Gas Distribution
Asset Management Plan
2013 – 2023

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Gas Distribution
Asset Management Plan
2013 – 2023

Executive Summary – Section 1

1 Summary of the Asset Management Plan

1.1 Asset Management at Vector

Asset management is critical for ensuring Vector's gas distribution business provides safe and reliable services, which meet the needs and expectations of consumers, help to achieve the business' commercial and strategic objectives and satisfies its regulatory obligations. Effective planning helps ensure Vector maintains and invests appropriately in its network. Vector's ongoing goal is to achieve a high standard of asset management (with a focus on safety), given its critical nature to the business and consumers, while reflecting the regulatory and economic environment within which it finds itself. It is important to note that gas is not an essential product. There are alternative fuels available in the market. The approach to management of the gas distribution business is therefore different to that of the electricity distribution business.

Vector aims to be:

"New Zealand's first choice for integrated infrastructure solutions that build a better, brighter future"

This Asset Management Plan supports achieving Vector's vision.

1.2 Purpose of the Plan

The purpose of this Asset Management Plan (AMP) is to comply with the requirements set out in the Commerce Commission's Gas Distribution Information Disclosure Determination 2012. It covers a ten year planning period starting from 1st July 2013.

The AMP accurately represents asset management practices at Vector as well as the forecasted ten year capital and maintenance expenditure on the Vector gas distribution network. The objectives of the AMP are to:

- Demonstrate that safe management processes are in place;
- Inform stakeholders about how Vector intends to manage its gas distribution network based on the information available;
- Demonstrate alignment between gas network asset management and Vector's vision and goals;
- Provide visibility of effective life cycle asset management at Vector;
- Provide visibility of the level of performance of the network;
- Provide guidance of asset management activities to its staff and field service providers;

- Provide visibility of forecast gas distribution network investment programmes and forecast medium-term construction activities to external users of the AMP;
- Demonstrate innovation and efficiency improvements;
- Discuss the impact of regulatory settings on future investment decisions;
- Discuss Vector's view on expected technology and consumer developments and the asset investment strategies to deal with a changing environment; and
- Meet Vector's regulatory obligations under the aforementioned Determination.

From an asset manager perspective the AMP:

- Supports continued efficient improvement in Vector's performance;
- Is essential to Vector's goal to continually improve its asset management practices; and
- Will help Vector achieve its overarching vision.

1.3 Business Operating Environment

1.3.1 Qualification

This AMP represents Vector's current and best view of the ongoing investment, maintenance and operational requirements of its gas network, in the current operating environment. However, as discussed below, the business faces significant ongoing uncertainty, especially in relation to the current investment landscape and the still-evolving regulatory environment. This has a direct impact on Vector's ability to make investment decisions and attract investment capital.

Vector follows an annual budget process and the implementation of the works programmes may be modified to reflect any changing operational and economic conditions as they exist or are foreseen at the time of finalising the budget, or to accommodate changes in regulatory or customer requirements that may occur from time to time. Any expenditure must be approved through normal internal governance procedures. This AMP does therefore not commit Vector to any of the individual projects or initiatives or the defined timelines described in the plan.

1.3.2 Economic Factors

Economic cycles impact on business activities and hence gas demand particularly in business sectors. GDP figures published by Statistics NZ over the past three years ending June 2012 show a period of moderate to low growth (2.0%, 1.5% and 0.7% for the years ending June 2012, June 2011 and 2010). During the same period, gas delivered through the Vector network recorded low growth rates[1] of 4.1%, -0.4% and -1.8% respectively. More recent economic indicators such as consumer and business confidence, unemployment rate and housing construction point towards a cautious recovery, although the full impact of this on the gas network is still to be realised. Overseas, various economies are facing uncertainties caused by state and private sector debt burden, the fading effect of economic stimulus packages and low consumer confidence leading to low rates of job creation and economy activities. The full impact of this on New Zealand's export earnings and therefore the state of its economy is still uncertain.

For the purposes of this AMP, Vector has assumed that economic growth will resume at relatively modest to low levels in the short to medium term and that new connection growth patterns will continue at historical rates.

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[1] Figures based on Vector's information disclosure.

1.3.3 Regulatory Factors

Vector’s electricity distribution, gas distribution, and gas transmission businesses are subject to price and quality regulation. This regulation is undertaken by the Commerce Commission under Part 4 of the Commerce Act 1986.

The Part 4 regulation can impact on both the opex and capex through the requirement to meet regulated service quality standards. The Commerce Commission’s operation of Part 4 can also impact on the ability and incentives to innovate and to invest, including in replacement, upgraded, and new assets; and to improve efficiency and provide services at a quality that reflects consumer demands.

On 28 February 2013 the Commission issued its first default price-quality path (“DPP”) decision for gas pipeline businesses, including Vector’s distribution services. The regulatory period started on 1 July 2013 and will end on 30 September 2017. For the first assessment period (15 months from 1 July 2013 to 30 September 2014[2]) Vector’s maximum allowable revenue (before allowing for pass-through and recoverable costs) was set at $86.6m. (Pass-through and recoverable costs can be covered over and above the maximum allowable revenue.) For the following 3 assessment periods of 12 months Vector is able to increase its maximum allowable annualised revenues by CPI. The DPP also sets quality standards that must be maintained throughout the regulatory period.

1.3.4 Technical Factors

Vector anticipates that Auckland will experience continued population increase and associated growth in business activities and gas demand for the foreseeable future. However, the extent to which this population growth translates into new gas connections varies considerably over years, and network reinforcements are therefore deferred until sufficient certainty of new developments and network demand is obtained.

1.3.5 Legislative requirements

Vector's gas distribution assets have been designed and constructed and are operated in accordance with the following principal Acts, Regulations and industry codes:

- Gas Act 1992 and Gas Amendment Act;
- Health and Safety in Employment Act ;
- Gas (Safety and Measurement) Regulations;
- Civil Defence and Emergency Management Act;
- Hazardous Substances and New Organisms Act;
- NZS 7901 Electricity and Gas Industries – Safety Management Systems for Public Safety;
- AS/NZS 4645.1 Gas Network Management;
- AS/NZS 2885 Pipelines – Gas and liquid petroleum; and
- NZS 5263 Gas detection and odorisation.

These Acts, Regulations and industry codes include both prescriptive and performance based requirements which have been embedded into Vector's suite of design, construction, maintenance and material specification technical standards.

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[2] The first assessment period is 15 months to allow the regulatory regime to transition to an October-September regulatory year.

1.4 Vector's Network

Vector's natural gas distribution network assets are the result of progressive amalgamation, mergers and acquisitions of a number of private and public gas utilities, a process that took place over the last hundred years. Vector provides gas to over 30 towns and cities across the North Island as shown in the map below.

A comparison of the key features of the gas distribution network for 2011 and 2012 is presented below (as at 30 June):

Description	**2012**	**2011**	**Change**
Consumers connected[3] (no.)	153,585	151,104	1.6%
System length[4] (km)	10,361	10,291	0.7%
Consumer density (consumer/km)	14.8	14.7	1.0%
Gate stations[5]	63	63	0.0%
District regulating stations[6] (DRS)	248	260	-4.6%
DRS density (system km/DRS)	42	40	5.6%
DRS utilisation (consumers/DRS)	619	581	6.6%
Peak load[7] (scmh)	143,620	151,010	-4.9%
Gas conveyed[8] (PJ pa)	22.0	21.1	4.3%
Load factor[9] (%)	79.1%	79.1%	0.0%

Table 1-1 : Key features of Vector's gas distribution networks

1.5 Demand Forecasts

Historical trends show gas demand (and sales volume) is primarily influenced by economic activities in an area, price and availability of substitute fuels (e.g. electricity, fuel oil etc.), marketing effort, population / household growth, socio-economic factors, climate and the investment decisions made by large industrial and commercial gas consumers. In the short-term, gas demand is very sensitive to climatic conditions. A cold snap, for example, could drive up the demand for gas significantly. Conversely, a warm winter could result in a materially lower demand. Hence on a year–by-year basis, demand can vary significantly.

Historical information, after normalising for year-on-year variances, shows a reasonably steady demand trend. The exceptionally high peak demand hours occur due to extreme weather conditions and normally represent only a small percentage of hours in a year.

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[3] Source: Information Disclosure 2012 http://www.vector.co.nz/sites/vector.co.nz/files/Gas%20Distribution%20-%20with%20KPMG%20stamps.pdf

[4] Source: Vector's GIS as at 30 June. Includes mains and service pipe lengths

[5] ibid, footnote 4

[6] ibid, footnote 4

[7] Calculated by adding the coincident load of each network system for a calendar year. Measured as standard cubic metres per hour (scmh)

[8] ibid, footnote 3

[9] ibid, footnote 3

Based on the available information and using the methodology described in this AMP, the following graph shows the load forecast[10] for Vector's gas distribution networks in the Auckland and North Island pricing regions.

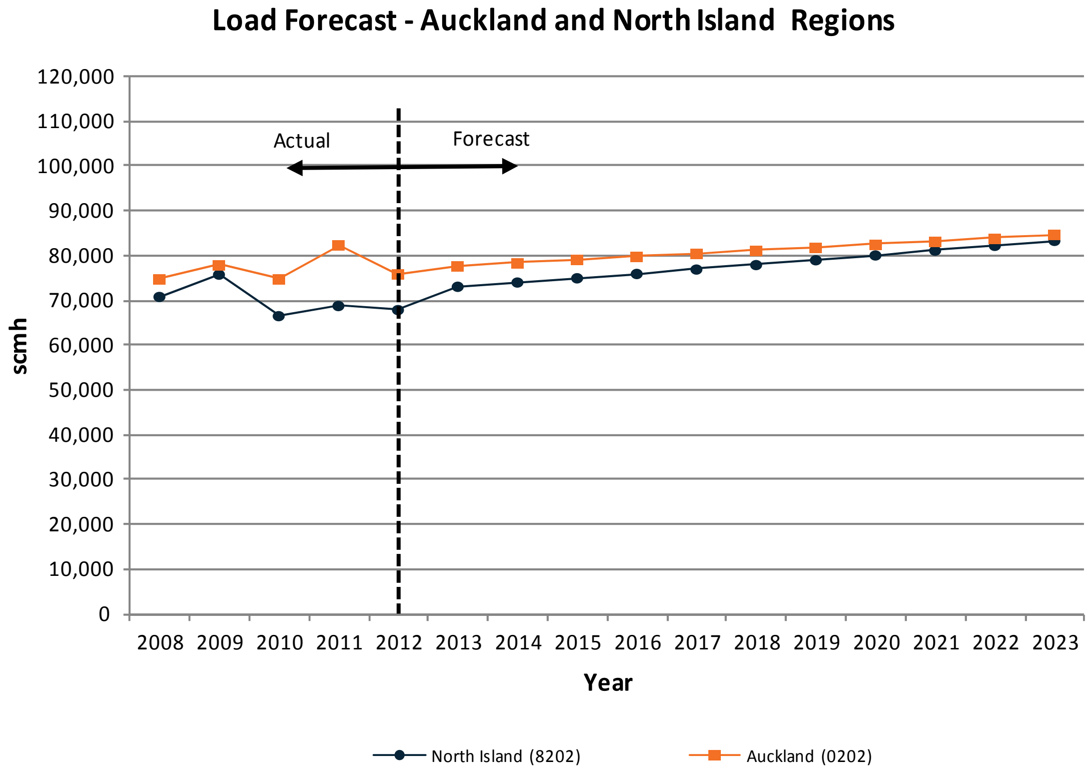

Figure 1-1 : Load forecast for Vectors networks in Auckland and North Island regions

1.6 Network Development

1.6.1 Planning Criteria

Vector's approach to network development planning is driven by:

- Ensuring the safety of the public, staff and service providers;
- Meeting network capacity and security requirements in an economically efficient manner;
- Striving for least life-cycle cost solutions (optimum asset utilisation) and optimum timing for capex;
- Maximising capex efficiency in a sustainable manner;
- Outcomes that improve asset utilisation take into account the increased risk trade-off;
- Incorporating enhanced risk management strategies and processes into Vector's planning philosophy;
- Continuously striving for innovation and optimisation in network design, and trialling new technology where available and applicable to improve network performance;
- Reference to targets set by industry best practice where economic and practical;

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[10] A linear relationship of forecast values between years 2010 to 2013, 2013 to 2016 and 2016 to 2021 has been used.

- Ensuring assets are operated within their design rating; and
- Meeting statutory requirements including acceptable pressure levels.

Vector's planning criteria are detailed in Section 5 of this AMP.

1.6.2 Network Development Plan

Vector's primary objectives in network planning are to identify and prevent foreseeable network related security[11], capacity and quality (system pressure) problems in a safe, technically efficient and cost-effective manner. The planning process involves identifying and resolving:

- Supply quality, security or capacity issues that may prevent Vector from delivering its target service levels;
- Adequacy of supply to new developments or areas requiring gas connections;
- The need to relocate assets, when reasonably required by third parties; and
- Supply quality problems can be identified from a wide range of sources including network measurement and monitoring (system pressure), gas flow modelling and customer complaint databases.

Vector's ten-year network development plan is described in Section 5 of the AMP.

This plan details the anticipated gas demand in each geographical region for the next ten years. Based on these demand forecasts and Vector's network planning criteria, various projects are planned (and alternatives considered) to ensure that adequate supply capacity and reliability levels will be maintained. Planning is especially detailed for the first five years of the plan.

1.7 Service Commitment

Vector contracts with energy retailers for pipeline services, while end users contract with energy retailers for both energy and line services. This is called an interpose arrangement. Vector is committed to providing a high standard of service and a safe, reliable and secure gas supply to the end users.

Vector's supply quality and service standards are explained in detail in Section 4 of this AMP.

1.8 Asset Management Planning

1.8.1 Maintenance Planning Policies and Criteria

Vector's overall philosophy on maintaining network assets is based on four key factors:

- Ensuring the safety of consumers, the public and the network field staff;
- Ensuring reliable and sustainable network operation, in a cost-efficient manner;
- Achieving the optimal trade off between maintenance and replacement costs. That is, replacing assets only when it becomes more expensive to keep them in service. Vector has adopted, where practicable, condition-based assessments rather than age based replacement programmes; and
- Integration (alignment) of asset management practices given Vector is a multi utility asset manager.

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[11] "Security" as used in a planning context means the security of the gas supply – i.e. the likelihood that supply may be lost.

Safety is the key consideration in the design, construction and maintenance of Vector's gas networks and accordingly Vector manages its gas distribution networks in accordance with relevant acts, regulations and industry standards. Although Vector strives to maintain the integrity of its gas networks at levels in line with good industry practice, some gas leakage and escapes occur on all utility networks (e.g. gas, water and wastewater services etc), including on Vector's gas networks from time to time. . Vector responds immediately when becoming aware of any such event, ensuring the safety of customers and installations. We also closely monitor incident trends and, where warranted, this could be the trigger for network upgrades.

Vector has developed maintenance standards for each major class of assets. The standards form a key part of Vector's schedule for planned maintenance. The purpose of these standards, in conjunction with the schedules of maintenance work, is to ensure assets operate safely and deliver their designed outcomes with regard to life and performance.

Based on these maintenance standards, to ensure that all assets are appropriately inspected and maintained, Vector's maintenance contractors develop an annual maintenance schedule for each class of asset they are responsible for. The asset maintenance schedules are aggregated to form the overall annual maintenance plan which is implemented once it has been approved by Vector. Progress against the plan is monitored monthly.

Maintenance data is being directly fed into Vector's databases, based on the activities of our field services providers (FSPs).

Maintenance works at Vector are categorised in three main categories:

- Preventive maintenance is defined by Vector's standards and is work intended to identify issues before they occur. The frequency of performing the preventive maintenance work (per asset group) is defined in the maintenance standards, flowing through into the contractors' schedule;
- Corrective maintenance work is the work that flows from the preventive activities, site inspections, testing and observations by Vector's FSPs or any party that reports on potential issues relating to our network's conditions or performance; and
- Reactive maintenance work is undertaken following customers' complaints, accidents or any other work that is to rectify damage to the assets caused by unforeseen circumstances.

In addition, Vector also has categories for third party services maintenance and for maintenance management services.

Vector's asset renewal plans are discussed in Section 6. The overall asset-condition of various asset categories is discussed in detail, highlighting areas where upgrades or renewal is required (as well as the process and factors support these decisions). This forms the basis of the ten-year asset renewal programme.

In general Vector replaces assets on a condition-assessment rather than age-basis. We strive to achieve the optimal replacement point where the risk associated with asset failure and the likelihood of this occurring becomes unacceptably high, and it is more economically efficient to replace an asset than to continue to maintain it.

1.9 Risk Management

1.9.1 Risk Management Policies

Managing risk is one of Vector's highest priorities. Risk management is practiced at all levels and parts of the Vector Group and is overseen by the Board Risk and Assurance Committee, the Executive Risk and Assurance Committee and Vector's Chief Risk Officer.

Vector's risk management policy is designed to ensure that material risks to the business are identified, understood, and reported and that controls to avoid or mitigate the effects of these risks are in place. Detailed contingency plans are also in place to assist Vector in managing high impact events.

The consequences and likelihood of failure or non performance, current controls to manage these, and required actions to reduce risks, are all documented, understood and evaluated as part of the asset management function. Risks associated with the assets or operations of the network are evaluated, prioritised and dealt with as part of the network development, asset maintenance, refurbishment and replacement programmes, and work practices.

Asset-related risks are managed by a combination of:

- Reducing the probability of failure through the capital and maintenance work programme and enhanced work practices, including design standards, equipment specification and selection, quality monitoring, heightened contractor and public awareness of the proximity of or potential impact of interfering with assets; and
- Reducing the impact of failure through the application of appropriate network security standards and network architecture, robust contingency planning and performance management of field responses.

The capital and maintenance asset risk management strategies are outlined in the Asset Maintenance and Network Development sections (Section 6 and Section 5, respectively). Vector's contingency and emergency planning is based around procedures for restoring gas supply in the event of a fault on the network, and is detailed in Section 5 of this AMP.

1.9.2 Health and Safety

At Vector, safety is a fundamental value, not merely a priority. Vector is committed to a goal of zero harm to people, assets and the environment. Vector's Health and Safety Policies can be found in Section 8 of this AMP. In summary, the policies are developed to ensure safety and wellbeing of its staff, contractors and the public at its work sites and around its assets.

To achieve this Vector aims to comply with all relevant health and safety legislation, standards and codes of practices; establish procedures to ensure its safety policies are followed; encourage its staff and service providers to participate in activities that will improve their health, safety and wellbeing; and take all practical steps to ensure its field services providers (FSPs) adhere to Vector's health and safety policies and procedures.

The Gas (Safety and Measurement) Regulations came into force on 4 May 2010. A key change for asset owners within the gas and electricity industries is the requirement to operate an accredited safety management system that incorporates process for the safety of the public and public property.

Vector's gas distribution network has been audited against the requirements of NZS7901. Vector has subsequently received certification that the gas distribution networks operate under an accredited safety management system, which incorporates public safety and the protection of public property.

The accreditation is effective for 3 years, with annual monitoring required every year.

1.9.3 Environment

Vector's environmental policy is contained in Section 8 of this AMP. In summary, the policy is developed to monitor and improve Vector's environmental performance and to take preventive action to avoid adverse environmental effects of Vector's operation.

To achieve this Vector will:

- Plan to avoid, remedy or mitigate adverse environment effects of Vector's operations; and
- Focus on responsible energy management and energy efficiency for all Vector's premises, plant and equipment where it is cost effective to do so.

Vector's long term operational objectives with regard to environmental factors are to:

- Utilise fuel as efficiently as practicable;
- Mitigate, where economically feasible, fugitive emissions and in particular greenhouse gas emissions; and
- Work with consumers to maximise energy efficiency.

1.10 Approval of the AMP and Reporting on Progress

Approval of the disclosure AMP will be sought once a year, initially at the September board meeting and in future at the June meeting. This timing is aligned with the regulatory requirement to publish a disclosure AMP. No update of the AMP is made between publication dates.[12]

Progress in implementing Vector's asset management plan is regularly monitored, and progress against its investment plans and asset performance measured through several metrics, including:

- Health, safety and environmental issues;
- Monthly reporting on progress and expenditure on major projects/programmes;
- Reliability performance;
- Performance and utilisation of key assets;
- Progress with risk register actions; and
- Security of supply.

1.11 Financial Forecasts

Table 1-2 and Table 1-3 summarise the capital and operations and maintenance expenditure forecast covering the AMP planning period.

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[12] In future, following changes to the required AMP publication dates under the new information disclosure requirements, Vector's AMP approval process will be amended to reflect the years in which an AMP update only is required.

Budget and Expenditure Forecasts FY	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Customer connection	$10,470	$10,756	$10,470	$10,460	$10,460	$10,460	$10,430	$10,430	$10,383	$10,383
System growth	$3,729	$5,307	$3,400	$3,159	$3,551	$5,717	$8,598	$7,275	$6,598	$3,369
Asset replacement and renewal	$12,908	$4,228	$1,585	$1,545	$1,185	$1,085	$1,085	$1,060	$1,060	$1,060
Asset relocations	$4,068	$4,065	$3,043	$2,398	$2,485	$3,550	$3,550	$3,300	$3,300	$3,300
Quality of supply	$617	$759	$420	$127	$120	$253	$120	$80	$306	$80
System Fixed Assets Total	**$31,793**	**$25,116**	**$18,917**	**$17,688**	**$17,801**	**$21,065**	**$23,783**	**$22,145**	**$21,647**	**$18,192**
Non-system fixed assets (Asset IT)	$290	$300	$300	$300	$300	$300	$300	$300	$300	$300
Asset Capital Expenditure Total	**$32,083**	**$25,416**	**$19,217**	**$17,988**	**$18,101**	**$21,365**	**$24,083**	**$22,445**	**$21,947**	**$18,492**

* Figures are in 2014 real New Zealand dollars ($'000)

** The year reference indicates the end date of the Vector financial year

*** The forecasts are inclusive of cost of finance and in line with Vector's business practice

Table 1-2 : Capital expenditure forecast for Vector's Auckland and North Island regions - revised (portfolio) forecasting methodology (Vector financial years)

Budget and Expenditure Forecasts	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Service interruptions incidents and emergencies	$4,149	$4,149	$4,149	$4,149	$4,149	$4,149	$4,149	$4,149	$4,149	$4,149
Routine and corrective maintenance and inspection	$4,704	$4,716	$4,760	$4,698	$4,774	$4,778	$4,807	$4,836	$4,865	$4,895
Asset replacement and renewal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
System operations and network support	$20	$20	$0	$0	$0	$0	$0	$0	$0	$0
Business support	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Direct Operational Expenditure Total	**$8,873**	**$8,885**	**$8,909**	**$8,847**	**$8,923**	**$8,927**	**$8,956**	**$8,985**	**$9,014**	**$9,044**

* Figures are in 2014 real New Zealand dollars ($'000);

** The year reference indicates the end date of the Vector financial year

Table 1-3 : Direct Operational Expenditure Forecast for Vector's Auckland and North Island regions (Vector financial years)

Gas Distribution
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Background and Objectives – Section 2

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2. Background and Objectives

2.1 Context for Asset Management at Vector

Asset management is critical for ensuring Vector's gas distribution business provides safe and reliable services which meet the needs and expectations of consumers, help to achieve the business's commercial and strategic objectives and satisfies its regulatory obligations. Effective planning helps ensure Vector maintains and invests appropriately in its network. Vector's ongoing goal is to ensure good industry practice asset management, given its critical nature to the business and consumers, while reflecting the regulatory and economic environment within which it finds itself.

Vector also recognises that providing a network that is safe to customers, the public and operators alike is a top priority. This is reflected in Vector's work processes and standards, as well as the safety management system that is currently being enhanced from the present well developed systems.

The Asset Management framework adopted for Vector's gas distribution business is illustrated in Figure 2-1.

This is a generic Asset Management model widely adopted by many types of infrastructure businesses. The framework is superimposed on the environment within which Vector operates.

