ACTIVITY MANAGEMENT PLAN
For Foul Sewer

VERSION 5

March 2015

Mackenzie District Council
Activity Management Plan
for Foul Sewer

Mackenzie District Council Adopted .....

Date .....

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Status: FINAL

MACKENZIE DISTRICT COUNCIL

ACTIVITY MANAGEMENT PLAN FOR FOUL SEWER

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Mayor (on behalf of Councillors)

Document No

File No .....

UPDATE REGISTER

Number	Date	Description of Update	Updated by
Version 1	April 2006	Revision of the second AMP produced by MDC	Waugh Consulting
Version 2	2004	Revision of the first AMP produced by Waugh Consulting	MDC
Version 3	April 2006	Revision of the second AMP produced by MDC	MDC
Version 4	November 2012	Full update to Version 3	MDC
Version 5	February 2015	Revision to incorporate the issues determined by the 30 year Infrastructure Strategy.	MDC

CIRCULATION LIST

Number	Issued to (*name & organisation*)

CONTENTS

The following terms and acronyms (in brackets) are used in this Plan.

ACCRUAL ACCOUNTING
The recognition of revenues as they are earned and expenses as they are incurred.

ANNUAL PLAN
A document produced annually by an organisation to inform stakeholders of its objectives, intended activities, performance, income and expenditure required for a period of one financial year. It may also indicate anticipated future short-term income and expenditure

ASSET
A physical component of a facility, which has value, enables services to be provided and has an economic life of greater than 12 months. Dynamic assets have some moving parts, while passive assets have none.

ASSET MANAGEMENT (AM)
The combination of management, financial, economic, engineering and other practices applied to physical assets with the objective of providing the required level of service in the most cost-effective manner.

ASSET MANAGEMENT PLAN
A plan developed for the management of one or more infrastructure assets that combines multidisciplinary management techniques (including technical and financial) over the lifecycle of the asset in the most cost-effective manner to provide a specified level of service. A significant component of the plan is a long-term cashflow projection for the activities.

ASSET MANAGEMENT STRATEGY
A strategy for asset management covering the development and implementation of plans and programmes for asset creation, operation, maintenance, rehabilitation/replacement, disposal and performance monitoring to ensure that the desired levels of service and other operational objectives are achieved at optimum cost.

ASSET REGISTER
A record of asset information considered worthy of separate identification including inventory, historical, financial, condition, construction, technical and financial information about each.

BENEFIT-COST RATIO (B/C)
The sum of the present values of all benefits (including residual value, if any) over a specified period, or the lifecycle, of the asset or facility, divided by the sum of the present value of all cost.

CAPITAL EXPENDITURE (CAPEX)
Expenditure used to create new assets or to increase the capacity of existing assets beyond their original design capacity or service potential. CAPEX increases the value of asset stock.

COMPONENTS
Specific parts of an asset having independent physical or functional identity and having specific attributes such as different life expectancy, maintenance regimes, risk or criticality.

CURRENT REPLACEMENT COST
The cost of replacing the service potential of an existing asset, by reference to some measure of capacity with an appropriate modern equivalent asset.

DEFERRED APPROACH
The shortfall in rehabilitation work required to maintain the service potential of an asset.

DEPRECIATED REPLACEMENT COST (DRC)

The replacement cost of an existing asset less an allowance for wear or consumption having regard for the remaining economic life of the existing asset.

DEPRECIATION

The wearing out, consumption or other loss of value of an asset whether arising from use, passing of time or obsolescence through technological and market changes. It is accounted for by the allocation of the cost (or revalued amount) of the asset less its residual value over its useful life.

DETERIORATION RATE
The rate at which an asset approaches failure.

DISPOSAL
Activities necessary to dispose of decommissioned assets.

ECONOMIC LIFE
The period from the acquisition of the asset to the time when the asset, while physically able to provide a service, ceases to be the lowest cost alternative to satisfy a particular level of service. The economic life is at the maximum when equal to the physical life; however obsolescence will often ensure that the economic life is less than the physical life.

FACILITY
A complex comprising many assets (e.g. a hospital, water treatment plant, recreation complex, etc) which represents a single management unit for financial, operational, maintenance or other purposes.

FINANCIAL STATEMENTS
Balance sheets, profit and loss accounts, statements of changes in financial position, notes an other statements which collectively are intended to give a true and fair view of the state of affairs and profit or loss for an entity for a defined period.

GAP ANALYSIS
A method of assessing the gap between a business's current asset management practices and the future desirable asset management practices. Also called needs analysis or improvement planning.

INFRASTRUCTURE ASSETS
Stationary systems forming a network and serving whole communities, where the system as a whole is intended to be maintained indefinitely at a particular level of service potential by the continuing replacement and refurbishment of its components. The network may include normally recognised ordinary assets as components.

LEVELS OF SERVICE
The defined service quality for a particular activity (i.e. Foul Sewer) or service area (i.e. maintenance) against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental acceptability and cost.

LIFE
A measure of the anticipated life of an asset or component; such as time, number of cycles, distance intervals etc.

LIFECYCLE
The cycle of activities that an asset (or facility) goes through while it retains an identity as a particular asset i.e. from planning and design to decommissioning or disposal.

LIFECYCLE COST
The total cost of an asset throughout its life including planning, design, construction, acquisition, operation, maintenance, rehabilitation and disposal costs.

LIFECYCLE COST ANALYSIS
Any technique which allows assessment of a given solution, or choice from among alternative solution, on the basis of all relevant economic consequences over the service life of the asses

MAINTENANCE
All actions necessary for retaining an asset as near as practicable to its original condition, but excluding rehabilitation or renewal. Fixed interval maintenance is used to express

the maximum interval between maintenance tasks.
On-condition maintenance is where the maintenance action depends upon the item reaching some predetermined condition.

MAINTENANCE PLAN
Collated information policies and procedures for the optimum maintenance of an asset or group of assets.

MAINTENANCE STANDARDS
The standards set for the maintenance service, usually contained in preventive maintenance schedules, operation and maintenance manuals, codes of practise, estimating criteria, statutory regulations and mandatory requirements, in accordance with maintenance quality objectives.

OPERATION
The active process of utilising an asset, which will consume resources such as manpower, energy, chemicals and materials. Operation costs are part of the lifecycle costs of an asset.

OPTIMISED DEPRECIATED REPLACEMENT COST (ODRC)
The optimised replacement cost after deducting an allowance for wear or consumption to reflect the remaining economic or service life of an existing asset. ODRC is the surrogate for valuing assets in use where there are no competitive markets for assets, or for their services or outputs.

PERFORMANCE MONITORING
Continuous or periodic quantitative and qualitative assessments of the actual performance compared with specific objectives, targets or standards.

PLANNED MAINTENANCE
Planned maintenance activities fall into three categories:

i) Periodic – necessary to ensure the reliability or to sustain the design life of an asset.
ii) Predictive – condition-monitoring activities used to predict failure.
iii) Preventive – maintenance that can be initiated without routine or continuous checking (e.g. using information contained in maintenance manuals or manufacturers' recommendations) and is not condition based.

REHABILITATION
Works to rebuild or replace parts or components or an asset, to restore it to a required functional condition and extend its life, which may incorporate some modification. Generally involves repairing the asset to deliver its original level of service (i.e. heavy patching of roads, slip-lining of sewer mains, etc.) without resorting to significant upgrading or renewal, using available techniques and standards.

RENEWAL
Works to upgrade refurbish or replace existing facilities with facilities of equivalent capacity or performance capability.

REMAINING ECONOMIC LIFE
The time remaining until an asset ceases to provide the required service level or economic usefulness.

REPAIR
Action to restore an item to its previous condition after failure or damage.

REPLACEMENT
The complete replacement of an asset that has reached the end of its life, so as to provide a similar or agreed alternative, level of service.

REPLACEMENT COST
The cost of replacing an existing asset with a substantially identical new asset.

RESIDUAL VALUE
The net market or recoverable value that would be realised from disposal of an asset or facility at the end of its life.

RISK MANAGEMENT
The application of a formal process to the range of possible values relating to key factors associated with a risk in order to determine the resultant ranges of outcomes and their probability of occurrence.

ROUTINE MAINTENANCE
Day-to-day operational activities to keep the asset operating (replacement of light bulbs, cleaning of drains, repairing leaks, etc.) and which form part of the annual operating budget, including preventive maintenance.

SERVICE POTENTIAL
The total future service capacity of an asset. It is normally determined by reference to the operating capacity and economic life of an asset.

STATEMENT OF FINANCIAL PERFORMANCE
A report on the net surplus/deficit, and its components, arising from activities or events during a given period, that is significant for the assessment of both past and future financial performance.

STRATEGIC PLAN
A plan containing the long-term goals and strategies of an organisation. Strategic plans have a strong external focus, cover major portions of the organisation and identify major targets, actions and resource allocations relating to the long-term survival, value and growth of the organisation.

UNPLANNED MAINTENANCE
Corrective work required in the short-term to restore an asset to working condition so it can continue to deliver the required service or to maintain its level of security and integrity.

USEFUL LIFE
May be expressed as either:

a) The period over which a depreciable asset is expected to be used, or
b) The number of production or similar units (i.e. intervals, cycles) that is expected to be obtained from the asset.

VALUATION
Assessed asset value, which may depend on the purpose for which the valuation is required, i.e. replacement value for determining maintenance levels, market value for lifecycle costing and optimised deprival value for tariff setting.

1. EXECUTIVE SUMMARY

1.1 INTRODUCTION

This Activity Management Plan for Foul Sewer (AMP) has been developed to provide the Mackenzie District Council (MDC) with a long term management tool for the Foul Sewer asset. It sets out the current asset condition, what issues are currently and likely to impact on the asset and the costs associated with maintaining, operating, renewing, developing and disposing of the asset.

In terms of population, the Mackenzie District is the third smallest territorial authority in New Zealand with a normally resident population of approximately 4,000, with limited growth. In contrast to its small population, the area of the District is large, comprising 745,562 hectares. Fairlie, Lake Tekapo and Twizel are the main towns and there are villages at Albury, Kimbell, Burkes Pass and Mount Cook.

1.2 PURPOSE OF FOUL SEWER ASSET MANAGEMENT PLANNING

The purpose of this AMP is to provide a tool combining management, planning, financial, engineering and technical practices to ensure that the level of service required by customers is provided at the lowest long term cost to the community. The plan is intended to demonstrate to customers that Council is managing the assets responsibly and that they will be regularly consulted over the price/quality trade-offs resulting from alternative levels of service.

1.3 PLAN LEVEL

MDC considers the required sophistication of their plan in the short to medium term need not progress beyond a **"Core"** planning level, as:

- the cost at this time to move to an advanced plan would provide little significant benefit to Council or its' customers
- the size, complexity and use of the assets is consistent with a rural sparsely populated district
- the risks associated with failure are low

This AMP is one of the Council's suite of plans that together describe the services and workload that the community sees as important for the Council to provide and sustain. They outline the basic methodologies Council will use to achieve the strategic objectives promoted in the MDC LTP 2015 – 2025 and thus move towards achieving the "outcomes" and the citizens' "vision" of the society they wish to be a part of.

1.4 SCOPE OF ASSET MANAGEMENT PLAN

This revision provides a update to Version 4 of the AMP produced by Mackenzie District Council. It provides a medium to long term indication of asset management requirements and specific work programmes over the planning period from 1 July 2015 to 30 June 2025.

The plan will continue to be periodically reviewed to incorporate, as appropriate new asset information and improved knowledge of customer expectations. The objective is to optimise life

cycle asset management activities and provide a greater degree of confidence in financial forecasts.

1.5 FOUL SEWER ASSET MANAGEMENT ACTIVITY

Council is responsible for the management of Foul Sewer assets with an optimised depreciated replacement cost of $14,985,817 (July 2013 valuation). For 2014/15 Council has budgeted to spend $583,000 on maintaining, operating and renewing these assets (including staff, overhead costs and depreciation).

The following list summarises the MDC Asset Management activities:

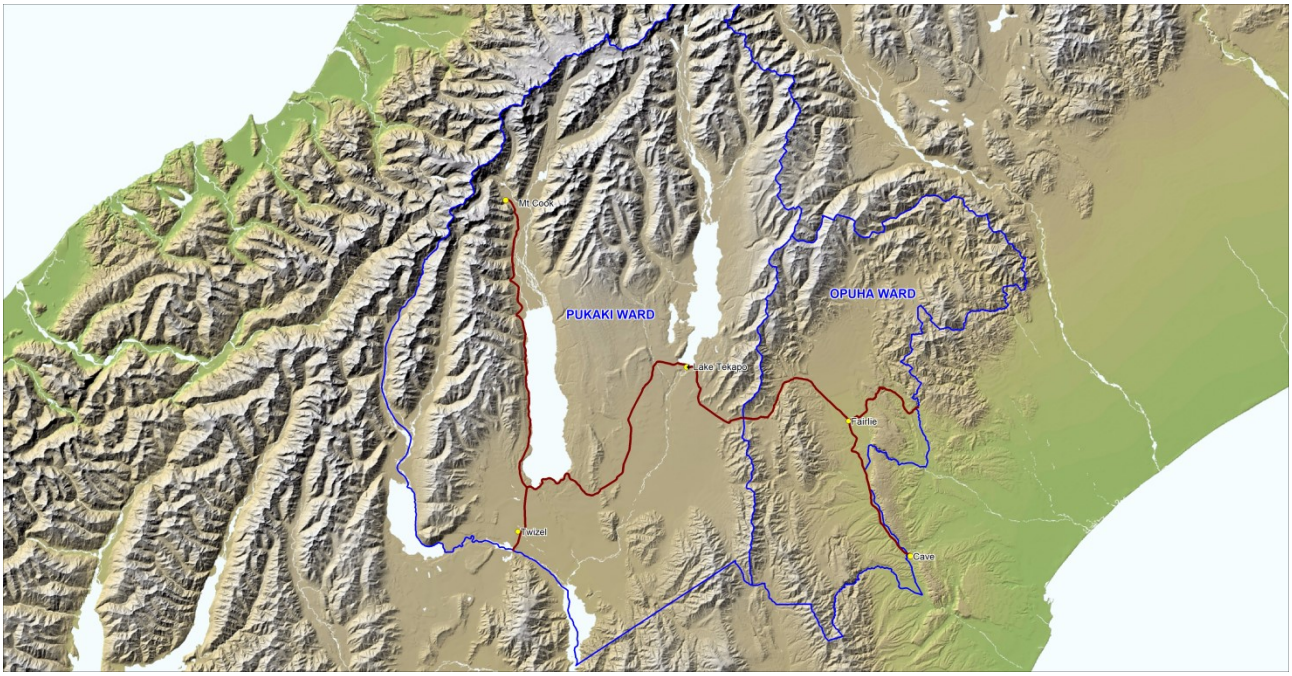
- Asset Management
- Safety Management
- Foul Sewer Maintenance
- Foul Sewer Data Management
- Project Management
- Environmental Management
- Network Inspections
- Legislative Compliance Management
- Network Management
- Customer Management

1.6 ASSET DESCRIPTION

1.6.1 LOCATION

Figure 1.1 shows the location of the district within the Canterbury Region

Figure 1.1 – Map of Mackenzie District



The Mackenzie District is bounded in the north and east by the Timaru and Waimate Districts, in the south by the Waitaki District and to the West by the Southern Alps/ Westland District boundary. There are two wards: **Pukaki** which in effect takes in the Mackenzie Basin and **Opuha** being the remaining area to the west of a line following the upper reaches of the Hakataramea River through Burkes Pass to Mt Musgrove in the Two Thumb Range.

The backbone of the roading network in the district is provided by the following State Highways which are the responsibility of the New Zealand Transport Agency (NZTA).

State Highway 8 Timaru - Fairlie - Lake Tekapo - Twizel - Omarama
State Highway 79 Fairlie - Geraldine
State Highway 80 Twizel - Mt Cook Village

The Mackenzie District Foul Sewers consists of a network of pipes conveying effluent to oxidation ponds in the towns of Fairlie, Tekapo, Twizel and Burkes Pass. In every case the effluent that exits the oxidation ponds after treatment discharges to ground.

1.6.2 THE ASSET

The Foul Sewer asset includes all Council owned pipelines, manholes and related infrastructure within the District as shown in Table 1.1.

Table 1.1 – Foul Sewer assets included in this plan

Asset Description	Sub-Asset Description	Quantity
Lines		78297m
Manholes		880
Treatment Facilities	Each of the four schemes are treated with oxidation pond wastewater treatment systems	4

1.7 KEY STAKEHOLDERS AND CUSTOMERS

Key Stakeholders
The Council as the ultimate owner of assets. Other key stakeholders of the Foul Sewer network include:

- Regional council
- Owners and operators of inter-connecting or separate Foul Sewer networks, specifically those owned and managed by Lake Tekapo Enterprises Ltd.

Funding Partners
Funding is provided by several parties and in particular the following are significant contributors:

- Ratepayers – Rates provide funding for maintenance and operation of the networks
- Developers – By constructing infrastructure and vesting it in the Council plus providing the required financial contributions

Customer Groups
MDC's customers fall into three different groups: associated service providers, users and the wider community. These are detailed in Table 1.2.

Table 1.2 – MDC Foul Sewer Customer Groups

Customer Group	Description	Customers
Associated Service Providers	These are other service providers who rely on the Foul Sewer network	• Contractors • Commercial operators
Users	Those who directly benefit from the service	• Ratepayers • Residents and holiday home owners • Commercial properties • Industrial users
The Wider Community	Non-users that are affected if the service is not provided	• Ratepayer and residents • Tourists • Local businesses

Other Parties

Other parties with an interest in MDC's AMP include Council employees, consultants and contractors who manage and work on the asset.

1.8 LEVEL OF SERVICE

Council's current and target levels of service were defined in the 2012-2022 LTP, and are summarised in Table 4.1 and are summarised below.

- The sewerage systems are managed without risk to public health
- Sewage is able to be disposed of without significant disruption.
- Safe discharge of wastewater

These show how levels of service contribute to the community outcomes and provide a technical measure that enables Council to monitor current levels of service against target levels of service.

The current LOS are documented as a combination of:

- LTP LOS documentation based on real or perceived customer feedback
- Contract processes which describe the contractors response to events such as system blockages or discharges.

The current LOS can be improved by:

- Augmentation of existing information e.g. clearer relationships between alternative service levels for pipeline replacement and their associated costs.
- Utilisation of a LOS model defining quality, quantity, location, and timeframe. This would accurately record over time events that cause disruption to the service impact on public health including the safe disposal of effluent and then look to solutions to minimise that disruption taking into account the risk of leaving the LOS as it is.

1.9 FUTURE DEMAND

The Mackenzie District Foul Sewer network caters for the three towns of Fairlie, Tekapo and Twizel. The districts population of approximately 4,000 is low and the growth at approximately 9.3% (since the 2006 census) this is a significant change from the 2001-2006 period where the population grew by a modest 2.3%.

Future demand on the network will be driven by residential subdivision and commercial development.

These areas sustained considerable growth during the period 2003-2009, but since then have slowed down significantly. That period of growth created a large number of sections in Twizel that will take some time to develop. As Twizel's infrastructure was designed for the total population when the town was at its height in the 1970's there is more than adequate capacity to cater for the growth expected.

In Tekapo planning during that period catered for large areas to be developed and infrastructure was designed and installed to cater for that. Resource consents were also obtained for that growth area. Therefore it is unlikely that there will be an increase in demand outside those already planned for.

1.10 RISK MANAGEMENT

Risk management is "the systematic application of management policies, procedures and practices to the task of identifying, analysing, evaluating, treating and monitoring those risks that could prevent a Local Authority from achieving its strategic or operational objectives or plans, or from complying with its legal obligations".

There is currently no formal Risk Management process being implemented for the foul sewer activity within council. This in itself is a significant risk. A risk management strategy has been described in Section 8 of this AMP. The use of this strategy as outlined in the Improvement Plan should be completed with high priority. In particular issues surrounding emergency management and insurance require full review and inclusion in this plan. It is proposed to engage an external party to develop and implement the formal risk management process for the 3 waters infrastructure within the next two years.

1.11 LIFE CYCLE MANAGEMENT PLANS

Life cycle management plans outline what is work planned to keep the assets operating at the current levels of service defined in Section 4 while optimising lifecycle costs. The overall objective of the Life Cycle Management Plan is:

> ***To maintain performance measures to ensure that the current strategies do not consume the asset leading to an unexpected increase in maintenance/renewal expenditure in the future.***

In this AMP the lifecycle management plan has been separated into asset groups. Each Lifecycle Management plan covers the following:

- **Background Data** including current capacity and performance, current condition and historical data including costs.

- **Operations and Maintenance Plan** covering planning for on-going day to day operation and maintenance to keep assets serviceable and prevent premature deterioration or failure.

- **Renewal/Replacement Plan** covering Major work which restores an existing asset to its original capacity or its required condition (e.g. pipeline replacement, replanting treatment facilities).

- **Asset Development Plan** covering the creation of new assets (including those created through subdivision and other development) or works which upgrade or improve an existing asset beyond its existing capacity or performance in response to changes in usage or customer expectations.

- **Disposal Plan** covering activities associated with the disposal of a decommissioned asset.

1.11.1 ASSET CONDITION AND PERFORMANCE

The basis of the lifecycle management plans is the current condition and performance of the asset. This allows comparison with the prescribed level of service, and from this a gap analysis can be completed to determine future work requirements.

Currently MDC undertakes some condition and performance analysis of the network relying on internal CCTV inspections and the practical experience and knowledge of the engineering staff to provide a gauge of the networks overall performance. This knowledge is used extensively for planning purposes. Although adequate for the purpose, it would useful to extend the new Asset Register in ArcGIS and Asset Finda to record and analyse the condition and performance of the network to be more objective in its planning methodology.

Ongoing condition surveys of the asset components are undertaken and results recorded within the Asset Register. Council needs to keep up the internal CCTV inspection programme and the regular sampling of water mains, so that the sample results can be extrapolated out across the other similar pipe networks. Intermediate and long term planning of asset renewal is then be based on the results of these surveys, the performances obtained compared to that desired, the remaining expected life of the asset component and the decision making processes outlined (see appendix I) within this plan. Recently samples of Asbestos Cement pipe have also been analysed to confirm the level of deterioration and predicted replacement.

1.11.1.1 Asset Condition

Specific condition for each asset is not currently measured but internal inspections of representative sections of the network are carried out and the results extrapolated across the network. There is good condition information for Foul Sewer assets with the majority of assets graded at 2 or better (88%). Only 1% of the network is graded as having a rating of 4 and no asset is graded as requiring replacement.

Figure 1.2 – Condition Data for Foul Sewer Assets

Notes:
1 = **Very Good Condition** - Only normal maintenance required
2 = **Minor Defects Only** - Minor maintenance required (5%)
3 = **Maintenance Required to Return to Accepted Level of service** - Significant maintenance required (10-20%)
4 = **Requires Renewal** - Significant renewal/upgrade required (20-40%)
5 = **Asset Unserviceable** - Over 50% of asset requires replacement

There are no pipelines that are graded as requiring renewal and 3% showing a grade of 4 that suggests a need to replace. This equates to 965m of pipework in Fairlie. It is not planned to programme the replacement of this pipework, but rather put it on a regular review and inspection regime to monitor the deterioration to replace at the optimum time.

1.11.2 ROUTINE MAINTENANCE PLAN

Current practice is to apply a combination of "reactive" condition driven and network lifecycle depreciation techniques to determine the work necessary to maintain the network within pre-determined financial constraints (see charts in Appendix I). The majority of maintenance is reactive so budgets have been based on historical expenditure. Increases to costs for some asset groups are projected in future due to vested assets from developers.

1.11.3 RENEWAL/REPLACEMENT PLAN

This plan is recommending the following renewal works to the existing Foul Sewer infrastructure.

- Twizel, land purchase around existing oxidation ponds, including legal costs
- Fairlie, pipeline replacement. The pipework in Fairlie is getting old and being impacted with tree root intrusion, so it is suggested that Council budgets for the replacement of one section of pipe as required.
- Tekapo, Upgrade existing pump station on Lakeside Drive to replace aging equipment and to cater for increased demand.
- Tekapo and Fairlie, Replace aerators at oxidation ponds.

1.11.4 ASSET DEVELOPMENT PLAN

This plan is recommending the following improvement works to the existing Foul Sewer infrastructure.

- Twizel, construct rapid infiltration basins and associated pipework to redirect the effluent disposal from the current disposal trench into the RIBs. The existing trench will be decommissioned at that time. The timeframe for this work is completion by early 2017.

- Twizel, construct a new rising main from Mackenzie Park pump station to the oxidation ponds. This work is programmed for later in the life of the plan when or if demand puts pressure on the current systems to the point it cannot cope.

- Tekapo, construct an extra disposal field for the effluent discharging from the oxidation ponds. There are periodically discharge issues caused by extra flow, particularly in the winter when the ground is frozen. A new disposal system will give Council an alternative disposal system for those periods.

1.11.5 ASSET DISPOSAL PLAN

In general Council has no specific plans for disposal of components of the Foul Sewer asset.

1.12 FINANCIAL FORECASTS

As at 1 July 2013 the total optimised replacement cost of the Foul Sewer Infrastructure was assessed to be $23,635,947. The total optimised depreciated replacement cost was assessed to be $14,985,817. The annual depreciation has been determined to be $322,585 per annum.

Mackenzie District Council											
Funding Impact Statement for 10 Years to 30 June 2025 for Foul Sewer											
	Annual Plan 2014/15 ($000)	LTP Year 1 2015/16 ($000)	LTP Year 2 2016/17 ($000)	LTP Year 3 2017/18 ($000)	LTP Year 4 2018/19 ($000)	LTP Year 5 2019/20 ($000)	LTP Year 6 2020/21 ($000)	LTP Year 7 2021/22 ($000)	LTP Year 8 2022/23 ($000)	LTP Year 9 2023/24 ($000)	LTP Year 10 2024/25 ($000)
Sources of operating funding											
General rates, uniform annual general charges, rates penalties	-	-	-	-	-	-	-	-	-	-	-
Targeted rates (other than a targeted rate for water supply)	461	441	576	555	541	530	494	493	552	490	497
Subsidies and grants for operating purposes	-	-	-	-	-	-	-	-	-	-	-
Fees, charges, and targeted rates for water supply	-	-	-	-	-	-	-	-	-	-	-
Internal charges and overheads recovered	37	49	31	46	72	93	98	130	136	159	173
Local authorities fuel tax, fines, infringement fees, and other receipts	-	6	6	6	7	7	7	7	8	8	8
Total operating funding (A)	**498**	**496**	**613**	**607**	**620**	**630**	**599**	**630**	**696**	**657**	**678**
Applications of operating funding											
Payments to staff and suppliers	179	157	237	250	256	227	225	233	243	253	264
Finance costs	-	-	-	-	-	-	-	-	-	-	-
Internal charges and overheads applied	13	-	-	-	-	-	-	-	-	-	-
Other operating funding applications	-	-	-	-	-	-	-	-	-	-	-
Total applications of operating funding (B)	**192**	**157**	**237**	**250**	**256**	**227**	**225**	**233**	**243**	**253**	**264**
Surplus (deficit) of operating funding (A - B)	**306**	**339**	**376**	**357**	**364**	**403**	**374**	**397**	**453**	**404**	**414**
Sources of capital funding											
Subsidies and grants for capital expenditure	-	-	-	-	-	-	-	-	-	-	-
Development and financial contributions	133	-	-	262	-	-	657	-	-	208	-
Increase (decrease) in debt	-	-	-	-	-	-	-	-	-	-	-
Gross proceeds from sale of assets	-	-	-	-	-	-	-	-	-	-	-
Lump sum contributions	-	-	-	-	-	-	-	-	-	-	-
Total sources of capital funding (C)	**133**	**0**	**0**	**262**	**0**	**0**	**657**	**0**	**0**	**208**	**0**
Applications of capital funding											
Capital expenditure											
to meet additional demand	-	-	-	-	-	-	-	-	-	-	-
to improve the level of service	-	-	-	-	-	-	-	-	-	-	-
to replace existing assets	109	902	31	11	17	398	219	306	-	330	-
Increase (decrease) in reserves	330	-563	345	608	347	5	812	91	453	282	414
Increase (decrease) in investments	-	-	-	-	-	-	-	-	-	-	-
Total applications of capital funding (D)	**439**	**339**	**376**	**619**	**364**	**403**	**1031**	**397**	**453**	**612**	**414**
Surplus (deficit) of capital funding (C - D)	-306	-339	-376	-357	-364	-403	-374	-397	-453	-404	-414
Funding balance ((A - B) + (C - D))	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

1.13 ASSET MANAGEMENT PRACTICES

MDC employ an Asset Manager, a Utilities Engineer and an Engineering Technician who are responsible for the management of the Foul Sewer asset.

Management planning is actioned in-house generally based on the knowledge of the Asset Manager/Utilities Manager assisted by the council's contractors and by such planning tools as the ArcGIS Asset Register software and Asset Finda (asset management software)

Occasionally elements of the management of the network may be competitively tendered to consultancy services.

Routine maintenance is undertaken through a competitively tendered contract of normally 3 to 5 year duration.

MDC accounts for revenue and expenditure on an accrual basis. All works are identified through a job cost ledger with appropriate breakdown level to be able to monitor and report on revenues and expenditure. All external reports are prepared in compliance with Generally Accepted Accounting Principles.

1.13.1 ASSET MANAGEMENT PROCESSES

Council uses the LTP process to identify community concerns and issues which are incorporated into levels of service that are expressed by performance measures written into the professional services and physical works contracts. The satisfactory execution of these performance measures result in levels of service compliance that ensures the MDC's outcomes are achieved and the community vision of a district they wish to live in is accomplished.

Well documented standards and processes exist for an on-going inspection programme.

Maintenance and renewal costs are recorded in the general ledger.

There is no formal risk management process.

1.13.2 ASSET MANAGEMENT SYSTEMS

The ArcGis Geographic Information System database is used as the inventory management system and should be the depository for all the available asset data.

Council also uses Asset Finda (linked to ArcGis) which is a complete system for designing and managing solutions through the application of geographic knowledge. Data can be manipulated within Asset Finda, ArcGIS or exported to excel to assist in the decision making process for Stormwater network management.

Other systems operated by the Council are:

- NCS Corporate financial management system
- NCS electronic plan record system
- Hardcopy plan filing systems

The Council is moved its GIS platform from MapInfo to ArcGis from 24th October 2011. This continues to provide a good Asset Register.

1.14 PLAN IMPROVEMENT AND MONITORING

This AMP has previously been reviewed and updates incorporated including improvements to move towards "Core" level Asset Management. Council is committed to a continual improvement as outlined in Section 10. A key objective is to dovetail the asset management planning process with the other key planning processes, particularly the LTP.

1.15 KEY FACTORS ASSUMED IN DEVELOPING THIS AMP

There are a number of key factors that have been assumed in the development of this AMP as outlined below.

1.15.1 ASSET DATA

In preparing the plan, data in the ArcGis database has been taken as the verified network asset. As a result of the recent revaluation and the move to ArcGis, significant validation checks were carried out on the data.

Table 9.1 gives the assessed data confidence quality of the MDC asset register as described in the 2013 Water, Wastewater, Stormwater and Solid Waste Assets "Mackenzie District Infrastructure Revaluation" report.

1.15.2 LEVELS OF SERVICE

These have been based on Levels of Service (LOS) outlined in the 2012-2022 LTP and updated in the 2014/15 Annual Plan. It is assumed that customer consultation completed as part of the LTP process has been taken into account in the development of these LOS.

Changes in government requirements in future may affect future LOS.

1.15.3 DEMAND

Although the population remains static within the district, other demand factors are based on limited information. No specific consultation or research has been completed to determine future demand on the network. There is a moderate level of confidence in future demand based on limited input information.

1.15.4 LIFE CYCLE MANAGEMENT

The knowledge of the practitioners directly providing this activity, both on a day-to-day basis and historically, has been relied upon. These practitioners include Council's engineering staff, Council's consultants and staff of the various physical works contractors.

1.15.5 FINANCIAL FACTORS ASSUMED

Key factors assumed in the financial forecasts are as follows:
(Inflation figures have been provided by Business and Economic Research Limited.)

Table 3: Adjustors: % per annum change

	Road	Property	Water	Energy	Staff	Other	Earthmoving	Pipelines	Private Sector Wages
Year Ending	**% pa change**								
Jun 12	5.2	3.3	6.0	15.4	2.3	1.4	4.7	3.1	2.1
Jun 13	1.1	1.7	-2.8	-1.8	2.1	2.9	2.1	-2.7	1.9
Jun 14	0.7	1.9	-2.1	1.3	1.9	1.8	2.8	-2.5	1.7
Jun 15	0.4	1.9	4.7	4.2	1.6	1.5	1.7	1.8	1.7
Jun 16	1.2	2.2	5.2	3.5	1.8	2.3	1.8	2.1	1.7
Jun 17	1.4	2.4	3.8	3.8	1.9	2.5	2.6	2.5	1.8
Jun 18	2.2	2.5	3.0	3.9	2.0	2.6	2.4	2.6	1.9
Jun 19	2.4	2.6	3.2	4.1	2.1	2.7	2.0	2.8	2.0
Jun 20	2.5	2.8	3.3	4.3	2.2	2.9	2.1	2.9	2.1
Jun 21	2.7	2.9	3.5	4.5	2.3	3.0	2.3	3.1	2.1
Jun 22	2.8	3.0	3.7	4.7	2.4	3.1	2.4	3.2	2.2
Jun 23	3.0	3.2	3.8	4.9	2.5	3.3	2.5	3.4	2.3
Jun 24	3.1	3.3	4.0	5.1	2.6	3.4	2.9	3.5	2.4
Jun 25	3.3	3.4	4.2	5.3	2.7	3.6	3.1	3.6	2.5
20-year avge %pa	3.2	2.9	3.5	4.7	2.4	3.0	3.0	3.0	2.2

- Council will continue to fund the level of service currently set out in this AMP
- The dollar values shown in this Plan are January 2015 dollars adjusted for inflation applicable to this Activity.
- Some renewal costs are rough order of cost estimates based on length and types of components using replacement costs form the recent revaluation exercise. These estimates will need to be further refined as projects develop.
- No account has been taken of the impacts related to the development, acceptance and implementation of the Risk Management Plan.
- Assumptions made on Total Useful Life and Residual Useful Lives of the assets in relation to the asset valuation.
- The asset data is considered to be reliable and fit for the purpose for developing the long term financial forecasts.
- Any other specific assumptions

2. INTRODUCTION

2.1 PURPOSE OF THE PLAN

The objective of Asset Activity Management planning is:

"To provide the required level of service, in the most cost effective manner, through management of assets for existing and future customers."

Activity Management Planning is a management tool that provides the link between strategic planning and managerial areas of Council's business and community's desired outcomes.

The need for Activity Management Plans for Council's major infrastructure and other major assets is an implied requirement of the Local Government Act 2002 and the Long Term Plan (LTP). Such Activity Management Plans define agreed levels of service, and the expenditure required to maintain these agreed service levels for the period of the plan.

Levels of service are the definitions of service quality resulting from operation of the particular asset against which the assets service performance may be measured. Levels of Service are one of the key outputs from the strategic planning process and typically comprise the following elements.

- Quantity
- Quality
- Cost
- Timescales
- Performance Measures
- Sustainability

2.2 RELATIONSHIP WITH OTHER PLANNING DOCUMENTS

The Activity Management Planning process analyses the impact of the Levels of Service on the business and should be structured to be compatible with other key planning mechanisms and documents, including:

LTP: Council's LTP 2012 – 2022 sets out the broad strategic direction for the period of the plan, defining the District Vision, Outcomes, Strategic Objectives, Projects and Tasks and the Financial Framework. The outcomes are directly related to Governance, Community Well-Being, Environment Protection, Sustainability, Economic Development, and Organisation Performance. These will remain relevant in the upcoming LTP.

District Plan: The Mackenzie District Plan assists the Council in carrying out its functions under the Resource Management Act 1991 so that it may achieve the purpose of the Act which is to "promote the sustainable management of natural and physical resources." The Plan was developed in consultation with local communities and interest groups. The Plan controls such activities as:

- Erection, relocation, or demolition of structures, buildings, network utilities and signs.
- Commercial activities.
- Earthworks.
- Use of hazardous substances.
- Planting, trimming or removing vegetation.

- Subdivision of land.

Infrastructure Strategy: Section 101B of the Local Government Act requires Councils to adopt an Infrastructure Strategy as part of their LTPs. The strategy covers a period of 30 years, and is required to identify significant infrastructure issues facing the district, the principal options for managing those issues and the implications of those options. The Council's Infrastructure Strategy outlines how the Council intends to manage its infrastructure assets, and provides the longer-term context for all infrastructure AMPs including this one.

Other Related Activity Management Plans: Council has other activities each managed through the production and use of Activity Management Plans. Of particular relevance to the Foul Sewer activity are the Roading, Water and Stormwater Activity Management Plans. Cooperation with these activity groups is required as their works in the road corridor will have impact on all assets.

Annual Plan and Budget: The works identified in this AMP will form the basis on which future annual plans are prepared.

