**REPORT 3**
*(1215/52/IM)*

# WASTEWATER OVERFLOW MITIGATION PLAN

## 1. Purpose of the report

This paper outlines the reasoning and possible range of options to address the issue of wastewater overflows due to excess stormwater entering the wastewater system. These overflows may occur to land, streams or to the coastal marine environment.

Potential alternatives to help abate the cause of the overflows, or the effects of the overflows, are outlined with additional criteria that may assist the Council in evaluating options once further development and catchment specific fine-tuning of assessments have been completed.

It is envisaged that officers will develop mitigation options, a catchment specific work programme and the implications of implementing these actions and report back to the Committee so that any financial implications can be included in the 2011/12 draft Annual plan.

## 2. Recommendations

Officers recommend that the Committee:

1. *Receives the information.*

2. *Agrees with the proposed approach*

3. *Notes that officers will bring to the Strategy and Policy Committee a number of options for consideration to mitigate wastewater overflows before the 2011/2012 draft Annual Plan considerations.*

## 3. Background

The collection, transport, treatment and discharge of wastewater are key functions of the Council to safeguard public health and protect the environment. This is undertaken in accordance with the provisions of relevant legislation and regional plans.

In December 2008 this committee considered a range of options to mitigate excess stormwater entering the wastewater system. That report focused on the stormwater entering the system through private laterals and the options available to Council to reduce the effects. Whilst further investigation was being carried out, the scope of the issue and possible solutions was expanded and a number of other issues also became significant. These included the creation of the Taputeranga Marine Reserve, the Council's application for an area-wide stormwater discharge consent from GWRC and the granting of the Moa Point Resource Consents in May 2009.

The wastewater network generally operates well during dry weather and Wellington's seasonal rainfall events. However, during heavy rainfall events the network can become overwhelmed leading to wastewater overflow events – discharges of untreated wastewater to land, streams or the coastal marine environment.

## 4. Wastewater Overflows

The issue is that there is too much flow in our wastewater system with this flow being transported to our wastewater treatment plants. The network's capacity can be compromised for a number of reasons. There may be blockages or partial pipe collapse but generally the capacity is exceeded through the introduction of stormwater. With the expected growth in the city, these flows will increase.

Stormwater entering the wastewater network is known as "inflow and infiltration" (I&I). "Inflow" occurs when stormwater enters the wastewater network through gully-traps, down pipes or improper connections. "Infiltration" occurs when stormwater enters the wastewater network via cracks, holes or defects in the pipelines and joints.

Wastewater[1] overflows can occur from any part of the network whether it is publicly or privately owned. They occur when there is insufficient capacity within that part of the network to cope with the volume of influent channelled to the wastewater treatment plant.

### *4.1 Why wastewater overflows are a problem*

Discharges of untreated wastewater at a point other than at the wastewater treatment plants present a risk to public health and the environment, are socially and culturally undesirable, contrary to Council and community outcomes, and in some circumstances are illegal[2].

Wellington City Council has obtained resource consent for foreseeable discharges that may occur from time to time from the Moa Point and Western wastewater treatment plants[3].

The Council also obtained resource consent to discharge stormwater and stormwater contaminated with wastewater and potentially other contaminants.

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[1] Wastewater includes sewage, water used in bathrooms, laundries, kitchens and liquid trade waste from commercial operations.
[2] Resource Management Act 1991, section 15 "Discharge of contaminants into the environment"
[3] Porirua City Council holds resource consent to discharge wastewater under certain circumstances, a portion of this wastewater is sourced from properties in the Northern areas of WCC's wastewater catchments.

Currently there are 11 consents being operated under, this approach will evolve into a single consent currently being applied for to cover the coastal marine environments as a single receiving area[4]. It is expected that this resultant consent will have a number of conditions that will affect the way Council manages wastewater flows. The details will become more transparent as we progress through the consent process.

Such consents are granted by Greater Wellington Regional Council with conditions attached to mitigate adverse effects.

Unforeseen overflow events are not subject to resource consent but may occur from the pipe network or wastewater pump stations. The 'unforeseen' overflows generally occur when a redundancy, or number of redundancies, built into the network have failed. The risk of this occurring is minimised through robust operations and maintenance programmes, monitoring systems and network renewal and upgrade programmes.

Overflow prevention measures are employed at wastewater pump stations to minimise the risk of an overflow event. In the event of an overflow occurring an investigation is carried out in order to determine what steps can be taken to prevent a recurrence.

