Report to General Manager

Attachments:
1. NSC Risk Management Plan – Stormwater Inlets September 2019
2. NSC Stormwater Inlets Risk Register

SUBJECT: North Sydney Council Stormwater Inlets Risk Management

AUTHOR: Ibrahim Malla, Acting Assets Manager

ENDORSED BY: Duncan Mitchell, Director Engineering and Property Services

EXECUTIVE SUMMARY:

North Sydney Council received correspondence on 16 July 2019 from Local Government NSW notifying Councils of the recommendations recently made by the Acting State Coroner following the inquest into the death of 11 year old Ryan Teasdale on 16 March 2017 at Riley Park, Unanderra, South Wollongong, when he was swept into a stormwater inlet following heavy rains and flooding.

Local Government NSW recommended that Councils consider whether any stormwater inlets in their local government area pose any unacceptable risks to public safety, particularly with respect to drowning.

In response to Local Government NSW recommendations North Sydney Council has undertaken investigation of its stormwater inlet network and prepared a Risk Management Plan for drainage inlets within the North Sydney LGA. In total 84 sites were inspected in detail. Of the 84 drainage inlets which were identified and inspected in detail, 33 inlets were assessed as having no risk and 51 inlets were assessed as having some degree of risk.

The breakdown for each risk category is as follows:

- High risk: 12 x Inlets
- Medium risk: 11 x Inlets
- Low risk: 28 x Inlets

This was reported to MANEX on 9 October 2019 (Item 4.7).

FINANCIAL IMPLICATIONS:

Currently there is no specific funding in Council's adopted Delivery Program to address drainage inlet risks, however there is $50,000 currently available in Council's "Critical Inlet Program". The Critical Inlet Program is used to rebuild existing old pits into more effective and efficient pits to reduce the risk of flooding. The Critical Inlet Program is also used to build additional pits to increase the inlet capacity of the drainage network, again to reduce the risk of flooding. The total cost to address all the drainage inlet risks that is currently known is $418,000. The following is a breakdown of those costs:

- High risk: $175,000 (12 x Inlets)
- Medium risk: $110,000 (11 x Inlets)
- Low risk: $133,000 (28 x Inlets)

TOTAL: $418,000

It is being requested that Council consider at the next quarterly financial review (November 2019) that additional funds of $125,000 be brought forward from Council's 2020/21 Stormwater budget to address the 12 x high risk inlets this financial year. The balance of the funding ($50,000) will come from the 2019/20 Critical Inlet Program which will exhaust all funds in that program.

Note: The implications of diverting all of the Critical Inlet Program budget into addressing this issue with the current inlet pits is that there will be no funding in 2019/20 to rebuild existing old pits into more effective and efficient pits or to build additional pits to increase the inlet capacity of the drainage network, to reduce the risk of flooding.

It is also being requested that Council consider at the next quarterly financial review that to address the balance of the inlets identified as Medium and Low Risk, Council's Critical Inlet Program funding be increased in 2020/21 from $50,000 to $100,000 for the following five (5) Financial years to address the 39 inlets that have been identified as medium and low risk.

RECOMMENDATION:

1. THAT Council commence a Capital Works Program this financial year to address high risk stormwater inlets using $50,000 currently available from the Critical Inlet Program.

2. THAT consideration be given at the Quarterly Budget Review to the possibility of bringing forward additional funding to fast-track works on the balance of the 12 high risk stormwater inlets not addressed by (1) above.

LINK TO COMMUNITY STRATEGIC PLAN

The relationship with the Community Strategic Plan is as follows:

Direction: 2. Our Built Infrastructure

Outcome: 2.1 Infrastructure and assets meet community needs

BACKGROUND

North Sydney Council received correspondence on 16 July 2019, from Local Government NSW notifying Councils of recommendations recently made by the Acting State Coroner following the inquest into the death of 11-year-old Ryan Teasdale on 16 March 2017 at Riley Park, Unanderra, South Wollongong, when he was swept into a stormwater inlet following heavy rains and flooding.

Local Government NSW recommended that Councils consider whether any stormwater inlets in their local government area pose any unacceptable risks to public safety, particularly with respect to drowning.

A Risk Management Plan was developed for drainage inlets within the North Sydney LGA. In total 84 sites were inspected in detail. Of the 84 drainage inlets which were identified and inspected in detail 33 inlets were assessed as having no risk and 51 inlets were assessed as having some degree of risk.

The breakdown for each risk category is as follows:

- High risk: 12 x Inlets
- Medium risk: 11 x Inlets
- Low risk: 28 x Inlets

This was reported to MANEX on 9 October 2019 (Item 4.7).

CONSULTATION REQUIREMENTS

Community engagement is not required.

SUSTAINABILITY STATEMENT

The sustainability implications are of a minor nature and did not warrant a detailed assessment.

DETAIL

In determining potential similar risks within the North Sydney LGA, it is important to review the particular location of this tragic incident. The incident occurred in Riley Park which has 5 stormwater outlets discharging into the park at various locations. This stormwater flows across

the grassy sloped park and converges into a single stormwater inlet consisting of a headwall and open concrete pipe, 600mm in diameter, at the bottom of the park.

As at 16 March 2017, there was a practice of children and adults sliding down the hillside at Riley Park during heavy rain events. Children and adults would use body boards as makeshift toboggans to slide down the hill. According to evidence prepared by Wollongong City Council, body boarding in Riley Park had been "promoted" in posts or articles on the Illawarra Mercury news site in the lead up to 16 March 2017, with a particular Facebook page having been "liked" by hundreds of people. On 15 and 16 March 2017 the Illawarra region received in excess of 100 mm of rain. There was significant rainfall within a short period on the afternoon of 16 March 2017. At the time of the incident eyewitnesses estimated that there were about 15 to 20 people in Riley Park. Detective Senior Constable Zammit concluded that "Ryan came within close proximity of the stormwater inlet and was pulled into it by the suction effect, created by the flow of water into the inlet, and then drowned. Ryan was ultimately swept about 860 metres through the stormwater drainage system and exited the pipes located outside the Western Suburbs Pool, Unanderra."

The Coroner's recommendations, were as follows:

1. "Public Works Advisory (NSW), in conjunction with Local Government NSW, develop guidelines for the safe design of stormwater inlets in New South Wales. Without being exhaustive, the guidelines are to provide:
    a. technical design assistance with the construction of safe stormwater inlets, particularly those situated in residential or areas readily accessible to the public; and
    b. criterion for the conduct of risk assessment of the risks posed by existing stormwater inlets, identification of sites posing unacceptable risks to public safety particularly with respect to drowning and/or the allocation of resources to improve sites considered to require design improvements as a matter of priority.
2. Public Works Advisory (NSW), possibly in conjunction with Local Government NSW, disseminate copies of these findings to all Local Councils in New South Wales for the attention of elected Council members and relevant council officers having responsibility for stormwater and flood management within the relevant Local Government Area."

North Sydney Council Context

There are no similar stormwater inlet and outlet (multiple or otherwise) configurations within the North Sydney Council LGA stormwater drainage network similar to that of what existed at Unanderra. However, North Sydney Council does have a number of sites that have high volumes of water intake that need to be modified to ensure that a tragedy, like what occurred at Unanderra, cannot occur.

Risk Management Plan

In response to Local Government NSW recommendations North Sydney Council has undertaken investigation of its stormwater inlet network and prepared a Risk Management Plan was developed for drainage inlets within the North Sydney LGA. So that this Risk Management Plan was consistent with industry standards, the following organisations were contacted to obtain details of their risk management criteria:

- Public Works Advisory. Allan Gear advised that they are in the process of developing a Project Plan to consider the findings of the Inquest. They then plan to set up a Stakeholder Group. The Project Plan will consider how risk management guidelines will be developed. The process of developing guidelines for the safe design of stormwater inlets as well as criterion for the conduct of risk assessment of the risks posed by existing stormwater inlets particularly with respect to drowning, is expected to take some time.
- Wollongong Council. Brian Cha advised that they followed the IPWEA Queensland Urban Drainage Manual (did not provide their specific plan). The IPWEA Queensland Urban Drainage Manual includes generic Risk Assessment Matrix principles only. It includes Design Guidelines for inlets but does give guidance on when to apply.
- Stormwater Australia. Did not have a specific Risk Assessment Guideline for stormwater inlets.
- Sydney Water. Are aware of risks and have addressed inlet issues on a case by case basis. Did not have a specific Risk Assessment Guideline for stormwater inlets.
- RMS. Did not respond.

In the absence of a detailed adopted industry Guideline, a Risk Management Plan was developed by the Asset Management Team from the Engineering and Property Services Division from first principles using the standard IPWEA Risk Management Plan template. This template is the standard Risk Management Template that North Sydney Council uses in the assessment of Risks for all of its Assets.

Council has approximately 98km of stormwater drainage pipes and has approximately 5,426 stormwater drainage pits. Detailed proactive CCTV condition surveys are carried out on approximately 5 to 10% of Council's pipe network each year. Reactive CCTV inspections are also carried out as required. Approximately 40% of stormwater drainage assets are still yet to be inspected. The vast majority of drainage inlets in the North Sydney LGA are standard drainage pits that have grates and a standard kerb inlet. There are also a significant number of junction pits with solid lids (some are buried). Drainage inlets such as these present no risk. There are a number of drainage pits that are outlets. Drainage outlets do not form part of this Risk Management Plan. The Coroner's Inquest quotes the published guideline from "Australian Rainfall and Runoff 1987" which states: "Grates should not be placed over outlets to pipe systems. Although these prevent children from climbing into pipes, they could prove fatal to a person who is somehow caught in the system." Sydney Water staff advised that they generally do not place grates or exclusion bars at outlets. Sydney Water staff advised that there very few instances where outlets have bars and only is considered where the entire drainage system is grated.