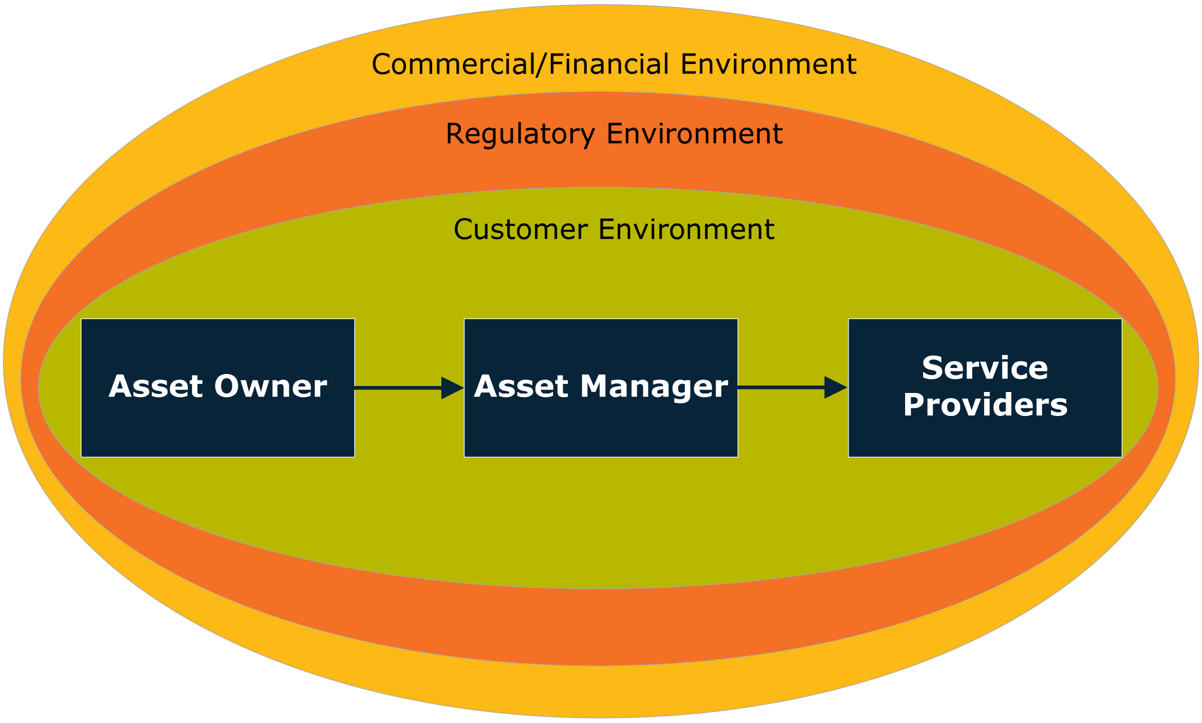

Figure 2-1 : Vector's asset management framework

In this model, the Asset Owner is the highest level of management within Vector that owns the assets, which in this case is the Vector executive, with oversight from the Vector Board. The Asset Owner determines the operating context for the Asset Manager, focusing on corporate governance and goals, and the relationship with regulators and other stakeholders.

The Asset Manager develops the asset management strategy, directs asset risk management, asset investment and asset maintenance planning, and decides where and how asset investment is made in accordance with directions set by the Asset Owner. The Asset Manager sets policies, standards and procedures for service providers to implement. In Vector the Asset Manager function is, broadly, the responsibility of the Asset Investment (AI) group.

The Service Providers are responsible for delivering asset investment programmes, to maintain and operate the assets based on the guidelines set by the Asset Manager.

Vector's Service Providers are a combination of the Service Delivery (SD) group - capital programmes, network operations and service operations - and the external contractors and consultants supporting them (see Section 2.7 below).

Asset management is strongly influenced by safety and customer needs as well as commercial, financial and regulatory requirements:

- Safety is one of Vector's key priorities. The health and safety policy sets out the directives of Vector's health and safety framework to ensure health and safety considerations are part of all business decisions;
- Customer needs and expectations, along with safety and technical regulations, are the key determinants of network design. Network layout and capacity is designed to ensure contracted or reasonably anticipated customer demand can be met during all normal operating circumstances. Quality of supply levels[1], which relate to the level of redundancy built into a network to avoid or minimise outages under abnormal operating conditions, are based on customer requirements and the value they place on reliability of supply;

  Most direct interaction with customers occurs through the Service Delivery group. Asset management involves close interaction with the Service Delivery group to assist with understanding and addressing customer technical requirements, consumption forecasts and upcoming developments;
- There are technical and economic regulations relating to how networks are built and operated and how network services are provided and sold. Commercial return on investment is regulated. These regulations directly influence investment decisions;

  Regulatory certainty is critical to the investment framework, given the long-term nature of the assets and the need for gas distribution businesses to have confidence that they can expect to recover their costs of efficient and prudent investment. Importantly, Vector also has to attract capital both locally and from offshore;[2]

  Direct contact with the regulators is generally maintained through the Commercial and Regulatory Affairs group, which in turn works with the Asset Manager to provide guidance on regulatory issues and requirements;
- Vector takes a commercial approach to investment and therefore has to ensure that it makes optimal investment decisions and implement targeted maintenance programmes in the network, including replacement, upgrades and new assets, while always keeping safety as a priority. This requires demonstration that investment decisions are not only economically efficient, but that realistic alternative options have been investigated to ensure the most beneficial solution – technically and commercially – is applied. This may involve taking a view on likely future technical changes in the energy sector;

  In addition, financial governance has a direct and significant bearing on asset management. Capital allocation and expenditure approvals are carefully managed in accordance with Vector's governance policies. Short and long-term budgeting

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[1] These are discussed in Section 5 of the AMP (asset management plan).

[2] In Vector's experience, the New Zealand regulatory regime is often cited by capital markets and rating agencies as being uncertain.

processes take into account the balance between network needs, construction resources and available funding – requiring careful project prioritisation; and

Asset management, in particular where expenditure is involved, therefore requires close interaction with the Finance and Service Delivery groups.

In the context described above, this Vector Asset Management Plan (AMP) has been developed to define and record Vector's asset management policies, responsibilities, targets, investment plans and strategies to deal with the future of the gas distribution network. It describes Vector's asset management policies, responsibilities, targets, investment plans and strategies to provide confidence to its board and regulators that it has considered all options to ensure the gas distribution network is maintained and enhanced to support Vector's commercial investment approach and meet the needs of consumers, while ensuring safe and efficient gas distribution network operations. It also reflects feedback obtained from customers on their requirements for the quality and cost of their gas distribution services, and the manner in which they interact with Vector. The Plan sets out the forward path for Vector's gas distribution network capital investment and maintenance needs and how we intend to address these.

While this AMP's emphasis is on gas distribution network asset management, it is a document used Vector-wide. It supports the achievement of the vision and goals of Vector through maximising the efficiency of asset management activities. Rather than being prepared in isolation by and for the gas distribution business only, the Plan is guided by Vector's overall goals, relies extensively on inputs from all areas within Vector, and one of its key functions is to provide visibility on the asset investment strategies and forecasts to the entire Vector Group.

This Plan is also publicly disclosed to satisfy Vector's regulatory obligation. To satisfy the Information Disclosure requirements, the contents of this AMP are presented in accordance with the requirements stated in the Gas Distribution Information Disclosure Determination 2012.

2.1.1 Relationship between Asset Management and Vector's Strategies and Goals

As indicated above, the Asset Owner determines the operating context for the Asset Manager, focusing on corporate governance, strategies and goals, and the relationship between regulatory issues and other stakeholder requirements. The Asset Manager interprets these strategies and goals and translates the strategic intentions into an asset investment strategy which is supported by a series of asset management policies. These are documented in this AMP. Technical standards, work practices and equipment specifications support the asset management policies, guiding the capital and operational works programmes.

Performance of the network is monitored against a set of performance indicators that are based on realising customer expectations, meeting regulatory requirements, meeting safety obligations and achieving best-practice network operation. Performance monitoring ensures resources are optimally allocated to the appropriate areas.

The diagram in Figure 2-2 illustrates the relationship between Vector's corporate strategies and goals with its asset management policy framework.

Vector's gas distribution network asset management objective is to efficiently and effectively deliver safe and reliable gas distribution network services to customers at a quality commensurate with their technical and economic preferences.

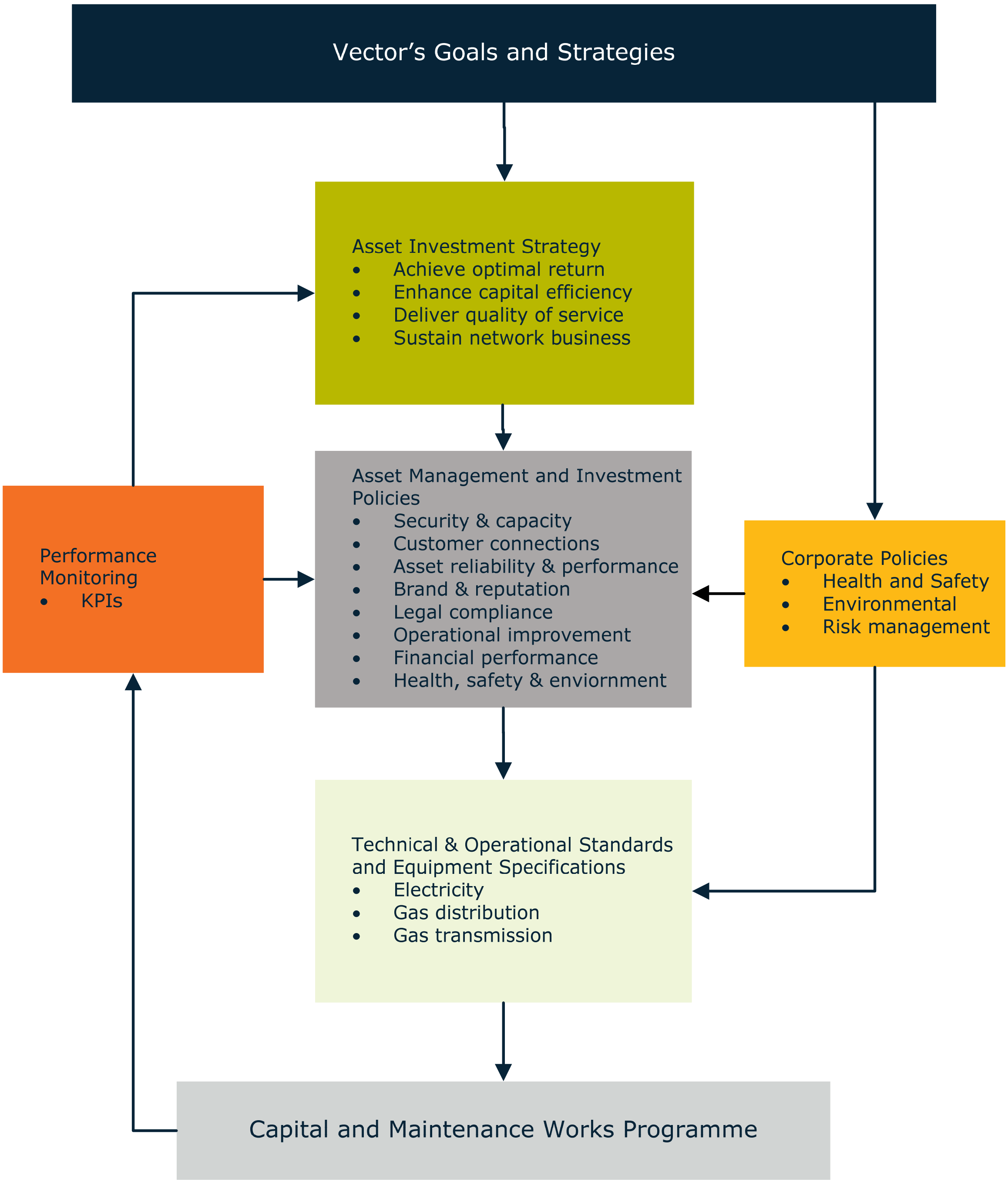

Figure 2-2 : How Vector's asset management strategies and policies relate to the strategic goals

2.2 Planning Period and Approval Date

This AMP covers a ten year planning period, from 1st July 2013 through to 30th June 2023 and was approved by the board of directors on 11th September 2013.

The first five years of the AMP is based on detailed analysis of customer, network and asset information and hence provides a relatively high degree of accuracy (to the extent reasonably possible) in the descriptions and forecasts. The capital and maintenance forecasts set out in the AMP, particularly for the first year, are inputs into Vector's annual budgeting cycle.

The latter period of the AMP is based on progressively less certain information and an accordingly less accurate and detailed level of analysis. From year five on, the AMP is only suitable for provisional planning purposes.

2.3 Purpose of the Plan

This AMP has been developed as part of the requirements under Clause 2.6 of the Gas Distribution Information Disclosure Determination 2012 and covers ten years starting on 1st July 2013. The purposes of this AMP are to:

- Inform stakeholders how Vector intends to manage and expand its gas distribution network based on information available at preparation;
- Demonstrate the impact of regulatory settings on future investment decisions;
- Demonstrate alignment between gas distribution network asset management and Vector's goals and values;
- Demonstrate innovation and efficiency improvements;
- Provide visibility of effective life cycle asset management at Vector;
- Provide visibility of the level of performance of the network;
- Provide guidance of asset management activities to its staff and field service providers;
- Provide visibility of forecasted gas network investment programmes and upcoming medium-term construction programmes to external users of the AMP;
- Discuss Vector's views on expected technology and consumer developments and the asset investment strategies to deal with a changing environment;
- Meet Vector's regulatory obligation under the aforementioned Determination; and
- Demonstrate that safe management processes are in place.

This AMP does not commit Vector to any of the individual projects or initiatives or the defined timelines described in the AMP. Vector follows an annual budget process and the implementation of the works programmes may be modified to reflect any changing operational and economic conditions as they exist or are foreseen at the time of finalising the budget, or to accommodate changes in regulatory or customer requirements that may occur from time to time. Any expenditure must be approved through normal internal governance procedures.

2.3.1 Asset Management in Support of Vector's Vision

Vector's strategic vision is to be:

> *"New Zealand's first choice for integrated infrastructure solutions that build a better, brighter future"*

To support Vector in achieving this vision a number of group goals have been defined as follows:

- Public, employee and contractor safety;
- Vector Customer Index;
- Environmental compliance;
- Business line specific goals, including:
    - Public Reported Escapes (PRE) for gas distribution business;
    - Availability of core network for telecommunications;
    - SAIDI for electricity business; and
    - Reliability of smart meters; and
- EBITDA.

These group goals are also used as key performance indicators to assess and award staff performance bonuses.

The group goals are supported by the strategies of the various Vector business units. Asset management, as captured in this AMP, is a key part of the wider AI business plan and consequently plays an important part in achieving the overall Vector vision.

The manner in which the AMP supports Vector's vision is demonstrated in Figure 2-3.

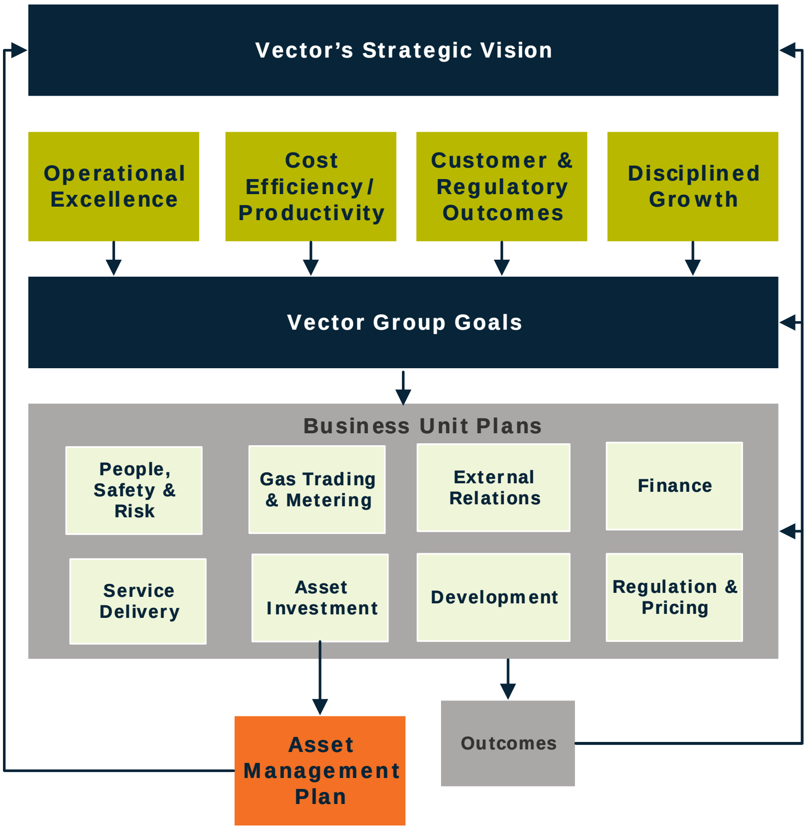

Figure 2-3 : The AMP in support of the overall Vector strategic vision

Table 2-1 below demonstrates how asset management supports Vector to achieve its strategic objectives[3].

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[3] The group goals and initiatives are not in any priority order.

Group Goal	← **Asset Management in support of**
Disciplined Growth	• Investigate new technologies and associated opportunities • Optimise capital contributions • Support commercially attractive investments • Innovation and optimal investment efficiency • Economies of scale from long-term view
Customer and Regulatory Outcomes	• Providing safe and reliable services • Fit-for-purpose network designs • Understanding and reflecting customer needs in designs • Security and reliability levels adapted to customer needs • Meeting regulatory requirements • Maintaining appropriate price/quality trade-off • Detailed five-year expenditure budgets • Strategic scenario planning
Operational Excellence, Cost Efficiency & Productivity	• Safety is a top priority • Full compliance with health, safety and environmental regulations • Needs clearly defined • Understanding risks • Technical excellence • Reliable asset information source • High quality network planning • Effective maintenance planning • Fit-for-purpose network designs • Providing reliable service • Security and reliability levels adapted to customer needs • Easy-to-maintain and operate networks • Investigate new technologies and opportunities offered • Clear prioritisation standards • Clear roles and responsibilities for asset management • Strong, well-documented asset management processes • Clear communication of network standards and designs
People Engagement (enabler for the goals)	• Health and safety, environmental and risk management principles implemented at an asset investment level • Asset management and performance expectations clearly set • Clear roles and responsibilities

Table 2-1 : How asset management supports Vector's group goals

2.3.2 Vector's Vision Driving Asset Management

The previous section indicated how asset management at Vector supports the group's overall vision and goals. Conversely, and very importantly for this AMP, the Vector vision and goals also sets the framework and fundamental parameters for asset management[4]. This is illustrated in Table 2-2.

Group Goal driving	→ **Asset Management**
Disciplined Growth	• Keep abreast of technology changes • Seek optimal commercial outcomes in investment decisions • Innovation and capital efficiency • Optimised network solutions • Optimised investment timing

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[4] The group goals and initiatives are not in any priority order.

Group Goal driving	→ Asset Management
	• New product development and investment where economically viable
Customer & Regulatory Outcomes	• Understanding customer needs and recognising this in decisions • Good project communications • Appropriate price/quality trade-off • Soundly justified investment programme • High quality asset data management • Fit-for-purpose solutions • Security of supply levels appropriate to customer needs • Respond to regulatory quality incentives (when they are introduced) • Keep abreast of technology changes
Operational Excellence, Cost Efficiency & Productivity	• Effective consideration of HS&E in investment and maintenance decisions • Asset decisions reflects safe networks as top priority • Implement high priority projects only • Appropriate to network environment • Maintain appropriate risk levels • Fit-for-purpose solutions • Easy-to-maintain and operate networks • Consistent project prioritisation • Minimising asset environmental impact • Standardisation • Clear roles and responsibilities • Strong, well-documented asset management processes • Clear forward view on upcoming work • Consider service providers' capacity
People Engagement (enabler for the goals)	• Setting KPIs for the Group and individual performance • Technical training and development • Leadership development

Table 2-2 : How Vector's group goals drive asset management

2.3.3 Key Premise for the AMP

On a practical level, incorporating the Vector values and goals in the asset management strategy determines the fundamental assumptions or premise on which the AMP is based. These assumptions[5], listed in Table 2-3 below, reflect the manner in which AI understands and implements Vector's strategic direction.

Key Premise for the AMP	
Safety will not be compromised	• Safety of the public, staff and contractors is paramount. Safety is a focus across the business. • Current safety regulations place the accountability for public safety on Vector as the owner of the assets. This is not expected to change.[6] • Vector fully complies with New Zealand safety codes, prescribed network operating practices and regulations.
The present industry structure remains	• The Vector gas distribution network will continue to operate as a stand-alone, regulated business (not vertically-integrated). Open access of the network will be maintained.

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[5] The assumptions are not listed in any priority order.

[6] This does not absolve Vector's service providers from meeting Vector's health & safety obligations, particularly in respect of public safety – Vector requires full compliance with its health and safety policies from all its service providers. Their performance in this regard is audited on a regular basis and managed under performance-based contracts.

	Key Premise for the AMP
	• Vector's gas distribution network development will continue broadly in the same direction. The existing network will be maintained in accordance with good industry practice, ensuring that sufficient capacity, at appropriate reliability levels, will be retained to meet the needs of Vector's customers.
Existing Vector gas distribution business operation model remains	• Field services will continue to be outsourced. Adequate resources with the relevant skills will be available to implement the works programme to deliver the service to the required level. (Alternative approaches for field services provision were investigated prior to the current field services contracts being awarded. The commercial model for these contracts is continually tested and refined. Any change to the provisions of the contract requires negotiation with the field services providers.)
Current supply reliability levels remain unchanged	• Under the current regulatory arrangement in New Zealand it is imperative that reliability does not materially deteriorate. Under current price quality regulation Vector will therefore ensure reliability levels are maintained. • Customer survey results indicate Vector's customers in general are satisfied with the quality of service they receive, at the price they pay for the service. There is no material evidence to support increased service levels with the associated price increases.
A deteriorating asset base will be avoided	• In general, assets will be replaced when economic to do so, which is likely to be before they become obsolescent, reach an unacceptable condition, can no longer be maintained or operated, or suffer from poor reliability. In a number of instances (where it is technically and economically optimal and safety is maintained), some assets will be run to failure before being replaced.
Regulatory requirements are met	• Regulatory requirements with regards to information disclosure or required operating standards will be met accurately and efficiently.
A sustainable, long-term focused network will be maintained	• Asset investment levels will be appropriate to support the effective, safe and reliable operation of the network. • Expenditure will be incurred at the economically optimum investment stage without unduly compromising supply security, safety and reliability. • New assets will be good quality and full life-cycle costing will be considered rather than short-term factors only. • Networks will be effectively maintained, adhering to international good industry practice asset management principles. • Avoid over design or building excess assets. • Investments must provide an appropriate commercially sustainable return reflecting their risks.
Existing efficiency, reliability and supply quality levels are generally maintained	• At present there is no regulatory incentive to improve reliability and quality of supply. Incentives to improve efficiency are present within the price path mechanism but are relatively weak and the incentives are uneven over a regulatory period, blunting their effectiveness.
Under normal operating conditions, full required demand will be met	• Assets will not be unduly stressed or used beyond appropriate short or long-term ratings to avoid damage. This is part of maintaining a long term sustainable gas distribution network.
Network security standards (for delivery) will be met	• In exceptional cases breaches may be accepted, as long as this is consciously accepted, explicitly acknowledged and contingency plans prepared to cater for asset failure. The security standards are based on the optimal trade-off between providing an economically efficient network and Vector's best understanding of customer requirements and the price/quality trade-offs they would like to make.
Asset-related risks will be managed to appropriate levels	• Network risks will be clearly understood and will be removed or appropriately controlled – and documented as such.
An excessive future "bow-wave" of asset replacement will be avoided	• Although asset replacement is not age-predicated, there is a strong correlation between age and condition. To avoid future replacement capacity constraints or rapid performance deterioration, age-profiles will be monitored and appropriate advance actions taken.
Quality of asset data and information will continue to improve	• Vector's asset management is highly dependent on the quality of asset information. Its information system and data quality improvement programme will continue for the foreseeable future.

Table 2-3 : Key premises for the AMP

These key premises have a direct and major impact on the quality of service provided by the network, the condition of the assets, the levels of risk accepted and the asset expenditure programmes.

2.4 Changing External Outlook

New Zealand has yet to experience a sustained economic recovery following the recession of 2008/09. Recent events around the world, and in particular in Europe where several countries face sovereign debt issues, could influence the economic recovery in New Zealand. Acceleration in the current slow growth trend for gas demand is therefore not anticipated in the foreseeable future.

2.5 Asset Management in the Wider Vector Context – Internal Stakeholders

Asset management at Vector is not practised in isolation. It is heavily reliant on inputs from the various parts of Vector, either directly or indirectly. The AMP provides visibility of asset management activities to the rest of Vector, for incorporation into the broader business plans and strategies. This two-way support flow is illustrated in Figure 2-4 and Figure 2-5.

Figure 2-4 : Interaction with the rest of Vector - the flow into asset management

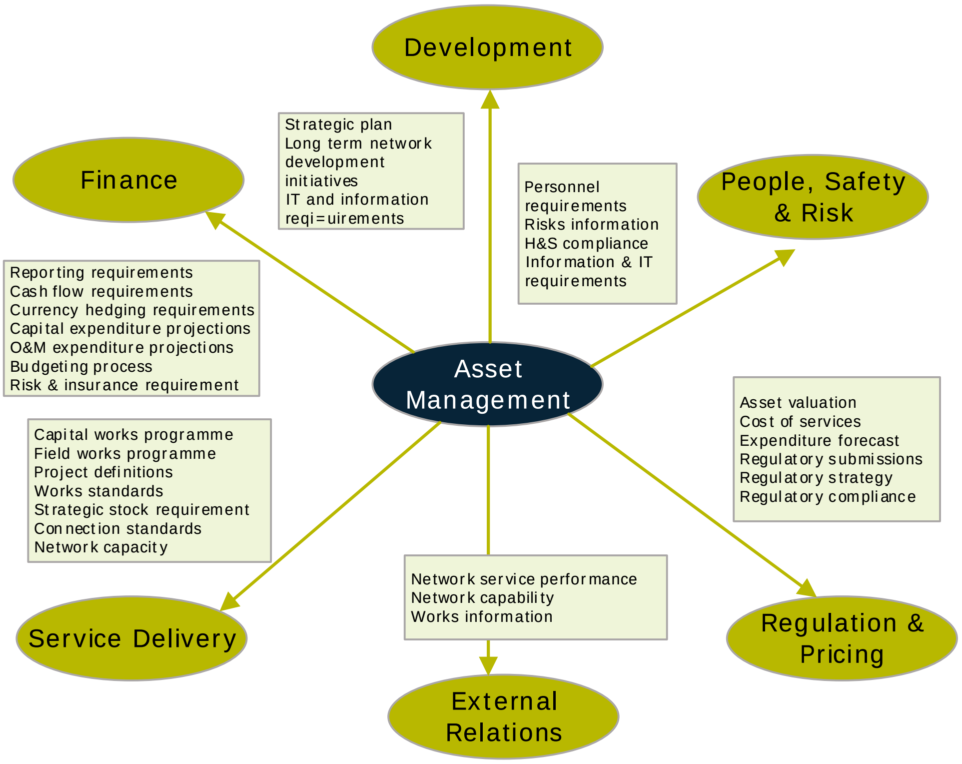

Figure 2-5 : Interaction with the rest of Vector - the flow from asset management

2.5.1 Communication and Business Participation in Preparing the AMP

As part of business-as-usual, there is ongoing close communication and cooperation between the various business units in Vector and the asset management team. This is considered key to the success of Vector.