"Constructed overflows" have also been built into the network to provide relief when the network is placed under excessive stress. Currently there are 38 constructed overflows that can overflow into the stormwater network from the wastewater pipe network and 58 overflows designed for operation under emergency conditions at wastewater pump stations. These constructed overflows are distributed across 17 catchments and were constructed often decades ago in order to mitigate the risk of overflows occurring onto private properties, footpaths and roadways. Section 5.1 details work underway to address the occurrence and effects of the constructed overflows.

### *4.2 Why abate wastewater overflows?*

The relative importance of abating or mitigating the occurrence and effects of wastewater overflows has been considered within the context of the Long-Term Council Community Plan and the community outcomes found therein.

The Council's vision for a vibrant, internationally competitive and affordable city demands a reliable and efficient wastewater network. Wastewater overflow that potentially cause harm to the coastal environs and freshwater habitats adversely impacts on that vision.

### *4.3 Current situation and context*

An overview of the current situation provides a snapshot of the information gathered to date and also reflects the constructed overflow monitoring programme that is underway.

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[4] SPC Paper (Report # 4) '*Application for Resource Consent to discharge Stormwater into Wellington Harbour and Coastal Marine Area*' 20/11/2008

### 4.3.1 Moa Point wastewater treatment plant

Moa Point wastewater treatment plant overflows at its bypass point an average of 3.3 times[5] per year but has peaked at eight events in one year. This has been calculated to rise to an average of nine overflow events per annum by 2043 due to population growth and the possible effects of climate change.

An overflow event leads to a bypass discharge when the influent exceeds the 3,000 litres per second treatment capacity of the plant.

Works already committed to by the Council to mitigate the effects of bypass discharges include the trial of a ultra-violet treatment process that partially treats the bypassed wastewater prior to discharge. An upgrade of the plant's inlet pumps will increase pump capacity and address the incidence of bypass discharges occurring due to surge effects of the current pumps.

The Council is required to report annually to Greater Wellington Regional Council on the steps undertaken each year and intended for future years to reduce infiltration and stormwater ingress into the Wellington city wastewater network.

### 4.3.2 Western wastewater treatment plant.

In a similar fashion the Western wastewater treatment plant experiences overflow events an average of 3.9 times[6] per year and has peaked at nine times per year. The key difference with the Western treatment plant is that there is potential for discharges to affect both freshwater environments as well as the south coast marine environment whereas the Moa Point event will discharge out to sea south of Moa Point and Lyall Bay.

Like the Moa Point plant, the Western plant has adequate capacity for dry weather flows; it is the increased wastewater flows generated from rainfall induced inflow and infiltration that are the cause of overflows at the plants.

### 4.3.3 Porirua wastewater treatment plant

Porirua wastewater treatment plant[7] averages a bypass event once every thirteen days (28 events per annum). The plant capacity is being upgraded in 2010/11 with a third clarifier to eliminate the cause of some of these bypasses. In 2009/10 a meter is being installed at the boundary between Wellington and Porirua Cities to enable accurate flows to be measured and give a better understanding of the impact of inflow and infiltration on the Wellington and Porirua catchments.

### 4.3.4 Constructed overflows.

Constructed overflows, as discussed previously (4.2), provide relief from wastewater overflows to private property, footpaths and roadways during intense rainfall events. This relief is channelled into the stormwater network and eventually reaches the freshwater and coastal environments.

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[5] Figures based on wastewater treatment plant data collected since plant commissioning in October 1998.

[6] Figures based on wastewater treatment plant data collected since July 2001.

[7] Porirua Wastewater Treatment Plant is operated jointly with Wellington City Council owning 27.6% of the plant.

Over the last two years selected constructed overflows have been monitored in order to provide a better understanding of their operating parameters. This will allow for some devices to be removed and others having upgrades within the catchment in order to reduce the possibility of an overflow occurring.

The monitoring programme of 32 sites has recorded 19 overflow events at seven locations since July 2009. This information builds on the 14 sites monitored in 2007/2008 where 21 overflow events were recorded.

Overflow events that occur at constructed overflows are investigated to determine if they are caused by blockages - usually evident due to the event occurring despite low rainfall beforehand, or as a result of flows exceeding the catchment's network capacity - usually as a result of localised inflow and infiltration.

Where circumstances allow remedial work is undertaken as a priority to remove blockages, fix broken pipes or address damage. Where the cause of the overflow is of a systemic nature investigations are undertaken to evaluate underlying causes8 and the potential remedies available.

This includes instances where the wastewater overflow may carry leachate or contaminants from landfills (whether in use or closed). Currently work is underway to address the circumstances that lead to discharges of leachate contaminated stormwater at Houghton Bay.

