`AUCKLAND CITY COUNCIL – ISTHMUS DISTRICT PLAN REVIEW 2007/08

EUM/METROWATER TECHNICAL INPUTS

1.	PAPER TITLE:	Wastewater and Combined System Issues
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2. PAPER ISSUE STATUS: Draft for Review

Issue No	Date	Contributors	Reviewer	Summary of main changes
1	28.04.08	IM/KB	RM, CZ	Revise approach to dry weather overflows, add stormwater detention tanks as mitigation measure in combined sewer areas, add graphs/diagrams/references and summary.
2	20.05.08	IM/KB	As above	
3	23.05.08	IM/KB	GO	Review and minor alterations and release by Manager Water and Landfill Operations
4	23.05.08	IM		Minor editorial changes to clarify previous edits.

3. KEYWORDS:

Wastewater, combined, dry weather capacity, Three Waters Strategy, overflows, operation and maintenance

4. SUMMARY

The city's wastewater drainage network is an essential component of the urban fabric, providing for the health safety and social and economic well being of the community. Its on-going operation and development is therefore essential to the functioning, growth and development of the city.

There are significant issues facing the drainage system, notably regional conveyance and treatment capacity issues and the extent of sewer overflows, particularly from the city's combined sewer system. These issues have been the subject of recent studies including Auckland City Council and Metrowater's Integrated Catchment Study and the Regional 3 Waters Project.

This assessment considers four issues as follows:

- The capacity of the local wastewater network to cater for growth and the potential for regular dry weather overflows;
- The wet weather capacity of the wastewater and combined networks and overflows from this system;
- Regional conveyance and treatment issues;

- On-going operation and maintenance requirements.

In relation to capacity and the potential for regular dry weather overflows, this is not considered a significant issue in respect of the local network – the main issue relates to regional conveyance capacity that is being addressed through the regional three waters project. Apart from the CBD, which experiences different growth issues to the rest of the Isthmus area, capacity issues are highly localised and best addressed on a case-by-case basis through resource consents for development. In addition, Metrowater has a programme of network development and renewals to ensure that sufficient wastewater capacity is provided to meet the needs of both intensive growth areas and general intensification. However, should the growth model be altered then this needs to be communicated to Metrowater at an early stage to allow integration into work planning.

In respect of wet weather sewer overflows, long term targets and medium term milestones have been identified and detailed investigation projects and works programmes have been implemented to achieve the outcomes. It is considered that the approach that has been adopted is robust and will be authorised through long term drainage network discharge consents; it is likely that only the timing/expenditure of improvements will be debated through the consent process with the pressure being on doing more in less time.

Accordingly, the presence of wet weather overflows is not considered a constraint to growth and development, although ideally intensive growth should be timed to occur subsequent to the resolution of combined system overflows in that area. However, on-site storage of stormwater is appropriate for development in combined sewer areas to minimise the exacerbation of overflows in the interim.

There are significant regional issues associated with wastewater conveyance and treatment, with insufficient capacity predicted to occur around 2025 and these have been an important component of the regional 3 waters project. A range of potential solutions have been identified and the next step is to undertake more detailed assessment and subsequent design/implementation. Given the lead time that is available, and the advanced options analysis that has been undertaken, it is not considered that these issues provide a constraint to growth within Auckland City – if anything they provide potential opportunities to address other issues including wastewater overflows in a more cost effective manner.

It is considered premature for the District Plan to specifically provide for this future regional infrastructure, except perhaps to provide general recognition of the potential issues and high level policy support.

In relation to on-going operation and maintenance of the drainage network, it is important for the plan to achieve a suitable balance between facilitating essential operation/maintenance and managing other values and resources. Significant traction has been achieved with PC 90 and 90A and a continuation of these processes is considered appropriate to achieve this balance.

5. RECOMMENDATIONS FOR CONSIDERATION FOR THE DISTRICT PLAN:

Dry Weather Overflows

- Dry weather flow capacity in the Metrowater network is not a significant issue and should not be a factor to constrain or direct growth.
- Liaise with Metrowater in respect of potential major growth areas, particularly if there is a change to the current growth model, to ensure that capacity issues are addressed ahead of need.
- Require an assessment of wastewater capacity for developments of a certain size or change in zoning to identify any local constraints/performance issues.

Wet Weather Overflows

- Wet weather overflows are being addressed at a city wide level, with long and medium term targets being established. Overflows will likely be authorised through a discharge resource consent subject to meeting these (or other) targets. Consequently, the presence of overflows should not be considered a constraint to growth.
- Liaise with Metrowater in respect of potential major growth areas, particularly if there is a change to the current growth model. Ideally, timing of development should reflect the timing of improvement works in relevant areas as far as is practicable.
- Require on-site stormwater detention tanks for intensification within areas serviced by the combined stormwater/wastewater areas that occurs prior to sewer separation/overflow mitigation works being undertaken
- Consider the extent and timing of development directly adjacent to major public watercourses where wastewater overflows discharge, due to amenity and public health issues.

Regional Conveyance/Treatment Capacity

- Provide high level plan/policy support for regional drainage infrastructure requirements as it is premature to include targeted provisions at this stage.

Water and Drainage Network Operation and Maintenance

- Continue with the development and implementation of PC90A or similar.

6. OUTSTANDING MATTERS:

Number	Item	Comment on Work Pending to Address this
1.	Develop criteria to assess when review of local wastewater capacity is required for resource consents for development	Review applicability of current process and revise as necessary.
2.	Map areas serviced by the combined network where stormwater detention is required on new developments to minimise additional overflows.	Review current practice. Areas of combined network are variable and difficult to determine due to complexities of the drainage network and inter-relationship between combined and separated network.

7. ISSUES AND SCOPE

7.1 *Issues*

Auckland City is serviced by an extensive wastewater drainage system that comprises a number of components including wastewater pipes owned and operated by individual property owners/occupiers, a local wastewater system owned and operated by Metrowater, a local combined stormwater/ wastewater system owned by Auckland City Council and operated by Metrowater, and a trunk wastewater network and treatment/disposal plant (Mangere) owned and operated by Watercare Services Limited. The treatment plant also services other councils in the Auckland Region.

In respect of the wastewater/combined network, the following issues may be relevant to the District Plan review and are assessed in this paper:

1. Dry Weather Wastewater Capacity – Is the capacity of the wastewater network sufficient to provide for future growth or is it a constraining factor to growth?

   Currently the local wastewater systems across the isthmus have sufficient capacity to accommodate dry weather wastewater flows (the flows that occur during dry weather with minimal ingress of water). However, with additional growth there is the potential for areas of the local network to reach capacity to the point where regular dry weather wastewater overflows may occur.

2. Wet weather overflows – is the presence of wet weather overflows, which may be exacerbated by additional growth, a factor that should constrain growth?

   The wastewater and combined systems (including Watercare Services) overflow some 3,000,000 cubic metres of stormwater/wastewater to streams and the harbour during wet weather on an annual basis due to excessive ingress of stormwater into these systems (this occurs by design in the combined system). While a 20 year programme of capital expenditure has been committed to under the LTCCP to reduce overflows within the local system (particularly from the combined system), additional growth through intensification in some areas will likely exacerbate existing overflows in the interim.

3. Regional conveyance and treatment issues – are there regional conveyance and treatment issues that should be provided for in the district plan?

   The Watercare trunk network, and major treatment plants in the region (Rosedale, Mangere) are also approaching their capacity. It is estimated that elements of the trunk pipe system will reach capacity by 2025 and the combined capacity of the treatment plants will be exceeded by 2030. Providing additional capacity to the trunk pipe system and treatment plants are major projects that require significant lead time and planning is well underway. There may be a role for the District Plan to support or facilitate the development of this essential infrastructure.

4. Operation and maintenance of stormwater/wastewater/water networks – what is the appropriate balance between enabling maintenance of these essential networks vs potential effects of this activity?

   Water, wastewater and stormwater systems are essential to the health and wellbeing of the community. However, their generally “below ground” location means that they are often afforded less protection in the District Plan from inappropriate development than above ground natural and physical elements. The extensive nature of drainage networks is such that there is inevitably conflict between essential maintenance and development work on the networks and public amenity and other values – particularly trees that are located in road reserves. An appropriate level of protection needs to be given to the drainage network to ensure that it can be adequately operated, maintained and developed to ensure that it continues to meet Auckland’s growing population. This may require an appropriate choice of tree type in flood prove areas to reduce leaf fall for example.

7.2 *Scope*

In respect of the four key issues identified above, the report will cover the following:

Issue 1:

- The extent of information on components of the local wastewater network that are currently known to be near capacity.
- A discussion of the potential implications of additional growth on dry weather performance.
- Potential implications for the District Plan.

Issue 2:

- An identification of the current level and location of overflows around the city.
- The level of information available to enable potential growth areas to be assessed in more detail.
- A discussion of the potential implications of additional growth in areas subject to wet weather overflows.
- Potential implications for the District Plan.

Issue 3:

- A discussion of the strategic Three Waters project, highlighting major infrastructure requirements – particularly in respect of drainage.
- An identification of the likely upgrade projects that will occur in Auckland.
- Potential District Plan options/implications.

Issue 4:

- A discussion on the conflicts between water and drainage networks and trees/above ground activities.
- General maintenance activities and requirements for the operation and development of the networks.
- Summarise the current framework, particularly Plan Change 90.
- Potential District Plan options and implications.

8. NARRATIVE:

8.1 General introduction to the wastewater combined system

Pipe Network

Wastewater is contaminated water arising from homes, commercial premises, such as offices or shops, and industry. For residential properties, the wastewater generally comes from toilets, baths, washing machines and dishwashers. Major contaminants in domestic wastewater are suspended solids, nutrients, organic material, bacteria and pathogenic micro-organisms. Wastewater from commercial premises and industries may additionally contain substances such as oils, grease, fats, metals and solvents.

The wastewater network in Auckland City is made up of three components:

i. Private pipes from private residences, and other buildings and facilities.

ii. Local pipes and other infrastructure owned by Auckland City Council (combined system – see below) and Metrowater (separate wastewater system).

iii. The trunk wastewater network owned by Watercare Services Limited (Watercare).

Metrowater's wastewater network (and Auckland City Council's combined network) receives wastewater from private pipe networks, which is then transported to the Mangere Wastewater Treatment Plant via Watercare's trunk wastewater network.

Around 40 properties in the city are not connected to the combined or wastewater network and have private septic tanks.

The wastewater network predominantly operates by gravity with the flow direction being toward low lying areas and the coastline. The main branch sewers, typically owned by Watercare, are therefore usually located in gullies or adjacent to natural watercourses. These flow to interceptors, which are the larger pipes that collect all flow for conveyance to the treatment plant.

There are approximately 1,440 km of Metrowater-owned wastewater pipes on the isthmus. Approximately 92% of the pipes are ceramic (vitreous clay). Watercare operates approximately 140 km of trunk network within the isthmus.

The Auckland City Council /Metrowater and Watercare pipe networks are shown in Figure 1.