With respect to the preparation of the AMP, the following action plan has been prepared to guide its development and implementation, and to communicate the strategies and activities to the relevant parties.

Step	**Description**
1	Inform staff involved in the preparation of the AMP of the evolving information disclosure requirements (what information to be provided) and definitions of terms used to ensure consistency in the presentation of the AMP.
2	Reinforce the asset management strategies (risk assessment, maintenance strategies, network development standards, etc) and how these relate to the corporate goals. This strengthens the focus of the Asset Management Plan on the objectives of the Plan.
3	Information requirements include: • Reiteration of requirements under the previous regime (that are still required under the current regime) that require attention • New or additional (to the previous regime) requirements • Key issues include (but not limited to): o Definition of capex and opex categories o Asset categories and asset classes o Planning period and disclosure year

Step	Description
	o Price inflation factor o Key assumptions o Options analysis and justifications for near term projects o Service levels targets and performance level o Capability to deliver works programme o Asset Management Maturity Assessment Tool (AMMAT).
4	Identify data and information requirements.
5	Notify relevant parties of information systems and accounting structure needed to provide the required information in the required format.
6	Inform staff of the structure of the disclosure AMP and the time line for preparing the AMP.
7	Identify the assumptions to be used in preparing the disclosure AMP (demand forecast, cost estimation, escalation, etc.).
8	Assess the deliverability of the works programme (within the next two years). Seek input from project managers and field service providers.
9	Allocate responsibilities for preparation of the AMP.
10	Engage with staff and field service providers to seek input prior to finalising the AMP.
11	Circulate the drafts of the AMP to interested parties (External Relations, SD, Finance, Regulatory, IT) within Vector for inputs and comments.
12	Seek staff input / comments on risk assessment and service performance aspects of the AMP.
13	Finalise the AMP taking into account relevant inputs and comments received.
14	Seek comments and approval from executives prior to seeking board approval.
15	Upon approval of the AMP (and associated budgets), organise staff to prepare works programme (including detailed designs, etc) for the next two years and communicate the works programme to staff and service providers.
16	Present highlights of the AMP (asset management strategies and policies, how they support Vector's goals, works programmes, etc) to staff and field services partners involved in asset management activities.
17	Reiterate Vector's aim for achieving capital efficiency (including its goals and past achievements and respective staff KPIs).
18	Monitor project and works programme progress against plan. Monitor expenditure against budget.

Table 2-4 : AMP Action Plan

2.6 Asset Management in the Wider Vector Context – External Stakeholders

Vector has a large number of internal and external stakeholders that have an active interest in how Vector's assets are managed. The essential service nature of the gas distribution service Vector provides, and its importance to the Nation's well-being and economy, creates a keen interest in how Vector conducts its business.

In Figure 1-6, the important external stakeholders to Vector are highlighted. Understanding of how these stakeholders interact with Vector and the requirements or expectations they have of Vector has a major bearing on the manner in which Vector constructs and operates the gas distribution networks.

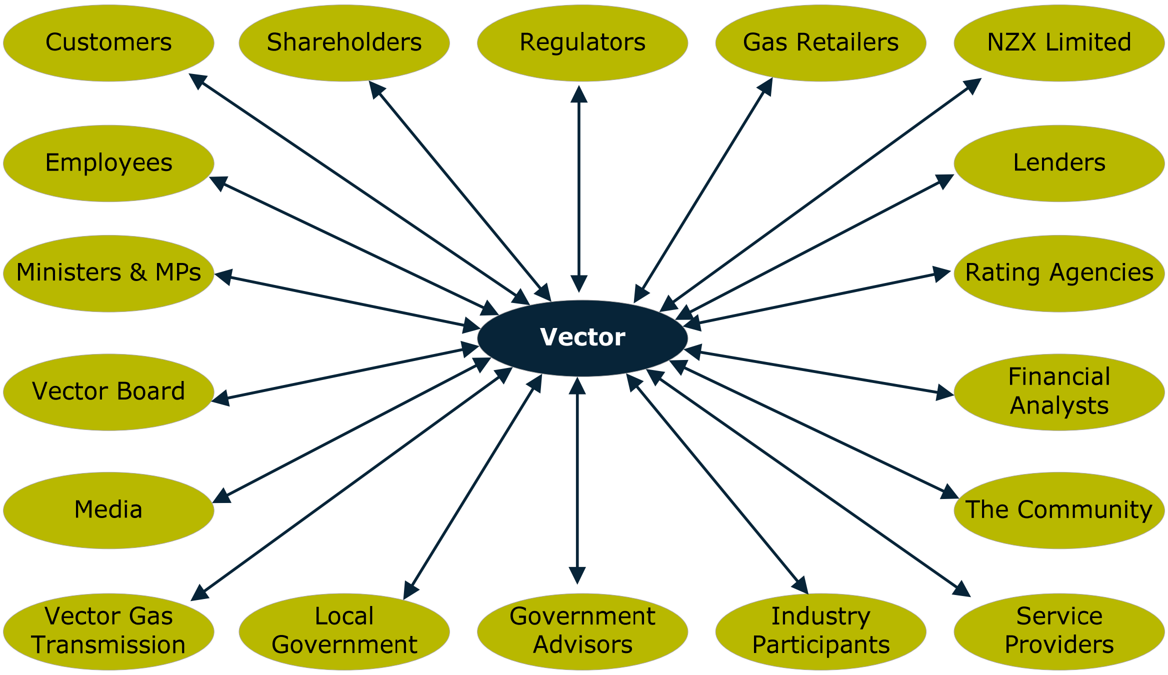

Figure 2-6 : Vector's key external stakeholders

2.6.1 Stakeholder Expectations

Important stakeholder expectations[7] are listed in Table 2-5 below.

Customers (and End-Use Consumers)	
Health and safety	Reliable supply of gas
Quality of supply	Planned outages
Security of supply	Timely response to complaints and queries
Efficiency of operations	Information in fault situations
Reasonable price	Environment
Timely response to outages	Timely connections
Innovation, solution-focus	
Shareholders	
Health and safety	Regulatory and legal compliance
Sustainable growth	Prudent risk management
Sustainable dividend growth	Good reputation
Reliability	Good governance
Confidence in board and management	Clear strategic direction
Accurate forecasts	Return on investment

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[7] The stakeholders and their expectations are not listed in any order of priority.

Retailers

- Health and safety
- Reliability of supply
- Quality of supply
- Managing any customer issues
- Information in fault situations
- Ease of doing business
- Good systems and processes

Regulators

- Health and safety
- Statutory requirements
- Accurate and timely information
- Inputs on specific regulatory issues
- Input into policy proposals and initiatives
- Fair and efficient behaviour

Vector Board

- Health, safety and the environment
- Regulatory and legal compliance
- Good governance
- Accurate and timely provision of information
- Expenditure efficiency
- Prudent risk management
- Security and reliability of supply
- Return on investment
- Accurate budgeting

NZX Limited

- Compliance with market rules
- Good governance

Financial Analysts/Rating Agencies/Lenders

- Transparency of operations
- Accurate performance information
- Clear strategic direction
- Adhering to the NZSX listing rules
- Adhering to the NZDX listing rules
- Prudent risk management
- Good governance
- Accurate forecasts
- Confidence in board and management

Service Providers

- Safety of the work place
- Stable work volumes
- Quality work standards
- Maintenance standards
- Clear forward view on workload
- Construction standards
- Innovation
- Consistent contracts
- Clearly defined processes
- Good working relationships

Government Advisors

- Public safety
- Workplace safety
- Vector's views on specific policy issues
- Efficient and equitable markets
- Innovation
- Infrastructure investment
- Reduction in emissions
- Accurate and timely provision of information

Ministers and MPs

- Public safety
- Workplace safety
- Reliable supply of gas
- Efficient and equitable markets
- Industry leadership
- Security of supply
- Investment in infrastructure and technologies
- Environment
- Good regulatory outcomes
- Energy and supply outage management

Local Government

- Public safety
- Environment
- Support for economic growth in the area
- Visual and environmental impact

Coordination between utilities	Compliance
Sustainable business	
Community	
Public safety	Engagement on community-related issues
Good corporate citizenship	Improvement in neighbourhood environment
Gas safety programme	Visual and environmental impact
Energy Industry	
Health and safety	Policy inputs
Leadership	Influencing regulators and government
Innovation	Sharing experience and learning
Participation in industry forums	
Gas Transmission	
Effective relationships	Well maintained assets at the networks interface
Ease of doing business	Co-ordinated approach to system planning and operational interfaces
Secured source of supply	Sharing experience and learning
Media	
Effective relationship	Information on Vector's operations
Access to expertise	

Table 2-5 : Stakeholder expectations

Vector ascertains its stakeholders' expectations by, amongst other things:

- Meetings and discussion forums;
- Consumer engagement surveys;
- Engagement with legislative consultation processes;
- Employee surveys (Pulse surveys);
- Annual planning sessions;
- Direct liaison with customers;
- Membership on industry working groups;
- Feedback received via complaints and compliments;
- Investor roadshows and annual general meetings;
- Analyst enquiries and presentations;
- Monitor analyst reports;
- Media enquiries and meetings with media representatives; and
- Monitoring publications and media releases.

Vector accommodates stakeholders' expectations in its asset management practices by, amongst other things:

- Due consideration of the health, safety and environmental impact of Vector's operations;
- Providing a safe and reliable gas distribution network;
- Quality of supply performance meeting consumers' needs and expectations, subject to price / quality trade off;

- Optimisation of capital and operational expenditures (capex and opex);
- Maintaining a sustainable business that caters for consumer growth requirements;
- Comprehensive risk management strategies and contingency planning;
- Compliance with regulatory and legal obligations;
- Security standards reflecting consumers' needs and expectations, subject to price / quality trade off;
- Network growth and development plans;
- Provision of accurate and timely information;
- Development of innovative solutions; and
- Comprehensive asset replacement strategies.

2.6.2 Addressing Conflicts with Stakeholder Interests

In the operation of any large organisation with numerous stakeholders with diverse interests, situations will inevitably arise where not all stakeholder interests can be accommodated, or where conflicting interests exist. From a Vector asset management perspective, these are managed as follows:

- Clearly identifying and analysing stakeholder conflicts (existing or potential);
- Having a clear set of fundamental principles drawing on Vector's vision and goals, on which compromises will normally not be considered (see the list in Section 2.3);
- Effective communication with affected stakeholders to assist them to understand Vector's position; and
- Where Vector fundamentals such as safety are not compromised, seeking an acceptable alternative or commercial solution.

Other aspects considered when assessing aspects impacting on stakeholder interests or resolving conflicts include:

- Health and safety;
- Cost/benefit analysis;
- Central and local government interface and policies;
- Commercial and technical regulation;
- Long-term planning strategy and framework;
- Environmental impacts;
- Societal and community impacts;
- Legal implications;
- Sustainability of solutions (technically and economically);
- Works/projects prioritisation process;
- Security and reliability standards;
- Quality of supply;
- Risks; and
- Work and materials standards and specifications.

At a practical level in relation to asset management, Vector has developed an extensive set of asset management and investment policies, guidelines and standards which implicitly embrace practical solutions to the requirements of stakeholders. These policies and standards provide guidance to the safe operation and maintenance of the gas network assets. At an investment decision level, a project prioritisation matrix (Table 9.3) has been developed to provide guidance on the selection of projects for implementation.

2.7 Asset Management Structure and Responsibilities

This section discusses how gas distribution asset management currently operates at Vector. It is based on a functional rather than organisational structure and therefore discusses how the functions are structured according to the business units within the Vector Group. It does not distinguish between functions undertaken by particular legal entities within the Group.

2.7.1 Vector Senior Level Structure

The Vector senior level structure is provided in Figure 2-7 below. Vector is split into several functional areas, each with a responsible general manager.

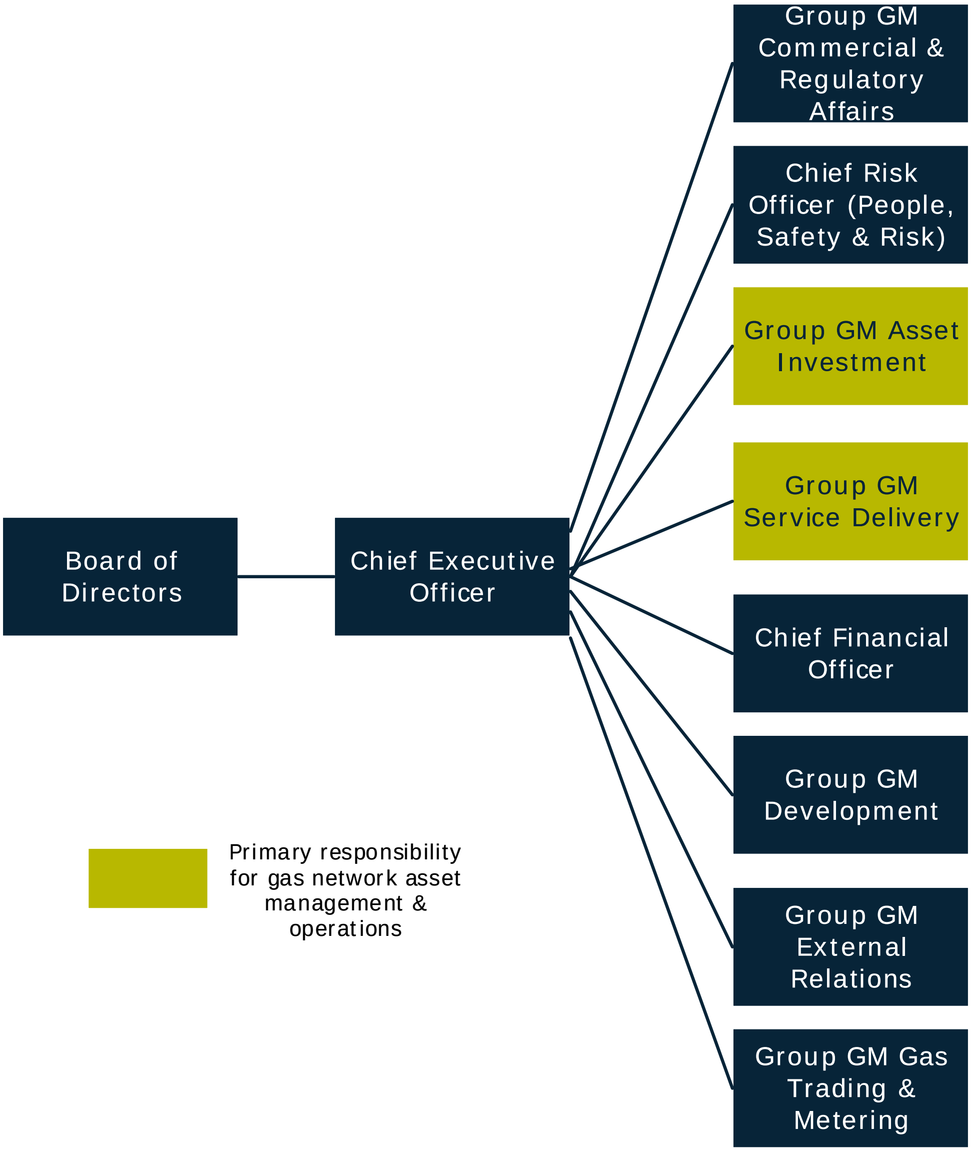

Figure 2-7 : The Vector senior management structure

The primary responsibility for the asset management of the gas distribution network lies with the Group General Manager Asset Investment. The service provider function for the gas distribution network is primarily fulfilled by the SD group, under the Group General Manager Service Delivery. The role these two business units play in asset management is further discussed in Section 2.7.2 and Section 2.7.3.

In summary, the responsibilities of the other groups are as follows:

- Commercial and Regulatory Affairs

  Responsible for interaction with the industry regulators, monitoring regulatory compliance, developing regulatory strategies, gas and electricity transmission, making regulatory submissions, setting gas pricing, developing pricing strategy and asset valuation, key customer relationships, mass market customer relationships, commercial strategies and energy consumption projections.

- People, Safety & Risk

  Enterprise risk management, health, safety and environmental policies, information & knowledge management, human resources support, training and development, recruitment, personnel performance management, business continuity management, internal audit and internal control, and strategic insurance.

- Finance

  Financial accounting and reporting, budgeting, treasury, management accounting, tax management, corporate development, properties, business analytics and insurance.

- Development

  Group legal services, company secretary, corporate initiatives, solar programme, business and data systems, IT support, computer hardware and software support and maintenance, cyber-security, economic analysis, communications strategies, Vector's Fibre and Communications business.

- External Relations

  Public affairs, government relations, marketing services and strategic relations.

- Gas Trading and Metering

  Wholesale gas business, liquid petroleum gas (LPG) business and metering services.

2.7.2 The Asset Investment Group

As the Asset Manager, the primary responsibility for the management of the gas distribution network and preparation of the AMP lies with the AI group. In broad terms, this group is responsible for:

- Setting gas distribution network security standards;
- Supporting Vector's development and implementation of a Safety Management System;
- Ensuring asset investment is efficient and provides an appropriate commercially sustainable return to Vector's shareholders;
- Ensuring the configuration of the gas distribution network is technically and economically efficient, meets customer requirements, and is safe, reliable and practical to operate;
- Planning network developments to cater for increasing gas demand and customer requirements;
- Ensuring the integrity of the existing asset base, through effective renewal, refurbishment and maintenance programmes;

- Preparing detailed engineering design for projects, including engagement of design consultants;
- Keeping abreast of technological and consumption trends, assessing the potential impact thereof and devising strategies to effectively deal with this in the long-term network planning; and
- Maintaining current and accurate information about the extent and performance of the network and assets.

The AMP is the prime document that captures how the above functions are discharged.

In Figure 2-8 the structure of the AI group is expanded, emphasising the asset management responsibilities.

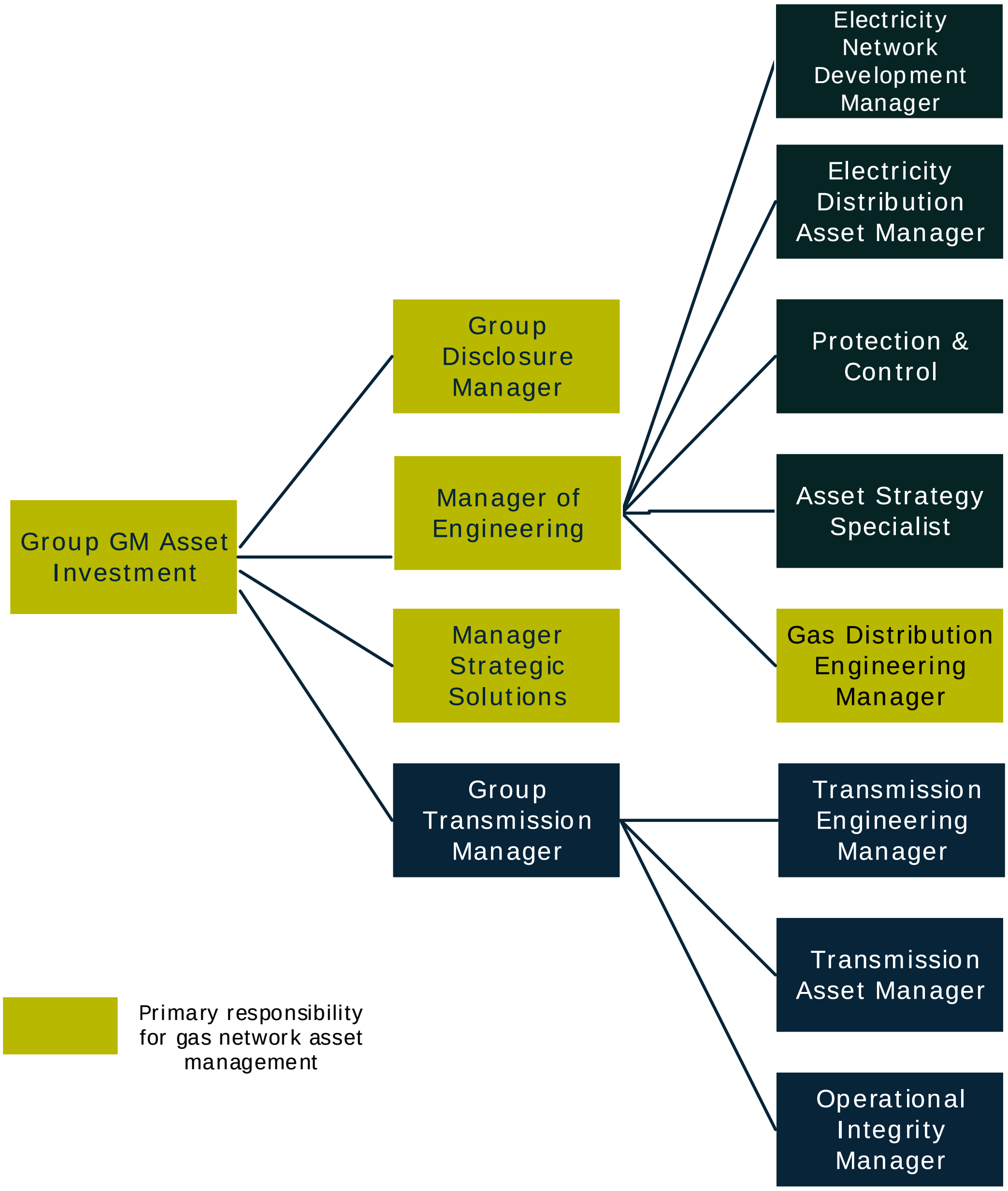

Figure 2-8 : The Asset Investment management structure supporting the AMP

2.7.3 The Service Delivery Group

In Vector's asset management model, the service provider function is predominantly fulfilled by the SD group. In conceptual terms, the AI team defines what assets are required, when and where, and how these should be operated and maintained, while the SD group delivers on providing, operating and maintaining the assets.

The SD group has a wide brief but the key functions as far as it relates to asset management, or the provision of the service provider function for the gas distribution network, are illustrated in Figure 2-9 and further expanded below.

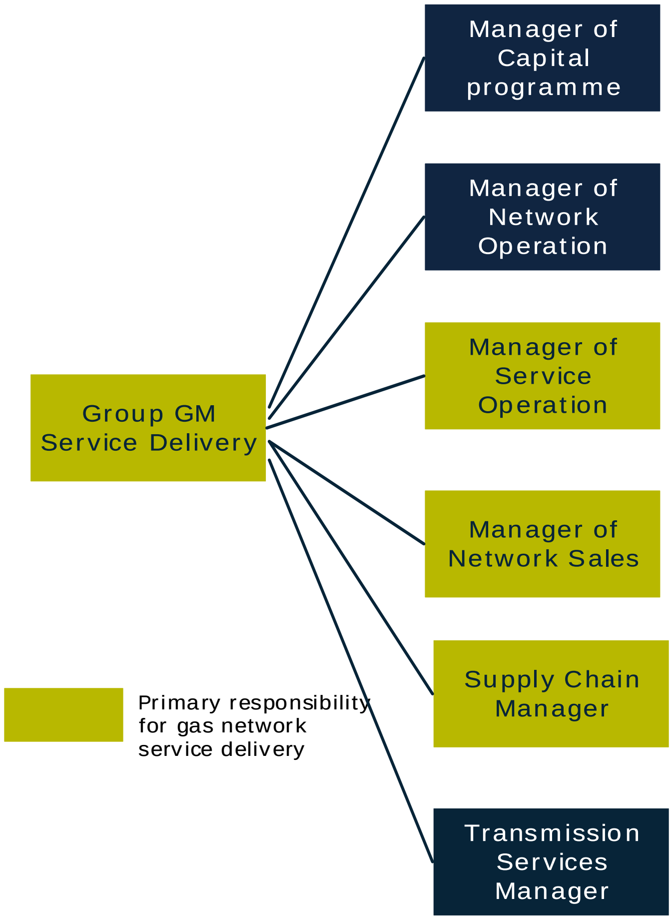

Figure 2-9 : Service Delivery as an asset management service provider

2.7.3.1 Service Operations

The Service Operations section is responsible for the maintenance and day-to-day safe operation of the gas distribution network including planning network configuration; managing, reporting and investigating incidents and contingency management.

The Service Operations section is also responsible for the delivery of infrastructure projects and customer connections including detailed project engineering and cost estimates, as well as project and contract management services. Vector does not have an in-house construction section for the gas distribution network. Construction work is predominantly undertaken by our contracted Service Provider partners (Northpower and Electrix), which were selected through a competitive tender process. In some instances work is also done by other contractors sourced on a competitive tender basis.[8]

The AI engineering group manages the overall capital budget and is responsible for setting and controlling this, including obtaining the necessary expenditure approvals through the Vector governance process. After expenditure is approved, SD manages the individual projects and associated expenditure.

