruya Heads, located 305 km south of Sydney, Moruya is situated on the Moruya River whilst Moruya Heads is located on the coast south of the Moruya River ocean entrance. The Moruya STP (***Figure 14-1***) services a total of around 4,800 Equivalent Persons.

14.1 Sewage Treatment Plant and Collection System

The Moruya STP comprises the following treatment /process units:

- Inlet works - Inflow reception, screening, grit removal, flow measurement and flow division;
- Septage receival facilities;
- Storm ponds (x2) and storm return pumping station;
- Continuous Extended Aeration reactor;
- Clarifier;
- Maturation pond;
- Sludge Lagoons; and
- Sludge drying beds.

The Moruya and Moruya Heads sewage collection system comprises of the following:

- Gravity mains;
- Sewage pumping stations (SPS MO01 –MO020); and
- Rising mains (from each SPS).

The STP and the collection system operate under Environmental Protection Licence (EPL) No. 1614 granted by the NSW Environment Protection Authority (EPA) that is renewed annually.

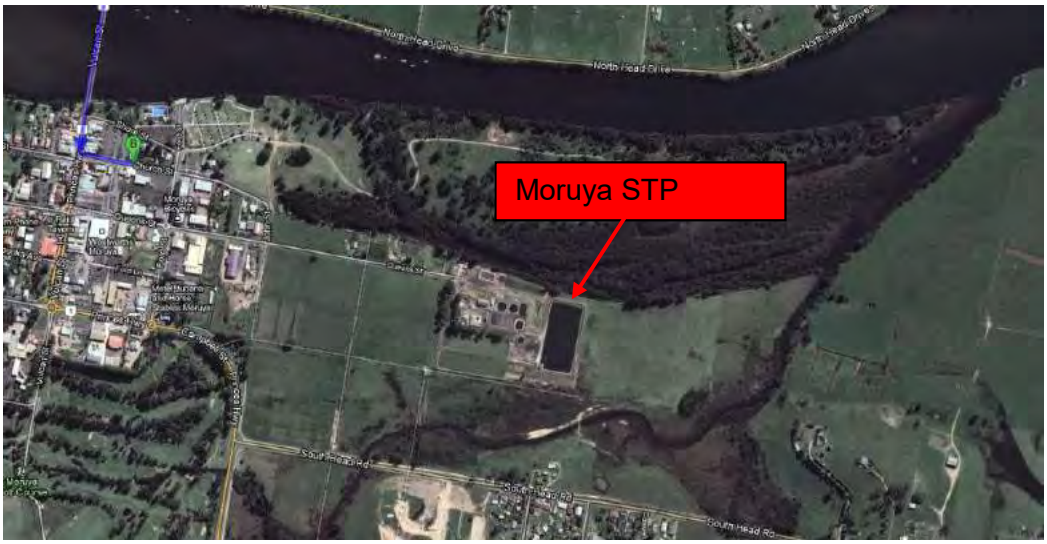
Effluent quality on EPA licence is summarized in ***Table 14-1***.

Table 14 - 1: Pollutant List – Sewage and Effluent for Moruya STP

Parameter	Typical Raw Sewage	Effluent (90 percentile) *	Effluent (100 percentile) *
Biochemical oxygen demand (BOD_5)	270 mg/L	< 10 mg/L	< 20 mg/L
Suspended solids (SS)	270 mg/L	< 15 mg/L	<30 mg/L
Total nitrogen (TN)	53 mg/L	<15mg/l	
Ammonia	12 mg/L		
Total phosphorus (TP)	11 mg/L	<1 mg/L	
Oil and grease (O&G)	< 10 mg/L		< 10 mg/L
Faecal coliforms (FC)	1,000,000 cfu/100 mL		
pH	6.5 - 8.5		

* Licence Conditions

Figure 14 - 1: Moruya STP Location



14.2 Types of Pollution Incidents

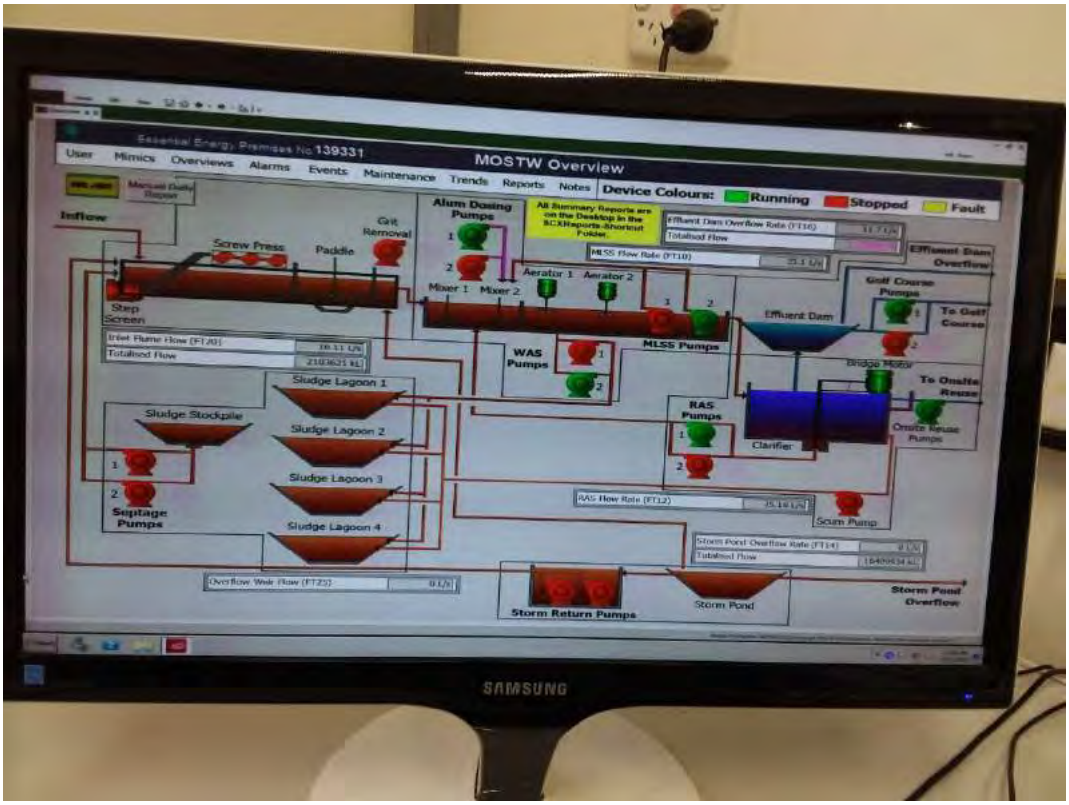
14.2.1 STP Overflowing or Bypass

The Moruya STP has a storm pond and effluent dam to store bypasses during wet weather conditions and effluent used for golf course irrigation and on-site reuse. The overflow or bypass may occur when exceptional circumstances such as malfunction of systems due to mechanical/ electrical failure or blockages occur or bypassed flows exceed the volume of the storm pond.

The plant has a SCADA system and a telemetry system. This means that the STP is monitored continuously. Alarms triggered by the SCADA system will alert the Telemetry Operator who will then alert either STP Operator or the Water and Sewer Coordinator by SMS/phone/radio. The Operator would then respond to the alarm by attending the STP. The Operators live locally to the STP which provides ready response to any treatment problem events.

The general flow schematic of the treatment process in the Moruya STP is demonstrated on the plant SCADA screen (***Figure 14-2***).

Figure 14 - 2: Moruya STP Flow Schematic SCADA Screen



14.2.1.1 Dry Weather

Generally, unless exceptional circumstances such as malfunction of systems due to mechanical/ electrical failure or blockages occur, overflows or bypasses of poor quality effluent at the STP in dry weather flow conditions are extremely unlikely.

The following overflow or bypass events that could occur are shown below. Also shown in the appropriate management strategy to minimise the possible effects;

- Inlet works bypass
  - blocked screens – telemetry alarm, flow to storm pond then return for treatment.
  - screen failure – telemetry alarm, flow to storm pond then return for treatment, manual screens.
  - power failure - telemetry alarm, flow to storm pond then return for treatment.
- Aeration system
  - aerator system bearing failure - telemetry alarm, Council has spare aerators (ejectors) to be used when an aerator bearing failure or for peak flow loading. The treated or partially treated effluent will flow into the effluent dam.
  - power failure - telemetry alarm, gravity flow to storm ponds, if the storm ponds are full, water will overflow into adjacent Creek.
- Clarifier
  - failure of RAS pump - telemetry alarm, settlement by other clarifier, flow to ponds for partial treatment.