Supporting Infrastructure

In addition to the pipe network there are a variety of infrastructure components that make up the wastewater network. Note that elements of this infrastructure are common to both the separated system and the combined system discussed below. A more detailed description of this infrastructure is provided in Auckland City Council's and Metrowater's AMPs [Ref 1 and 2]

- Pump stations: pump wastewater from low-lying areas through rising mains to elevations where gravity can convey the flow. There are 110 wastewater pump stations in Auckland City (83 in Metrowater's wastewater system, and 27 in the Watercare trunk system), and two leachate pump stations (each serving an old landfill). Each pump station has capacity for at least four hours storage at average dry-weather flow, calculated on maximum probable development in its catchment. In the event of an extended loss of power, Metrowater has a stand-by generator that can access about 70 of the 83 pump stations. Flows to the remainder can be managed by suction-trucks.
- Rising mains: tend to serve small number of properties by conveying wastewater from low-lying or isolated pockets of the city not served by a public gravity sewer system. There are only 15km of rising mains in the city.
- Manholes and lampholes: provide maintenance and inspection access to pipelines. Manholes are chambers that are big enough to allow a person access to the pipeline. Lampholes enable inspection and maintenance equipment from ground level. Metrowater has 32,629 manholes and 1,739 lampholes on the wastewater network.
- Terminal vents: vents prevent the build up of dangerous gases such as methane in the wastewater system. Metrowater has 294 terminal vents across the network.
- Drainage connections: every property connected to the Metrowater wastewater network has a drainage connection, a pipe connecting it to the gravity wastewater pipe. Although the property owner usually owns the drainage connection to their property, historical anomalies mean that Metrowater own 31 connections.

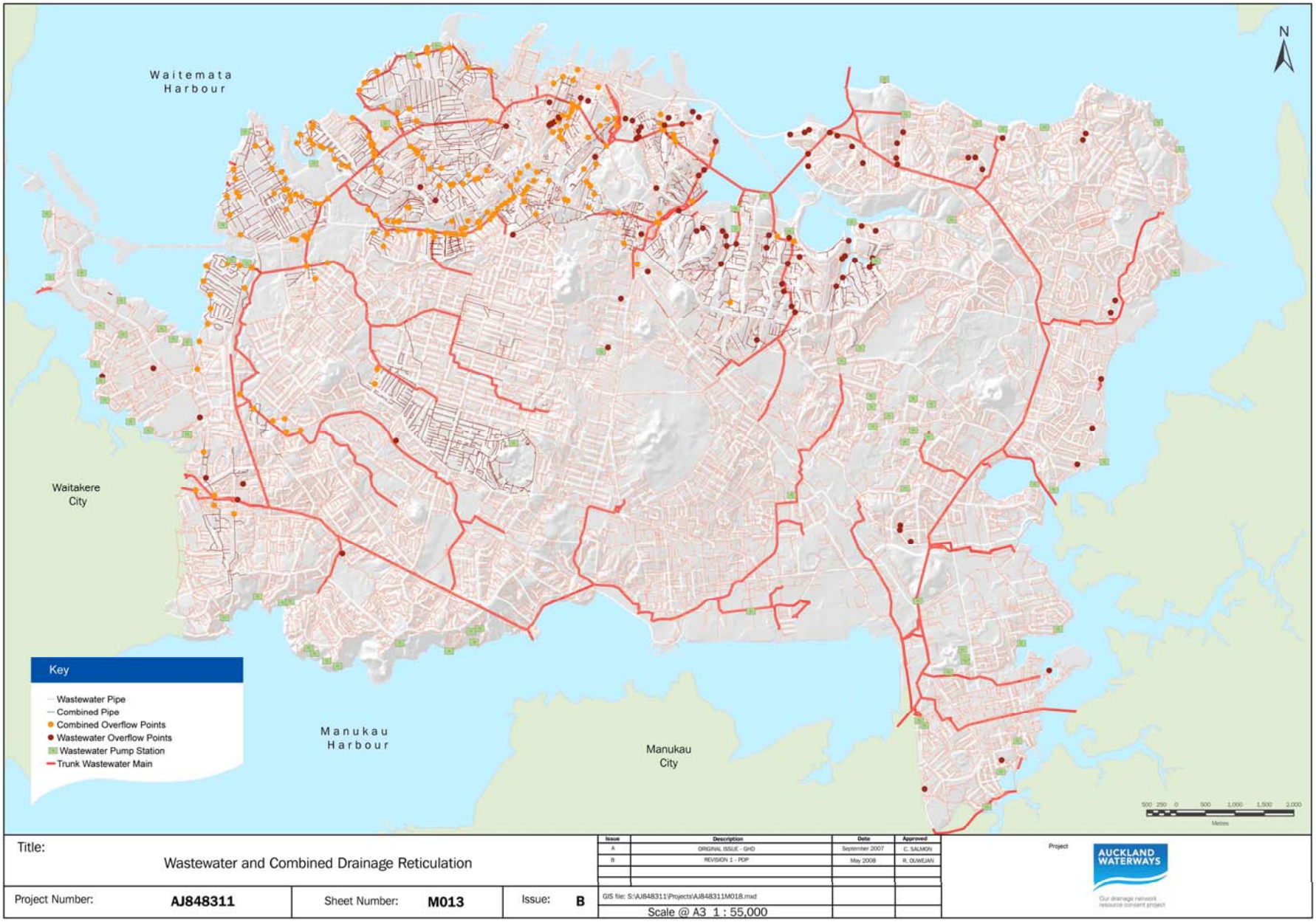

Figure 1: Auckland City Council and Metrowater wastewater, combined network and overflow points and Watercare trunk network

- Pipe bridges: most of Metrowater's pipe network is underground, but a small number of above-ground gravity pipes and rising mains span watercourses or small divides. Pipe bridges are dedicated bridges that support these. Metrowater has 101 pipe bridges totalling 4.4km in length
- Overflow screens: provide a practical means of reducing solids in wastewater overflows from being discharged into the receiving environment. Metrowater has three overflows screens in service at Wellington Street, Auckland Central; Taniwha Street, Glen Innes; and Concord Place, Glen Innes.
- Siphons: are where pipes are designed to go under other objects such as stormwater pipes, railway lines, creeks and rivers. Metrowater has seven siphons across the city.
- Wastewater tunnels: are where wastewater pipes are laid in the bottom of tunnels that are created specifically to contain wastewater pipes. These tunnels are generally at depths greater than five metres, and the tunnels / voids between the pipe and the excavation for the tunnel are not backfilled to allow access for maintenance. Metrowater has six tunnels in use.

Wastewater Overflows

Wastewater overflows are a significant aspect of the wastewater and combined network drainage system and potential adverse effects on the environment and public health in particular. Wastewater overflows occur when a component of the wastewater system does not have the capacity to contain the wastewater flows. This can occur for a range of reasons including:

- Growth and development results in pipe capacity being exceeded.
- Blockages in the network, for example, tree roots or fatty deposits or local pipe collapse.
- Breakdown at a pump station or another failure of the system.
- Infiltration, where rainwater and groundwater seeps into the system through cracked pipes and joints. The rate of infiltration increases immediately after rain and can remain high for a number of days. Infiltration is also higher in winter due to increased groundwater levels and moisture in the soil.
- Inflow, where stormwater and surface water enters the sewer directly. This is usually through roofs and paved areas that are illegally connected to the wastewater system or local flooding into low-lying gully traps. Inflow occurs quickly after the start of rain but tends to subside within hours following the event.

The first three: insufficient pipe capacity, blockages and breakdowns often result in what is termed dry weather overflows. That is overflows that occur in dry weather without the additional contribution of stormwater.

The Metrowater wastewater system is designed, operated and maintained to minimise the likelihood of dry weather overflows occurring. This includes the implementation of a "Dry Weather Overflow Abatement Strategy" that identifies common and repetitive dry weather overflow problems and proactive maintenance requirements to minimise their occurrence.

Infiltration and inflow generally result in wet weather overflows, or overflows that occur during rainfall events. As drainage systems become "leaky" over time through cross connections and pipe deterioration, there is always a risk of an extreme event occurring that contributes stormwater to an extent that exceeds the system's capacity. Such overflows occur as follows:

Designed system relief overflows

Designed overflows are structures that operate as relief or safety valves to relieve the pressure and allow excess stormwater and wastewater to overflow at planned locations, usually to the nearest watercourse or stormwater drain. Designed overflows are an essential component of the wastewater system and protect public health by preventing wastewater or combined stormwater and wastewater from backing up into homes and businesses for any of the causes outlined above. Damage to the drainage system is also prevented by designed overflows and as a result, purpose-built overflow points are often located near pump stations or critical areas of the network. Designed overflow points and volumes from both the local wastewater system and the combined system are shown in Figure 2.

Pump station and emergency overflows

Overflows at wastewater or combined wastewater pump stations are rare in Auckland City, but potentially can occur during times of heavy rainfall when the pump station is operating normally but the capacity of the pumps and the emergency storage are exceeded. Overflows can also be caused by a blockage, or in an emergency situation in which there is equipment failure, such as pump failure or loss of electricity. As they are incident related, the exact location, severity and occurrences of these cannot be predicted.

Pump stations are generally designed to be able to store wastewater for at least four hours at average dry weather flow to provide for temporary power loss, have telemetered alarms and in addition critical pump stations have back up power supplies to minimise disruption to wastewater flows.

Uncontrolled overflows

Uncontrolled overflows occur when purpose built overflow points are not available on either the separate and combined wastewater networks and the flows exceed the system capacity causing excessive surcharging of the pipes. They may occur during extreme rainfall events through manholes or into pump stations. As the location of this type of overflow is unpredictable, it can be damaging to the environment and can also flow overland and flood property and roads causing public health risks.

Combined Stormwater and Wastewater System

The older parts of the city were and still are to some extent served by a combined stormwater and wastewater system. In this system wastewater and stormwater are carried in the same pipe. In dry weather the pipe capacity is sufficient to ensure all wastewater is conveyed to the Mangere treatment plant. Similarly, in light rain both wastewater and stormwater are conveyed to the treatment plant.

However, heavy rain generates more stormwater than the combined pipe can convey and when this occurs the combined system overflows releasing a mixture of stormwater and wastewater to streams and the coast. While the proportion of wastewater in the combined flow varies depending on the rainfall intensity, the nature of the overflow structure and pipe network, it generally comprises less than 10 % of the total overflow volume and may be a little as 1 % of the volume in large overflows.

It is noted that Auckland City Council administers five public watercourses – the Oakley, Meola and Motions Creeks and the Newmarket and Remuera streams. Control of the watercourses was transferred to Auckland City Council (from the ARC) as a result of the Local Government Reorganisation Order 1989. It is understood that these streams were administered by the ARC and hence Auckland City Council as a result of the significant drainage issues present, and in particular the extent of combined sewer overflows into these watercourses. As such, these watercourses in particular receive significant volumes of overflows from the combined sewer system.