The maintenance of the gas distribution network is undertaken in conjunction with Vector's Service Provider partner (Electrix), who was selected through a competitive tender process.

The Service Operations section interacts with Asset Management in various areas, including:

- Managing the end-to-end project delivery process;
- Work scopes and project briefs;
- Detailed project engineering, including appointment of design consultants;
- Detailed project cost estimation;
- Reporting on project progress;
- Expenditure tracking and forecasting;
- Construction and commissioning standards;
- Project close-out and capturing learning;
- Implementation of asset maintenance policies;
- Providing asset information for AI to set maintenance budgets;
- Feedback on asset performance and customer issues; and
- Investigating asset failures.

2.7.3.2 Supply Chain

The Supply Chain section manages procurement of major assets for Vector. Since the bulk of these assets are procured for capital delivery projects this activity is closely linked to Asset Management, including:

- Preparation of asset (contract) specifications;
- Selection of equipment suppliers;
- Supply line negotiation;
- Tender awards; and
- Equipment cost-estimation.

2.7.3.3 Network Sales

The Network Sales team manages the relationship with commercial customers and subdividers and arranges the necessary network extensions to enable connection of new customers.

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[8] Works provided by our contracted Service Providers are still managed through a competitive bid process, although it may not be put out to open tender on a project by project basis.

2.7.4 Asset Management Activities by Other Groups

While the bulk of gas distribution network asset management activities are performed by the AI group, supported by the SD group, as noted in Section 2.5 the rest of Vector has many inputs. Most of these inputs are indirectly related to the assets themselves, but there are the following exceptions, where gas-related assets are directly sourced and incorporated by others.

2.7.4.1 External Relations

The External Relations group is responsible for setting and measuring the service experience that customers on Vector's networks should receive for connection, faults repair and other services.

2.7.4.2 Information Technology (part of Development group)

There is increasing overlap in the real-time operation of gas distribution network assets and corporate-wide information technology services. Not only does Asset Management require increasingly sophisticated information systems, but the traditional SCADA/telemetry systems are, over time, becoming less of a stand-alone application with unique requirements and protocols, and more of an integrated IT network application. Increased cyber-security of both SCADA and telemetry has to be provided for.

Procurement and implementation of Asset Management and IT support systems, and the core SCADA equipment, is managed by the Information Technology group.

2.7.4.3 Vector Communications (part of Development group)

Vector Communications manages Vector's fibre optic network, for internal and external clients. They provide a major part of the SCADA/Telemetry system – the communication link between the Sky Tower and Vector's offices at Carlton Gore Road in Auckland. Provision of this service is on a strict commercial basis, with the AI group treated similar to external clients and charged on the same basis.

2.7.5 Field Service Model

Vector's business model for operating and maintaining its gas distribution network assets is to outsource much of this work to Field Services Providers (FSPs).

After an extensive investigation in 2008/09 it was decided to retain the outsourcing model. Through a competitive process, Vector selected Electrix Ltd as the maintenance contractor for the gas distribution networks. Electrix is responsible for the preventative, corrective and reactive maintenance works of the gas distribution network.

Other outcomes of the review included establishing new key performance indicators (KPIs) and a new framework with guiding principles to manage the working relationships between Vector and the FSP. The objective of the business model is to improve the efficiency and quality of the delivered services to Vector and its customers.

2.8 AMP Approval Process

Approval of the disclosure AMP is sought at the September 2013 board meeting.

This AMP is subject to a rigorous internal review process, initially within the AI group (the developer of the Plan), and then by the Regulatory, External Relations, Financial and SD groups as well as external experts. Finally, the AMP is reviewed and certified by the board, in accordance with the Gas Distribution Information Disclosure Determination 2012[9].

2.8.1 Alignment with the Vector Budgeting Process

Vector operates under a July to June financial year. This matches with the regulatory year. The Asset Management planning processes and documents form a key input into the budgeting process. These contain detailed, prioritised breakdowns of the gas distribution network expenditure requirements identified by AI for the next five years, with supporting evaluation for the individual projects or programmes. This is intended to assist the executive with the budget process, clarifying the gas distribution network priorities and also prioritising these along with other business investment needs.[10]

2.8.2 The Expenditure Forecasting Process

In Figure 2-10 the forecast process for capex projects in the AMP is illustrated. This process follows the following steps:

- The overall capital works programme is divided into different work categories. A plan covering the next five-year period is first developed for each work category (based on the asset management criteria for that work);
- A works programme is then drawn up and the corresponding capex to implement the works programme is developed. This is an unconstrained estimate;
- The prioritisation process described in Section 9 is then applied to the projects and programmes within the work category. This identifies projects that could be left out from the programmes without undue negative consequences. Through this, it is possible to set an upper and lower boundary for the expenditure levels;
- Discussions then take place with Service Delivery (and Service Providers) to ensure the required resources and skills to complete the works programme are available, and appropriate adjustments made prior to the works programme being finalised; and
- An overall prioritisation process is then applied to the combined suite of network projects, to develop the final AMP forecast for combined capex.

As noted before, the accuracy of forecasts further out in the planning period diminishes. The capital forecasts for years six to ten are based on a combination of projects foreseen at this stage and trend analysis for other types of projects. Project prioritisation for this period is indicative only.

A similar process is adopted for the operation and maintenance expenditure forecasts, which are prepared in conjunction with Service Delivery.

2.9 Asset Management Decisions and Project Expenditure Approval

Implementation of the AMP requires decisions to be made by management and staff at all levels, reflecting their functional responsibilities and level of delegated financial authorities (DFAs), as set in accordance with the Vector governance rules. Functional responsibilities define the role of each staff member in Vector. The DFAs specify the level of financial commitment that individuals can make on behalf of Vector.

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[9] Schedule 17 of the Gas Distribution Information Disclosure Determination 2012

[10] As with all companies, Vector does not have unlimited cash resources, and competing investment needs and commercial opportunities have to be balanced.

Investment decisions are budget-based, with the board approving yearly budgets before any commitment can be made. Preliminary project approval is normally given through the annual (one-year) budgeting process, but projects are not individually assessed in detail at this stage. Project-specific capex approval therefore still has to be granted for all projects prior to committing capital, despite these having been included in the approved annual budget. The detailed project approval process has been developed in accordance with the Vector DFA system. The Board is not bound to giving approval to the programmes and projects included in the AMP as the key factors affecting investment may be subject to change.

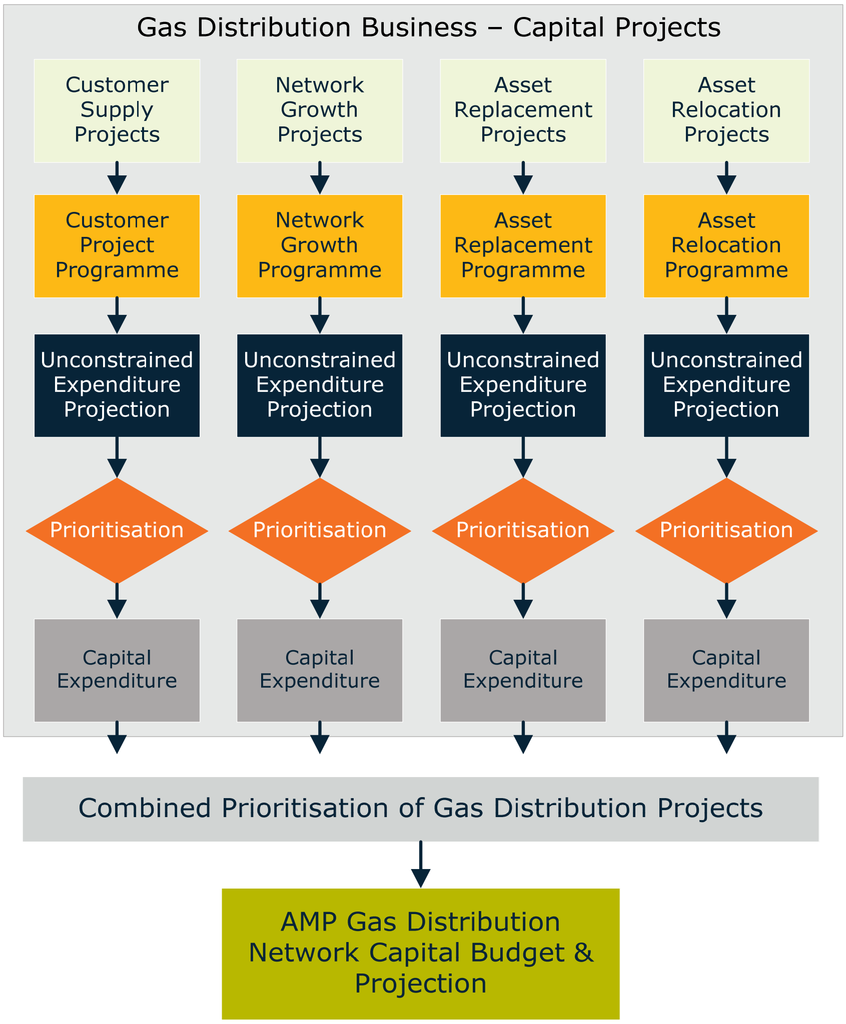

Figure 2-10 : Capex forecasting process adopted for the AMP

Critical unbudgeted investments will be taken to the board for consideration at any stage of the financial year, if supported by a robust business case or arising from an urgent safety, reliability or compliance issue.

Applications for expenditure approval must be supported by formal business cases. Each business case contains information on the expenditure objective, constraints and assumptions, strategic fit, options investigated, project time line, resources required and available, project deliverability, cost benefit analysis, return on investment and risk assessment. This assists Vector management to assess and approve investment applications.

2.10 Progress Reporting

Performance against the annual budgets is closely monitored, with formalised change management procedures in place. Regular reports are sent to the Vector board regarding:

- Health, safety and environmental issues;
- Monthly report on overall expenditure against budget;
- Progress of key capital projects against project programme and budget;
- Reliability performance – SAIDI, SAIFI;
- Response time to emergencies (RTE);
- Public report escapes (PRE); and
- Progress with risk register actions (the board has a risk committee with a specific focus on risks to the business).

2.11 Asset Management Processes

The diagram in Figure 2-11 shows the high level asset investment process within Vector. This highlights the relationship between the different asset creation and evaluation processes within Vector.

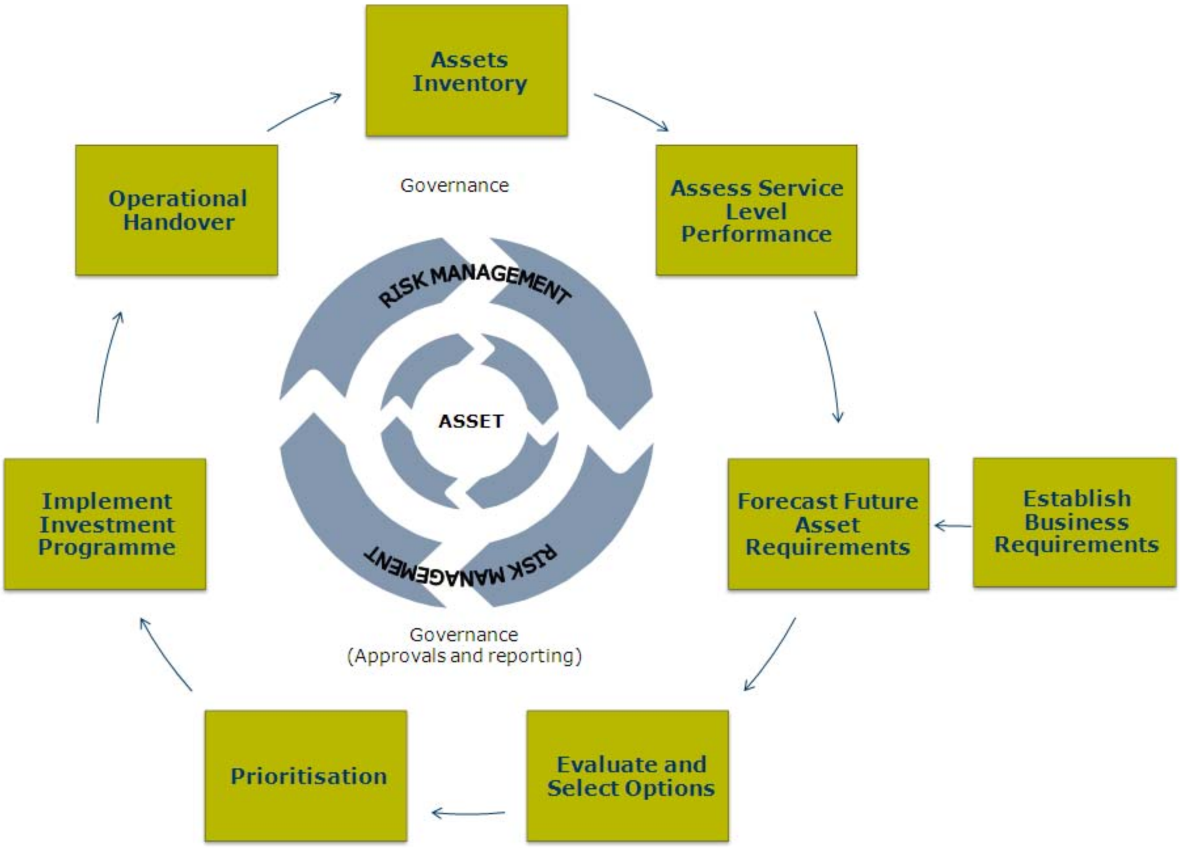

Figure 2-11 : High-level overview of the Vector asset investment process

Assets Inventory

Information on the quantity, age and capability of existing assets is essential to understand and effectively manage the asset base. Information on the existing assets and network configuration is set out in Section 3 and Section 6 of this AMP.

The asset register, geographical information system (GIS) and associated databases store cost information and technical characteristics for all assets, including their location, history and performance. The way in which information systems support Asset Management processes is described in Section 7.

Assess Service Level Performance

Information on the performance, utilisation and condition of existing assets and the different parts of the network is needed to forecast future investment, renewal or upgrading requirements and improve service level. This requires ongoing monitoring of asset condition and network performance, the consumption of resources associated with maintaining the assets, and the efficiency and effectiveness with which assets are utilised (including network configuration). Information on the condition and performance of existing assets and on the network configuration is set out in Section 4, Section 5 and Section 6.

Establish Business Requirements

The levels of service required from the gas distribution network are guided by the wider business requirements. These requirements in turn are determined by Vector's operating environment and reflect corporate, community, environmental, financial, legislative, institutional and regulatory factors together with stakeholder expectations.

Section 2 sets out the background and business requirements that drive the AMP. Service levels are described in Section 4, Section 5 and Section 6.

Forecast Future Asset Requirements

The combination of asset condition and performance drivers, load demand and the business requirement drivers form the basis for assessing future asset needs and the resulting network development plans. Section 4, Section 5 and Section 6 discuss this information.

Evaluate and Select Options

Once the future network or asset requirements are established, options for addressing these needs have to be evaluated and potential solutions have to be identified. Decision tools and systems used to support the evaluation of options include network modelling and analysis, effective capital budgeting techniques, optimised renewal modelling, life-cycle costing, risk assessments and geographic information. At the same time, the feasibility of non-network or unconventional solutions to address network requirements is also considered.

Vector broadly categorises asset investment planning in two main streams:

- Network development planning is undertaken to ensure service target levels are met in an environment of increasing load (demand) growth, or increased customer quality expectations. It is based on systematic analysis of maximum demand trends, consumer requests and demographic estimates. Vector's approach to network development planning is set out in Section 5; and
- Asset maintenance and replacement planning is undertaken to ensure assets remain fully functional for their reasonably expected lifespan when operating within design ratings. It also includes activities to prolong asset lives or to enhance asset

performance. Maintenance planning addresses both capital investments on renewal or refurbishment, or long, medium and short-term asset maintenance. Vector's approach to maintenance planning is set out in Section 6.

Prioritisation

Prioritisation is a process that ranks all projects identified during the network development and maintenance planning processes. This process ensures only projects that meet Vector's investment thresholds – which encompass safety, commercial and technical considerations - are included in the project programme.

Projects also undergo a second prioritisation process, to compare investment needs across Vector. This is to ensure the best use of available resources on a Vector-wide basis.

The way Vector prioritises gas asset capital investment projects is discussed in Section 5, Section 6 and Section 9.

Implement Investment Programme

Budgets are prepared on a cash-flow basis mirroring expected expenditure based on works programmes. The board approves the overall expenditure on an annual cycle and project expenditure on the larger projects in accordance with DFA governance rules. While most projects are delivered in the financial year, the delivery of larger projects, such as low pressure pipeline replacement, may straddle financial years. Budgetary provision is made in the year expenditure will be incurred.

The implementation of solutions identified as part of the Asset Replacement (Section 6) or Planning Process (Section 5) is managed by SD. This team also manages the maintenance programmes, liaising directly with the Service Providers.

Operational Handover

Once construction and installation is completed, a formal handover process takes place. The process is designed to check the quality of work and equipment meets Vector's standards and the assets are constructed to allow maintenance in accordance with Vector's maintenance standards. It also includes a walkover between the Project Manager, a Service Delivery representative and the asset specialists who take assets over and implement the maintenance regime and the contractors who manage the assets on Vector's behalf. The GIS record is updated with the new assets as well as the Asset Life Information System (ALIS) database.

Governance (Approvals and Reporting)

Formal approval (budgets and expenditures) and reporting (progress and risks) processes are in place to satisfy Vector's Corporate Governance requirements.

Risk Management

Risk management underpins all Asset Management business processes and forms an important part in defining project requirements (discussed in Section 8).

2.12 Works Coordination

2.12.1 Internal Coordination

Over the last few years, Vector has put extensive effort into continuously improving the coordination of the various activities associated with the delivery of the capital works programme with the objectives of better utilisation of resources, enhancing capital efficiency and delivering improved customer outcomes. Improvement initiatives have included:

- Enhanced reporting in SAP to capture project forecast information; and
- Improved processes and communication between project initiators, network planners, asset specialists, designers and project managers.

In addition to its gas distribution networks, Vector operates electricity networks, a gas transmission system and a fibre optic telecommunication network. To maximise the synergy benefits that can be achieved from cooperation, and to deliver projects in the most effective, least disruptive manner, effective coordination of capital works between these business units is essential. Significant improvement in delivery has been achieved over the last couple of years through the implementation of these initiatives.

2.12.2 External Coordination

As well as internal coordination, new processes have also been put in place to improve coordination between Vector and other utilities, roading authorities, local councils and their service providers. These works coordination processes are focused on maintaining effective communication channels and effective working relationship with external agencies, identifying cost effective future proofing opportunities, minimising disturbance to the public as a result of infrastructure works, streamlining works processes and meeting Vector's regulatory obligations.

It is important for Vector to be cooperative and supportive in its relationships with other agencies. In the past this has resulted in a number of win-win outcomes.

2.13 Other Asset Management Documents and Policies

Vector has a number of other documents used to capture Asset Management policies and procedures. Including all of these in one document would produce an unwieldy, impractical plan. In addition, there are a number of Vector-wide policies that have a direct bearing on asset management.

2.13.1 Other Asset Management Documents

The AMP is supported by a collection of detailed Asset Management documents, guidelines and policies in the following areas (not in any order of priority):

- Asset management and investment;
- Network quality and security;
- Detailed asset maintenance;
- Network design and construction;
- Network equipment;
- Risk management;
- Contracts management;
- Procurement;
- Health and safety;
- Environmental;
- Asset rehabilitation;
- Asset settlement;
- Network contingency plans;
- Network projects quality assurance; and

- Drug and alcohol management.

In addition to the policies, Vector has also developed a suite of work practice standards and guidelines and equipment specifications to guide its service providers in the course of implementing the works programme. These standards, guidelines and specifications can be found on Vector's internal communications website.

2.13.2 Other Vector Policies Affecting Asset Management

Vector has a number of business policies[11] designed to help the business to operate efficiently and effectively. Many of these interact with, or impact on, the Asset Management policies and this AMP.

Business:

- Code of conduct;
- Legal compliance policy;
- Protected disclosure policy;
- Remuneration policy;
- Customer credit policy;
- Foreign exchange policy;
- Expense management policy;
- Delegated financial authority policy;
- Drug and Alcohol policy;
- Network WIP (work-in-progress) management policy;
- Network fixed asset creation and disposal policy; and
- Capex policy.

Information Technology:

- Access policies;
- Password and authentication policy;
- Network management policy;
- Internet use policy;
- E-mail policy;
- Access control policy;
- Antivirus policy;
- Communications equipment policy;
- Computer systems and equipment use policy;
- Cyber crime and security incident policy;
- E-commerce policy;
- Firewall policy;
- Hardware management policy;

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[11] These policies are not listed in any order of priority.

- Information technology exception policy; and
- Information technology general user policy.

2.14 Review of Vector's Asset Management Practice

2.14.1 Asset Management Maturity Assessment (AMMAT)

In terms of the Gas Distribution Information Disclosure Determination 2012, the Commerce Commission now requires its Asset Management Maturity Assessment Tool (AMMAT) to be applied by all gas distribution businesses. This tool, which is an extract from the British Standards Institute PAS55 (2008) Asset Management Model, is intended to facilitate a self-reflection on the maturity of asset management at each business and to highlight areas for possible improvement.

Vector is not convinced that the AMMAT, or indeed PAS55, is necessarily an appropriate tool to measure asset management maturity for New Zealand electricity distribution businesses. Over the years Vector has been striving to strike an appropriate balance between operating efficiency and the increased workload and bureaucracy associated with adopting formal asset management standards (such as PAS55). As discussed in section 2.14.2, our asset management practices are independently reviewed by international experts on a regular basis, and have repeatedly been found to be aligned with best industry practices.

Nonetheless, to comply with the Information Disclosure Determination (2012), Vector has applied the AMMAT. Vector's self-assessment was carried out in a workshop setting by the group of middle managers responsible for the various facets of asset management at Vector. The results were reviewed by the senior executives in charge of the Asset Investment and Service Delivery groups. The assessment was carried out in accordance with guidelines provided by the Commerce Commission and also the Electricity Engineers' Association (EEA) [12].

The AMMAT is essentially a series of questions against which a business has to assess its maturity level. Maturity is measured on a 5-point scale, defined as follows (by the EEA):

- **Maturity Level 0**

  The elements required by the function are not in place. The organisation is in the process of developing an understanding of the function.

- **Maturity Level 1**

  The organisation has a basic understanding of the function. It is in the process of deciding how the elements of the function will be applied and has started to apply them.

- **Maturity Level 2**

  The organisation has a good understanding of the function. It has decided how the elements of the function will be applied and work is progressing on implementation.

- **Maturity Level 3**

  All elements of the function are in place and are being applied and are integrated. Only minor inconsistencies may exist.

- **Maturity Level 4**

  All processes and approaches go beyond the requirements of PAS 55. The boundaries of asset management development are pushing to develop new concepts and ideas.

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[12] Electricity Engineers' Association, "Guide to Commerce Commission Asset Management Maturity Assessment Tool (AMMAT)", October 2012

As part of the maturity self-assessment, Vector also considered the maturity level it desires to achieve. On all assessment questions, the Vector goal is set at maturity level 3. While achieving level 4 could be desirable in some instances, the cost and effort this would involve is generally considered to exceed the value it would add to Vector's operations.

The result of Vector's self-assessment is provided in 6 below. More commentary on the response to individual questions is included in Appendix 6.