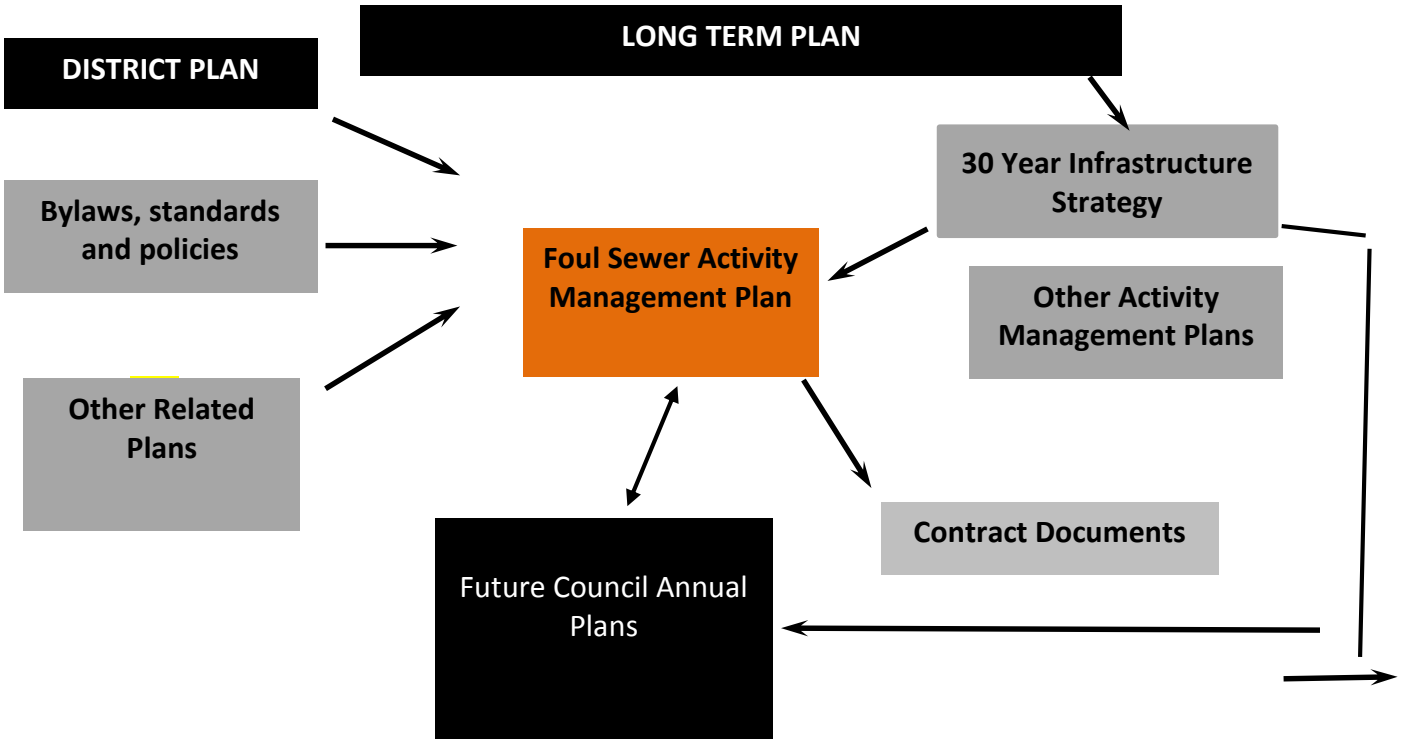
Contracts: The levels of service, strategies and information requirements contained in AMP's are translated into contract specifications and reporting requirements.

Bylaws, standards and policies: These tools for asset creation and subsequent management are needed to support AM tactics.

Other Foul Sewer Related Plans: These include:

- National Policy Statements
- Regional Policy Statements

Figure 2.1 – Relationship between the Foul Sewer Activity Management Plan and Other Plans



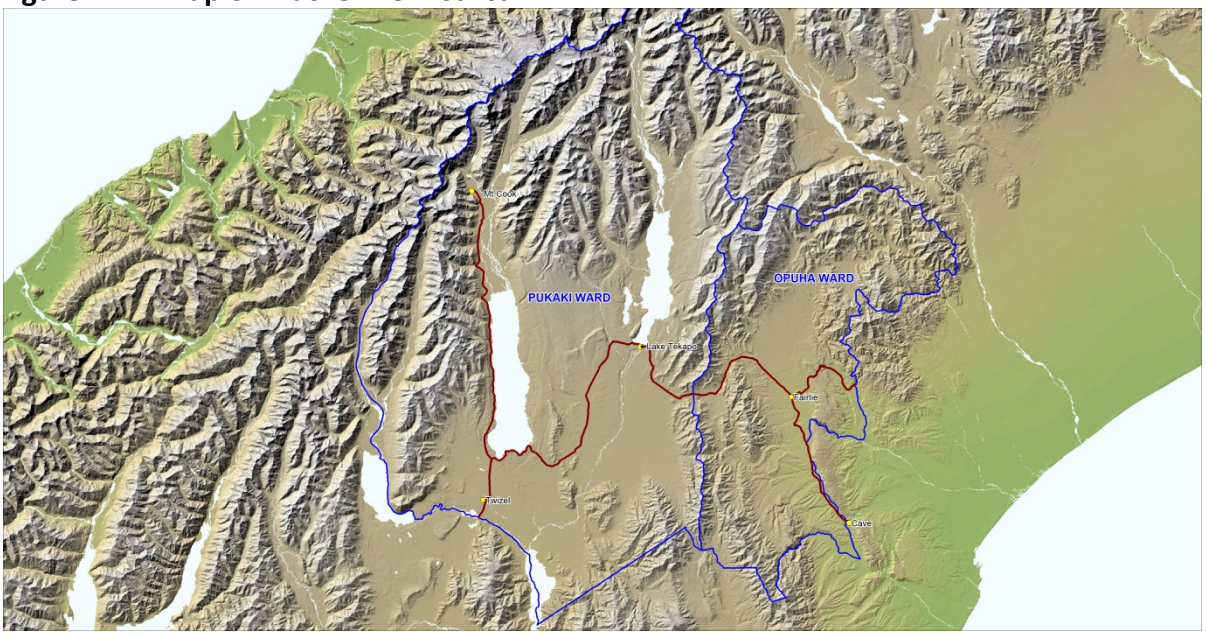
2.3 ASSETS INCLUDED IN THIS PLAN

2.3.1.1 Location

Figure 2.2 shows the location of the district within the Canterbury Region

The Mackenzie District is bounded in the north and east by the Timaru and Waimate Districts, in the south by the Waitaki District and to the West by the Southern Alps/ Westland District boundary. There are two wards: **Pukaki** which in effect takes in the Mackenzie Basin and **Opuha** being the remaining area to the west of a line following the upper reaches of the Hakataramea River through Burkes Pass to Mt Musgrove in the Two Thumb Range.

Figure 2.2 – Map of Mackenzie District



2.3.1.2 The Asset

The Foul Sewer asset includes all Council owned pipelines, manholes, treatment facilities and related infrastructure within the District as shown in Table 2.1.

Table 2.1 – Foul Sewer assets included in this plan

Asset Description	Sub-Asset Description	Quantity
Lines		74078m
Manholes		184
Treatment Facilities	Effluent from each of the four schemes is treated by oxidation pond systems	4

2.4 KEY STAKEHOLDERS AND CUSTOMERS

Key Stakeholders
The Council as the ultimate owner of assets.

- Regional council
- Owners and operators of inter-connecting or separate Foul Sewer networks.

Funding Partners

Funding is provided by several parties and in particular the following are significant contributors:

- Ratepayers – Rates provide funding for maintenance and operation of the networks
- Developers – By constructing infrastructure and vesting it in the Council plus providing the required financial contributions

Customer Groups

MDC's customers fall into three different groups: associated service providers, users and the wider community. These are shown in Figure 2.3 and further detailed in Table 2.2.

Figure 2.3 – Customer Groups (Ref IIMM Figure 2.1.5)

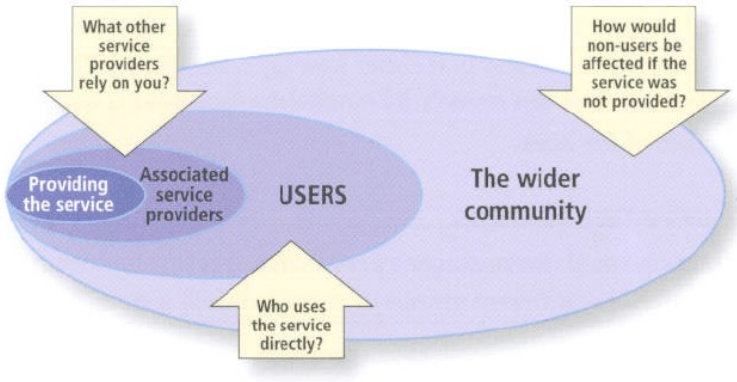


Table 2.2 – MDC Foul Sewer Customer Groups

Customer Group	Description	Customers
Associated Service Providers	These are other service providers who rely on the Foul Sewer network	• Contractors
Users	Those who directly use the service	• Rate Payers • Residents • Commercial business owners/operators • Industrial users
The Wider Community	Users that are affected if the service is not provided	• Citizens • Tourists • Visitors

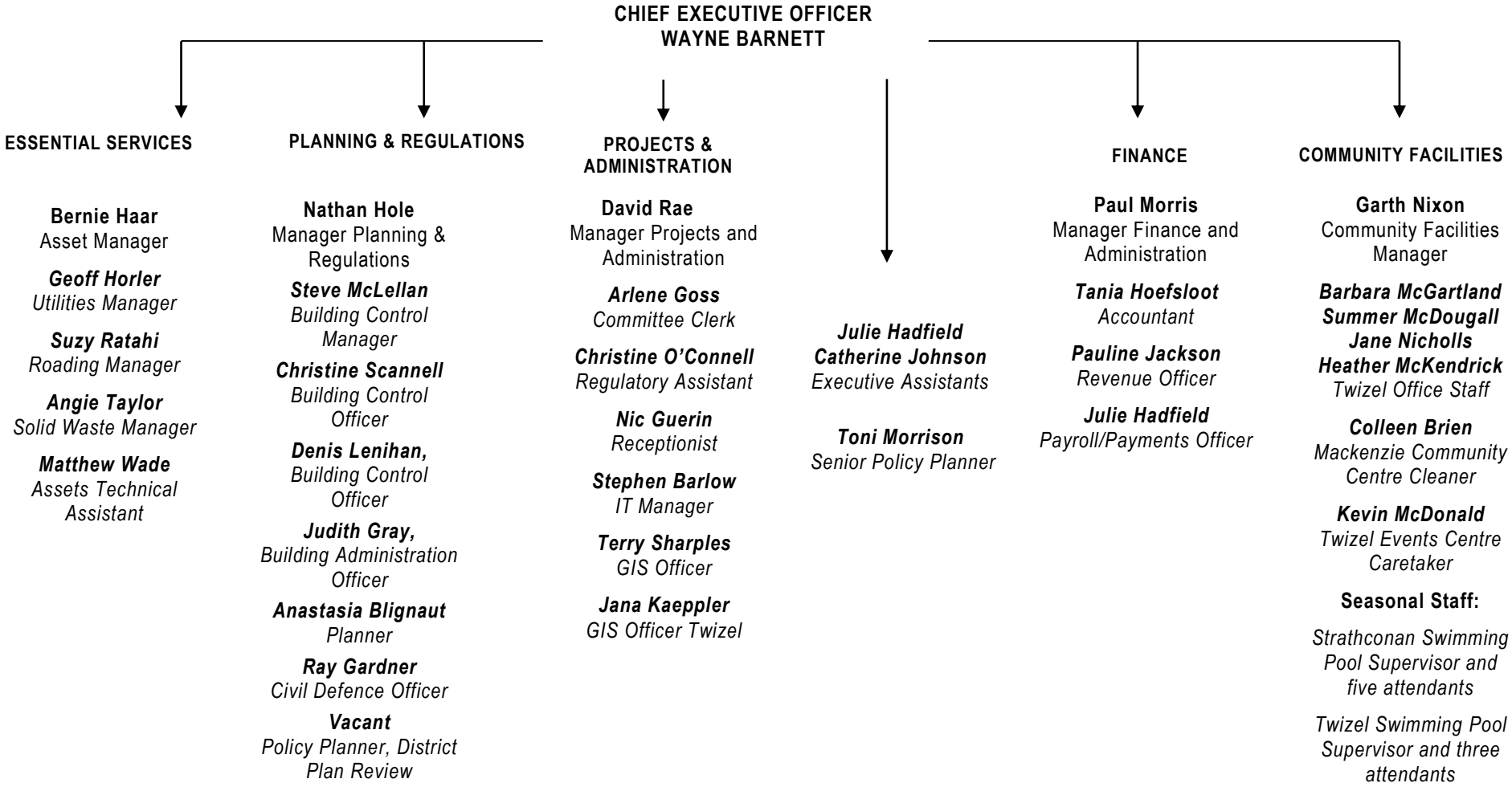
Other Parties

Other parties with an interest in MDC's AMP include Council employees, consultants and contractors who manage and work on the asset.

2.5 ORGANISATION STRUCTURE

Mackenzie District Council's organisation structure is shown in Figure 2.4. This AMP covers activities included under Essential Services, led by the council Asset Manager and Utilities Manager.

Figure 2.4 – MDC Organisation Structure



2.6 GOALS AND OBJECTIVES OF ASSET OWNERSHIP

Purpose of Ownership
Council provides a safe, effective and sustainable Foul Sewer system:

- To ensure that adequate wastewater treatment and disposal systems are provided (by either private or public means) for all dwellings.
- To provide and maintain reliable and affordable wastewater systems which protect public health, property, safety and the environment and which recognise cultural values, both now and in the future.

The Council's overriding goal is:

"The outcome desired by the community is to have safe, effective and sustainable water, waste communication, energy and transport systems in place when required, through sound long term planning and funding"

Review of Activities and Funding
The LTP identifies planned activities, defines the rationale for justifying these activities, and identifies the appropriate funding source.

Legal Authority for Council Action
The ***Local Government Act 2002*** gives local authorities the full capacity, and full rights, powers and privileges, to carry on or undertake any activity or business, do any act, or enter into any transaction wholly or principally for the benefit of its district.

Along with these wide sweeping powers comes the requirement to identify all reasonably practicable options before making a decision, and to assess the benefits and costs of each option against the likely economic, environmental, social and cultural impacts.

Local authorities are also required to consult widely, effectively and appropriately with the community to determine the communities' wishes and to seek feedback on all potentially significant activities – not only when a particular course of action is proposed, but at the various stages of the decision-making process.

A significant aspect of this consultation process is the development of the LTP, which forms the long-term (not less than ten years) direction for all Council's activities.

2.7 LINKS TO ORGANISATION VISION, MISSION, GOALS AND OBJECTIVES

VISION
Mackenzie will be a district in which:

- We foster the unique attributes and strong sense of community that makes the Mackenzie District special.
- Our natural environment is protected and enhanced in balance with achieving social and commercial objectives.
- A dynamic economy provides employment and investment opportunities consistent with the quality of life aspirations of existing and future generations.
- Democracy is respected and equal opportunity and the rights of the individual are upheld.

- A variety of sporting, recreational, cultural, spiritual, welfare and educational resources are available to enrich the lives of our people.
- Safe, effective, sustainable water, waste, communication, energy and transport systems are in place.
- People are encouraged to use their skills and talents for the benefit of the community.

MDC's outcomes and objectives for the foul sewer network are stated in the LTP 2009 – 2019.

These outcomes and objectives have been translated into various targets for maintenance and renewals to be achieved in each financial year. The outcomes are reported in each Annual Report.

The principal goal is to provide an effective, efficient, accountable and sustainable range of services that meet the actual needs of the residents. The foul sewer network provides the means to collect and convey sewage away from properties and dispose of it in an environmental and sustainable way.

The over-riding management strategy is that the Foul Sewer infrastructure as it presently exists will be maintained in the same state in perpetuity.

Table 2.3 – Community outcomes

Community Outcome	Contributions of the Foul Sewer Activity towards the Outcomes
'Safe, effective and sustainable infrastructure'	By ensuring that adequate public disposal systems are provided and maintained and that private disposal systems are properly installed, Council provides an essential component of the District's infrastructure.
'A fit and healthy community."	Every household requires a good wastewater disposal system to avoid exposure to water-borne health risks.
'A thriving economy'	By ensuring that adequate public disposal systems are provided and maintained.

2.8 ASSET MANAGEMENT DRIVERS

The business drivers, which define the need, priority and scope for improved AM practices within Council may be summarised as follows:

Customer Service
Customers require that agreed levels of service be delivered reliably, efficiently and economically. The use of AM techniques provides the following benefits in satisfying these demands:

- focuses on identifying and satisfying customer requirements
- provides a basis for customer consultation when determining levels of service preferences by identifying the range and cost of service level and service delivery options
- enhances customer confidence that funding is being allocated in an equitable and cost effective manner; that assets are being well managed and improves understanding of service level options and requirements

Financial Responsibility

The Local Government Act requires Local Authorities to:

- prepare and adopt, every three years, a long term (10 years plus) financial strategy for all infrastructural assets which takes into account asset creation, realisation, and loss of asset service potential
- prepare and adopt, every three years, a 30 year infrastructural strategy
- determine their long term financial strategy, consider all relevant information and assess the cost/benefit of alternatives
- adopt a financial system consistent with generally accepted accounting practices
- manage assets prudently in the interests of the district and its inhabitants
- fund or otherwise provide for loss of service potential (deferred maintenance or depreciation) from July 1999

The implementation of the optimised work programmes and resulting long-term cash flow projections contained in AMP's will aid compliance with these requirements.

AMP's (supported by appropriate processes, systems and data) should provide clear justification for forward works programmes (and associated funding programmes) and provide the ability to even out peak funding demands and account for changes in asset service potential.

Environmental Responsibility

Asset Management (AM) Planning demonstrates how MDC is addressing sustainable management of its physical resources while enhancing the protection of the environment as required under the provisions of the Resource Management Act.

Safety

AM planning addresses MDC's safety obligations through:

- adoption of appropriate design standards for the creation of new assets
- development of risk management practices

Economic Efficiency

The techniques incorporated into this AMP support economic efficiency by:

- providing a basis for monitoring asset performance and utilisation
- enabling asset managers to anticipate, plan and prioritise asset maintenance and renewal expenditure
- identifying under-funding of asset maintenance and renewal
- quantifying risk, leading to minimisation of high impact (financial and service level) failures and environmental effects and resulting in savings where asset renovation is less than the cost of replacement
- extending the life of an asset by optimising maintenance programmes and demand management

Achieve Strategic Goals

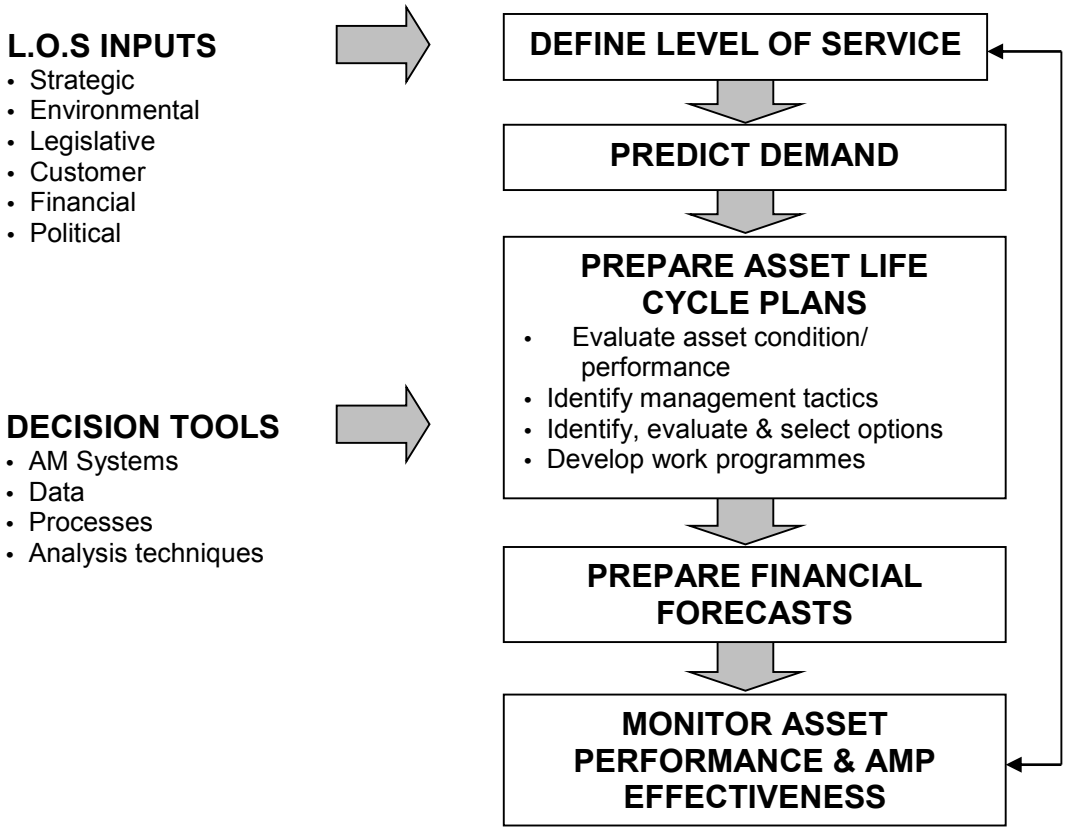
MDC has a strategic intent to “achieve sustainable development” and other goals relating to growth, building communities, protecting the environment, supporting the economy and providing quality customer service.

2.9 PLAN FRAMEWORK

This AMP is structured around the current asset inventories, the existing levels of service and consequential financial management plan for the next ten years. It includes Maintenance requirements, Renewals, and Capital improvements in terms of Council requirements.

This AMP generally follows the format recommended in the National Asset Management Steering Groups (NAMS) Infrastructure Asset Management Manual to a core level. Figure 2.5 shows the framework of this AMP.

Figure 2.5 – Foul Sewer AMP Framework



This AMP assumes that the current sewer network will be maintained in perpetuity.

2.10 APPROPRIATE LEVEL OF ASSET MANAGEMENT

The International Infrastructure Management Manual (IIMM) provides a summary of the different degree asset management complexity: Minimum, Core, Intermediate and Advanced. The degree of complexity differs according to an organisation's corporate needs. The level of complexity of Asset Management is dependent on the following:

- The costs and benefits to the organisation
- Legislative and other mandated requirements
- The size, condition and complexity of the assets
- The risks associated with failures
- The skills and resources available to the organisation
- Customer expectations

A core Activity Management Plan will meet minimum legislative and organisational requirements for financial planning and reporting. It provides basic technical management outputs such as statements of current levels of service, forward replacement programmes and associated financial projections.

MDC considers the required sophistication of their plan in the short to medium term need not progress beyond a **"Core"** planning level, as:

- the cost at this time to move to an advanced plan would provide little significant benefit to Council or its' customers
- the size, complexity and use of the assets is consistent with a rural sparsely populated district
- the risks associated with failure are low

The current Activity Management Plan generally meets "Core" requirements. By implementing improvement planning Council can assess the asset management performance and identify gaps to drive the improvement actions.

3. DESCRIPTION OF FOUL SEWER ASSET

3.1 DESCRIPTION OF ACTIVITY

Foul Sewer management is the median of the three water activities with an annual expenditure of $583,000 (2014/15).

There are un-sophisticated networks in Fairlie, Tekapo, Twizel and Burkes Pass only. In every case the effluent is treated by way of an oxidation pond system and then discharge to ground.

The Foul Sewer asset is made up of the following components, which are described in more detail in the sections below.

- Pipelines
- Manholes
- Pump chambers
- Overflow storage chambers
- Treatment facilities

3.2 FAIRLIE

3.2.1 GENERAL

a)	Total population (2013)	
	Permanent	693
	At Holiday times	900
b)	Number of properties in area of benefit	
	Connectable	527

3.2.2 OVERVIEW AND OVERALL ASSET CONDITION

The Fairlie waste water system was first constructed in 1938 using earthenware pipes with cement joints. The Initial Oxidation ponds were constructed in 1971 and then upgraded in 2002 with the dividing up of the secondary pond with solid bunds and filter paths at the ends. This was to control the flow paths through the ponds.

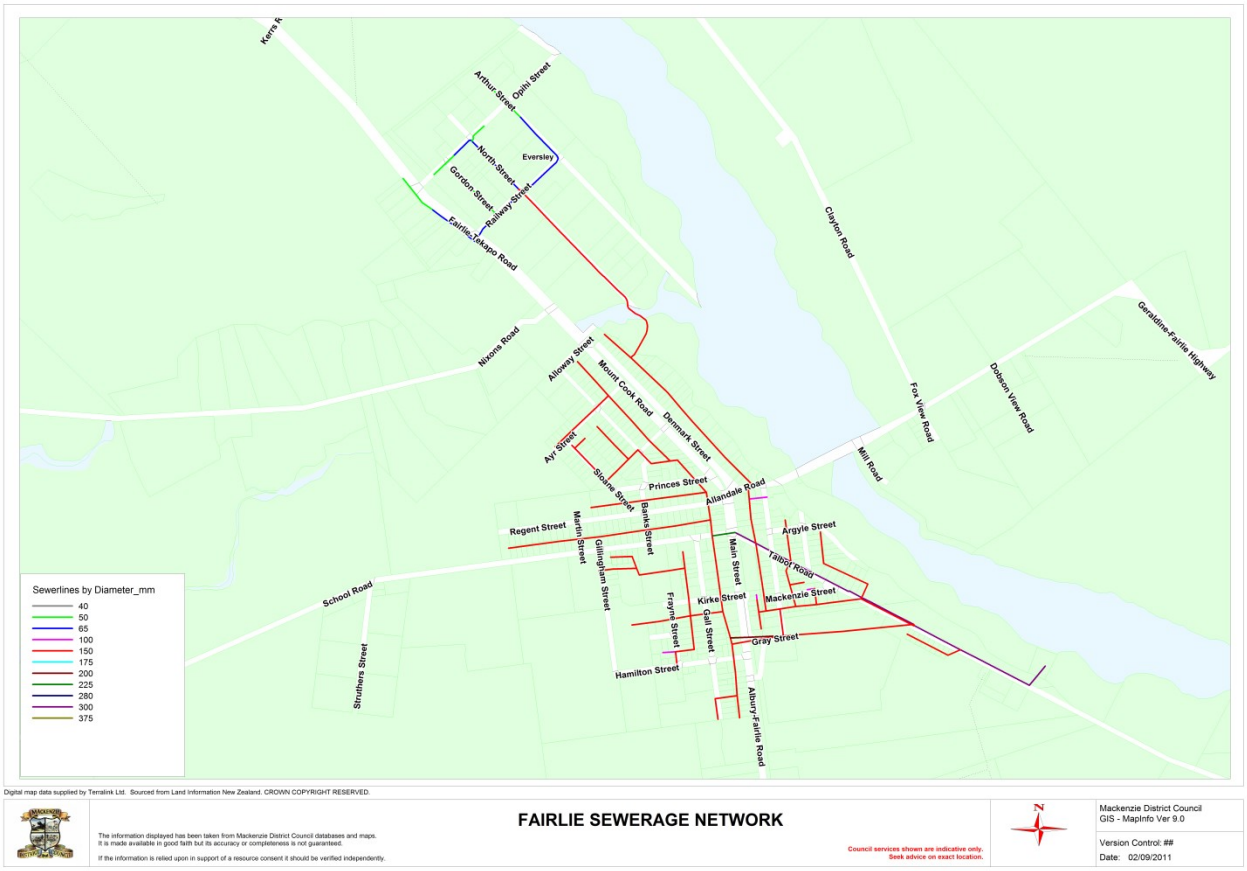
The five soakage basins were constructed in 2004 to remove the discharge from the Opihi River. Now all effluent either evaporates or discharges to ground.

Extensions of pipelines over the years have been mainly in asbestos cement and uPVC.

3.2.3 DISCHARGE LOCATIONS

Foul Sewer Oxidation pond and disposal system is located on Talbot Road.

FIGURE 3.1 – Current Foul Sewer Network



3.2.4 CONDITION AND PERFORMANCE OF ASSETS

- **CONDITION**

The condition profile in the graph is based on the results of surveys undertaken from 1993 to 2010. Closed circuit television was used to video the wastewater pipes, with faults recorded and grades assigned to each fault depending on the severity and type of fault.

Generally speaking, all of the systems in Fairlie are in a good state of repair and if they are maintained and renewed regularly, and at the appropriate times, they can be expected to last indefinitely, without any significantly abnormal costs having to be incurred.

3.2.5 PUMP STATIONS

There is only one pump station in Fairlie. This collects the effluent from the Camping Ground and pumps it via a rising main into the gravity system.

The original Camp Ground Pump Station was decommissioned and a new pack pump system was installed in 2014. The system installed was a Model 2014iP 1100 x 2000mm supplied by Ecoflow Ltd.

The pump station has two EOne 0.75 kW submersible grinder pumps and an alarm panel as part of the package. The Duplex station is rated for 4000litres per day. With both pumps running it pumps 1.2 l/s.

Pump Station Instalation

Emergency Holding Tank (2m^3) Installation

TREATMENT

Fairlie	
Oxidation Ponds	Pond 1 0.98ha Maturation Ponds (5) 0.60ha
Properties Connected	474

FAIRLIE OXIDATION PONDS

The Initial Oxidation ponds were constructed in 1971 and then upgraded in 2002 with the dividing up of the secondary pond with solid bunds and filter paths at the ends. This was to control the flow paths through the ponds. The soakage basins were constructed in 2004.

The effluent enters the ponds in the south west corner travelling a long flow path to exit the pond system at the north east corner.

The treated effluent then enters the soakage system to finally discharge to ground via the soakage basins. The five soakage basins are automatically rotated in the following sequence:- Basin 1 – 3 - 5 – 2 then 4.

3.2.6 FLOW AND LOADING ESTIMATIONS (ORIGINAL DESIGN)

Flow and loading monitoring is now in place for the discharge. However, the following assumptions were used during the investigation and design of the wastewater treatment and disposal investigation.

LOADINGS

Allowing a standard contribution of 75g BOD/person.day and a population of 1000 then an average loading of 75 kg/day is expected. This is a reasonable estimation because the town is largely residential with some commercial properties which are typically quite stable contributors. The 75g BOD/person.day is an upper value with a range of 60-75 being used in assessments elsewhere. The large number of school children arriving to town each day, relative to the base population supports the use of the upper value.

FLOWS

Significant infiltration is expected. A good approach for estimation of flows is given by the Christchurch Drainage Board Design Manual. This approach was used in the Status Report, assuming a population of 800. As a design population of 1000 has been chosen, the flows have been reworked with this increased population.

The Average Wastewater Flow (AWF) can be reliably approximated with an allowance of 270 l/day/person which gives a flow of 3.14 l/s. Determination of the Peak Wet Weather Flow (PWWF) and the Peak Dry Weather Flow (PDWF) can be achieved by the Christchurch Drainage Board method as follows:

Table 3.1.6a – Flow Estimation (l/s)

Zone	Area (ha)	AWF	P/A	PDWF	BI	SA	PWWF
A	27	1.21	5.7	6.9	1.9	5.4	14.2
B	20.3	0.91	6.9	6.3	1.4	4.1	11.7
C	8.5	0.38	12	4.6	0.6	1.7	6.9
D	14.5	0.65	8.4	5.4	1.0	2.9	9.4
Total	70.3	3.14		23.1	4.9	14.1	42.1

Notes:
The town is split into 4 zones: A, B, C, D with the AWF based on each area
AWF = Average Wastewater Flow
P/A = Peak to Average ratio which increases for smaller catchments
BI = Basic Infiltration which allows for sub-surface infiltration
SA = Storm Allowance which allows for surface infiltration (e.g. through manhole covers) and increased sub-surface infiltration
PDWF = Peak Dry Weather Flow
PWWF = Peak Wet Weather Flow

From the above table, wet weather and groundwater infiltration will have a significant effect on the flow rate. Fairlie has a remarkably consistent rainfall from month to month through the year with only April having a significantly higher precipitation than the other months. Hence the infiltration rate will be assumed as consistent when evaluating an Average Wastewater Flow (AWF). The AWF will be assumed to be the sum of the Average Sewage Flow and the Basic Infiltration or 8.04 l/s.

Average Flow = BI + AWF

= 8.04 l/s

An estimation of the sustained wet weather flow can be made by combining the AWF, BI and a percentage of the SA. Inclusion of a percentage of the SA is justified because it is defined as including not only the direct run-off entering the sewerage but also the delayed increase in sub-surface infiltration. Thirty percent of the SA will be included in the Sustained Wet Weather Flow to give a rate of 12.3 l/s over a week of wet weather.

Sustained Wet Weather Flow = AWF + BI + 0.3SA

=12.3 l/s

The above flow rates display a high variability which is typical of smaller and older sewerage reticulations. The peaking factors for the above flow rates are:

	Flow rate (l/s)	Peaking Factor
AWF	8.0	1
SWWF	12.3	1.5
PDWF	23.1	2.9
PWWF	42.1	5.3

The minimum flow rate can be assumed to be less than the AWF of 3.1 l/s. The new system is operating effectively and we are experiencing no issues with it.

3.2.7 TREATMENT FACILITY PERFORMANCE

- Fairlie – complies with the current Resource Consent for air and effluent discharge

3.2.8 RESOURCE CONSENTS HELD

Wastewater Treatment Plant	Consent No.	Type	Expiry Date	Comments
Fairlie	CRC992647	Air Discharge	17-Dec-2038	
	CRC992608	Discharge to land 400m3 daily	17-Dec-2038	

3.2.9 RETICULATION

Summary of Fairlie Urban Foul Sewer System

Asset Type	Fairlie
Pipelines	13354 m
Foul Sewer Manholes	98
Pump stations	1

Reticulation Description

The following tables have been compiled to show the extent and makeup of the systems.

Figure 3.2 – Pipe Size Distribution

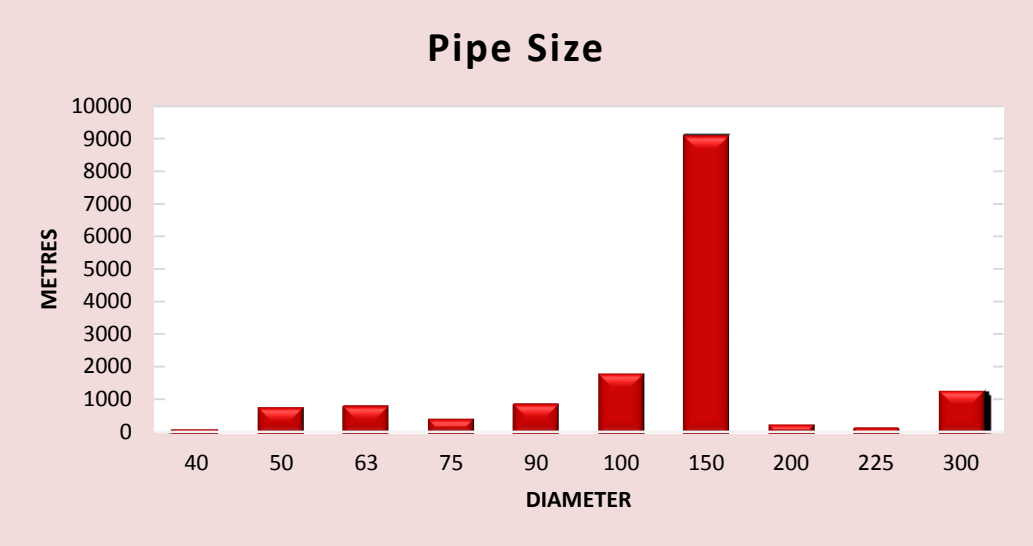


Figure 3.3 – Pipe Material Type Distribution

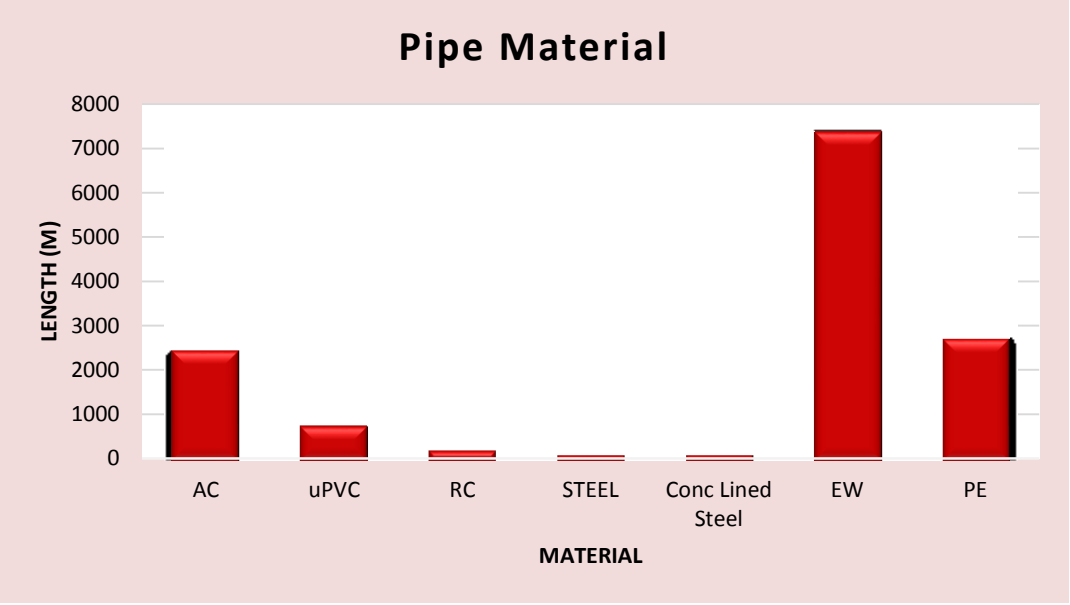


Figure 3.4 – Pipe Age Distribution

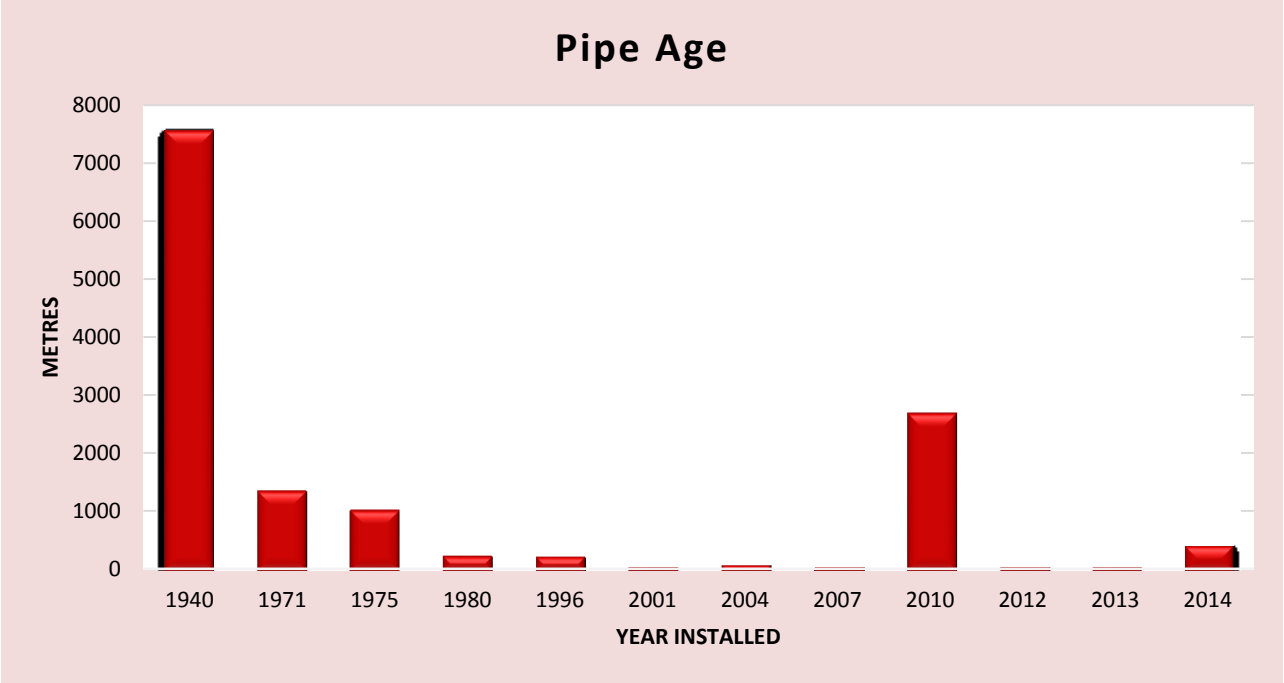
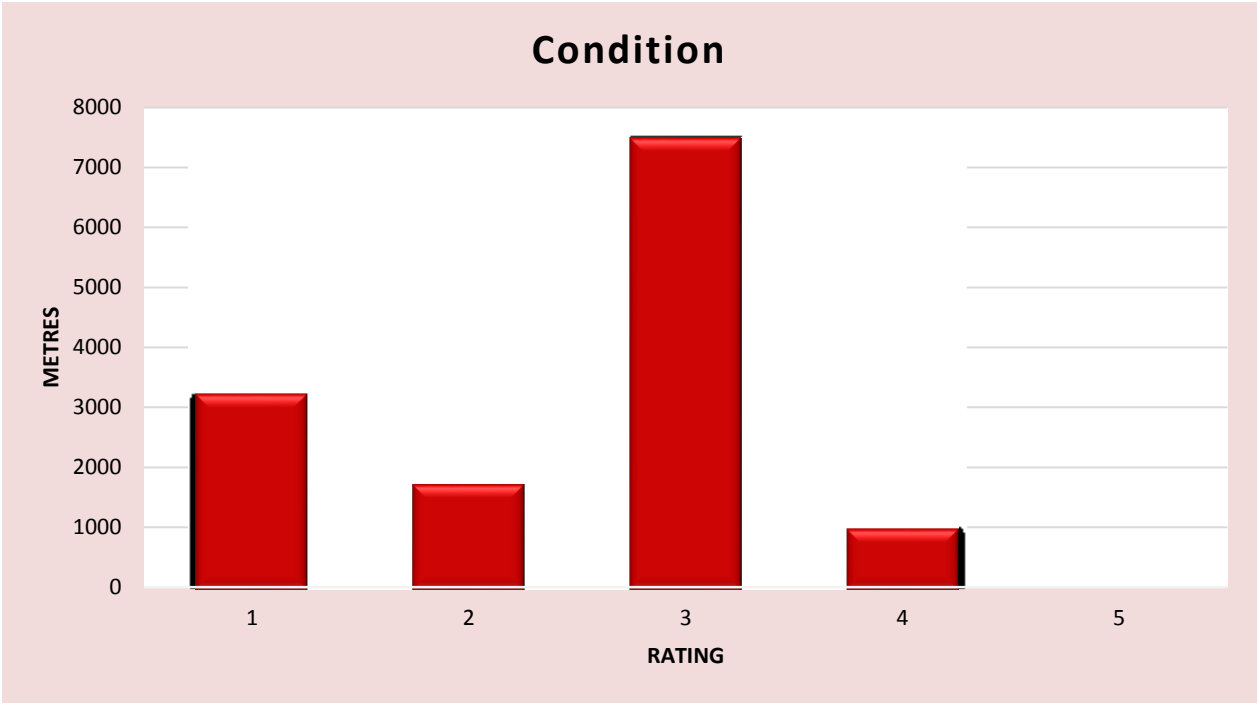


Figure 3.5 Current Condition Profile



Notes:

1 = **Very Good Condition** - Only normal maintenance required

2 = **Minor Defects Only** - Minor maintenance required (5%)

3 = **Maintenance Required to Return to Accepted Level of service** - Significant maintenance required (10-20%)

4 = **Requires Renewal** - Significant renewal/upgrade required (20-40%)

5 = **Asset Unserviceable** - Over 50% of asset requires replacement

A number of pipes are shown as three or four, these are regularly monitored including visual inspection and sampling. This gives us the information to decide on replacement timeframes. No pipelines are graded as unserviceable.