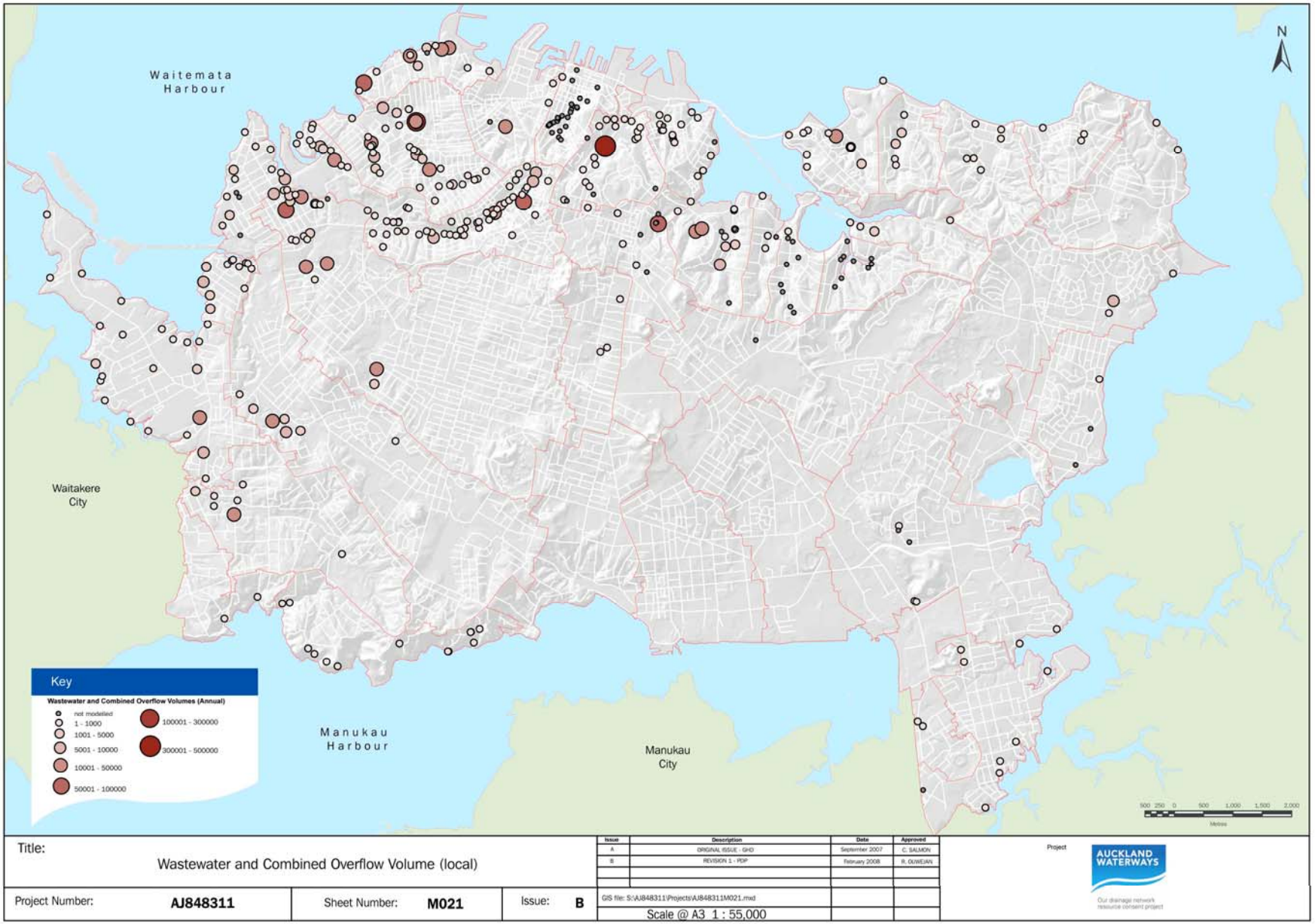

Figure 2: Overflow locations and volumes

Overall, there is approximately 300 km of combined system pipes remaining in the city. These are predominantly located in the catchments from the Central Business District through to Point Chevalier. Figure 1 shows the extent of the combined stormwater and wastewater network.

As for the wastewater system, the combined system has designed overflow relief points to enable excess flows to be discharged with minimal nuisance and risk to public health. There are currently 227 overflow points in the combined system, although this figure is continually reducing as separation and other work is undertaken.

Watercare Trunk Network

The wastewater and combined networks predominantly operate by gravity, with the flow direction being toward low lying areas and the coastline where it is collected by the Watercare trunk system. The main branch sewers, typically owned by Watercare, are therefore usually located in gullies along side natural watercourses. These flow to interceptors, which are larger pipes that collect all flow for conveyance to the treatment plant. Within Auckland City the main interceptors are:

- The Orakei Main Interceptor. This flows from approximately the Oakley Catchment in the west through the CBD to Okahu Bay in the east. This interceptor services a mix of combined and separated areas.
- The Eastern Interceptor. This begins at Okahu Bay, collecting flow from the Orakei Main via a large pump station and flow through Glen Innes, Panmure and Otahuhu before passing into Manukau City and continuing to the treatment plant at Mangere. This interceptor services separate areas including large areas of Manuaku City.
- The Western Interceptor – which flows from Waitakere City through suburbs including Mt Roskill and Hillsborough before passing under the Manukau Harbour to the treatment plant. This interceptor services separate areas including all of Waitakere City.

Despite the different ownership of the separate, combined and trunk networks, the system operates in an integrated manner. High flows derived from the local system, particularly the combined areas, can cause capacity issues in the trunk system. Conversely, capacity constraints in the trunk system can mean that local wastewater flows are unable to enter the trunk system causing flows to back up and overflow.

In combined areas, flows are throttled at various points throughout the system by an abrupt decrease in pipe diameter. These are often at entry points to the trunk system as a means of limiting flows from any given catchment. While this has the benefit of preserving some capacity for downstream catchments within the trunk system, it causes local overflows at this point.

It is noted that Watercare have a contract with Metrowater that provides for a connection to the trunk system that allows up to 900 l/person/day in the contributing catchment and the throttles are set at the appropriate level at each connection point. Accordingly, in principle, Watercare's contract implies that it will provide sufficient capacity to cater for Metrowater's growth requirements. However, it is understood that the Metrowater wastewater pipes are generally larger in diameter than the Watercare connection (150 dia) to the main trunk so trunk capacity is more likely to be a limiting factor for growth than capacity in the local network.

Overflows resulting from surcharging of the Watercare system are not confined to any one part of the city. However, the worst affected sections are to the north and west of the city from Pt Chevalier, through Herne Bay and the CBD, to Remuera largely due to flows from the Auckland City Council combined system.

As for Auckland City Council and Metrowater's wastewater and combined system, the Watercare system also contains constructed overflow points; particularly where there are throttle points in the combined part of the system. Where these overflows are not located close to a suitable discharge location they are usually directed into the Auckland City Council stormwater network. In these cases, the stormwater discharging from a stormwater outfall would include wastewater from the Watercare system, and potentially, the local wastewater system as well. These are mainly located in, but not confined to, the north and west of the city.

In the areas where there is a separate wastewater system, there are typically no designed throttle points. However, excess flows and surcharging can still occur in heavy rain events although typically not to the same extent as the combined system.

In summary, due to the nature of the wastewater system in Auckland City there is a significant interaction between the local wastewater and combined system and the Watercare trunk network. This is particularly so in the combined areas of Auckland City, due to the high volumes of stormwater/wastewater generated within this system.

As such, improvements undertaken within the local system may result in significant benefits to the performance of the trunk network. For example, the separation of the combined network will result in a significant reduction in flows to the trunk network, which may provide benefits in respect of the wet weather performance of this network, not only in the catchment where work is being undertaken, but also potentially in downstream catchments. The converse also holds in that significant upgrades of the trunk system may provide opportunities to resolve performance issues within the local network, by providing greater trunk capacity to contain flows.

Accordingly, Auckland City, Metrowater and Watercare are undertaking joint studies and initiatives to develop options and solutions that represent the best overall benefit to the city and region.

9. Narrative Issue 1 – Dry Weather Capacity of Wastewater System

9.1 *Introduction/Background/Prior Work*

When it is designed and constructed, a wastewater system is sized to accommodate wastewater from its contributing catchment – generally on the basis of population. The wastewater system is designed with sufficient capacity to accommodate peak flows with extra capacity to cater for growth and a component of inevitable stormwater/groundwater ingress.

The significant majority of the wastewater system servicing the city is more than 40 years old. Despite the additional capacity that was initially built into the system, there are components of the local wastewater network where the sewers are approaching capacity. The implication of limited capacity for dry weather flows is that overflows will start to occur on a regular basis during the normal operation of the system. That is, the system simply cannot accommodate peak wastewater flows (typically morning and evening) and will overflow on a daily basis.

Dry weather overflows constitute primarily undiluted wastewater and, while it depends significantly on the receiving environment, such overflows can have significant adverse effects on small streams and human health. Occasional dry weather overflows, as a result of local blockages/system failures etc, are inevitable and have to be managed through appropriate response. However, regular dry weather overflows as a result of insufficient capacity are not considered acceptable due to public health and environmental effects and are not likely to be authorised through the network consents.

Accordingly, in response to growth, and network degradation, Metrowater has an ongoing programme of upgrades and renewals to ensure that sufficient dry weather capacity is available within the network – regular dry weather overflows as a result of inadequate pipe capacity is not considered acceptable. To assist in ongoing identification of problem areas, Metrowater has modelled the performance of the wastewater network to identify components of the network that are at or near capacity for future peak

dry weather flows. Watercare has undertaken a similar assessment in respect of the trunk network. For example Project Hobson, the undergrounding of the Hobson Bay sewer line, was in part driven by the need to provide greater capacity in the trunk system and the 3 Waters project is also looking at capacity issues (see below).

9.2 *Status Quo Situation*

Currently, Metrowater manages its network to minimise the occurrence of dry weather overflows. This includes proactive maintenance to minimise blockages and obstructions to programmed upgrades to increase pipe capacity to cater for current and future flow requirements.

Advice from Metrowater indicates that there are few capacity issues within the local network. Those that exist are relatively localised to particular pipes or sections of pipe within some catchments. The only significant area where pipe capacity has been identified as a significant potential future issue is the CBD, where large new buildings and apartments can put significant additional stress on existing pipes. To address this, Metrowater and Watercare are undertaking a joint study to identify capacity issues and requirements to enable upgrade works to be programmed. However, other than the CBD, there are no major known capacity issues that may affect the implementation of growth.

In addition, Metrowater is continually reviewing its forward works programme to assess requirements for renewals and replacements as growth occurs. Metrowater has forecast a 20 year capital expenditure of $131 million to provide infrastructure capacity to prevent uncontrolled overflows downstream of growth areas, $104 million for wastewater renewals and dry weather overflow mitigation and $36 million for other growth related expenditure [Ref 2]. In this regard, it is noted that Metrowater has apportioned growth at 73% within identified growth areas and 27% within general areas.

It is also noted that new connections to the Metrowater network are subject to a network upgrade change (NUC). This charge is a growth related contribution to the capital cost of providing increased capacity in the wastewater network.

Currently Metrowater assesses consents for new developments on a case-by-case basis to determine whether there are localised capacity issues that need to be addressed.

Metrowater advise that the major issue in respect of wastewater capacity lies within the Watercare trunk network, where projections suggest that dry weather flows will exceed network capacity by 2025 for the Orakei Main sewer and by 2040 for the eastern and western interceptor (and siphon under the Manukau Harbour) [Ref 3]. This identified lack of capacity was in part a driver for the Regional 3 Waters project (see Section 11 below).

It should be noted that the trunk capacity issues are not simply related to Auckland City, but to the wider regional growth in the areas that Watercare service. For example, Watercare collects wastewater from Waitakere City and transports it across Auckland City via the western interceptor and the Orakei main trunk/eastern interceptor. Therefore any increase in flows as a result of growth in Waitakere, and other areas, materially affects performance and capacity within the trunk system over much of Auckland City.