- power failure of RAS pump - telemetry alarm, settlement by other clarifier, flow to ponds for partial treatment.

- SCA Failure
  - failure of SCA from fire - segregated boards, flow to pond for partial treatment.

14.2.1.2 Wet Weather

The STP is designed to treat all dry weather inflows and small wet weather events to 3xADWF. Wet weather inflows in excess of the treatment capacity of the secondary units will bypass to the storm detention pond. These flows will be returned once the wet weather event has passed. Wet weather events where the bypassed flows are greater than the capacity of the storm pond will cause an overflow to the Moruya River.

The SCADA and telemetry alarms will be generated when overflow occurs from the storm ponds.

14.2.2 Sewage Pumping Station or Manhole Overflowing

Overall, the reticulation system is in a good condition and has sufficient capacity. The number of overflows or incidents per kilometre of pipeline per year would be considered low by industry standards. Council uses water jetting equipment to clear blockages. Blockages in reticulation mains occur infrequently. The main cause is tree root intrusions but can also occur due to foreign objects lodging in the pipelines.

The schematic of Moruya sewerage scheme is displayed the plant SCADA screen ***(Figure 14-3).***

All SPSs are in a good condition, each pumping station has following capacity and control methods to minimise the overflowing from a SPS:

- Adequate pumping capacity;
- Reliable power supply;
- Emergency power generation (portable diesel generator);
- Ability to store 8 hours ADWF flows before an overflow occurs;
- Ability to detect and respond to abnormal operating conditions via telemetry system and visual alarm light (flashing) in the events of power failure, pump failure, etc.;
- Availability of standby pumps (duty/ standby operation);
- Provision of Sykes pump bypass in case of all pumps failure;
- Control arrangement;
- Spare infrastructure available;
- Implementation of effective emergency plan/operational procedures for attending to failure and breakdown within the system; and
- Flood protection.

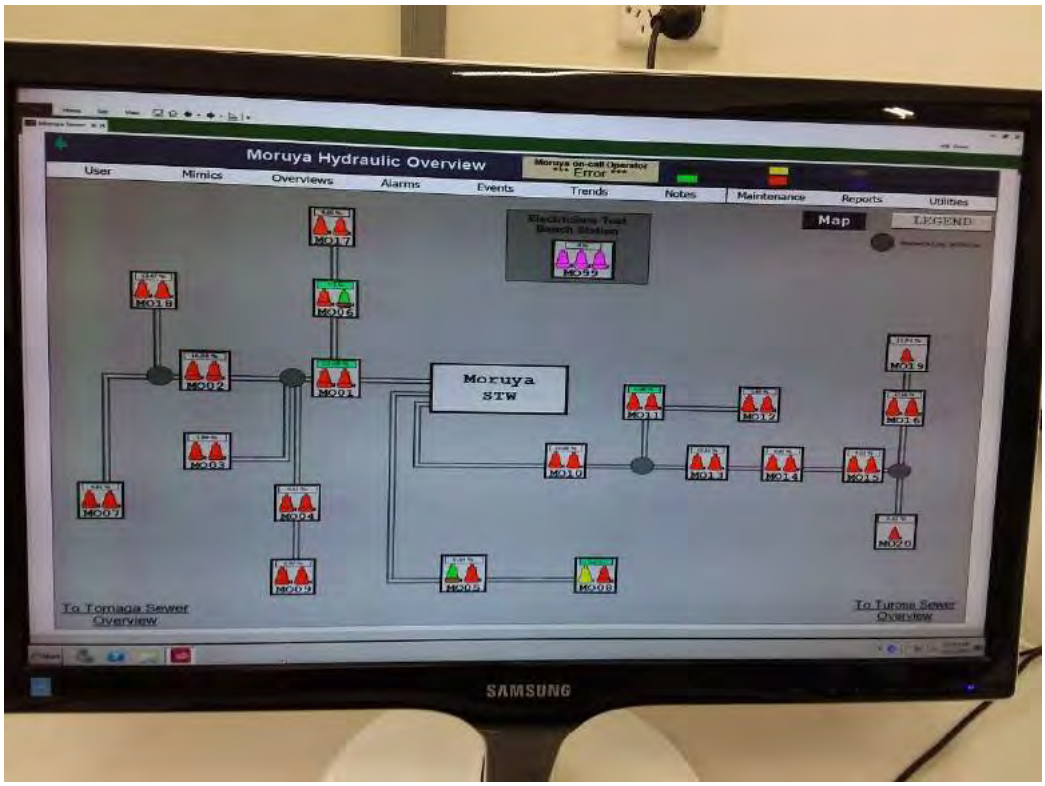
Level sensors are installed in some manholes to provide early warning alarms when sewage in the manhole has potential to overflow to the Moruya River which has oyster farming.

Council will respond to overflows once notified. The Water and Sewer technical officer now has a tablet with the reticulation layout included. This aids in pinpointing problems and for isolating upstream mains and SPS.

Overflows can also happen during unusual excessive inflows (>PWWF) which may occur during extreme flood events if reticulation manholes are inundated and the inflow is greater than the pumping station capacity.

Other possibilities for sewer overflows include illegal connection of storm water pipes and low-lying gullies or boundary traps.

Figure 14 - 3: Moruya Reticulation Schematic SCADA Screen



14.2.3 Chemical Spill or Leakage

The Moruya STP uses aluminium sulphate in the treatment process and chlorine for the disinfection of effluent sent for reuse at the local golf course. All chemicals are installed inside a secure bund area (***Figure 14-4*** to ***Figure 14-7***). The leakage from the chemical dosing system will be retained in the bund and flows into the sump. An isolation valve is installed inside the sump and kept in closed position. A minor chemical spill in the sump is flowed into the storm water pit when the isolation valve is opened manually, and then flows into the plant storm water system.

A major chemical spill would be retained in the bund, which is designed for holding whole tank's chemical volume. Any spills would be removed by tanker/vacuum truck.

There is no monitoring of chemical spills on the plant SCADA and telemetry. Detection is dependent on the Operator's routine inspections and checks.

A number of other chemicals are stored on site which are used in the maintenance of the facility. These are stored within a chemical storage container, which has an inbuilt bund as shown in ***Figure 6-9***.

A safety shower and eyewash facility is provided in the event of direct human contact with alum/chlorine chemicals. Safety data sheet (SDS) shall be located at the STP office and chemical bund area.

Figure 14 - 4: Moruya STP – Chemical Storage Sodium Hypochlorite for Effluent Reuse

Figure 14 - 5: Moruya STP – Chemical Storage Alum Sulphate Used for Effluent Reuse

Figure 14 - 6: Moruya STP – Chemical Storage Alum Sulphate Used for Treatment Process

Figure 14 - 7: Moruya STP – Chemical Storage Sodium Hypochlorite

14.2.4 Odour Emission

STP

Odour is not an issue at the Moruya STP.

Reticulation System

Council uses dosing of pure oxygen and calcium nitrate solution to reduce septicity. Council has a low rate of complaints due to odour.

14.3 Risk Assessment – Moruya STP and Collection System

Table 14 - 2: Risk Register for Moruya STP and Collection System

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
	STP								
1	**Sewage**	**Excessive inflows – bypass**	✓	✓	Likely	Wet weather	Minor	Low	Storm detention ponds provided
2	**Effluent**	**Septage upsets process**	✓	✓	Rare	Toxic waste	Minor	Low	The operator must authorise. Domestic septage only. Trade waste to Nowra. To sludge lagoons.
3	**Effluent**	**Toxic wastes upsets / kills process**	✓	✓	Rare	Trade waste discharges	Moderate	Low	Trade waste policy. Routine plant monitoring.
4	**Effluent**	**Stormwater inflow to STP causing overflows**	✓	✓	Unlikely		Minor	Low	Plant designed to handle PWWF. All inflows pumped. Telemetry system. Operator attendance within 1 hour.
5	**Effluent**	**Poor quality - sabotage of plant**	✓	✓	Rare		Minor	Low	Locked gates. Locked building. Telemetry system.