Council also has 26 x Gross Pollutant Traps (GPTs). A consultant's audit undertaken in March 2016 and reported to Council in July 2016 (EPS-05) Gross Pollutant Trap Capital Works Program) recommended repairs to only one inlet leading to a GPT. This GPT inlet was repaired in the 2018/19 financial year.

Investigation Methodology

Using available data and thousands of existing photos of drainage inlets and pits, the Asset Management Team were able to view and assess if any risks existed in Council's Stormwater inlet network. In addition, based on the extensive knowledge, Council Asset Management Team identified other known drainage inlets throughout the North Sydney Council area that may be deemed as a risk.

After the extensive desktop investigation, site visits were then undertaken at identified inlets in order to determine the credibility of the risk. Any inlet opening that was under 200mm was deemed to present no risk. In total 84 sites were physically inspected in detail. The below factors were used to determine the Risk Rating:

- Accessibility - how easily accessible is the inlet to the public;
- Inlet Approach – is the approach to the inlet steep and grassy (high risk) or uneven bushland;
- Level of typical pedestrian activity near inlet;
- Depth of inlet/pit;
- Length of pipe beyond inlet; and
- Probability of occurrence.

Once the Risk Rating was determined, preliminary Risk Treatments and Costs were estimated along with Residual Risk. This is detailed in the North Sydney Council Risk Management Plan - Stormwater Drainage Inlets, refer to attachment No1.

There are several existing drainage inlets that have treatments of various forms to minimise the risk of entry into an inlet. Of the 84 drainage inlets inspected in detail 33 inlets were assessed as having no risk and 51 inlets were assessed as having some degree of risk.

In summary the estimated cost to alleviate the risks associated with these 51 inlets is $418,000. The breakdown for each risk category is as follows:

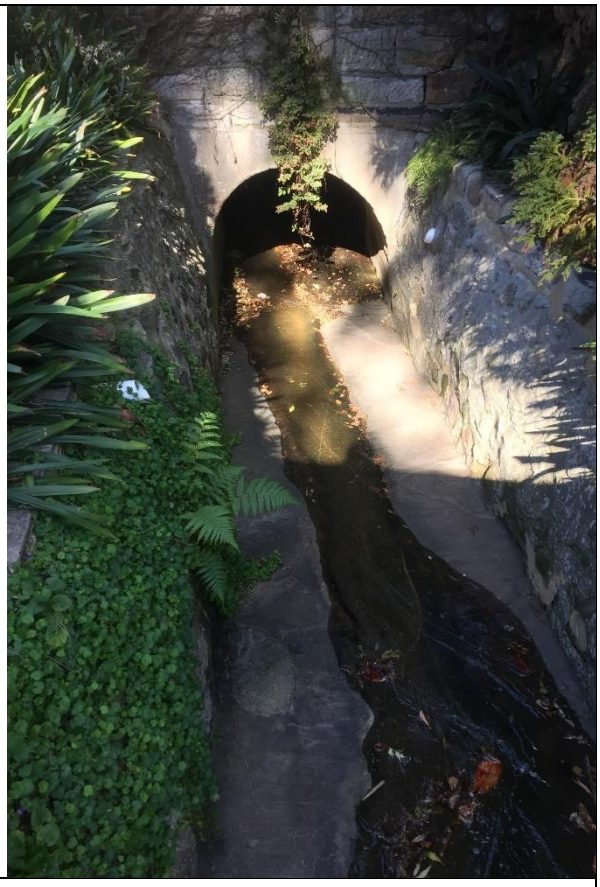
- High risk: $175,000 (12 x Inlets)
- Medium risk: $110,000 (11 x Inlets)
- Low risk: $133,000 (28 x Inlets)

TOTAL: $418,000

Refer to Figure 1 of this Report which Maps each of the inlets in each Risk Category.

Examples of inlets in each risk category are below.

	
Low Risk	Low Risk
	
Medium Risk	Medium Risk

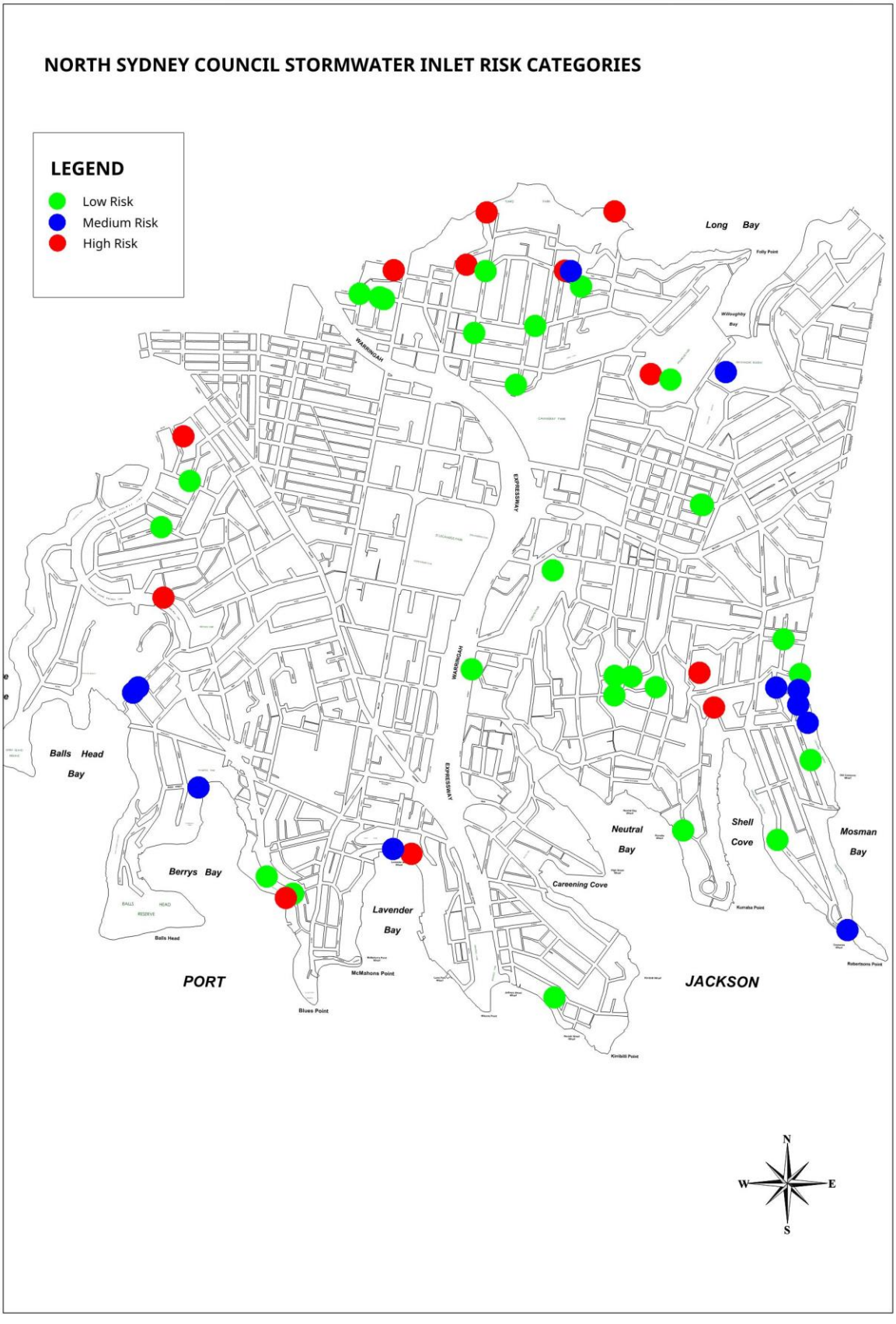
	
High Risk	High Risk

Refer to NSC Stormater Risk Managemnet Plan attached to this Report for the locations and Risk Rating Methodology for all stormater inlets in the North Sydney Local Government Area.

The treatments vary from installing fencing, grates, mesh, fabricated exclusion bars to placing a roof over open channels. Treatments and their cost are subject to detailed design and quotation. It should be noted that there were no drainage inlets within North Sydney that were assessed as being in the Very High Risk category. There are no specific stormwater areas that are well known for people to use recreationally during intense storm events. It should also be noted that there may be some inlets that exist that may pose some level of risk that are yet to be discovered and assessed. In addition drainage inlets managed by Sydney Water, Roads & Maritime Services, and private inlets are not covered by this Risk Management Plan.

Primrose Park Flooding – 27 November 2018 – 1:100 year storm event

Flooding Damage examples in North Sydney LGA – 27 November 2018 – 1:100 year storm event
Figure 1. Map showing Inlets in each Risk Category below.