In the meantime upgrades are underway on the Metrowater infrastructure in parts of the isthmus but the nature of funding means that they have been prioritised and in some localised areas where upgrades are not programmed for some while there still may be occasional reports of problems. These are exacerbated where the areas have been locations for ad hoc intensification by the market..

9.3 *Further Information/Details*

- The ICS project has provided indicative maps of wastewater pipe capacity (% full under peak flow conditions). These are available from Metrowater, although they should only be considered as indicative.
- The 3 Waters reports provide more detailed discussion on wastewater trunk capacity (see Section 11).

9.4 *District Plan Options*

There are three main options for managing this issue through the isthmus district plan:

1. Constrain growth in areas where local capacity is known to be an issue.

   Under this option, local capacity issues are an influencing factor as to whether growth should occur in a particular area. Once potential areas are identified, consideration of the wastewater capacity can then be undertaken to determine whether local constraints exist. If sufficient constraints exist then growth in this area is timed to occur subsequent to pipe upgrade works[1].

   The benefits of this option are that it will reduce the potential for regular dry weather overflows to develop by ensuring that growth does not outstrip wastewater network capacity in identified growth areas. This is a conservative approach which will ensure compliance with network resource consents.

   The drawback of this approach is that, other than the CBD, there are no significant areas that have been identified where capacity is an issue and, if there were, they would be targeted for upgrading by Metrowater. While some localised capacity issues exist, these are typically associated with individual pipes that may service only a few houses etc.

   The wider issues pertaining to trunk system capacity are discussed below. However, this is a regional issue and as such constraining growth within the Auckland City isthmus may not address the issue.

2. Do not make wastewater capacity a factor to constrain growth areas on the basis that additional capacity will be provided by Metrowater as part of their capital works programme as and when required.

   The benefits of this option are that areas of growth can be determined by other constraints, reducing the factors for consideration and is consistent with the general approach within the current LTCCP – that is, to provide infrastructure where growth is preferred as opposed to growth being infrastructure led. This approach is consistent with the current situation and Metrowater's expectations.

   The drawback of this approach is that it assumes that all necessary infrastructure works can be provided in time to meet growth needs. To achieve this requires significant detailed planning, good linkages into the setting of priorities for Metrowater and sufficient funding to enable works to occur. Should the current growth model be significantly amended, then wastewater planning and priorities may need to be revised to meet new requirements. Given the lead time to plan, design consent and implement improvements changes cannot occur rapidly If necessary upgrade works are not be able to be implemented in accordance with the timing of growth, then this option provides a greater risk of regular dry weather overflows.

[1] Note that the pipe capacity constraints are highly localised and it is impractical to provide a city-wide picture of under-capacity pipes

3. Allow growth as in Option 2 above, but make wastewater capacity a matter for consideration for developments over a certain size/intensity.

   This option has the benefit that it does not provide a blanket constraint on growth but instead enables assessments to be made at the development scale, which is consistent with the scale of any capacity or loading constraints. The opportunity to look at localised constraints such as the existence of dry weather overflows or significant wet weather overflows within the vicinity of the development is essential. Options to mitigate capacity constraints such as private storage, could be considered as part of this assessment.

   Changes in types of activity are also matters that should be considered as there are different types of loads on the wastewater system created by residential activity as opposed to business activity. Critical to this is activity that increases day loads. Mixed Use areas where there is little difference in the day and night population may have different characteristics than day time business activity and 24/7 industry may have different characteristics again. The consideration of these aspects of development will impact on whether changes in zoning and activity are appropriate in certain locations.

   The main drawbacks to this approach are that:

   - It does not provide certainty, in that an additional process will need to be undertaken for each proposal;
   - Capacity will decrease over time as growth occurs, penalising later developments;
   - Criteria will be required to assess at what point an assessment is required; and
   - There will need to be some consideration given to the situation where capacity constraints occur – eg does the developer undertake upgrades as necessary in addition to a NUC, does Metrowater initiate upgrades and growth in the area is halted until this is completed? In some instances, upgrades may be within the scope of what a developer could undertake; however, in other circumstances the scale or location of necessary upgrades (which may be downstream of the subject site) may be outside of the scope of what a developer would be reasonably expected to undertake.

9.5 *Discussion*

Managing dry weather overflows is a critical aspect of growth. Regular dry weather overflows are not considered acceptable and growth should be managed to avoid this occurring.

It should be recognised that managing a wastewater network is a complex process that balances network performance and levels of service against upgrade needs, priorities and cost. Key to any consideration of the best option for managing growth in respect of dry weather wastewater capacity issues is the level and detail of information available to identify potential areas of significant growth, the locations where capacity problems exist and the extent to which Metrowater's upgrade programme addresses (or will address) such capacity issues.

From the advice provided by Metrowater, the following conclusions are reached:

1. There are no major areas where significant dry weather capacity issues exist, with the exception of the CBD. A joint project has been established with Watercare to assess the current and future requirements within the CBD.
2. There are localised areas where specific pipes may be at or near capacity. General intensification and/or land use change should consider local network issues as part of that process as is currently undertaken.

3. Capacity should be growth led, rather than the other way around. That is, Metrowater's forward work programme reflects and responds to growth requirements. Should the growth model change, then this may result in a review of priorities and programmed works.

4. Major regional capacity problems exist in the Watercare trunk network. These are being assessed as part of the 3 Waters project.

9.6 *Outstanding Matters/Additional Research*

If Option 1 is selected then detailed information will be required to support constraints. If Option 3 is selected, consideration will need to be given to criteria to define when development is significant enough to warrant site specific capacity assessments.

9.7 *Interim Conclusions [District Plan Implications]*

Option 3, allowing growth with a trigger for an assessment of the wastewater capacity issues for certain types/sizes of development, is considered to provide the best outcome based on the current level of information that is available on network constraints.

It should be recognised that a "case-by-case" assessment may be problematic for some developers and give rise to debates regarding who should fund upgrades should constraints be identified. However, it is also noted that this is essentially the status quo.

Either option requires continued integration with Metrowater's upgrade programme to ensure that growth priorities and upgrade works are aligned.

10. NARRATIVE: Issue 2 – Wet Weather Overflow Performance

10.1 *Introduction/Background/Prior Work*

As discussed previously, wet weather overflows occur as a result of excessive volumes of stormwater entering the wastewater and combined system – either as a result of cracks/cross connections (wastewater system) or by design (combined system).

The wet weather performance of the wastewater and combined system was the focus of significant studies undertaken through the ICS. Studies included the monitoring of overflow performance, the development of catchment models to model overflow performance in both systems [summarised in ICS Drainage System Reports - Ref 3], and to predict the effect that overflows have on water quality at the city's bathing beaches [Ref 4].

Studies were also undertaken at general level (Medium Level Options Assessment) and in some instances a detailed level (Detailed Options Assessment) to develop an understanding of the potential options to reduce overflow volumes and frequencies to specific levels of performance and the costs of doing so. This work was used in the Drainage Strategic Review, which in turn formed part of Auckland City Council's Water and Sanitary Services Assessment and LTCCP to confirm performance and expenditure levels for managing wet weather wastewater overflows.

10.2 *Status Quo Situation*

Overflow Volumes and Frequencies

It is estimated that approximately 3,000,000 cubic metres of stormwater/wastewater overflows from the wastewater and combined systems in Auckland City (including the Watercare network), of which approximately 1,800,000 cubic metres is estimated to discharge from the Auckland City Council/Metrowater system. Of this total volume of overflow, more than two thirds occurs from four catchments – Stanley Street, Motions, Grey Lynn and Herne Bay, with the Watercare overflow into Meola Creek being the largest single overflow (Figures 3 and 4).