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
6	**Effluent**	**Poor quality - extended power failure**	✓	✓	Unlikely		Minor	Low	Reliable power system. Long outages would be planned. Units will provide some treatment. Telemetry system. Inlet works bypass to ponds.
7	**Effluent**	**Poor quality - equipment failure**	✓	✓	Unlikely		Minor	Low	Standby capacity. SPS storage if required. Telemetry system. Operator attendance in less than 1 hour.
8	**Various Chemicals**	**Chemical spill**	✓	✓	Unlikely		Minor	Low	All chemicals are stored in secure bund areas.
9	**Sludge**	**Spill from pond due to heavy rain**	✓	✓	Unlikely	Wet weather	Minor	Low	Duty and standby supernatant return pumps. Telemetry system.
10	**Stored biosolids**	**Washed off site**	✓	✓	Unlikely		Minor	Low	Bund area.
11	**Effluent**	**Fire - switchroom**	✓	✓	Rare		Minor	Low	Segregated SCA. Telemetry Fire extinguisher.
12	**Effluent/ Sludge**	**STP flooded**	✓	✓	Rare		Minor	Low	STP is above flood level

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
	SPS Near Waterways								
13	**Sewage**	**Overflow to estuary/creek - extended power failure**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Reliable power system. Long outages would be planned. 8 hours ADWF emergency storage Operator response less than 1 hour. Council has generators, Sykes pump bypass and SCA's have connection points.
14	**Sewage**	**Overflow to creek - extended power failure unplanned**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Reliable power system. 8 hours ADWF emergency storage. Telemetry system. Operator response less than 1 hour Council has generators, Sykes pump bypass and SCA's have connection points.
15	**Sewage**	**Overflow to creek - pump failure**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Duty and standby Pumps - Pumps maintained every 3 years 8 hours ADWF emergency storage Telemetry system. Operator response less than 1 hour.

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
16	**Sewage**	**Overflow to creek - electrical failure**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Telemetry system. Operator response less than 1 hour. Diesel pumps and connection point. Spare SCA at depot. 8 hours ADWF emergency storage
17	**Sewage**	**Overflow to creek - flooding of SPS**	✓	✓	Rare	Wet weather event	Moderate	Low	Telemetry system. Operator response less than 1 hour. SCA above 1 in 100 level. 8 hours ADWF emergency storage
	SPS Not Near Waterways								
18	**Sewage**	**Overflow to estuary/creek - extended power failure**	✓	✓	Unlikely	Wet weather event	Minor	Low	Reliable power system. Long outages would be planned. 8 hours ADWF emergency storage Operator response less than 1 hour. Council has generators, Sykes pump bypass and SCA's have connection points.
19	**Sewage**	**Overflow to creek - extended power failure unplanned**	✓	✓	Unlikely	Wet weather event	Minor	Low	Reliable power system. 8 hours ADWF emergency storage. Telemetry system. Operator response less than 1 hour Council has generators and SCA's have connection points.

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
20	**Sewage**	**Overflow to creek - pump failure**	✓	✓	Unlikely	Wet weather event	Minor	Low	Duty and standby Pumps - Pumps maintained every 3 years 8 hours ADWF emergency storage Telemetry system. Operator response less than 1 hour.
21	**Sewage**	**Overflow to creek - electrical failure**	✓	✓	Unlikely	Wet weather event	Minor	Low	Telemetry system. Operator response less than 1 hour. Diesel pumps and connection point. Spare SCA at depot. 8 hours ADWF emergency storage
22	**Sewage**	**Overflow to creek - flooding of SPS**	✓	✓	Rare	Wet weather event	Minor	Low	Telemetry system. Operator response less than 1 hour. SCA above 1 in 100 level. 8 hours ADWF emergency storage
	Gravity System								
23	**Sewage**	**Overflow due to blockage**	✓	✓	Moderate	Wet weather event	Minor	Low	Operator to call in tanker and use Jet Flush Units to clear. Operator response less than 1 hour. Small volumes
24	**Sewage**	**Discharge due to pipe break – ground movement/ earthquake**	✓	✓	Rare	Wet weather event	Major	Moderate	Operator to call in tanker and use Jet Flush Units to clear. Operator response less than 1 hour. Small volumes

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
25	**Sewage**	**Discharge due to pipe break – excavation works**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Dial before dig. Maintain up-to-date plan records.
	Rising Mains								
26	**Sewage**	**Discharge due to pipe break – poor pipe condition or high pressure**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Flow/pump monitoring. Telemetry system.
27	**Sewage**	**Discharge due to pipe break – ground movement**	✓	✓	Rare	Wet weather event	Major	Moderate	Flow/pump monitoring. Telemetry system.
28	**Sewage**	**Discharge due to pipe break – excavation works**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Flow/pump monitoring. Telemetry system. Dial before dig. Maintain up-to-date plans.

14.4 Evacuation Procedure

The evacuation procedure should be depicted on a plan as displayed in the amenities building/site office and reviewed annually by Water and Sewer Operations Engineer.

14.5 Emergency Assembly Point

The emergency assembly point, as indicated on the Evacuation Plan, is located near the entrance to the STP and is clearly sign posted as shown in ***Figure 14-8.***

Figure 14 - 8: Moruya STP Emergency Evacuation Point

15 Tuross Head Sewerage Scheme

The Tuross Sewerage Scheme services the township of Tuross Head, located 320 km south of Sydney, and the village of Turlinjah which is 6 km inland from Tuross head on Tuross Lake. The Tuross Sewerage Scheme includes the Tuross Head sewage treatment plant (STP) sometimes referred to as the Bingie STP, the Turlinjah STP and the collection system servicing Tuross Head and the village of Turlinjah.

15.1 Sewage Treatment Plant and Collection System

The Tuross Head STP ***(Figure 15-1)*** comprises the following treatment /process units:

- Inlet works - Inflow reception, screening, flow measurement and flow division;
- Continuous Extended Aeration reactors (Pasveer Channels x 2);
- Exfiltration beds;
- Sludge Lagoons;
- Sludge drying beds;
- A reuse system for plant use and irrigation at the Tuross head golf club which includes:
    - Gravity sand filters
    - Ultra violet disinfection
    - Chlorination

The Tuross STP is to be upgraded in the near future. The upgrade will entail a new inlet works, balance tank, Pasveer aeration upgrades and new reuse system. This upgrade will increase hydraulic capacity and improve the quality of effluent for reuse.

The Turlinjah STP ***(Figure 15-2)*** is a small wetland based STP.

The Tuross Head and Turlinjah sewage collection system comprises the following:

- Gravity mains;
- Sewage pumping stations (SPS TU01 –TU10) and Turlinjah (SPS TJ01-TJ02); and
- Rising mains (from each SPS).

The STP and the collection system operate under Environmental Protection Licence (EPL) No. 3108 granted by the NSW Environment Protection Authority (EPA) that is renewed annually.

Effluent quality on EPA licence is summarized in ***Table 15-1***.

Table 15 - 1: Pollutant List – Sewage and Effluent for Tuross Head STP

Parameter	Typical Raw Sewage	Effluent (50 percentile)*	Effluent (100 percentile)*
Biochemical oxygen demand (BOD_5)	270 mg/L	< 15 mg/L	< 20 mg/L
Suspended solids (SS)	270 mg/L	< 20 mg/L	<30 mg/L
Total nitrogen (TN)	53 mg/L		
Ammonia	12 mg/L		
Total phosphorus (TP)	11 mg/L		
Oil and grease (O&G)	< 10 mg/L		< 10 mg/L
Faecal coliforms (FC)	1,000,000 cfu/100 mL		
pH	6.5 - 8.5		