NORTH SYDNEY COUNCIL STORMWATER INLET RISK CATEGORIES
LEGEND
Low Risk
Medium Risk
High Risk
Long Bay
Folly Point
Willoughby Bay
WARRINGAH
EXPRESSWAY
Balls Head Bay
Berrys Bay
Balls Head
Lavender Bay
McMahons Point
Blues Point
Careening Cove
Neutral Bay
Shell Cove
Kurraba Point
Mosman Bay
Robertsons Point
Kirribilli Point
PORT
JACKSON
N
W
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S

NORTH SYDNEY COUNCIL

Risk Management Plan

Stormwater Drainage Inlets

Version 1

September 2019

Document Control	

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Rev No	Date	Revision Details	Author	Reviewer	Approver
1	011/09/2019	Draft	JG	JVH	DM

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Aim

The purpose of this risk management plan is to document the results and recommendations resulting from periodic identification, assessment and treatment of risks associated with providing services to the community from drainage inlets, using the fundamentals of International Standard ISO 31000:2009 *Risk management – Principles and guidelines*.

Risk Management is defined in ISO 31000:2009 as: "coordinated activities to direct and control an organisation with regard to risk" [1].

1.2 Objectives

The objectives of the plan are:

- to identify risks to North Sydney Council that may impact the delivery of services from infrastructure
- to select credible risks for detailed analysis,
- to analyse and evaluate risks in accordance with ISO 31000:2009,
- to prioritise risks,
- to identify risks requiring treatment by management action,
- to develop risk treatment plans identifying the tasks required to manage the risks, the Department responsible for each task, the resources required and the due completion date.

1.3 Core Infrastructure Risk Management

This core risk management plan has been designed to be read as a supporting document to Council's asset management plans. It has been prepared using the fundamentals of International Standard ISO 31000:2009 Risk management – Principles and guidelines.

1.4 Scope

This plan considers risks associated with delivery of services from infrastructure.

1.5 The Risk Management Context

Council has implemented many management practices and procedures to identify and manage risks associated with providing services from infrastructure assets. These include:

- operating a reactive maintenance service for all assets and services;
- operating a planned maintenance system for key assets;
- monitoring condition and remaining service life of assets nearing the end of their service life;
- renewing and upgrading assets to maintain service delivery;
- closing and disposing of assets not providing the required service level; and
- acquiring or constructing new assets to provide new and improved services.

Council has assigned responsibilities for managing risks associated with assets and service delivery to the following departments;

- Engineering and Property Services is responsible for Council Stormwater Drainage Infrastructure

[1] ISO 31000:2009, p 2.

1.6 Risk Management Process

The risk management process used in this project is shown in Figure 1.6 below.

It is an analysis and problem solving technique designed to provide a logical process for the selection of treatment plans and management actions to protect the community against unacceptable risks.

The process is based on the fundamentals of International Standard ISO 31000:2009.

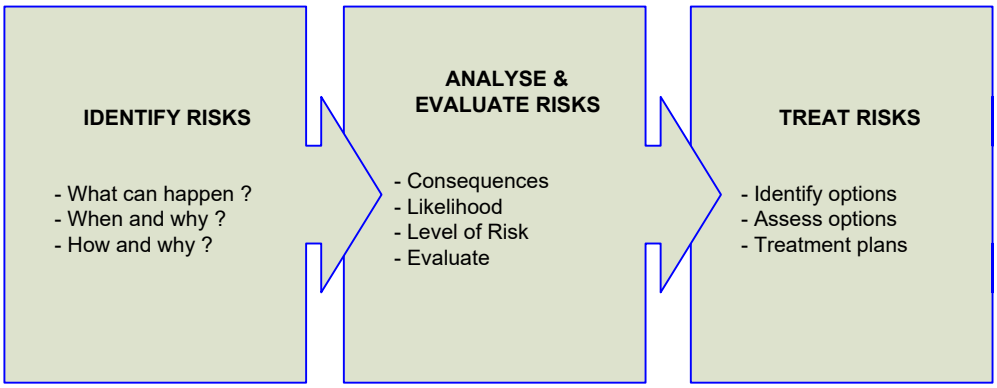

Fig 1.6. Risk Management Process – Abridged
Source: Adapted from ISO 31000:2009, Figure 1, p vii

2. COMMUNICATION AND CONSULTATION

Risk communication and consultation is “continual and iterative processes that an organisation conducts to provide, share or obtain information and to engage in dialogue with stakeholders regarding the management of risk” [2].

‘Appropriate communication and consultation seeks to:

- Improve people’s understanding of risks and the risk management processes;
- Ensure that the varied views of stakeholders are considered; and
- Ensure that all participants are aware of their roles and responsibilities.’ [3]

The development of this risk management plan was undertaken using a consultative team approach to: -

- Identify stakeholders and specialist advisors who need to be involved in the risk management process;
- Discuss and take into account the views of stakeholder and specialist advisors; and
- Communicate the results of the risk management process to ensure that all stakeholders are aware of and understand their and roles and responsibilities in risk treatment plans.

Members of the team responsible for preparation of this risk management plan are:

- John Van Hesden
- Ibrahim Malla
- Jim Moore
- Josh Glanville

3. RISK IDENTIFICATION

3.1 General

Council has approximately 98km of stormwater drainage pipes. Council has approximately 5,426 stormwater drainage pits. Detailed proactive CCTV condition surveys are carried out on approximately 5 to 10% of Council’s pipe network each year. Reactive CCTV inspections are also carried out as required. Approximately 40% of stormwater drainage assets are still yet to be inspected. The vast majority of drainage inlets in North Sydney are standard drainage pits that have grates and a standard kerb inlet. There are also a significant number of junction pits with solid lids (some are buried). Drainage inlets such as these present no risk. There are a number of drainage pits that are outlets. Drainage outlets do not form part of this Risk Management Plan. The published guideline from “Australian Rainfall and Runoff 1987” states: “Grates should not be placed over outlets to pipe systems. Although these prevent children from climbing into pipes, they could prove fatal to a person who is somehow caught in the system.”. Sydney Water staff advised that they generally do not place grates or exclusion bars at outlets. Sydney Water staff advised that there very few instances where outlets have bars and is only considered where the entire drainage system is grated.

Council also has 26 Gross Pollutant Traps (GPTs). A consultant’s report recommended repairs to only one inlet leading to a GPT. This GPT inlet was repaired in the 2018/19 financial year.

Using available data thousands of existing photos of drainage inlets and pits were viewed to assess if any risks existed. In addition, based on the extensive knowledge, Council Officers identified other known drainage inlets throughout the North Sydney Council area that may be deemed as a risk. Site visits were undertaken at these sites in order to determine the credibility of the risk. Any inlet opening that was

[2] ISO 31000:2009, p 3
[3] HB 436:2004, Sec 3.1, p 20

under 200mm was deemed to present no risk.

Potential risks associated with providing services from drainage inlet infrastructure were identified by council staff.

Each risk was then tested for credibility to ensure that available resources were applied to those risks that the team considered were necessary to proceed with detailed risk analysis

The assets at risk, what can happen, when, possible cause(s), existing controls and credibility are shown in Appendix A – Risk Register.

Credible risks are subjected to risk analysis in Section 4.4.5. Risks assessed as non-credible were not considered further and will be managed by routine procedures.

4. RISK ANALYSIS

4.1 General

Credible risks which have been identified during the risk identification stage were analysed. This process considers the '**likelihood'** and the '**consequences'** of the event. The objective of the analysis is to separate the minor acceptable risks from the major risks and to provide data to assist in the assessment and management of risks.

The risk analysis process is applied to all credible risks to determine levels of risk. The process acts as a filter by applying a reasoned and consistent process. Minor risks can be eliminated from further consideration and dealt with within standard operating procedures.

The remaining risks will therefore be of such significance as to consider the development of risk treatment options and plans.

4.2 Likelihood

Likelihood is a qualitative description of chance of an event occurring. The process of determining likelihood involves combining information about estimated or calculated probability, history or experience. Where possible it is based on past records, relevant experience, industry practice and experience, published literature or expert judgement.

4.3 Consequences

Consequences are a qualitative description of the outcome of an event affecting objectives. The process of determining consequences involved combining information about estimated or calculated effects, history and experience.

4.4 Method

The risk analysis method uses the risk rating chart shown in Section 4.4.3. This process uses a qualitative assessment of likelihood/probability and history/experience compared against a qualitative assessment of severity of consequences to derive a risk rating.

The qualitative descriptors for each assessment are shown below.

4.4.1 Likelihood

Likelihood	Descriptor	Probability of occurrence
Rare	May occur only in exceptional circumstances	More than 20 years
Unlikely	Could occur at some time	Within 10-20 years
Possible	Might occur at some time	Within 3-5 years
Likely	Will probably occur in most circumstances	Within 2 years
Almost certain	Expected to occur in most circumstances	Within 1 year

4.4.2 Consequences

Consequence	Length of Pipe	Depth of Inlet	Pedestrian Activity near Inlet	Access	Inlet Approach
Insignificant	Less than 2m	Less than 0.2m	Very Low	Heavily Vegetated	Steep, bushland terrain
Minor	2m - 10m	0.2m - 0.5m	Low	Fenced Off	Bushland Terrain
Moderate	10m - 50m	0.5m - 1m	Medium	Partly Fenced Off	Grassed Approach
Major	50m - 100m	1m - 1.5m	High	Full Access within open area	Smooth Concreted Channel
Catastrophic	Larger than 100m	Larger than 1.5m	Very High	Full Access next to footpath	Steep Grassed Approach

4.4.3 Risk Assessment

The risk assessment process compares the likelihood of a risk event occurring against the consequences of the event occurring. In the risk rating table below, a risk event with a likelihood of 'Possible' and a consequence of 'Major' has a risk rating of 'High'. This rating is used to develop a typical risk treatment in Section 5.3.