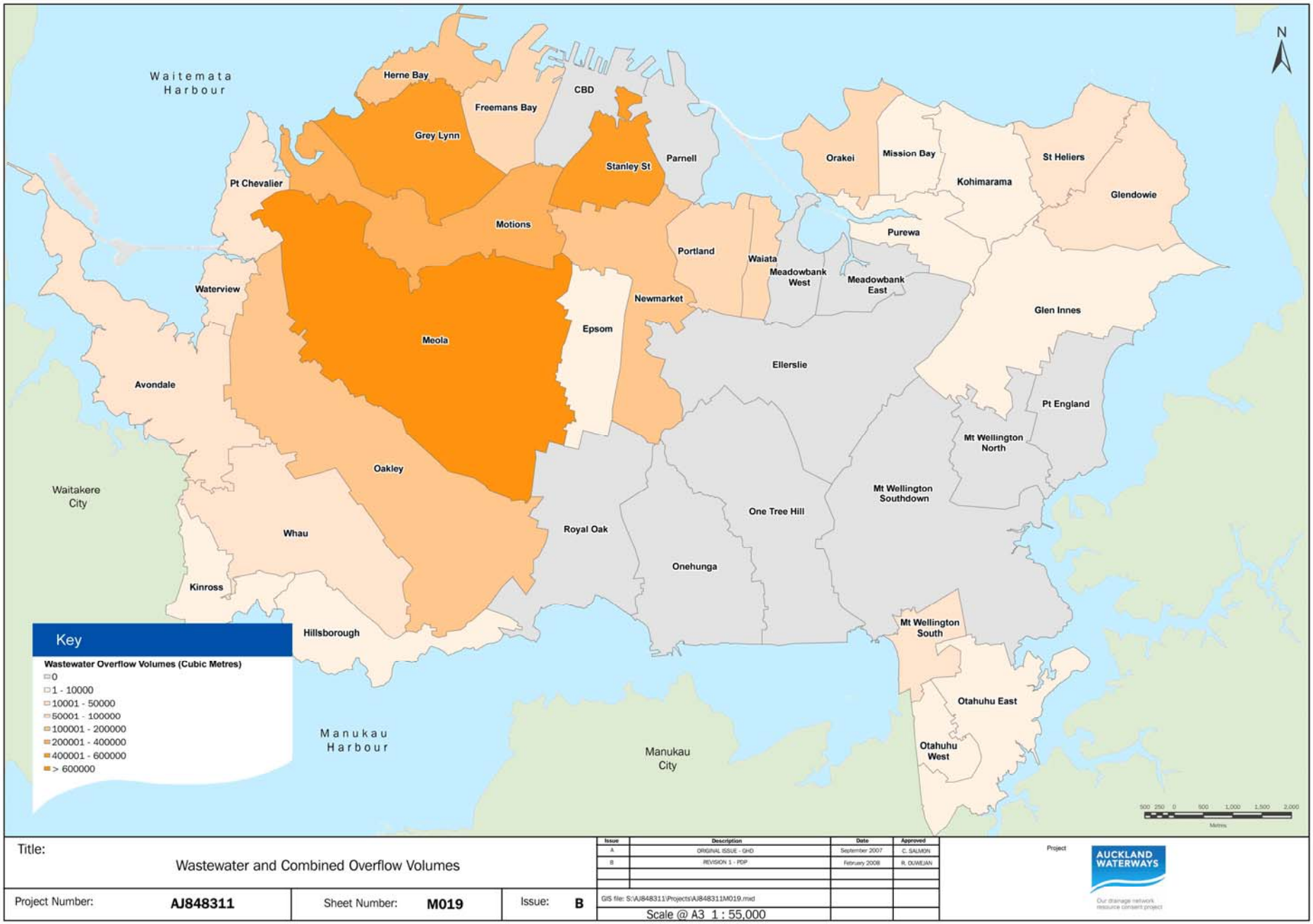

Figure 3: Overflow volumes across the city

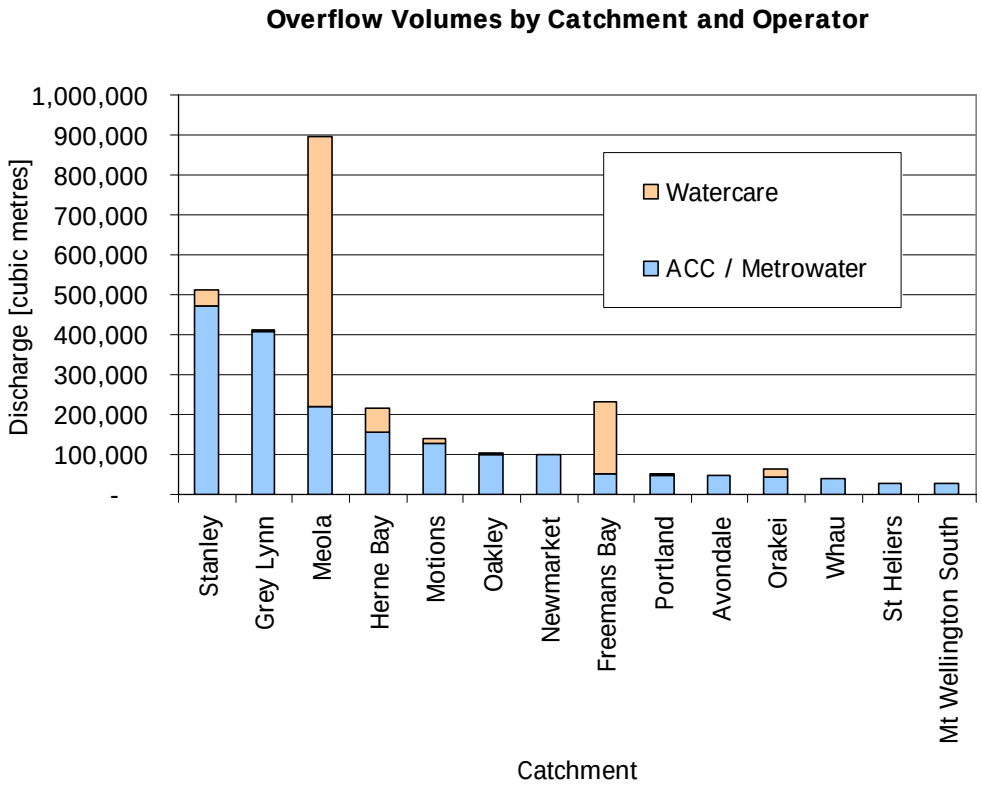

Figure 4: Overflow volumes across the city (14 largest)

It is important to recognise that this volume is the total volume of overflow, including the stormwater component. As wet weather overflows have a high component of stormwater (particularly in the combined system where the significant overflow volumes occur), the volume of wastewater is a relatively small proportion of the total overflow volume – less than 10 %. Not surprisingly, the high volume overflows are located in the areas that are serviced by the combined system.

In addition to overflow volumes, the frequency of overflow events – that is, how often they occur – is also a relevant factor. In parts of the combined areas, the system overflows in low to moderate rain and overflow frequencies can be more than 100 times per year. In the separated system, which is generally designed not to overflow, frequencies are typically significantly less – in the order of a few times per year.

Adverse Effects

Wastewater and combined overflows can give rise to a number of adverse effects as follows:

- Public health effects in areas with high public contact potential – for example stream reaches and bathing beaches affected by overflows
- Public health and amenity effects on local landowners;
- Stream water quality and effects on ecosystems;
- Cultural and social effects associated with the discharge of wastewater to the natural environment.

As indicated previously, the five public watercourses –Oakley, Meola and Motions Creeks and the Newmarket and Remuera streams receive significant volumes of overflows from the combined sewer

system. While a significant programme of overflow reduction is planned to address these overflows, it will be some 13 years before this work is complete (see below).

In respect of bathing beaches, modelling work has been undertaken to estimate the potential effects of wet weather overflows on bathing beach water quality [Ref 5] and regular monitoring of beach water quality is undertaken as part of the Safeswim programme [Ref 6].

The results from the weekly Safeswim programme, and previous monitoring undertaken by the ARC, indicates that bathing beach water quality is good across the city except in times of, or immediately following, periods of heavy rain (Figure 5) with few exceedences of public health guidelines during the summer period. However computer modelling suggests that the actual number of exceedences of the guidelines is greater when water quality is assessed on a daily (rather than weekly) basis. In this regard, it should be noted that bathing beach water quality is also affected by stormwater derived bacteria and for some beaches, stormwater alone is sufficient to cause public health guidelines to be exceeded.

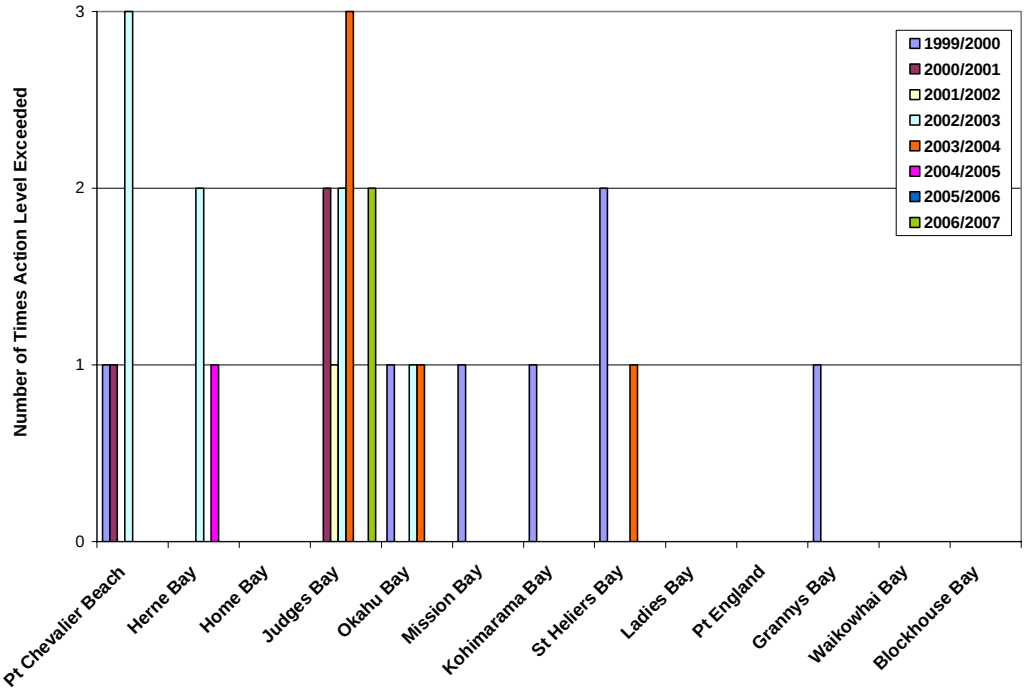

Figure 5: Bathing Beach Public Health Exceedences 1999 to 2007

10.3 *Future Issues*

Growth

Growth has the potential to increase the volumes of wet weather overflows. This is a result of increased wastewater flows, but more significantly, as a result of increased impervious surfaces and hence stormwater runoff that may enter the stormwater network and add to the overflow volumes. This is particularly the case in the combined areas where stormwater is directed into the combined system.

Growth also has the potential to increase the number of people living and working and visiting land in close proximity to overflows, particularly the public watercourses which travel through large lengths of public reserves.

Improving Performance

Despite the significant growth that has occurred, Auckland City Council and Metrowater have been working to reduce overflow volumes. In the 2000 strategic plan, a target of reducing overflows by half by 2005 was established and subsequently met.

This process of establishing overflow reduction targets continued as part of Auckland City's 2006/07 LTCCP. This involved the development of a Drainage Strategic Plan, which summarised the results of the ICS and developed a range of overflow reduction scenarios (volume and overflow frequency targets) and associated costs. The scenarios covered a range of possible future levels of performance, with an emphasis on protecting public health at bathing beaches and areas of high recreational use in the marine environment.

It should be noted that the costs of reducing sewer overflow volumes and frequencies is significant – in the order of $ 500 to 1,000 million. In some instances the scenarios represented a different timeframe (and hence expenditure profile) over which the future levels of performance are met.

This information was then used in the Council's Water and Sanitary Services Assessment (WASSA) [Ref 7] and LTCCP to consult with the public and establish wastewater overflow objectives that were subsequently included into Metrowater's Statement of Corporate Intent.

As a result of this process, the key overflow targets that have been adopted are as follows:

- Reduce combined sewer overflows by 35% by 2012;
- Eliminate combined sewer overflows by 2021;
- Meet specific overflow frequency targets of 1,:2 and12 overflows per annum by 2033 for respective areas of the isthmus as shown in Figure 6.

In respect of the frequency targets, lower levels of performance (up to 12 overflows per year) have been established for the Whau/Waterview catchments. This is on the basis of a lower level of public contact activities in the marine receiving environments in these areas and the cost of meeting higher performance levels.

It is noted that the Auckland Regional Plan: Coastal – Proposed Variation 1, provides a guideline of two overflows a year resulting in an exceedance of MfE/MoH water quality guidelines at designated bathing beaches. However, this is only a starting point for a "best practicable option" (BPO) assessment and it is considered that achieving a very high level of performance on the eastern beaches is a better investment due to the high level of public use and contact recreation that occurs in these areas. This is considered the best overall outcome for the funding that is available.

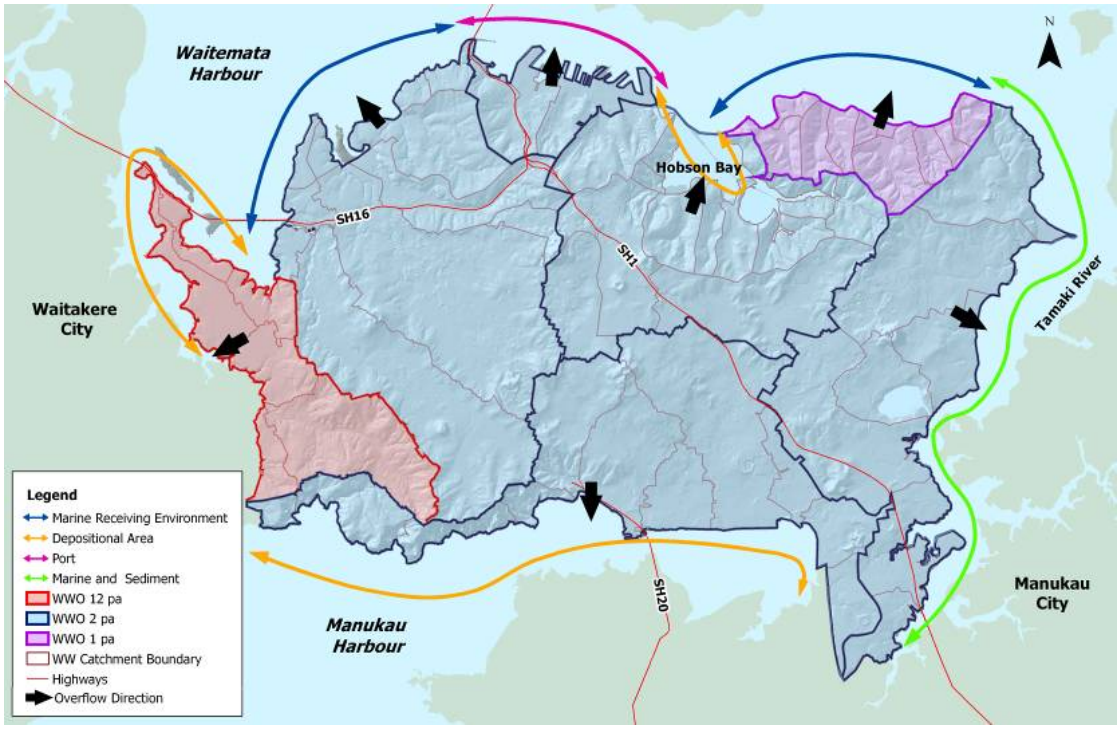

Figure 6: Overflow Frequency Targets Auckland City Council LTCCP

Network Resource Consents

Resource consent applications, called the Drainage Network Consents, were applied for in 2001 and are currently on hold pending the provision of further information in respect of network performance and adverse effects. It is anticipated that this information will be provided to the ARC in mid 2008 to enable the consents to be notified.