* Licence Conditions

Figure 15 - 1: Tuross Head STP Location

Figure 15 - 2: Turlinjah STP Location

15.2 Types of Pollution Incidents

15.2.1 STP Overflowing or Bypass

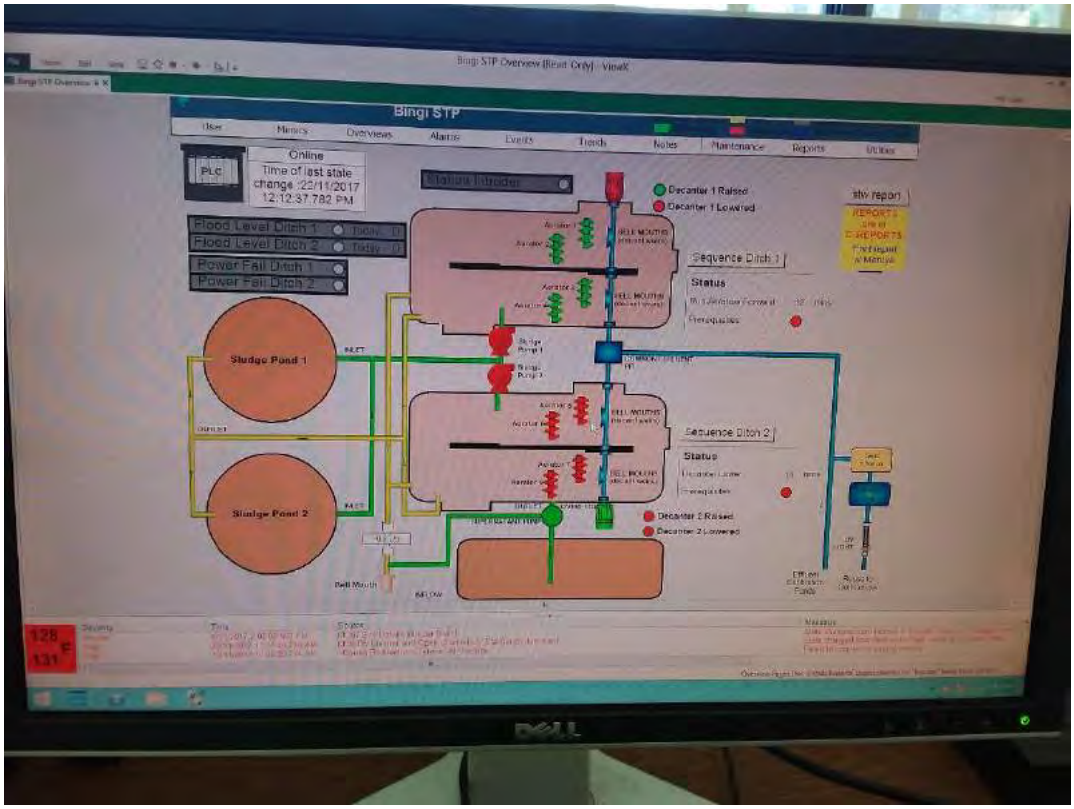
The Tuross Head STP is an older style STP, which is currently close to its design capacity.

At present, all flows are pumped via SPS TU01 to the plant inlet works. During non-peak periods, all inflows can be fully treated as the design capacity of the STP is in excess of the connected non-peak population. Peak holiday loads, especially during wet weather, can result in a deterioration in effluent quality. Council is currently looking at upgrading the plant.

The plant has a SCADA system and a telemetry system. This means that the STP is monitored continuously. Alarms triggered by the SCADA system will alert the Telemetry Operator who will then alert either STP Operator or the Water and Sewer Senior Operator by SMS/phone/radio. The Operator would then respond to the alarm by attending the STP. The Operators live locally to the STP which provides ready response to any treatment problem events.

The general flow schematic of the treatment process in the Tuross Head STP is demonstrated on the plant SCADA screen (***Figure 15-3***).

Figure 15 - 3: Tuross Head STP Flow Schematic SCADA Screen



15.2.1.1 Dry Weather

Generally, unless exceptional circumstances such as malfunction of systems due to mechanical/ electrical failure or blockages occur, overflows or bypasses of poor quality effluent at the STP in dry weather flow conditions are extremely unlikely.

The following overflow or bypass events that could occur are shown below. Also shown are the appropriate management strategies to minimise the possible effects;

- Inlet works overflows
    - blocked manual screens – operator daily inspection, flow to Pasveer for treatment via the screen bypass,
    - power failure – gravity flow, telemetry alarm.
- Aeration system
    - aerator bearing failure - telemetry alarm, Council has spare aerators (ejectors) to be used when an aerator bearing failure or for peak flow loading. The treated or partially treated effluent will flow into the effluent exfiltration area from the common effluent pit,
    - power failure - telemetry alarm, inflow flows into the Pasveer Channels and overflows to the common effluent pit via the bellmouth located inside the Pasveer Channel.
- Gravity Sand Filter
    - filter blocked - bypass line to the dune exfiltration system.
- Reuse pump stations
    - pump or power failure - bypass line to the dune exfiltration system.
- SCA Failure

- failure of SCA from fire - segregated boards, flow to the common effluent pit from the bellmouth of a Pasveer Channel, then flows into the exfiltration pond.

15.2.1.2 Wet Weather

The Tuross STP is designed to treat all inflows. Generally, unless exceptional circumstances such as malfunction of system due to mechanical/ electrical failure or blockages occur, overflows at the STP due to wet weather flow conditions are unlikely.

In wet weather conditions, all inflow flow into Pasveer Channels and then into the effluent common pit, and then into the exfiltration area. If the inflows are greater than the capacity of the dune exfiltration system then the area will overflow to the adjacent dunes.

The plant SCADA and telemetry alarm will be generated when the overflowing occurs in the Pasveer Channels.

15.2.2 Sewage Pumping Station or Manhole Overflowing

Overall the Tuross reticulation system is in good condition and has sufficient capacity. The number of overflows or incidents per kilometre of pipeline per year would be considered low by industry standards. Council uses water jetting equipment to clear blockages. Blockages in reticulation mains occur infrequently. The main cause is tree root intrusions but can also occur due to foreign objects lodging in the pipelines.

All SPSs are in good condition and each pumping station has the following capacity and control methods to minimise the overflowing from a SPS:

- Adequate pumping capacity,
- Reliable power supply,
- Emergency power generation (portable diesel generator),
- Ability to store 8 hours ADWF flows before an overflow occurs,
- Ability to detect and respond to abnormal operating conditions via telemetry system and visual alarm light (flashing) in the events of power failure, pump failure, etc.
- Availability of standby pumps (duty/ standby operation),
- Provision of Sykes pump bypass in case of all pumps failure,
- Control arrangement,
- Spare infrastructure available,
- Implementation of effective emergency plan/operational procedures for attending to failure and breakdown within the system, and
- Flood protection.

Council will respond to overflows once notified. The Water and Sewer Operator now has a tablet with the reticulation layout included. This aids in pinpointing problems and for isolating upstream mains and SPS.

Overflows can also happen during unusual excessive inflows (>PWWF) which may occur during extreme flood events if reticulation manholes are inundated and the inflow is greater than the pumping station capacity.

Other possibilities for sewer overflows include illegal connection of storm water pipes and low-lying gullies or boundary traps.

15.2.3 Chemical Spill or Leakage

There are no major quantities of chemicals stored on-site. Alum sulphate ***(Figure 15-4)*** is used for removal phosphorus and enhance of sludge settleability in the Pasveer Channels. Sodium hypochlorite ***(Figure 15-5)*** is used at the STP for disinfection of the effluent sent to the golf course. Both chemicals are used in very small amounts, 25-30 L/d for alum sulphate and less than 50 L/d for sodium hypochlorite. Safety data sheets (SDS) for both chemicals shall be placed in the operation room and chemical storage area.

Various gear oils or petrol or other chemicals used for the maintenance of equipment and for maintaining the grounds of the treatment plant and the SPS are stored on site chemical storage container ***(Figure 15-6)***. Safety data sheets (SDS) are located at the STP.

A safety shower and eyewash facility is provided in the event of direct human contact with alum/chlorine chemicals. Safety data sheet (SDS) shall be located at the STP office and chemical bund area.

Figure 15 - 4: Tuross STP – Chemical Storage for Alum Sulphate

Figure 15 - 5: Tuross STP – Chemical Storage Sodium Hypochlorite

Figure 15 - 6: Tuross STP – Chemical Storage Container

15.2.4 Odour Emission

STP

Odour is not an issue at the Tuross STP.

Reticulation System

Council uses dosing of pure oxygen and calcium nitrate solution to reduce septicity. Council has a low rate of complaints due to odour.