3.2.10 CAPACITY / FUTURE DEVELOPMENT REQUIREMENTS

Capacity Issues

Detailed work was completed as part of the upgrade of the treatment facility in 2002. Reports for the Fairlie Oxidation Ponds state:

Allowing a standard contribution of 75g BOD/person/day and a population of 1000 then an average loading of 75 kg/day is expected. This is a reasonable estimation because the town is largely residential with some commercial properties which are typically quite stable contributors. The 75g BOD/person/day is an upper value with a range of 60-75 being used in assessments elsewhere. The large number of school children arriving to town each day, relative to the base population supports the use of the upper value.

Significant infiltration is expected. A good approach for estimation of flows is given by the Christchurch Drainage Board Design Manual. This approach was used in the Status Report, assuming a population of 800. As a design population of 1000 has been chosen, the flows have been reworked with this increased population.

With a population of 717 (2006) at a peak holiday loading estimated at 900 then there is capacity in the treatment facility without further pre-treatment.

Over winter problems can occur with high water tables causing increased infiltration in a number of locations these are private drains but regular monitoring of the known sites and smoke detection surveys will need to be carried out to locate any large infiltration and remedy it. This used to create an issue of non-compliance with our resource consent but the conditions were varied in 2008 to allow for discharge of the increased flows.

3.3 LAKE TEKAPO

3.3.1 INTRODUCTION

a)	Total population (2013)	
	Permanent	369
	At Holiday times	1050
b)	Number of properties in area of benefit	
	Connectable	687

3.3.2 OVERVIEW AND OVERALL ASSET CONDITION

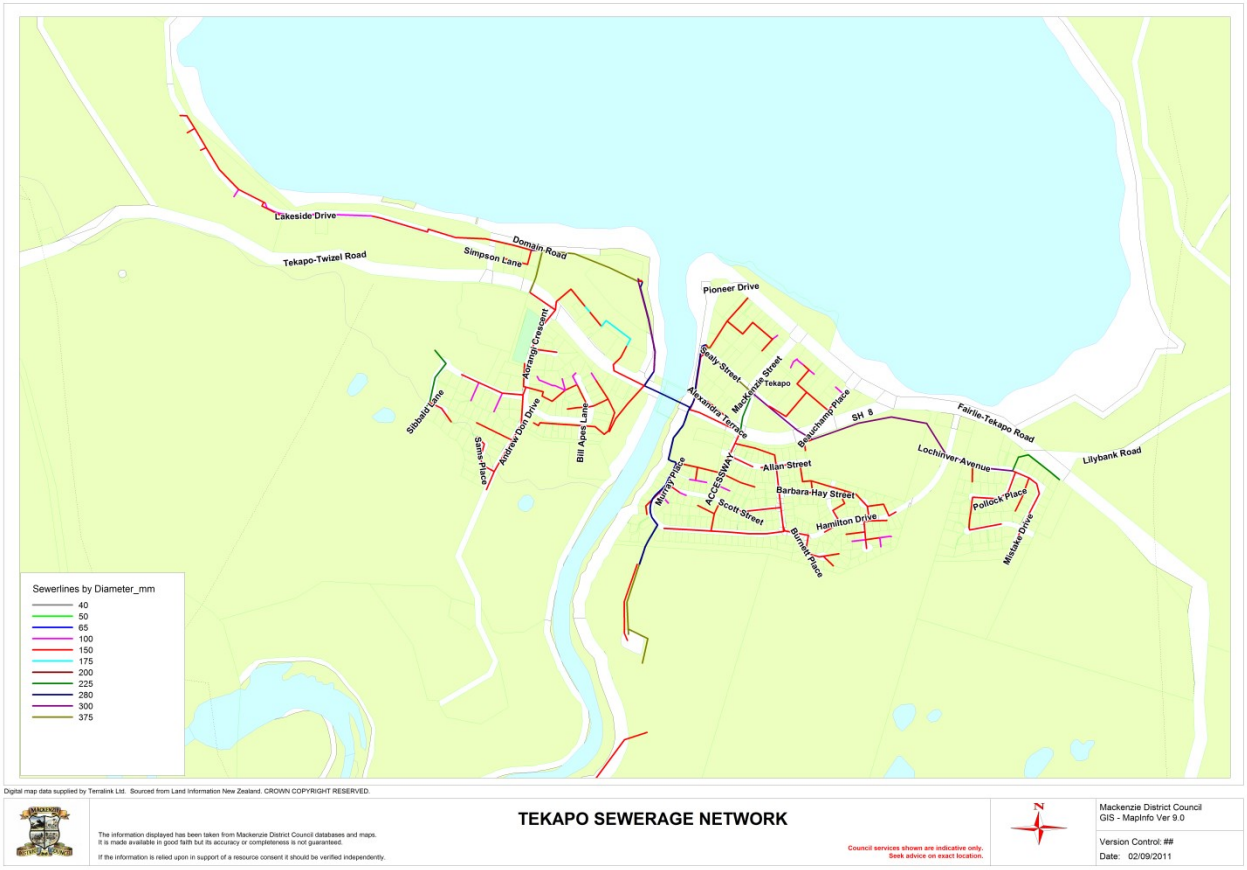
Lake Tekapo waste water system was first constructed in the 1950's when Lake Tekapo was predominantly a Ministry of Works and NZED Village. In 1972 the present oxidation pond was constructed and development of the Lake View subdivision has developed since that time. In the early 1980's the Pioneer Drive Area was connected to the waste water system. A variety of materials have been used for sewer lines.

Recently the Tekapo township has seen a growth in subdivision with significant developments on both sides of the river. This demand has slowed up in the last two years.

3.3.3 DISCHARGE LOCATIONS

Foul Sewer Oxidation pond and disposal system is located on Council land off Murray Place, with discharge by way of trickle irrigation to the south of the site.

FIGURE 3.1 – Current Foul Sewer Network



3.3.4 CONDITION AND PERFORMANCE OF ASSETS

- **CONDITION**

The condition profile in the graph is based on the results of surveys undertaken from 1993 to 2010. Closed circuit television was used to video the wastewater pipes, with faults recorded and grades assigned to each fault depending on the severity and type of fault.

Generally speaking, all of the systems in Tekapo are in a good state of repair and if they are maintained and renewed regularly, and at the appropriate times, they can be expected to last indefinitely, without any significantly abnormal costs having to be incurred.

3.3.5 PUMP STATIONS

There are three Foul sewerage pump stations in Tekapo. Two recently constructed (Sealy St and West Side) constructed in 2005 using modern engineering design. They are both connected to the

Fairlie office by telemetry, monitoring a range of functions. Both have eight hours over flow storage at peak flow.

The third one is beside the Camping ground and has no telemetry but is connected to our alarm system. This PS will have to be upgraded when the demand increases in the area. It also has at least eight hours overflow storage at peak flow.

Sealy Street Pump Station (installed 2005)

Duty Regime	Q max l/s	H Total m	H Static m
Initial Stage	77	31.4	24.6
Future Stage (3rd pump)	77	31.4	24.6

Pumps (two installed)	
Make	Flygt
Model	NP 3202.180 HT
Outlet Size	DN 150
Impeller diameter	344mm
Motor Out put rating	37 Kw
Motor rated current	63 A
Motor poles	4
Motor efficiency	91%
Motor Power factor	0.90
Base frequency	57Hz
Rated speed	1475 rpm

West Side Pump Station (installed 2005)

Duty Regime	Q max l/s	H Total m	H Static m
Initial Stage	77	31.4	24.6
Future Stage (3rd pump)	77	31.4	24.6

Pumps (two installed)	
Make	Flygt
Model	NP 3202.180 HT
Outlet Size	DN 150
Impeller diameter	344mm
Motor Output rating	37 kW
Motor rated current	63 A
Motor poles	4
Motor efficiency	91%
Motor Power factor	0.90
Base frequency	57Hz
Rated speed	1475 rpm

Camp Ground Pump Station (installed 1990)

Duty Regime	Q max l/s	H Total m	H Static m

Initial Stage	7	14	X

Pumps (two installed)

Make	Sarlin
Model	SV-044BH-1
Outlet Size	DN 100
Impeller diameter	X
Motor Output rating	X
Motor rated current	X
Motor poles	X
Motor efficiency	X
Motor Power factor	X
Base frequency	X
Rated speed	X

3.3.6 TREATMENT

Treatment Elements of Tekapo Waste Water Treatment Plant

WWTP Overview

Raw sewage from Tekapo Township gravitates to three pumping stations: one on the shore of Lake Tekapo to the west of the outlet, one at the camping grounds and the main one in Sealy Street on the eastern bank.

The Sealy Street and West Side Pump Stations are equipped with two large submersible pumps (with provision for a third) and they operate automatically. The Camping Ground pump station conveys the sewage over a small rise, then it gravitates for approximately 800 m back down to the West Side pump, which pumps the sewage 1000 m to the treatment plant in a 200 mm diameter PE pipeline. The Tekapo sewage reticulation system was upgraded is 2004/05 to cater for the projected demand for the next 50 years.

The plant was first commissioned in 1972 and consisted of a single oxidation pond, which was overloaded by 2000. It was upgraded in 2002 to two oxidation ponds and three maturation ponds, which discharge into two evaporation basins and now provides primary, secondary and tertiary treatment. Any overflow from the evaporation basins discharges via trickle irrigation on the forested slopes of the site.

The flow is split between two primary oxidation ponds, then recombines to flow through three maturation ponds in series. The increased area provided by the four additional ponds has increased the capacity of the treatment plant.

Tekapo	
Oxidation Ponds	Pond 0.42ha (2) Maturation Ponds (5) 0.3ha
Properties Connected	525

Fig 3.3.1 – Location of Oxidation Ponds

The original ponds were constructed in 1972and upgraded in 2002. The incoming effluent is split between the two primary ponds and then takes a long flow path through the five maturation ponds. The design in 2002 allowed for the disposal of the effluent to ground via the 4th and 5th pond. During operation it was found that there was insufficient permeability in the underlying soils and these ponds overflowed. In 2004 the outflow was modified to include a gravity trickle irrigation system, discharging to ground amongst a stand of wilding pines to the south of the site.

This area has scope for extension. The system has been working reasonably well since the extensions to the irrigation in 2010. The new arrangement allows for three different configurations of disposal to spell disposal areas or cope with increased demand.

3.3.7 FLOW AND LOADING ESTIMATIONS (ORIGINAL DESIGN)

The facultative ponds (primary oxidation ponds) were sized on surface BOD loading rate according to temperature. The photo above shows the upgraded treatment plant surface areas for the ponds at the Tekapo WWTP.

Table 3.3.6a

Pond Surface Areas	
Pond Number	Area
Previous	0.42 ha
Pond 1	
Current	
Pond 1A (existing)	0.42 ha (0.59ha(1))
Pond 1B (new)	0.47 ha
Pond 2 (new)	0.30 ha
Pond 3 (new)	0.10 ha
Pond 4 (new)	0.05 ha

Pond 5 (new basins)	0.03 ha

1 Provision has been made for future extension of existing Pond 1A.

A freeboard of 0.6m has been provided for the Tekapo WWTP external bunds. Internal bunds at Tekapo have a freeboard of 0.2m. Overtopping of internal bunds at maximum storage levels will be infrequent and of minor consequence. Retention time in Pond 1A and 1B at ADF is approximately 35 days. Total retention time in all ponds is about 52 days.

Aeration improves oxygen transfer in primary ponds, allowing improved nutrient removal and micro-organism reduction (disinfection) by sunlight. Previously there was no aeration capability at the Tekapo WWTP.

Mechanical aeration has been adopted in the Tekapo primary ponds to increase the oxygen transfer during adverse weather (especially cold, still weather). Two floating, 2.2 kW brush aerators are now installed (one aerator shown in Photo 3.4 anchored to the northern bund), located so that flow circulation is encouraged away from the outlet.

The pump data showed that wastewater flows into the Tekapo ponds fluctuate seasonally. This resulted in seasonal overloading of the original pond. Aeration of the new primary ponds provides increased oxygen transfer, allowing effective treatment of the increased wastewater flow.

The pond capacity can meet the BOD demand for a population of approximately 1,000 people (without aerator assistance). If the size of pond 1A is increased from 0.42 ha to 0.59 ha (as allowed for in the layout), the ponds can meet the demand for a population of approximately 1,300 people (without aerator assistance). The present capacity of the Tekapo WWTP with the existing aerator assistance can meet a BOD demand for a population of approximately 1,800 people. Capacities are for monthly average populations because the load is buffered by the long retention time.

Should the population increase beyond 1,800, the capacity of the WWTP could be increased by installing additional brush aerators on the oxidation ponds and extending Pond 1A. A 1 kW brush aerator capacity can meet the BOD demand for 300 people (with algae oxygen supply). Allowing for two 2 kW aerators on each of Pond 1A and 1B and a total pond surface area of 1.06 ha, the pond capacity could meet a BOD demand of 2,100 people.

For any further growth above 2,100 people, the Tekapo WWTP will require the addition of a dedicated aeration basin at the inlet with all oxygen being supplied by aerators. Similar pre-treatment has been undertaken at the Oamaru and Blenheim WWTPs and can remove 40% of BOD. Therefore, these upgrades (extended Pond 1A, two 2 kW aerators and aeration basin with aerators) can increase plant capacity to about 3,500 people. If the population of Tekapo increases above 3,500, alternative means of treatment and disposal will have to be investigated and new resource consents applied for.

3.3.7 Pond Construction Details

(a) Rock Filters

In-bank rock filters have been constructed at the Tekapo WWTP, providing increased SS and nitrogen removal from the wastewater during summertime. The rock filters were designed on the basis of the horizontal velocity through the rock filter. The more conservative guideline value of 3m/hr was applied to achieve solids capture as
per the Delft concept. Table 3.6 shows the rock filter sizing for various section of the WWTP.

Table 3.3.7a
Rock Filter Sizing

	Tekapo
Pond 1 – 2	None
Pond 2 – 3	3.00m
Pond 3 – 4	>10m (full bank width)

(b) Flow Splitting

The primary ponds at the Tekapo WWTP operate in parallel. Flow to these ponds is split, using manual valves located at the original manhole immediately prior to the original primary pond. These valves are manually trimmed until a suitable flow split is achieved.

The flow splitting structure divides the flow between the two primary ponds (Ponds 1A and 1B), as the ponds operate at two different levels, Pond 1A at 64.75m and Pond 1B at 63.50m.

The flow splitter is located at the original manhole located at the northwest corner of the original pond (RL65.50), which is manually adjusted to split the flow as follows:
– 49% to Primary Pond 1A
– 51% to Primary Pond 1B.

Adjustable weirs in the outlet manholes control flow out of both primary ponds.

(c) Inlet Scum Baffle

Previous to the WWTP upgrade, significant scum formations had been observed on the pond. Scum baffles have been constructed around the inlet structures to trap scum and floatable material discharging into the ponds, minimising the scum formation across the pond surface.

As the scum is trapped within the baffle structure, it builds up within the baffled area. If left for an extended period, this scum could become putrid, creating an odour nuisance. It is therefore necessary to manually remove any scum that has been trapped within the baffle structure at least weekly and possibly more often during periods of high flows or warm weather.

(d) Pond Liner

A pond liner minimises seepage from the new treatment ponds. This liner uses a silt-clay material, which was sourced from the bed of Lake Tekapo when levels were low. The liner has been placed 0.2m thick on the pond base and 0.3m thick on the external pond bunds.

Lining internal bunds was not considered necessary. In addition to the clay liner, a geotextile liner has been used beneath the clay liner on the pond base and the external pond bunds to reduce the chance of the fines being lost by seepage erosion.

(e) Embankment Structure

The pond banks were constructed using gravel/silt material available from the site. The gravel/silt material on site was suitable to construct the banks after screening to separate larger gravel (65-150mm) for use as rip rap and in the rock filters. Some parts of this site were used as rubbish pits

and these areas were excavated to remove any rubbish material and backfilled with suitable fill material.

Rock rip rap protection against wave action has been adopted rather than the construction of a concrete wave band. Rip rap has lower construction cost and greater surface area available for biofilm growth, which aids the treatment processes. If minor settlement of the banks occurs the rock rip rap will be more forgiving and easily repairable if required.

3.3.8 Effluent Disposal

The Tekapo WWTP uses soakage to land for the final disposal of treated effluent. The disposal system is comprised of a two-cell evaporation basin system, located behind the Refuse Transfer Station (refer Fig 3.3.1). A single soakage basin was previously used for the disposal of the treated effluent and this formed the basis of the design of the upgraded system.

The original soakage basin overflowed from time to time, during extreme wet weather, and when the base became blinded by solids. The two new basins operate in parallel, with provision made to operate each individually (manual valves), so that the basins can be emptied and the accumulated solids dewatered, prior to disposal.

In periods of low evaporation and/or rainfall, the basins overflow to a slow rate irrigation land disposal system. The irrigation system is sited on the forested slopes south of the ponds and contours approximately 100 m across the slope. Discharge rates are dependent on water levels in the evaporation basins. Recently this system has not been as efficient, particularly in cold weather with concerns expressed by Ecan regarding the ponding. Investigations are underway to identify an alternative disposal system that will cope with the cold winter extremes and avoid the ponding issues we have had in the past.

Increased vegetation is noticeable near the discharge points along the irrigation line. Flow monitoring of the irrigation system has been undertaken since 22 December 2003. The results of this monitoring have shown a range of flow rates from 0 to 200 m3/d.

During the peak season (summer holidays) the irrigation averaged approximately 150 m3/day (2.0 L/s). During the rest of the year the flows fluctuate (depending on evaporation rates and sewage flows) around 45 m3/d (0.5 L/s).

A comparison of pump station flow rates and irrigation data for the monitoring period (December to April) show that a considerable percentage of flow is being evaporated prior discharge in the irrigation system.

3.3.8 TREATMENT FACILITY PERFORMANCE

Lake Tekapo - complies with Resource Consents for effluent discharge.

3.3.9 RESOURCE CONSENTS HELD

Wastewater Treatment Plant	Consent No.	Type	Expiry Date	Comments
Lake Tekapo	CRC042914	Discharge to land 1100m3 daily	18-Mar-2040	

3.3.10 RETICULATION

Summary of Tekapo Urban Foul Sewer System

Asset Type	Tekapo
Pipelines	15514 m
Foul Sewer Manholes	241
Pump stations	3

Reticulation Description

The following tables have been compiled to show the extent and make up of the systems.

Figure 3.3.2 – Pipe Size Distribution

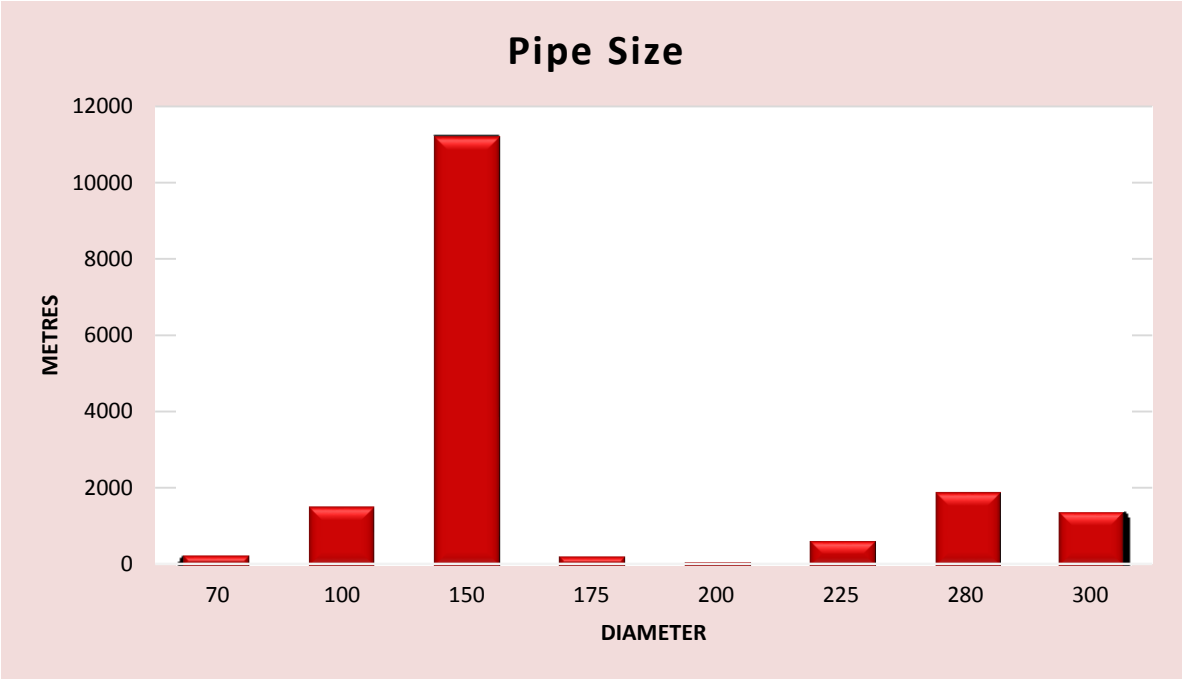


Figure 3.3.3 – Pipe Material Type Distribution

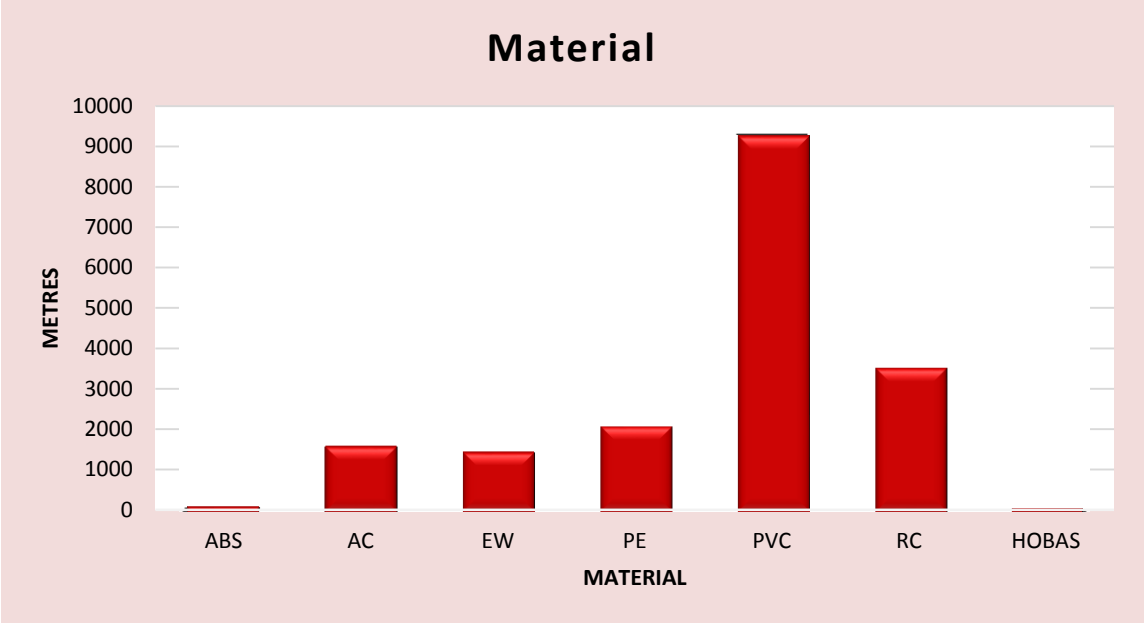


Figure 3.3.4 – Pipe Age Distribution

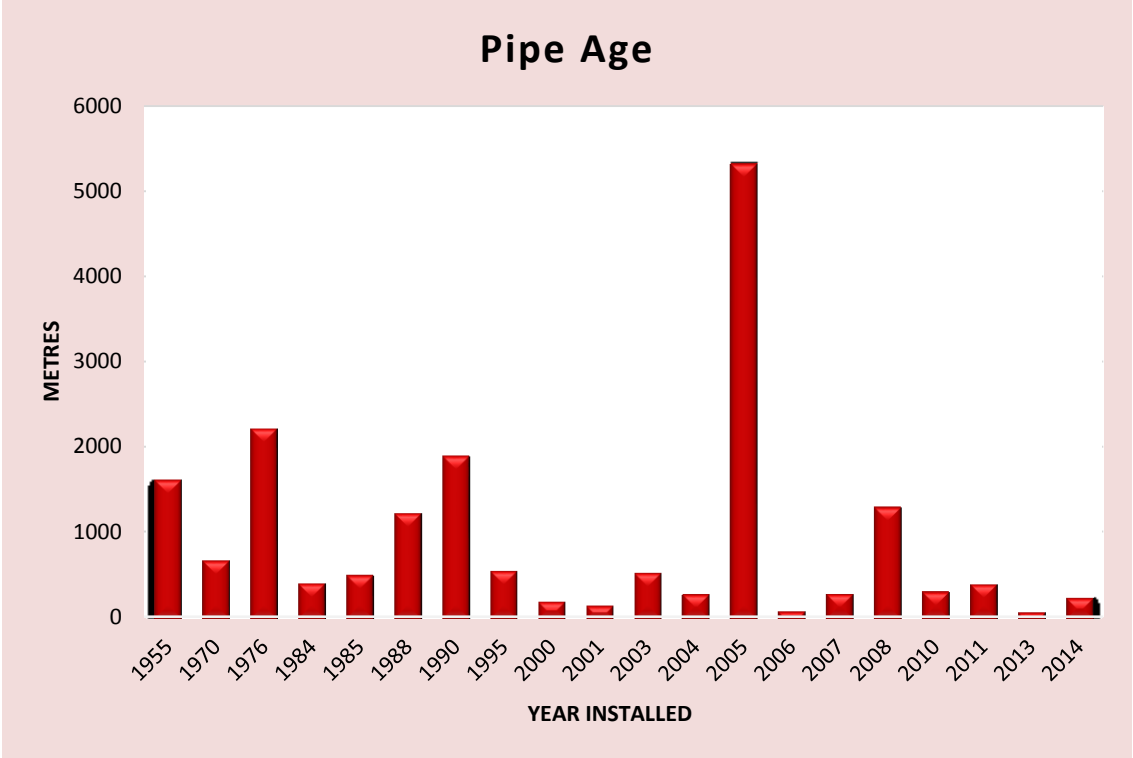
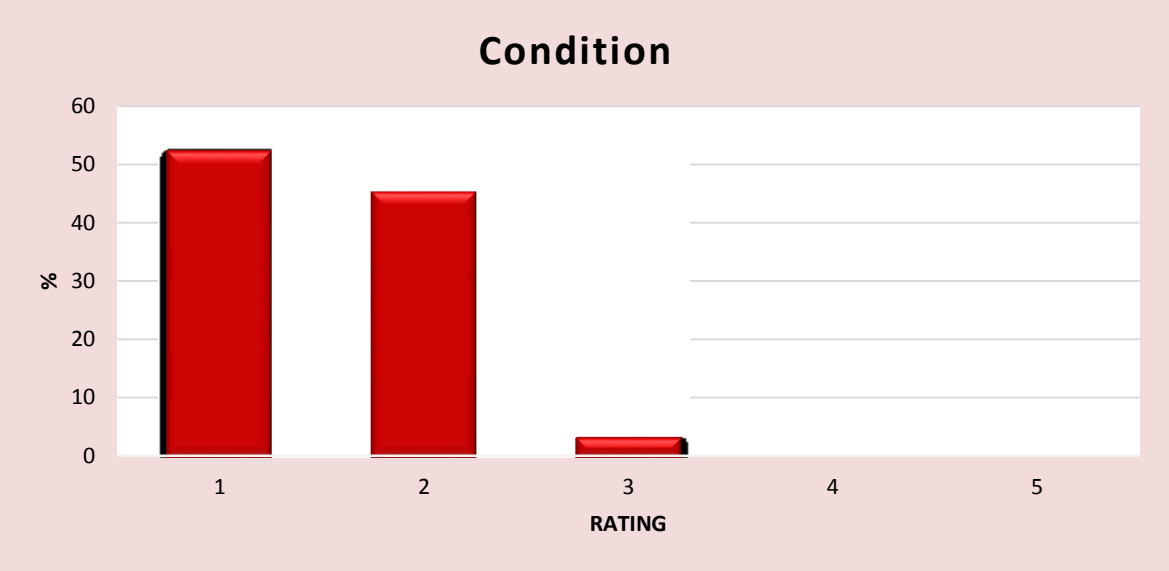


Figure 3.3.5 Current Condition Profile



Notes:
1 = **Very Good Condition** - Only normal maintenance required
2 = **Minor Defects Only** - Minor maintenance required (5%)
3 = **Maintenance Required to Return to Accepted Level of service** - Significant maintenance required (10-20%)
4 = **Requires Renewal** - Significant renewal/upgrade required (20-40%)
5 = **Asset Unserviceable** - Over 50% of asset requires replacement

There are no pipelines that are graded as requiring renewal and only a small section, graded three, that requires monitoring as to the amount of deterioration.

3.3.11 CAPACITY / FUTURE DEVELOPMENT REQUIREMENTS

Capacity Issues

Detailed capacity calculations were completed as part of a significant upgrade of the treatment facilities in 2002.

The pond capacity can meet the BOD demand for a population of approximately 1,000 people (without aerator assistance). If the size of pond 1A is increased from 0.42 ha to 0.59 ha (as allowed for in the layout), the ponds can meet the demand for a population of approximately 1,300 people (without aerator assistance). The present capacity of the Tekapo WWTP with the existing aerator assistance can meet a BOD demand for a population of approximately 1,800 people. Capacities are for monthly average populations because the load is buffered by the long retention time.

Should the population increase beyond 1,800, the capacity of the WWTP could be increased by installing additional brush aerators on the oxidation ponds and extending Pond 1A. A 1 kW brush aerator capacity can meet the BOD demand for 300 people (with algae oxygen supply). Allowing for two 2 kW aerators on each of Pond 1A and 1B and a total pond surface area of 1.06 ha, the pond capacity could meet a BOD demand of 2,100 people.

The upgraded pump stations and network, constructed in 2004 were sized to for an average size section of 400m2 that would see the network able to provide the current level of service beyond 2025.

There is a reasonable increase in flow to the oxidation ponds during wet weather. The Community Board have approved a programme of smoke detection to identify any illegal connections to the sewer network, as this is the most likely source. Once located the property owner will be required to resolve the situation.

3.4 TWIZEL

3.4.1 INTRODUCTION

a)	Total population (2013)	
	Permanent	1,137
	At Holiday times	3500
b)	Number of properties in area of benefit	
	Connectable	1769

3.4.2 OVERVIEW AND OVERALL ASSET CONDITION

Twizel was a purpose built town constructed in the late 1960's and early 1970's. The design parameters for the oxidation ponds were for a population in excess of 5,000 persons. The whole of the original system is gravity flow and asbestos cement pipe has been used extensively for the

sewers. In 2006 a pump station was built to service the Mackenzie Park subdivision. This pump station discharges to the sewer in Ostler Road.

3.4.3 DISCHARGE LOCATIONS

The effluent from Twizel flows under gravity across State Highway 8 eastward onto land owned by the Council and discharges into oxidation ponds. After passing the oxidation ponds the effluent discharge to ground via a 1700 m long disposal trench.

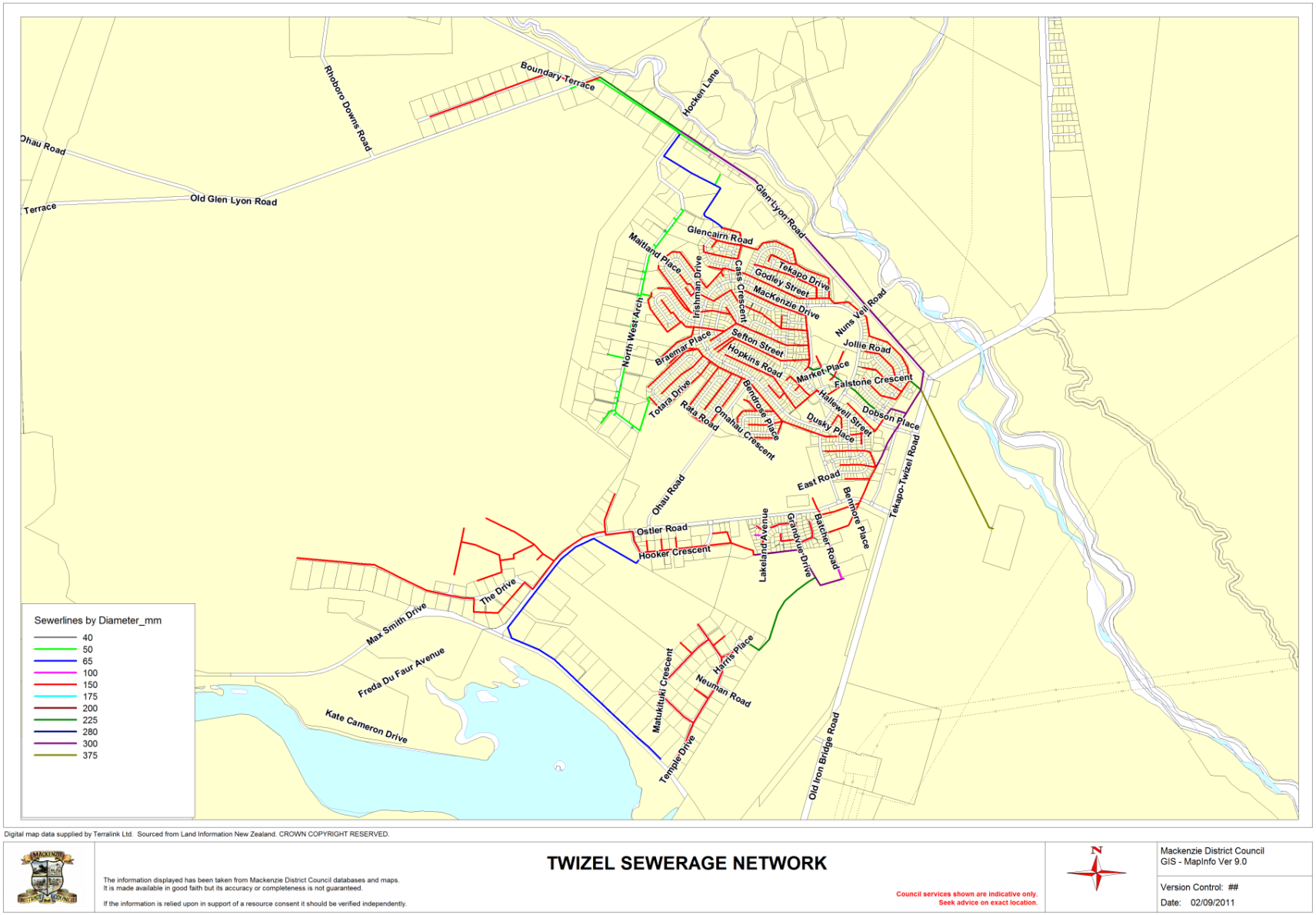
The original trench was 2600m long but as part of the renewal of the resource consent a condition was imposed to terminate the disposal system at an agreed point above the escarpment. This has not caused Council any operational issues.