Question No.	**Function**	**Question**	**Rating**				
			0	**1**	**2**	**3**	**4**
3	Asset management policy	To what extent has an asset management policy been documented, authorised and communicated?	🟨	🟨	🟨		
10	Asset management policy	What has the organisation done to ensure that its asset management strategy is consistent with other appropriate organisational policies and strategies, and the needs of stakeholders?	🟨	🟨	🟨		
11	Asset management policy	In what way does the organisation's asset management strategy take account of the lifecycle of the assets, asset types and asset systems over which the organisation has stewardship?	🟨	🟨	🟨		
26	Asset management plan(s)	How does the organisation establish and document its asset management plan(s) across the life cycle activities of its assets and asset systems?	🟨	🟨	🟨		
27	Asset management plan(s)	How has the organisation communicated its plan(s) to all relevant parties to a level of detail appropriate to the receiver's role in their delivery?	🟨	🟨	🟨		
29	Asset management plan(s)	How are designated responsibilities for delivery of asset plan actions documented?	🟩	🟩	🟩	🟩	
31	Asset management plan(s)	What has the organisation done to ensure that appropriate arrangements are made available for the efficient and cost effective implementation of the plan(s)? (Note this is about resources and enabling support)	🟩	🟩	🟩	🟩	
33	Contingency planning	What plan(s) and procedure(s) does the organisation have for identifying and responding to incidents and emergency situations and ensuring continuity of critical asset management activities?	🟩	🟩	🟩	🟩	
37	Structure, authority and responsibilities	What has the organisation done to appoint member(s) of its management team to be responsible for ensuring that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s)?	🟩	🟩	🟩	🟩	
40	Structure, authority and responsibilities	What evidence can the organisation's top management provide to demonstrate that sufficient resources are available for asset management?	🟩	🟩	🟩	🟩	
42	Structure, authority and responsibilities	To what degree does the organisation's top management communicate the importance of meeting its asset management requirements?	🟩	🟩	🟩	🟩	
45	Outsourcing of asset management activities	How does the organisation develop plan(s) for the human resources required to undertake asset management activities - including the development and delivery of asset management strategy, process(es), objectives and plan(s)?	🟨	🟨	🟨		
48	Training, awareness and competence	To what extent has an asset management policy been documented, authorised and communicated?	🟨	🟨	🟨		
49							

Question No.	Function	Question	Rating				
			0	1	2	3	4
	Training, awareness and competence	How does the organisation identify competency requirements and then plan, provide and record the training necessary to achieve the competencies?	🟨	🟨	🟨		
50	Training, awareness and competence	How does the organization ensure that persons under its direct control undertaking asset management related activities have an appropriate level of competence in terms of education, training or experience?	🟩	🟩	🟩	🟩	
53	Communication, participation and consultation	How does the organisation ensure that pertinent asset management information is effectively communicated to and from employees and other stakeholders, including contracted service providers?	🟩	🟩	🟩	🟩	
59	Asset Management System documentation	What documentation has the organisation established to describe the main elements of its asset management system and interactions between them?	🟩	🟩	🟩	🟩	
62	Information management	What has the organisation done to determine what its asset management information system(s) should contain in order to support its asset management system?	🟨	🟨	🟨		
63	Information management	How does the organisation maintain its asset management information system(s) and ensure that the data held within it (them) is of the requisite quality and accuracy and is consistent?	🟨	🟨	🟨		
64	Information management	How has the organisation ensured its asset management information system is relevant to its needs?	🟨	🟨	🟨		
69	Risk management process(es)	How has the organisation documented process(es) and/or procedure(s) for the identification and assessment of asset and asset management related risks throughout the asset life cycle?	🟩	🟩	🟩	🟩	
79	Use and maintenance of asset risk information	How does the organisation ensure that the results of risk assessments provide input into the identification of adequate resources and training and competency needs?	🟩	🟩	🟩	🟩	
82	Legal and other requirements	What procedure does the organisation have to identify and provide access to its legal, regulatory, statutory and other asset management requirements, and how is requirements incorporated into the asset management system?	🟩	🟩	🟩	🟩	
88	Life Cycle Activities	How does the organisation establish implement and maintain process(es) for the implementation of its asset management plan(s) and control of activities across the creation, acquisition or enhancement of assets. This includes design, modification, procurement, construction and commissioning activities?	🟩	🟩	🟩	🟩	
91	Life Cycle Activities	How does the organisation ensure that process(es) and/or procedure(s) for the implementation of asset management plan(s) and control of activities during maintenance (and inspection) of assets are sufficient to ensure activities are carried out under specified conditions, are consistent with asset management strategy and control cost, risk and performance?	🟩	🟩	🟩	🟩	
95	Performance and condition monitoring	How does the organisation measure the performance and condition of its assets?	🟩	🟩	🟩	🟩	
99	Investigation of asset-related failures, incidents and nonconformities	How does the organisation ensure responsibility and the authority for the handling, investigation and mitigation of asset-related failures, incidents and emergency situations and non conformances is clear, unambiguous, understood and communicated?	🟩	🟩	🟩	🟩	
105	Audit						

Question No.	Function	Question	Rating				
			0	1	2	3	4
		What has the organisation done to establish procedure(s) for the audit of its asset management system (process(es))?	🟨	🟨	🟨		
109	Corrective & Preventative action	How does the organisation instigate appropriate corrective and/or preventive actions to eliminate or prevent the causes of identified poor performance and non conformance?	🟨	🟨	🟨		
113	Continual Improvement	How does the organisation achieve continual improvement in the optimal combination of costs, asset related risks and the performance and condition of assets and asset systems across the whole life cycle?	🟨	🟨	🟨		
115	Continual Improvement	How does the organisation seek and acquire knowledge about new asset management related technology and practices, and evaluate their potential benefit to the organisation?	🟨	🟨	🟨		
		OVERALL RATING	🟨	🟨	🟨		

Table 2-6 : Asset management maturity assessment ratings

At an overall level, Vector's asset management maturity compares well with generally accepted New Zealand asset management standards, and is considered sound, but with scope for further improvement. Two broad areas in particular have been identified where improvement in Vector's asset management could be achieved:

a. Formalising Processes and Documentation

Vector's asset management practices were developed over several decades and help to ensure a high-quality, safe gas supply to its customers. However, formal documentation relating to these practices is somewhat incomplete, or exists in varying formats and degrees of detail. There are also some gaps in documented asset management processes, and no formal, board-approved asset management policy is in place (traditionally it was considered appropriate for the board to sign off on the asset management policy as set out in the Asset Management Plan).

Vector is systematically reviewing and updating asset management documentation and processes. This includes better documentation, improved communication of formal asset management documentation and requirements, documenting the resource and training requirements for asset management and more formally measuring performance against asset management requirements. In addition, a formal asset management policy document is being developed which will be formally approved by the Vector board, and widely communicated to stakeholders.

b. Information Management

Vector owns a number of legacy information systems with data stretching back to early in the 20th century. Consolidating this into an effective, integrated data management system poses an ongoing challenge which Vector is actively addressing. Current improvement initiatives include upgrading the GIS system, consolidating asset performance information into the SAP plant maintenance system and developing asset management reporting systems that will extract information directly from verifiable source data – see section 7 for a discussion.

Associated data quality issues also pose some difficulties, as historical asset data is sometimes inaccurate or incomplete, and the extent of available asset performance information is not fully sufficient for modern asset management practices. Accordingly Vector has several initiatives underway to improve its asset data quality, including the systematic analysis of historical asset records and rectification of data anomalies; to develop processes to cross-check and validate field-information; and to expand the extent of asset performance information being collected in the field.

Vector's progress against the AMMAT will be measured in future AMPs – with the goal to achieve a "3" rating on the bulk of all measures by 2016.

2.14.2 External Asset Management Reviews

Vector has engaged external expert technical advisers (Utility Consultants in Hamilton and Zincara Ltd in Melbourne) to review its asset management practices. These reviews have been very positive in their feedback thus confirming good industry practice asset management at Vector and Vector has taken note of the feedback and recommendations received, and where practical and beneficial reflected these in asset management practices.

2.15 Cross Reference to the Information Disclosure Requirements

As indicated earlier (section 2.3), one of the key purposes of this disclosure AMP was to also inform internal stakeholders on how Vector intends to manage its asset management activities. As such the order of presentation of this disclosure AMP is somewhat different from that presented in Attachment A of the Gas Distribution Information Disclosure Determination 2012.

The following table provides a cross reference between the disclosure requirements and the sub-sections in this AMP.

ID Determination Attachment A	Commerce Commission Disclosure Contents Requirements	AMP Section
3	The AMP must include the following:	
3.1	A summary that provides a brief overview of the contents and highlights information that the *GDB* considers significant	Executive Summary
3.2	Details of the background and objectives of the *GDB*'s asset management and planning processes	2.1 and 2.3
3.3	A purpose statement which:	
	(a) Makes clear the purpose and status of the AMP in the GDB's asset management practices. The purpose statement must also include a statement of the objectives of the asset management and planning processes	2.1 and 2.3,
	(b) States the corporate mission or vision as it relates to asset management	2.1 and 2.3
	(c) Identifies the documented plans produced as outputs of the annual business planning process adopted by the *GDB*	2.3 and 2.13
	(d) States how the different documented plans relate to one another, with particular reference to any plans specifically dealing with asset management	2.1, 2.3, 2.8 and 2.13
	(e) Includes a description of the interaction between the objectives of the AMP and other corporate goals, business planning processes, and plans *The purpose statement should be consistent with the GDB's vision and mission statements, and show a clear recognition of stakeholder interest*	2.1, 2.3, 2.8, 2.9, 2.10, 2.11, 2.12 and 2.13
3.4	Details of the AMP planning period, which must cover at least a projected period of 10 years commencing with the disclosure year following the date on which the AMP is disclosed *Good asset management practice recognises the greater accuracy of short-to-medium term planning, and will allow for this in the AMP. The asset management information planning information for the second 5 years of the AMP planning period need not be presented in the same detail as the first 5 years*	2.2
3.5	The date that it was approved by the directors	2.2
3.6	A description of each of the legislative requirements directly affecting management of the assets, and details of:	6.1
(a)	How the GDB meets the requirements; and	

ID Determination Attachment A		Commerce Commission Disclosure Contents Requirements	AMP Section
	(b)	The impact on asset management	
3.7		A description of stakeholder interests (owners, consumers etc) which identifies important stakeholders and indicates:	2.5 and 2.6
	(a)	How the interests of stakeholders are identified	2.5 and 2.6
	(b)	What these interests are	2.5 and 2.6
	(c)	How these interests are accommodated in asset management practices	2.5 and 2.6
	(d)	How conflicting interests are managed	2.5 and 2.6
3.8		A description of the accountabilities and responsibilities for asset management on at least 3 levels, including:	2,1, 2.7, 2.8, 2.9, 2.10 and 2.12
	(a)	Governance—a description of the extent of director approval required for key asset management decisions and the extent to which asset management outcomes are regularly reported to directors	2.1, 2.7, 2.8, 2.9 and 2.10
	(b)	Executive—an indication of how the in-house asset management and planning organisation is structured	2.1 and 2.7
	(c)	Field operations—an overview of how field operations are managed, including a description of the extent to which field work is undertaken in-house and the areas where outsourced contractors are used	2.1, 2.7, 2.9 and 1.12
3.9		All significant assumptions	2.3, 5.2, 5.4 and 9.3
	(a)	Quantified where possible	2.3, 5.2, 5.4 and 9.3
	(b)	Clearly identified in a manner that makes their significance understandable to interested persons, including	2.3, 5.2, 5.4 and 9.3
	(c)	A description of changes proposed where the information is not based on the GDB's existing business	n/a
	(d)	The sources of uncertainty and the potential effect of the uncertainty on the prospective information	2.4, 5.2, 5.4 and 9.3
	(e)	The price inflator assumptions used to prepare the financial information disclosed in nominal New Zealand dollars in the Report on Forecast Capital Expenditure set out in Schedule 11a and the Report on Forecast Operational Expenditure set out in Schedule 11b	9.5

ID Determination Attachment A		Commerce Commission Disclosure Contents Requirements	AMP Section
3.10		A description of the factors that may lead to a material difference between the prospective information disclosed and the corresponding actual information recorded in future disclosures	2.4, 5.2, 5.4 and 9.3
3.11		An overview of asset management strategy and delivery *To support the AMMAT disclosure and assist interested persons to assess the maturity of asset management strategy and delivery, the AMP should identify:* (a) How the asset management strategy is consistent with the GDB's other strategy and policies; (b) How the asset strategy takes into account the life cycle of the assets; (c) The link between the asset management strategy and the AMP; (d) Processes that ensure costs, risks and system performance will be effectively controlled when the AMP is implemented.	2.1, 2.3, 2.8, 2.9, 2.10 and 2.11
3.12		An overview of systems and information management data *To support the AMMAT disclosure and assist interested persons to assess the maturity of systems and information management, the AMP should describe:* (a) The processes used to identify asset management data requirements that cover the whole of life cycle of the assets; (b) The systems used to manage asset data and where the data is used, including an overview of the systems to record asset conditions and operation capacity and to monitor the performance of assets; (c) The systems and controls to ensure the quality and accuracy of asset management information; and (d) The extent to which the systems, processes and controls are integrated	2.11, 7.1, 7.2 and 7.3
3.13		A statement covering any limitations in the availability or completeness of asset management data and disclose any initiatives intended to improve the quality of this data *Discussion of the limitations of asset management data is intended to enhance the transparency of the AMP and identify gaps in the asset management system*	7.2, 7.3 and 7.4
3.14		A description of the processes used within the *GDB* for:	
	(a)	Managing routine asset inspections and network maintenance	6.2
	(b)	Planning and implementing network development projects	5.1, 5.2 and 5.3

ID Determination Attachment A	**Commerce Commission Disclosure Contents Requirements**	**AMP Section**
(c)	Measuring network performance	4.7
3.15	An overview of asset management documentation, controls and review processes *To support the AMMAT disclosure and assist interested persons to assess the maturity of asset management documentation, controls and review processes, the AMP should:* *(a) Identify the documentation that describes the key components of the asset management system and the links between the key components;* *(b) Describe the processes developed around documentation, control and review of key components of the asset management system;* *(c) Where the GDB outsources components of the asset management system, the processes and controls that the GDB uses to ensure efficient and cost effective delivery of its asset management strategy;* *(d) Where the GDB outsources components of the asset management system, the systems it uses to retain core asset knowledge in-house; and* *(e) Audit or review procedures undertaken in respect of the asset management system*	7
3.16	An overview of communication and participation processes *To support the AMMAT disclosure and assist interested persons to assess the maturity of asset management documentation, controls and review processes, the AMP should:* *(a) Communicate asset management strategies, objectives, policies and plans to stakeholders involved in the delivery of the asset management requirements, including contractors and consultants; and* *(b) Demonstrate staff engagement in the efficient and cost effective delivery of the asset management requirements*	2.5 and 2.6
3.17	The AMP must present all financial values in constant price New Zealand dollars *except where specified otherwise*	9
3.18	The AMP must be structured and presented in a way that the *GDB* considers will support the purposes of AMP disclosure set out in clause 2.6.2 of the determination	
	Assets covered	
4	The AMP must provide details of the assets covered, including:	
4.1	A map and high-level description of the areas covered by the GDB, including the region(s) covered	3.1

ID Determination Attachment A		Commerce Commission Disclosure Contents Requirements	AMP Section
4.2		A description of the network configuration, including: *if sub-networks exist, the network configuration information should be disclosed for each sub-network*	3.6 and 5.19
	(a)	A map or maps, with any cross-referenced information contained in an accompanying schedule, showing the physical location of: (i) All main pipes, distinguished by operating pressure (ii) All ICPs that have a significant impact on network operations or asset management priorities, and a description of that impact (iii) All gate stations (iv) All pressure regulation stations	3.2 and 3.9
	(b)	If applicable, the locations where a significant change has occurred since the previous disclosure of the information referred to in sub clause 4.2(a) above, including- (i) A description of the parts of the network that are affected by the change (ii) A description of the nature of the change	n/a
		Service Levels	
5		The AMP must describe the network assets by providing the following information for each asset category:	6.3
5.1		Pressure	6.3
5.2		Description and quantity of assets	6.3
5.3		Age profiles	6.3
5.4		A discussion of the results of formal risk assessments of the assets, further broken down by subcategory as appropriate. Systemic issues leading to the premature replacement of assets or parts of assets should be discussed.	6.3
6.		The asset categories discussed in clause 5 above should include at least the following:	6.3
6.1		Main pipe	6.3
6.2		Service pipe	6.3

ID Determination Attachment A	Commerce Commission Disclosure Contents Requirements	AMP Section
6.3	Stations	6.3
6.4	Line valve	6.3
6.5	Special crossings	6.3
6.6	Monitoring and control systems	6.3
6.7	Cathodic protection systems	6.3
6.8	Assets owned by the GDB but installed at gate stations owned by others.	6.3
7.	The AMP must clearly identify or define a set of performance indicators for which annual performance targets have been defined. The annual performance targets must be consistent with business strategies and asset management objectives and be provided for each year of the AMP planning period. The targets should reflect what is practically achievable given the current network configuration, condition and planned expenditure levels. The targets should be disclosed for each year of the AMP planning period	4.1
8.	Performance indicators for which targets are defined in clause 7 above must include—	
8.1	The DPP requirements required under the price quality path determination applying to the regulatory assessment period in which the next disclosure year falls	4.1
8.2	Consumer oriented indicators that preferably differentiate between different consumer types	4.1
8.3	Indicators of asset performance, asset efficiency and effectiveness, and service efficiency, such as technical and financial performance indicators related to the efficiency of asset utilisation and operation	4.4, 4.5 and 4.6
8.4	The performance indicators disclosed in Schedule 10b of the determination	4.1 and 4.4
9.	The AMP must describe the basis on which the target level for each performance indicator was determined. Justification for target levels of service includes consumer expectations or demands, legislative, regulatory, and other stakeholders' requirements or considerations. The AMP should demonstrate how stakeholder needs were ascertained and translated into service level targets	4.1, 4.2 and 4.3
10.	Targets should be compared to historic values where available to provide context and scale to the reader	4.1, 4.2 and 4.3

ID Determination Attachment A		Commerce Commission Disclosure Contents Requirements	AMP Section
11		Where forecast expenditure is expected to materially affect performance against a target defined in clause 7 above, the target should be consistent with the expected change in the level of performance *Performance against target must be monitored for disclosure in the Evaluation of Performance section of each subsequent AMP*	n/a
		Network Development Planning	
12.		AMPs must provide a detailed description of network development plans, including—	
12.1		A description of the planning criteria and assumptions for network development;	5.2, 5.3, 5.4 and 5.6
12.2		Planning criteria for network developments should be described logically and succinctly. Where probabilistic or scenario-based planning techniques are used, this should be indicated and the methodology briefly described;	5.2 and 5.4
12.3		The use of standardised designs may lead to improved cost efficiencies. This section should discuss:	3.8
	(a)	The categories of assets and designs that are standardised; and	
	(b)	The approach used to identify standard designs	
12.4		A description of the criteria used to determine the capacity of equipment for different types of assets or different parts of the network *The criteria described should relate to the GDB's philosophy in managing planning risks*	5.3
12.5		A description of the process and criteria used to prioritise network development projects and how these processes and criteria align with the overall corporate goals and vision	9.4
12.6		Details of demand forecasts, the basis on which they are derived, and the specific network locations where constraints are expected due to forecast increases in demand:	
	(a)	Explain the load forecasting methodology and indicate all the factors used in preparing the load estimates;	5.4
	(b)	Provide separate forecasts to at least system level covering at least a minimum five year forecast period. Discuss how uncertain but substantial individual projects/developments that affect load are taken into account in the forecasts, making clear the extent to which these uncertain increases in demand are reflected in the forecasts;	5.4, 5.8, 5.9, 5.10, 5.11, 5.12, 5.13, 5.14 and 5.15

ID Determination Attachment A		Commerce Commission Disclosure Contents Requirements	AMP Section
	(c)	Identify any network or equipment constraints that may arise due to the anticipated growth in demand during the AMP planning period *The AMP should include a description of the methodology and assumptions used to produce the utilisation and capacity forecasts and a discussion of the limitations of the forecasts, methodology and assumptions. The AMP should also discuss any capacity limitations identified or resolved in years during which an AMP was not disclosed*	5.4, 5.8, 5.9, 5.10, 5.11, 5.12, 5.13, 5.14 and 5.15
12.7		Analysis of the significant network level development options identified and details of the decisions made to satisfy and meet target levels of service, including:	5.8, 5.9, 5.10, 5.11, 5.12, 5.13, 5.14, 5.15 and 5.16
	(a)	The reasons for choosing a selected option for projects where decisions have been made;	
	(b)	Alternative options considered for projects that are planned to start in the next five years; and	
	(c)	Consideration of planned innovations that improve efficiencies within the network, such as improved utilisation, extended asset lives, and deferred investment	
12.8		A description and identification of the network development programme and actions to be taken, including associated expenditure projections. The network development plan must include:	5.16
	(a)	A detailed description of the material projects and a summary description of the non-material projects currently underway or planned to start within the next 12 months;	5.8, 5.9, 5.10, 5.11, 5.12, 5.13, 5.14, 5.15 and 5.16
	(b)	A summary description of the programmes and projects planned for the following four years (where known); and	5.16, 5.17 and 5.18
	(c)	An overview of the material projects being considered for the remainder of the AMP planning period *For projects included in the AMP where decisions have been made, the reasons for choosing the selected option should be stated which should include how target levels of service will be impacted. For other projects planned to start in the next five years, alternative options should be discussed*	5.16 and 5.20
		Lifecycle Asset Management Planning (Maintenance and Renewal)	
13		The AMP must provide a detailed description of the lifecycle asset management processes, including—	6.1 and 6.2
13.1		The key drivers for maintenance planning and assumptions;	6.1 and 6.2

ID Determination Attachment A		Commerce Commission Disclosure Contents Requirements	AMP Section
13.2		Identification of routine and corrective maintenance and inspection policies and programmes and actions to be taken for each asset category, including associated expenditure projections. This must include:	6.3
	(a)	The approach to inspecting and maintaining each category of assets, including a description of the types of inspections, tests and condition monitoring carried out and the intervals at which this is done;	6.3
	(b)	Any systemic problems identified with any particular asset types and the proposed actions to address these problems; and	6.3
	(c)	Budgets for maintenance activities broken down by asset category for the AMP planning period	6.2
13.3		Identification of asset replacement and renewal policies and programmes and actions to be taken for each asset category, including associated expenditure projections. This must include:	6.2, 6.3 and 6.4
	(a)	The processes used to decide when and whether an asset is replaced or refurbished, including a description of the factors on which decisions are based, and consideration of future demands on the network and the optimum use of existing network assets;	
	(b)	A description of innovations that have deferred asset replacements;	4.7
	(c)	A description of the projects currently underway or planned for the next 12 months;	
	(d)	A summary of the projects planned for the following four years (where known); and	
	(e)	An overview of other work being considered for the remainder of the AMP planning period	
13.4		The asset categories discussed in subclasses 13.2 and 13.3 above should include at least the categories in sub clause 6 above	
		Non-Network Development, Maintenance and Renewal	
14		AMPs must provide a summary description of material non-network development, maintenance and renewal plans, including—	7.1 and 7.2
14.1		A description of non-network assets;	7.2

ID Determination Attachment A	Commerce Commission Disclosure Contents Requirements	AMP Section
14.2	Development, maintenance and renewal policies that cover them;	7.4
14.3	A description of material capital expenditure projects (where known) planned for the next five years;	7.4
14.4	A description of material maintenance and renewal projects planned (where known) for the next five years	n/a
	Risk Management	
15	AMPs must provide details of risk policies, assessment, and mitigation, including—	8
15.1	Methods, details and conclusions of risk analysis;	8.1 an 8.3
15.2	Strategies used to identify areas of the network that are vulnerable to high impact low probability events and a description of the resilience of the network and asset management systems to such events;	8.4
15.3	A description of the policies to mitigate or manage the risks of events identified in sub clause 15.2 above; and	8.3
15.4	Details of emergency response and contingency plans *Asset risk management forms a component of a GDB's overall risk management plan or policy, focusing on the risks to assets and maintaining service levels. AMPs should demonstrate how the GDB identifies and assesses asset related risks and describe the main risks within the network. The focus should be on credible low-probability, high-impact risks. Risk evaluation may highlight the need for specific development projects or maintenance programmes. Where this is the case, the resulting projects or actions should be discussed, linking back to the development plan or maintenance programme*	8.4
	Evaluation of performance	
16	AMPs must provide details of performance measurement, evaluation, and improvement, including—	
16.1	A review of progress against plan, both physical and financial; (a) Referring to the most recent disclosures made under sub clause 2.5.1 of the determination, discussing any significant differences and highlighting reasons for substantial variances; (b) Commenting on the progress of development projects against that planned in the previous AMP and provide reasons for substantial variances along with any significant construction or other problems experienced; and (c) Commenting on progress against maintenance initiatives and programmes and discuss the effectiveness of these programmes noted	n/a

ID Determination Attachment A	Commerce Commission Disclosure Contents Requirements	AMP Section
16.2	An evaluation and comparison of actual service level performance against targeted performance (a) In particular, comparing the actual and target service level performance for all the targets discussed in the previous AMP under clause 7 above and explain any significant variances	4
16.3	An evaluation and comparison of the results of the asset management maturity assessment disclosed in the Report on Asset Management Maturity set out in Schedule 13 against relevant objectives of the GDB's asset management and planning processes	2.14
16.4	An analysis of gaps identified in sub-clauses 16.2 and 16.3 above. Where significant gaps exist (not caused by one-off factors), the AMP must describe any planned initiatives to address the situation	2.14 and 4
	Capability to Deliver	
17	AMPs must describe the processes used by the GDB to ensure that:	
17.1	The AMP is realistic and the objectives set out in the plan can be achieved	2.8
17.2	The organisation structure and the processes for authorisation and business capabilities will support the implementation of the AMP plans.	2.7, 2.8, 2.9 and 2.12

Table 2-7 : Cross reference between the sub-sections in this AMP and the disclosure requirements referenced in Attachment A of Commerce Commission Decision No. NZCC 23- Gas Distribution Information Disclosure Determination 2012 dated 1 October 2012

Clause 2.6.1 of the Commerce Commission Gas Distribution Information Disclosure Determination 2012 requires Vector to include the following information schedules in this Asset Management Plan:

Information Disclosure Schedule	Title	AMP Appendix
Schedule 11a	Report on Forecast Capital Expenditure	Appendix 1
Schedule 11b	Report on Forecast Operational Expenditure	Appendix 2
Schedule 12a	Report on Asset Condition	Appendix 3
Schedule 12b	Report on Forecast Utilisation	Appendix 4

Information Disclosure Schedule	Title	AMP Appendix
Schedule 12c	Report on Forecast Demand	Appendix 5
Schedule 13	Report on Asset Management Maturity Assessment	Appendix 6

Table 2-8 : Commerce Commission Information Disclosure Schedules included in the AMP

Gas Distribution
Asset Management Plan
2013 – 2023

Assets Covered by this Plan– Section 3

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3 Assets Covered by this Plan

3.1 Distribution Area

Vector’s natural gas distribution network assets are the product of the progressive amalgamation, merger and acquisition of a number of private and public gas utilities, a process that has occurred over the last hundred years.

In 2002, Vector acquired UnitedNetworks. Under this arrangement the gas network assets located in Wellington, Palmerston North and Hawkes Bay were sold to Powerco, and Vector retained the natural gas distribution network assets in Auckland.