15.3 Risk Assessment – Tuross Head STP and Collection System

Table 15 - 2: Risk Register for Tuross Head STP and Collection System

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
	Tuross Head STP								
1	Sewage	Inlet Works Overflow	✓	✓	Possible		Minor	Moderate	The operator attends daily. Run off to site.
2	Effluent	Septage upsets process	✓	✓	Rare	Toxic waste	Minor	Low	The operator must authorise. Not currently taken.
3	Effluent	Toxic wastes upsets / kills process	✓	✓	Rare	Trade waste discharges	Moderate	Low	Trade waste policy. Routine plant monitoring.
4	Effluent	Stormwater inflow to STP causing overflows	✓	✓	Unlikely		Minor	Low	Plant designed to handle PWWF. All inflows pumped. Telemetry system. Operator attendance within 1 hour.
5	Effluent	Poor quality - sabotage of plant	✓	✓	Rare	Holiday load	Minor	Low	Locked gates. Locked building. Telemetry system.
6	Effluent	Poor quality - extended power failure	✓	✓	Unlikely		Minor	Low	Reliable power system.

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
									Long outages would be planned. Units will provide some treatment. Telemetry system. Inlet works bypass to ponds.
7	Effluent	Poor quality - equipment failure	✓	✓	Unlikely	Holiday load	Minor	Low	Standby capacity. SPS storage if required. Telemetry system. Operator attendance in less than 1 hour.
8	Various Chemicals	Chemical spill	✓	✓	Unlikely		Minor	Low	Chemicals stored in a secure chemical container.
9	Sludge	Spill from pond due to heavy rain	✓	✓	Likely	Wet weather	Insignificant	Low	Duty and standby supernatant return pumps. Telemetry system.
10	Stored biosolids	Washed off site	✓	✓	Unlikely		Minor	Low	Bunded area.
11	Effluent	Fire - switch room	✓	✓	Rare		Minor	Low	Segregated SCA. Telemetry Fire extinguisher.

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
	SPS Near Waterways								
12	Sewage	Overflow to estuary/creek - extended power failure	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Reliable power system. Long outages would be planned. 8 hours ADWF emergency storage Operator response less than 1 hour. Council has generators, Sykes pump bypass and SCA's have connection points.
13	Sewage	Overflow to creek - extended power failure unplanned	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Reliable power system. 8 hours ADWF emergency storage. Telemetry system. Operator response less than 1 hour Council has generators, Sykes pump bypass and SCA's have connection points.
14	Sewage	Overflow to creek - pump failure	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Duty and standby Pumps - Pumps maintained every 3 years 8 hours ADWF emergency storage Telemetry system. Operator response less than 1 hour.

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
15	Sewage	Overflow to creek - electrical failure	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Telemetry system. Operator response less than 1 hour. Diesel pump and connection point. Spare SCA at depot. 8 hours ADWF emergency storage
16	Sewage	Overflow to creek - flooding of SPS	✓	✓	Rare	Wet weather event	Moderate	Low	Telemetry system. Operator response less than 1 hour. SCA above 1 in 100 level. 8 hours ADWF emergency storage
	SPS Not Near Waterways								
17	Sewage	Overflow to estuary/creek - extended power failure	✓	✓	Unlikely	Wet weather event	Minor	Low	Reliable power system. Long outages would be planned. 8 hours ADWF emergency storage Operator response less than 1 hour. Council has generators, Sykes pump bypass and SCA's have connection points.
18	Sewage	Overflow to creek - extended power failure unplanned	✓	✓	Unlikely	Wet weather event	Minor	Low	Reliable power system. Long outages would be planned. 8 hours ADWF emergency storage Operator response less than 1 hour. Council has generators, Sykes pump bypass and SCA's have connection points.

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
19	Sewage	Overflow to creek - pump failure	✓	✓	Unlikely	Wet weather event	Minor	Low	Duty and standby Pumps - Pumps maintained every 3 years 8 hours ADWF emergency storage Telemetry system. Operator response less than 1 hour.
20	Sewage	Overflow to creek - electrical failure	✓	✓	Unlikely	Wet weather event	Minor	Low	Telemetry system. Operator response less than 1 hour. Diesel pumps and connection point. Spare SCA at depot. 8 hours ADWF emergency storage
21	Sewage	Overflow to creek - flooding of SPS	✓	✓	Rare	Wet weather event	Minor	Low	Telemetry system. Operator response less than 1 hour. SCA above 1 in 100 level. 8 hours ADWF emergency storage
	Gravity System								
22	Sewage	Overflow due to blockage	✓	✓	Moderate	Wet weather event	Minor	Low	Operator to call in tanker and use Jet Flush Units to clear. Operator response less than 1 hour Small volumes
23	Sewage	Discharge due to pipe break – ground movement/ earthquake	✓	✓	Rare	Wet weather event	Major	Moderate	Operator to call in tanker and use Jet Flush Units to clear. Operator response less than 1 hour Small volumes

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
24	Sewage	Discharge due to pipe break – excavation works	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Dial before dig. Maintain up-to-date plan records.
	Rising Mains								
25	Sewage	Discharge due to pipe break – poor pipe condition or high pressure	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Flow/pump monitoring. Telemetry system.
26	Sewage	Discharge due to pipe break – ground movement	✓	✓	Rare	Wet weather event	Major	Moderate	Flow/pump monitoring. Telemetry system.
27	Sewage	Discharge due to pipe break – excavation works	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Flow/pump monitoring. Telemetry system. Dial before dig. Maintain up-to-date plans.

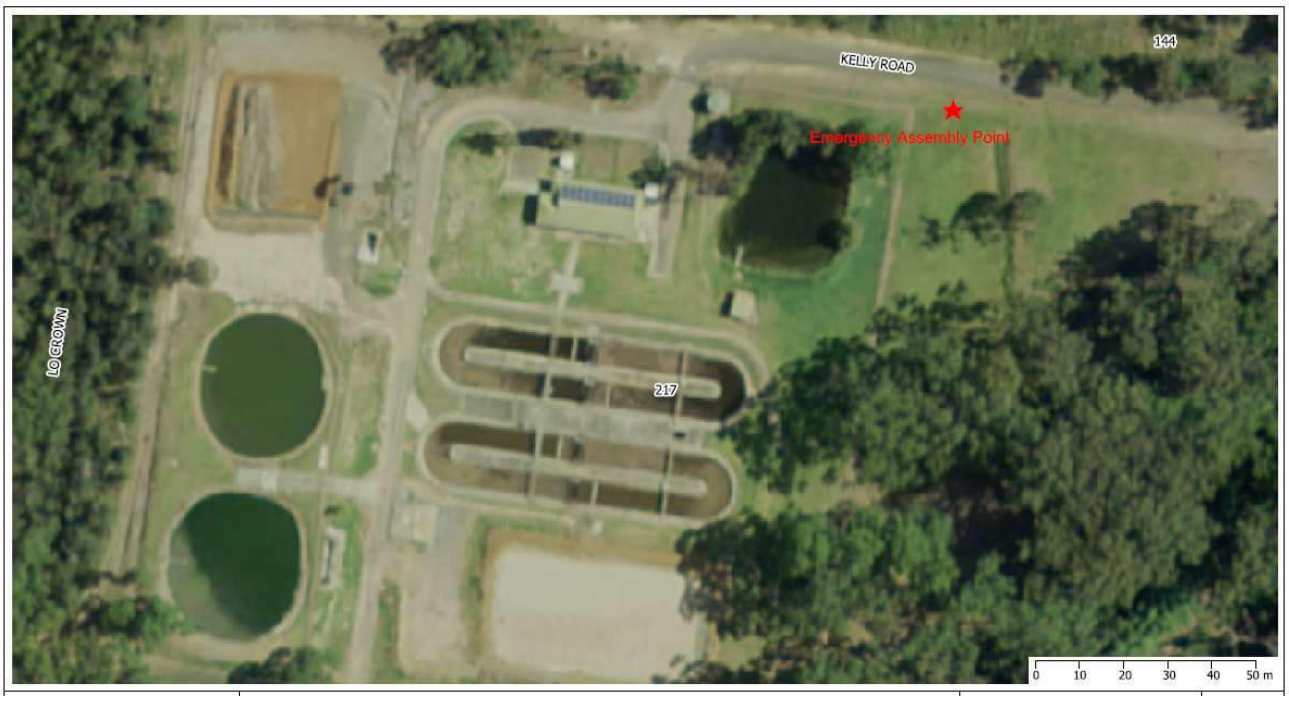
15.4 Evacuation Procedure

The evacuation procedure should be depicted on a plan as displayed in the amenities building/site office and reviewed annually by Water and Sewer Operations Engineer.