Council has progressed the plan to acquire land adjacent to the oxidation ponds and construct rapid infiltration basins and consolidate the disposal on that site. The basins will be fenced for site security and the trench abandoned.

The soakage basins will be a series of below ground perforated distribution laterals that will discharge the effluent below the frost line to ensure they continue to operate even in winter extremes.

FIGURE 3.4.1 – Current Foul Sewer Network

DESCRIPTION OF FOUL SEWER ASSET



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It is made available in good faith but its accuracy or completeness is not guaranteed.

If the information is relied upon in support of a resource consent it should be verified independently.

TWIZEL SEWERAGE NETWORK

Council services shown are indicative only.
Seek advice on exact location.

Mackenzie District Council
GIS - MapInfo Ver 9.0

Version Control: ##

Date: 02/09/2011

3.4.4 CONDITION AND PERFORMANCE OF ASSETS

♦ **CONDITION**

The condition profile in the graph is based on the results of surveys undertaken from 1993 to 2010. Closed circuit television was used to video the wastewater pipes, with faults recorded and grades assigned to each fault depending on the severity and type of fault.

Generally speaking, all of the systems in Twizel are in a good state of repair and if they are maintained and renewed regularly, and at the appropriate times, they can be expected to last indefinitely, without any significantly abnormal costs having to be incurred.

The Twizel sewer network was constructed in the 1970s using the Asbestos Cement (AC) pipe. A Pipe is composed of approximately 10-15% asbestos fibres in a matrix of ordinary Portland cement and finely ground silica. The process of making pipes was refined between 1906 and 1913 In Italy. In service these pipes have shown to deteriorate both from the inside, due to normal service, and the outside due to aggressive soil and ground water conditions.

In Twizel there are no aggressive soils or groundwater surrounding the AC pipes so the deterioration is only from the inside. Nationally studies have shown that the deterioration model is very irregular throughout the networks where AC pipe is used so it is necessary to have a programme of sampling to get a better understanding when these pipes will have to be replaced and by default adjust the depreciation charged accordingly.

There is 21354m of AC pipe in the Twizel sewer network and the current replacement cost (2010) of $4.2m. Due to known performance of the AC pipe the base life of the pipe has been set at 80 years leaving a remaining life of 40 years.

3.4.5 PUMP STATIONS

There are two pump stations in Twizel. One collects the effluent from the Mackenzie Park subdivisions and sections to the west of it and pumps it via a rising main into the gravity system in Ostler Rd and the second one pumps effluent from the Pukaki Airport into Twizel.

Mackenzie Park Pump Station (installed 2006)

Duty Regime	Q max	H Total	H Static
	l/s	m	m
Initial Stage	11.5	7.5	

Pumps (two installed)	
Make	Flygt
Model	NP3127.180MT
Outlet Size	DN 100
Impeller diameter	X
Motor Output rating	X
Motor rated current	X
Motor poles	X
Motor efficiency	X
Motor Power factor	X
Base frequency	X

Rated speed	X
Pump Controller	Flygt FMC200

Pukaki Airport Pump Station (installed 2009)

Duty Regime	Q max l/s	H Total m	H Static m
Initial Stage	2.1	28.1	

Pumps (two installed)	
Make	Flygt
Model	NP3068.170-210MT
Outlet Size	DN 75
Impeller diameter	X
Motor Output rating	X
Motor rated current	X
Motor poles	X
Motor efficiency	X
Motor Power factor	X
Base frequency	X
Rated speed	X
Pump Controller	Flygt FMC300

3.4.6 TREATMENT

Twizel	
Oxidation Ponds	Pond 1 2.5ha Pond 2 1.73ha

The two oxidation ponds were constructed in the 1970's with a discharge to the Twizel River. This discharge has been discontinued and now discharges to ground via 1.7km long soakage trench. Depending on demand the treated effluent does not always reach the end of the trench.

Disposal Trench (viewed from the south)

Disposal Trench (viewed from the north)

The original initial inlet that discharges into the centre of pond 1 has been reinstated and this has avoided having to relocate that inlet to the south west corner of pond 1 which will give the maximum flow path through the pond. A bund has been constructed (2010) in Pond 2, two thirds of the way across the pond to ensure the maximum retention time of the effluent within the ponds.

3.4.7 FLOW AND LOADING ESTIMATIONS (ORIGINAL DESIGN)

The Twizel WWTP was commissioned in 1969 and treats domestic sewage, as well as small quantities of trade wastes from Twizel Township. The WWTP provides primary treatment of the influent in oxidation ponds before discharging effluent into a 2km long soakage/evaporation trench that runs south from the plant.

The Twizel ponds were originally designed in 1969 for a population of 5,000 assuming an average daily flow (ADF) of 1,818 m3/day and a peak flow of 5,455 m3/day. An ADF of 650 m3/d was predicted by CH2MBeca in the "Application for Resource Consent and Assessment of Environmental Effects for the Twizel WWTP "(June 2004).

3.4.8 TREATMENT FACILITY PERFORMANCE

Twizel complies with the current Resource Consent for air and effluent discharge

3.4.9 RESOURCE CONSENTS HELD

Wastewater Treatment Plant	Consent No.	Type	Expiry Date	Comments
Twizel	CRC0442915	Discharge contaminants	08-Jul-2020	

		onto land		

3.4.10 RETICULATION

Summary of Twizel Urban Foul Sewer System

Asset Type	Twizel
Pipelines	43452 m
Foul Sewer Manholes	437
Pump stations	2

Reticulation Description

The following tables have been compiled to show the extent and makeup of the systems.

Figure 3.2 – Pipe Size Distribution

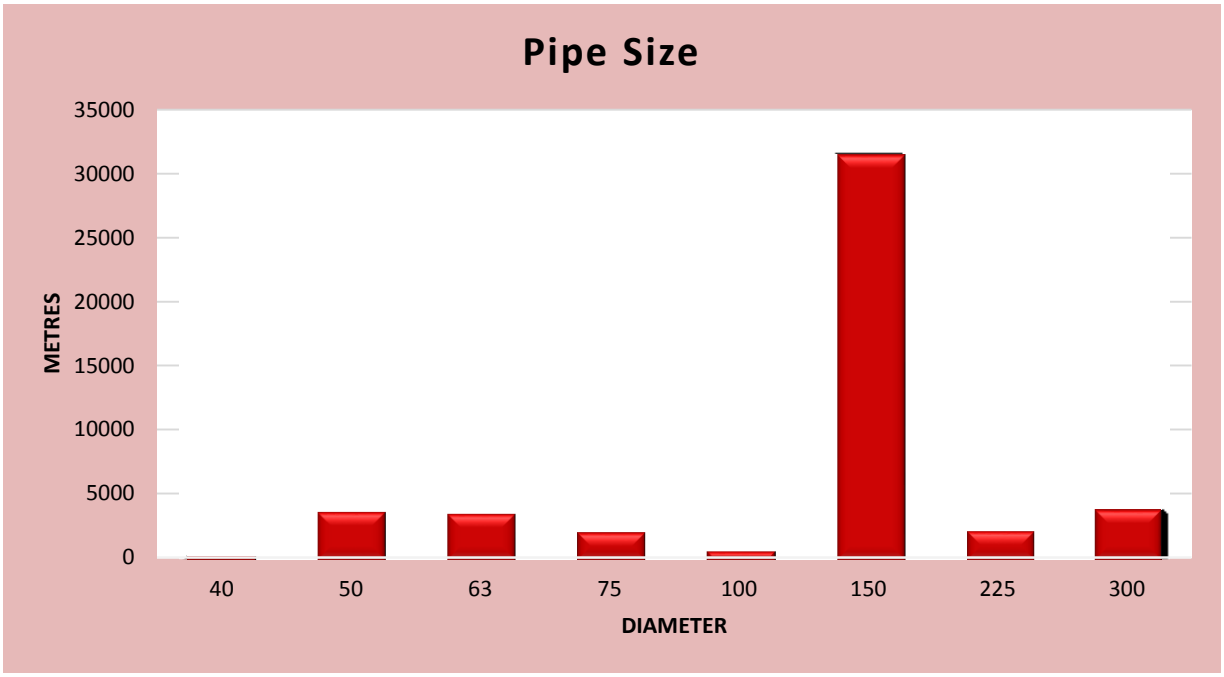


Figure 3.3 – Pipe Material Type Distribution

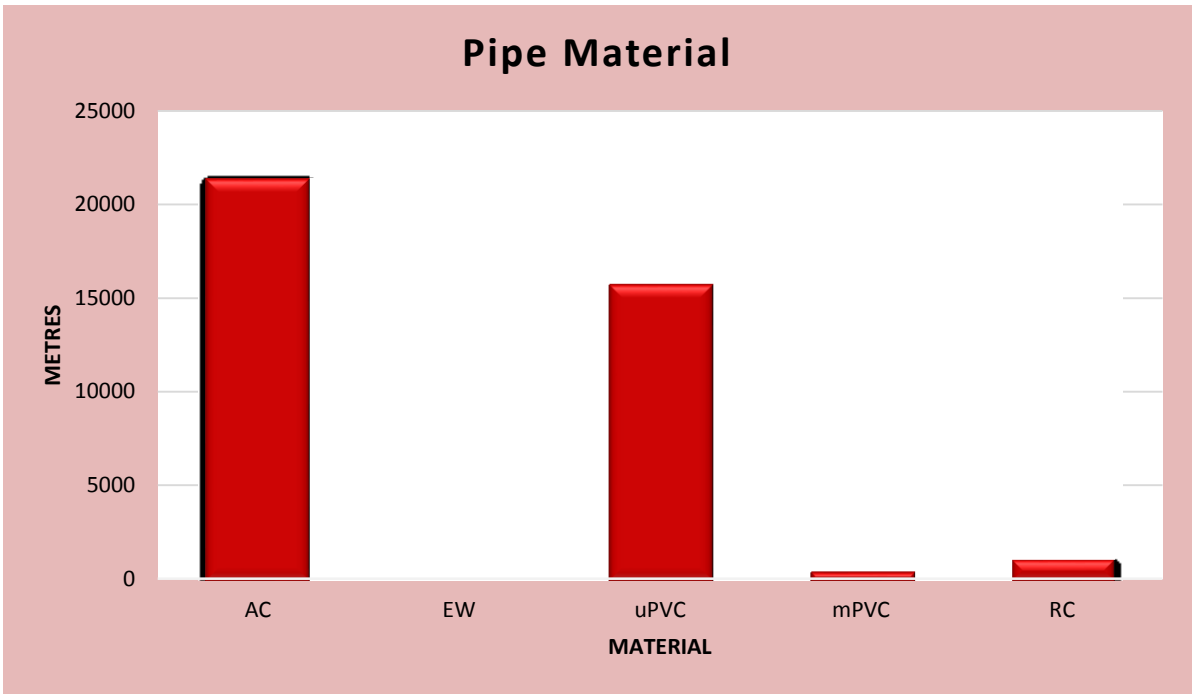


Figure 3.4 – Pipe Age Distribution

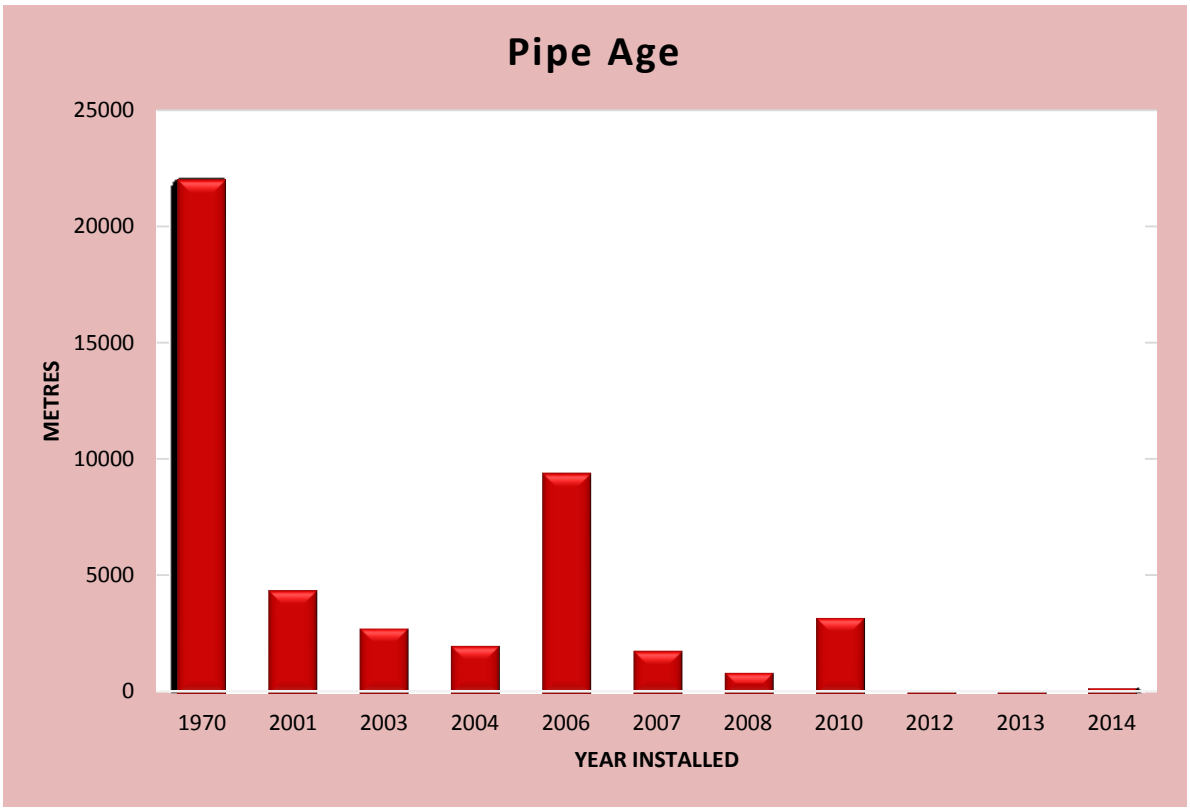
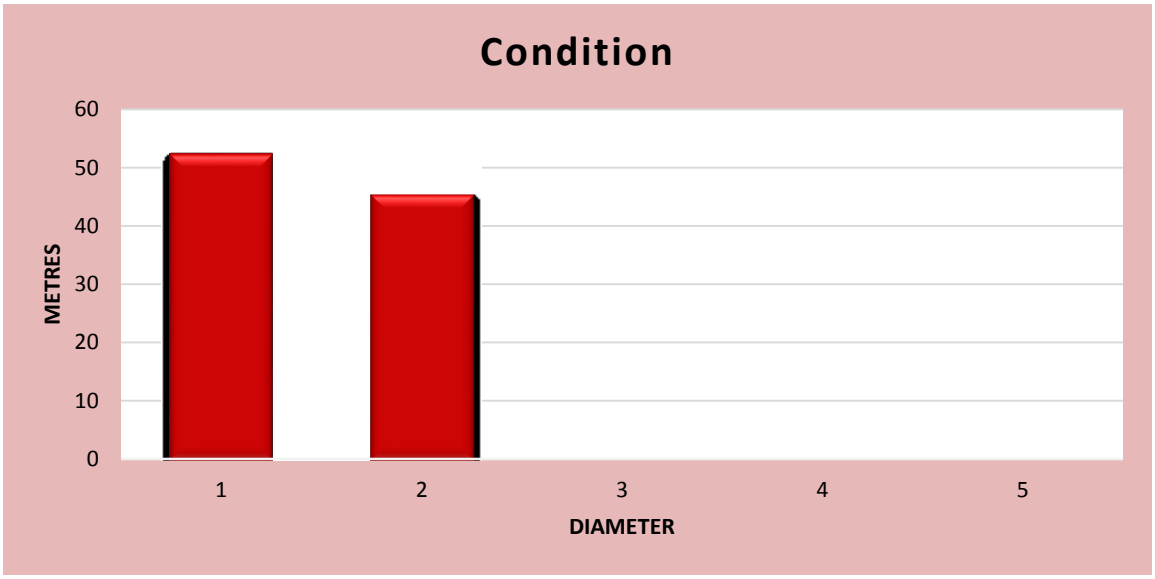


Figure 3.5 Current Condition Profile



There are no pipelines that are graded as requiring renewal.

3.4.11 CAPACITY / FUTURE DEVELOPMENT REQUIREMENTS

The Twizel ponds were originally designed in 1969 for a population of 5,000 assuming an average daily flow (ADF) of 1,818 m3/day and a peak flow of 5,455 m3/day. An ADF of 650 m3/d was predicted by CH2MBeca (June 2004) to be reached by 2025 with a population o 1860. This shows that there are no capacity issues with the oxidation ponds.

Council plans to acquire land adjacent to the oxidation ponds and construct rapid infiltration basins and consolidate the disposal in them. The basins will be fenced for site security and the existing disposal trench abandoned. This will retire the existing trench and consolidate the disposal on the 5.6ha site. The driver for this change is that in 2010, Council was granted a resource consent for the discharge to ground of the effluent that expires on the 8th July 2020. It is unlikely that Council will be able to renew this consent for the current disposal system.

Twizel continues to show steady growth in holiday homes and in order to understand the total demand Council will model the network so that it will be better able to predict when pipes need to be upsized or aeration installed at the oxidation ponds to improve treatment and when a new rising main will have to be constructed directly to the oxidation ponds from the pump station in Mackenzie Park. This work is programmed for 2018/19, but will only be constructed if demand puts pressure on the current systems to the point they cannot cope.

3.5 BURKES PASS

3.5.1 INTRODUCTION

a)	Total population (2006)	
	Permanent	30 approx
	At Holiday times	60 approx
b)	Number of properties in area of benefit	
	Connectable	18

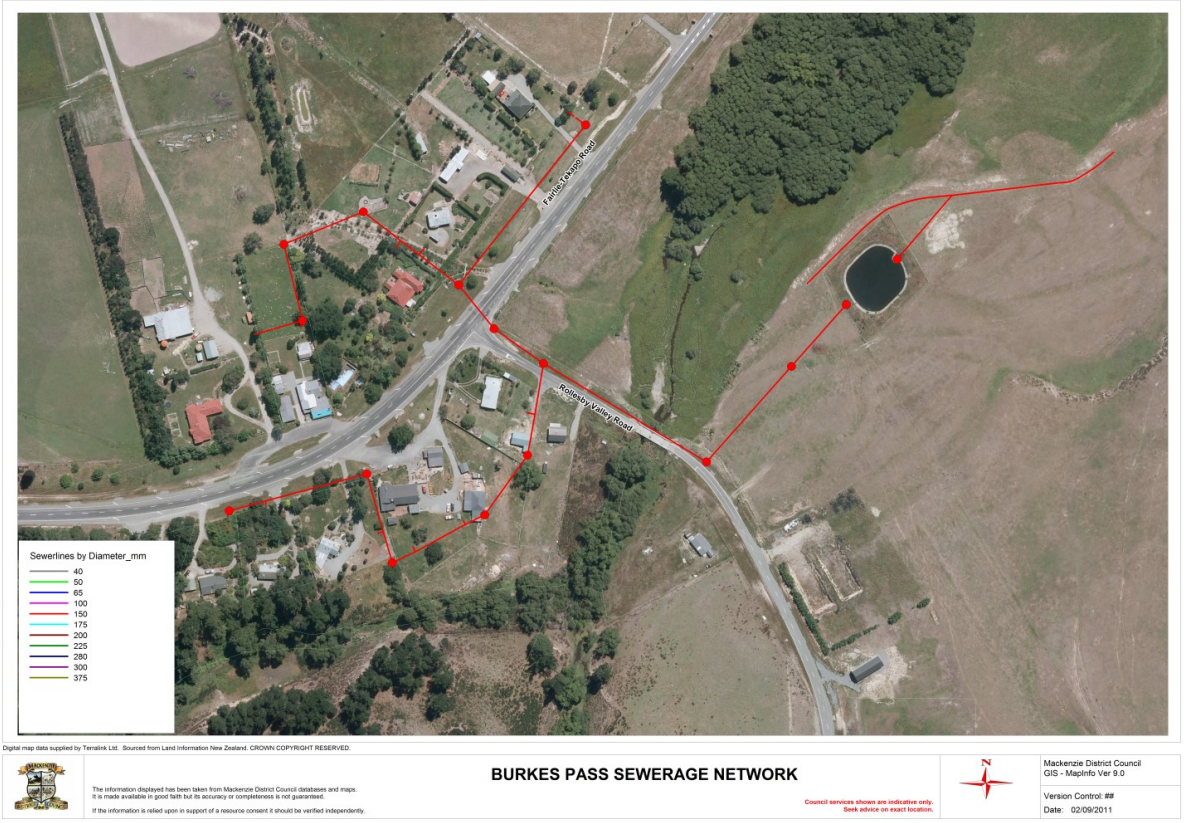
3.5.2 OVERVIEW AND OVERALL ASSET CONDITION

The Burkes Pass waste water system was built in 1990 to serve the existing town which is largely unchanged today.

3.5.3 DISCHARGE LOCATIONS

The effluent from Burkes Pass flows under gravity across State Highway 8 eastward onto land owned by the Council and discharges into oxidation ponds. After passing the oxidation ponds the effluent discharges to ground via two irrigation pipelines that are spelled individually on a six month cycle.

Figure 3.11 - Burkes Pass Foul Sewer Network



3.5.4 CONDITION AND PERFORMANCE OF ASSETS

- **Condition**

The condition profile in the graph is based on an assessment of the pipe network. With the pipe being uPVC and laid to the appropriate engineering standards fifteen years ago there is no reason to expect the pipe to be less than perfect.

However within ten years there should be a video inspection to confirm that there are no issues. This date will be bought forward if we start experiencing problems with the pipe system.

Currently the network performs as designed with no maintenance issues at all.

3.5.5 RESOURCE CONSENTS

Scheme	Consent Number	Expires
Burkes Pass Discharge	CRC0992607	07 Jun 2040

3.5.6 PUMP STATIONS

There are no sewerage pump stations in Burkes Pass.

3.5.7 TREATMENT

Burkes Pass	
Oxidation Ponds	One oxidation pond, of

	area 0.11ha
Properties Connected	18

3.5.8 FLOW AND LOADING ESTIMATIONS (ORIGINAL DESIGN)

LOADINGS

For oxidation ponds without mechanical aeration, the former MWD guideline value of 84 kg/BOD/ha/day is considered appropriate. This equates to 1,200 persons/ha for a mainly domestic catchment, which is the case for Burkes Pass.

1,200/ha x 0.11 =132 persons

Therefore the Burkes Pass pond appears to be adequate for servicing the estimated current population of 45 persons, including any short term peak loadings.

FLOWS

Estimated flow volume (domestic)	=	8,250 l/day
Estimated flow volume (commercial)	=	600 l/day
TOTAL FLOW	=	8,850 L/DAY

3.5.9 TREATMENT FACILITY PERFORMANCE

Burkes Pass – complies with the current Resource Consent for air and effluent discharge

3.5.10 RESOURCE CONSENTS HELD

Wastewater Treatment Plant	Consent No.	Type	Expiry Date	Comments
Burkes Pass Discharge	CRC0992607	Discharge contaminants onto land	07 Jun 2040	

3.5.11 RETICULATION

Summary of Burkes Pass Urban Foul Sewer System

Asset Type	Burkes Pass
Pipelines	1137 m
Foul Sewer Manholes	16
Pump stations	0

Reticulation Description

The following tables have been compiled to show the extent and make up of the systems.

Figure 3.2 – Pipe Size Distribution

Figure 3.2 – Pipe Size Distribution

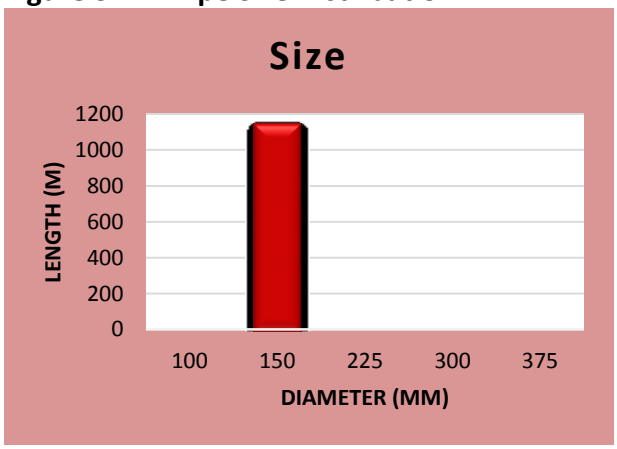


Figure 3.3 – Pipe Material Type Distribution

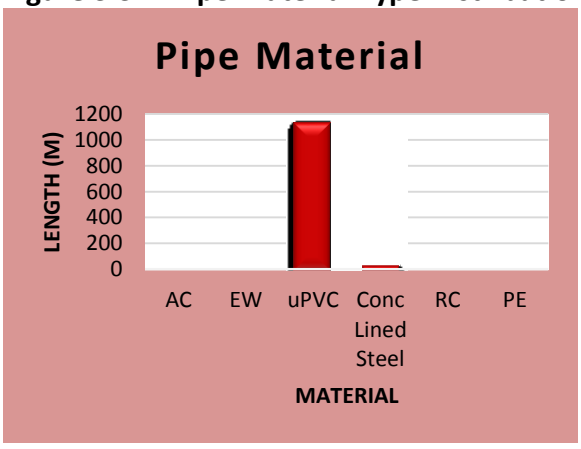
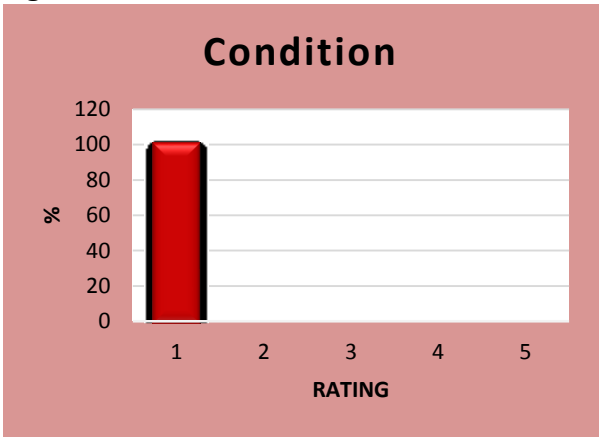


Figure 3.4 – Pipe Age Distribution

Figure 3.5 Current Condition Profile



Notes:
1 = **Very Good Condition** - Only normal maintenance required
2 = **Minor Defects Only** - Minor maintenance required (5%)
3 = **Maintenance Required to Return to Accepted Level of service** - Significant maintenance required (10-20%)
4 = **Requires Renewal** - Significant renewal/upgrade required (20-40%)
5 = **Asset Unserviceable** - Over 50% of asset requires replacement

All pipework is graded as being in very good condition and only requiring normal maintenance.

3.5.12 CAPACITY / FUTURE DEVELOPMENT REQUIREMENTS

Capacity Issues

Given the current population, no upgrading of the primary pond is necessary at this time. The pond is located on flat farmland, with strong prevailing winds (especially from the north-west in the summer time) so adequate wind mixing within the pond is expected.

As no data is available for the pond influent quality, an allowance of 70g BOD/person/day is assumed (former MWD guideline) for both the domestic and commercial wastewaters from Burke's pass. The total assumed BOD loading is, therefore, 3.2 kg/day for Burke's Pass.

The former MWD guideline of 84kg BOD/ha/day, when applied in this case, results in an allowable BOD loading of 9.24kg BOD/day for the single oxidation pond. The existing BOD loading on the pond is therefore well within the allowable BOD loading.

3.6 ENVIRONMENTAL EFFECTS

There are no negative environmental effects from any of the networks.

3.7 FUTURE IMPROVEMENTS

FAIRLIE

The oxidation pond was surveyed for sludge build up in September 2013. The average sludge depth was 0.50m and with a pond depth of 1.73m there is enough water depth to control odour. A liquid depth of 1m over the sludge is enough to control odour release.

The sludge depth will be checked periodically for accumulation, but this would only need removing if the sludge depth was to increase by another 300mm.

As the current population is within the design loading (and unlikely to increase substantially), the existing pond system appears to be more than adequate for continuation of wastewater treatment at Fairlie.

TEKAPO

The pond capacity can meet the BOD demand for a population of approximately 1,000 people (without aerator assistance). If the size of pond 1A is increased from 0.42 ha to 0.59 ha (as allowed for in the layout), the ponds can meet the demand for a population of approximately 1,300 people (without aerator assistance). The present capacity of the Tekapo WWTP with the existing aerator assistance can meet a BOD demand for a population of approximately 1,800 people. Capacities are for monthly average populations because the load is buffered by the long retention time.

Should the population increase beyond 1,800, the capacity of the WWTP could be increased by installing additional brush aerators on the oxidation ponds and extending Pond 1A. A 1 kW brush aerator capacity can meet the BOD demand for 300 people (with algae oxygen supply). Allowing for two 2 kW aerators on each of Pond 1A and 1B and a total pond surface area of 1.06 ha, the pond capacity could meet a BOD demand of 2,100 people.

For any further growth above 2,100 people, the Tekapo WWTP will require the addition of a dedicated aeration basin at the inlet with all oxygen being supplied by aerators. Similar pre-treatment has been undertaken at the Oamaru and Blenheim WWTPs and can remove 40% of BOD. Therefore, these upgrades (extended Pond 1A, two 2 kW aerators and aeration basin with aerators) can increase plant capacity to about 3,500 people. If the population of Tekapo increases above 3,500, alternative means of treatment and disposal will have to be investigated and new resource consents applied for.

The oxidation pond was surveyed for sludge build up in September 2013. The average sludge depth was 0.57m and with a pond depth of 1.67m there is enough water depth to control odour. A liquid depth of 1m over the sludge is enough to control odour release.

The sludge depth will be checked periodically for accumulation, but this would only need removing if the sludge depth was to increase by another 200mm.

The most pressing issue facing Tekapo is the disposal system. At the moment the disposal is generally adequate for the demand but during winter freezing periods we are having some problems. Environment Canterbury has indicated their dissatisfaction and has issued a notice of non-compliance with our discharge consent as a consequence. Also, as demand increases in

Tekapo the volume of effluent to be disposed of will also increase. We intend to review all of our disposal options in early 2015/16 with construction of a new system in later in that financial year.

TWIZEL

Council plans to acquire land adjacent to the oxidation ponds and construct rapid infiltration basins and consolidate the disposal in them. The basins will be fenced for site security and the existing disposal trench abandoned. This will retire the existing trench and consolidate the disposal on the 5.6ha site. The driver for this change is that in 2010, Council was granted a resource consent for the discharge to ground of the effluent that expires on the 8th July 2020. It is unlikely that Council will be able to renew this consent for the current disposal system.

Twizel continues to show steady growth in holiday homes and in order to understand the total demand Council will model the network so that it will be better able to predict when pipes need to be upsized or aeration installed at the oxidation ponds to improve treatment and when a new rising main will have to be constructed directly to the oxidation ponds from the pump station in Mackenzie Park. This work is provisionally programmed for 2018/19, but will only be constructed if demand puts pressure on the current systems to the point they cannot cope.

Twizel WWTP - Investigation of Disposal of Effluent by Soakage (letter from BECA to MDC, Nov 2005)

Introduction

Mackenzie District Council (MDC) has commissioned CH2M Beca Ltd to provide an assessment of the suitability of soils adjacent to the Twizel Wastewater Treatment Plant (WWTP) for disposal of effluent by soakage.

This letter presents the results of the geotechnical investigations undertaken, summarises the permeability characteristics of the soils and provides an estimate of the area of land required for sustainable soakage of effluent. The scope of work is outlined in our letter to Mackenzie District Council dated 15 September 2004.

Should you be in any doubt as to the applicability of this report and/or its recommendations for the proposed development as described herein, and/or encounter materials on site that differ from those described herein, it is essential that you discuss these issues with the authors before proceeding with any work based on this document.

Twizel WWTP and Proposed Development

The Twizel WWTP was commissioned in 1969 and treats domestic sewage, as well as small quantities of trade wastes from Twizel Township. The WWTP provides primary treatment of the influent in oxidation ponds before discharging effluent into a 2km long soakage/evaporation trench that runs south from the plant.

The Twizel ponds were originally designed in 1969 for a population of 5,000 assuming an average daily flow (ADF) of 1,818 m3/day and a peak flow of 5,455 m3/day. An ADF of 650 m3/d was predicted by CH2MBeca in the "Application for Resource Consent and Assessment of Environmental Effects for the Twizel WWTP "(June 2004).

A design effluent ADF of 1000 m3/d has been assumed in this report for the sizing of soakage ponds. This assumes a worst case scenario of peak summer or winter loadings, coupled with prolonged wet weather. It should be noted the oxidation ponds will buffer short term peak inflows and the effluent flow will be averaged over a period of a week or more. The design value of 1000 m3/d assumes no evaporation from the oxidation ponds and soakage basins. Normally evaporation will be significant in this locality.

Soakage Basin Site Requirements

Disposal by soakage involves the regular application of pre-treated effluent to shallow spreading basins in permeable soils with exposed soil surfaces. Additional treatment occurs within the soil as the effluent seeps through the base of the basins and travels with the groundwater to a discharge point.

In accordance with US EPA (1981), soakage systems require the following conditions for disposal of secondary treated effluent:

- Permeable soils, such as sands, gravels or sandy loams with hydraulic conductivities in the order of 1.4 x 10-4 to 1.4 x 10-6 m/s;
- Flat land is preferred, maximum slope is < 10%;
- Depth to groundwater greater than 1.5 m to 3 m;
- Soil depth of greater than 1.5 m;
- The hydraulic loading rate is dependent on the permeability of the soil and the depth to groundwater.

Properly designed and sited soakage systems can effectively remove organic and microbiological contaminants. However, limited nitrogen removal (specifically nitrate) means that down gradient contamination of groundwater resources needs to be assessed.

Preliminary assessments (AEE, CH2M Beca, 2004) suggest a soakage area in the order of 1ha, excluding margins, would be required for disposal of 650 m3/d. These assessments assumed an average hydraulic conductivity of 1.8 x 10-5 m/s to 3.6 x 10-5 m/s.

Site Description

The Twizel WWTP is located on a pastured, relatively flat, elevated alluvial terrace, approximately 200 m southwest of the Twizel River. The terrace lies at an elevation of approximately RL 450 m, some 5 m above the Twizel River bed.

Two oxidation ponds are sited on the terrace above the river. The ponds discharge via a weir into a soakage trench, which extends some 2 km south from the WWTP. The trench is about 3.5 m wide, 0.5 m deep, and vegetated with bulrushes. The oxidation ponds cover an area of 4.2 ha. Access to the site is via an access track which exits off SH8 nearly opposite the Twizel township entrance. The existing gravity sewer, which contains the raw sewage from Twizel, is buried adjacent to this track (see Figure 1 in Appendix A).

Geology

The geology of the study area has been assessed from site observations, the published geological map (Gair, 1975) and previous reports. The map describes the soils underlying the site as the Mt John Formation, which includes outwash gravels formed during the Otira Glaciation, some 18,000 yrs ago. Previous reports indicate that these gravels have an average permeability in the order of 10-4 to 10-5 m/s (Anderson, 1987; in URS, 2001). The higher permeabilities were considered to occur within layers comprising open gravel lenses.

Some 5 km west of the Twizel oxidation ponds lies the north - south trending active Ostler Fault Zone. The fault zone is up to 3 km wide, crossing the upstream end of the Ruataniwha Dam reservoir and passing through the Ohau A project. The recurrence interval for this fault has been calculated to be about 3,000 years (van Dissen et al. 1993 in Forsyth 2001), which means that the fault can be described as “active”.

Geotechnical Site Investigations
Test Pits

The geotechnical investigations were undertaken on 6 October 2004 and comprised four test pits up to 3 m deep in the area south of Pond A, and two soakage tests performed within the existing soakage trench (Figure 1, Appendix A). The pits were excavated by Whitestone Ltd and the soils logged by a Beca Geologist. Test pit logs are presented in Appendix B, photographs of pits are presented in Appendix C. Scala Penetrometer tests were undertaken from the ground surface adjacent to the test pits, to measure the density of an upper silt layer.

Soakage Tests

The soakage tests were undertaken within the soakage trench to estimate the hydraulic conductivity of the soils beneath the trench using effluent discharged from the oxidation ponds.

The existing vegetation in the trench was removed over a 6 m long section, and temporary bunds were created at each end of the section. The bunds were made from soils lying adjacent to the trench and previously excavated trench material that had been dumped nearby. The soakage pits were allowed to fill up prior to the upstream end being blocked off. Pit geometry was then measured and monitored throughout the day as the effluent infiltrated through the soil.

This procedure had the advantage of utilising the actual effluent and therefore provides a more realistic indication of the infiltration capacity of the subsoils.

Results of Investigations
Hydraulic Conductivities

The soakage test and graphical data are given in Appendix D. The assessed hydraulic conductivities, derived from the soakage tests, are summarised in Table 1.

Table 1

Assessed Hydraulic Conductivity Test Results

Soakage Trench	Hydraulic Conductivity, K (m/s)
S1	9.5 x 10-7
S2	9.4 x 10-7

The soakage trench is 0.5 m deep, therefore the assessed hydraulic conductivities are representative of layer 2 (silty gravels) as described in Table 2. It should be noted that the values in Table 1 do not include any allowance for evaporation of water from the trench during the test period.

Soil Profile

The soil profile assessed from the test pit excavations is summarised in Table 2 below.