### 4.3.5 Other overflows from the system

There are a number of other overflows that occur from wastewater pumping stations. Each overflow is investigated to determine its cause and minimise the likelihood of a repetition. Each pump station has mitigation plans in place to minimise the likelihood of such overflows occurring.

It must be understood that we will never have a system that will be able to avoid all overflows. The challenge is to provide a system and processes whereby the number of overflows is within a range that is affordable and consistent with Council / Community Outcomes. That is what the next stage of work will attempt to identify.

## 5. Management of the wastewater network

As alluded to previously Wellington City council operates the wastewater network according to the provisions of the Local Government Act 2002, Resource Management Act 1991, Health Act 1956, Marine Reserves Act 1971 and the plans established for the Wellington region by the Regional Council.

Where appropriate the Council seeks resource consent[9] to ensure that the operational requirements of the wastewater activity are correctly catered for.

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[8] Systemic influences may include I&I caused by incorrectly sited gully-traps, down pipes or improper connections, cracks, holes or defects in the pipelines and joints – this should be viewed in the context of the public and private elements of the wastewater network being a single system. Faults, breakages, blockages can 'appear' within the network quite remotely from their source.

[9] A resource consent application is currently before GWRC to allow the discharge of stormwater and contaminated stormwater into the coastal marine environment (SPC Paper Report 4 '*Application for Resource Consent to discharge Stormwater into Wellington*

Any resource consent will commit the Council to a series of conditions that seek to maintain public health and the objectives of applicable legislation and regional plans.

Routine water quality monitoring that looks for indications of bacterial contamination (faecal coliforms, Enterococci, E.coli), pH levels, heavy metals, poisons and industrial chemicals is undertaken in both the freshwater and coastal bathing and stormwater discharge environs throughout the year. Instances of poor water quality are investigated and where possible traced to the source and addressed through remedial work.

### *5.1 Wastewater overflow monitoring (2008/09 – 2011/12)*

Wastewater overflow monitoring is currently undertaken as part of an effort to better understand the extent to which the wastewater network contributes to the state of Wellington city's aquatic environments. It also serves to provide a wider understanding of which catchments might have operational redundancies incorporated into them unnecessarily.

Where monitoring and subsequent investigation and hydraulic analysis reveal such redundancies it may be appropriate to close off that particular overflow feature. This will remove the chance of an overflow occurring to the aquatic features of that catchment from the network but must only be considered when the ramifications are fully understood.

In short we must be completely confident that the removal of a constructed overflow in one location does not increase or divert the risk to public health or the environment in another location. Where removal is not an option a management plan will be developed to provide for upgrading, monitoring or catchment specific works.

## 6. Mitigation options for wastewater overflows

While dry weather overflows are generally able to be dealt with through the application of modest repairs or maintenance mechanisms due to their localised nature, wet weather overflows have a level of complexity over and above simple blockages with causes being a combination of faults distributed across the upstream catchment.

A modest amount of infiltration is included in the design parameters of a reticulated wastewater network to allow for deterioration of the network over its economic life. Introduction of excessive volumes of I&I via improper connections, aging pipes, joints and manholes exceeds the engineered capacity of the network in many parts of the catchments across the city. With I&I affecting publicly and privately owned parts of the network an approach is required to address the contributions of both parts of the network[10].

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*Harbour and Coastal Marine Area*' 20/11/2008). This reflects the requirements of Regional Plan # 53 and the Council commitment to addressing stormwater quality.

[10] Inflow and Infiltration is known to contribute greatly to the volume that leads to wastewater overflow events (GHD, 2007). It is also an issue that can be identified to varying degrees in many urban environments where the effects of wastewater discharges are becoming more important.

There are limited options to reduce the occurrence of wastewater overflows. These are increasing the network's capacity upstream of the wastewater treatment plant, a combination of wastewater storage and reticulation options, propriety treatment devices (such as filters or screens at overflow points) or volume related approaches (I&I).

The option of increasing the capacity of the treatment plant will provide relief only in the short-term and does not deal with the underlying causes that are known to be occurring upstream.

Options are outlined in categories that relate to asset or non-asset based approaches and reflect the general application to the city's network as a whole. Combinations of these options require detailed evaluation in order to meet the specific needs of catchments according to their varied characteristics. It is envisioned that the possible solutions that will be identified will be a combination of the most effective and efficient approaches from those outlined below.