The overflow reduction scenario and frequency targets described above provide the basis of the wastewater component of these consents. It is anticipated that the discharges from the city's drainage network will be authorised in accordance with these, or similar, performance targets in accordance with the BPO approach required by the relevant regional plans.

Implications for the District Plan

In broad terms, there are two competing "effects". Growth through intensification under the District Plan will exacerbate existing overflows and may increase the population in close proximity to the overflow. At the same time, however, improvement works will significantly reduce overflow volumes and frequency over time and reduce associated adverse effects.

Overall, the timetable and cost for reducing overflows to the specified LTCCP targets take account of increases brought about by growth. Ultimately these targets will be authorised through the network consent project – Council will hold resource consents for the discharges, both existing and future, subject to appropriate levels of performance and associated timeframes[2]. That is, the overflows will be authorised under the RMA, subject to a range of conditions. Only if growth occurs in a manner that is significantly different to that identified through the consent applications and which results in significant changes to the discharges (both stormwater and overflows), will the network consents be invalidated. Should this

[2] Note that the actual targets and timeframes may change through the consent process. However, given that it is proposed to improve the performance of the system over time, it is reasonable to assume that similar targets and timeframes will ultimately be determined through this process.

circumstance arise, then it is likely that the consent will be varied to make it consistent with the actual development/discharges that occur. In this regard, it is noted that growth will actually occur as a result of market forces, which may be different from anticipated growth areas.

In the intervening period there are likely to be localised areas where overflows are potentially exacerbated as growth occurs in advance of improvement works occurring in that area – despite an overall reduction in the volume and frequency of overflows city-wide. This is most likely to be the case where intensification occurs in areas that are serviced by the combined system, particularly those areas where solutions are dependent on the regional solutions outlined above – which will potentially occur over a longer timeframe. However, it is noted that in these instances, the provision of private stormwater detention tanks can minimise the increase in overflows by retaining stormwater and discharging it over a period of time.

Given the scale of the overflows that already occur in the combined areas, any increases in overflow volumes are likely to be small in the comparison and are unlikely to result in a measurable change to existing adverse effects. That said, there are members of the community who will focus on overflows as a reason to oppose further intensification and growth in specific areas.

It should also be noted that it is anticipated that this situation will be provided for in the network consents – that is, the consents will authorise short to medium term minor increases in overflow volumes in some areas, subject to meeting the overall improvement levels.

A related issue is the development of land in areas adjacent to streams that are affected by significant overflows – essentially the public watercourses – and the potential public health and amenity effects associated with overflow events. This may include private land bordering streams, schools and possible park amenity developments such as walkways. As a result, consideration should also be given to the timing of growth and development adjacent to the public watercourses.

10.4 *District Plan Options*

Plan options include:

1. Allow growth irrespective of wastewater/combined overflows on the basis that discharges are (or will be) authorised and there is an overall net improvement in accordance with agreed timeframes and criteria.

   The benefits of this approach are that growth is enabled in accordance with existing undertakings (or future changes) and the level of discharges will be consented, so that Council will be acting in compliance with its resource consents. Overall environmental performance will increase despite growth.

   The drawback of this approach is that, unless otherwise mitigated, overflows will increase where growth occurs in advance of network upgrades. While this is likely to be in accordance with network resource consents, this was one of the areas in the previous district plan review process where local submitters highlighted overflow problems which caused council some concerns. In addition, as a result of the district plan review if growth should occur in a manner that is substantially different to that provided for in the network consents, a review of the resource consents will be necessary to ensure compliance.

2. Delay growth in all areas until relevant LTCCP overflow targets are met. That is, consider wet weather overflows an absolute constraint to growth.

   The benefit of this approach is that it provides the most benefit from the perspective of the natural environment in that overflows will not increase in response to growth.

The major drawback is that commitments have already been given in Auckland City Council signing up to the regional growth strategy through the central sector agreement and the LGAAA changes to the district plan introduced in 2005. Also, the existing district plan already allows a level of development that will be able to be utilised until the proposed plan has greater weight.

This option may also not be defensible where council has obtained resource consents to discharge wastewater overflows in accordance with growth/upgrade programme – that is, there is no legal basis by which to delay growth as the adverse effects are anticipated and provided for under the network consents.

3. Time growth in combined areas consistent with the timing of improvement works. Clearly, the major issue associated with wet weather overflows lies in the combined sewer areas and the issues/benefits are more significant in these areas.

   In respect of benefits, to some extent this option is essentially the status quo, with the existing provisions in the district plan. Appendix 12 and the priority/timing of growth nodes to some extent reflects the timing on which it is expected that infrastructure will be in place and growth able to be provided for in the form of the Residential 8 zone. For example, priority 2 growth areas are identified in catchment such as Motions, Meola and Grey Lynn where combined overflow volumes are significant.

   However, the drawbacks of this approach are that there are still some growth nodes that occur in areas with combined overflows (such as Newmarket and Whau) and that this approach is reliant on timing of improvements being consistent with the timeframe for growth to occur.

   In addition, the growth areas represent areas where significant change is likely to occur. General intensification will occur outside of the specific growth areas, which will also contribute to increase pressure on the combined system in areas served by this system.

4. Allow growth[3] in combined areas as per option 4, but have development subject to a requirement to install stormwater tanks of a sufficient size to enable stormwater to be collected, stored and discharged following the rain event.

   The benefit of this approach is that wet weather overflows are not a constraint to growth. In addition, the exacerbation of existing overflow problems are minimised through on-site controls.

   The main drawback of this approach is that there will be different requirements applied to development in different areas – those in combined sewer areas will be required to implement rain tanks to reduce stormwater volumes. However, this may be reduced if stormwater detention tanks are required for other purposes such as stormwater reuse.[4]

10.5 *Discussion*

The information surrounding wet weather overflows, their volume and occurrence is relatively robust. These overflows affect large parts of the city and the predominant areas of concern are those serviced by the combined system, where there are significant overflow volumes and frequencies. The issue is a "large scale" issue that in almost all circumstances requires the provision of public infrastructure to resolve. Combined sewer overflows are programmed to be resolved by 2021, with overflow frequency targets being achieved by 2033.

In respect of the current situation, the areas identified for significant growth have been prioritised through a number of criteria, including infrastructure performance. To some extent, the timing of growth is dependent

[3] Subject to the usual District Plan requirements
[4] See discussion paper on stormwater use/reuse

on the timing of infrastructure improvements, although this relationship appears "loose" and it is likely that in some areas, growth will precede resolution of significant overflows.

In general the approach of enabling the development of areas of significant growth consistent with the timing of improvements is appropriate to ensure that existing adverse effects are not significantly exacerbated. In this regard, it should be noted that the 2006 WASA [Ref 7] has the general theme that growth drives infrastructure improvement, rather than the converse. That is, priorities areas for growth become priority areas for infrastructure improvements to enable the growth to occur. It is therefore essential that any changes to significant growth areas are communicated to Utility Operators to ensure that upgrade planning and prioritisation can take this into account.

In respect of intensification in combined sewer areas, this can occur ahead of improvement works. However, on-site stormwater tanks are required to capture and store stormwater flows and minimise the exacerbation of existing overflow problems. This has the potential to create different requirements for development in different areas – although it is noted that stormwater detention tanks may also be desirable in other areas for stormwater flow mitigation and water reuse.

The drainage network consents seek approval for both stormwater and wastewater discharges, within the context of the current growth model and priority areas. Inherent in this is that in some areas overflows will be worsened by growth until improvements are implemented, although clearly it is essential to minimise these interim increases in overflow volumes and frequencies to the extent practicable through measures such as on-site stormwater tanks. It is anticipated that a "global" view of discharges and adverse effects, that allows some minor and temporary increases in overflow volume to occur in some areas in the context of a net overall improvement, will be acceptable.

It is therefore considered that the occurrence of wet weather overflows is not a major constraint to growth, on the basis that identified growth areas are then prioritised for improvements to enable the growth to happen while minimising adverse effects and stormwater detention tanks are utilised in development in combined sewer areas to reduce increases in overflows.

One further area of consideration is the effects of intensifying around the open public watercourses that are significantly affected by overflows or undertaking development in affected parks and reserves.

10.6 *Outstanding Matters/Additional Research*

The Proposed Variation 1 to the Auckland Regional Plan Coastal provides much of the statutory basis for the assessment of discharges of wastewater to the marine environment. Auckland City Council has lodged appeals to the Variation and these are currently being mediated.

The final outcome of the mediation may have implications for the network resource consents and the final performance levels and timeframes for wastewater overflow reduction. At this stage it is expected that there will be little change to the current provisions that promote the adoption of the BPO, with a focus on water quality at identified bathing beaches.

Additional consideration should be given to the development of areas adjacent to the public watercourses that received significant combined sewer overflows given the potential for public health and amenity issues associated with increasing populations and proximity to such events.

10.7 *Interim Conclusions [District Plan Implications]*

Overall, wet weather overflows should not be considered a major constraint to growth – particularly where growth priorities drive priorities for wastewater/combined system improvements. The key is to ensure that there is good alignment between areas of intensive growth and wastewater/combined system improvement programmes – noting that there is inevitably a 3+ year time lag before improvements can be implemented. This time frame is needed for planning, design, consent and implementation. Some supporting District Plan rules may reduce this timeframe by reducing consent requirements. At the same time however, it is

necessary to ensure that existing overflow problems are not unduly increased, particularly in combined sewer areas. Accordingly Option 4, which is essentially the status quo, is considered the most appropriate.

11. NARRATIVE: Issue 3 – Three Waters Strategic Issues

11.1 *Introduction/Background/Prior Work*

The Regional 3 Waters project, led by Watercare Services Ltd, is a joint initiative between the various TAs, Metrowater, Watercare and the ARC to consider the strategic issues facing the region in the provision and management of water supply, wastewater and stormwater infrastructure. The project has recently released an updated Draft Strategic Plan [Ref 8].