Typical Soil Profile

Layer	Soil Description	Top of Bed (m)	Thickness (m)	Scala Penetrometer blows/150 mm	K (m/s)
1	Stiff dark brown ORGANIC SILT, some sand, minor gravel	0	0.2 - 0.25	2 - 4 typically 3	
2	Dense to very dense orange brown SILTY GRAVEL, minor sand	0.2-0.25	0.6	6 - 20+ typically 20+	**9.5 x 10-7
3	Tightly packed yellow-grey GRAVEL	0.8	0.6 - 0.7	Not tested	*1 x 10-4 to 1 x 10-5
4	Tightly packed yellow grey GRAVELLY BOULDERS trace silt-clay	1.35-1.5	1m+	Not tested	
* From URS (2001) ** Measured in soakage trench refer discussion in section 8					

Groundwater

A groundwater table was not encountered within the test pit excavations.

From URS (2001), the following information on groundwater is provided:

- General groundwater flow is towards the southeast;
- There is 1 m seasonal difference between winter and summer groundwater levels;
- Depth to nearest aquifer is 15 m in central Twizel and considered to be at a similar level below the WWTP.

Discussion
Overview

The site is relatively flat and comprises a river terrace that is considered to be an 18,000 yr old surface. The groundwater table was not encountered within the upper 3 m of the excavations, however, as the riverbed is some 5 m below the site, a depth of 4 m to groundwater is considered appropriate for analyses.

Soakage testing indicates layer 2 comprises soils of a moderately low hydraulic conductivity (9.5 x10-7 m/s). Previous reports indicate layers 3 and 4 comprise soils of moderately high hydraulic conductivity (1x10-4 to 1x10-5 m/s).

However, it is noted that the soakage testing undertaken within layer 2 provides an indication of the permeability after some 30 years of exposure to effluent. Pores between the soil particles beneath the trench are likely to have become clogged with sludge that has been accumulating since 1969, even though the surface of the trench was cleared for sludge testing. There are no permeability results for layer 2 using fresh water.

The hydraulic conductivity of layer 2 is lower than the recommended range of hydraulic conductivity given in USEPA (1981) (1.4x10-4 to 1.4x10-6 m/s). However, the deeper layers (3 & 4) are particularly suitable for land application of effluent, as the main purpose of the basins is seepage and the upgraded oxidation pond effluent will be of sufficiently high quality to avoid any adverse effects on the receiving groundwater environment.

Design Loading Rate

The design hydraulic loading rate is based on the soil infiltration rate. Allowable hydraulic loading rates are estimated to be in the order of 15 m/yr if applied to layer 2, or 250 m/yr if applied directly to layer 3 (US EPA, 1984). The 15m/yr loading rate would require an excessive land area and a more practicable loading rate will be 120m/yr applied to layer 3.

Assuming an 8 day cycle of wetting and drying (1 day loading and 7 days drying) applied to a series of 8 beds and a design effluent volume of 1000m3/day, 0.3ha will be required for each basin giving a total area of 2.4ha.

This area relates to the basin floor and does not include basin berms, roads, or buffer area. The US EPA (1981) recommends an allowance of 15 to 20 % of the field area for these items, giving a total required area at Twizel of 2.9 ha.

Because the peak effluent discharge rate of 1000m3/d is a long term prediction, it is recommended that half the basins be constructed initially with space left for doubling the area, if and when required by future growth and operating experience. A four day cycle would allow draining and reaeration of the soil or alternatively, effluent could be fed to one basin for 2 days, retaining an 8 day cycle.

The higher permeability layer 3 is about 0.8m below the surface. To remove all material down to layer 3 would require excavation of about 20, 000m3, which would cost an estimated $100,000 to $300,000, depending on whether the material was stockpiled on site or carted offsite. The soakage basin material could possibly be used as a source of fill for other developments in the area.

Alternatively, if all of layer 2 is not excavated, periodic deep ripping down to layer 3 could maintain sufficient soakage in the immediate future. If the need for ripping became too frequent, the basin area could be increased or layer 2 removed.

Groundwater Mounding

The higher permeability soils (layer 3) underlying layer 2 reduces the effect of groundwater mounding at this site. The US EPA (1984) states that groundwater mounds (localised rise in the groundwater table directly beneath a basin as a result of wastewater application) should not be closer than 0.6 m from the bottom of the basin. Assuming the basin areas identified in 8.2, a groundwater table at 4m below the ground surface, and application of the effluent to layer 2 (as a worst case), a groundwater mound of up to 0.2 m could be expected beneath the basins, reducing to about 0.1 m at the edge. As the water table occurs at a depth of more than 3 m, groundwater mounding could raise this to about 2 m below the existing ground surface, or 1.5 m below basins constructed in layer 2, which exceeds the 0.6 m minimum requirement.

Area Required and Possible Location

It is recommended that soakage basins be located adjacent to, and immediately down gradient of Pond A.

It is also recommended that MDC provide for the designation of an area, 150m around the upgraded WWTP and infiltration basins, as an odour buffer. This is considered normal practice for pond systems to minimise the potential for encroachment of sensitive development-and therefore future issues of reverse sensitivity.

Conclusions

Infiltration testing in the area south of Pond A, indicates that soils would be suitable for discharge of effluent by soakage.

As the basins are primarily required for soakage, rather than treatment, then effluent could be applied to soil layer 3 at about 0.8m below the existing ground surface.

Assuming a future, wet weather, sustained effluent flow rate of 1000 m3/day, the total area required for rapid infiltration is in the order of 2.9 ha. Initially, MDC could construct 4 basins with the balance provided based on actual operating experience and rate of growth.

Further Developments (Feb 2015)

MDC is in the process of acquiring a 150m odour buffer around the overall WWTP and disposal site as well as the land it requires for the consolidated disposal area.

The plan is to consolidate the disposal to ground by a series of sparge pipes just to the south of the ponds. As part of the agreement with the land owner to acquire necessary land. This project has been accelerated and is planned for completion by early 2017.

This will also require a land subdivision, land purchase, new resource consent and construction of the physical works along with the de-commissioning of the existing disposal trench.

BURKES PASS

The pond should be checked for sludge accumulation periodically, but this would only need removing if the sludge depth was much greater than 150mm.

As the current population is small (and unlikely to increase substantially), the existing pond appears to be more than adequate for continuation of wastewater treatment at Burke's Pass.

4. ASSET MANAGEMENT PRACTICES

4.1 INTRODUCTION

MDC has an Asset Manager, Utilities Manager and a Technician responsible for the maintenance management of the Utilities network. Occasionally some elements of the work are tendered to consultancy services to manage (e.g. Pipeline replacements etc). The Utilities Manager and the Maintenance Contractors regularly inspect and monitor the network. Any work identified is directly tasked to the incumbent maintenance contractor or, if it is beyond the scope of the maintenance contract, tendered using Competitive Pricing Procedure guidelines. This may or may not need the involvement of consultants depending on the nature or extent of the work.

MDC accounts for revenue and expenditure on an accrual basis. All work under the Works Programme is identified through a job cost ledger with a significant level of breakdown using analysis codes. The costs are summarised into the general ledger where operational/maintenance costs are identified separately to capital/renewal items.

The majority of the work (physical works and professional services) carried out as part of the total management of all Utilities Asset functions is actioned under either physical works or consultancy contracts.

All contract works are claimed monthly against each of the contract item numbers by the physical works and professional services contractors. MDC and/or consultants confirm the payment value for all physical works and the MDC confirms the payment of any professional services. The accounts job number and account codes are included on the payment certificate. These certificates are forwarded to MDC for payment. The types of work that this system relates to are maintenance, renewals and capital expenditure.

There are a range of reports prepared in order to comply with the requirements of Council, and the Auditors. All external reports are prepared in compliance with Generally Accepted Accounting Principles (GAAP).

4.2 ASSET MANAGEMENT PROCESSES AND SYSTEMS

4.2.1 PROCESSES

4.2.1.1 Levels of Service

The LTP process is used to determine the level of customer satisfaction and identify community concerns and issues. Council has incorporated the mandatory performance measures imposed by the Department of Internal Affairs as the measures for this activity.

The performance measures are:

Performance measure 1 (system adequacy)

The number of dry weather sewerage overflows from the territorial authority's sewerage system.

expressed per 1000 sewerage connections to that sewerage system.

Performance measure 2 (discharge compliance)

Compliance with the territorial authority's resource consents for discharge from its sewerage system measured by the number of:

a) abatement notices

b) infringement notices

c) enforcement orders, and

d) convictions,

received by the territorial authority in relation those resource consents.

Performance measure 3 (fault response times)

Where the territorial authority attends to sewerage overflows resulting from a blockage or other fault in the territorial authority's sewerage system, the following median response times measured:

(a) attendance time: from the time that the territorial authority receives notification to the time that service personnel reach the site, and

(b) resolution time: from the time that the territorial authority receives notification to the time that service personnel confirm resolution of the blockage or other fault.

Performance measure 4 (customer satisfaction)

The total number of complaints received by the territorial authority about any of the following:

(a) sewage odour

(b) sewerage system faults

(c) sewerage system blockages, and

(d) the territorial authority's response to issues with its sewerage system, expressed per 1000 connections to the territorial authority's sewerage system.

4.2.1.2 Knowledge of Assets

The process of capturing as-built records for the on-going enhancement of asset registers is included as a requirement of the maintenance contracts. The information is supplied to Council staff for them to upgrade the relevant registers. Projects undertaken outside the maintenance contracts have a requirement within their contract for the relevant information to be collected

and forwarded to Council for them to upgrade the registers. There are some observed gaps in the securing of data for new infrastructural assets (e.g. subdivisions).

4.2.1.3 Accounting/Economics

Maintenance and renewal costs are recorded against broad activities in the general ledger. Valuations are currently based on straight line depreciation and assumed effective lives.

4.2.1.4 Condition and Performance Monitoring

Well documented standards and processes exist for an on-going inspection programme of all foul sewer assets. Other assets are inspected irregularly.

Processes for regularly monitoring the performance of the Fouls Sewer network, (e.g. pipeline inspection, debris over inlets, debris in grass swales) and the information is also used for identifying and prioritising upgrading and development of projects. The monitoring of other assets is informal and mostly reactive.

4.2.1.5 Risk Management

Although processes are in place for the monitoring of some critical assets (e.g. pump stations), risk management is generally practised informally based on the knowledge of experienced staff as the foul sewer networks are relatively unsophisticated.

4.2.1.6 Operations

Operational processes are documented in service delivery contracts and are subjected to regular review.

4.2.1.7 Maintenance

Competitively tendered contracts are entered into annually for major budget items.

4.2.1.8 Optimised Life Cycle Strategy

Work optimisation for other assets is based on the judgement of experienced staff, internal inspection of pipelines and renewal projections are based on assumed economic lives.

4.2.1.9 Design, Project Management

There are no documented project management procedures for MDC, however there is confidence that suitable procedures are used during the project evaluation and design phase. Sound contract management procedures are in place. The supervision of assets constructed within sub-divisional development and subsequently taken over by MDC is considered to be adequate.

4.2.1.10 Quality Assurance/ Continuous Improvement

Audit NZ annually audits performance measures reported in the annual plan. All recommendations for improvement are adopted and implemented as resources permit.

4.2.2 SYSTEMS

Council uses Asset Finda which is a complete system for designing and managing solutions through the application of geographic knowledge. Data can be manipulated within AssetFinda, ArcGIS or exported to excel to assist in the decision making process for Foul Sewer network management.

4.2.2.1 Asset Finda

Asset Finda is an advanced Assets Management System designed to assist Councils in whole of life management of their assets. AssetFinda is designed to meet Council's long term and statutory asset management requirements.
It is has three main components:

Asset Register: An accurate asset register is critical to any asset management system. It controls a database that utilizes GIS, Web and iPad to view, edit, analyse and add data – faster, easier and more accurately than ever before.

Asset Maintenance: Maximizes the useful lifespan of assets by managing past, present and future maintenance requirements of your assets.

Asset Reporting: There is wide variety of reports, including Asset Revaluations, Monthly & Annual Depreciation Calculations, and Predictive Modelling.

AssetFinda utilizes a Web front end, GIS interfaces and iPad apps, thus creates a flexible and user friendly interface that even the newest of users can navigate quickly. The iPad App is designed to give real-time access to data in the field. View, analyse, edit & add data, capture images, run inspections, complete works requests from anywhere in the field with in either Online or Offline mode.

Council uses AssetFinda to manage the following:

- Water
- Drainage
- Wastewater
- Parks (to be added)
- Buildings (to be added)

The Asset Register contained within AssetFinda/ArcGIS (previously MapInfo) is contained within separate databases. Each database records the attribute of each asset to component level including age, condition, performance etc. An example of the information is shown in Fig 1 below.

Depending on what type of asset is identified there are varying amounts of information recorded for that asset. There are gaps in the information for each asset, but we are continually gathering information on these to complete the Asset Register.

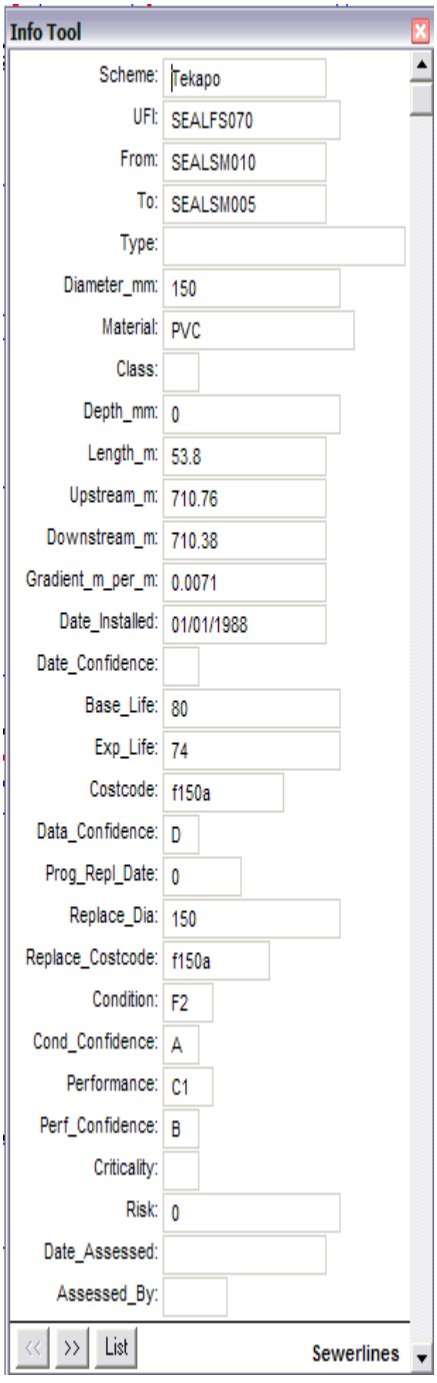
4.2.3 SCADA

SCADA (supervisory control and data acquisition) is a system operating with coded signals over communication channels so as to provide control of remote equipment. The control system may be combined with a data acquisition system.

The term SCADA (Supervisory Control and Data Acquisition) usually refers to centralized systems which monitor and control entire sites, or complexes of systems spread out over large areas. Most control actions are performed automatically by RTUs or by PLCs. Host control functions are usually restricted to basic overriding or supervisory level intervention.

Council is rolling out SCADA to all its remote sites across the district. This will not only control the operation of the site but actively monitor and send the operational data back to the Fairlie in real time via telemetry.

Figure 1



Info Tool
Scheme : Defines the scheme the infrastructure is part of
UFI : Unique identifier
From : Defines from where the pipe came from
To : Defines to where the pipe exits
Type :
Diameter_mm ; Diameter expressed in millimeters
Material: Material from which the pipe is made
Class : Class of pipe used
Depth_mm : Depth of pipe in millimeters
Length_m ; Length of pipe
Upstream _m : Upstream invert level
Dowstream_M : Downstream invert level
Gradient_m_per_m: Gradient of pipe
Date_Installed : Date pipe installed
Date_Confidence : How sure of date when installed
Base_Life : Initial life of the pipe
Expected_Life: Life expectancy of pipe
Costcode : This is a code assigned to replace the current pipe
Data_Confidence :
Prop_Repl_Date: Date proposed for replacement
Replace_Dia: Optimised replacement diameter
Replace_Costcode : Optimised replacement cost code
Condition: Condition rating of the pipe
Cond_Confidence : Degree of certainty of the condition
Performance : Performance rating of the pipe in the network
Perf_Confidence : Degree of certainty of the performance of the network
Criticality
Risk
Date_Assessed: : Date of latest assessment
Assessed_By : Name of person completing the

assessment of the pipe

This is an example of the information we hold on any section of sewer main, for other assets a different set of information is available.

Table 9.1 gives the assessed data confidence quality of the MDC Asset Register tables as described in the MDC 2010 Water, Wastewater, Stormwater and Solid Waste Assets Infrastructure Revaluation" report.

Table 9.1 – Data Confidence Levels

Valuation Element	Pipelines	Manholes	Plant
Asset Registers or Databases	H	H	H
Attribute Details	H	H	H
Age	VH	VH	VH
Optimisation Information	A	A	A
Useful Lives Information	G	G	G
Condition	H	H	G

The table Data Confidence Levels are:

VH	very high confidence	H	high confidence	G	good confidence
A	average confidence	P	poor confidence		

4.2.3.1 CCTVs role in Asset Management

The aim of asset management is to manage assets, such as sewer systems, in a way that provides the required level of service in the most cost-effective manner through the creation, operation, maintenance, renewal and disposal of assets to provide for existing and future customers.
CCTV inspections can help organisations gain an understanding of the existing condition of their piped assets. This understanding can help organisations make decisions such as which pipelines are:

- Undersized and need to be upsized to meet future flows.
- In risk of collapse.
- In need of maintenance works such, as root cutting.

Council is then able to prioritise works and prepare a timetable and budget for any required rehabilitation works.

4.2.3.2 Pipeline - Condition Assessments

Pipelines are regularly internally inspected by CCTV.

The process involves a camera that travels through the pipeline and transfers images to a screen on the surface, where they can be viewed by an operator. The images can then be recorded on video, DVD or direct to hard drive. At the same time the operator can also record observations of the pipe and faults, capture still images and/or produce sketches showing, for example, the position of manholes.

Some of the reasons that CCTV inspections are undertaken include:
• General condition surveys to determine the areas in pipe networks that require attention and to develop long-term programmes for replacement and maintenance of the network.
• Responsive maintenance, e.g. to identify and repair faults in pipes that have caused overflows or flooding.
• Determination of rehabilitation requirements, e.g. to determine which pipes need to be lined to prevent too much water entering into the system. This can result in the pipes not having enough capacity to cope with the flow, thus causing overflows.
• Quality checks on new works or after the rehabilitation of pipes.
• Build over approvals, e.g. inspections of pipes to determine whether buildings can be constructed above them.

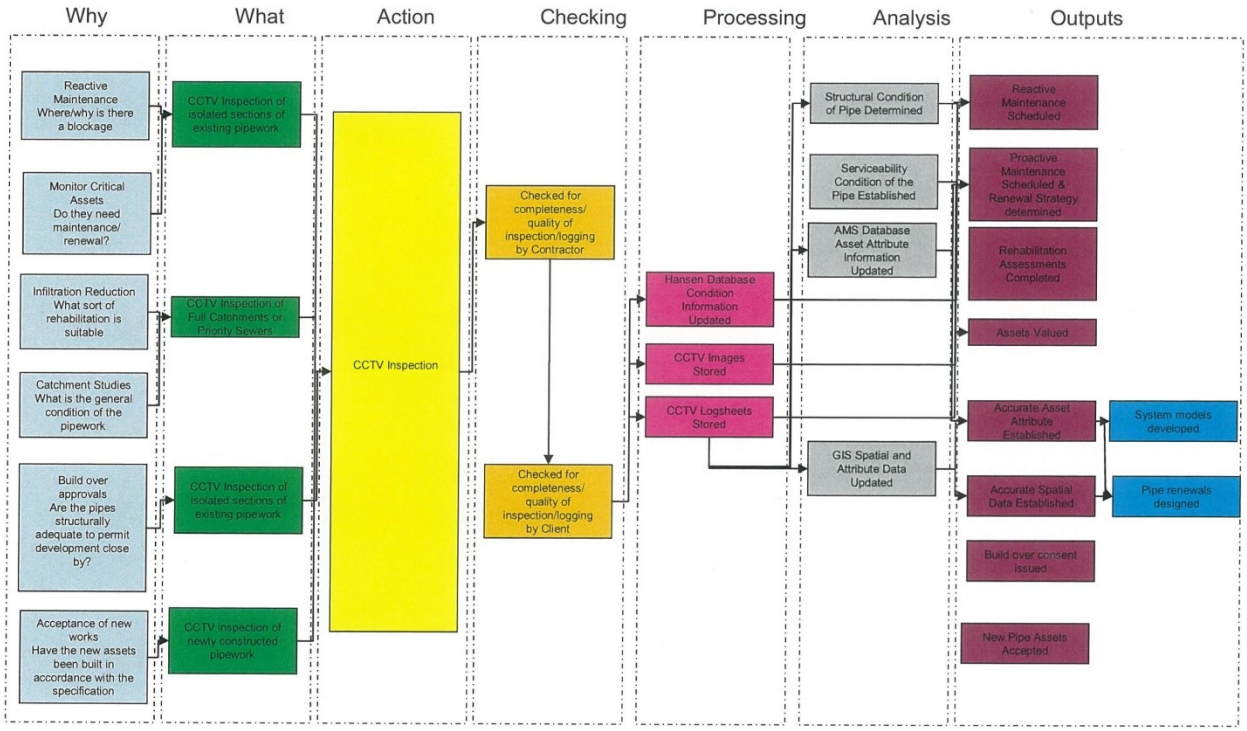
If CCTV inspections are carried out correctly then a CCTV inspection completed for one purpose, e.g. a build over approval, should be able to be used for any other purpose.

A CCTV inspection provides information for asset management, maintenance and rehabilitation purposes. CCTV inspections view the condition of assets, and provide information on attributes. Condition data can be used to:

• Determine the structural condition of pipes to enable rehabilitation works to be prioritised.
• Maintain a check on the structural condition and rate of deterioration of pipes to enable forward budgeting for maintenance and rehabilitation.
• Provide an overall inventory of the asset and a global picture of system problems.
• Check service conditions to enable regular maintenance planning.
• Provide miscellaneous information for additional uses, such as locating unused lateral connections for new housing developments.
• Provide a status of sewer and stormwater systems for industry benchmarking.

CCTV inspections also provide valuable information on the position and type/size of the pipes being inspected, such as:
• Connectivity, i.e. which manholes are connected by the pipe.
• The location of pipes and manholes can be determined by the length of the pipe surveyed and the position of the manholes noted when the CCTV camera was put into or retrieved from the pipe.
• The diameter of the pipe being inspected.
• The material of the pipe being inspected.

The CCTV Process



By taking this information on selected pipelines the data can be used to infer the condition of similar aged and type pipes to give a complete picture of the network.

4.3 INFORMATION FLOW REQUIREMENTS AND PROCESSES

General maintenance work is continuous throughout the year and responds to the needs of the network. The data from the repairs carried out is reported to Council and recorded in MDCs systems on a regular basis.

New subdivisions in the District result in additions to the pipeline infrastructure. In the past there have been difficulties in capturing the resulting updated and additional asset information. Processes need to be established to ensure that this data is provided electronically so that it can easily recorded in the Asset Register and available for ongoing effective Asset management.

4.3.1 PROGRAMMING OF WORKS AND FUNDING

Planning for the physical works programme involves the preparation of a 10 year programme and collating information required for the funding application to Council (The Annual Plan Process).

All the information obtained from network inspections, maintenance inputs and Asset Register analysis are used to develop the 10 year capital works programmes.

The Each year the following year's physical works programme is assessed by the Utilities Engineer and the Contractors representative, with sites inspected and confirmed as requiring work or deferred one or more years.

The total funds required are based on the current requirements identified and the previous year's expenditure. During the year there is very little ability to reallocate funds due to the silo-ed effect of each Community Board funding their respective maintenance and renewals and also the very small budget in each community.

4.3.2 STANDARDS AND GUIDELINES

The management of the pipeline assets are constrained by the funding available to maintain the network as a viable entity.

Another key manual is the International Infrastructure Management Manual which provides guidelines on the structure and format for Asset Management Plans and practice.

4.3.2.1 Levels of Service

The LTP process is used to determine the level of customer satisfaction and identify community concerns and issues. A good range of performance measures in keeping with NAMS guidelines are in use.

4.3.2.2 Knowledge of Assets

The process of capturing as-built records for the on-going enhancement of asset registers is included as a requirement of the maintenance contracts. The information is supplied to Council staff for them to upgrade the relevant registers. Projects undertaken outside the maintenance contracts have a requirement within their contract for the relevant information to be collected and forwarded to Council for them to upgrade the registers. There are some observed gaps in the securing of data for new infrastructural assets (e.g. subdivisions). The Contractors staff use IPads in the field to check and capture data for updating the asset registers. This information is confirmed by Council staff prior acceptance into the asset register.

4.3.2.3 Accounting/Economics

Maintenance and renewal costs are recorded against broad activities in the general ledger. Valuations are currently based on straight line depreciation and assumed effective lives.

4.3.2.4 Condition and Performance Monitoring

All pipelines, pump stations and oxidation ponds are monitored by the maintenance contractors to determine maintenance needs. This ensures MDC staff also monitors the network condition as an audit of the Contractors performance.

Well documented standards and processes exist for condition rating pipework as part of CCTV inspection.

4.3.2.5 Risk Management

Although processes are in place for the monitoring of some critical assets (e.g. pump stations), risk management is generally practised informally based on the knowledge of experienced staff.

4.3.2.6 Operations

Operational processes are documented in service delivery contracts and are subjected to regular review.

4.3.2.7 Maintenance

Competitively tendered contract is entered into approximately every five years to deliver the maintenance of this activity. Major new pipeline construction or replacement is tendered individually for larger budget items.

4.3.2.8 Optimised Life Cycle Strategy

Work optimisation for other assets is based on the judgement of experienced staff, internal inspection of pipelines and renewal projections are based on assumed economic lives.

4.3.2.9 Quality Assurance/ Continuous Improvement

Audit NZ annually audits performance measures reported in the annual plan. All recommendations for improvement are adopted and implemented as resources permit.

5. LEVELS OF SERVICE

5.1 DEFINING THE LEVEL OF SERVICE

Asset management planning requires a clear understanding of customer needs and preferences and the minimum obligations that must be met. A key objective of this activity plan is to match the level of service provided by the asset with the expectations of the customers given legislative, financial, technical and safety constraints. Service standards, set to meet this objective, provide the basis for the life cycle management strategies and work programmes identified in Section 7.

The service standards defined in this section will be used:

- to ensure legal and legislative requirements are met
- to inform customers of the type and level of service offered
- as a focus for the asset management strategies developed to deliver the required level of service
- as a measure of the effectiveness of this Plan
- to identify costs and benefits of the services offered
- to enable customers to assess the suitability, affordability and equity of the services offered

The MDC levels of service for Foul Sewer reflect current industry standards and are based on:

- **Customer Research and Expectations:** Information gained from the community on their expectations of quality and price of services
- **Strategic and Corporate Goals:** Provide guidelines for the scope of current and future services offered, the manner of service delivery and define specific levels of service which the MDC wishes to achieve
- **Legislative Requirements:** Environmental standards, regulations and acts that impact on the way assets are managed (i.e. resource consents, building regulations, health and safety legislation, Local Government Act)
- **Demands on the Network:** Service demands that are placed on the network.

5.2 CUSTOMER RESEARCH AND EXPECTATIONS

The Council utilises the following methods to determine and measure customer expectations:

- Public meetings
- Consultation via the Annual Plan and LTP process
- Feedback from customers and elected representatives
- Publicity

Ratepayers want full time availability of the sewerage network, free from blockages. They expect to flush and forget.

Customer expectations are one of the key considerations used to determine the acceptable target levels of service prescribed for the MDC Foul Sewer Network.

The community's expectations can be summarised as being:

- Foul Sewer networks are provided to remove sewerage effluent from properties and dispose of it in an environmentally appropriate way meeting the disposal requirements of the relevant resource consent.
- Foul Sewer networks are replaced to ensure that they continue to operate efficiently and maximise the life of the asset.

In order to achieve the above community expectations there are two specific strategies that the MDC will implement:

- The maintenance of Foul Sewer networks to provide appropriate means to collect and dispose of Foul Sewer in a safe and environmentally acceptable way.
- The Council will employ preventative maintenance and monitoring systems to protect the network and ensure compliance with resource consent conditions.

5.3 STRATEGIC AND CORPORATE GOALS

The Foul Sewer network must be operated to meet Council policy, objectives and various Environment Canterbury requirements. Council's goals and the community's expectations are stated in the LTP which provides the framework for the operation and development of the Foul Sewer infrastructural assets.

Organisation Mission, Goals and Objectives

The Council's mission statement is: ***"FOSTERING OUR COMMUNITY"***. The particular aspects of the overall mission that relate to the sewer activity are:

SERVICE
We are a service organisation. Providing efficient and cost-effective services is our prime responsibility.

SUSTAINABILITY
We are committed to the sustainable management of all the resources of the district.

Foul Sewer Activity Goal and Principal Objectives

As outlined in Council's Long Term Plan (LTP) Council, the sewerage asset contribution to achieving Council's governance goal and the community outcomes identified in Section 2 is through the **Foul Sewer Activity Goal**:

To ensure all Foul Sewer assets are managed to measures minimise damage and inconvenience to property and there are no environmental ill effects arising from Foul Sewer protection work

The specific **Objectives** of the Foul Sewer activity are as follows:

- To develop an activity management plan for effluent disposal
- To contract cost-effective service delivery
- To identify and prioritise key areas for network improvements and progressively correct these.
- To ensure all resource consent conditions are met.
- To ensure the maintenance of the public infrastructural assets in perpetuity, so that there is no diminution in value, and to forecast the estimated future cost of so doing.

5.4 LEGISLATIVE REQUIREMENTS

Legislative requirements set the framework for the minimum standards of service that Council has to meet. The key legislation relating to the Council's responsibility to manage the Foul Sewer asset is:

- The Local Government Act 2002.
  Especially
  - Part 7.
  - Schedule 10.
  - The requirement to consider all options and to assess the benefits and costs of each option.
  - The consultation requirements.
- The Local Government Act 1974.
- The Climate Change Response Act.
- The Civil Defence Emergency Management Act 2002 (Lifelines).
- The Health Act 1956.
- The Resource Management Act 1991.
- The Local Government (Rating) Act 2002.
- The Health and Safety in Employment Act 1999.
- The Building Act 2004.
- The Local Authority's District Plan.
- The Council's Engineering Design Standards for Subdivisions and Development. SNZ 4404:2010
- Any existing established policies of the Council (outside those contained in this Activity Management Plan itself) regarding this activity.
- New Zealand Standard SNZHB 4360:2000 'Risk Management for Local Government'.
- Natural Resources Plan – Environment Canterbury
- Land and Water Plan – Environment Canterbury

The ***Local Government Act 2002*** gives local authorities the full capacity, and full rights, powers and privileges, to carry on or undertake any activity or business, do any act, or enter into any transaction wholly or principally for the benefit of its district.

Along with these wide sweeping powers comes the requirement to identify practicable options before making a decision, and to assess the benefits and costs of each option against the likely economic, environmental, social and cultural impacts.

Local authorities are also required to consult widely, effectively and appropriately with the community to determine the communities' wishes and to seek feedback on all potentially significant activities – not only when a particular course of action is proposed, but at the various stages of the decision-making process.

The MDC has determined that it will consult its communities where practical, reasonable and within the resources available to it. A significant aspect of this consultation process is the development of the LTP, which forms the long-term (not less than ten years) direction for all Council's activities.

The ***Local Government Act 1974*** gives local authorities the full capacity, and full rights, powers and privileges, to constitute "Drainage Areas" and construct drains.

The ***Resource Management Act 1991*** requires Council to:

- sustain the potential of natural and physical resources to meet the reasonably foreseeable needs of current and future generations
- comply with the District and Regional Plans
- avoid, remedy or mitigate any adverse effect on the environment and structures (e.g. adverse effect of surface run-off)
- control the use of land for the purpose of the maintenance and enhancement of the quality of water in water bodies and coastal water;
- manage discharges of contaminants into water and discharges of water into water
- control the taking, use, damming and diversion of water, including:
    - the setting of any maximum or minimum levels or flows of water;
    - the control of the range, or rate of change, of levels or flows of water; and
- control the discharges or contaminants into water and discharges of water into water.

The ***Building Act 2004*** requires Council to:

- Ensure all buildings and facilities constructed comply with the Act
- Produce Project Information Memoranda (PIM's) which supply all available information relating to an individual property. For the foulsewer network the relevant information may include details of the location of the services to the property and any known issues with a history of blockage, type of disposal system, etc

The ***Health and Safety in Employment Act 1992*** requires Council to:

- Ensure that its employees, contractors are protected from injury as a result of its activities
- Notify the Occupational Safety and Health Department of serious harm or fatal accidents as a result of its activities within 7 days

The ***Civil Defence Emergency Management Act 2002*** requires Council to:

- Establish and be a member of a Civil Defence Emergency Management Group

- Co-ordinate, through regional groups, planning, programmes and activities related to civil defence emergency management across the areas of reduction, readiness, response and recovery, and encourage co-operation and joint action within those regional groups
- Improve and promote the sustainable management of hazards in a way that contributes to the well-being and safety of the public and also to the protection of property

Environment Canterbury's Land and Water Regional Plan

Environment Canterbury's Land & Water Regional Plan provides the regulatory framework to implement the community's aspirations for water management under the Canterbury Water Management Strategy. It addresses competing demands for land and water resources in both rural and urban Canterbury in a sustainable manner.
It also provides the regulatory framework around a number of other environmental and development matters required to be managed by Council.

- The objectives of the plan identify the outcomes that are to be met with regards to management of these resources. These outcomes will be achieved over varying timeframes.
- The policies (which direct how activities are to be managed to achieve these outcomes) give effect to the objectives.
- The rules are the tools used to implement these policies.

Natural Resources Regional Plan – Environment Canterbury
Chapter 7: Water Quality
7.1 Introduction
Canterbury's water resources - rivers, lakes and groundwater- are a significant regional and national resource (Figure WQL1, WQL2). The water resources are important for aquatic ecosystems, their aesthetic, cultural and recreation values, tourism, and as a source of water for drinking, industry and agriculture. Much of the region's surface water and groundwater resources are of high quality, and many water bodies are still largely in their natural state. Human activities, however, have greatly increased the concentrations and types of contaminants entering the region's water bodies. The impact of these activities on water quality varies throughout Canterbury. In most places, they are relatively minor (compared to other parts of New Zealand and the rest of the world), but in some areas the impacts are significant, restricting the use of water for drinking, recreational and other uses.
The objectives and policies in the Canterbury's Regional Policy Statement provide the broad planning framework for managing water quality in the region. Chapter 9, Objective 3 of the Canterbury Regional Policy Statement recognises the need that present and future generations of Canterbury's communities can to provide for their social and economic well-being from the use of water as a receiving environment while ensuring that certain values are safeguarded.

Ngai Tahu values
Ngai Tahu perceive water as the source of life and sustenance. It is held that water contains a mauri (life essence) that joins physical and spiritual elements and links water to every other part of the natural world. Water is viewed as a taonga (treasure) because it carries the lifeblood of the land; the well-being of all living things depends on it. Maintaining water quality in the best

possible condition so that a water body and its ecosystems are in a healthy state is an issue of major concern for Ngai Tahu. The use of water bodies for certain types of activities can impact on their spiritual and cultural values. For example, the discharge of effluent to water, especially human waste, is considered an offensive activity, that defiles the spiritual and cultural values of the water.

Ngai Tahu have sought the following outcomes:

- maintenance of the mauri of natural and physical resources, and to restore mauri where it has been degraded by the actions of humans.
- recognition of tangata tiaki as kaitiaki of water;
- protection of wahi tapu sites from inappropriate activities.
- the integrity and cultural uses of water bodies are protected by prohibiting "unnatural" mixing of waters from different water bodies.
- maintain or enhance water quality by controlling the discharge of point and non-point sources of contaminants to water, and prohibiting the direct discharge of human effluent to water.
- the discharge of water containing industrial and agricultural effluent be required to pass through land before it enters a water body.
- the restoration of wetlands and riparian margins is encouraged because of their pollution abatement function.

Wider community

Awareness throughout the community of the effects of human activities on water quality has increased in recent times. People now have a better understanding of the linkage between human activities and their impacts on water quality. Communities are less tolerant of polluters than a decade ago. This is part of a world wide recognition of the importance of protecting water quality which has led to improved methods for detecting contaminants, tracing their sources, managing and treating wastes.

Over the last 20 years, control of point source discharges has led to a significant improvement in the water quality of degraded water bodies. Businesses are increasingly conscious of the need to maintain a positive public image in relation to impacts on the environment and to adopt environmentally acceptable policies and practices. The greatest pressures on water quality are now from non-point source discharges. These are the most difficult to manage because reducing the impacts of non-point source discharges involves changes to land management practices and consumption patterns. Education will play a key role in increasing awareness of the issues and bringing about a change in practices and patterns of resource use.

Land Drainage Act 1908

This Act is subject to the provisions of the Resource Management Act 1991.

The Governor General may constitute a drainage district which in turn will cause a Board to be created.

Local Authorities may assume the powers of a Drainage Board for areas outside of drainage districts.

Soil Conservation and Rivers Control Act 1941

This Act is subject to the provisions of sections 176 to 182 of the Harbours Act 1950 and the Resource Management Act 1991.

This Act generally covers rivers and drainage that was previously under the control of Catchment Boards but now administered by Regional Councils.

There are implications for Local Authorities mainly to do with the overall drainage of a district.
Section 143 States –

> (2) Every Catchment Board shall exercise a general supervision with respect to the exercise and performance within the catchment district by local authorities of any powers, functions, and duties as to watercourses and as to drainage conferred and imposed on local authorities by the Land Drainage Act 1908, the River Boards Act 1908, the Local Government Act 1974, or any other Act, and may give such general or special directions as it considers reasonable for the guidance of local authorities with respect to the exercise and performance of those powers, functions, and duties.
>
> (3) Without prejudice to the generality of the foregoing provisions of this section, no Drainage Board, River Board, or local authority shall, in exercise or performance of any of the powers, functions, or duties referred to in the foregoing provisions of this section, construct or alter any watercourse or any other works in a catchment district otherwise than with the consent (not to be unreasonably withheld) of the Catchment Board of the district.

Public Works Act 1981

This Act would be used if necessary to procure land for Foul Sewer activities but has no specific reference to Foul Sewer.