### *6.1 Public network*

| Approach | Targets | Comments |
|---|---|---|
| Review of pipeline renewal programme. | Inflow and Infiltration within public network. | Business as usual. This could be accelerated relative to the volume of additional funds being committed. |
| Review of pipeline / pump station upgrade programme | • Inflow and Infiltration within the public network.<br>• Network capacity.<br>• Emergency overflows (PS). | Potentially offers a significant contribution to a reduced number of overflows. |
| Review network capacity at choke points | Overflows caused by undersized reticulation. | Investigation is a normal consideration of any renewal or upgrade proposal. |
| Review of pipeline / manhole construction specifications. | Inflow and Infiltration within the public network. | Contribution factor to overall solution uncertain. |
| Increase storage capacity within network. | Provides targeted volume relief in specific catchments or locations based on information gathered in overflow monitoring programme. This also provides relief to the wastewater treatment plants. | Potentially offers a significant contribution to reduced overflows (but at significant additional cost). *Should be combined with private network initiatives*. |
| Remove constructed overflows from network. | Untreated wastewater entering stormwater network and aquatic environs. | Good long-term catchment specific solution / outcome (but requires capacity enhancement). |
| Review the pump station emergency overflow mitigation measures. | Occurrence of pump station emergency overflows. | Only addresses a low frequency event. Upstream work could achieve similar results. |

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|---|---|---|
| Investigate feasibility of incorporating proprietary treatment devices at wastewater overflow points. | Effect of wastewater overflows at specific sites or points within catchment. | Catchment specific but provides relief to overall network |

## *6.2 Private network*

| Approach | Targets | Comments. |
|---|---|---|
| District Plan change. | Waste minimisation | Consider encouraging alternatives to public reticulated networks such as localised treatment options, grey water re-use. |
| Building Code changes. | Inflow and Infiltration within private network. | Warrants of Fitness required for private drains connecting to public network (a long term outlook but transfers cost to property owner). |
| Public education campaign. | Inflow and Infiltration within public network. | Moves ownership of effects of poor quality private drains back to property owner (along with the cost) |
| Multi-faceted approach to addressing poor quality or under performing private sewer drains. | Inflow and Infiltration within public network. | Requires analysis to determine long term effects and policy and legal requirements as well as public tolerance for 'change' in policy. |

It should be noted that in each case the private network options assign the cost and responsibility to the polluting property and its owner as it is their responsibility. However there may be a need for additional involvement and funding by the Council for investigation and enforcement costs.

Additional options include introducing localised treatment mechanisms that would divert treated wastewater from the network during time of high system demand. This is largely unexplored and requires further analysis as to Regional Plan consideration around water quality and environmental effects.

There are also very limited wastewater reduction (volume) benefits to be gained from aspects of water conservation.

Increased adoption of newer technologies such as water efficient clothes or dishwashing appliances, low-flow shower heads or dual-flush/low volume toilet cisterns will provide some relief on the network. This however should be viewed as a 'bonus' from water conservation rather than a programme to reduce wastewater volume.

At this stage we have limited factual knowledge of the relative contributions by the two parts of the network. However, in terms of scale the private network is estimated to be approximately 1400 kilometres in length alongside a public network of 1022 kilometres.[11] Studies have shown that approximately 40-60% of I/I volumes enter the pipe system through defects in private house laterals.[12]

[11] Wellington City Council, *'Three Waters Summary Asset Management Plan 2010/11-2019/20'*
[12] Report to Wellington City Council, "*Moa Pt Consent Renewal – Supporting Report on Interceptor Sewer Works"* GHD Ltd. – June 2007

It is important that the public's input is sought in terms of the Council's responsibilities for drainage maintenance versus the ratepayer's tolerance for a higher level of council scrutiny into the condition of private laterals and the potential for the consequential costs.

Any programmes that require ongoing testing of private drains, certification of drainage condition or performance driven testing may be seen as a significant imposition on individual property owners. As with public perceptions that Council should address potable water leakage within the public water supply network before making requirements for private leaks to be addressed it is likely that a similar stance would arise with a focus on the wastewater networks.

### *6.3 Option development and evaluation*

Packages of possible future work will be identified that have varying degrees of asset (e.g. storage) and non asset (e.g. regulation) solutions. These option packages will take into consideration the effectiveness of each package and will be evaluated for effectiveness and the benefit/costs (both financial and non financial.

## 7. Long-Term Council Community Plan implications

The addressing of wastewater overflows could impact on the LTCCP fiscally – failure to address wastewater overflow events will mean that Council is unlikely to be able to meet levels of service, community/council outcomes and performance measures. All of these are key areas within the LTCCP framework and principles. The level of required expenditure associated with the different options to reduce excess flow will be reported back to this committee.