Risk Rating					
Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Rare	L	L	M	M	H
Unlikely	L	L	M	M	H
Possible	L	M	H	H	H
Likely	M	M	H	H	VH
Almost Certain	M	H	H	VH	VH

Ref: HB 436:2004, Risk Management Guidelines, Table 6.6, p 55.

4.4.4 Indicator of Risk Treatment

The risk rating is used to determine risk treatments. Risk treatments can range from immediate corrective action (such as stop work or prevent use of the asset) for 'Very High' risks to manage by routine procedures for 'Low' risks.

An event with a 'High Risk' rating will require 'Prioritised action'. This may include actions such as reducing the likelihood of the event occurring by physical methods (limiting usage to within the asset's capacity, increasing monitoring and maintenance practices, etc), reducing consequences (limiting speed of use, preparing response plans, etc) and/or sharing the risk with others (insuring the organisation against the risk).

Risk Rating		Action Required and Timing
VH	Very High Risk	Immediate corrective action
H	High Risk	Prioritised action required
M	Medium Risk	Planned action required
L	Low Risk	Manage by routine procedures

4.4.5 Analysis of Risk

The team conducted an analysis of credible risks identified in section 3.1 using the method described above to determine a risk rating for each credible risk.

The credible risks and risk ratings are shown in Appendix A – Risk Register

4.5 Risk Evaluation

The risk management team evaluated the need for risk treatment plans using an overall assessment of the following evaluation criteria to answer the question "is the risk acceptable?"

Criterion	Risk Evaluation Notes
Operational	Risks that have the potential to reduce services for a period of time unacceptable to the community and/or adversely affect the council's public image.
Technical	Risks that cannot be treated by council's existing and/or readily available technical resources.
Financial	Risks that cannot be treated within council's normal maintenance budgets or by reallocation of an annual capital works program.
Legal	Risks that have the potential to generate unacceptable exposure to litigation.
Social	Risks that have the potential to: - cause personal injury or death and/or - cause significant social/political disruption in the community.
Environmental	Risks that have the potential to cause environmental harm.

The evaluation criteria are to provide guidance to evaluate whether the risks are acceptable to the council and its stakeholders in providing services to the community. Risks that do not meet the evaluation criteria above are deemed to be unacceptable and risk treatment plans are required to be developed and documented in this Infrastructure Risk Management Plan, for consideration by council.

"Decisions on managing risk should take account of the wider context of the risk and include consideration of the tolerance of the risks borne by parties, other than the organisation that benefits from the risk. Decisions should be made in accordance with legal, regulatory and other requirements.

In some circumstances, the risk evaluation can lead to a decision to undertake further analysis. The risk evaluation can also lead to a decision not to treat the risk in any way other than maintaining existing controls. This decision will be influenced by the organisation's risk attitudes and the risk criteria than have been established."[4]

5. RISK TREATMENT PLANS

5.1 General

The treatment of risk involves identifying the range of options for treating risk, evaluating those options, preparing risk treatment plans and implementing those plans. This includes reviewing existing guides for treating that particular risk, such as Australian and State legislation and regulations, International and Standards and Best Practice Guides.

Developing risk treatment options starts with understanding how risks arise, understanding the immediate causes and the underlying factors that influence whether the proposed treatment will be effective.

One treatment option is to remove the risk completely by discontinuing the provision of the service.

Risk treatment options can include:

a) avoiding the risk by deciding not to start or continue with the activity that give rise to the risk,

b) taking or increasing the risk in order to pursue an opportunity,

c) removing the risk source,

d) changing the likelihood,

e) changing the consequences,

f) sharing the risk with another party or parties (including contracts and risk financing),

g) retaining the risk by informed decision.[5]

5.2 Risk Treatment Options

The risk treatment options selection process comprises 5 steps.

Step 1. Review causes and controls

The risk identification process documented in Section 3 included identifying possible causes and documenting existing controls.

Step 2. Develop treatment options

Treatment options include those that eliminate risk, reduce the likelihood or the risk event occurring, reducing the consequences should the risk event occur, sharing of the risk with others and accepting the risk.

Step 3. Assess risk treatment options against costs and residual risk

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[4] ISO 3100:2009, Sec 5.4.4, p 18.
[5] ISO 3100:2009, Sec 5.5.1, p 19

The method of assessment of risk treatment options can range from an assessment by a local group of stakeholders and practitioners experienced in operation and management of the assets/service to detailed risk cost and risk reduction cost/benefit analysis involving assessment of the likelihood and consequences to determine the residual risk and analysis of the reduction in risk against the costs for each treatment option.

Step 4. Select optimum risk treatment

Step 5. Develop risk treatment plans

5.3 Risk Treatments

The risk treatments identified for non-acceptable risks are detailed in Appendix A – Risk Register.

5.4 Risk Treatment Plans

From each of the risk treatments identified in Appendix A – Risk Register, risk treatment plans were developed.

The risk treatment plans identify for each non-acceptable risk: -

1. Proposed action
2. Responsibility
3. Resource requirement/budget
4. Timing
5. Reporting and monitoring required

The risk treatment plan is shown in Appendix A – Risk Register.

6. MONITORING AND REVIEW

The plan will be monitored and reviewed as follows.

Activity	Review Process
Review of new risks and changes to existing risks	To be reviewed on a case by case basis
Review of Risk Management Plan	Review in conjunction with Asset Management Plan
Performance review of Risk Treatment Plan	Review in conjunction with Asset Management Plan and budget constraints

7. FINDINGS

The inlet risk assessment has assessed 84 inlets throughout the North Sydney LGA, as shown in the following figure:

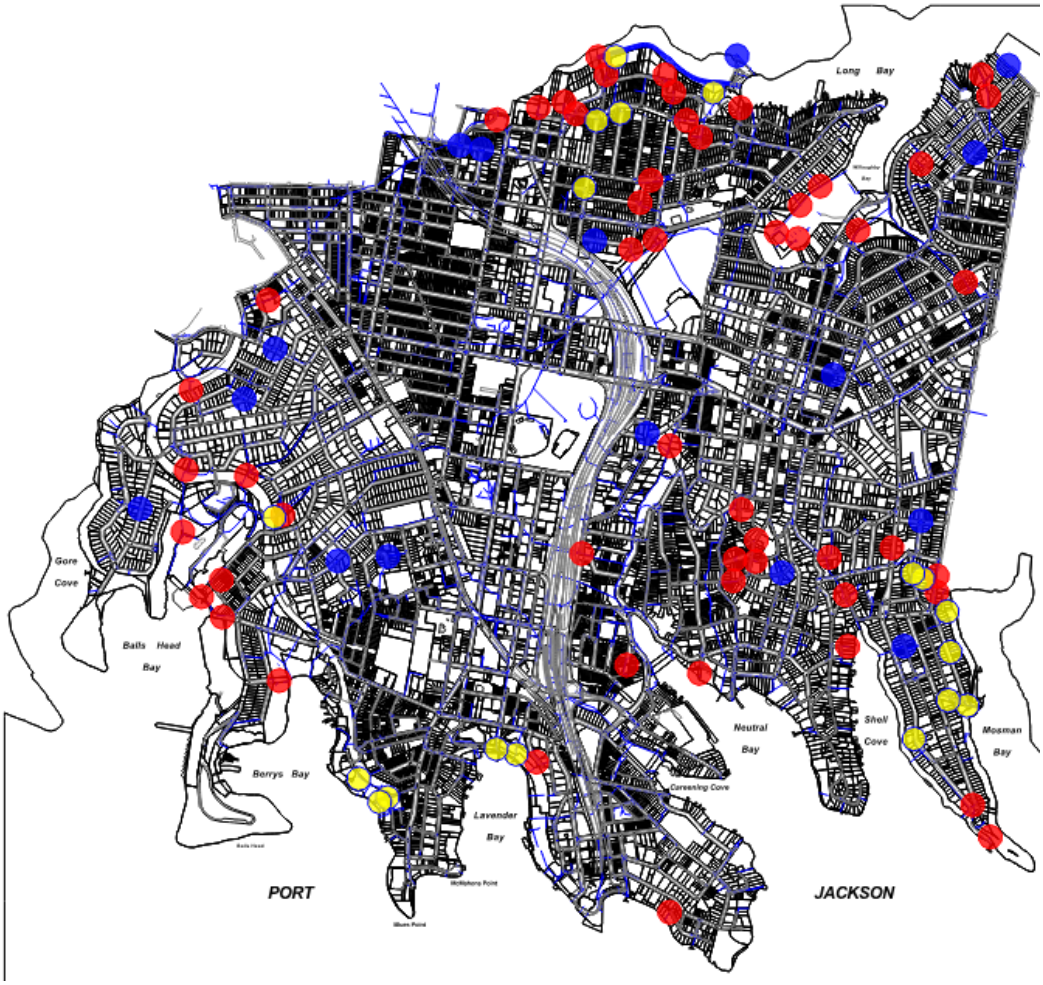


Figure 1: Inlets Assessed

- Red dots indicate inlets that were identified by council officers has having the potential to be a risk requiring further investigation.

- Blue dots indicate inlets that were acknowledged by searching photos of inlets in council's database and identifying inlets with a potential risk requiring further investigation.