During 2004/2005, Vector acquired a 66.05% stake in NGC Holdings Ltd from Australian Gas Light (AGL). After listing on the New Zealand Stock Exchange in the same year, Vector successfully acquired the remaining shares in NGC. This acquisition increased Vector’s gas distribution network and transmission asset base to supply gas to over 30 towns and cities across the North Island. The map in Figure 3-1 shows the extent of Vector’s gas distribution network supply areas.

Figure 3-1 : Vector's gas distribution network supply areas

3.2 Major Customer Sites on the Vector Network

Vector has a number of large customer sites at various locations in its network. The following are those customer sites with individual energy demand above 200TJ and which hence have a significant impact on network operations and asset management (collectively they represent 30% of gas usage on the network):

- O-I Glass
- BOPE Cogeneration Plant
- CHH Whakatane
- CHH Tasman Mill
- Fletcher Steel and Wire
- J D Wallace
- Reporoa Dairy Factory
- Morrinsville Dairy Factory
- Hautapu Dairy Factory
- NZ Sugar Co Limited
- SCA Hygiene
- Winstone Wallboards Limited

3.3 Key Features

A comparison of the key features of the gas distribution network for 2011 and 2012 is presented below (as at 30 June):

Description	Auckland region			North Island region		
	2012	2011	Change	2012	2011	Change
Consumers connected[1] (no.)	90,392	88,682	1.9%	63,193	62,422	1.2%
System length[2] (km)	5,641	5,601	0.7%	4,720	4,690	0.6%
Consumer density (consumer/km)	16.0	15.9	0.8%	13.4	13.3	0.7%
Gate stations[3]	16	16	0.0%	47	47	0.0%
District regulating stations[4] (DRS)	111	119	-6.7%	137	141	-2.8%
DRS density (system km/DRS)	50.8	47.1	8.0%	34.5	33.9	1.6%
DRS utilisation (consumers/DRS)	814	727	12.0%	461	452	2.0%
Peak load[5] (scmh)	75,318	81,769	-7.9%	68,302	69,241	-1.4%

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[1] Source: Information Disclosure 2012
http://www.vector.co.nz/sites/vector.co.nz/files/Gas%20Distribution%20-%20with%20KPMG%20stamps.pdf

[2] Source: Vector's GIS as at 30 June. Includes mains and service pipe lengths

[3] ibid, footnote 2

[4] ibid, footnote 2

[5] Calculated by adding the coincident load of each network system for a calendar year. Measured as standard cubic metres per hour (scmh)

Description	Auckland region			North Island region		
	2012	2011	Change	2012	2011	Change
Gas conveyed[6] (PJ pa)	12.4	11.8	5.0%	9.6	9.3	3.0%
Load factor[7] (%)	76.8%	78.5%	-2.1%	82.1%	79.9%	2.8%

Table 3-1: Key features of Vector's gas distribution networks

3.4 Load Characteristics

The capacity of an individual pipeline is determined by the operating pressure, the diameter and the allowable pressure difference between inlet and outlet. Meshed distribution networks work on the same principle with the difference that pipelines are interconnected at several points and that such distribution networks can be fed at multiple points.

As the distribution networks expand and demand grows, certain parts of the networks, in particular feeder mains, can develop large pressure drops that constrain delivery in downstream parts of the distribution systems. Each year, Vector prepares network pressure monitoring surveys and carries out distribution network analysis to identify any constraints and to reinforce networks to ensure operating pressures do not become insufficient.

Regulator stations have nominal outlet pressures which supply each discrete pressure system on the distribution network. System pressures in the network drop in accordance with demand and the supply pressure. Under the normal network operating arrangement, Vector's Quality of Supply standard stipulates the pressure at any point on the network shall be no less than 50% of its nominal pressure and no more than 10% above its maximum operating pressure. Further details of Vector's Quality of Supply standard can be found in Section 5.

Pressure drops on each pressure system need to be considered separately, due to the meshed nature of the network and the different characteristics, i.e. mix of residential, commercial and industrial customers, each system exhibits.

Vector uses individual system pressure profiles to illustrate the load characteristics of each network. These are based on system pressure data that Vector collects as part of its system pressure monitoring programme and an understanding of the relationship between pressure and flow.

The typical daily winter[8] pressure profile for residential loads and load profile for commercial/industrial customers are illustrated in Figure 3-2 and Figure 3-3. Residential load typically has two peaks whereas the commercial and industrial load is more consistent for the whole day.

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[6] ibid, footnote 1

[7] ibid, footnote 1

[8] The greatest demand on the gas distribution networks occurs during winter

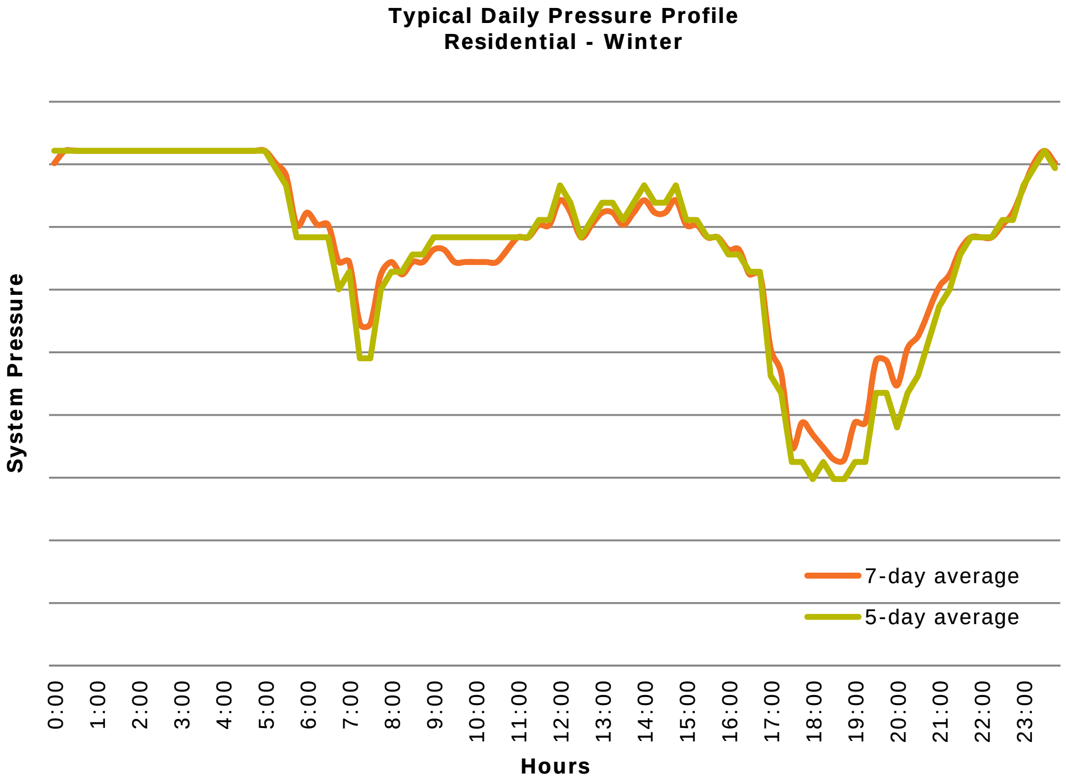

Figure 3-2 : Typical winter system pressure profile for residential customers

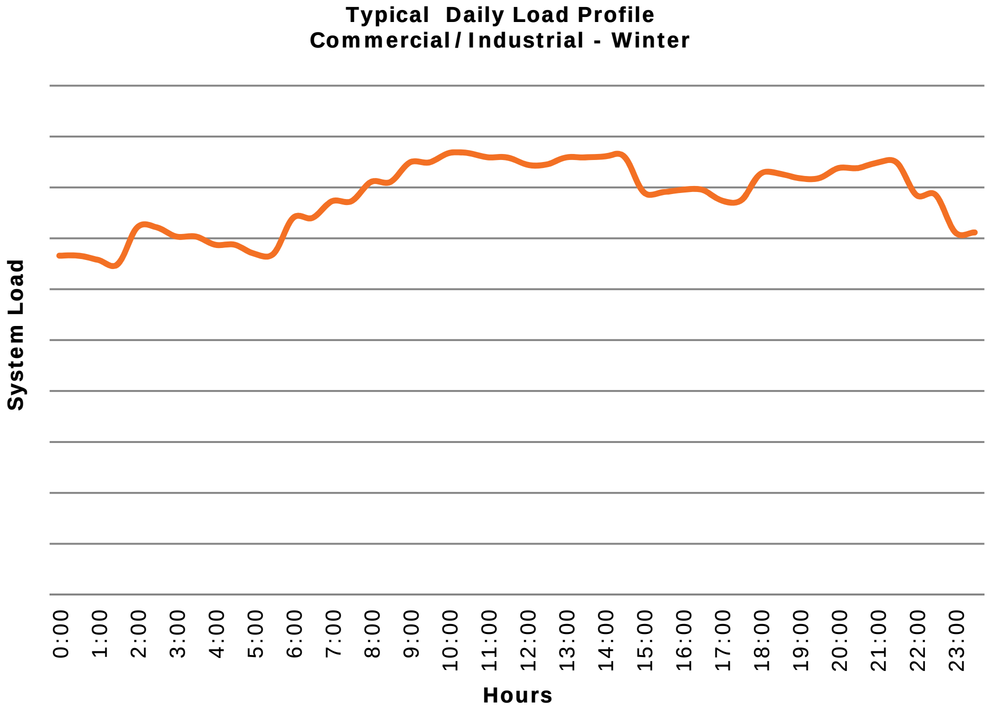

Figure 3-3 : Typical winter load profile for commercial and industrial customers

Demand curves for specific industrial consumers are far more variable – conforming closely to the nature of the customer's business. A typical industrial load curve is therefore not a meaningful concept.

A measure of load diversity is achieved with residential customers providing peaks in the morning and early evening, with the commercial and industrial load filling in the trough between these peaks. The mix of customer types within a distribution network, and their location, influences the size and duration of the peaks.

3.4.1 Peak Demand and Energy Delivered

Historical trends show gas demand (and sales volume) is primarily influenced by economic activities in an area, price and availability of substitute fuels (e.g. electricity, fuel oil etc.), marketing effort, population / household growth, socio-economic factors, climate, and the investment decisions made by large industrial and commercial gas consumers. In the short-term, gas demand is very sensitive to climatic conditions. A cold snap, for example, could drive up the demand for gas significantly. Conversely, a warm winter could result in a materially lower demand. Hence on a year–by-year basis, demand can vary significantly.

Historical information, after normalising for year-on-year variances, shows a reasonably steady demand trend. The exceptionally high peak demand hours occur due to extreme weather conditions and normally represent only a small percentage of hours in a year.

The peak demand[9] on the gas distribution network and the gas conveyed[10] for the past three years is listed in Table 3-2 (the individual demand forecasts for all gate stations on Vector's network are detailed in Section 5).

	Auckland region				**North Island region**			
	Peak Demand		**Gas Conveyed**		**Peak Demand**		**Gas Conveyed**	
Year	**scmh**	**% change**	**PJ**	**% change**	**scmh**	**% change**	**PJ**	**% change**
2008/09	77,251	-	11.9	-	76,261	-	9.7	-
2009/10	74,066	-4.1%	11.7	-1.7%	66,985	-12.2%	9.5	-2.1%
2010/11	81,769	10.4%	11.8	0.9%	69,241	3.4%	9.3	-2.1%
2011/12	75,318	-7.9%	12.4	5.1%	68,302	-1.4%	9.6	3.2%

Table 3-2: Peak hour demand and energy delivered on the gas distribution network

The values reported above are the coincidental peak demands of all gate stations delivering supply to Vector's gas distribution networks.

3.5 Distribution System Design

Vector's gas distribution networks are generally relatively young (built in the late 1980s onwards) and are mostly constructed of modern steel and polyethylene materials, operating at significantly higher pressures than the original network. Standard operating pressures within the Intermediate Pressure (IP) and Medium Pressure (MP) bands are

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[9] The peak demand is calculated by adding the peak load of each network system for a calendar year. Where a network system comprises of more than one gate station or a gate station supplies to more than one network system, the coincident peak load is used.

[10] ibid, footnote 1

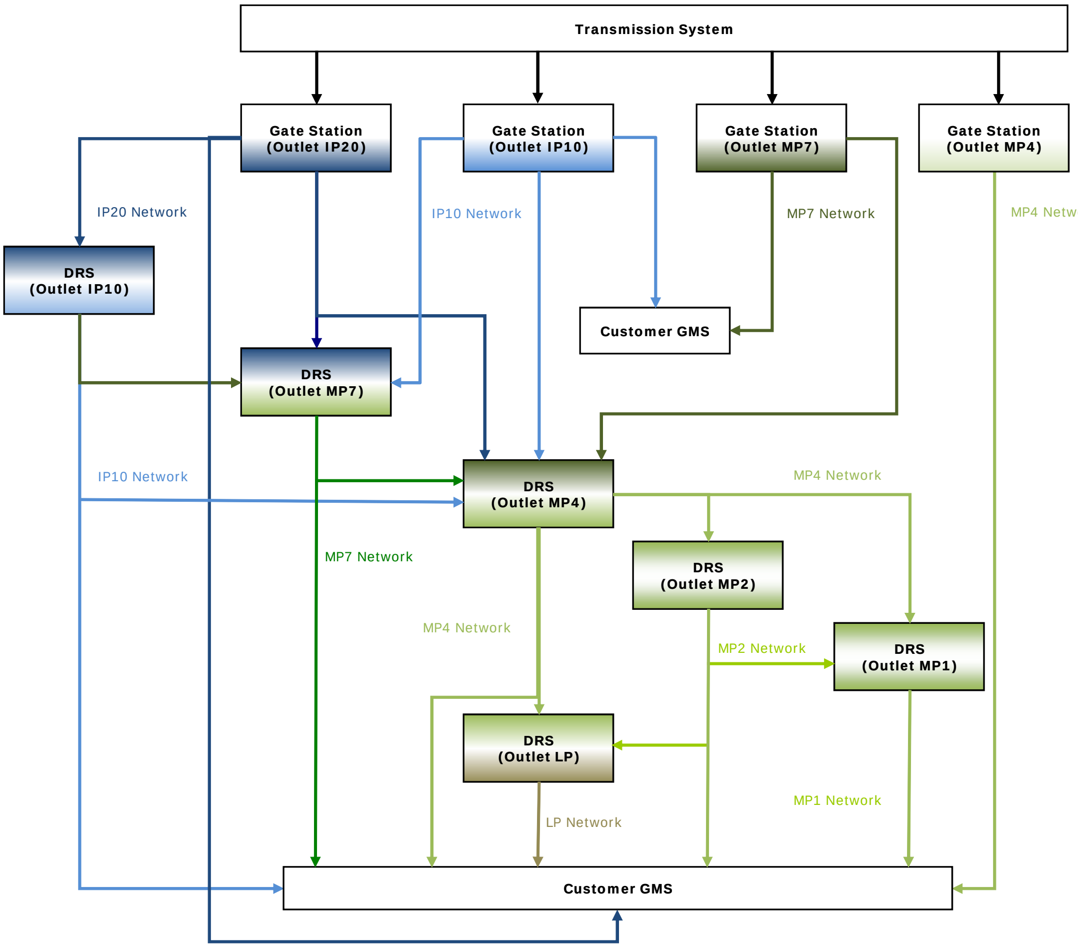
however not consistent between the individual networks - a legacy of the different operating standards applied by the previous owners of the separate gas networks; with older parts of the networks having to operate at significantly lower pressures than the new parts. (Vector intends to rationalise/standardise the design and operating pressure ranges in accordance with future planned improvement programmes.)

3.6 Network Configuration

Vector takes bulk gas supply from the High Pressure (HP) transmission systems operating across the North Island. The transmission systems operate at pressures ranging between approximately 50 and 80 bar and typically deliver gas to Vector's distribution systems at IP20, IP10, MP7 and MP4 pressure level (20 bar down to 4 bar).

The IP and higher pressure MP systems tend to be radial in design, whereas the design of the majority of MP and Low Pressure (LP) systems tends to be of a mesh nature, providing back-feed security to large numbers of residential and commercial loads. MP and LP systems are often supplied from multiple district regulator stations (DRSs) thereby further increasing the security of supply.

The overall current architecture of the Vector gas distribution network is shown in Figure 3-4.



IP = Intermediate Pressure
MP = Medium Pressure
LP = Low Pressure
DRS = District Regulator Station
GMS = Gas Measurement System
PE = Polyethylene

Figure 3-4 : Schematic of Vector's gas distribution network

3.7 Distribution Systems

Distribution networks extend from the outlet valve of the transmission gate station to the inlet valve on a consumer gas measurement system (GMS). Distribution networks broadly contain the following five main categories of assets:

- Distribution pipelines;
- Pressure stations;
- Valves;
- Corrosion protection equipment;
- Telenet/SCADA equipment; and
- Special crossings.

3.7.1 Distribution Pipelines

Vector's distribution networks generally comprise HP, IP, MP and LP systems. Table 3-3 shows the eight pressure levels used by Vector to categorise the gas distribution networks:

Pressure Level	Auckland region		North Island region	
	Asset Length (km)	% of Total Network	Asset Length (km)	% of Total Network
High Pressure (>2,000 kPa)	24	0.4%	0	0.0%
Intermediate Pressure 20 (1,000-2,000 kPa)	135	2.4%	91	1.9%
Intermediate Pressure 10 (700-1,000 kPa)	56	1.0%	112	2.4%
Medium Pressure 7 (420-700 kPa)	57	1.0%	26	0.6%
Medium Pressure 4 (210-420) kPa	5,143	91.2%	4,288	90.8%
Medium Pressure 2 (110-210 kPa)	67	1.2%	14	0.3%
Medium Pressure 1 (7 - 110kPa)	69	1.2%	81	1.7%
Low Pressure (0 - 7kPa)	89	1.6%	108	2.3%

Table 3-3: Pressure levels and corresponding asset length[11]

The majority of Vector's bulk gas distribution assets are operated in the IP range of 700 to 2,000kPa. The selection of these pressures has, in the majority of cases, historically been justified on an economic basis (consideration of gas volumes, transmission distances, delivery pressures etc). The IP systems are all constructed to a high technical standard of welded steel with all of them being protected against corrosion by Cathodic Protection (CP), using either a system of sacrificial anodes or an impressed current installation.

The IP systems are generally the principal "backbone" systems of the distribution networks with laterals radiating from them to supply adjacent areas. The distribution assets which are used to directly supply gas consumers are constructed mostly of polyethylene and work in the MP range.

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[11] Source: Vector's GIS as at 30 June 2012. Includes mains and service pipe lengths.

LP systems typically operate between 2kPa and 7kPa and represent the oldest parts of the distribution system, supplying residential and small commercial loads. LP systems typically consist of cast iron mains pipelines. (Note: These are progressively being replaced.)

Vector's gas distribution network includes a high pressure system which is integrated into the gas distribution network. The pipeline is a 200mm steel pipeline running from the Henderson Gate Station (North West of Auckland) to Albany on Auckland's North Shore. The pipeline was constructed and is maintained to high pressure standards, and is rated to operate at 4,600kPa, but is currently only operating at 1,900kPa. The higher design pressure was selected to enable the operating pressure to be increased in the future.

Service connections provide the link between the gas mains in the street and the customer's gas meter and are comprised of a service pipe, riser and a meter valve. The outlet connection of the meter valve designates the end of Vector's distribution system. A service regulator is normally fitted downstream of the meter tap to regulate the gas pressure to the consumer meter-set and to downstream appliances / plant (in these cases the regulator is owned by retailers or Gas Measurement System (GMS) owners).

3.7.2 Pressure Stations

Pressure stations are those parts of a gas system that link two pressure levels in gas networks through pressure regulators. They are the points of input to a pressure level. Vector has three categories of pressure stations: gate stations, district regulating stations and service regulators.

3.7.2.1 Gate Stations

Where the pressure station is the link between the gas transmission system and a gas distribution network, it is known as a gate station. High pressure equipment (i.e. pressure regulating equipment and custody transfer metering etc) within the gate station is operated by Vector Transmission[12], whereas distribution system equipment (i.e. check metering (where installed) and associated valves and pipework etc) within the gate station is operated as part of Vector's distribution networks.

3.7.2.2 District Regulating Stations

Where the pressure station is the link between two Vector gas pressure networks it is known as a District Regulating Station (DRS). DRSs are used to reduce the operating pressure from higher operating pressure systems to systems with lower operating pressures.

DRSs are strategically located within the distribution network such that a continuous and safe gas supply of gas is delivered to the maximum number of customers. They are primarily used to reduce the higher pressures associated with 'high volume' mains, (i.e. those with an operating pressure of 1,900kPa, 1,000kPa and 700kPa), down to a more economical distribution pressure level of between 200kPa and 420kPa. They are also used to provide a controlled pressure into the low pressure networks. In this case the DRS may be sited to use an IP or MP system as its source, depending upon which is geographically available.

Generally a DRS converts significant volumes of gas from one pressure to another and they are the source of supply to a significant number of consumers. The importance of DRSs in the supply networks means duplicate assets are often provided in order to deliver a reasonable level of security. This duplication also enables maintenance to take place without a loss of supply to customers.

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[12] Vector Transmission is the gas high pressure pipeline operator

The lower operating pressures provided by the DRS assets allow modern technology and materials to be used to provide a safe, assured and economical gas supply to the areas where customers are situated.

3.7.2.3 Service Regulators

A service regulator is used to regulate the flow of gas (reduce the pressure) to individual customer premises and is typically installed as part of the gas measurement system.

Where for practical reasons a service regulator cannot be installed immediately adjacent the gas meter (i.e. as part of the GMS) it is installed at a location upstream from the GMS and owned and maintained by Vector.

3.7.3 Valves

Distribution system valves are comprised of in-line mains and service valves (to isolate the flow of gas within the system) and blow down valves (to depressurise sections of the system in the event of an emergency). Valve types currently in use include ball valves, plug valves, gate valves and a relatively small number of other valve types.

3.7.4 Corrosion Protection Equipment

Below ground steel plant is protected against corrosion by the provision of protective coatings (e.g. high density polyethylene) and the application of impressed current or sacrificial anode Cathodic Protection (CP) systems. Protective coatings are inspected whenever underground plant is exposed. CP test points are monitored on a periodic basis and maintained to ensure that the levels of protection being provided to the underground plant are kept within prescribed maximum and minimum levels.

Above ground steel or metallic plant is protected against corrosion by the provision of paint or other suitable protective coating e.g. wrapping. Periodic inspections are carried out to monitor the condition of protective coatings.

3.7.5 Telemetry Systems

The telemetry systems used by Vector to monitor its gas distribution networks comprise the Telenet Supervisory Control and Data Acquisition (SCADA) system, and the Cello system. The Telenet SCADA system is currently deployed in Auckland and the Cello system is used on other regional networks.

Access to Telenet data is provided via the PI archiving system, and access to the Cello data is provided via a proprietary PMAC database.

The telemetry systems provide remote monitoring and alarming of critical inlet/outlet pressures, temperatures and flow rates, and corrected and uncorrected metering data. The telemetry monitors data at gate stations, DRSs and major gas customer sites, and also provides remote control facilities for the operation of the IP20 valves located at either end of the Auckland Harbour Bridge.

3.7.6 Special Crossings

Special crossings are locations where a section of pipeline is installed above ground in order to cross over a roadway, river or railway etc. The above ground crossing enables the gas distribution pipeline route to negotiate obstacles presented by the presence of a roadway, river or railway etc where a below ground crossing is not practical.

3.8 Justification of Assets

Network assets are created for a number of reasons. While asset investment is often the most effective and convenient means of addressing network issues, Vector also considers other solutions to network issues and applies these where practical and economic. Such alternatives may include network reconfiguration, asset maintenance, or adopting non-network solutions such as adjusting gate station and DRS pressure regulator set points or entering into load management arrangements with customers.

The key factors leading to asset investment at Vector are:

- Health and safety: Where health and safety concerns indicate the need for asset investment, this takes priority;
- New developments: Where new building or urban developments occur, or existing developments are extended, this usually requires investment in network assets;
- Legal and regulatory compliance: Ensuring Vector is not in breach of statutory obligations of a gas distributor or regulatory requirements such as satisfying the gas quality and pressure specifications;
- Capacity: Maintaining sufficient network capacity to supply the needs of consumers is a key driver for asset investment;
- Vector's technical standards: Vector is committed to meeting its Quality of Supply standard (refer Section 5 for details), and any potential breaches of these often indicate a need for asset investment;
- Customer requirements: Assets are often installed at the request of customers (who then contribute to the investment cost) for example to provide higher security of supply levels;
- Renewal: Assets are usually replaced before they have deteriorated to the extent that they pose a safety or reliability risk, or when they have reached the end of their useful lives (where maintenance starts to be more expensive than replacing an asset); and
- Obsolete Assets: When assets become obsolete and can no longer fulfil the basic requirements of a modern, effective network, this will lead to replacement.

Vector's network investment is that of a prudent network company, meeting realistic network growth requirements over a reasonable planning window. Several factors influence how assets are selected and the manner in which they are implemented.

- **Network design standards**

  Vector has developed a detailed network supply standards, which sets out the basic requirements for network planning for the gas distribution networks (refer to Section 5 of this AMP for details). These standards define largely the stage at which network reinforcement (i.e. new assets) becomes essential, and the capacity to which new installations should be built.