In respect of wastewater, the issue report identified a number of key urgent issues:

- Excessive overflow frequencies and volumes in wet weather in parts of the network and the methods by which they may be managed;
- Lack of dry weather capacity in key elements of the network (Orakei Main by 2025, Eastern and Western Interceptors by 2040);
- The continuity of service of critical elements of the network including the Hillsborough Rd tunnel and the Manukau Siphon
- The current capacity of the Mangere and Rosedale treatment plants will be reached by 2030 and current levels of growth and more stringent requirements may be imposed.

The aim of the 3 Waters project is to identify the strategic issues and potential solutions and provide for the implementation of regional solutions in sufficient time for these to be designed, consented and constructed in time to meet growth demands. A number of the issues relating to overflows – both dry and wet weather are discussed elsewhere in this paper.

11.2 *Status Quo Situation*

Agreement has yet to be reached on the possible options to address the capacity issues associated with the pipe network (both dry weather and wet weather) and the treatment plant. Several options have been identified that may affect Auckland City in the medium to longer term:

- Construction of a new pipeline from central Auckland to the Mangere sewage treatment plant to address dry weather capacity and enable an alternative/addition to critical elements of the wastewater network. Subject to design the pipeline may also assist in reducing wastewater overflows, particularly from the combined area.
- Possible diversion of some wastewater flows to the Rosedale treatment plant (and associated infrastructure);
- In the longer term, possible consideration of a sewage treatment plant within Auckland City (together with a range of other alternative sites).

However, at this stage, there is little detail in relation to these projects.

11.3 *Further Information/Details*

Further reference can be made to the Draft Three Waters Strategic Plan (April 2008) [Ref 8].

11.4 *District Plan Options*

Given the limited detail available, there is limited role that the district plan could play in respect of the three waters regional initiatives. Possible options are:

1. Provide general rules that enable the construction of regional infrastructure

This option may be useful to provide for some of the infrastructure that is necessary to implement the regional solutions. Rules may be prepared that facilitate the construction of the infrastructure and better enable the regional projects to be implemented.

However, the projects are significant in scale and nature and are more likely to be designated or be the subject of significant consent applications. Facilitating such work through general rules is unlikely to be appropriate as the adverse effects of such significant projects may be wider than can be anticipated at this stage with no detailed knowledge of the works.

Recent information suggests that the most imminent of the projects, the wastewater tunnel servicing central Auckland is currently being scoped in more detail and consideration is being given to consenting/designation requirements.

2. Include general provisions (policies etc) that recognise the strategic importance of the issue and the need for such infrastructure to be facilitated.

This alternative to Option 1 above does not go as far as to provide rules to facilitate the implementation of the regional 3 waters projects; however, it will provide some statutory recognition of the importance and need for the infrastructure. This high level statutory support may assist through consenting and designation processes, while at the same time not constraining a detailed assessment of adverse effects.

3. Limit growth until the completion of key three waters projects.

The benefit of this option is that limiting growth would reduce the increasing pressure on existing infrastructure and reduce the need for, or delay the provisions of new regional infrastructure.

However, the drawback of this approach is that growth within Auckland City is not the only driver for required infrastructure. Growth in areas outside Auckland City and duplication of essential infrastructure are equally important elements. Such an approach will also not allow Auckland City to meet its growth commitments.

11.5 *Discussion*

There is limited ability for the District Plan to provide for the implementation of the 3 Waters projects, perhaps other than to recognise the importance of the essential infrastructure to provide statutory support through future consent or designation processes.

There appears to be little benefit in limiting growth to minimise the need for additional infrastructure, as this need is also driven by growth outside of Auckland and the need to provide alternatives for existing drainage components to enable their servicing or to provide continuity of service in the event of their failure.

11.6 *Outstanding Matters/Additional Research*

The regional 3 Waters options continue to develop. As this process continues, the options will become better defined and the implications for Auckland City clearer. Continued Auckland City involvement in the 3 Waters project will assist in this.

11.7 *Interim Conclusions [District Plan Implications]*

There is little that the District Plan can achieve in respect of the provision of regional 3 Waters drainage infrastructure. Recognition of the issues and general policy support for the provision of essential drainage infrastructure may support future consent/designation processes.

12. NARRATIVE: Issue 4 – Operational Requirements

12.1 *Introduction/Background/Prior Work*

As is discussed in Section 8.1, the city is serviced by an extensive drainage network that comprises largely an underground pipe network, with supporting surface infrastructure such as stormwater grates, pump stations, manholes and outfalls in streams and at the coast.

This network requires on-going maintenance and upgrading to continue to meet community expectations. Typically, Auckland City Council and Metrowater undertake up to 10 km of watermain, 5km of wastewater and 5km of stormwater construction each year. Watercare Services also undertake a programme of repairs and renewals – although typically less due to the smaller network that it operates.

Maintenance occurs on a daily basis. A range of repair and maintenance activities is listed in Table 1.

Table 1: Typical maintenance and repair activities – water supply and drainage network

Works	Description
Cracking	A tool head (or guide) is inserted into an existing pipe. The existing pipe is burst as the brittle pipe material is weaker than the tool used to burst them. The new pipe is attached to the tool head so that as the original pipe is cracked, the new pipe is progressively laid.
Drilling and thrusting	Drilling and thrusting are used to lay new pipes in new positions. An envelope in the soil profile is determined where there are no other services present. An entry and exit pit is dug using a machine digger. The pits are located outside of the dripline of trees wherever possible. When there is no alternative but to locate the pit within a dripline of a tree, the pits are hand dug. Directional drilling involves inserting a pilot tube (to ensure there are no rocks or obstructions). After the pilot tube is inserted, the soil is back cut to the desired diameter and the pipe is inserted. Thrusting machines are located within the pit and a cavity is thrust through to the other pit. The pipe is pulled through the cavity.
Dye testing	Dye is placed in the pipe system to check for leaks.
Earthworks/ Excavation	Earthworks and excavation are carried out using the following machinery. Particular equipment used is dependant on the job specification but can include the use of, excavators, horizontal drills, large vertical drills, rock breakers, pneumatic hammers, spades and shovels.
Structures	The installation of infrastructure including cesspits, culverts, erosion protection and energy dissipation devices, hydrants, inlet and outlet (including overflows) structures, manholes, pipe bridges and pump stations
Microtunnelling	This is a trenchless method. A large microtunnelling machine is placed down a manhole. A pilot tube is piped through the ground and microtunnelling subsequently occurs. The machine has a cutting face and waste material is thrown backwards. The cutting occurs through the ground and the machine is retrieved through an appropriate manhole.
Open Cut/trenching	Open cut is used to place a new pipes in a new position. It involves trenching using hand held tools and mechanical excavators.
Pipe Jacking	With this method, workers inside a pipe remove (hand dig or use of pneumatic picks) material in front of the pipe and then jack the pipe into position.
Replacement of an old water main	Before the replacement of an existing pipe is made, a temporary above ground pipe is laid. The existing pipe is removed using hand held tools, or an excavator. Subsequently, a new pipe is laid within the existing trench and the temporary pipe is removed.
Root Cutting	Root cutting occurs within the pipe when tree roots enter wastewater and stormwater pipes. It is essential that this maintenance task is undertaken regularly to ensure that the roots do not cause significant blockages within the pipes and that they do not expand, damage the pipe and cause significant sewage overflows or flooding. Cutters are placed in the pipe and the roots are sheered off at the pipe wall. The roots generally have a small diameter and hang down into the pipe like a curtain. Within stormwater pipes runners sometimes grow along the pipes. These runners would never be greater than 50 mm in diameter. Within sewers root runners are not common. After cutting has occurred, the inside of the pipe may be grouted, sliplined, or CIPP (cured in place pipe) to seal the pipe.
Smoke testing	A mechanical device pumps smoke into the pipes to test for leaks. If smoke escapes, it generally indicates there is a leak in the system.
Tunnelling	This method is only used in special circumstances, generally for very deep or inaccessible sites and large diameter sewers.

Unblocking drains	Drains are unblocked using water blasting, jet bursts or by using a mechanical screw. Any roots present in the pipe may be affected by these methods.
Vegetation trimming/ removal for access	Vegetation trimming and tree removal occurs where site access is required for machinery or works. Trimming and removal for access is entirely site specific and only occurs where there is no viable alternative.

The majority of the water and drainage infrastructure is located within the road reserve land. Watermains are generally sited within the berm adjacent to the road carriageway. Where this is not possible, they are placed on private property (very rarely) or within the road reserve carriageway. The majority of wastewater and stormwater pipes are located either on private property (the private section of the pipes) or within the berm and road carriageway.

As discussed in Section 12.2, many of the activities listed in Table 1 are currently regulated by provisions in the District Plan, with the most common requirement for resource consents being for earthworks or works undertaken within the dripline of scheduled or generally protected trees which often also share the road berm with the drainage networks.

To facilitate the ongoing operation and maintenance of the water and drainage networks, the District Plan needs to strike an appropriate balance between enabling essential maintenance activities to occur while at the same time, not compromising the values and amenity of trees and other features. It is contended by infrastructure managers that this balance is not currently in place where maintenance activities are difficult to undertake due to conflicts with trees.

12.2 *Status Quo Situation*

The current operative Isthmus District Plan has a section called Part 4A General Rules. Within this section is a specific set of issues, objectives and policies as well as rules, for Network Utility Services (4A.4). The plan recognises that maintaining an efficient infrastructure including access to services is important to the well-being of the people of the district and essential to the sustainability of the economic fabric of the City.

Examples of general rules for sewerage network providers can be found in the operative plan in Section 4A.4, in Proposed Plan Change 90 (PC 90) which is seeking to change the provisions in 4A.4 and in Variation 90A which was introduced at Metrowater's request to PC 90 . These examples demonstrate the type of approach that could be followed in the reviewed plan.

<u>Part 4A.4</u>

The current operative Isthmus district plan provides for:

- the construction (including earthworks), installation, operation and maintenance of sewage reticulation including rising mains, manholes and ventilation shafts, inlet and outlet structures as permitted activities where they are in or under the road.(the protection of trees and tree roots is required)
- the construction, installation, operation and maintenance of sewage reticulation including rising mains, manholes and ventilation shafts, inlet and outlet structures and underground connections to sewer pipes and fittings including meters and protective surrounds from buildings and sites, subject to compliance with the development control rules for the particular zone:
- Where the site or land is a scheduled geological or archaeological sites and it involves digging and trenching or work within the drip line of a protected tree it is a discretionary activity. If it is in the Coastal Protection Yard then it is provided for as a discretionary activity.
- Pumping stations for sewage and ancillary above ground equipment, together with associated earthworks if located in any business zone or in the Mixed Use zone are a permitted activity, (subject to compliance with the development controls) provided that:

    i. they do not exceed 25m² in area or 3.0 metres in height above ground level, or are provided within an existing building; and

ii. they are not located on sites containing scheduled heritage features, or on sites in Conservation Areas.