Local Government (Rating) Act 2002 No 6

The purpose of this Act is to promote the purpose of local government set out in the Local Government Act 2002 by—

- (a) providing local authorities with flexible powers to set, assess, and collect rates to fund local government activities:
- (b) ensuring that rates are set in accordance with decisions that are made in a transparent and consultative manner:
- (c) providing for processes and information to enable ratepayers to identify and understand their liability for rates.

Bylaws

These are permitted under the Local Government Act for a range of purposes including preserving public health, well being, and safety. However amendments in 1991 restrict its use to ensure the Building Act over rules a bylaw in that area of activity.

District Plan

The District Plan requires all new subdivision areas make provision for Foul Sewer control infrastructure, encourages the retention of natural open water ways for Foul Sewer disposal and requires Foul Sewer disposal to be carried out in a manner that avoids inundation of land within or adjoining the subdivision. The District Plan provides means of compliance for Foul Sewer control

works, which includes reference to Mackenzie District Council Code of Practice. This Code is based on the Code of Practice for Urban Land Subdivision (NZS 4404:2004).

Other Legislation and Regulations

The following additional legislation or regulations affect the operation of the Urban Foul Sewer Systems:

- Water Supplies Protection Regulations 1961
- Dangerous Goods Act 1974

In addition to the above legislation the following is applicable to the Fairlie and Burke Pass Foul Sewer discharge.

- Environment Canterbury, Opihi River Regional Plan

Legislation (e.g. Resource Management Act) requires Council to consult with the Tangata Whenua and take into account the principles of the ***Treaty of Waitangi*** in the management of infrastructural assets.

5.5 CURRENT AND TARGET LEVELS OF SERVICE

Council's current and target levels of service are summarised in Table 5.1. These show how levels of service contribute to the community outcomes and provides a technical measure that enables Council to monitor current levels of service against target levels of service.

These Levels of Service will be no longer used from 1 July 2015 onwards, instead they will be replaced by the mandatory performance measures as required by Audit NZ.

Table 5.1 – Current and Target Levels of Service

Levels of Service	Measure of Service	Baseline Information	Target
Sewage is managed without risk to public health.	Number of sewage overflows from pump stations. Number of annual blockages per 10km of sewer. % of ratepayers satisfied with the sewage treatment and disposal service.	Last measured YE June 2011, there were nil overflows. Last measured YE June 2011, there were 1.1 blockages per 10kms. CINTA survey October 2011, showed 91% were satisfied.	Nil Less than six 85%
Sewage is able to be disposed of without significant disruption.	% of temporary or permanent repairs completed within 6 hours (during working hours) or 12 hours (outside working hours). Normal disruption should not exceed 8 hours. Apart from earthquake or flood, no single disruption should exceed 24 hours.	Last measured YE June 2011, where these targets were met. Not measured in YE June 2011.	100% 100%
Safe discharge of wastewater	% of notices of non-compliance, issued by Environment Canterbury, for Council's discharge consents actioned within 20 working days.	New measure and we have no prior year data.	100%

Further to the levels of Service in Table 5.1 there are requirements that form part of the maintenance contract specifications. These are detailed in the following sections.

5.5.1 SECONDARY LEVELS OF SERVICE

These are technical measures included in the Infrastructural Services Contract

Table 5.2

MDC Event	Service Standard
Response	Provide a 24 hour, 365 day per year call out service
	Complete administration functions in a timely manner
Response Times	Faults with potential to cause disruption of service – two working days
	Blockage in Public Sewer and Other Emergency Repairs: During working hours - The service to be reinstated by temporary or permanent repairs within six hours of call out Outside working hours - The service to be reinstated by temporary or permanent repairs within nine hours of call out

Availability / *Disruption to Service*	Maximum duration of one disruption - 24 hours
	Normal duration of one disruption - eight hours *(It should be noted the above duration would not apply for an extraordinary event such as a major earthquake or flood)*

5.5.2 ASSET PRESERVATION MEASURES

MDC is committed to maintaining and improving the network where current levels of service may not be met. Analysis of the network condition over time provides an indication of asset behaviour and performance achievement. Table 5.3 outlines the measures that will be used to determine the network condition and performance.

Table 5.3 - Asset Preservation Measures

Measure	Explanation	Method of Measurement	Target Values	Response Times
All sewerage facilities functioning satisfactorily	Sewerage facilities, such as: - Pipelines - Manholes - Manholes - Pump Stations -Treatment Facilities - Disposal systems	Visual inspection DO monitoring	Oxidation Ponds – Clean out inlets. Measure and record DO Check aerators and disposal fields for effective operation. Pump Stations – Check and record water levels and pump hours. Wash down wells and test alarms Service all pumps Clear blocked sewer mains	Weekly Inspected at least monthly Six monthly 6 hours in normal work hours and 12 hrs to clear blockages at any other time.

5.6 GAP ANALYSIS

5.6.1 LEVELS OF SERVICE DEVELOPMENT WITH USERS AND STAKEHOLDERS

The current LOS being provided has been established through Council's LTP process. This would suggest there is approval with the current regime, although this could also be interpreted as an over provision of service in the context of Council's broader service profile.

Options to further examine this issue in the future could include:

(a) Monitor and interpret customer feedback through customer feedback and complaints. This information can be analysed for any trends or common factors related to current service levels (e.g. number of complaints received)

(b) Engage customers in a formal process. There are a number of mechanisms to achieve this from public meetings to surveys to focus groups. This may include the use of documented feedback processes. In all methods the clear description of different LOS options, fully costed, is a prerequisite to meaningful feedback

(c) Engagement with key stakeholders. These include the Regional Council, and others. Again good input information to these engagements will produce valuable feedback.

5.6.2 LEVELS OF SERVICE DEFINITION

The current LOS are documented as a combination of:

- LTP LOS documentation based on real or perceived customer feedback
- Contract processes which describe some elements of the quality of service provided, mainly travelling surfaces and intervention levels

This can be improved by:

(a) Augmentation of existing information e.g. clearer relationships between alternative service levels for blockages, surcharge etc and their associated costs.

(b) Utilisation of a LOS model defining quality, quantity, location, and timeframe. This would be based on the IIMM and define the wastewater service in terms of Accessibility, Health and Safety, Quality, Reliability and Responsiveness, Sustainability, Functionality.

These would form the basis for a consultative process as outlined above.

5.6.3 PERFORMANCE MEASURES

Council has suite of performance measures agreed with the community and reported on annually by the Annual Reports. This performance is measured as per contractual requirements and changes in indicators such as increased flooding or maintenance. However Central Government introduced a suite of mandatory performance measures covering Transportation, Three Waters and Flood Control that came into force on 1 July 2014.

These mandatory performance measures have been adopted by Council for inclusion in the 2015-25 Long Term Plan and no other measures will be used.

Performance measure 1 (system adequacy)

The number of dry weather sewerage overflows from the territorial authority's sewerage system,

expressed per 1000 sewerage connections to that sewerage system.

Performance measure 2 (discharge compliance)

Compliance with the territorial authority's resource consents for discharge from its sewerage system measured by the number of:

e) abatement notices

f) infringement notices

g) enforcement orders, and

h) convictions,

received by the territorial authority in relation those resource consents.

Performance measure 3 (fault response times)

Where the territorial authority attends to sewerage overflows resulting from a blockage or other fault in the territorial authority's sewerage system, the following median response times measured:

(c) attendance time: from the time that the territorial authority receives notification to the time that service personnel reach the site, and

(d) resolution time: from the time that the territorial authority receives notification to the time that service personnel confirm resolution of the blockage or other fault.

Performance measure 4 (customer satisfaction)

The total number of complaints received by the territorial authority about any of the following:

(e) sewage odour

(f) sewerage system faults

(g) sewerage system blockages, and

(h) the territorial authority's response to issues with its sewerage system, expressed per 1000 connections to the territorial authority's sewerage system.

5.6.4 AFFORDABILITY AND WILLINGNESS TO PAY

Hand in hand with the current LOS vs. Desired LOS is the issue of cost. This needs to be addressed at two levels:

(a) Cost for different Levels of Service options within the Foul Sewer Activity

(b) Cost of the Foul Sewer activity within the total Council programme.

The first level can be addressed using the options outlined above where fully described and costed service level options are consulted with the community.

The second level needs to be addressed as an assessment of the relative contribution the Foul Sewer Activity makes towards the achievements of Community Outcomes at the current level vs. greater or lesser levels of service.

6. FUTURE DEMAND

6.1 DEMAND DRIVERS

The significant future demands affecting foul sewer infrastructural services in Mackenzie District to be considered are:

➔ **Growth Trends –** Trends in population growth or decline give a good indication of future growth and in turn demand on the network.

➔ **Economic Changes** – Changes in land use, industry, economic climate and tourism can all affect the demand on the Foul Sewer asset.

➔ **Improvements to Levels of Service** - Continual demand for improvements in the levels of service. This can result from:

- Advances in available technology
- A greater understanding of customers' perceptions and expectations
- A higher level of public conscientiousness
- Changing legislative requirements
- Government organisations setting higher standards

6.2 DEMAND FORECASTS

6.2.1 GROWTH TRENDS

6.2.1.1 Population Projections

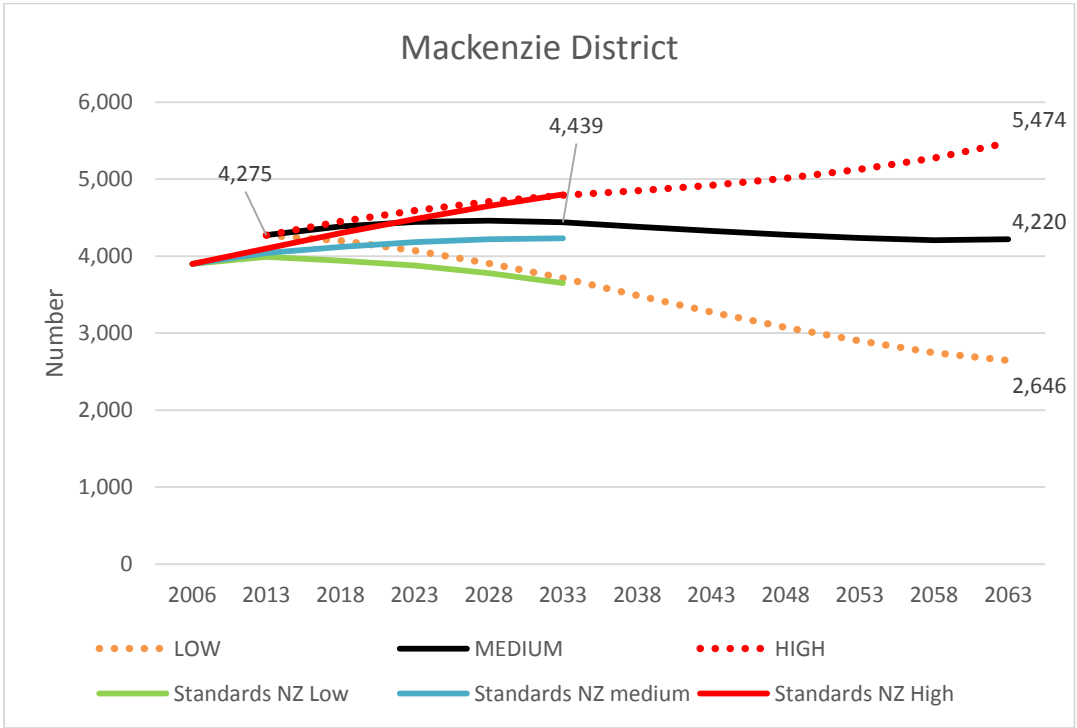
The Mackenzie District has seen an increase in population of 9.3% since 2006, this is a significant change from the 2001-2006 period where the population grew by a modest 2.3%

As we cannot predict the future population level and when it will occur, it will be inappropriate to extrapolate this trend to a 20 – 25 year horizon.

The projected population trends (2013) from a collaborative study completed for the three South Canterbury Councils is demonstrated in Figure 6.1. This shows that a medium population projection indicates that the population will remain stable. As, we have identified, the Mackenzie District has had a 9.3% increase in normal resident population, therefore are tracking slightly above the medium growth projection, however, the results are slightly skewed due to the longer period between census surveys.

Consequently the following graph predicts a relatively static population growth over the period of this asset management plan. As a result there will not be any significant increase or decrease in demand for Council services based on change in population.

Figure 5.1 Estimated and projected population (Statistics NZ)



6.2.1.2 Development

Analysis of the future urban and rural residential subdivision over the next 4 years shows an average of 10 sections per year, along with associated infrastructure, to be vested in Tekapo and an average of 46 per year in Twizel.

During the 2015/17, 2355m of Foul Sewer network, including sumps and manholes, will be vested in Council. Whilst developers have to construct this to Councils standard before vesting the ongoing maintenance and depreciation costs have to be allowed for.

It is assumed that this level of development will slow down to about a third of this but continue at that rate for the duration of this strategy.

6.2.2 ECONOMIC CHANGES

The economy of the District is built on tourism, farming and hydroelectric development.

The District is fortunate in having Lake Tekapo and Aoraki Mount Cook, the international tourist icons, within its boundaries. They provide an excellent platform from which to develop the tourism potential of the District.

Land use intensification, due in part to increased irrigation, such as dairying, cropping, horticulture and forestry are becoming increasingly common and offer considerable scope to grow the local economy.

Change in land use is ongoing and something that is hard to predict. The following factors influence those land use changes.

- Tourism
    - Mt John Tourism along with the Night Sky Reserve are putting increasing pressure on Godley Peaks Rd as people want to travel to the top of Mt John.
    - Lake Alexandrina. Having been to the top of Mt John and observed the lake the tourist wants to visit these scenic attractions. Challenge here is keeping them on the "right" side of the road, along with the associated wear of the sealed and un-sealed pavements.
    - Haldon Camp. This is on the shore of Lake Benmore and puts high summer traffic on Haldon Road.
    - Ski Fields. As these open the traffic on the feeder roads can increase by 1200%
    - Alp2O cycle trail. This new attraction is starting to put increased demands on Mt Cook Station Road and Hayman Road creates conflict with other road users especially the logging operations.
- Tenure Review
    - There are a number of High Country Stations still to go through tenure review. Historically this has involved part of the station passing into the public estate and being opened up for access. There is a higher expectation from the Department of Conservation and other road users for better access to be made available with no extra funding from either NZTA or DoC. Staff are working with DoC to try to minimise this effect so significant allowance has been made for this.
- Land Use Intensification
    - Godley Peaks Station – New water take consent obtained and it is projected to significantly add to the 30,000 lambs that come off the property and the 1500 tonnes super applied to the property last year. 250 HCV movements on and off the property, all towed through the Cass River by a dozer.
    - Dairy Conversions
    - Mt Cook Station 50yr forestry programme
    - Primary Produce increase as the result of increased irrigation

Due the difficulty in predicting where this demand might be over the next 30 years, it is important to recognise that it will happen and plan for it as early as the knowledge and effects become better understood.

6.2.2.1 Tourism

Local Government and the Tourism Strategy

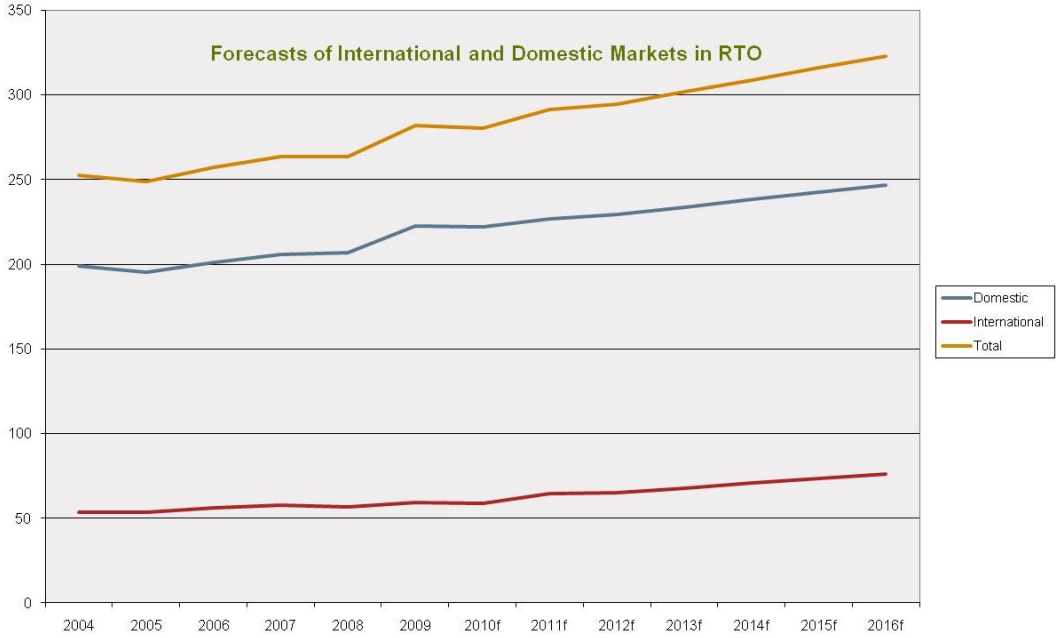
Outcome Four of the New Zealand Tourism Strategy 2015 New Zealand Tourism Strategy 2015 is, "The Tourism Sector and Communities to Work Together for Mutual Benefit". The Strategy states that the role of local government is to provide:

- Infrastructure and facilities, such as roads, water, waste management, lighting, and, in some areas, public transport. Many local authorities also operate attractions such as museums, art galleries, gardens, sports venues, and events for the enjoyment of both locals and visitors
- Visitor information and marketing services through the i-SITE network, signs and the Regional Tourism Organisations
- Planning support for the tourism sector, including regional tourism strategies, destination-management plans, Long Term Plans and District Plans.

Tourism makes up a large component of transportation demand within the district. The Ministry of Tourism states that total visits by travellers to Mackenzie RTO (Mackenzie District) are forecast to rise from 960,377 in 2009 to 1,075,079 in 2016 - an increase of 11.9% or 1.6% per annum. Growth is shown in Figure 6.2.

The influx of domestic holiday-makers into the district, particularly the Mackenzie Basin, has little impact on the Foul Sewer network. As development occurs, the developers are required to develop their own Foul Sewer system to connect into the Council system. They are also required to confirm that the existing network can cope with the increased effluent from the proposed subdivision.

Figure 6.2 – Forecast Tourism for Mackenzie District (Ministry of Tourism)



6.2.2.2 Changes in Land Use, Practices and Resource Use

Rural change can take several different dimensions, which might include:

- Land cover (e.g. grass, indigenous vegetation)
- Land use (e.g. development)

The change in land use will not adversely affect the districts Foul Sewerage systems

In Twizel, change in land use around the oxidation pond could affect their continued use. There is a no build zone of 150m for rural residential building around the oxidation ponds and 50m adjacent to the disposal trench. The proposed consolidation of the discharge from the oxidation pond will see the trench de-commissioned, a 150m buffer around the ponds purchased by Council and a further 150m no build zone established.

6.2.3 IMPROVEMENTS TO LEVELS OF SERVICE

6.2.3.1 Changes in Customer Expectations

In recent years there has been an increasing awareness on the part of owners with respect to Foul Sewer issues. It is anticipated that the following issues will become an increasing priority for Council in determining design and operational standards.

- Extended areas being desiring to be connected to reticulated sewerage systems
- Improved response times

6.2.3.2 Changing Level of Service Demands

The intended Levels of Service defined in Section 3 are considered to be representative of the service demands of the current and the future community. With rate of growth in the rating base reducing, the following factors may need to be considered:

- reduction in maintenance of some facilities that have little impact on the overall service delivery (if possible)

6.2.3.3 Policy or Management Changes

Changes to Foul Sewer policies may be driven from a number of directions. They could be internally driven (e.g. Development Impact Levy policies) or externally driven (e.g. changes driven

by regional or national organisations like Environment Canterbury). Monitoring and being aware of possible implications of these changes enables the impacts of such changes to be anticipated and predicted. While there is no certainty, it is important to consider them when developing asset management risk forecasts and strategies.

National Infrastructure Plan 2011

The second National Infrastructure Plan was released on Monday 4 July 2011. The Plan outlines the government's 20 year vision for New Zealand's infrastructure:

By 2030, New Zealand's infrastructure is resilient, coordinated and contributes to economic growth and increased quality of life.

It also outlined a 3 year programme of work to progress this vision. The next edition is due to be released in August 2015.

The overall purpose of this Plan is to improve investment certainty for businesses by increasing confidence in current and future infrastructure provision.

Three-Year Action Plan

Government is committing to the following actions to give effect to the vision and principles and to move towards the next edition of the Plan in 2015.

Transport

Ensuring a stable regulatory environment. Supporting growth in Auckland. Improving the overall effectiveness and efficiency of the network.

Telecommunications

Public and private sector take up UFB infrastructure. Greater efficiency in telecommunications networks.

Energy

Further develop and improve the electricity regulatory regime. Improve the information base available to support further investments in petroleum and minerals sectors.

Water

Better demand management practices and consistent performance criteria for water infrastructure. Promote partnerships and activities within the sector. Ensure that management of water assets contributes to improved social, economic, environmental and cultural wellbeing of communities.

Social

Alternative approaches to the funding delivery and management of assets and associated services. Improved spatial consideration of social infrastructure to support growing communities. Greater use of shared services by local government.

Strategic Opportunities

The following is a snapshot of the strategic opportunities that will help achieve vision and goals that have been identified in each sector.

1. Central government will commit to developing and publishing a ten year Capital Intentions Plan for infrastructure development to match the planning timeframe required of local government.
2. Increase understanding of and encourage debate on the use of demand management and pricing in infrastructure sectors.

3. Improve access to information on current infrastructure performance to create certainty about when, where and how infrastructure development is occurring, including consideration of whole of life costs.
4. Develop performance indicators for each sector on the stock, state and performance of central and local government infrastructure assets as well as those managed by the private sector.
5. Work with regions to develop more strategic infrastructure planning at a macro-regional level. Consider where adoption of spatial planning would produce optimum outcomes, particularly in metropolitan areas.
6. Improve scenario modelling to more accurately project likely infrastructure investment requirements from the short to very long term.
7. Use lessons from Christchurch to significantly enhance the resilience of our infrastructure network. This may include developing improved seismic design standards, reviewing organisation culture to improve performance in emergencies and identifying ways to quickly return services to full operational capacity.
8. Explore alternative sources of funding, and implement funding tools that can be used to manage the current portfolio more effectively.

Financial Contributions

Financial Contributions are another means of funding network infrastructure, reserves or community infrastructure. Mackenzie District Council has prepared a 'Financial Contribution Policy'. The contribution policy includes a methodology for calculating the equity in the existing specific infrastructure network including Foul Sewer. This ensures that the Developer pays their fair share of that network, installed previously, that allows the development to connect to that service and proceed to completion.

The policy uses the following formula to calculate the level of contribution:

ASSET VALUATION – DEBT LOADING / THE NUMBER OF CONNECTABLE PROPERTIES TO THE SCHEME.

For 2015/16, the financial contribution payable on each lot created at the time of subdivision is calculated at $3706. This amount is GST exclusive.

The financial contribution figures are reviewed annually.

Environment Canterbury's Land and Water Regional Plan

Environment Canterbury's Land & Water Regional Plan provides the regulatory framework to implement the community's aspirations for water management under the Canterbury Water Management Strategy. It addresses competing demands for land and water resources in both rural and urban Canterbury in a sustainable manner.

It also provides the regulatory framework around a number of other environmental and development matters required to be managed by Council.

- The objectives of the plan identify the outcomes that are to be met with regards to management of these resources. These outcomes will be achieved over varying timeframes.
- The policies (which direct how activities are to be managed to achieve these outcomes) give effect to the objectives.
- The rules are the tools used to implement these policies.

6.3 DEMAND IMPACTS ON ASSETS

Overall implications for the network of continual demand for improvement in levels of service tied to an effectively static population are:

- An increasing level of treatment and disposal caused by outside agencies requirements.
- An increasing focus environmental controls/requirements
- An increased level of expenditure to attain those desired controls/requirements
- A static ratepayer base to fund Mackenzie District Council's contribution to the separate community based foul sewer budget

6.4 DEMAND MANAGEMENT PLAN

There are two recognised components to a demand management strategy:

6.4.1 ASSET BASED DEMAND MANAGEMENT

Asset Based demand management on the system really can only be focused on removing stormwater or ground water infiltration.

In Fairlie there are private drains that require repair to correct the infiltration of groundwater when the water table is high. These will be identified as part of an ongoing monitoring programme and owners will be asked to repair the offending drains.

In Tekapo we are aware of stormwater infiltration into the pipe network caused most likely by roof water being plumbed into the on property sewer pipework. Council has begun a programme (2012) to identify those offending properties and have their stormwater redirected to the appropriate location.

There are minimal asset based demand options that do not have a significant cost attached.

6.4.2 NON-ASSET BASED DEMAND MANAGEMENT

There are few options to affect reduced demand on the sewerage network that are not asset based. Loading on oxidation ponds can be reduced by requiring more on property treatment, in particular for high BoD loading industries.

6.5 UPCOMING ISSUES IN THE NEXT TEN YEARS

Fairlie

It is intended to install Scada telemetry in 2018-19 at a cost of $15,000. Also the resource consent for the discharge from the oxidation ponds expires in 2038. $50,000 has been allowed for consent renewal in 2036/37.

The Fairlie oxidation ponds require regular monitoring of sludge level build up and eventually will require sludge removal. $2,000 has been allowed in 2020 to repeat the sludge depth survey and $150,000 for de-sludging the Primary pond in 2025 if required.

There are 7,100 metres of earthenware pipe in Fairlie. These were originally condition rated in 2000 as 4 and 5.

It is intended to re-evaluate these sewer mains over the next three years and then develop a replacement programme from that re-inspection. $99,000 has been allowed over the period 2015-18 for the re-inspection. If the CCTV inspection confirms the results of earlier inspections with further deterioration, then the whole 7,100m will have to be replaced. In anticipation of that result, we have allowed for a replacement programme starting in 2017/18 with completion by 2027. Approximately 1200m to be replaced or rehabilitated every second year at a rate of $255,000 starting in 2017/18. Deterioration can take the form of cracked pipes leading to effluent leakage into the surrounding ground or ground water intrusion which puts excessive pressure on the disposal system and less effective treatment.

Replacement options include dig and relay with new pipe or in-situ refurbishment using relining techniques or pipe bursting.

Tekapo

There are 1,600 metres of earthenware pipe in Tekapo. These were originally condition rated in 2000 as 3.
It is intended to re-evaluate these sewer mains over the next two years and then develop a replacement programme from that re-inspection. $23,000 has been allowed over the period 2015-17 for that re-inspection. If the CCTV inspection confirms the results of earlier inspections with further deterioration, then the 1,600m of sewer main will be programmed for replacement or refurbishment.

If there is significant deterioration then replacement will need to be scheduled for 2031-35 and $408,000 has been allowed in that period. Deterioration can take the form of cracked pipes leading to effluent leakage into the surrounding ground or ground water intrusion which puts excessive pressure on the disposal system and less effective treatment.

Replacement options include dig and relay with new pipe or in-situ refurbishment using relining techniques or pipe bursting.

The most pressing issue facing Tekapo is the disposal system. At the moment the disposal is

generally adequate for the demand but during winter freezing periods we are having some problems. Environment Canterbury has indicated their dissatisfaction and has issued a notice of non-compliance with our discharge consent as a consequence. Also, as demand increases in Tekapo the volume of effluent to be disposed of will also increase. We intend to review all of our disposal options in early 2015/16 with construction of a new system in later in that financial year.

There are alternative sites on Council owned land in the area where we can dispose of the effluent, but these have not been used in the past as they require pumping to a higher elevation and discharging on a face above the Oxidation Ponds. A total cost of $100,000 has been allowed for the investigation, design and installation of an alternative disposal system.

The existing aerators are programmed for replacement in 2020/21 at an estimated price of $124,000.

Twizel

Network Modelling: Twizel continues to show steady growth in holiday homes and in order to understand the total demand staff suggest that the network should be modelled to be able to predict when pipes needed to be upsized or aeration installed at the oxidation ponds to improve treatment. It can also be used to predict when the rising main (mentioned later) has to be replaced.

Asbestos Cement (AC) pipe: The Twizel sewer network was constructed in the 1970s using the Asbestos Cement (AC) pipe. A Pipe is composed of approximately 10-15% asbestos fibres in a matrix of ordinary Portland cement and finely ground silica. The process of making pipes was refined between 1906 and 1913 In Italy. In service these pipes have shown to deteriorate both from the inside, due to normal service, and the outside due to aggressive soil and ground water conditions.

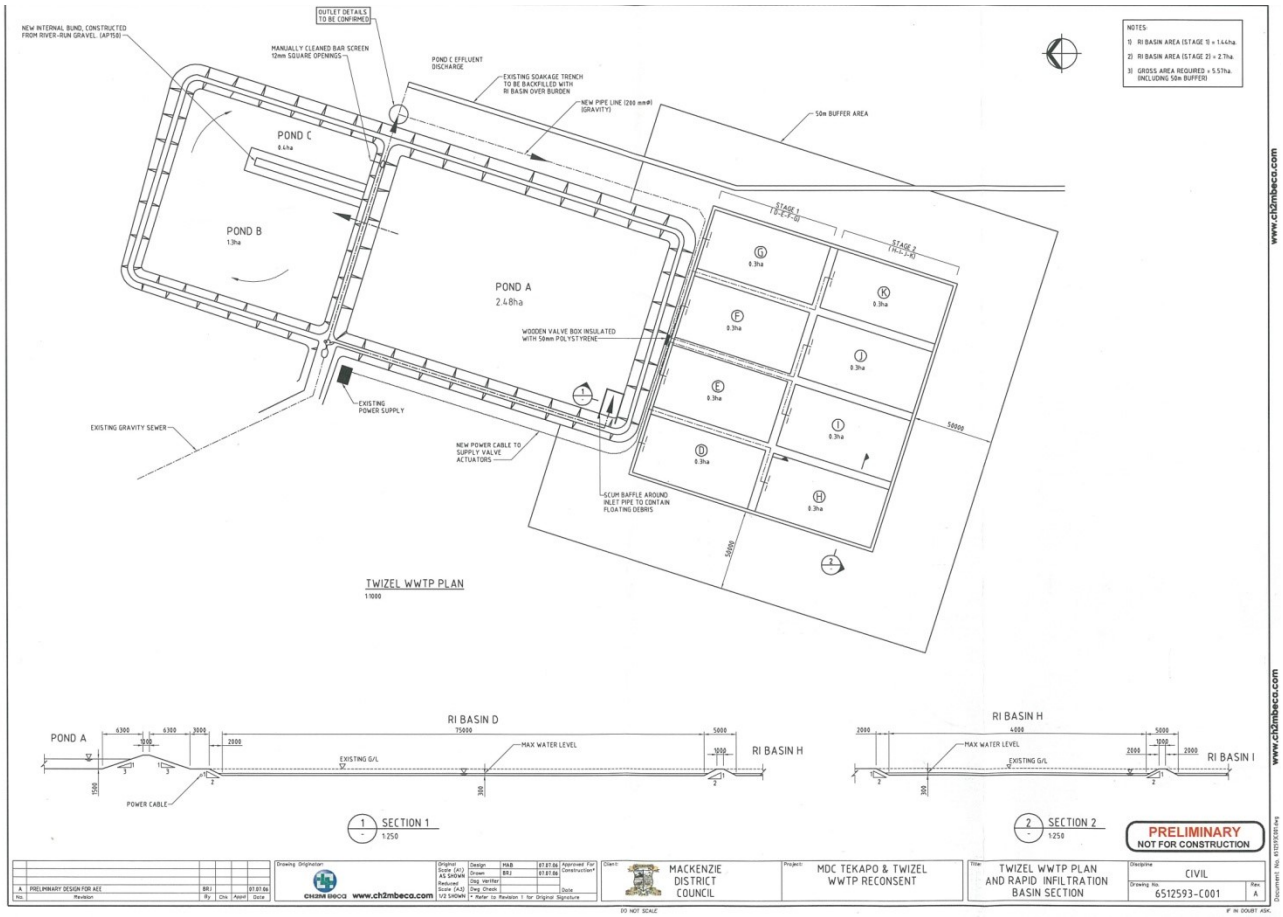
In Twizel there are no aggressive soils or groundwater surrounding the AC pipes so the deterioration is only from the inside. Nationally studies have shown that the deterioration model is very irregular throughout the networks where AC pipe is used so it is necessary to have a programme of sampling to get a better understanding when these pipes will have to be replaced and by default adjust the depreciation charged accordingly.

There is 21354m of AC pipe in the Twizel sewer network and the current replacement cost (2010) of $4.2m. Due to known performance of the AC pipe the base life of the pipe has been set at 80 years leaving a remaining life of 40 years. This figure is based on knowledge to date but further work should be done on a specific deterioration model for the gravity sewers in Twizel to more accurately predict the replacement date.

Disposal Consolidation and Retirement of Disposal Trench: Effluent from the Oxidation Ponds in Twizel currently discharges to ground via a 1700m long disposal trench that meanders across private property. The trench has been in existence for many years and performed well during that time.

The plan is to consolidate the disposal to ground by a series of sparge pipes just to the south of the ponds. As part of the agreement with the land owner to acquire necessary land. This project has been accelerated and is planned for completion by 2017.

This will require a land subdivision, land purchase, new resource consent and construction of the physical works along with the de-commissioning of the existing disposal trench. The budget for this work is $750,000.



Key to protecting the Twizel Oxidation Ponds for the future is acquiring the land required and also the access easements for power and the proposed rising main.

Rising Main: The sewerage network from the new subdivisions to the south of Twizel were not able to be gravity fed to the existing network and as such discharge to a new pump station on Batcher Road. Due to the low initial flows from this pump station, a rising main was constructed from it to the existing network on Ostler Road where the pumped effluent discharges. At some stage in the future, growth in the area will overload the 100mm rising main and a new main will have to be constructed directly to the oxidation ponds. Budget has been provisionally allowed for this work in the year 2018/19. The timing of construction of this new main is dependent on actual building constructed and occupied in the area served. It may be accelerated from the 2018/19 year but could equally be delayed.

Burkes Pass

There are no issues facing Burkes Pass sewerage network in the next ten years other than the installation of SCADA telemetry monitoring.

6.6 FUTURE IMPROVEMENTS

In order to have a more accurate idea of the impacts of demand on the network and managing any growth, Council should consider the following:

Foul Sewer Network Modelling
Modelling the existing Foul Sewer network would provide definitive information on the ability of the existing network to cope with increased development at the top end of the pipe networks. There are no immediate plans to complete this but Twizel is the highest priority.

Asbestos Cement Deterioration Modelling
Modelling the Asbestos Cement pipework deterioration for Foul Sewer network would provide definitive information on the replacement timeframes and therefore the amount of depreciation to be funded on these schemes.

Customer Demand Changes
Complete a Customer Survey, including local industry, to establish any changes in customer expectations as they relate to demand on the network.

7. RISK MANAGEMENT

7.1 INTRODUCTION

The following outlines a suggested risk management procedure for the MDC infrastructure networks. The procedure establishes the basic parameters within which risks must be managed and sets the scope for the risk management process.

The risk management process proposed is based on the Guidelines in AS/NZS 4360:2004, "Risk Management" and SNZ HB 4360:2000 New Zealand Handbook "Risk Management for Local Government" that defines the risk management process as:

"The systematic application of management policies, procedures and practices to the task of identifying, analysing, evaluating, treating and monitoring those risks that could prevent a Local Authority from achieving its strategic or operational objectives or Plans or from complying with its legal obligations".

These plans may include the Long Term Plan, Activity Management Plan, Annual Plan, Financial Strategies, corporate plans and policy documents.

It is important for Council and it's stakeholders to understand and appreciate that the risk management structure for the any asset management system will inevitably be different from that which is appropriate for capital works projects, and will be greatly influenced by the structure of existing asset management systems. With capital projects, risk management systems are very much focussed on the early identification of live or emerging risks and then developing treatments or strategies to minimize or mitigate their negative effects.

Because the capital project has a beginning and an end, the identification of these risks is a dynamic process that must focus on actively managing known risks, and also expending resources on identifying those risks that were unanticipated. In the capital project, one would expect a significant number of unanticipated events that may affect the completion date or the financial performance of the project, but the majority of these risks then decline to zero as the project nears completion.

In contrast, asset management and network operations are ongoing activities that have been functionally providing expected results to Council for many years. Within this environment, the risk management practitioner is likely to find fewer emerging risks, particularly because existing systems have been established to minimize their occurrence.

Managing infrastructural assets and network operations as a management activity has evolved as it has matured as an industry and the modus operandi has been structured over time to minimize the risk of unexpected events. In many cases these existing controls were likely implemented with risk being one of several motivators for the control. In most cases, these controls will materialise as a set of policies, procedures, and detailed systems that manage some of the network risks in more detail. One tenet within "Risk Management" is "once the risk actually occurs, it ceases to be risk management, and becomes incident management". While incidents continue to occur, in the

asset management case, many of these incidents will have occurred early in the industry's history. Policy, procedure and micromanagement have therefore already been developed to minimize their frequency and consequences.

From the asset manager's perspective, the existing system for managing risk to a standard level will be reliant on a defined level of funding, and further investment and effort will be required to allow for an increase in the level of control of existing risk exposure.