15.5 Emergency Assembly Point

The emergency assembly point, as indicated on the Evacuation Plan, is located near the entrance to the STP and is clearly sign posted as shown in ***Figure15-7.***

Figure 15 - 7: Tuross Head STP Emergency Evacuation Point



16 Narooma Sewerage Scheme

The Narooma Sewerage Scheme services the townships of Narooma, Dalmeny and Kianga. Narooma is located 350 km south of Sydney with Kianga located 5 km north and Dalmeny a further 4 km north. Narooma is situated on the coast south of the Narooma River with Kianga also located on the coast south of Kianga Lake with and Dalmeny on the coast and south of Lake Mummuga. The Kianga STP has a capacity of 8,000 Equivalent Persons.

16.1 Sewage Treatment Plant and Collection System

The Narooma STP ***(Figure 16-1)*** comprises the following treatment /process units and discharges to the ocean via an outfall at Kianga Headland:

- Inlet works - Inflow reception, screening, grit removal, flow measurement and flow division;
- Storm ponds (x2 Pasveer) and storm return pumping station;
- Continuous Extended Aeration reactor;
- Clarifiers (x2);
- Maturation pond;
- Sludge Lagoons; and
- Sludge drying beds.

The Narooma, Dalmeny and Kianga sewage collection systems comprises the following:

- Gravity mains;
- Sewage pumping stations (SPS NA01 – NA021); and
- Rising mains (from each SPS).

The STP and the collection system operate under Environmental Protection Licence (EPL) No. 1398 granted by the NSW Environment Protection Authority (EPA) that is renewed annually.

Effluent quality on EPA licence is summarized in ***Table 16-1***.

Table 16 - 1: Pollutant List – Sewage and Effluent for Narooma STP

Parameter	Typical Raw Sewage	Effluent (50 percentile) *	Effluent (100 percentile) *
Biochemical oxygen demand (BOD_5)	270 mg/L	< 10 mg/L	< 20 mg/L
Suspended solids (SS)	270 mg/L	< 15 mg/L	<30 mg/L
Total nitrogen (TN)	53 mg/L		
Ammonia	12 mg/L		
Total phosphorus (TP)	11 mg/L		
Oil and grease (O&G)	< 10 mg/L		< 10 mg/L
Faecal coliforms (FC)	1,000,000 cfu/100 mL		
pH	6.5 - 8.5		

* Licence Conditions

Figure 16 - 1: Narooma STP Location

16.2 Types of Pollution Incidents

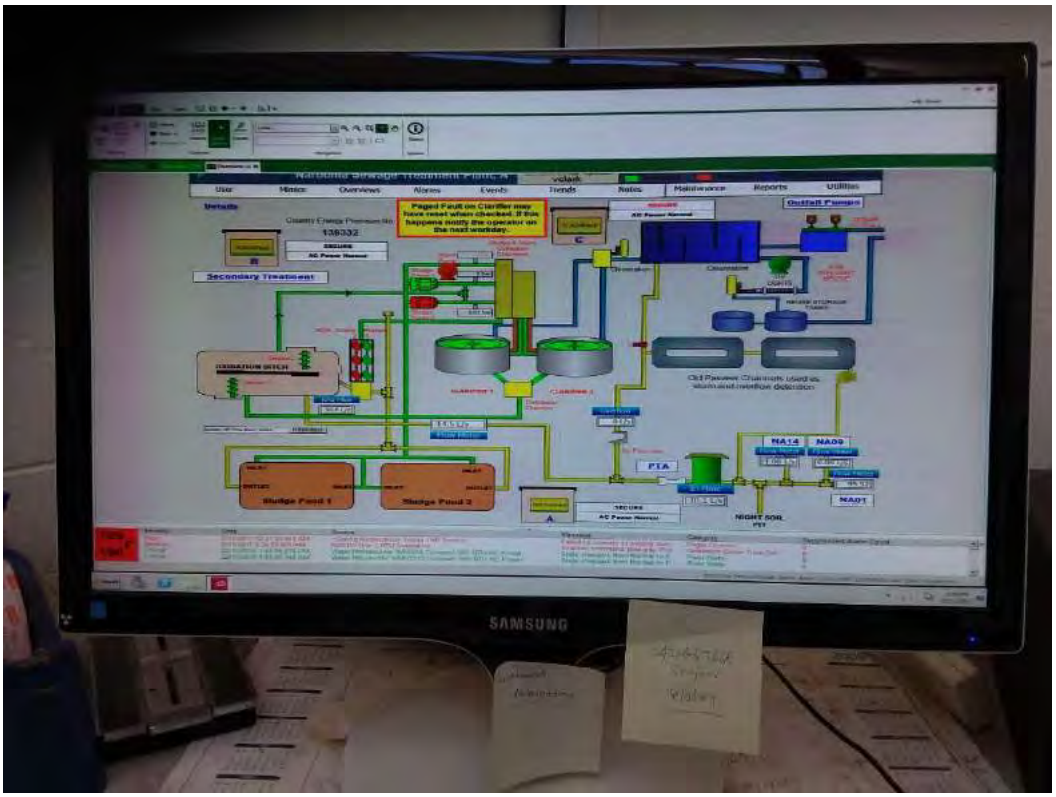
16.2.1 STP Overflowing or Bypass

The Narooma STP has two storm detention ponds converted from existing Pasveer Channels to store storm water during wet weather conditions. An overflow or bypass may occur when exceptional circumstances such as wet weather events or malfunction of systems due to mechanical/ electrical failure or blockages occur. Bypasses will go to the storm pond and then the maturation pond prior to ocean release.

The plant has a SCADA system and a telemetry system. This means that the STP is monitored continuously. Alarms triggered by the SCADA system will alert the Telemetry Operator who will then alert either STP Operator or the Water and Sewer Senior Operator by SMS/phone/radio. The Operator would then respond to the alarm by attending the STP. The Operators live locally to the STP which provides ready response to any treatment problem events.

The general flow schematic of the treatment process in the Narooma STP is demonstrated on the plant SCADA screen ***(Figure 16-2)***.

Figure 16 - 2: Narooma STP Flow Schematic SCADA Screen



16.2.1.1 Dry Weather

Generally, unless exceptional circumstances such as malfunction of systems due to mechanical/ electrical failure or blockages occur, overflows or bypasses of poor quality effluent at the STP in dry weather flow conditions are extremely unlikely.

The following overflow or bypass events that could occur are shown below. Also shown in the appropriate management strategy to minimise the possible effects;

- Inlet works bypass
  - blocked screens – bypass to the fixed screen, telemetry alarm, flow to storm ponds then return for treatment or to tertiary pond,
  - screen failure – bypass to the fixed screen, telemetry alarm, manual screens,
  - excessive inflows - flow to storm ponds then return for treatment or to tertiary pond,
  - power failure -- telemetry alarm, flow to storm ponds, return for treatment or to tertiary pond.
- Aeration system
  - aerator system bearing failure - telemetry alarm, Council has spare aerators (ejectors) to be used when aerator bearing failure or for peak flow loading ***(Figure 16-3)***. Treated or partially treated effluent flows into the tertiary pond prior to ocean outfall for final disposal,
  - power failure - telemetry alarm, gravity flow to the storm detention ponds, then to the tertiary pond.
- Clarifier
  - failure of RAS pump - telemetry alarm, settlement by other clarifier, flow to tertiary ponds for partial treatment,

- power failure of RAS pump - telemetry alarm, settlement by other clarifier, flow to tertiary ponds for partial treatment.

- Sludge Lagoons
  - supernatant pump failure - telemetry alarm, standby pump, ponds free board used,
  - power failure - telemetry alarm, standby pump, ponds free board used.
- SCA Failure
  - failure of SCA from fire - segregated boards, flow to the storm detention ponds, then to tertiary pond.
- Effluent Pump Failure
  - effluent pump failure - duty and standby pumps, freeboard of pond,
  - power failure of effluent pump station - freeboard of pond.