  To manage supply risk, Vector has put in place a system of operational contingency plans (which are regularly updated).

  Capacity and security are not the only criteria for the design of the distribution network. In Section 5 other planning criteria are also described.

- **Optimising installations**

  When a potential network issue or constraint is identified, project options will be developed and the optimal (usually least life cycle cost) solution will be adopted. The optimal solution may not have the lowest initial capital cost or be the lowest capacity solution.

- **Equipment standardisation**

  To minimise cost in the long-term and to ensure that optimally rated equipment is installed to meet a range of possible situations, Vector has a policy of using standardised equipment on its network. Standardisation helps to reduce design and procurement costs during the establishment phase, increase operational flexibility and makes equipment maintenance more effective. It also allows more effective strategic spares management. For example, we have standardised on pipe sizes for polyethylene pipelines which are designed to operate at a standard pressure of 420kPa. Other examples of standardised asset categories, defined in Vector's material specifications, include district regulator station equipment (such as meters, regulators and filters), valves and telemetry equipment.

- **Customer-specific assets**

  From time to time, Vector builds dedicated assets to supply customers at their request based on agreed commercial terms.

- **Life-cycle considerations**

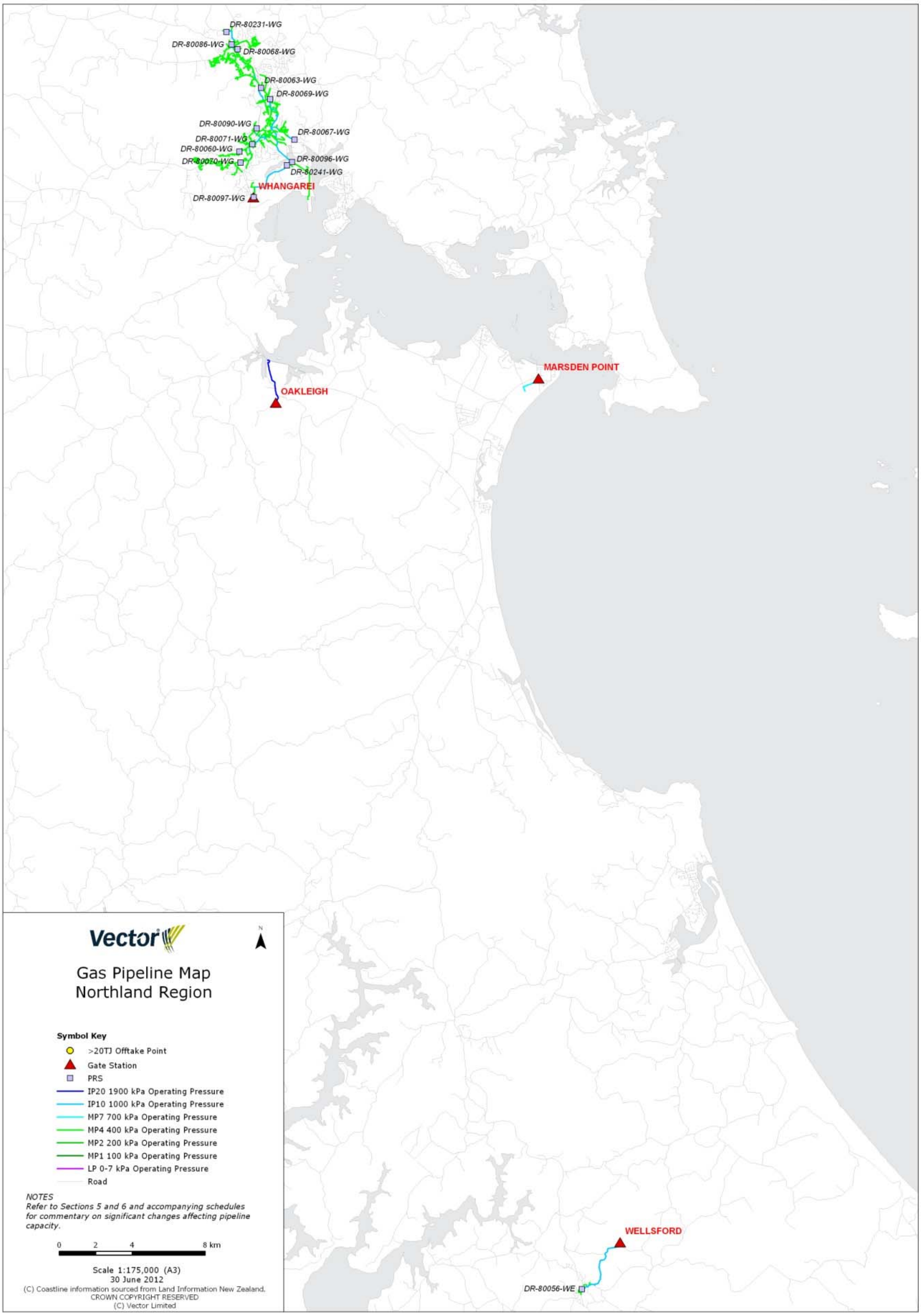
  Vector adopts a life-cycle cost approach to choosing network solutions and assets. This implies that the lowest cost short-term solution may not always be adopted. For example, designing and building district pressure stations to accommodate future telemetry equipment.

- **Historical considerations**

  Load growth, load density and historical network architecture and equipment standards resulted in varying types of assets, states of security and asset condition throughout the network. While historical network architectures and equipment standards converge over-time, replacing well-functioning assets to achieve such alignment in the short-term can generally not be economically justified. However, as assets are replaced or new assets are added to the network, these are designed to comply with the present specifications.

3.9 Gas Distribution Maps

3.9.1 Northland Region

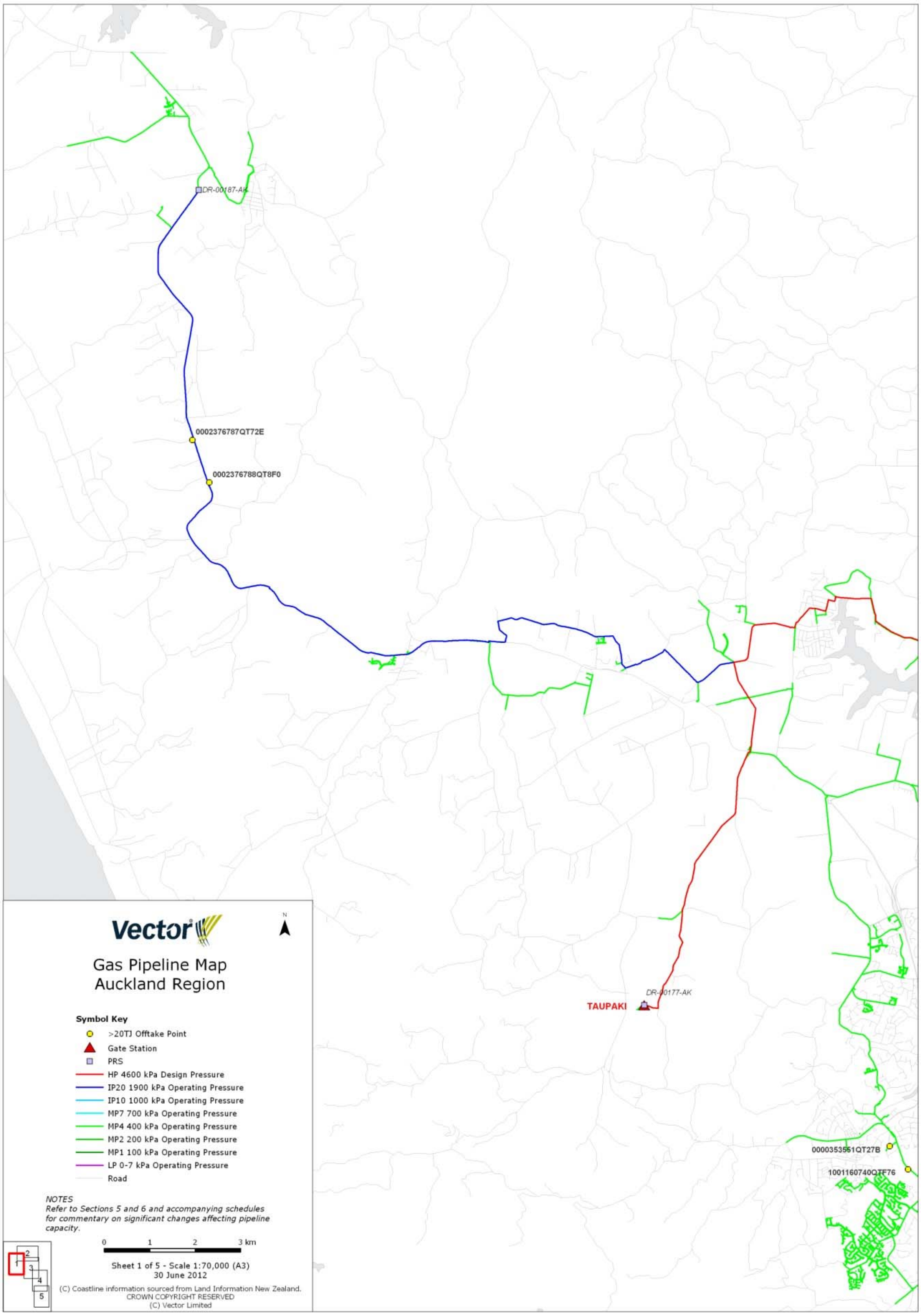


Gas Pipeline Map
Northland Region

NOTES
Refer to Sections 5 and 6 and accompanying schedules for commentary on significant changes affecting pipeline capacity.

Scale 1:175,000 (A3)
30 June 2012

3.9.2 Auckland Region



Gas Pipeline Map
Auckland Region

NOTES
Refer to Sections 5 and 6 and accompanying schedules for commentary on significant changes affecting pipeline capacity.

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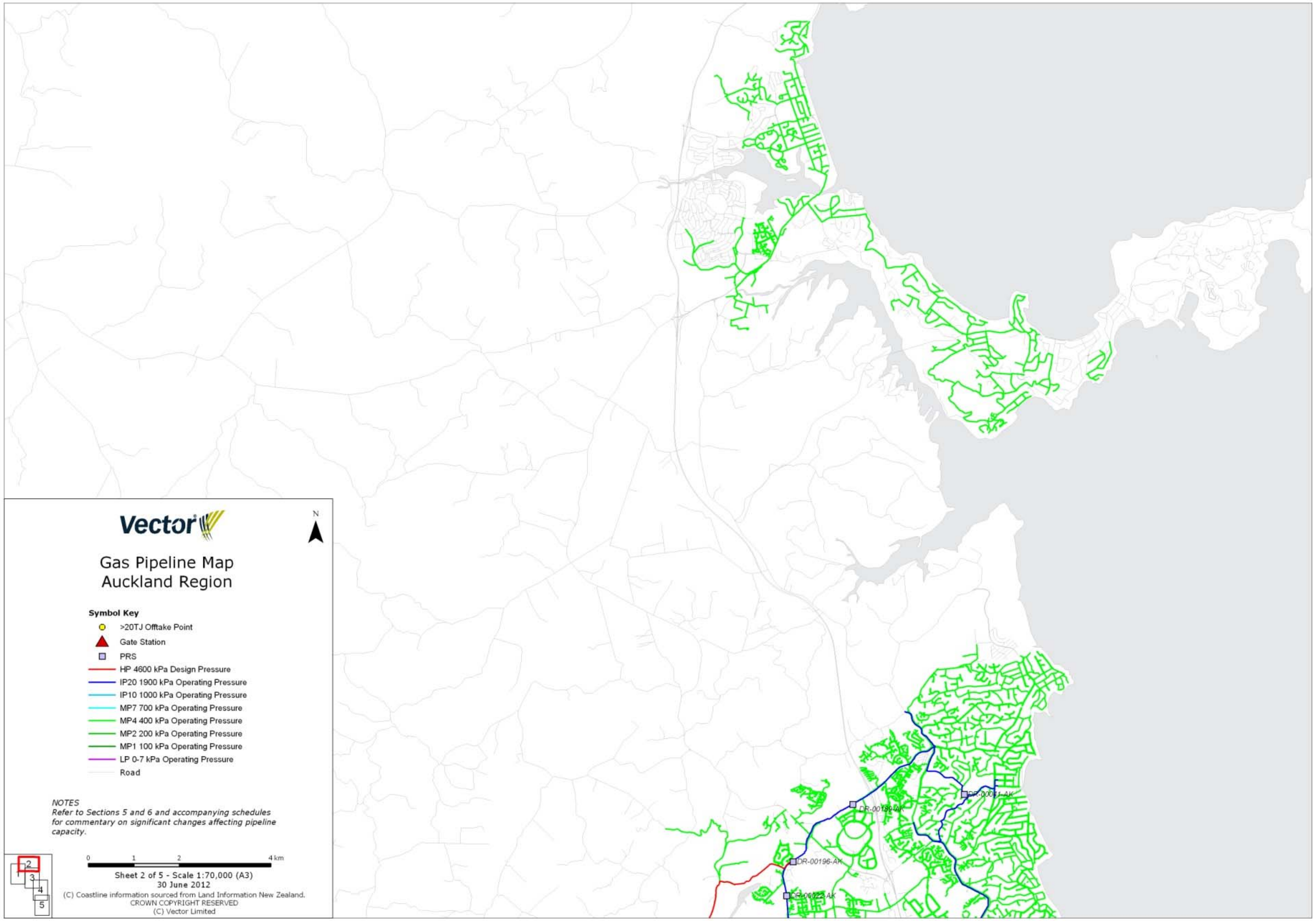
30 June 2012


Vector
N
Gas Pipeline Map
Auckland Region
Symbol Key
● >20TJ Offtake Point
▲ Gate Station
□ PRS
HP 4600 kPa Design Pressure
IP20 1900 kPa Operating Pressure
IP10 1000 kPa Operating Pressure
MP7 700 kPa Operating Pressure
MP4 400 kPa Operating Pressure
MP2 200 kPa Operating Pressure
MP1 100 kPa Operating Pressure
LP 0-7 kPa Operating Pressure
Road
NOTES
Refer to Sections 5 and 6 and accompanying schedules for commentary on significant changes affecting pipeline capacity.
1
2
3
4
5
0
1
2
4 km
Sheet 2 of 5 - Scale 1:70,000 (A3)
30 June 2012
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CROWN COPYRIGHT RESERVED
(C) Vector Limited
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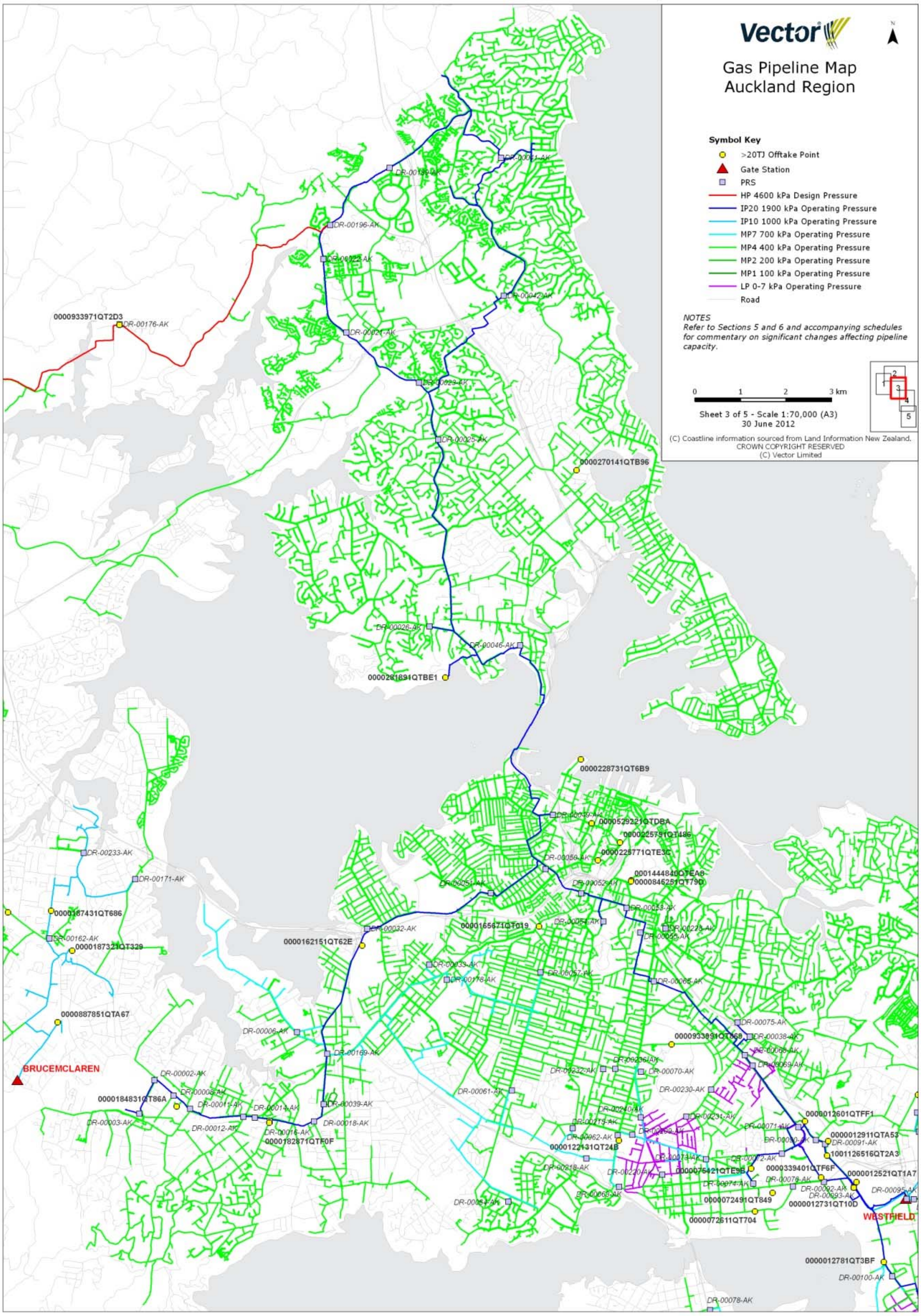
Vector
N
Gas Pipeline Map
Auckland Region
Symbol Key
>20TJ Offtake Point
Gate Station
PRS
HP 4600 kPa Design Pressure
IP20 1900 kPa Operating Pressure
IP10 1000 kPa Operating Pressure
MP7 700 kPa Operating Pressure
MP4 400 kPa Operating Pressure
MP2 200 kPa Operating Pressure
MP1 100 kPa Operating Pressure
LP 0-7 kPa Operating Pressure
Road
NOTES
Refer to Sections 5 and 6 and accompanying schedules for commentary on significant changes affecting pipeline capacity.
0
1
2
3 km
Sheet 3 of 5 - Scale 1:70,000 (A3)
30 June 2012
1
2
3
4
5
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CROWN COPYRIGHT RESERVED
(C) Vector Limited
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DR-00171-AK
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DR-00162-AK
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DR-00032-AK
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DR-00054-AK
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DR-00076-AK
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DR-00093-AK
DR-00095-AK
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WESTFIELD
0000072611QT704
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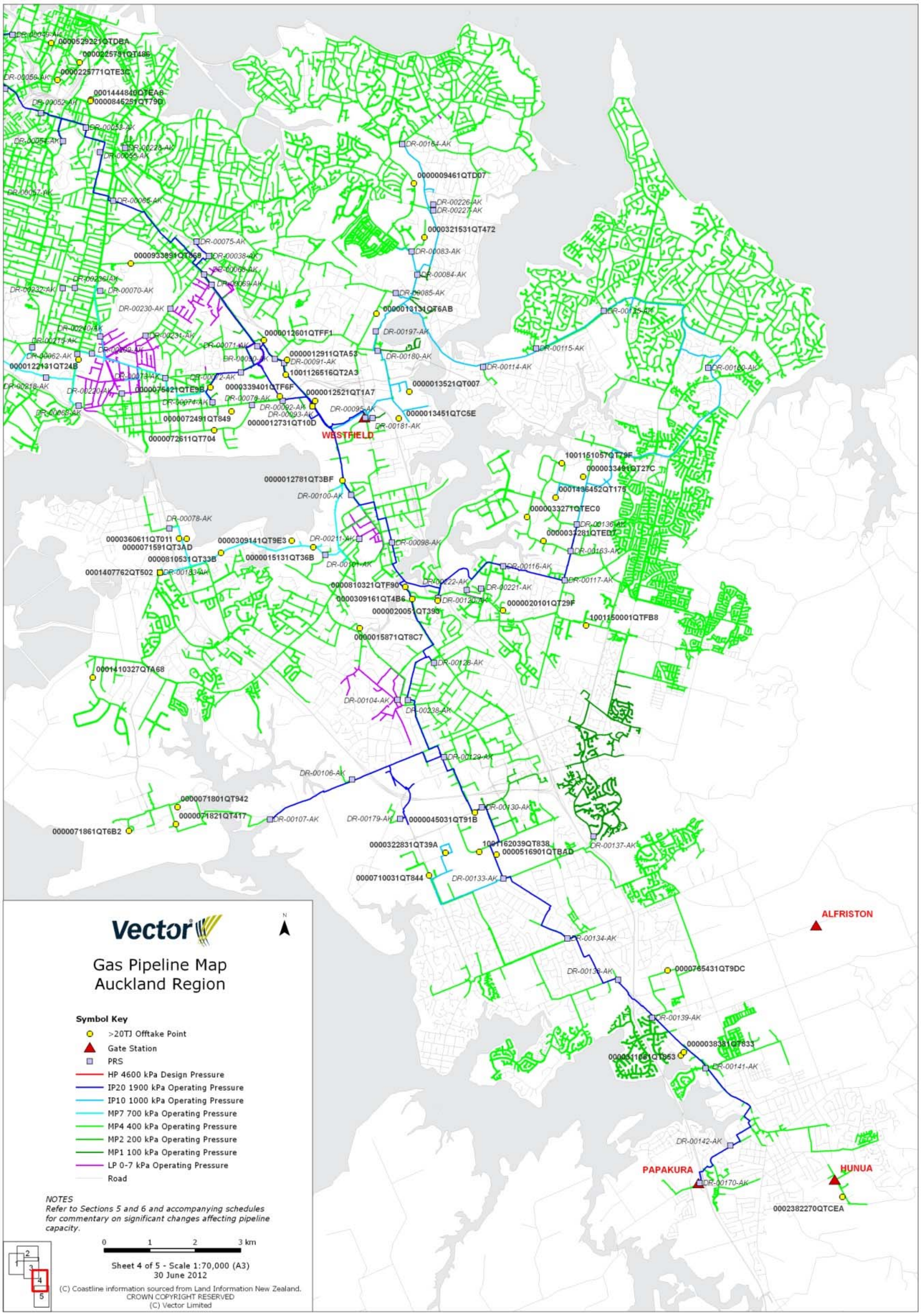
DR-00078-AK