The risk management system requires a reporting function that informs management personnel, who are likely to be outside the day-to-day activities of asset management, of the impact their existing decisions have on their risk exposure, along with the effective communication of emerging risks that may be exceptional. This reporting function should be composed of both a standardised format at a defined frequency in addition to an exceptional reporting mechanism that will occur at a higher frequency as the need arises. It is through this reporting mechanism that Council can be:

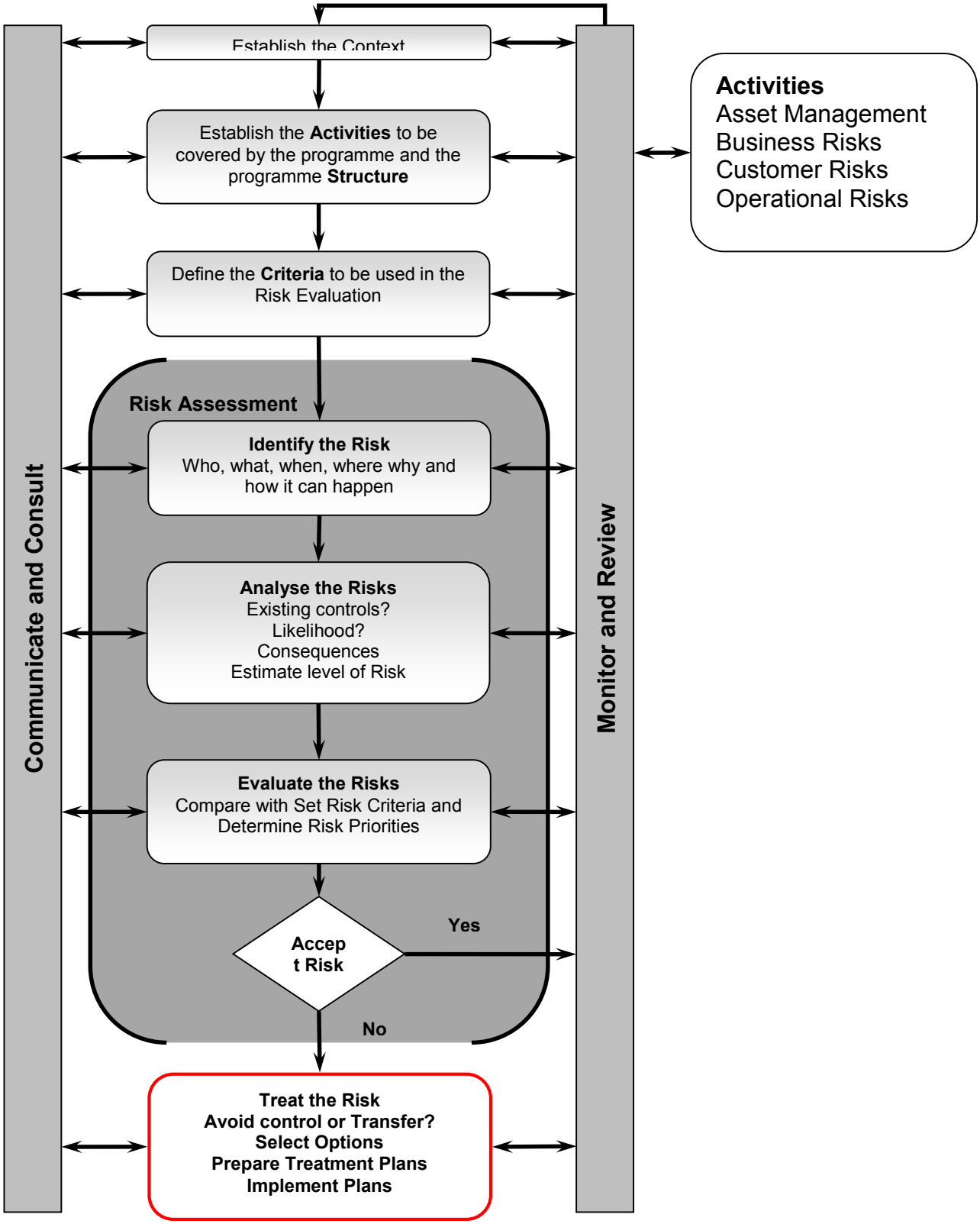
- Informed of current risk levels given the existing funding regime
- Appraised of emerging risks that may require immediate or exceptional attention and resources

This information will assist Council personnel to assess where risk reduction efforts should be focussed based on their corporate accepted risk level. The reporting mechanism will also allow the asset management teams the opportunity to provide alternatives to decrease the current risk levels based on Council's priorities and assist with the development of preferred strategies which can be effectively implemented at the functional level.

Assessment of risks is initially based on a qualitative analysis. More sophisticated analysis or quantitative risk analysis may be carried out as part of the risk treatment plan for specific high risk events.

The overall risk management process is illustrated in Figure 7.1.

Figure 7.1 – Risk Management Process



7.2 THE RISK MANAGEMENT PROCESS

7.2.1 UNDERSTANDING THE CONTEXT

As for the levels of service, the context for the application and development of risk must be set to ensure that risk development is not completed in isolation, as the identification analysis and treatment of risk will impact at all levels in the management of the asset; from community outcomes through to service level delivery, strategic goals and operational delivery.

Context refers to strategic context, organisational context and risk management context.

7.2.1.1 Strategic Context

This AMP for Sewerage sets out the strategic context as it relates to risk management. It outlines the relationship to identified community outcomes, activity goals, strategic result and strategic action. Further the plan sets out the relationship to other plans, legal requirements, financial strategies, regulatory and policy obligations of this infrastructural activity.

7.2.1.2 Organisational Context

The organisational context is approached through the identified activities of managing the asset, as the activity identifies the risk associated with staffing, the elected representatives and work areas, location and IT systems.

7.2.1.3 Risk Management Context

The risk management context refers to the risk-related activities undertaken within the activity. The remainder of this section sets out the risk management context in terms of risk management activities, likelihood scale, and consequence scale. A risk assessment matrix and risk register are introduced, as are the required analysis and format for a risk treatment plan.

7.2.2 ESTABLISHING THE ACTIVITIES

Table 6.1 sets the areas of activity associated with the MDC foul sewer activity. Under each heading is a process that might occur within these activities (not an exhaustive list). These processes have associated with them a number of risks. By setting the activity and their associated processes the development of the risk register and all associated risks can be considered and analysed and related to the AMP for Foul Sewer.

Table 6.1 – Risk Management Activities

Foul Sewer Risk Management Activities				
	Asset Management	**Business**	**Customer Services**	**Operational**
Processes	Forward Planning	Funding Provision	Public Request Management	Routine Maintenance
	Council Maintenance Programme	Governance	Managing Response Times	Planned Maintenance
	Information Management	Legislation Compliance	Customer Expectation - Raise/Reduce	Routine Network Maintenance

Foul Sewer Risk Management Activities				
	Asset Management	**Business**	**Customer Services**	**Operational**
	Standards and Guidelines	Policy Development	Level of Service change	Planned Maintenance - Unsealed
	Demand Change	Service Provision Purchasing	Customer not understanding service levels	Routine Corridor and Safety Maintenance
	Data Storage	Employment	Customer Consultation	Capital/Renewal Physical Works (QA, Management, Timeliness)
	Information Systems	Financial Reporting /Management		Routine Inspections - (Contractor/Consultant/ Asset Owner)
	Consultant	Political – Elected Representative		Contract Administration
	Contractor	Council Staff		Drainage Maintenance

7.2.2.1 Relationship of Risk

The relation of risk in the AMP is achieved through the risk management activities. The activities relate to the plan in the following way:

Table 6.2 – Relating Risk to Foul Sewer Activity Plan Sections

Risk Management Activity	Plan Section
Activity Management	Life Cycle Management, Future Demand, Level of Services, Asset Management Practice
Business	Financial Summary, Level of Service, Asset Management Practice, Plan Improvement and Monitoring
Customer Services	Levels of Service, Life Cycle Management, Plan Improvement and Monitoring
Operational	Life Cycle Management, Asset Management Practice

Risks apply across all processes in the management of the asset. The risk register holds the identified risk and which activity the risk impacts on.

The outcome of the process, illustrated in Figure 6.1, will be development and on-going maintenance of a Foul Sewer Risk Register. This register will contain a prioritised list of all of the identified risk within each of the above four Risk Management Activity areas.

7.2.3 RISK CRITERIA

Criteria are used to evaluate the level of risk. They may be measured by key performance indicators. Risk is a function of consequence and probability/likelihood of an adverse event. Risk

management procedures set out in AS/NZS 4360:2004 provide a general frame work for different organisations and activities. The following tables suggest criteria for the MDC sewer network.

7.2.3.1 Likelihood (L) Scale

Likelihood Scale applicable for foul sewer activities are based on frequency or return period, rather than an absolute probability. These are set out in Table 6.3 below.

Frequency and probability of occurrence in 10 years are indicative only. Values are rounded off where appropriate to avoid giving a greater impression of accuracy than is justified by the qualitative analysis that is undertaken. The prime objective of this process is to determine a set of applicable likelihood criteria which are also reasonable within the context of managing the foul sewer network.

Table 6.3 – Likelihood Scale

Likelihood Scale (L)				
Level	**Descriptor**	**Description**	**Indicative Frequency**	**Probability of at least one occurrence in 10 years**
A	**Probable**	The threat is expected to occur frequently	> 1 year	>99.9%
B	**Common**	The threat will occur commonly	1 to 5 years	90% to 99.9%
C	**Possible**	The threat occurs occasionally	5 to 10 years	65% to 90%
D	**Unlikely**	The threat could occur infrequently	10 to 50 years	20% to 65%
E	**Rare**	The threat may occur in exceptional circumstances	>50 years	<20%

7.2.3.2 Consequence (C) Scale

The scale of consequence is focused around a quantitative approach and includes categories of health and safety, image/reputation, annual costs, obligations, network condition and serviceability.

The following provides explanatory notes for each consequence type:

- **Health and Safety**: Self explanatory
- **Image Reputation**: Self explanatory
- **Environment**: The possible impact on the environment from an event taking place
- **Annual cost**: The risk assessment for annual cost is the whole cost of negative events, without considering the potential subsidies from Central Government for reducing the risk or dealing with the potential consequences. This is something that maybe taken into account at 'Treatment Plan' stage.

- **Obligation**: Relates to those issues of sound governance and includes the ability of the Council to meet identified Community Outcomes as stated in the LTP in relation to the LGA2002's four well beings
- **Network Condition**: Is the net reduction of the asset value in the case of an event occurring. This is a subjective measure and is used to indicate the unexpected loss of service potential in the asset.
- **Serviceability**: Relates to accessibility and the impact on accessibility from an event.

Where an event may impact upon more than one outcome area, then the one scored as having the highest level should be used for the risk rating calculation.

Table 6.4 – Consequence Scale

Level	Descriptor	Consequence Scale (C)						
		Health and Safety	Image / Reputation	Environment	Annual Cost	Obligations	Network Condition	Serviceability
I	**Severe**	Multiple fatalities	International media cover	Permanent widespread ecological damage	>$10M	Central government takeover	Net reduction to asset value > $10 million	Prolonged (> 1 Month) disruption to major facility or large area
II	**Major**	At least one fatality	Sustained national media cover	Heavy ecological damage	$1M to $10M	Government or independent commission of Inquiry	Net reduction to asset value $2 to $10 million	Temporary (5 Days – 1 Month) disruption to large area or prolonged disruption to smaller area
III	**Moderate**	Serious injury	Regional media cover or short term national cover	Significant, but recoverable, ecological damage	$100k to $1M	Abatement Notice, RMA prosecution, Audit tags	Net reduction to asset value $0.5 to $2 million	Temporary disruption to small area and significant reduction in Levels of Service. Detour > 10 km
IV	**Minor**	Minor Injury	Local media cover	Limited, medium term, ecological damage	$10k to $100k	Minor claims, excessive rate payer complaints.	Net reduction to asset value $100 to $500 thousand	Moderate reduction in Levels of Service. Significant traffic delay or short detour in place for < 1 day.
V	**Negligible**	Slight Injury	Brief local media cover	Short term damage	< $10k	Occasional rate payer complaints	Net reduction to asset value < $100,000	Minor traffic delay (< 2 hours)

7.2.3.3 Risk Rating

The risk ratings have been assigned 4 categories, based upon the actions required to mitigate the risk set out in Table 6.5. These actions are:

- For risks in the **Very High** category are considered intolerable and immediate action is required to reduce the likelihood or consequence to reduce the risk to a lower category. Risk treatment options may be required that are not justifiable on strictly economic grounds. Safety, legal and social responsibility requirements may override financial considerations. As a minimum there must be a specific risk treatment plan for each entry in the "very high risk" category.
- **High Risks** are undesirable, but may be accepted if they cannot be reduced or avoided. All reasonable measures should be undertaken to reduce these risks to as low a level as possible, regardless of cost, inconvenience or other factors. As a minimum there must be a specific risk treatment plan for each entry in the "high risk" category.
- Items in the **Medium Risk** category should be evaluated on a case by case basis. Action to reduce these risks will be undertaken only when the potential benefits of the risk treatment outweigh the expected costs. Normal project evaluation criteria can be used to asses potential risk treatment measures for medium risks.
- No action required for **Low Risks**, other that monitoring to ensure they do not progress into higher risks.

Table 6.5 – Risk Rating Categories

Rating	Description
Very High	**Intolerable. Urgent action required. Mitigation plan required for each risk**
High	**Take actions to reduce risk to as low as reasonable possible. Mitigation plan required for each risk.**
Medium	**Tolerable. Consider mitigation measures on case by case basis. Measures to reduce risk if justified.**
Low	Business as usual.

Table 6.6 summarises the outcome of the various likelihood x consequence (LxC) combinations producing a risk rating matrix. When the analysis of the risk is undertaken any item on the register that receives a rating of high or very high will require further work according to the rating outcome.

Table 6.6 – Risk Rating Matrix

Likelihood (L)		Consequence (C)				
		I	II	III	IV	V
		Severe	Major	Moderate	Minor	Negligible
A	Probable	Very High	Very High	High	High	Medium
B	Common	Very High	High	High	Medium	Medium
C	Possible	High	High	Medium	Medium	Low
D	Unlikely	High	Medium	Medium	Low	Low
E	Rare	Medium	Medium	Low	Low	Low

7.2.4 RISK ANALYSIS

The next steps in the risk management process are to develop a comprehensive list of risks (Identify the Risks), analyse the risks and to evaluate each one against the criteria defined above. The risks will be entered in a risk register, Appendix V, in the form shown on example table 6.7. Ideally, a risk should be identified in the following terms:

Table 6.7 – Example Risk Register

Ref	Name	Description	Existing controls	Likelihood (L)	Consequence (C)	Risk Rating (LxC)	Treatment option	Treatment cost

(Something happens) leading to a (negative outcome). The description should include additional information, such as:

- the source of the risk
- what are the existing controls or influences on the risk
- what (specifically) are the consequences
- is it dependent on other risks or conditions

The risk may trigger several categories of consequence, or if it has a range of probability/likelihood and consequence, it should be rated according to the combination that gives the highest risk rating.

Risks fall under the general headings of the Activities as outlined in table 5.1 “Risk Management Activities”:

- Asset Management (Ref A for example placed under “Management Activity” in the Risk register)
- Operational (Ref; O)
- Customer Services (Ref; C)
- Business (Ref; B)

The reference is then used to relate the identified risk to the Asset Management Plan for Foul Sewer.

An event leading to a negative outcome to Council's objectives is regarded as a **Threat.** However the process of risk analysis can also occasionally identify positive outcomes or **Opportunities**, and it is quite appropriate to use this register as a means of recording these in addition to the more common approach of only just considering the Threats.

The description should include additional information, such as: the source of the risk, what are the existing controls or influences on the risk, what **(specifically)** are the consequences, is it dependent on other risks or conditions.

Residual Risk

The Consequence and Likelihood values applied to derive Risk Rating on the register need to reflect the level of residual risk remaining after the Risk Treatment Plans have been developed and implemented and their effectiveness in mitigating or eliminating the initial level of risk has been assessed.

7.2.5 TREAT RISKS

A risk treatment plan should be created for all risks rated high or very high in the form shown in Figure 6.2, to document how the risk treatment options will be implemented.

Risk treatment options generally fall into the following categories:

- Avoid the risk by deciding not to start or continue with the activity that gives rise to the risk. This includes considering the possible risks within a project when a project is being considered
- Reduce the likelihood of the negative outcomes
- Reduce the consequences
- Sharing or transferring the risk with other organisations
- Retaining the risk, after all reasonable treatment measures have been considered.

Some risks may be rated high initially due to uncertainty in the likelihood or effects and the risk treatment plan may consist of further investigations or assessments to better define the level of risk. Other risk treatment options may consist of financial controls (e.g. insurance), operational improvements, contingency planning or physical works to reduce risks.

Figure 6.2 – Risk Treatment Plan

Risk Treatment Plan			
Risk:			**Ref:**
Summary			
Proposed actions			
Resource Requirements			
Responsibility			
Timing			
Reporting and Monitoring			
Compiled By:	Date:	Reviewed By:	Date:

7.2.6 RISK TRANSFER

A fundamental concept in Risk Management is that the Risk Treatment activities should be the responsibility of, and carried out by, the party who is in the best position to manage them; which may be Council staff, Consultant(s), the Maintenance Contractor(s) or other third parties. To assist with this understanding, Council is encouraged to seek and evaluate as much information as possible on the spectrum of risk associated with all practical alternatives along with their associated costs.

Through this process of risk/cost trade off they will be able to then determine an appropriate balance of accepted risk and associated cost. In some situations the Council may feel that it is appropriate for them to carry a higher level of risk rather than bare a much higher level of expenditure that would otherwise be necessary to see the risk transferred to another party.

7.3 IDENTIFIED RISKS

7.3.1 CRITICAL RISKS

The most critical risks are:

- Identifying and agreeing the risk management context, i.e. consequence/likelihood frame work. Without this agreement the risk rating process may lead to an extensive number of high to very high risks requiring funding to mitigate or fix
- The changing legislative environment requirements
- Incomplete management and supervision of this activity due to limited staff resources

7.3.2 CONSIDERED RISKS

MDC Contract Procedures Manual

- The various contracts for the operation and maintenance of this activity require the contractors to provide Quality Plans for the execution of the contract requirements. The Quality Plans include procedures for work to be carried out. The risk is that the MDC and contractors procedures are not followed.

Health and Safety

- Council has a comprehensive Health and Safety Programme for its operations. Internally there is no risk in the implementation of this Programme.
- The various contractors involved in this activity have Health and Safety Programmes in operation. Reports are received from the contractors about any incidents relating to health and safety. Council's risk is that no inspection of work sites is undertaken by Council staff or their consultant to ensure that the requirements of the Council's and the contractors' Health and Safety Programmes are being carried out on site.

General Management Issues

- **Contract Observation** - The various contractors are not being observed sufficiently to ensure that all aspects of the contracts are being carried out or met.

- **Legislative Compliance -** Council staff practitioners supported by their experience and training, believe that all legislative requirements that impact on this activity are being complied with.

- **Resources -** The financial provisions shown in this Plan should be sufficient to provide the service required for this activity.

- **Service Agreements -** There are no specific service agreements in place between each department to ensure everyone is aware of their roles in this activity. However being a

small Council with a small staffing level, interdepartmental discussion in relation to any facet of this activity is normal practice.

- **Council Policies Clear** - Council's policies are held in the Policy Manual. The activities for asset management policies were reviewed and approved by Council in December 2011.

Financial

- **Cost 'Overruns' -** Council staff manage expenditure by:
  - ordering work only if finance is available and approved
  - reviewing expenditure monthly
  - reporting exceptions

- **True Costs – Costs Not 'Manipulated' -** The financial forecasts that have been made in this Plan portray the true cost of this activity, given the assumptions made in making those forecasts.

7.4 INSURANCE

All above ground infrastructural assets are currently insured by Council. The below ground assets are not insured and Council is relying on its strong balance sheet to borrow sufficient funds to replace those assets in the unlikely event that there is widespread damage to those assets.

Council is not a member of LAPP, but have considered becoming a financial member but due to the Christchurch earthquake there is a significant buy in cost. Council is also concerned that another event like the Christchurch earthquake in another main centre would fully deplete the fund to the point there would not be enough funds available to repair our assets if they were damaged at the same time.

7.5 EMERGENCY MANAGEMENT

Operational Risks are those associated with the day to day operation of the District. The most prevalent of these are snow events followed by flooding and serious wind events. Initial response to all these events is managed through the Utilities Services Maintenance Contract, and is covered in our specifications. These specifications covers response times, liaison, notifications, plant and personnel requirements.

Council has held discussions on the "Life Lines" philosophy with the various groups that provide services within the district and is reviewing its "Disaster Resilience Summary". Council has participated in an Engineering Lifelines project, Earthquake Hazard Assessment, and the summary of the assessment is tabled below.

7.6 EARTHQUAKE DAMAGE ASSESMENT

Reference Report

The attached chart has been compiled for use with the Waimate, MacKenzie and North Waitaki

Districts Engineering Lifelines Project, Earthquake Hazard Assessment, Report to Environment Canterbury, May 2008, (Ecan Report no. U/08/18) prepared by Geotech Consulting Ltd. It should be read in conjunction with Sections 6, 7 and 8 of that report. Section 9 outlines three earthquake scenarios, and it is recommended that these also be read to provide a perspective on the chart contents.

Chart Zones

The chart has been set out for each of the three Ground Shaking Zones as shown in Figure 6.13 of the above report. Because of the large area of the Districts, and the range of expected earthquake shaking intensities for any single earthquake event, or on a probabilistic basis, indicative damage is shown for a range of shaking intensities for each zone. The damage is indicative only and a wide variation can be expected within each zone due to variations in subsurface conditions, geology, terrain and orientation of the site with respect to the earthquake source.

Chart Limitation

The Damage Assessment Chart is an indicative guide only. This table is derived from a similar chart originally prepared for the Christchurch Engineering Lifelines Study (Risks and Realities, 1997). It is based on damage reports from historical earthquakes in New Zealand and overseas. There is little information on damage ratios for structures or infrastructure other than buildings, (this particularly applies to in ground pipework) and the relative damage is necessarily somewhat subjective. The damage to structures should be read in conjunction with the description of damage in the Modified Mercalli Intensity Scale, Appendix C of the Report. It may be used for coarse screening of effects, but must not be used as the basis for any design. Any decision involving expenditure or engineering design requires a more detailed evaluation of the conditions pertaining at that particular site.

Liquefaction

The Damage Assessment Chart does not include reference to liquefaction. Areas of significant liquefaction hazard in the Districts are limited. The majority of the areas are underlain with alluvium are older Pleistocene surfaces. Both the relatively old age and the predominantly coarse grading of this gravel make widespread liquefaction very unlikely. Liquefaction is more likely to occur within the ground shaking Zone 3 areas. If liquefaction occurs, the damage outlined in the chart could be significantly greater. For an indication of the effect of liquefaction, refer to Table 2.2, page 28 of Risks and Realities, report of the Christchurch Engineering Lifelines Group, CAE, 1997.

RISK MANAGEMENT

A - Structures

IMPORTANT: Refer notes page 1

Zone	Shaking Intensity	Structures	Fixings designed for seismic loads	Equipment not fixed or fittings not designed for seismic loads
1	MM VI	Slight damage to Type I buildings	Little to no damage	Movement probable, 10% failure
	MM VII	Minor damage except for poorly constructed weak material Type I buildings	Minor damage	Movement expected, 30% failure
	MM VIII	Well designed structures serviceable, but with at least minor damage. Many non seismically designed structures damaged and unserviceable. Some settlement damage possible	Considerable damage, 30 - 40% failure	80% failure
	MM IX	Damage and distortion to even modern, well designed structures, some may be unserviceable. Non seismically designed structures likely to be seriously damaged and poorly constructed weak material structures collapse. Settlement damage probable.	Widespread damage 50 - 60% failure	90 - 100% failure
2	MM VI	Slight damage to Type I buildings	Little to no damage	Movement probable, 10% failure
	MM VII	Minor damage except for poorly constructed weak material Type I buildings	Minor damage	Movement expected, 30% failure
	MM VIII	Well designed structures serviceable, but with at least minor damage. Many non seismically designed structures damaged and unserviceable.	Considerable damage, 25% failure	70% failure
	MM IX	Damage and distortion to even modern, well designed structures, some may be unserviceable. Non seismically designed structures likely to be seriously damaged and poorly constructed weak material structures collapse.	Widespread damage 40% failure	90% failure
3	MM VI	As for Zone 2, with some small reduction in severity possible		
	MM VII			
	MM VIII			
	MM IX			

B - In Ground Pipework

IMPORTANT: Refer notes a e 1

Zone	Shaking Intensity	Welded Steel polyethylene	Moderately ductile pipes Concrete with rubber joints Steel and cast iron with rubber joints	Low strength/ low ductiliity pipes Earthenware with rubber joints Asbestos cement Cast iron with lead joints	Non-ductile pipes Ceramic with cement joints Brick
1	MM VI	Should be OK	Should be OK	Occasional mains damage and entry and junction failure	Minor mains damage 10% entries and junctions fail
	MM VII	Should be OK	some mains damage, 10% entries and junctions fail	Some mains damage, 25% of entries and junctions fail	Mains damage possible 40% entries and junctions fail
	MM VIII	Should be OK, minor damage and permanent distortion	mains damage, 30% entries and junctions fail	Mains damage probable 60% entries and junctions fail	Mains damage widespread
	MM IX	Distortion to mains, Damage possible at entry to structures and at junctions	Mains damage likely, 50% entries and junctions fail	Mains damage 80% entries and junctions fail	Major mains damage
2	MM VI	Should be OK	Should be OK	Occasional mains damage and entry and junction failure	Minor mains damage 5% entries and junctions fail
	MM VII	Should be OK	little mains damage, 5% entries and junctions fail	Little mains damage, 10% of entries and junctions fail	Mains damage possible 20% entries and junctions fail
	MM VIII	Should be OK, minor damage	Some mains damage, 15% entries and junctions fail	Mains damage likely 40% entries and junctions fail	Mains damage widespread
	MM IX	Damage possible at entry to structures and at junctions	Mains damage likely, 40% entries and junctions fail	Mains damage probable 60% entries and junctions fail	Mains damage
3	MM VI	As for Zone 2 but with 30% reduction in severity			
	MM VII				
	MM VIII				
	MM IX				

C - Transport

IMPORTANT: Refer notes øaae 1

Zone	Shaking Intensity	Roading	Railway	Bridge Structure	Bridge Abutments
1	MM VI	Little to no damage	Little to no damage	Refer section A - Structures	Little to no damage
	MM VII	Minor damage to kerbs and cracking of seal	Minor damage to alignment		Minor slumping
	MM VIII	Some damage to kerbs. Some distortion and cracking of seal.	Distortion of rail lines, some fissuring and spreading of embankments		Some slumping of abutment fill common
	MM IX	Widespread damage to kerbs, Distortion and cracking of seal, some ground fissuring. Permanent ground distortion and settlement.	Marked distortion of rail lines, both horizontal and vertical, significant embankment damage		Slumping of abutment fill at nearly all bridges, many of significant magnitude. Translational or rotational movement at some abutments.
2	MM VI	Little to no damage	Little to no damage		Little to no damage
	MM VII	Minor damage to kerbs and cracking of seal. Small slips on steep batters.	Minor damage to alignment		Minor slumping
	MM VIII	Some damage to kerbs. Some distortion and cracking of seal. Slips in batters	Distortion of rail lines, some spreading of embankments		Some slumping of abutment fill common
	MM IX	Damage to kerbs, distortion and cracking of seal, Landsliding in steep slopes and batters, cracking of ground	Distortion of rail lines, both horizontal and vertical, significant embankment damage		Slumping of abutment fill at most bridges, many of significant magnitude. Translational or rotational movement at some abutments.
3	MM VI	Little to no damage	Little to no damage		Little to no damage
	MM VII	Rockfall and small slips on steep batters.	Minor damage to alignment		Minor slumping
	MM VIII	Rockfall and slips in steep batters	Distortion of rail lines, some spreading of embankments		Some slumping of abutment fill common
	MM IX	Landsliding in steep slopes and batters, cracking of ground, large volume rockfall possible	Distortion of rail lines, both horizontal and vertical, significant embankment damage		Significant slumping of abutment fill at most bridges. Translational or rotational movement at some abutments.

RISK MANAGEMENT

7.7 FUTURE IMPROVEMENTS

Development of Risk Management

It is important to have input from a broad range of people and organisations so that the risk register is as comprehensive as possible. Often the greatest risks arise from events that were not anticipated or considered beforehand. Initially the risk register and assessment should be created in a workshop environment from a number of stake holders including Council staff and input from other stakeholders (e.g. contractors). Once the risks have been identified these should then be analysed in the consequence / likelihood frame work to assess the validity of the scales. If the risk outcome for all identified areas of risk is too great then the consequence and likelihood scales may need to be adjusted. At this stage a second review of the scales and reassessment of the identified risk can be completed.

After rating the risks and creating the risk register, Council will need to determine which parties are in the best position to carry out risk treatment planning for each of the high and very high risks, so that the appropriate actions may be taken.

Cross-Asset Risk Management Process

Risk Management procedures set out in AS/NZS 4360:2004 and SNZ HB 4360:2000 are generic for a wide range of activities and organisations. The Risk Management system proposed in this Activity Management Plan is based on the assessment of Council values and goals for its Foul Sewer network. Council will need to review the risk management process and provide feedback on the proposed risk rating criteria.

To ensure a robust and fair approach is taken with all of these assets, it is recommended that Council consider the development of a Cross-Asset Risk Management process in the future. This would then provide a greater level of assurance to Council that the prioritisation of the risks associated with its entire asset base, along the allocation of Council funds required to manage them, has been based upon an approach that is both rational and equitable.

On-Going Review

To ensure that emerging risks are identified and captured and that the Risk Treatment Plans are monitored for effectiveness over time, both the register and treatment plans must be reviewed on a regular basis by Council and other stake holders. The frequency for these reviews should be agreed and included in the Councils Operating Procedures.

Any significant additions or changes to the risk register will be noted as they occur through regular reporting procedures. It is recommended that the risk register should have a comprehensive update at each AMP review.

RISK MANAGEMENT

8. LIFECYCLE MANAGEMENT PLANS

8.1 LIFECYCLE MANAGEMENT – AN OVERVIEW

This section of the AMP outlines what is work planned to keep the assets operating at the current levels of service defined in Section 4 while optimising lifecycle costs. The overall objective of the Life Cycle Management Plan is:

> ***To maintain performance measures to ensure that the current strategies do not consume the asset leading to an unexpected increase in maintenance/renewal expenditure in the future.***

This lifecycle management plan covers the following:

➔ **Background Data** identifying where possible:

- Physical parameters of the assets as outlined in the description of the Foul Sewer asset included in Section 3
- Current capacity and performance of the asset relative to the levels of service defined in Section 5 and demand projections of Section 6
- Current condition of assets
- Asset valuations
- Historical data

➔ **Operations and Maintenance Plan**: This covers planning for on-going day to day operation and maintenance to keep assets serviceable and prevent premature deterioration or failure. This plan includes:

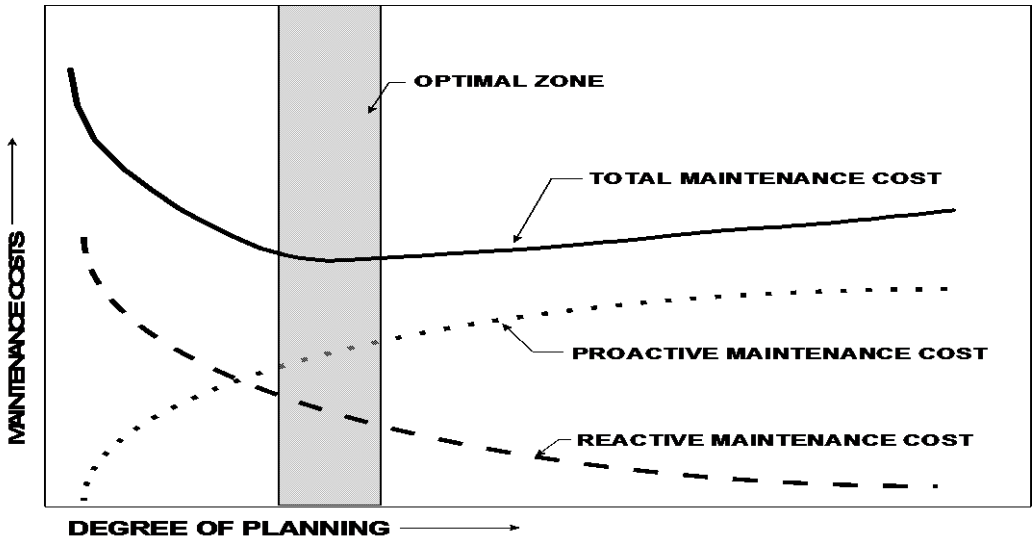
- Current trends and issues
- Maintenance decision making process
- Strategies required to meet levels of service
- How tasks are prioritised
- Summary of future costs
- Any deferred work and associated risks

Two categories of maintenance are carried out:

- Unplanned Maintenance: Reactive work carried out in response to reported problems or defects (e.g. clear blocked drains, respond to pump station alarms)
- Planned Maintenance: Proactive work carried out to a predetermined schedule (e.g. pipeline flushing, manhole inspections, pump station inspections and cleaning etc).

A key element of asset management planning is determining the most cost effective blend of planned and unplanned maintenance as illustrated in Figure 8.1.

Figure 8.1 – Balancing Proactive and Reactive Maintenance



➔ **Renewal/Replacement Plan**: This covers Major work which restores an existing asset to its original capacity or its required condition (e.g. pipeline replacement, pump replacement or reconditioning). This plan includes:

- End of life projections
- Renewal decision making process
- Renewals strategies and methods to meet required LOS
- How renewals are identified, prioritised and to what standard they are replaced
- Summary of future costs

➔ **Asset Development Plan**: This section of the plan covers the creation of new assets (including those created through subdivision and other development) or works which upgrade or improve an existing asset beyond its existing capacity or performance in response to changes in usage or customer expectations (e.g. development demand). This plan includes:

➔ **Disposal Plan**: This covers activities associated with the disposal of a decommissioned asset. Assets may become surplus to requirements for any of the following reasons:

- Under utilisation
- Obsolescence
- Provision exceeds required level of service
- Uneconomic to upgrade or operate
- Policy change
- Service provided by other means (e.g. private sector involvement)
- Potential risk of ownership (financial, environmental, legal, social, vandalism).

8.2 MANAGEMENT PROGRAMME

8.2.1 METHOD OF SERVICE DELIVERY

Council staff manages the Foul Sewer network with some assistance from consultants. The maintenance on the network is maintained through a competitively tendered multi-year contract. The current contracts let are included in Table 7.2.

The Utilities Services contracts (3 year + 1 yr + 1 yr) place considerable onus on the contractors to self-manage all utilities maintenance activities; this involves regular inspection of the various components of the networks, locating maintenance requirements and carrying them out.

Table 8.2 – 2011 Physical Works Contracts

Contract No.	Contract Name	Length (Years)	Responsibilities	Contractor
1213	Utilities Services Contract 2013-2016	3+1+1	**Water Supplies** The contract includes the complete operation and maintenance of the following water supplies ▪ Fairlie ▪ Lake Tekapo ▪ Twizel ▪ Burkes Pass ▪ Allandale **Waste Water Systems** The contract includes the complete operation and maintenance of the following waste water systems ▪ Fairlie ▪ Lake Tekapo ▪ Twizel ▪ Burkes Pass ▪ Mt Cook Lookout **Foul Sewer System** The contract includes the complete operation and maintenance of the following Foul Sewer system ▪ Fairlie ▪ Lake Tekapo ▪ Twizel	Whitestone

8.2.2 FORWARD WORKS PROGRAMME

There is currently a detailed 10-year forward works programme for renewals.
This programme has been used as a basis for works included in this AMP. When the AMP is next reviewed the newly developed full FWP will be incorporated.

8.2.3 ASSET VALUATION

A valuation is undertaken every three years in order to assess the value of the network, the depreciated value and the annual depreciation. Details on Asset Valuation and Depreciation are held in Section 8 Financial Summary.

8.2.4 HISTORICAL DATA

Historical data is used to make an assessment of past performance and to see if future trends can be applied. At a network level, these trends can indicate if the condition of the network is deteriorating or improving. The different forms of historical data and their location are outlined in Table 7.3.

Table 8.3 – Historical Data

Type	Location	Comment
CCTV	Asset Register	Pipelines are internally inspected and rated for condition
Past Maintenance Costs	Contractor's Database	Provides summary of maintenance costs and works completed.
Past History	MDC	

8.3 FOUL SEWER CONTROL

8.3.1 DRAINAGE CONTROL BACKGROUND DATA

8.3.1.1 Foul Sewer Control Scope and Nature of Asset

Foul Sewer assets are main pipeline, manholes, pump stations, oxidation ponds and the attached disposal fields. The "point of discharge" for the individual customer is where the property connection connects to the trunk main, not the property boundary.

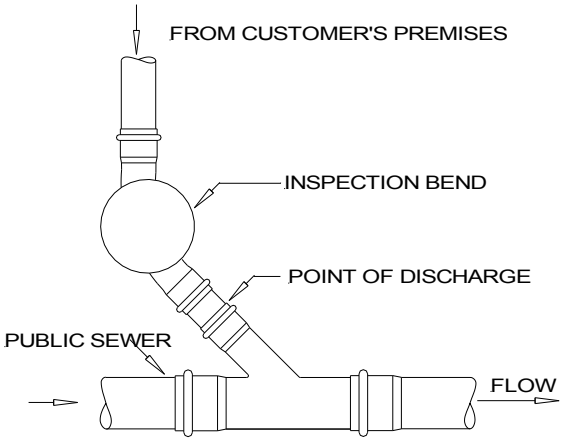


Figure 7.3Typical Layout at point of discharge

The key issues relating to sewer control are:

- blockages
- regular cleaning programmes
- monitoring
- aerator maintenance
- disposal field management

8.3.1.2 Drainage Control Current Condition

Council rates the condition of the Foul Sewer pipelines and manholes. There is an ongoing inspection and maintenance regime under the routine maintenance contract. Council has a programme of internal inspection of the pipeline by CCTV to also monitor and record condition and performance. This information is used to estimate the condition of similar types of pipe in similar ground conditions.

8.3.1.3 Drainage Control Current Performance and Capacity

The four sewer networks are performing well with limited blockages. These are generally tied to tree root intrusion. Specific condition for each asset is not currently measured but internal inspections of representative sections of the network are carried out and the results extrapolated across the network. There is good condition information for Foul Sewer assets with the majority of assets graded at 2 or better (88%). Only 1% of the network is graded as having a rating of 4 and no asset is graded as 5 (unserviceable).

8.3.1.4 Historic Maintenance Costs

The average expenditure over the three years 2008/09 to 2010/11 has totalled $81,995 per year for maintenance.

8.3.2 FOUL SEWER OPERATIONS AND MAINTENANCE PLAN

Foul Sewer drainage maintenance work is included under the main utilities services maintenance contract and covers:

- minimum maintenance standards
- frequency of routine inspections
- response times to correct defects

Drainage maintenance is achieved by undertaking the following activities annually:

- Pipelines
    - Inspection of all manholes as required
    - Repairs to damaged sewer pipes and manholes
    - Clearing of blocked pipes
    - Flushing of sewerlines as required, to maintain service levels.