Figure 16 - 3: Ejectors Used in Narooma STP

16.2.1.2 Wet Weather

The STP is designed to treat all inflows with wet weather flows in excess of 3xADWF being diverted to the storm ponds then returned for full treatment after the wet weather event has ended. Generally, unless exceptional circumstances such as malfunction of system due to mechanical/ electrical failure or blockages occur. During heavy rain overflows may be occurred from the tertiary pond to the adjacent Creek.

The plant SCADA and telemetry alarms will be populated when overflowing from the tertiary pond occurs.

16.2.2 Sewage Pumping Station or Manhole Overflowing

Overall the Narooma reticulation system is in good conditions and has sufficient capacity. The number of overflows or incidents per kilometre of pipeline per year would be considered low by industry

standards. Council uses water jetting equipment to clear blockages. Blockages in reticulation mains occur infrequently. The main cause is tree root intrusions but can also occur due to foreign objects lodging in the pipelines.

The schematic of Narooma sewerage scheme is displayed the plant SCADA screen ***(Figure 16-4).***

All SPSs are in good conditions, each pumping station has following capacity and control methods to minimise the overflowing from a SPS:

- Adequate pumping capacity;
- Reliable power supply;
- Emergency power generation (portable diesel generator);
- Ability to store 8 hours ADWF flows before an overflow occurs;
- Ability to detect and respond to abnormal operating conditions via telemetry system and visual alarm light (flashing) in the events of power failure, pump failure, etc.;
- Availability of standby pumps (duty/ standby operation);
- Provision of Sykes pump bypass in case of all pumps failure;
- Control arrangement;
- Spare infrastructure available;
- Implementation of effective emergency plan/operational procedures for attending to failure and breakdown within the system; and
- Flood protection.

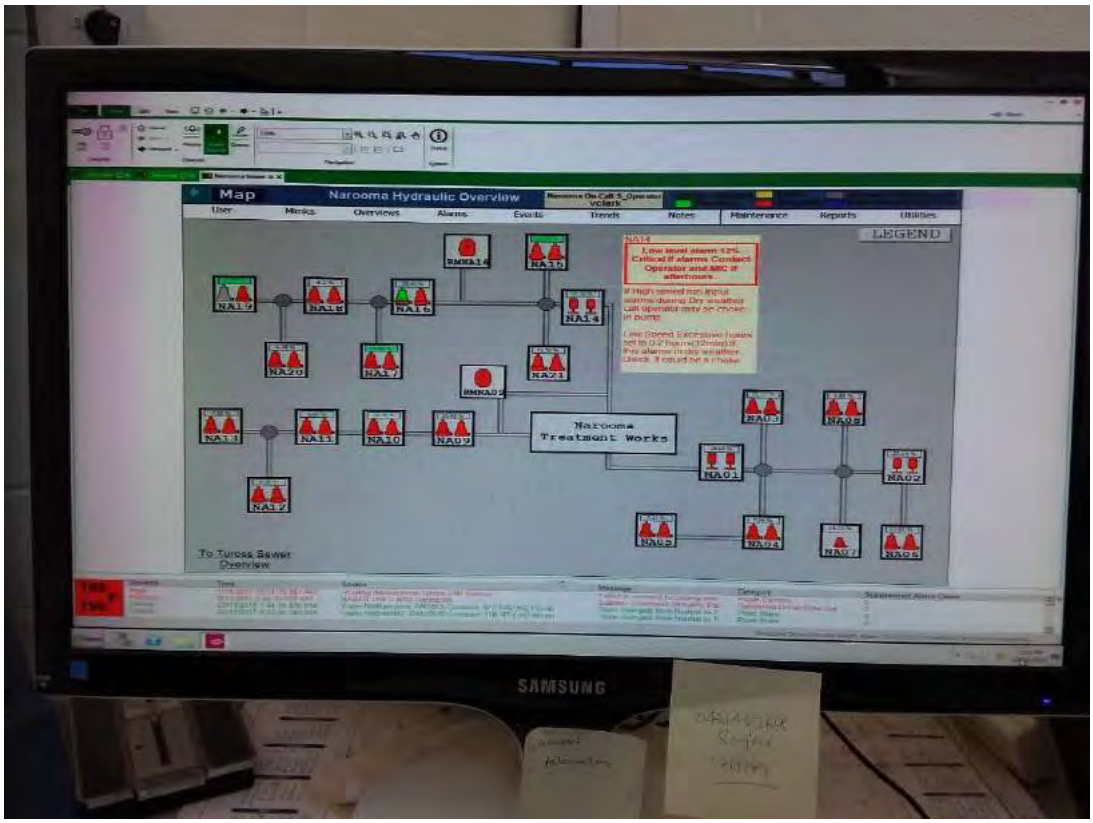
The level sensors are installed in some manholes to provide early warning alarms when sewage in a manhole has the potential of overflowing to local oyster lease.

Council will respond to overflows once notified. The Water and Sewer Operator now has a tablet with the reticulation layout included. This aids in pinpointing problems and for isolating upstream mains and SPS.

Overflows can also happen during unusual excessive inflows (>PWWF) which may occur during extreme flood events if reticulation manholes are inundated and the inflow is greater than the pumping station capacity.

Other possibilities for sewer overflows include illegal connection of storm water pipes and low-lying gullies or boundary traps.

Figure 16 - 4: Narooma Reticulation Schematic SCADA Screen



16.2.3 Chemical Spill or Leakage

Narooma STP uses chemicals of sodium hypochlorite and hydrochloric acid. Sodium hypochlorite is used for disinfection of final effluent and hydrochloric acid is used for pH correction for final effluent.

Leakage/ breaks from the chemical dosing system will be retained in the bund ***(Figure 16-5)*** and flows into the sump. An isolation valve is installed inside the sump and kept in a closed position. A minor chemical spill in the sump is flowed into the storm water pit when the isolation valve is opened manually, then flows into the plant storm water system.

There is a bund for the sodium hypochlorite storage container ***(Figure 16-6).*** A major chemical spill is retained in the bund, which is designed for holding whole tank's chemicals, and removed by truck tanker.

There is no detection or alarms to display chemical spills on the plant SCADA and telemetry. Detection is dependent on the Operator's routine checks and inspection.

A number of other chemicals are stored on site which are used in the maintenance of the facility. These are stored within a chemical storage container, which has an inbuilt bund as shown in ***Figure 16-7***.

A safety shower and eyewash facility are provided in the event of direct human contact with alum/chlorine chemicals. Safety data sheet (SDS) shall be located at the STP office and chemical bund area.

Figure 16 - 5: Narooma STP – Chemical Storage for Sodium Hypochlorite

Figure 16 - 6: Narooma STP – Sodium Hypochlorite Container

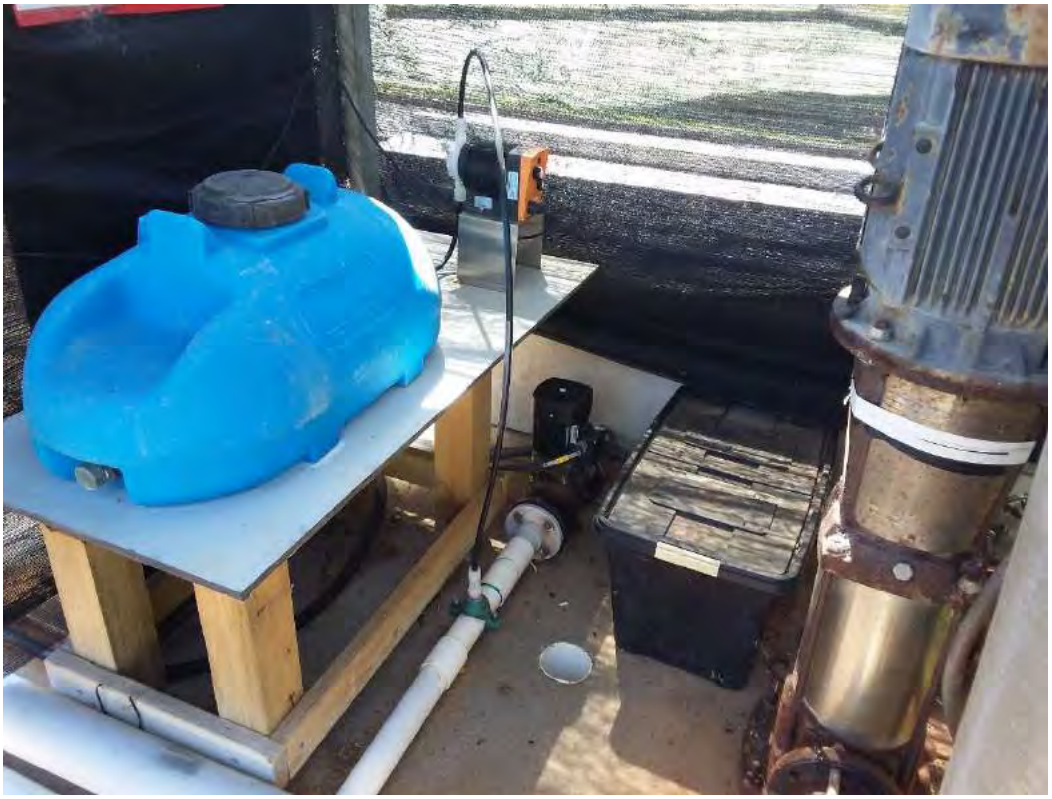


Figure 16 - 7: Narooma STP – Chemical Storage Container

16.2.4 Odour Emission

STP

The inflow balance tank and inlet channel are covered to prevent odour emission at the Narooma STP (***Figure 16-8***).