- Pumping stations for sewage, together with associated earthworks; provided that they do not exceed 25m2 in area and 3.0m in height above ground level, or are provided within an existing building, are restricted controlled activities in all residential zones, subject to compliance with the development control rules for the particular zone;

- All other activities are a discretionary activity

Plan change 90

The plan change identifies that in addition to utility services supporting the community, utility services have the potential to cause adverse effects. Such effects may include:

- Discharge of contaminants to air and water, (including objectionable or offensive odours and dust), glare, noise and vibration;
- The potential adverse effects of inappropriate storage and use of hazardous substances, safety hazards and possible adverse effects on health;
- Destruction or the compromising of items of natural, physical or cultural heritage value.
- Destruction or modification of trees and other vegetation in street corridors, within reserves and other public open spaces, within Coastal Protection Yard and even within private properties. Such effects may relate to the installation of utilities and/or the on-going maintenance of such services.
- Adverse effects on the amenity values of the sites on which they are located and surrounding areas. These are likely to be manifest in three ways:
    a. Related to the actual appearance and impact of the actual structures
    b. Through modification of the character of streetscapes, reserves and open spaces, coastal margins and heritage features. Such effects may include both direct impacts upon the immediate character of individual environments and the cumulative modification of wider areas. In this context, it should be recognised that physical effects upon vegetation and heritage features are likely to have both direct and cumulative amenity implications.
    c. Through intrusion into more distant outlooks and views towards key landscape features, such as Auckland's harbours and volcanic cones.

The Plan change also identified that there is an impact on the use of the road or other land when utilities are installing or undertaking maintenance of the services and it identified the need to address safety and efficiency.

PC 90 provided for underground sewerage networks as a permitted activity in the road as well as all zones and it provided for above ground sewerage networks with a range of sizes and heights above ground linked to location of and surrounding zones.

The Plan change also defined Sewerage Network as :

"Means a system comprising sewerage links to permit the reticulation of sewage. The definition is limited to the following:

(a) Underground; pipes and fittings, meters, pumping stations, equipment, cabinets.

(b) Aboveground; aerial pipe bridges, pumping stations, transformers, ventilation pipes, manholes, discharge outlets equipment, cabinets"

Variation to Proposed PC 90 (PC 90A)

This variation was notified at Metrowater's request to amend the provisions of PC 90 as they relate to sewerage (and water and stormwater). Some of the changes included in the variation related to sewerage and were seen as being clarifications. These included

- introducing as permitted activities the installation, operation, maintenance and upgrading of underground sewerage networks as a permitted activity.
- providing as a permitted activity for temporary above ground structures such as by-pass pumps, generators, floating booms, pipes, sandbags and silt fences that are required while the underground infrastructure is being worked on.
- providing for maintenance of existing sewerage network as a permitted activity and identifying a new definition of "maintenance' and including amongst other things the following:
    - Repairing and replacement of structures of a similar size, scale, character and intensity
    - Painting structures
    - Root cutting within pipes.
- providing for the relocation of components of sewerage infrastructure required to enhance the operation or function of this infrastructure as a permitted activity. Examples of relocation given included moving a pump station cabinet closer to a pump station, or • relaying an emergency overflow pipe from a pump station to its discharge point to ensure that sewage does not discharge onto residential properties in the event of a pump station failure.
- permitting the installation of aerial pipe bridges

The variation also changed the definition of sewerage network to help to differentiate more clearly the difference between underground and above ground elements of the network. This was necessary as PC 90 introduced a more stringent approach for above ground infrastructure.

It is also noted that components of Watercare Services infrastructure, such as pump stations, are designated. However, no assessment has been made as to the scope of the activities that are provided for under the designations.

12.3 *Further Information/Details*

None at this stage.

12.4 *District Plan Options*

1. Continue with provisions similar to those contained in plan change 90/Variation 90A approach.

   This option is seeking to find a compromise between the needs of the council to manage the effects of 'utilities' per se in spaces such as the road and in other areas of the city and a need to provide for essential services with the minimum of delay.

   The benefits of this approach are that it recognises the essential role drainage infrastructure plays in the fabric of the urban area, and that PC 90 and its variation have been the topic of significant discussion and negotiation over a period of time. Continuing to implement this Plan Change (albeit through the plan review) demonstrates an on-going commitment to facilitate the construction and maintenance of essential infrastructure and strikes a balance between delivering this essential function and the management of other natural and physical resources.

   The drawback of this approach is that the change is not operative and therefore it has not been demonstrated whether the Plan changes meets both parties expectations in practice and allows Auckland City Council, Metrowater and Watercare to deliver their infrastructure and maintain it with

the minimum of regulatory delay – apart from areas where the receiving environment is particularly sensitive – e.g. in ecologically/ archaeologically significant areas.

2. Rely on general rule provisions as found in the operative district plan.

   This option is a return to a regulatory environment that is purported to have been satisfactory for utilities in the past but is not addressing the issues that have developed over the past 10 years of the district plan.

3. Develop a new approach

   The nature of the underground infrastructure and the level of 'change' required to repair or maintain it is problematic in terms of developing a new approach. The networks are under both private land and land in the public realm, and as a consequence traverse a range of zones and types of land.

   As district plans become increasingly sophisticated, and areas more densely populated issues such as vegetation protection, controls on activities at certain times of the day and /night, and reinstatement will mean that there will be pressure to have even more onerous provisions. At the same time, increased intensification increases the need for utilities to undertake preventative maintenance, infrastructure development and response to problems. The ageing network will also likely see a need for increased maintenance in the future.

   One possible approach is to direct or facilitate the obtaining of 'global' consents for utilities to undertake the majority of routine works. Such a consent reduces costs to the operator by allowing them to carry out various activities on multiple sites and enables specific conditions to be imposed on various activities rather than requirements by way of general rules. For example, an approved self management regime could be included as a condition for a "global" consent.

   Another option may be to encourage the designation of strategic wastewater assets that provide for maintenance activities as of right, without the need to obtain additional resource consents. However, unless the entire network was designated, this does not provide for the routine activities that are required all over the network – not just in relation to critical elements. Such an approach also raises potential conflict issues with other infrastructure (such as roads) due to the nature of designations. Auckland City Council has already identified concerns with third party designation of infrastructure underlying the city's roads.

12.5 *Discussion*

Unplanned, urgent work that needs to be done can rely on emergency powers provided for under s 330 and 330Bof the RMA, which allows work to be undertaken without consent when immediate action is necessary to rectify a problem that, if left longer, would result in either worse outcomes for the environment or the likelihood of death, injury or serious damage to property. The necessity for immediate action would mean that there is not time to follow normal consent processes.

The Quality Planning (MfE) guideline on emergency powers suggest that "an emergency situation exists whereby a public work, project, network, or a natural or physical resource or area, *is* affected by or *is likely* to be affected by:

- an adverse effect on the environment requiring *immediate preventative measures*; or
- an adverse effect on the environment requiring *immediate remedial measures*; or
- any *sudden event* causing or is likely to cause loss of life, injury or serious damage to property."

Sections 330 and 330B do not require the approval or advice of council in deciding upon, or in the undertaking of, emergency works.

Given that these powers are available in times of emergency, the key issue is how to best provide for more routine day to day operational and maintenance activities that are essential, but not of an urgent or emergency nature.

Clearly some balance needs to be struck between facilitating the operation and maintenance of drainage infrastructure while providing for other natural features. While PC 90A has not been tested, it appears to provide a position that operators such as Metrowater are satisfied it will enable them to undertake their operations in an efficient and effective manner.

Work outside the scope of that provided for by PC 90A will likely require a resource consent to be obtained. If such work is regularly occurring across the city, the Plan could encourage operators to seek "global consents" to facilitate other, more complex, aspects of their routine activities. Discussions could also be held with operators in respect of designating strategic components of the drainage network to facilitate their operation and maintenance.

12.6 *Outstanding Matters/Additional Research*

12.7 *Interim Conclusions [District Plan Implications]*

Continue to implement an approach similar to PC 90A; this has achieved significant traction and buy in to date.

Consider ways in which global consents for additional works could be facilitated through the plan to enable utility specific consents to be obtained with appropriate conditions aimed at managing the effects of these more significant activities and reduce ongoing consent processing demands.

13. OVERALL COMMENTARY

The city's wastewater drainage network is an essential component of the urban fabric, providing for the health safety and social and economic well being of the community. Its on-going operation and development is therefore essential to the functioning, growth and development of the city.

There are significant issues facing the drainage system, notably regional conveyance and treatment capacity issues and the extent of sewer overflows, particularly from the city's combined sewer system. However, these issues have been the subject of recent studies including Auckland City Council and Metrowater' Integrated Catchment Studies and the Regional 3 Waters Project.

In relation to dry weather overflows, this is not considered a significant issue in respect of the local network – the main issue relates to regional conveyance capacity that is being addressed through the regional three waters project. Apart from the CBD, which is somewhat different to the Isthmus areas, capacity issues are minor and highly localised and best addressed on a case-by-case basis through resource consents for development. In addition, Metrowater has a programme of network development and renewals to ensure that sufficient wastewater capacity is provided to meet the needs of both intensive growth areas and general intensification. However, should the growth model be altered then this needs to be communicated to Metrowater at an early stage to allow integration into work planning.

In respect of wet weather sewer overflows, long term targets and medium term milestones have been identified and detailed investigation projects and works programmes have been implemented to achieve the outcomes. It is considered that the approach that has been adopted is robust and will be authorised through long term drainage network discharge consents; it is likely that only the timing/expenditure of improvements will be debated through the consent process with the pressure being on doing more in less time.

Accordingly, the presence of wet weather overflows is not considered a constraint to growth and development, although ideally intensive growth should be timed to occur subsequent to the resolution of combined system overflows in that area. However, on-site storage of stormwater is appropriate for development in combined sewer areas to minimise the exacerbation of overflows in the interim.

There are significant regional issues associated with wastewater conveyance and treatment capacity that are predicted to occur around 2025 and these have been an important component of the regional 3 waters project. A range of potential solutions have been identified and the next step is to undertake more detailed assessment and subsequent design/implementation. Given the lead time that is available, and the advanced options analysis that has been undertaken, it is not considered that these issues provide a constraint to growth within Auckland City – if anything they provide potential opportunities to address other issues including wastewater overflows in a more cost effective manner.

However, it is premature for the District Plan to specifically provide for this future regional infrastructure, except perhaps to provide general recognition of the potential issues and high level policy support.

In relation to on-going operation and maintenance of the drainage network, it is important for the plan to achieve a suitable balance between facilitating essential operation/maintenance and managing other values and resources. Significant traction has been achieved with PC 90 and 90A and a continuation of these processes is considered appropriate to achieve this balance.

14. REFERENCES

No	Author	Title	Date	Comment
1	Metrowater and Maunsell	Stormwater Asset Management Plan 2006/07	July 2006	Prepared for Auckland City Council. On-line version. New version available.
2	Metrowater	AMP 07 – July 2007 to June 2027	July 2007	
3	Three Waters Project Team	Regional Three Waters Strategic Planning Process - Issues Report TW2	June 2006	
4	Various Parties for Metrowater	Integrated Catchment Study Stage 3B: Drainage System Reports – Areas 1 to 5	December 2005	Five reports – one for each ICS Area
5	Uniservices Ltd	Coastal Receiving Environment Assessment (CREA): Report VII: Bacterial modelling report	January 2007	
6	Auckland City Council	http://www.aucklandcity.govt.nz/council/documents/safeswim/		Online results
7	Auckland City Council	Water and Sanitary Services Assessment. Incorporated into Auckland City LTCCP 2006 – 2016 Volume 3 Part 3	June 2006	
8	Three Waters Project Team	Three Waters Draft Strategic Plan: Discussion Version	April 2008	Updated version for discussion with participating organisations