- Facilities
    - Oxidation pond maintenance
    - Pumps operation and maintenance
    - Aerator Maintenance
    - Disposal field and drip irrigation maintenance
    - Calibration and operation of monitoring equipment
    - Alarms monitoring and testing
    - Dissolved oxygen monitoring at oxidation ponds
    - Compliance with resource consent conditions
    - Recording and reporting
    - Programming of maintenance not included in LS/mth Item
    - Attend callouts

Maintenance Strategy

Condition inspections: The maintenance contractors are required to report any defects observed during day to day maintenance activity.

Unplanned condition assessment of critical drainage assets are required after each blockage or surcharge situation to assess if there is cause for greater concern or action than just dealing with the immediate effect of that blockage.

The Contractors are required to maintain an effective communication system and level of preparedness to ensure emergency works are undertaken within the specified response timeframes.

Planned maintenance: Damaged and malfunctioning sewerage assets identified by public complaint or contractor reports are programmed for repair according to the following priority:

- Loss of Service
- Environmental impact
- public safety
- accelerated deterioration

Maintenance Standards

The maintenance standards to be achieved are set out in MDC specifications contained in the utility services maintenance contract.

All critical sewerage assets are required to be inspected and cleaned regularly.

Maintenance Programme

The majority of the sewer maintenance is reactive so budgets have been based on historical expenditure.

The financial forecasts are presented in Appendix III.

8.3.3 DRAINAGE CONTROL RENEWAL/REPLACEMENT PLAN

The renewal programme is prioritised on the basis of overall condition.

Preventive Maintenance
Preventative maintenance includes non routine work required to protect the serviceability of the network and minimise the threat of sewer surcharge.

Standards
The MDC standards for replacement infrastructure are based on NZS 4404:2010

8.3.4 DRAINAGE CONTROL ASSET DEVELOPMENT PLAN

Most new assets are created as part of subdivisions and subsequently taken over by the Council.

The criterion used for justifying new construction undertaken by Council includes evidence of regular blockage and surcharge or evidence of broken sections of pipe. There are no instances of internal pipeline erosion.

Development Standards
MDC uses the Land Subdivision Standard NZS4404: 2010

Development Programme
The cost of pipeline renewal and development works is included in the Council Renewal Programme.

8.4 DISPOSAL PLAN FOR ALL ASSETS

In general Council has no specific plans for disposal of components of the Foul Sewer asset. Details for specific assets are included in Table 7.6.

Table 8.6 – Disposal of Assets Summary

Asset Description	Disposal Plan	Comments
Pipelines	**None**	Generally left in the ground for possible future use as duct pipe for telecommunications or are removed in pieces as part of the excavation to lay the replacement pipe.
Manholes	**None**	Generally left in the ground
Pump Stations	**None**	Generally removed and the hole filled in. If any components can be reused then they are, otherwise they are disposed to waste.

9. FINANCIAL FORECASTS

9.1 INTRODUCTION

The forecast total Mackenzie District and Community Board expenditure on Foul Sewer for 2015/16 for operations, maintenance renewals and development totals $1,056,000 (inclusive of all administration costs and professional service fees). 11% ($154,000) of budgeted expenditure is to be spent on maintenance and operation with 66% to be spent on renewals. The remaining 23% is used to fund depreciation and administration costs.

The current financial forecast will need to be updated on a regular basis as the foul sewer network needs change.

This section sets out the funding forecast required for the Mackenzie District Council over the next 10 years cash flow forecasts, by year.

9.1.1 30-YEAR FUNDING FORECAST

Table 8.1 sets out the 30 year funding forecast for the Foul Sewer activity.

9.1.2 CAPITAL WORKS

Fairlie

- CCTV earthenware pipelines (7,100m) in 2016-19 - $100,000. Information used to plan their eventual replacement
- Replace aerator at Oxidation ponds $62,000 in 2020/21
- De-sludge primary pond in 2025 - $150,000 (Re-survey 2019/20)
- Replace all the pumps in the Eversley Reserve in 2031-35

Tekapo

- Design and construct new sewerage disposal irrigation system in 2015-16
- Investigate condition of sewers laid in 1955 during 2015-17 (by CCTV), if deterioration is as expected, replacement is programmed for 2031-35
- Replace aerators at Oxidation ponds $124,000 in 2020/21
- Replace Camp Ground Pump Station in 2020 - $100,000
- Replace pumps at the two main pump stations – 2026

Twizel

- Consolidate disposal system at the Oxidation ponds in 2018 at a cost of $700,000
- De-sludge primary pond in 2025 - $200,000 (Re-survey 2019/20)
- Investigate condition of 21.3km of AC sewers laid in 1970 (by CCTV). Information used to confirm the remaining life of the asset, set depreciation levels and plan for their eventual replacement

* Replace the two pumps in Mackenzie Park Pump Station

Table 8.1

	Forecast 2015/16 ($000)	Forecast 2016/17 ($000)	Forecast 2017/18 ($000)	Forecast 2018/19 ($000)	Forecast 2019/20 ($000	Forecast 2020/21 ($000)	Forecast 2021/22 ($000)	Forecast 2022/23 ($000)	Forecast 2023/24 ($000)	Forecast 2024/25 ($000)
OPERATING FUNDING										
Administration	11	11	11	11	11	11	11	11	11	11
Consultancy Expenses	5	8	5	15	0	0	8	0	0	7
Operational & Maintenance	182	183	184	141	144	144	144	144	144	144
Total operating funding	198	202	200	167	155	155	163	155	155	162
CAPITAL FUNDING										
Capital Expenses	902	30	35	15	349	186	250	0	250	150
Total Capital Funding	902	30	35	15	349	186	250	0	250	150

Table 8.2 - Capital Projects

Requirement for Work		Budget 2015/16 $0	Forecast 2016/17 $0	Forecast 2017/18 $0	Forecast 2018/19 $0	Forecast 2019/20 $0	Forecast 2020/21 $0	Forecast 2021/22 $0	Forecast 2022/23 $0	Forecast 2023/24 $0	Forecast 2024/25 $0
	Fairlie										
I	Ponds SCADA	10									
I	Ponds Magflo		20	-	-	-	-	-	-	-	-
R	Sewermain Replacement					250					
R	Sewermain Replacement							250			
R	Sewermain Replacement									250	
R	Aerator						62				
		10	**20**	**0**	**0**	**250**	**62**	**250**	**0**	**250**	**0**
	Tekapo										
I	Alternative Disposal	100									
R	Upgrade Campground Pump Station, SCADA	-				99					
R	Replace Aerators						124				
		100	**0**	**0**	**0**	**99**	**124**	**0**	**0**	**0**	**0**
	Twizel										
I	Design and pond construction – new disposal area, SCADA	762									
I	Mackenzie PS SCADA		10	-	-		-	-	-	-	-
		762	**10**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	TOTAL	**872**	**30**	**0**	**0**	**349**	**186**	**250**	**0**	**250**	**0**

9.2 FUNDING STRATEGY

The first priority is to maintain and operate the existing network in its current condition then allow for renewal expenditure that revitalises a component of the network that has worn out. Capital projects are funded through the Council's Policy for Funding Capital Expenditure, which was adopted as part of the 2012-2022 Long Term Plan.

The policy is summarised as follows:

Capital Reserves

- A Capital Reserve has been established for each activity that the Council undertakes.
- All depreciation that has been funded from that activity will be lodged into the Capital Reserve on a quarterly basis when each instalment of rates is due.
- Funds from other reserves or financial contributions can also be deposited into the Capital Reserve.
- All capital expenditure will be paid from the Capital Reserve at the time of payment.
- Capital Reserves may go into overdraft at any stage with prior approval of Council.

Capital Expenditure

- All Capital Expenditure must be approved by Council through the budget process or by an explicit resolution.

Interest Component For Debt Incurred Prior to 30 June 2012:

- If the balance of the Capital Reserve is overdrawn, the community of interest for the relevant activity will be charged an interest rate set at 100 basis points greater than the Official Cash Rate determined by the Reserve Bank. Such interest will be charged as a cost to the activity operating expenses and be rated for.
- If the balance of the Capital Reserve is in funds, then the Council will pay the community of interest in the relevant activity an interest payment set at 25 basis points less than the Official Cash Rate determined by the Reserve Bank. Such interest will accrue to the activity's Capital Reserve.

Interest Component For Debt Incurred After 30 June 2012:

- For the component of the debt incurred after 30 June 2012 the interest rate will be set at a level equal to the Council's average bond portfolio rate applying at the previous 1 January. Such interest will be charged as a cost to the activity operating expenses and rated for.

In determining the projects to be undertaken the benefit/cost ratio is the governing criteria used with preference being given to projects which can be shown to be economically justified, attract subsidy and have the necessary Council funding available.

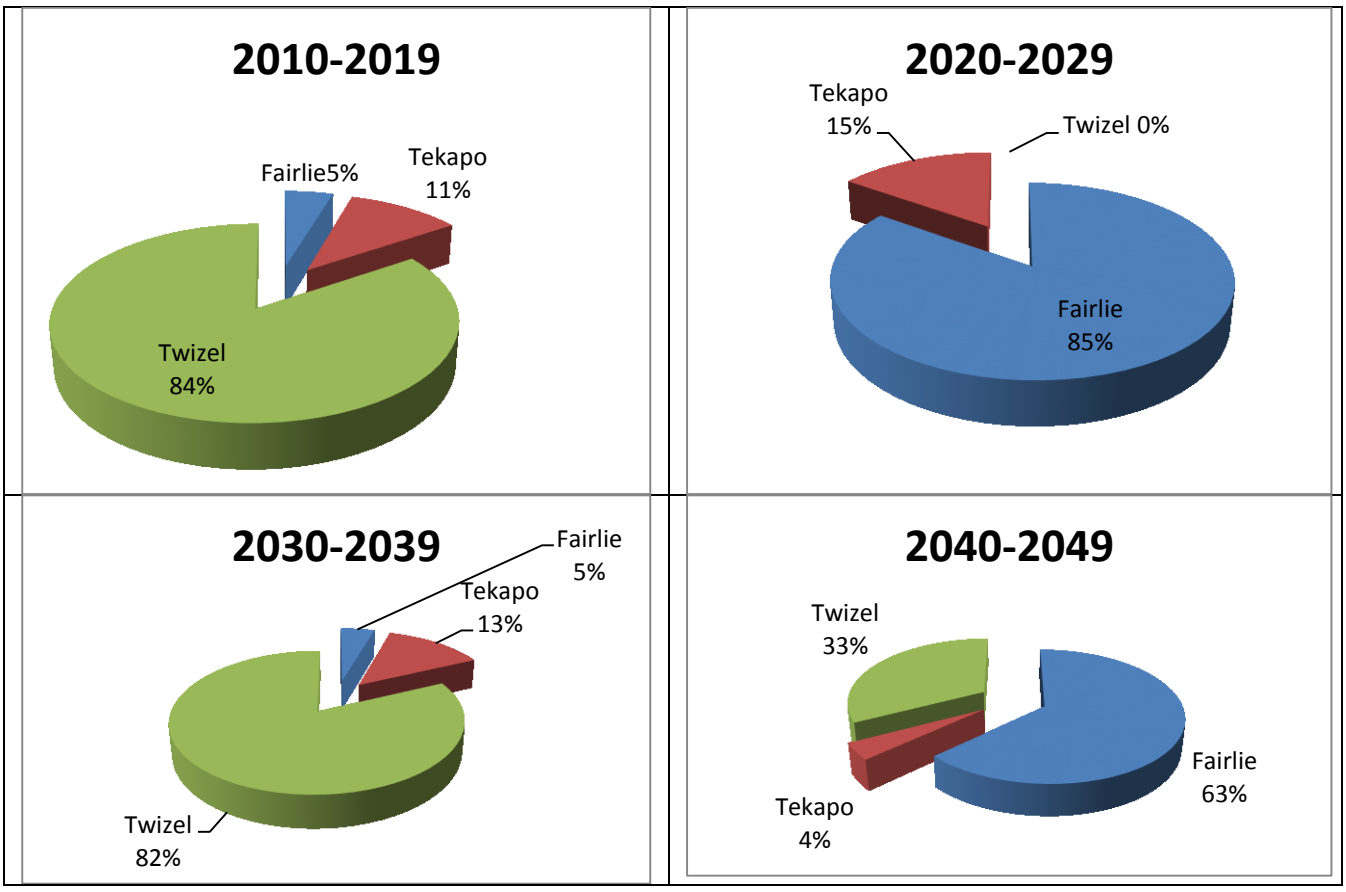
9.3 SUSTAINABILITY - LOOKING OUT SIXTY YEARS

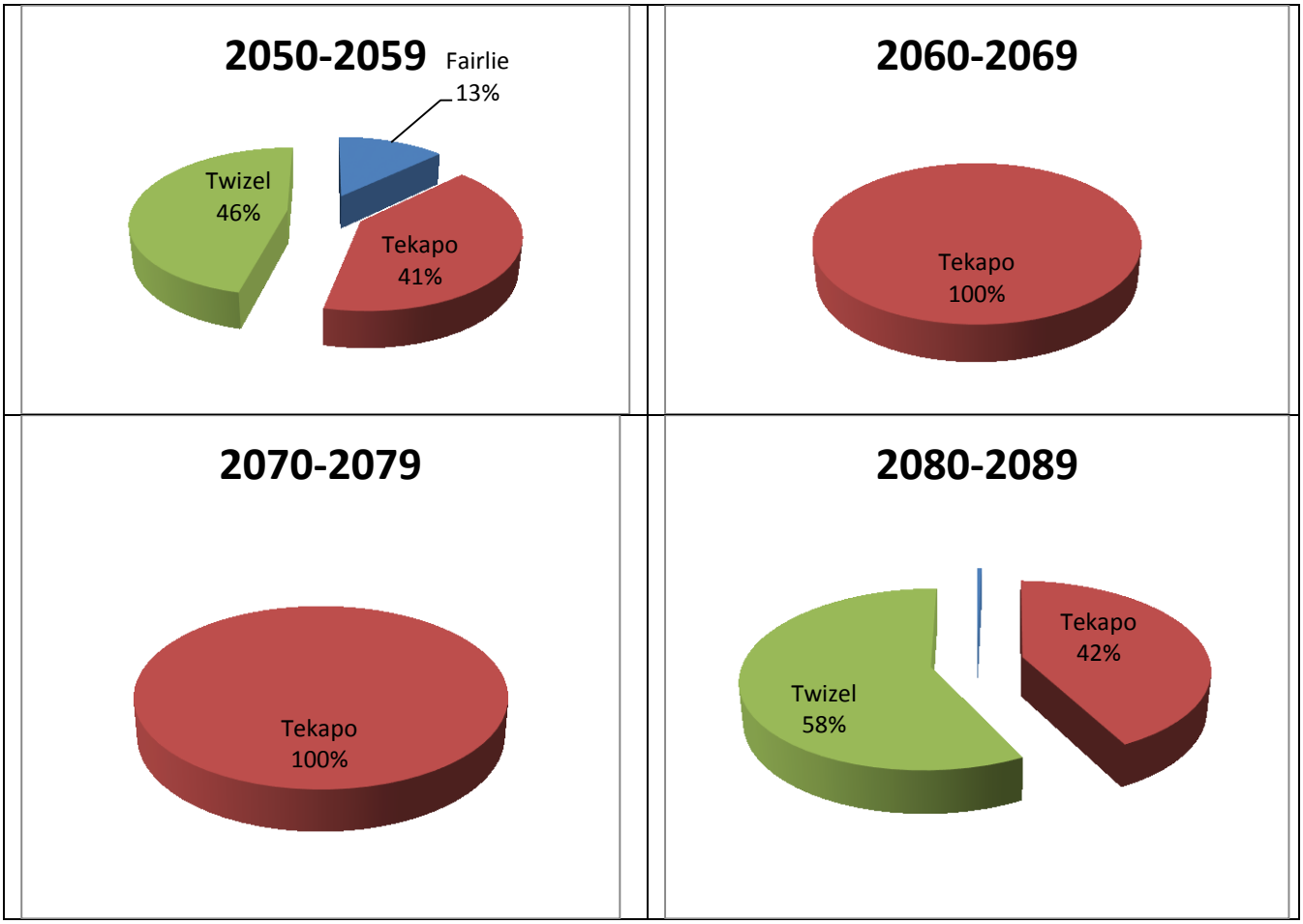
With these types of assets in is important to take a longer term view, perhaps forty to sixty years, especially considering the uniqueness of Twizel and to a lesser extent Tekapo. As Twizel was built in the seventies all assets are generally of the same level of deterioration and potential loss of service. Analysis of the initial construction date shows the following percentage of the overall network that will have to be replaced in a narrow timeframe:

Water supply 63%
Sewer network 51%
Stormwater network 0%
This is likely to be a major hurdle that Twizel cannot afford long term. Tekapo has a similar issue with the early town reticulation completed in three specific years, namely 1955, 1970 and 1976. These original networks are likely to fail at the same time.

A major piece of work was completed for the current AMP, using 2009 pipe construction costs and industry standard base lives, to look out eighty years. As part of this LTP the Council has also prepared a 30-year Infrastructure Strategy, which identifies significant infrastructure issues facing the District over the next 30 years, and outlines how the Council intends to manage its infrastructure assets.

The graphs below show that results of that work clearly on a decade by decade basis.





Summary (in 2009 dollars)

Decade	Fairlie	Tekapo	Twizel	Total
2010-2019	70,000	164,000	1,271,000	1,505,000
2020-2029	1,870,000	335,000	0	2,205,000
2030-2039	235,000	696,000	4,258,000	5,189,000
2040-2049	178,000	12,000	92,000	282,000
2050-2059	282,000	883,000	1,004,000	2,169,000
2060-2069	0	28,000	0	28,000
2070-2079	0	49,000	0	49,000
2080-2089	16,000	1,684,000	2,300,000	4,000,000
Totals	**2,650,000**	**3,850,000**	**8,926,000**	**15,426,000**

The table and graphs confirm what we intuitively know, that for the foul sewer networks in the three communities, Fairlie will be generally have its network renewed in the second decade, Tekapo will be spread over the fifth, sixth and seventh decade with Twizel have a big spike in the first and third decade and again in the fifth decade.

This work has allowed the Council to ascertain where the peaks in replacement expenditure of these assets are, by community. Council has modelled this expenditure and has come to the conclusion that some towns cannot afford this level of expenditure alone. If the District as a

whole is to be sustainable, the individual communities cannot be left to fund these large replacement costs.

Council has decided its preferred option is that each of the four urban water supplies, sewerage schemes and stormwater networks are amalgamated into single urban schemes for water, stormwater and sewerage, all paying the same rate for the provision of those services. Council is proposing that the cost of providing water services across the townships is funded universally across the users of those services. This is to ensure that water supply networks remain affordable to all ratepayers that benefit from the service, regardless of where they reside in the district.

With the combining of the water supplies, stormwater and the sewerage schemes, the Council will be able to set priorities on the key capital expenditure for the networks as a whole, and bring more resources to problems and remedy them more efficiently. This is also expected to provide lower operating costs and as a result, the Council will be able to control the overall rates increases rather than certain factors that will cause significant increases being recommended and endorsed by local boards.

This proposal is being consulted on during the 2015/2025 LTP process.

9.3.1 REVIEW AND FURTHER CONSULTATION

As part of the preparation of the 30 Year Infrastructure Plan, extensive modelling and testing was carried out on the Twizel infrastructure and this confirmed that there was an issue with the Asbestos Cement pipework and that replacement would have to begin in 2015/16.

Council is proposing to standardise the rate across the four urban Sewerage schemes, with all beneficiaries of the service paying the same rate for the provision of that service as part of the 2015/25 Long Term Plan, as it considers it the most sustainable way to fund and manage the Sewerage network across the district.

9.4 FOUL SEWER VALUATION

The last valuation of the Foul Sewer infrastructural network and associated assets was undertaken as at 1 July 2013 and is summarised in the Table 8.2. The valuation is updated 3 yearly to take into account capital works and additions to the foul sewer network.

The valuation consists of an assessment of the replacement cost, depreciated replacement cost and the annual depreciation or decline in service potential of the network. The annual depreciation or decline in service potential is the amount the asset declines in value over a year as a result of the remaining life of the asset reducing. Provision is required to be made to fund this depreciation so as to make suitable allowance for the future replacement or renewal of the asset.

Depreciation is provided on a straight-line basis on all physical assets at rates which write off the cost of the asset to the estimated residual value at the end of its assumed effective life.

Expenditure on renewing or improving the capacity of the asset is capitalised annually as are assets which are vested in Council by developers. Capital work in progress is not depreciated. The total cost of this work is capitalised at the end of the financial year in which it is completed and depreciated from then onwards.

Table 9.2 – Foul Sewer Infrastructure Valuation

Summary	ORC 1 July 2013 ($)	ODRC 1 July 2013 ($)	Annual Depreciation ($)
Pipelines	17,287,748	10,772,876	233,340
Manholes	2930,675	1,689,384	36,633
Plant	3,417,524	2,523,557	52,611
TOTAL	**$23,635,947**	**$14,985,817**	**$322,585**

The total optimised replacement cost of the Foul Sewer Infrastructure was assessed to be $23,635,947 as at 1 July 2013. The total optimised depreciated replacement cost was assessed to be $14,985,817

The annual depreciation or decline in service potential has been determined to be $322,585 per annum.

9.4.1 VALUATION METHODOLOGY

All assets have been valued using depreciated replacement cost (DRC). A DRC valuation requires:

- Determination of quantities of assets optimised to relate to those required for current service delivery and foreseeable demand
- Unit rates for replacement with modern engineering equivalent assets
- Effective lives that take account of local influences
- Depreciation that defines current value given a definable remaining life.

The NZ Infrastructure Asset Valuation and Depreciation Guidelines 2006 give direction as to the overall methodology applicable to a DRC valuation for all infrastructural assets. This has been applied in this case to achieve a suitable valuation for MDC Improvements and Infrastructure Asset Valuation.

Borrowing costs were excluded from the valuation.

The primary data source for this revaluation was MDC's Asset Register.

9.5 FINANCIAL FACTORS ASSUMED

Key factors assumed in the financial forecasts are as follows:

(Inflation figures have been provided by Business and Economic Research Limited.)

Table 9.5: Adjustors: % per annum change

	Road	Property	Water	Energy	Staff	Other	Earthmoving	Pipelines	Private

Year Ending	% pa change								Sector Wages
Jun 12	5.2	3.3	6.0	15.4	2.3	1.4	4.7	3.1	2.1
Jun 13	1.1	1.7	-2.8	-1.8	2.1	2.9	2.1	-2.7	1.9
Jun 14	0.7	1.9	-2.1	1.3	1.9	1.8	2.8	-2.5	1.7
Jun 15	0.4	1.9	4.7	4.2	1.6	1.5	1.7	1.8	1.7
Jun 16	1.2	2.2	5.2	3.5	1.8	2.3	1.8	2.1	1.7
Jun 17	1.4	2.4	3.8	3.8	1.9	2.5	2.6	2.5	1.8
Jun 18	2.2	2.5	3.0	3.9	2.0	2.6	2.4	2.6	1.9
Jun 19	2.4	2.6	3.2	4.1	2.1	2.7	2.0	2.8	2.0
Jun 20	2.5	2.8	3.3	4.3	2.2	2.9	2.1	2.9	2.1
Jun 21	2.7	2.9	3.5	4.5	2.3	3.0	2.3	3.1	2.1
Jun 22	2.8	3.0	3.7	4.7	2.4	3.1	2.4	3.2	2.2
Jun 23	3.0	3.2	3.8	4.9	2.5	3.3	2.5	3.4	2.3
Jun 24	3.1	3.3	4.0	5.1	2.6	3.4	2.9	3.5	2.4
Jun 25	3.3	3.4	4.2	5.3	2.7	3.6	3.1	3.6	2.5
20-year avge %pa	3.2	2.9	3.5	4.7	2.4	3.0	3.0	3.0	2.2

- Council will continue to fund the level of service currently set out in this AMP
- The dollar values shown in this Plan are January 2015 dollars adjusted for inflation applicable to this Activity.
- Some renewal costs are rough order of cost estimates based on length and types of components using replacement costs form the recent revaluation exercise. These estimates will need to be further refined as projects develop.
- No account has been taken of the impacts related to the development, acceptance and implementation of the Risk Management Plan
- Assumptions made on Total Useful Life and Residual Useful Lives of the assets in relation to the asset valuation.
- The asset data is considered to be reliable and fit for the purpose for developing the long term financial forecasts.
- Any other specific assumptions

10. IMPROVEMENT PLAN

10.1 STATUS OF AM PRACTICES

This section provides details of how Council plans to improve this version of the Foul Sewer AMP.

This AMP has previously been reviewed and updates incorporated including improvements to move towards “Core” level Asset Management. Council is committed to a continual improvement as outlined in this section of the AMP. A key objective is to dovetail the asset management planning process with the other key planning processes, particularly the LTP.

10.2 IMPROVEMENT PROGRAMME

The review and improvement of this AMP requires resource and budget in order to complete the selected improvement tasks. Table 10.1 outlines the items for improvement, relative urgency, resource, priority, budget and the authority sought to give approval to complete each item.

FOUL SEWER ACTIVITY MANAGEMENT IMPROVEMENT PLAN

Table 10.1 – Improvement Programme

Item	Task Name	Relative Urgency			Resource	Priority	Budget	Approval Sought	Timeframe
		1	2	3					
3.0	**Description of Asset**								
3.1	Current age and remaining life of all assets needs to be reviewed and determined.		✓		Council	Medium	**To be Confirmed**	Council	Within 12 months
4.0	**Levels of Service**								
4.1	Augment existing LoS information		✓		External Consultant	Medium	**To be Confirmed**	Council	Within 12 months
4.2	Undertake customer surveys with defined performance targets.			✓	Council or Consultant	Low	**To be Confirmed**	Council	Prior to next AMP revision
5.0	**Future Demand**								
5.1	Develop a model of the Twizel Sewer Network to determine what impact development will have on specific areas.		✓		Council	**Medium**	**To be Confirmed**	Council	Within 24 months
5.2	Conduct a research study, to determine the impact of the Land and Water Plan as produced by Environment Canterbury as it applies to MDC.			✓	Council	**Low**	**To be Confirmed**	Council	Within 12 months

Item	Task Name	Relative Urgency			Resource	Priority	Budget	Approval Sought	Timeframe
		1	2	3					
5.3	Complete a Customer Survey, including local industry, to establish any changes in customer expectations as they relate to demand on the network.			✓	Council	**Low**	**To be Confirmed**	Council	Prior to next AMP revision
6.0	**Risk Management**								
6.2	All assets need to be assessed for criticality	✓			External Consultant	**High**	**To be Confirmed**	Council	Within 12 months
6.3	Risk management register needs to be developed. Assessed risks can then be linked to maintenance and renewals programmes.		✓		Workshop utilising External Consultant	**Medium**	**To be Confirmed**	Council	Within 12 months
6.4	Significant negative effects need to be identified and provide an input into the LTP. Also identify procedures for mitigating significant negative effects.		✓		External Consultant	**Medium**	**To be Confirmed**	Council	Within 12 months
6.5	Emergency management (including lifelines) requires full review and inclusion. Require procedures in place for rapid response to emergency failures.	✓			Council External Consultant	**High**	**To be Confirmed**	Council	Within 6 months

Item	Task Name	Relative Urgency			Resource	Priority	Budget	Approval Sought	Timeframe
		1	2	3					
6.6	Corporate insurance policy/requirements and updating of asset insurance costs needs to be considered and incorporated.	✓			Council	**High**	**To be Confirmed**	Council	Within 6 months
7.0	**Life Cycle Management**								
7.1	Review and update the Asset Register database. Ensure all inventory data is captured.		✓		External Consultant	**Medium**	**Within Current PS Engineering Services Budget**	Utilities Manager	Within 12 months
7.2	Complete a full review of the network assets (using both ESRI and field inspections) and confirm a detailed 10 year Forward Work Programme for all asset groups.	✓			Council	High		Asset Manager	Prior to next AMP review in 2013
8.0	**Financial Forecasts**								
8.1	Confirm Annual Plan Forecasts, adjust 10 year plan and add Year 10 to total programme		✓			Medium		Utilities Manager	
8.2	The assessment of annualised depreciation needs to be reviewed to ensure that the depreciation collected is realistic and comparable to the lifecycle renewal cost.			✓	Council	Low		Asset Manager Utilities Manager	Prior to next Valuation in 2013

Item	Task Name	Relative Urgency			Resource	Priority	Budget	Approval Sought	Timeframe
		1	2	3					
8.3	**Valuation**								
8.3.1	Review and update the Asset Register database. Ensure all inventory data is captured and up todate			✓	Council	Low		Asset Manager Utilities Manager	Prior to next Valuation in 2013
8.3.2	The default construction date and the expected life of all assets need to be reviewed			✓	Council	Low		Utilities Manager	Prior to next Valuation in 2013
9.0	**Other Improvements**								
10.1	Sustainability Include further summary of sustainability measures that are in place, including details of Council Sustainability policy, strategies and operations enabling greater sustainability etc			✓	Council	Low	**To be Confirmed**	Council	Prior to next AMP revision

10.3 MONITORING AND REVIEW PROCEDURES

9.4.1 3 YEAR REVIEW

This AMP is to be reviewed on a 3-yearly basis, with the next full review taking place in 2017. During the three year period leading up to this review, the items in the Improvement Programme should be addressed within the timeframes provided. These improvements can then be incorporated into the next review of the AMP.

It is suggested that there may be value AMP is also audited externally with the review including process, data integrity and Levels of Service.

9.4.2 ANNUAL REVIEW

At the completion of each annual budgeting period the financial forecasts are to be updated to include the new Yr 10 figures and any changes made to the intervening budgets by the Council.

11. APPENDICES

11.1 METHOD OF FORECASTING LONG TERM CAPITAL EXPENDITURE

Asset Records

Asset records are held in Council's GIS system which forms the Asset Register. Thus assets can be located and information obtained and displayed easily, either spacially or by text fields. The following is a list of fields in the spatial attribute table in the GIS system for the waterlines layer.

Scheme
UFI
From
To
Type
DN_mm_ID
Dia _actual_mm
Material
PN
Depth_mm
Length_m
Date_installed
Date confidence
Base life
Exp life
Cost code
Data confidence
Prog replacement date
Replace dia
Replace cost code
Condition
Condition confidence
Performance
Performance confidence
Critically
Risk
Date assessed
Assessed by
Grading confidence
Note 1
Note 2
Note 3
Alterations
Row number
Theo replace

Calculations and Predictions

Calculations using data in the attribute table and from other sources are carried out more conveniently in Excel, rather than directly in the attribute table.

The attribute tables from the GIS system are downloaded to Excel where information contained within the tables along with information from the latest valuation of the assets are used to determine expected life, theoretical replacement date and programmed replacement date. These attributes are imported back into the spatial attribute tables.

Estimates of capital expenditure for renewals and new work are also calculated in excel.

Expected Life

The calculation of the theoretical remaining lives of each asset feature is a modification of the method explained in Section 4 “The Toolbox” of the 1998 New Zealand Infrustructural Asset Management Manual. It goes through processes which predict the theoretical remaining life by applying factors to a standard base life for each class of asset.

a) Age Factor (F1)
   Actuarial evidence shows that as assets age , their total life expectancy increases. This is best explained by drawing an anology with human beings – whilst at birth our life expectancy is 74 years, at age 70 our life expectancy is nearer 80 years if we are still enjoying good health. The age factor increases with age of the asset.

   Economic life from age alone = Base life x F1

b) Service Utilisation Factor (F2)

   The economic life of certain assets, eg pumps, is dependant on use (as measured on hours run) and not just age. The life of these assets is extended if they are used at less than their design capacity.

   Economic life from utilisation alone = Base life x F2

c) Combined effct of Age and Utilisation
   The starting life expectancy is calculated from the age and utilisation predictions before analyising the effect of condition and performance of those assets.

   Starting economic life = Base life x F1 x F2

d) Condition Grading Factor (F3)
   Each feature is graded according to its condition between C1 and C5. C1 being excellent condition and C5 requiring urgent replacement or rehabilitation. The F3 factor for condition grade C1 is 1 and for C5 is 0, with the factors varying uniformly in-between.

   The remaining economic life from condition = (starting economic life – age) x F3

e) Performance grading Factor (F4)
Each feature is graded according to its performance between P1 and P5. P1 being no performance problems, and P5 complete inadequate performance. The F4 factor for performance grade P1 is 1, and for P5 is 0, with the factors varying uniformly in-between.

The remaining economic life form performance = (starting economic life – age) x F4

f) Combined effect of Condition and Performance.
The remaining economic life is calculated by taking the lesser of the predictions for asset condition and performance. The economic life was extended by the age factor and reduced back by the condition or performance factors where the grade for condition or performance are less than "1".

g) Expected Life

Expected life = age + the lesser of the predictions of remaining economic life for condition and performance. The calculated expected lives are imported into the spatial attribute tables.

Capital Works Programme

a) Theoretical Replacement Date

Theoretical Replacement Date = Date installed + expected life. The theoretical replacement dates are imported into the spatial attributes table.

b) Programmed replacement Date.

All features that have a theoretical replacement date within the following 20 years are identified and assessed in more detail, with consideration given to factors which impact on the programmed replacement date, such as:

- Maintenance history
- Decay prediction
- Ability to rehabilitate
- Criticality
- Risk
- Demand
- Level of Service
- Maintenance Costs
- Operation Costs
- Management Costs
- Other Work Programmed such as road sealing

Programmed replacement dates are entered into the attribute tables for features where replacement is programmed within the following 10 years.

c) New Works

Proposed new works, where no asset currently exists are included in a separate Excel table and are not centre in the spatial attribute tables.

Financial Projections

a) Cost Codes

Cost codes are allocated for all asset classes. Pipes for example are allocated codes depending on size and ground conditions. Separate codes are allocated for pipes in sealed roads, in road berms, or in open country etc. On rural schemes the codes also distinguish between pressure classes. Unit values are attached to the cost codes at each three yearly valuation based on the optimised replacement costs.

The cost-codes for each asset feature are entered in the spatial attribute table.

b) Forecasting Future Demand

The likely future demand is considered for each asset feature.

The replacement asset and associated cost-code are entered in the spatial attribute table. Greater consideration is given to forecasting future demand for assets where the programmed replacement date is within the following 10 years period.

c) Calculations in Excel

As stated earlier the spatial attribute tables are downloaded to Excel. The “look-up” function in Excel attaches the most recent unit value (optimised replacement cost) to each asset feature and each replacement feature.

Renewal/new work expenditure is calculated on the optimised replacement costs of the existing asset and the proposed replacement asset. The forecast expenditure is separated into “Expenditure Renewal” which is the cost of replacing like with like, and “Expenditure New” which is the difference in cost between the existing asset and the proposed replacement asset.

Proposed new works, where no asset currently exists, are included in a separate table.

A long term capital expenditure programme is developed from the above information. The “Programmed Replacement Date”, when one has been allocated is used in preference to the “Theoretical Replacement Date”.

A pivot table is created for the 10 year programmed work which summarises the programmed works into years of expenditure.

The proposed expenditure amounts are not imported into the spatial attribute tables.

11.2 FUNDING IMPACT STATEMENT

Mackenzie District Council											
Funding Impact Statement for 10 Years to 30 June 2025 for Foul Sewer											
	Annual Plan 2014/15 ($000)	LTP Year 1 2015/16 ($000)	LTP Year 2 2016/17 ($000)	LTP Year 3 2017/18 ($000)	LTP Year 4 2018/19 ($000)	LTP Year 5 2019/20 ($000)	LTP Year 6 2020/21 ($000)	LTP Year 7 2021/22 ($000)	LTP Year 8 2022/23 ($000)	LTP Year 9 2023/24 ($000)	LTP Year 10 2024/25 ($000)
Sources of operating funding											
General rates, uniform annual general charges, rates penalties	-	-	-	-	-	-	-	-	-	-	-
Targeted rates (other than a targeted rate for water supply)	461	441	576	555	541	530	494	493	552	490	497
Subsidies and grants for operating purposes	-	-	-	-	-	-	-	-	-	-	-
Fees, charges, and targeted rates for water supply	-	-	-	-	-	-	-	-	-	-	-
Internal charges and overheads recovered	37	49	31	46	72	93	98	130	136	159	173
Local authorities fuel tax, fines, infringement fees, and other receipts	-	6	6	6	7	7	7	7	8	8	8
Total operating funding (A)	**498**	**496**	**613**	**607**	**620**	**630**	**599**	**630**	**696**	**657**	**678**
Applications of operating funding											
Payments to staff and suppliers	179	157	237	250	256	227	225	233	243	253	264
Finance costs	-	-	-	-	-	-	-	-	-	-	-
Internal charges and overheads applied	13	-	-	-	-	-	-	-	-	-	-
Other operating funding applications	-	-	-	-	-	-	-	-	-	-	-
Total applications of operating funding (B)	**192**	**157**	**237**	**250**	**256**	**227**	**225**	**233**	**243**	**253**	**264**
Surplus (deficit) of operating funding (A - B)	**306**	**339**	**376**	**357**	**364**	**403**	**374**	**397**	**453**	**404**	**414**
Sources of capital funding											
Subsidies and grants for capital expenditure	-	-	-	-	-	-	-	-	-	-	-
Development and financial contributions	133	-	-	262	-	-	657	-	-	208	-
Increase (decrease) in debt	-	-	-	-	-	-	-	-	-	-	-
Gross proceeds from sale of assets	-	-	-	-	-	-	-	-	-	-	-
Lump sum contributions	-	-	-	-	-	-	-	-	-	-	-
Total sources of capital funding (C)	**133**	**0**	**0**	**262**	**0**	**0**	**657**	**0**	**0**	**208**	**0**
Applications of capital funding											
Capital expenditure											
to meet additional demand	-	-	-	-	-	-	-	-	-	-	-
to improve the level of service	-	-	-	-	-	-	-	-	-	-	-
to replace existing assets	109	902	31	11	17	398	219	306	-	330	-
Increase (decrease) in reserves	330	-563	345	608	347	5	812	91	453	282	414
Increase (decrease) in investments	-	-	-	-	-	-	-	-	-	-	-
Total applications of capital funding (D)	**439**	**339**	**376**	**619**	**364**	**403**	**1031**	**397**	**453**	**612**	**414**
Surplus (deficit) of capital funding (C - D)	-306	-339	-376	-357	-364	-403	-374	-397	-453	-404	-414
Funding balance ((A - B) + (C - D))	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

APPENDIX I

11.3 RISK REGISTER

Management Activity	*Name*	*Description*	*Existing Controls*	*Assessment*				
				Consequence	**Likelihood**	**Risk**	**Treatment Option**	Treatment Cost

APPENDIX VI