Figure 16 - 8: Tomakin STP Inflow Balance Tank and Channel

Reticulation System

Council uses dosing of pure oxygen and calcium nitrate solution to reduce septicity. Council has a low rate of complaints due to odour.

16.3 Risk Assessment – Narooma STP and Collection System

Table 16 - 2: Risk Register for Narooma STP and Collection System

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
	STP								
1	**Sewage**	**Excessive inflows – bypass**	✓	✓	Likely	Wet weather	Minor	Moderate	Storm detention ponds provided
2	**Effluent**	**Septage upsets process**	✓	✓	Unlikely	Toxic waste	Minor	Low	Small volume received.
3	**Effluent**	**Toxic wastes upsets / kills process**	✓	✓	Rare	Trade waste discharges	Moderate	Low	Trade waste policy. Routine plant monitoring.
4	**Effluent**	**Stormwater inflow to STP causing overflows**	✓	✓	Unlikely		Minor	Low	Plant designed to handle PWWF. All inflows pumped. Telemetry system. Operator attendance within 1 hour. Ranger to close beaches.
5	**Effluent**	**Poor quality - sabotage of plant**	✓	✓	Rare	Holiday load	Minor	Low	Locked gates. Locked building. Telemetry system. Ranger to close beaches.

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
6	**Effluent**	**Poor quality - extended power failure**	✓	✓	Unlikely		Minor	Low	Reliable power system. Long outages would be planned. Units will provide some treatment. Telemetry system. Inlet works bypass to ponds. Ranger to close beaches.
7	**Effluent**	**Poor quality - equipment failure**	✓	✓	Unlikely	Holiday load	Minor	Low	Standby capacity. SPS storage if required. Telemetry system. Operator attendance in less than 1 hour.
8	**Various Chemicals**	**Chemical spill**	✓	✓	Unlikely		Minor	Low	All chemicals are stored in secure bund areas.
9	**Sludge**	**Spill from pond due to heavy rain**	✓	✓	Unlikely	Wet weather	Minor	Low	Gravity overflow of supernatant
10	**Stored biosolids**	**Washed off site**	✓	✓	Unlikely		Minor	Low	Bund area.
11	**Effluent**	**Fire – switch room**	✓	✓	Rare		Minor	Low	Segregated SCA. Telemetry Fire extinguisher.
12	**Effluent/ Sludge**	**STP flooded**	✓	✓	Rare		Minor	Low	STP is above flood level

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
	SPS Near Waterways								
13	**Sewage**	**Overflow to estuary/creek - extended power failure**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Reliable power system. Long outages would be planned. 8 hours ADWF emergency storage Operator response less than 1 hour. Council has generators, Sykes pump bypass and SCA's have connection points.
14	**Sewage**	**Overflow to creek - extended power failure unplanned**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Reliable power system. 8 hours ADWF emergency storage. Telemetry system. Operator response less than 1 hour Council has generators, Sykes pump bypass and SCA's have connection points.
15	**Sewage**	**Overflow to creek - pump failure**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Duty and standby Pumps - Pumps maintained every 3 years 8 hours ADWF emergency storage Telemetry system. Operator response less than 1 hour.
16	**Sewage**	**Overflow to creek - electrical failure**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Telemetry system. Operator response less than 1 hour. Diesel pumps and connection point. Spare SCA at depot. 8 hours ADWF emergency storage

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
17	**Sewage**	**Overflow to creek - flooding of SPS**	✓	✓	Rare	Wet weather event	Moderate	Low	Telemetry system. Operator response less than 1 hour. SCA above 1 in 100 level. 8 hours ADWF emergency storage
	SPS Not Near Waterways								
18	**Sewage**	**Overflow to sensitive area - extended power failure**	✓	✓	Unlikely	Wet weather event	Minor	Low	Reliable power system. Long outages would be planned. 8 hours ADWF emergency storage Operator response less than 1 hour. Council has generators, Sykes pump bypass and SCA's have connection points.
19	**Sewage**	**Overflow to sensitive area - extended power failure unplanned**	✓	✓	Unlikely	Wet weather event	Minor	Low	Reliable power system. 8 hours ADWF emergency storage. Telemetry system. Operator response less than 1 hour Council has generators, Sykes pump bypass and SCA's have connection points.
20	**Sewage**	**Overflow to sensitive area - pump failure**	✓	✓	Unlikely	Wet weather event	Minor	Low	Duty and standby Pumps - Pumps maintained every 3 years 8 hours ADWF emergency storage Telemetry system. Operator response less than 1 hour.

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
21	**Sewage**	**Overflow to sensitive area - electrical failure**	✓	✓	Unlikely	Wet weather event	Minor	Low	Telemetry system. Operator response less than 1 hour. Diesel pumps and connection points. Spare SCA at depot. 8 hours ADWF emergency storage
22	**Sewage**	**Overflow to sensitive - flooding of SPS**	✓	✓	Rare	Wet weather event	Minor	Low	Telemetry system. Operator response less than 1 hour. SCA above 1 in 100 level. 8 hours ADWF emergency storage
	Gravity System								
23	**Sewage**	**Overflow due to blockage**	✓	✓	Moderate	Wet weather event	Minor	Low	Operator to call in tanker Operator response less than 1 hour Small volumes
24	**Sewage**	**Discharge due to pipe break – ground movement/ earthquake**	✓	✓	Rare	Wet weather event	Major	Moderate	Operator to call in tanker Operator response less than 1 hour Small volumes
25	**Sewage**	**Discharge due to pipe break – excavation works**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Dial before dig. Maintain up-to-date plan records.
	Rising Mains								

	Contaminant	Description of the Hazardous Event	Human Health (Public Health)	Environmental Risks	Likelihood Almost certain - several times per year Likely - once every 1 - 3 years Possible - once every 3 - 10 years Unlikely - once every 20 years Rare - once every 100 years	Events or Circumstances that would increase likelihood	Impact Insignificant Minor Moderate Major Catastrophic	Assessed Risk Low Moderate High Very High	Pre-emptive Actions (Existing Controls) In addition to Operator training, SWMS
26	**Sewage**	**Discharge due to pipe break – poor pipe condition or high pressure**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Flow/pump monitoring. Telemetry system.
27	**Sewage**	**Discharge due to pipe break – ground movement**	✓	✓	Rare	Wet weather event	Major	Moderate	Flow/pump monitoring. Telemetry system.
28	**Sewage**	**Discharge due to pipe break – excavation works**	✓	✓	Unlikely	Wet weather event	Moderate	Moderate	Flow/pump monitoring. Telemetry system. Dial before dig. Maintain up-to-date plans.

16.4 Evacuation Procedure

The evacuation procedure should be depicted on a plan as displayed in the amenities building/site office and reviewed annually by Water and Sewer Operations Engineer.

16.5 Emergency Assembly Point

The emergency assembly point, as indicated on the Evacuation Plan, is located near the entrance to the STP and is clearly sign posted as shown in ***Figure 16-9***.

Figure 16 - 9: Narooma STP Emergency Evacuation Point

17 References

1. POELA Act 2011
2. POEO Act 1997
3. O&M Manual – Batemans Bay STP Operation and Maintenance Manual 2012

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