- Yellow dots indicate inlets that were identified whilst undertaking site visits.

In total, 84 inlets were assessed during the inlet risk assessment process.

The risk assessment process relied on an appropiate opening of 200mm. Any inlet with an opening larger than 200mm was assessed as a risk. The following summarises what was found as shown in Appendix A:

- 33 inlets were deemed to possess no risk

- 51 inlets were deemed to possess some level of risk

  - 12 of these inlets were identified as High risk

  - 11 of these inlets were identified as Medium risk

  - 28 of these inlets were identified as Low risk

Two of the identified high risk inlets are not the responsbility of council. One of the inlets that crosses underneath the North Shore Railway Line is the responsbility of Transport for NSW, whilst the risks associated with Primrose Park are the responsbility of Sydney Water. These organisations will be contacted to inform of our findings regarding their assets.

The budget estimate to alleviate the risks associated with all 51 inlets is $418,000. The breakdown for each risk is as follows:

- **HIGH** risk: $175,000
- **MEDIUM** risk: $110,000
- **LOW** risk: $133,000

Figure 2: High risk inlet

Figure 3: High risk inlet

Figure 4: High risk inlet

8. REFERENCES

IPWEA, 2011, *International Infrastructure Management Manual*, 2011, Institute of Public Works Engineering Australasia, Sydney, www.ipwea.org/iimm

ISO, 2009, *ISO 31000:2009, Risk management – Principles and guidelines*, Standards Australia, Sydney.

Standards Australia, 2004, *AS/NZS 4360:2004, Australian/New Zealand Standard, Risk Management*, Sydney (superseded by ISO 3100:2009).

Standards Australia, 2004, *HB 436:2004, Risk Management Guidelines, Companion to AS/NZS 4360:2004*, Sydney.

INSERT OTHER APPLICABLE REFERENCES IN ALPHABETICAL ORDER

APPENDIX A Risk Register

RISK IDENTIFICATION							RISK ANALYSIS					RISK TREATMENT			RISK TREATMENT PLAN				
Risk No.	Asset at Risk	What can happen?	When can it occur?	Possible cause	Existing controls	Is risk credible?	Likelihood	Consequences	Risk rating	Action required	Is risk acceptable?	Treatment option(s)	Residual risk	Risk treatment plan	Actions	Responsibility	Resources	Budget	Date due
1	R125010/R120045	No risk as the inlets have controls with a maximum opening of 120mm			Pit has an exclusion bar	No			#N/A	#N/A				Nil					
2	Channel downstream of R022005	No risk as area is fenced off, heavily vegetated and difficult to access			Fencing, heavy vegetation, difficult to access	No			#N/A	#N/A				Nil					
3	R022030	No risk as the inlet has controls with a maximum opening of 200mm			Inlet has exclusion bars	No			#N/A	#N/A				Nil					
4	Channel upstream of R022030	Person could access small channel from adjacent footpath.	Within 10 years	Major storm event	Partially fenced	Yes	Possible	Minor	Medium	Planned action required	No	Extend existing fencing - approximately 10m	Low	Construct 10m of fence within next 5 years		EPS		$5,000	
5	R022050	Person could access small channel from nearby footpath and enter a pipe that is 2m in length	Within 10 years	Major storm event	Partially fenced	Yes	Possible	Minor	Medium	Planned action required	No	Fence channel off	Low	Construct within next 5 years		EPS		$5,000	
6	Z145020	Person could access channel from adjacent footpath and wash into minimum 400mm inlet opening	Within 10 years	Major storm event	Access difficult due to bushland and steep terrain	Yes	Possible	Minor	Medium	Planned action required	No	Angled Grate	Low	Construct within next 5 years		EPS		$5,000	
7	Z142020	No risk as maximum inlet opening is 200mm			Access difficult due to bushland. Channel small and shows signs of very minor flows.	No			#N/A	#N/A				Nil					
8	R800020	No risk - no inlet evident - water discharges through heavily vegetated bushland			None	No			#N/A	#N/A				Nil					
9	GO10150	No risk as maximum inlet opening is 150mm			Inlet has exclusion bars	No			#N/A	#N/A				Nil					
10	H170030	No risk as there is sufficient controls in place			Inlet is covered with mesh fence	No			#N/A	#N/A				Nil					
11	H170040	No risk as there is sufficient controls in place			Inlet is completely covered with steel mesh	No			#N/A	#N/A				Nil					
12	H170060	No risk as there is sufficient controls in place			Inlet is covered completely covered with steel mesh	No			#N/A	#N/A				Nil					
13	H170070	Person could get washed into minimum 250mm inlet opening	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Install Grates	Low	Install within 5 years		EPS		$5,000	
14	H400005	Person could get washed into minimum 260mm inlet opening	Within 20 years	Major storm event	Area fenced off	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Install Grates	Low	Install within 5 years		EPS		$5,000	

RISK IDENTIFICATION							RISK ANALYSIS					RISK TREATMENT			RISK TREATMENT PLAN				
Risk No.	Asset at Risk	What can happen?	When can it occur?	Possible cause	Existing controls	Is risk credible?	Likelihood	Consequences	Risk rating	Action required	Is risk acceptable?	Treatment option(s)	Residual risk	Risk treatment plan	Actions	Responsibility	Resources	Budget	Date due
15	H170230	No risk as maximum inlet opening is 200mm			None	No			#N/A	#N/A				Nil					
16	H270050	No risk as maximum inlet opening is 110mm			None	No			#N/A	#N/A				Nil					
17	H280020	Person could get washed into minimum 300mm inlet opening	Beyond 20 years	Major storm event	Inlet has exclusion bars, however are in a poor condition	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Install Angled Grate	Low	Install within 5 years		EPS		$5,000	
18	W700020	No risk as there is sufficient controls in place			Area fenced off, heavily vegetated, steep terrain, difficult to access	No			#N/A	#N/A				Nil					
19	H220024	Person could get washed into minimum 300mm inlet opening	Beyond 20 years	Major storm event	Area fenced off	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Install Fence Mesh along existing fence	Low	Install within 5 years		EPS		$5,000	
20	H020020	Person could get washed into 850mm x 400mm inlet opening	Within 5 years	Moderate storm event	Inlet has exclusion bars, area partially fenced and heavily vegetated	No			#N/A	#N/A				Nil					
21	A640010	Person could get washed into minimum 230mm inlet opening	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Rebuild Pits	Low	Install within next 5 years		EPS		$10,000	
22	H240020	No risk as maximum inlet opening is 115mm			Inlet has exclusion bars, area partially fenced	No			#N/A	#N/A				Nil					
23	J950030	No risk as maximum inlet opening is 200mm			None	No			#N/A	#N/A				Nil					
24	J950040	Person could get washed into minimum 220mm inlet opening	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Install Grating	Low	Install within 5 years		EPS		$3,000	
25	V257050	Person could get washed into 600mm minimum inlet opening	Within 5 years	Moderate storm event	None	Yes	Possible	Moderate	High	Prioritised action required	No	Install Fencing	Low	Install within 5 years		EPS		$10,000	
26	V210060	Person could get washed into channel and minimum 700mm inlet	Within 5 years	Major storm event	None	Yes	Possible	Moderate	High	Prioritised action required	No	Channel needs a concrete roof on top	Low	Install within 5 years		EPS		$30,000	
27	V210040	Person could get washed into channel and minimum 450mm inlet	Within 5 years	Major storm event	Access to inlet area is heavily vegetated, steep terrain	Yes	Unlikely	Moderate	Medium	Planned action required	No	Channel needs to be completely closed off with mesh	Low	Install within 5 years		EPS		$40,000	
28	V190070	Person could get washed into minimum 300mm inlet	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Extend grating	Low	Install within 5 years		EPS		$5,000	
29	F592020	Person could get washed into minimum 200mm inlet	Within 5 years	Moderate storm	Lintels stacked at inlet	Yes	Unlikely	Minor	Low	Manage by routine	Yes	None	Low	Nil		EPS		$0	