### *7.1 Financial implications*

The impact of addressing wastewater overflows can have financial implications within the LTCCP in that adopting an option to introduce increased storage capacity within the network will require capital expenditure that is as yet unidentified. Detailed appraisals of catchment specific requirements and the respective cost/benefit analysis of various approaches are yet to be completed. The completion of catchment analysis works will be presented with an order of prioritisation based on public health and environmental effects and the expected outcomes.

### *7.2 Levels of Service*

The current level of service applied to the wastewater (and stormwater) activities has a considerable amount of durability in regard to meeting community expectations. Specifically "*an aim to protect public health and property without compromising the environment*"[13] allows for the adoption of a variety of strategies or policies without impacting on the agreed level of service.

[13] Wellington City Council Long-Term Council Community Plan 2009 – 2019, page 68

### 7.3 Council outcomes / Community outcomes[14]

The current LTCCP indicates a Council outcome that will see Wellington "*protect and restore its land and water based ecosystems to sustain their natural processes, and to provide for a range of indigenous and non-indigenous plants and animals*" as well as providing "*waste disposal systems that protect public health and property*".

Current Community outcomes provide that Wellington will "*protect and showcase its natural landforms and indigenous ecosystems*" and that "*Wellington's long-term environmental health will be protected through well-planned and well-maintained infrastructure*".

### 7.4 Performance measures[15]

Performance measures currently focus on water quality, response times and resource consent compliance - wastewater overflows contribute significantly to the reduction of Council's ability to meet these performance measures.

The future resource consents for stormwater discharges will include measures for dealing with overflows to the receiving waters. These will require reporting as part of that process. The suitability of these measures as wider performance measures will be evaluated.

## 8. Risks

Addressing, and not addressing the wastewater overflows carries an inherent level of risk in terms of the Council's policies and ratepayer expectations.

A failure to engage parties adequately will be likely to result in a less than satisfactory outcome. A failure to address the overflow issue carries risks relating to environmental, social, cultural and economic outcomes.

Additional risk assessment work relative to the following work plan will be presented alongside the individual deliverable.

## 9. Stakeholder engagement

As the majority of the work required in this next stage is technical in nature, consultation will focus on assistance with the identification of the "packages" and the effects of each package or part thereof.

It is anticipated that interested parties who have submitted on related proposals for wastewater or stormwater discharges, made submissions to the LTCCP or contributed to Council strategies on these matters will be engaged in the development of the options to address the effects of wastewater overflows.

Additional community engagement will be developed alongside GW, iwi, Regional Public Health. Inputs will also be sought from the Property Council, the WCC Environmental Reference Group and ecological and environmental community groups and entities and relevant industry forums.

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[14] *Ibid*, page 56
[15] *Ibid*, page 68

It is proposed to bring recommendations for implementation back to the Council, so that any budget or strategic implications can be incorporated into the Council's 2011/2012 Annual Plan process. Interested parties will also have the opportunity to consider any implications in the 2011/12 draft Annual plan process.

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## Supporting Information

**1)Strategic Fit / Strategic Outcome**

*The paper presented supports the Council's strategic direction of "protecting and enhancing Wellington's environment" as well as supporting programmes to make Wellington "more liveable", "more actively engaged", "more sustainable", "safer" and "healthier".*

**2) LTCCP/Annual Plan reference and long term financial impact**

*The approach prescribed will include LTCCP/Annual Plan implications and the respective planning and expenditure impacts.*

**3) Treaty of Waitangi considerations**

*Iwi engagement has occurred for limited portions of this paper in regards to Moa Point and stormwater discharges. This will continue as additional detailed work is completed however it is not expected that Treaty considerations will impair the work plan as stated.*

**4) Decision-Making**

*At this stage significant decisions are not required. Future reports will details the options and decisions that relate to them.*

*Additional reports will set out a number of options and reflects the views and preferences of those with an interest in this matter who have been consulted with.*

**5) Consultation**

**a)General Consultation**

*Consultation will be carried out in conjunction with the option development outlined in the report body where appropriate and to the degrees necessary to meet Council and stakeholder expectations.*

**b) Consultation with Maori**

*Refer comment 3. Additional engagement and consultation will be made in reference to specific action points contained in the report.*

**6) Legal Implications**

*Council's lawyers will be consulted in the drafting of policy or planning stages, or where there are legal connotations, according to work plan related project plans (created as per work plan timeframes).*

**7) Consistency with existing policy**

*This paper and the option development and evaluation work proposed will require review of current policies to ensure consistency with desired outcomes and also to ensure that outcomes are achievable. Initially the will affect water activity related policy and potentially urban development policy.*

In both cases relevant Council officers will be asked to provide additional input and support.