RISK IDENTIFICATION							RISK ANALYSIS					RISK TREATMENT			RISK TREATMENT PLAN				
Risk No.	Asset at Risk	What can happen?	When can it occur?	Possible cause	Existing controls	Is risk credible?	Likelihood	Consequences	Risk rating	Action required	Is risk acceptable?	Treatment option(s)	Residual risk	Risk treatment plan	Actions	Responsibility	Resources	Budget	Date due
				event						procedures									
30	S100080	Person could get washed into opening 925mm x 425mm	Anytime now	Minor storm event	Some parts caged, some open, heavy vegetation	Yes	Possible	Catastrophic	High	Prioritised action required	No	Replace missing/ damaged grate sections to close entry points	Low	Install within next 5 years		EPS		$15,000	
31	R120030	No risk as there are sufficient controls in place			Inlet completely caged	No			#N/A	#N/A				Nil					
32	S100050	Person could get washed into large channel and minimum 1330mm inlet opening and be carried hundreds of meters	Within 1 year	Minor storm event	None	Yes	Likely	Moderate	High	Prioritised action required	No	Appropriate caging needs to be installed surrounding bridged area	Moderate	Consult with homeowner as to how to ensure safety		EPS		$30,000	
33	S652030	Person could get washed into minimum 220mm inlet opening.	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Provide mesh behind wall	Low	Install within 5 years		EPS		$2,000	
34	S600020	Person could get washed into minimum 410mm inlet	Within 20 years	Major storm event	None	Yes	Possible	Minor	Medium	Planned action required	No	Install further grates up channel until inlet gap is less than 200mm	Low	Install within 5 years		EPS		$5,000	
35	S635010	No risk as inlet opening is 200mm			None	No			#N/A	#N/A				Nil					
36	B016020	No risk as inlet opening is 150mm			None	No			#N/A	#N/A				Nil					
37	B005020	Person could fall over edge of pathway get washed into minimum 900mm inlet opening and end up falling over steep cliff into valley below	Within 10 years	Major storm event	None	Yes	Possible	Moderate	High	Prioritised action required	No	Install fencing along pathway where inlet is	Low	Install within 5 years		EPS		$5,000	
38	B024020	Person could get washed into minimum 230mm inlet opening	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Install grates	Low	Install within 5 years		EPS		$3,000	
39	B025015	Person could get washed into minimum 230mm inlet	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Install grates	Low	Install within 5 years		EPS		$2,000	
40	P050061	Person could fall over edge of pathway get washed into minimum 750mm inlet opening	Within 5 years	Moderate storm event	None	Yes	Possible	Moderate	High	Prioritised action required	No	Install fencing along channel edge leading into inlet	Low	Install within 5 years		EPS		$15,000	
41	P075010	Person could get washed into minimum 240mm inlet opening	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Extension of pipe, install grates	Low	Install within 5 years		EPS		$15,000	
42	R020055	Person could get washed into minimum 1200mm inlet opening and travel a long distance	Within 5 years	Major storm event	Area heavily fenced off	No			#N/A	#N/A	No	Nil		Notify Transport for NSW regarding their asset		Transport for NSW			

RISK IDENTIFICATION							RISK ANALYSIS					RISK TREATMENT			RISK TREATMENT PLAN				
Risk No.	Asset at Risk	What can happen?	When can it occur?	Possible cause	Existing controls	Is risk credible?	Likelihood	Consequences	Risk rating	Action required	Is risk acceptable?	Treatment option(s)	Residual risk	Risk treatment plan	Actions	Responsibility	Resources	Budget	Date due
43	P040020	Person could get washed into minimum 220mm inlet opening	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Install grates	Low	Install within 5 years		EPS		$5,000	
44	B080010	No risk as minimum inlet opening is 160mm			None	No			#N/A	#N/A				Nil					
45	R010120	Person could get washed into minimum 1500mm inlet and travel a long distance	Beyond 20 years	Major storm event	Area partially fenced off	Yes	Possible	Moderate	High	Prioritised action required	No	Fence off area to prevent access	Low	Notify Transport for NSW regarding their asset		Transport for NSW			
46	F334010	Person could get washed into minimum 300mm inlet opening	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Construct Standard Grated Drainage Inlet	Low	To be re-constructed within 1 year		EPS		$5,000	
47	F335040	No risk as minimum inlet opening is 180mm			None	No			#N/A	#N/A				Nil					
48	F060020	No risk as maximum inlet opening is 150mm			Inlet covered by grate with a maximum opening of 180mm	No			#N/A	#N/A				Nil					
49	F060040	No risks as maximum inlet opening is 100mm			Inlet covered by grate with a maximum opening of 100mm	No			#N/A	#N/A				Nil					
50	F265020	Person could get washed into minimum 300mm inlet opening	Beyond 20 years	Major storm event	Partially fenced	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Extend Fence around headwall and install fence mesh	Low	Install within 5 years		EPS		$5,000	
51	V150080	Person could get washed into multiple large inlets and travel 700m and into Long Bay	Within 5 years	Major storm event	None	Yes	Possible	Moderate	High	Prioritised action required	No	Install fencing to prevent persons from entering inlets	Low	Install within 5 years		EPS		$30,000	`
52	Unknown Asset	No risk as sufficient controls are in place			Heavily vegetated, dense bushland	No			#N/A	#N/A				Nil					
53	Y950040	Person could get washed into minimum 360mm inlet opening	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Grate at angle	Low	Install within 5 years		EPS		$2,000	
54	Y950030	Person could get washed into minimum 270mm inlet opening	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Grate at angle	Low	Install within 5 years		EPS		$3,000	
55	Y820005	No risk as sufficient controls are in place			Fencing	No			#N/A	#N/A				Nil					
56	L044020	No risk as minimum inlet opening is 190mm			None	No			#N/A	#N/A				Nil					
57	F550050	Person could get washed into minimum 300mm inlet opening	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Install grated roof over entirety of	Low	Install within 5 years		EPS		$10,000	

RISK IDENTIFICATION							RISK ANALYSIS					RISK TREATMENT			RISK TREATMENT PLAN				
Risk No.	Asset at Risk	What can happen?	When can it occur?	Possible cause	Existing controls	Is risk credible?	Likelihood	Consequences	Risk rating	Action required	Is risk acceptable?	Treatment option(s)	Residual risk	Risk treatment plan	Actions	Responsibility	Resources	Budget	Date due
												channel							
58	Primrose Park	Person could fall into open channel and be washed out into Harbour	Within 5 years	Moderate storm event	None	Yes	Possible	Moderate	High	Prioritised action required	No	Install fencing to prevent persons from entering channel	Low	Notify Sydney Water regarding their asset		Sydney Water			
59	Y100040	Person could fall into large inlet and be washed out into Harbour	Beyond 20 years	Major storm event	Fencing, steep terrain, heavily vegetated	Yes	Unlikely	Moderate	Medium	Planned action required	No	Extend existing fencing	Low	Install within 5 years		EPS		$10,000	
60	X015030	Person could get washed into minimum 260mm inlet opening	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Install angled grate	Low	Install within 5 years		EPS		$5,000	
61	X056060	Person could get washed into minimum 260mm inlet opening	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Install grate at angle	Low	Install within 5 years		EPS		$5,000	
62	X010007	Person could get washed into minimum 600mm inlet opening and travel a long distance	Within 10 years	Moderate storm event	None	Yes	Possible	Minor	Medium	Planned action required	No	Extend fencing to prevent persons from entering inlet	Low	Install within 5 years		EPS		$10,000	
63	Downstream of L020050	No risk as there are sufficient controls in place			Fencing preventing all access	No			#N/A	#N/A				Nil					
64	W010030	Person could get washed into 250mm inlet opening and travel out into Harbour	Beyond 20 years	Major storm event	None	Yes	Possible	Minor	Medium	Planned action required	No	Install grating along entire wall	Low	Install within 5 years		EPS		$10,000	
65	X100030	Person could get washed into minimum 240mm inlet opening and travel out into Mosman Bay	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Install grates along entirety of channel	Low	Install within 5 years		EPS		$5,000	
66	H730040	Person could get washed into 250mm inlet opening and get washed into Harbour	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Install grated inlet	Low	Re-design of drainage currently taking place		EPS		$0	
67	Z300040	Person could get washed into minimum 300mm inlet opening and be washed into Harbour	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Re-construction of inlet	Low	Install within 5 years		EPS		$10,000	
68	Z050030	Person could get washed into 270mm inlet opening and be washed into Harbour	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Re-design of kerb and inlet to take place	Low	Install within 5 years		EPS		$10,000	
69	X047020	No risk as maximum inlet opening is 180mm			None	No			#N/A	#N/A				Nil					
70	X026020	No risk as maximum inlet opening is 170mm			None	No			#N/A	#N/A				Nil					
71	X041020	No risk as maximum inlet opening is 200mm			None	No			#N/A	#N/A				Nil					
72	W500020	Person could fall into open area, fall into double inlets and be washed into harbour	Within 5 years	Moderate storm event	None	Yes	Possible	Moderate	High	Prioritised action required	No	Custom Mesh roof to be installed	Low	Install within 5 years		EPS		$30,000	
73	Unknown Asset 2	Person could fall into open channel, into minimum 320mm inlet opening and be washed out into Mosman Bay	Beyond 20 years	Major storm event	None	Yes	Possible	Minor	Medium	Planned action required	No	Open channel to be have grated	Low	Install within 5 years		EPS		$10,000	

RISK IDENTIFICATION							RISK ANALYSIS					RISK TREATMENT			RISK TREATMENT PLAN				
Risk No.	Asset at Risk	What can happen?	When can it occur?	Possible cause	Existing controls	Is risk credible?	Likelihood	Consequences	Risk rating	Action required	Is risk acceptable?	Treatment option(s)	Residual risk	Risk treatment plan	Actions	Responsibility	Resources	Budget	Date due
												roof installed with loose repairs undertaken to side wall							
74	X053020	Person could get washed into a significant drop	Within 5 years	Major storm event	None	Yes	Possible	Minor	Medium	Planned action required	No	Render side of pit to prevent access	Low	Construct within 5 years		EPS		$5,000	
75	V240010	No risk as sufficient controls are in place			Exclusion Bars	No			#N/A	#N/A				Nil					
76	V236110	No risk as sufficient controls are in place			Exclusion Bars	No			#N/A	#N/A				Nil					
77	F930070	Person could get washed into minimum 210mm inlet opening	Beyond 20 years	Major storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Install Grating	Low	Install within 5 years		EPS		$3,000	
78	A200140	Person could get washed into minimum 200mm inlet	Within 5 years	Moderate storm event	Lintels stacked at inlet	Yes	Unlikely	Minor	Low	Manage by routine procedures	Yes	None	Low	Nil		EPS		$0	
79	A200142	Person could get washed into minimum 600mm inlet	Within 5 years	Moderate storm event	None	Yes	Unlikely	Minor	Low	Manage by routine procedures	Yes	None	Low	Nil		EPS		$0	
80	V233020	Person could get washed into minimum 225mm inlet	Within 20 years	Moderate storm event	Fence	Yes	Unlikely	Minor	Low	Manage by routine procedures	No	Construct Standard Grated Drainage Inlet	Low	Install within 5 years		EPS		$5,000	
81	V235020	Person could get washed into minimum 225mm inlet	Within 20 years	Moderate storm event	Exclusion bars	No			#N/A	#N/A				Nil					
82	X048005	Person could get washed into minimum 300mm inlet	Within 20 years	Moderate storm event	None	Yes	Unlikely	Moderate	Medium	Planned action required	No	Construct Standard Grated Drainage Inlet	Low	Install within 5 years		EPS		$5,000	
83	Z050010	Person could get washed into minimum 450mm inlet	Within 10 years	Moderate storm event	None	Yes	Possible	Moderate	High	Prioritised action required	No	Construct Standard Grated Drainage Inlet	Low	Install within 5 years		EPS		$5,000	
84	V090010	Person could get washed into minimum 225mm inlet	Within 5 years	Moderate storm event	None	Yes	Possible	Major	High	Prioritised action required	No	Construct Standard Grated Drainage Inlet	Low	Install within 5 years		EPS		$5,000	

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
25	V257050

What can happen?

Person could get washed into 600mm minimum inlet opening

When can it occur?	Possible cause	Is risk credible?
Within 5 years	Moderate storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Moderate	High

Action required	Is risk acceptable?
Prioritised action required	No

Risk Treatment

Treatment option(s)

Install Fencing

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
40	P050061

What can happen?

Person could fall over edge of pathway get washed into minimum 750mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Within 5 years	Moderate storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Moderate	High

Action required	Is risk acceptable?
Prioritised action required	No

Risk Treatment

Treatment option(s)

Install fencing along channel edge leading into inlet

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
32	S100050

What can happen?

Person could get washed into large channel and minimum 1330mm inlet opening and be carried hundreds of metres

When can it occur?	Possible cause	Is risk credible?
Within 1 year	Minor storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Likely	Moderate	High

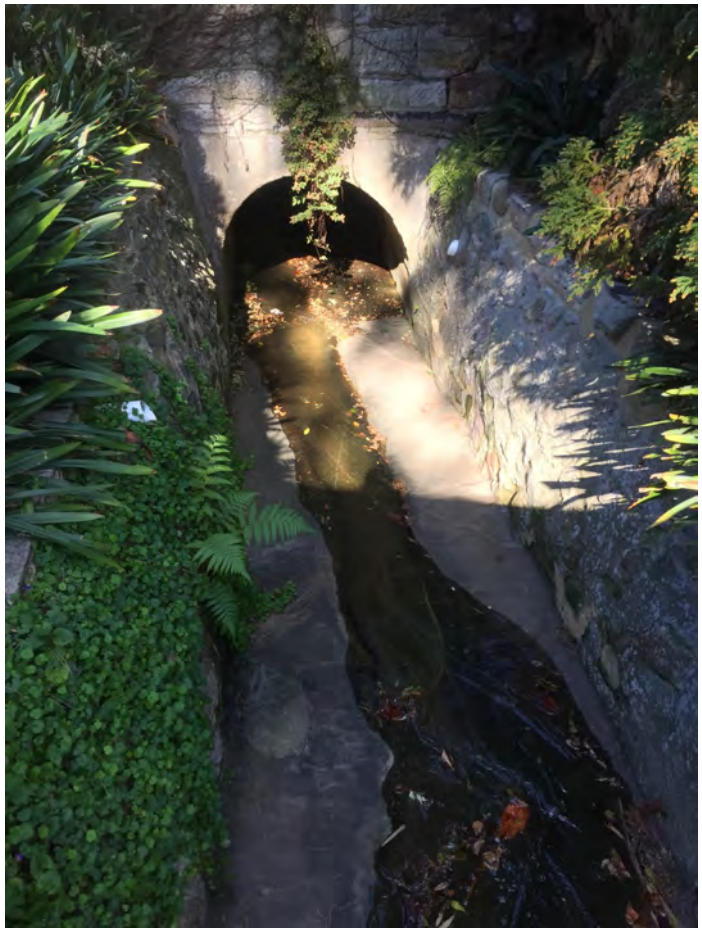
Action required	Is risk acceptable?
Prioritised action required	No

Risk Treatment

Treatment option(s)

Appropiate caging needs to be installed surrounding bridged area

Residual risk	Risk treatment plan
Moderate	Consult with homeowner as to how to ensure safety



Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
30	S100080

What can happen?

Person could get washed into opening 925mm x 425mm

When can it occur?	Possible cause	Is risk credible?
Anytime now	Minor storm event	Yes

Existing controls

Some parts caged, some open, heavy vegetation

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Catastrophic	High

Action required	Is risk acceptable?
Prioritised action required	No

Risk Treatment

Treatment option(s)

Replace missing/ damaged grate sections to close entry points

Residual risk	Risk treatment plan
Low	Install within next 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
84	V090010

What can happen?

Person could get washed into minimum 225mm inlet

When can it occur?	Possible cause	Is risk credible?
Within 5 years	Moderate storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Major	High

Action required	Is risk acceptable?
Prioritised action required	No

Risk Treatment

Treatment option(s)

Construct Standard Grated Drainage Inlet

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
51	V150080

What can happen?

Person could get washed into multiple large inlets and travel 700m and into Long Bay

When can it occur?	Possible cause	Is risk credible?
Within 5 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Moderate	High

Action required	Is risk acceptable?
Prioritised action required	No

Risk Treatment

Treatment option(s)

Install fencing to prevent persons from entering inlets

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
58	Primrose Park

What can happen?

Person could fall into open channel and be washed out into Harbour

When can it occur?	Possible cause	Is risk credible?
Within 5 years	Moderate storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Moderate	High

Action required	Is risk acceptable?
Prioritised action required	No

Risk Treatment

Treatment option(s)

Install fencing to prevent persons from entering channel

Residual risk	Risk treatment plan
Low	Notify Sydney Water regarding their asset

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
37	B005020

What can happen?

Person could fall over edge of pathway get washed into minimum 900mm inlet opening and end up falling over steep cliff into valley below

When can it occur?	Possible cause	Is risk credible?
Within 10 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Moderate	High

Action required	Is risk acceptable?
Prioritised action required	No

Risk Treatment

Treatment option(s)

Install fencing along pathway where inlet is

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
26	V210060

What can happen?

Person could get washed into channel and minimum 700mm inlet

When can it occur?	Possible cause	Is risk credible?
Within 5 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Moderate	High

Action required	Is risk acceptable?
Prioritised action required	No

Risk Treatment

Treatment option(s)

Channel needs a concrete roof on top

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
45	R010120

What can happen?

Person could get washed into minimum 1500mm inlet and travel a long distance

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

Area partially fenced off

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Moderate	High

Action required	Is risk acceptable?
Prioritised action required	No

Risk Treatment

Treatment option(s)

Fence off area to prevent access

Residual risk	Risk treatment plan
Low	Notify Transport for NSW regarding their asset

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
83	Z050010

What can happen?

Person could get washed into minimum 450mm inlet

When can it occur?	Possible cause	Is risk credible?
Within 10 years	Moderate storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Moderate	High

Action required	Is risk acceptable?
Prioritised action required	No

Risk Treatment

Treatment option(s)

Construct Standard Grated Drainage Inlet

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
72	W500020

What can happen?

Person could fall into open area, fall into double inlets and be washed into harbour

When can it occur?	Possible cause	Is risk credible?
Within 5 years	Moderate storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Moderate	High

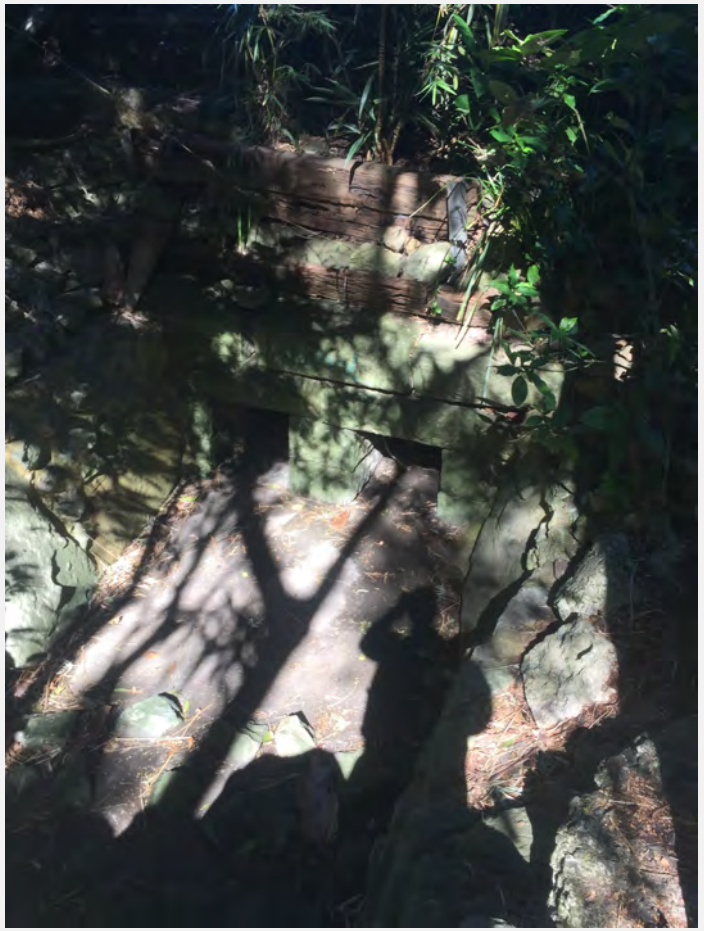
Action required	Is risk acceptable?
Prioritised action required	No

Risk Treatment

Treatment option(s)

Custom Mesh roof to be installed

Residual risk	Risk treatment plan
Low	Install within 5 years



Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
27	V210040

What can happen?

Person could get washed into channel and minimum 450mm inlet

When can it occur?	Possible cause	Is risk credible?
Within 5 years	Major storm event	Yes

Existing controls

Access to inlet area is heavily vegeated, steep terrain

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Moderate	Medium

Action required	Is risk acceptable?
Planned action required	No

Risk Treatment

Treatment option(s)

Channel needs to be completely closed off with mesh

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
34	S600020

What can happen?

Person could get washed into minimum 410mm inlet

When can it occur?	Possible cause	Is risk credible?
Within 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Minor	Medium

Action required	Is risk acceptable?
Planned action required	No

Risk Treatment

Treatment option(s)

Install further grates up channel until inlet gap is less than 200mm

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
64	W010030

What can happen?

Person could get washed into 250mm inlet opening and travel out into Harbour

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Minor	Medium

Action required	Is risk acceptable?
Planned action required	No

Risk Treatment

Treatment option(s)

Install grating along entire wall

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
73	Unknown Asset 2

What can happen?

Person could fall into open channel, into minimum 320mm inlet opening and be washed out into Mosman Bay

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Minor	Medium

Action required	Is risk acceptable?
Planned action required	No

Risk Treatment

Treatment option(s)

Open channel to be have grated roof installed with loose repairs undertaken to side wall

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
74	X053020

What can happen?

Person could get washed into a significant drop

When can it occur?	Possible cause	Is risk credible?
Within 5 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Minor	Medium

Action required	Is risk acceptable?
Planned action required	No

Risk Treatment

Treatment option(s)

Render side of pit to prevent access

Residual risk	Risk treatment plan
Low	Construct within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
59	Y100040

What can happen?

Person could fall into large inlet and be washed out into Harbour

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

Fencing, steep terrain, heavily vegetated

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Moderate	Medium

Action required	Is risk acceptable?
Planned action required	No

Risk Treatment

Treatment option(s)

Extend existing fencing

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
82	X048005

What can happen?

Person could get washed into minimum 300mm inlet

When can it occur?	Possible cause	Is risk credible?
Within 20 years	Moderate storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Moderate	Medium

Action required	Is risk acceptable?
Planned action required	No

Risk Treatment

Treatment option(s)

Construct Standard Grated Drainage Inlet

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
4	Channel upstream of R022030

What can happen?

Person could access small channel from adjacent footpath.

When can it occur?	Possible cause	Is risk credible?
Within 10 years	Major storm event	Yes

Existing controls

Partially fenced

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Minor	Medium

Action required	Is risk acceptable?
Planned action required	No

Risk Treatment

Treatment option(s)

Extend existing fencing - approximately 10m

Residual risk	Risk treatment plan
Low	Construct 10m of fence within next 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
5	R022050

What can happen?

Person could access small channel from nearby footpath and enter a pipe that is 2m in length

When can it occur?	Possible cause	Is risk credible?
Within 10 years	Major storm event	Yes

Existing controls

Partially fenced

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Minor	Medium

Action required	Is risk acceptable?
Planned action required	No

Risk Treatment

Treatment option(s)

Fence channel off

Residual risk	Risk treatment plan
Low	Construct within next 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
62	X010007

What can happen?

Person could get washed into minimum 600mm inlet opening and travel a long distance

When can it occur?	Possible cause	Is risk credible?
Within 10 years	Moderate storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Minor	Medium

Action required	Is risk acceptable?
Planned action required	No

Risk Treatment

Treatment option(s)

Extend fencing to prevent persons from entering inlet

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
6	Z145020

What can happen?

Person could access channel from adjacent foothpath and wash into minimum 400mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Within 10 years	Major storm event	Yes

Existing controls

Access difficult due to bushland and steep terrain

Risk Analysis

Likelihood	Consequences	Risk rating
Possible	Minor	Medium

Action required	Is risk acceptable?
Planned action required	No

Risk Treatment

Treatment option(s)

Angled Grate

Residual risk	Risk treatment plan
Low	Construct within next 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
33	S652030

What can happen?

Person could get washed into minimum 220mm inlet opening.

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Provide mesh behind wall

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
13	H170070

What can happen?

Person could get washed into minimum 250mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Install Grates

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
28	V190070

What can happen?

Person could get washed into minimum 300mm inlet

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Extend grating

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
17	H280020

What can happen?

Person could get washed into minimum 300mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

Inlet has exclusion bars, however are in a poor condition

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Install Angled Grate

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
14	H400005

What can happen?

Person could get washed into minimum 260mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Within 20 years	Major storm event	Yes

Existing controls

Area fenced off

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Install Grates

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
24	J950040

What can happen?

Person could get washed into minimum 220mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Install Grating

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
21	A640010

What can happen?

Person could get washed into minimum 230mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Rebuild Pits

Residual risk	Risk treatment plan
Low	Install within next 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
19	H220024

What can happen?

Person could get washed into minimum 300mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

Area fenced off

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Install Fence Mesh along exisiting fence

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
29	F592020

What can happen?

Person could get washed into minimum 200mm inlet

When can it occur?	Possible cause	Is risk credible?
Within 5 years	Moderate storm event	Yes

Existing controls

Lintels stacked at inlet

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	Yes

Risk Treatment

Treatment option(s)

None

Residual risk	Risk treatment plan
Low	Nil

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
60	X015030

What can happen?

Person could get washed into minimum 260mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Install angled grate

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
80	V233020

What can happen?

Person could get washed into minimum 225mm inlet

When can it occur?	Possible cause	Is risk credible?
Within 20 years	Moderate storm event	Yes

Existing controls

Fence

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Construct Standard Grated Drainage Inlet

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
79	A200142

What can happen?

Person could get washed into minimum 600mm inlet

When can it occur?	Possible cause	Is risk credible?
Within 5 years	Moderate storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	Yes

Risk Treatment

Treatment option(s)

None

Residual risk	Risk treatment plan
Low	Nil

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
78	A200140

What can happen?

Person could get washed into minimum 200mm inlet

When can it occur?	Possible cause	Is risk credible?
Within 5 years	Moderate storm event	Yes

Existing controls

Lintels stacked at inlet

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	Yes

Risk Treatment

Treatment option(s)

None

Residual risk	Risk treatment plan
Low	Nil

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
77	F930070

What can happen?

Person could get washed into minimum 210mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Install Grating

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
68	Z050030

What can happen?

Person could get washed into 270mm inlet opening and be washed into Harbour

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Re-design of kerb and inlet to take place

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
67	Z300040

What can happen?

Person could get washed into minimum 300mm inlet opening and be washed into Harbour

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Re-construction of inlet

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
66	H730040

What can happen?

Person could get washed into 250mm inlet opening and get washed into Harbour

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Install grated inlet

Residual risk	Risk treatment plan
Low	Re-design of drainage currently taking place

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
46	F334010

What can happen?

Person could get washed into minimum 300mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Construct Standard Grated Drainage Inlet

Residual risk	Risk treatment plan
Low	To be re-constructed within 1 year

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
61	X056060

What can happen?

Person could get washed into minimum 260mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Install grate at angle

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
38	B024020

What can happen?

Person could get washed into minimum 230mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Install grates

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
57	F550050

What can happen?

Person could get washed into minimum 300mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Install grated roof over entirety of channel

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
54	Y950030

What can happen?

Person could get washed into minimum 270mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Grate at angle

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
53	Y950040

What can happen?

Person could get washed into minimum 360mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Grate at angle

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
50	F265020

What can happen?

Person could get washed into minimum 300mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

Partially fenced

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Extend Fence around headwall and install fence mesh

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
43	P040020

What can happen?

Person could get washed into minimum 220mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Install grates

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
41	P075010

What can happen?

Person could get washed into minimum 240mm inlet opening

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Extension of pipe, install grates

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
39	B025015

What can happen?

Person could get washed into minimum 230mm inlet

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Install grates

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo

North Sydney Council Stormwater Drainage Inlets Risk Register

Risk Identification

Site No	Asset at Risk
65	X100030

What can happen?

Person could get washed into minimum 240mm inlet opening and travel out into Mosman Bay

When can it occur?	Possible cause	Is risk credible?
Beyond 20 years	Major storm event	Yes

Existing controls

None

Risk Analysis

Likelihood	Consequences	Risk rating
Unlikely	Minor	Low

Action required	Is risk acceptable?
Manage by routine procedures	No

Risk Treatment

Treatment option(s)

Install grates along entirety of channel

Residual risk	Risk treatment plan
Low	Install within 5 years

Photo