Vector
Gas Pipeline Map
Auckland Region
Symbol Key
>20TJ Offtake Point
Gate Station
PRS
HP 4600 kPa Design Pressure
IP20 1900 kPa Operating Pressure
IP10 1000 kPa Operating Pressure
MP7 700 kPa Operating Pressure
MP4 400 kPa Operating Pressure
MP2 200 kPa Operating Pressure
MP1 100 kPa Operating Pressure
LP 0-7 kPa Operating Pressure
Road
NOTES
Refer to Sections 5 and 6 and accompanying schedules for commentary on significant changes affecting pipeline capacity.
0 1 2 3 km
Sheet 4 of 5 - Scale 1:70,000 (A3)
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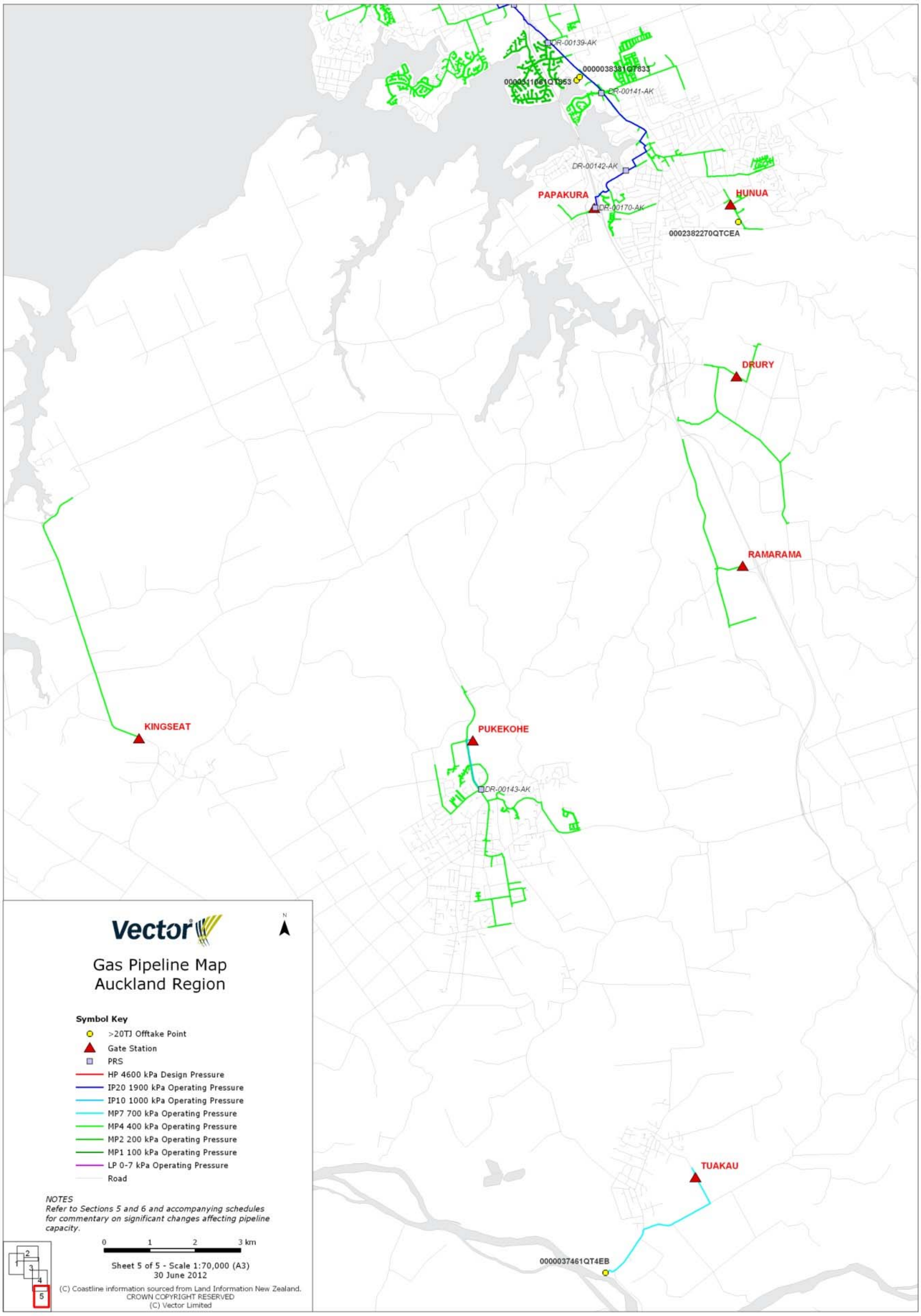
CROWN COPYRIGHT RESERVED
(C) Vector Limited
WESTFIELD
ALFRISTON
PAPAKURA
HUNUA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DR-00141-AK
DR-00142-AK
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DR-00170-AK
HUNUA
0002382270QTCEA
DRURY
RAMARAMA
KINGSEAT
PUKEKOHE
DR-00143-AK
TUAKAU
0000037461QT4EB
Vector
N
Gas Pipeline Map
Auckland Region
Symbol Key
>20TJ Offtake Point
Gate Station
PRS
HP 4600 kPa Design Pressure
IP20 1900 kPa Operating Pressure
IP10 1000 kPa Operating Pressure
MP7 700 kPa Operating Pressure
MP4 400 kPa Operating Pressure
MP2 200 kPa Operating Pressure
MP1 100 kPa Operating Pressure
LP 0-7 kPa Operating Pressure
Road
NOTES
Refer to Sections 5 and 6 and accompanying schedules for commentary on significant changes affecting pipeline capacity.
0
1
2
3 km
1
2
3
4
5
Sheet 5 of 5 - Scale 1:70,000 (A3)
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(C) Coastline information sourced from Land Information New Zealand.
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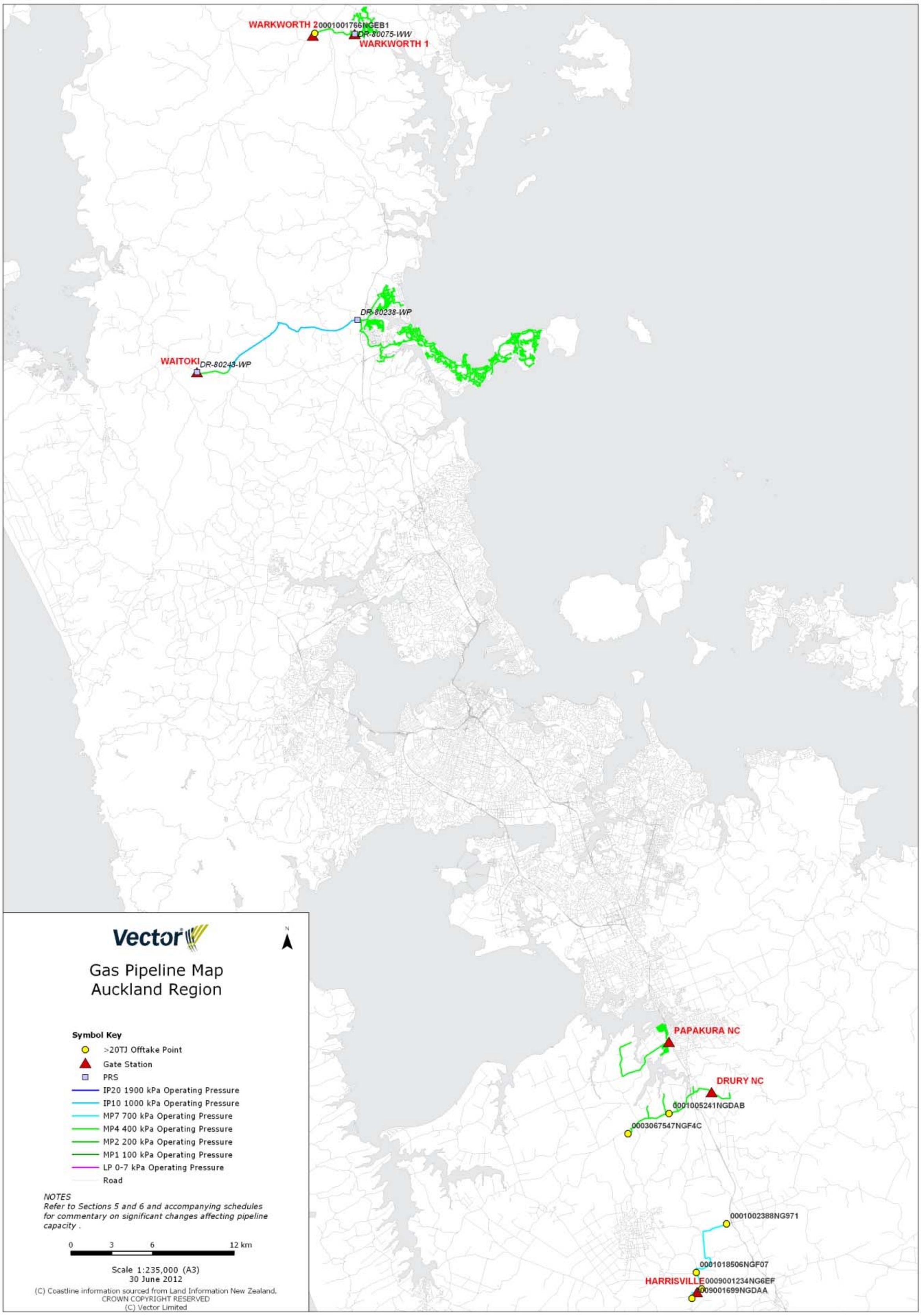

Gas Pipeline Map
Auckland Region

NOTES
Refer to Sections 5 and 6 and accompanying schedules for commentary on significant changes affecting pipeline capacity .

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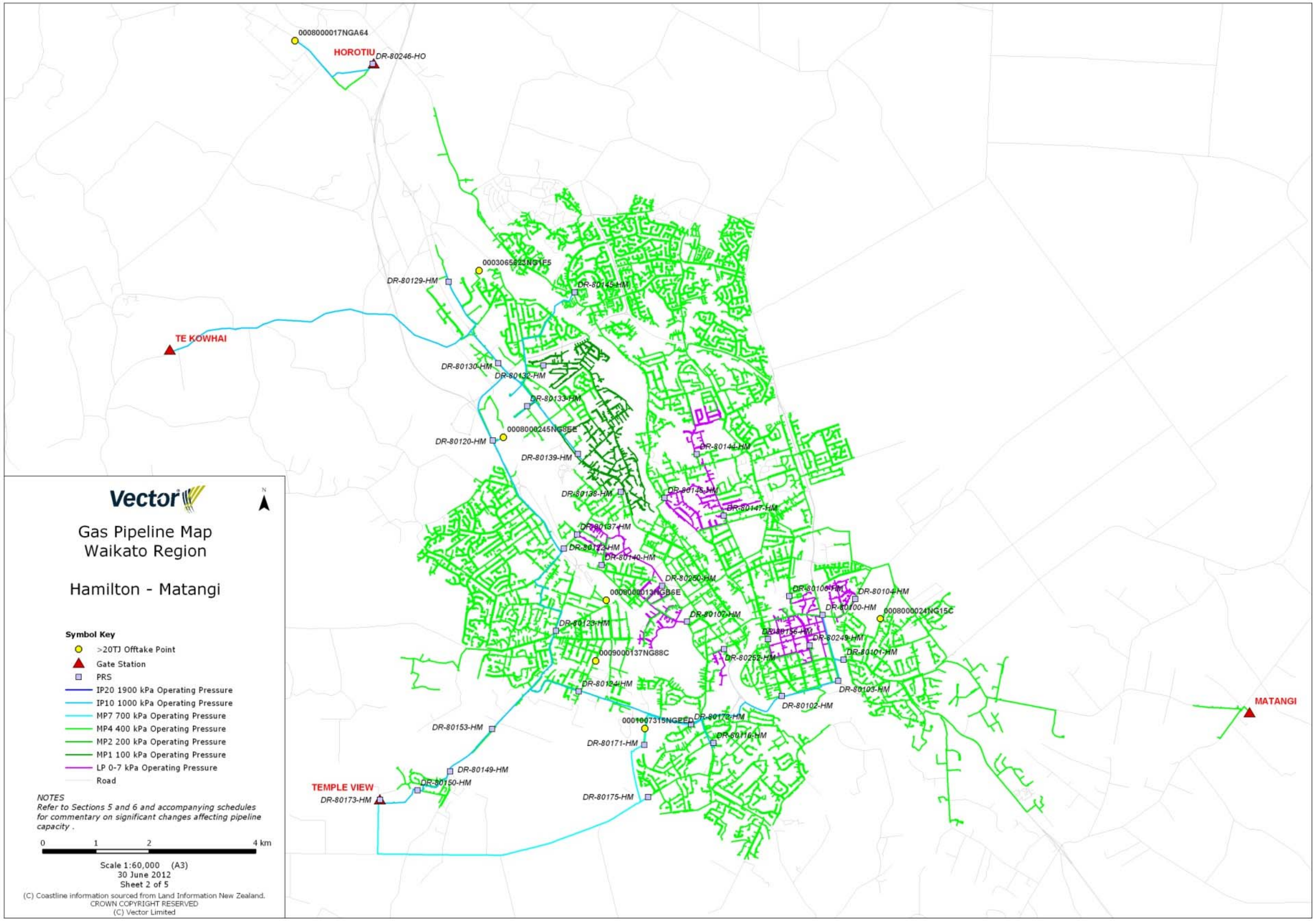
30 June 2012

3.9.3 Waikato Region



Gas Pipeline Map
Waikato Region

Hamilton - Matangi

Symbol Key

- ● >20TJ Offtake Point
- ▲ Gate Station
- □ PRS
- — IP20 1900 kPa Operating Pressure
- — IP10 1000 kPa Operating Pressure
- — MP7 700 kPa Operating Pressure
- — MP4 400 kPa Operating Pressure
- — MP2 200 kPa Operating Pressure
- — MP1 100 kPa Operating Pressure
- — LP 0-7 kPa Operating Pressure
- — Road

NOTES
Refer to Sections 5 and 6 and accompanying schedules for commentary on significant changes affecting pipeline capacity .

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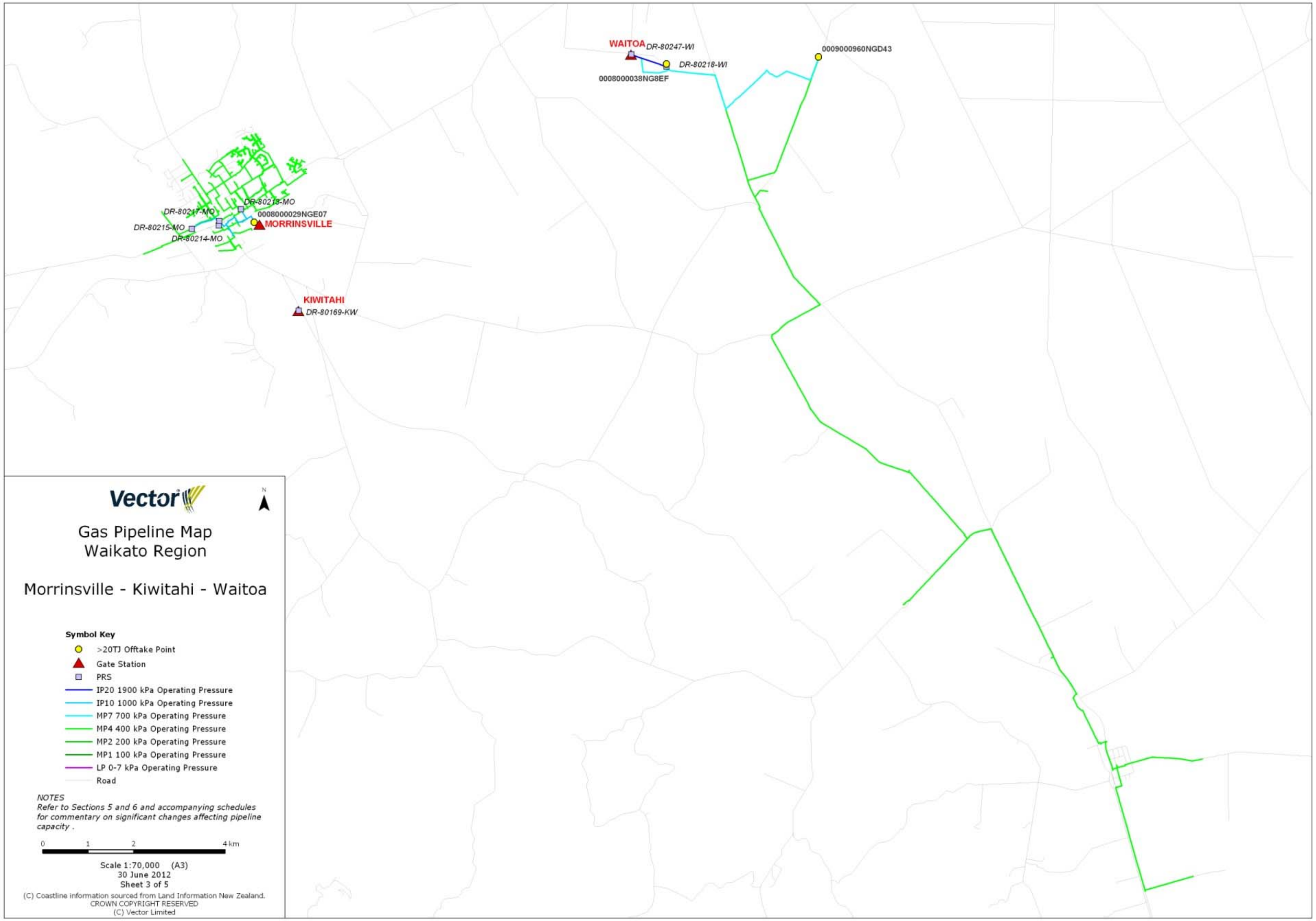
Sheet 2 of 5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DR-80218-WI
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0009000960NGD43
DR-80213-MO
DR-80217-MO
0008000029NGE07
DR-80215-MO
MORRINSVILLE
DR-80214-MO
KIWITAHI
DR-80169-KW
Vector
N
Gas Pipeline Map
Waikato Region
Morrinsville - Kiwitahi - Waitoa
Symbol Key
>20TJ Offtake Point
Gate Station
PRS
IP20 1900 kPa Operating Pressure
IP10 1000 kPa Operating Pressure
MP7 700 kPa Operating Pressure
MP4 400 kPa Operating Pressure
MP2 200 kPa Operating Pressure
MP1 100 kPa Operating Pressure
LP 0-7 kPa Operating Pressure
Road
NOTES
Refer to Sections 5 and 6 and accompanying schedules for commentary on significant changes affecting pipeline capacity .
0
1
2
4 km
Scale 1:70,000 (A3)
30 June 2012
Sheet 3 of 5
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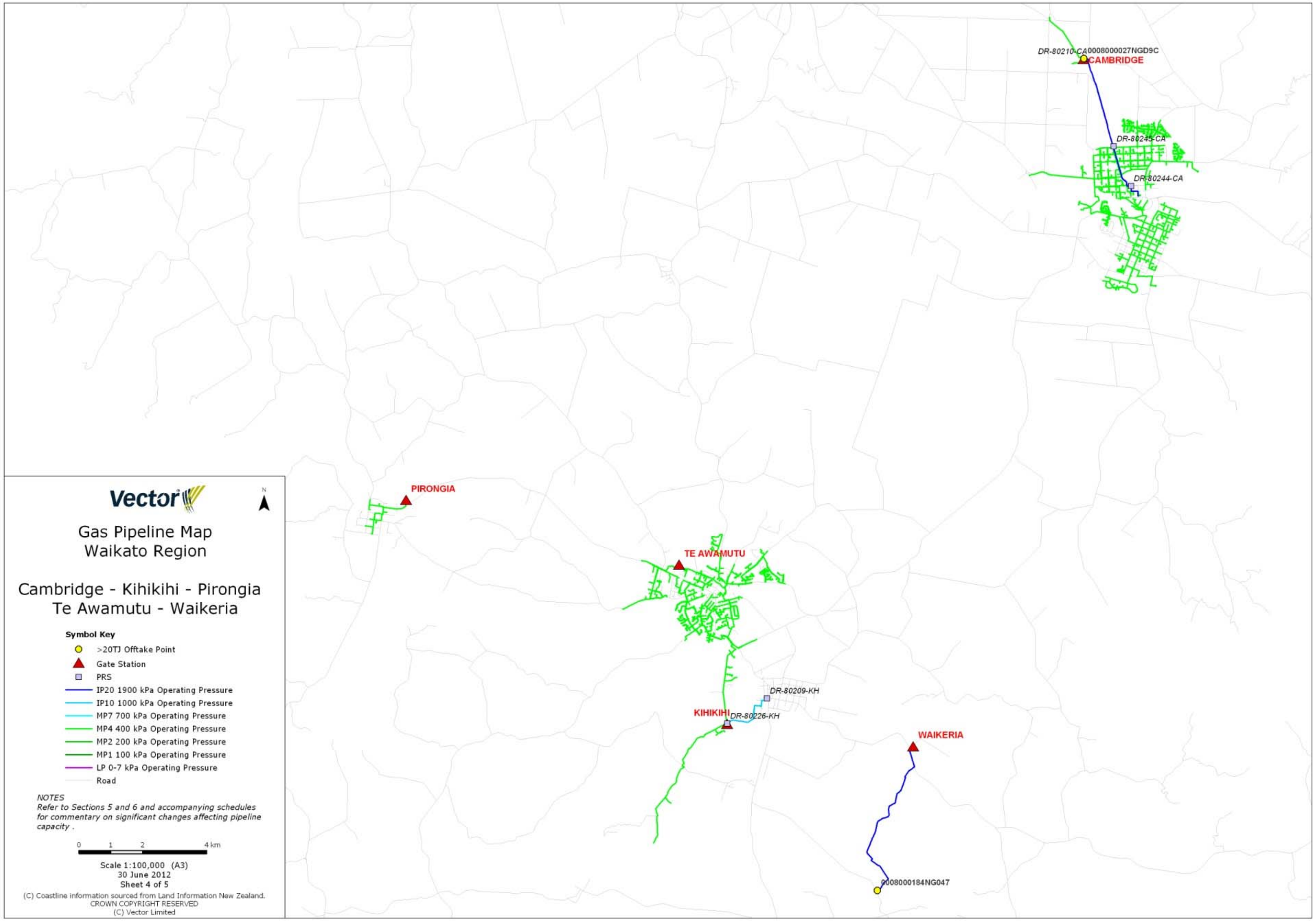
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CAMBRIDGE
DR-80245-CA
DR-80244-CA
PIRONGIA
TE AWAMUTU
DR-80209-KH
KIHIKIHI
DR-80226-KH
WAIKERIA
0008000184NG047
Vector
N
Gas Pipeline Map
Waikato Region
Cambridge - Kihikihi - Pirongia
Te Awamutu - Waikeria
Symbol Key
>20TJ Offtake Point
Gate Station
PRS
IP20 1900 kPa Operating Pressure
IP10 1000 kPa Operating Pressure
MP7 700 kPa Operating Pressure
MP4 400 kPa Operating Pressure
MP2 200 kPa Operating Pressure
MP1 100 kPa Operating Pressure
LP 0-7 kPa Operating Pressure
Road
NOTES
Refer to Sections 5 and 6 and accompanying schedules for commentary on significant changes affecting pipeline capacity .
0
1
2
4 km
Scale 1:100,000 (A3)
30 June 2012
Sheet 4 of 5
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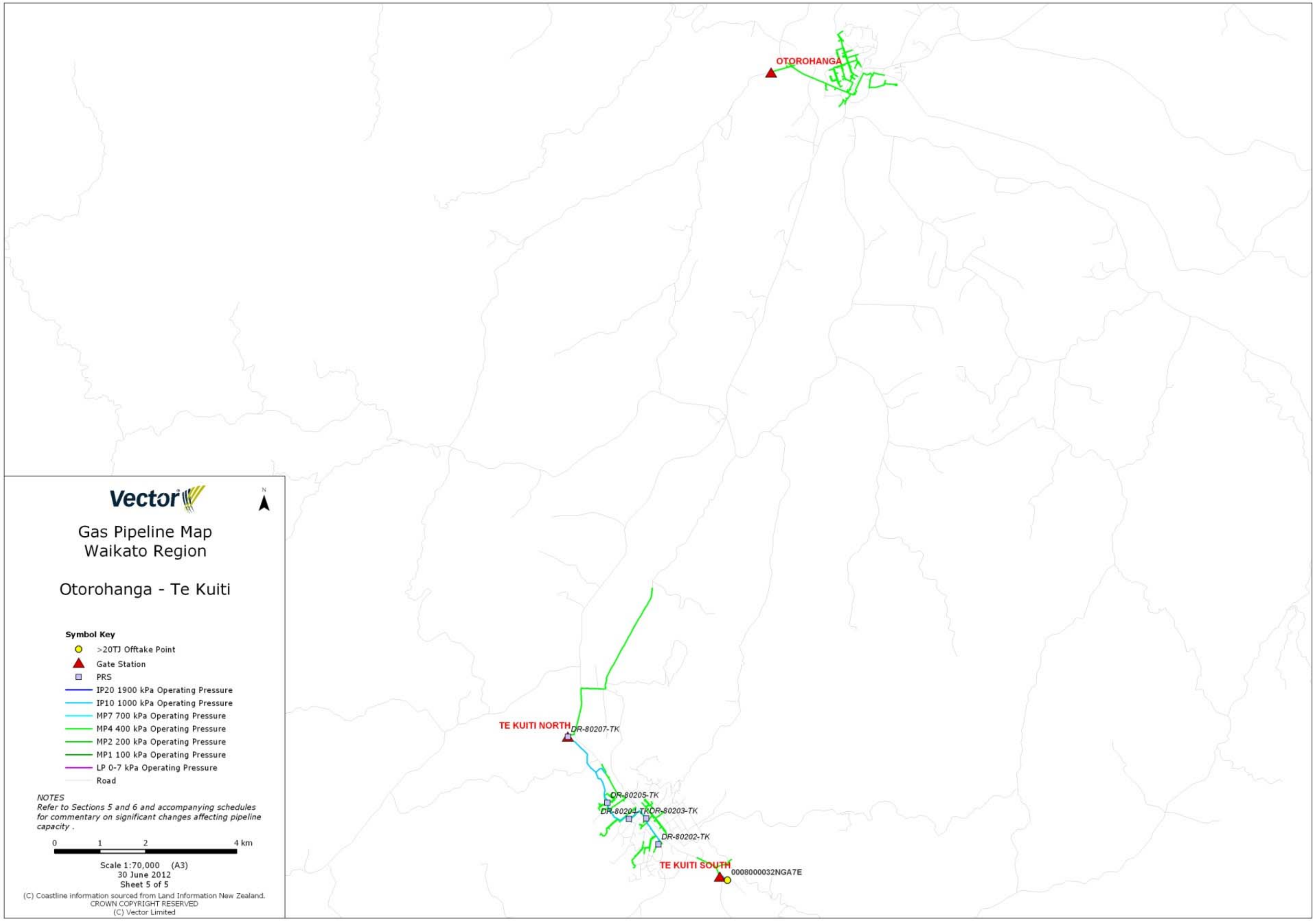
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TE KUITI NORTH
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DR-80205-TK
DR-80204-TK
DR-80203-TK
DR-80202-TK
TE KUITI SOUTH
0008000032NGA7E
Vector
N
Gas Pipeline Map
Waikato Region
Otorohanga - Te Kuiti
Symbol Key
>20TJ Offtake Point
Gate Station
PRS
IP20 1900 kPa Operating Pressure
IP10 1000 kPa Operating Pressure
MP7 700 kPa Operating Pressure
MP4 400 kPa Operating Pressure
MP2 200 kPa Operating Pressure
MP1 100 kPa Operating Pressure
LP 0-7 kPa Operating Pressure
Road
NOTES
Refer to Sections 5 and 6 and accompanying schedules for commentary on significant changes affecting pipeline capacity .
0
1
2
4 km
Scale 1:70,000 (A3)
30 June 2012
Sheet 5 of 5
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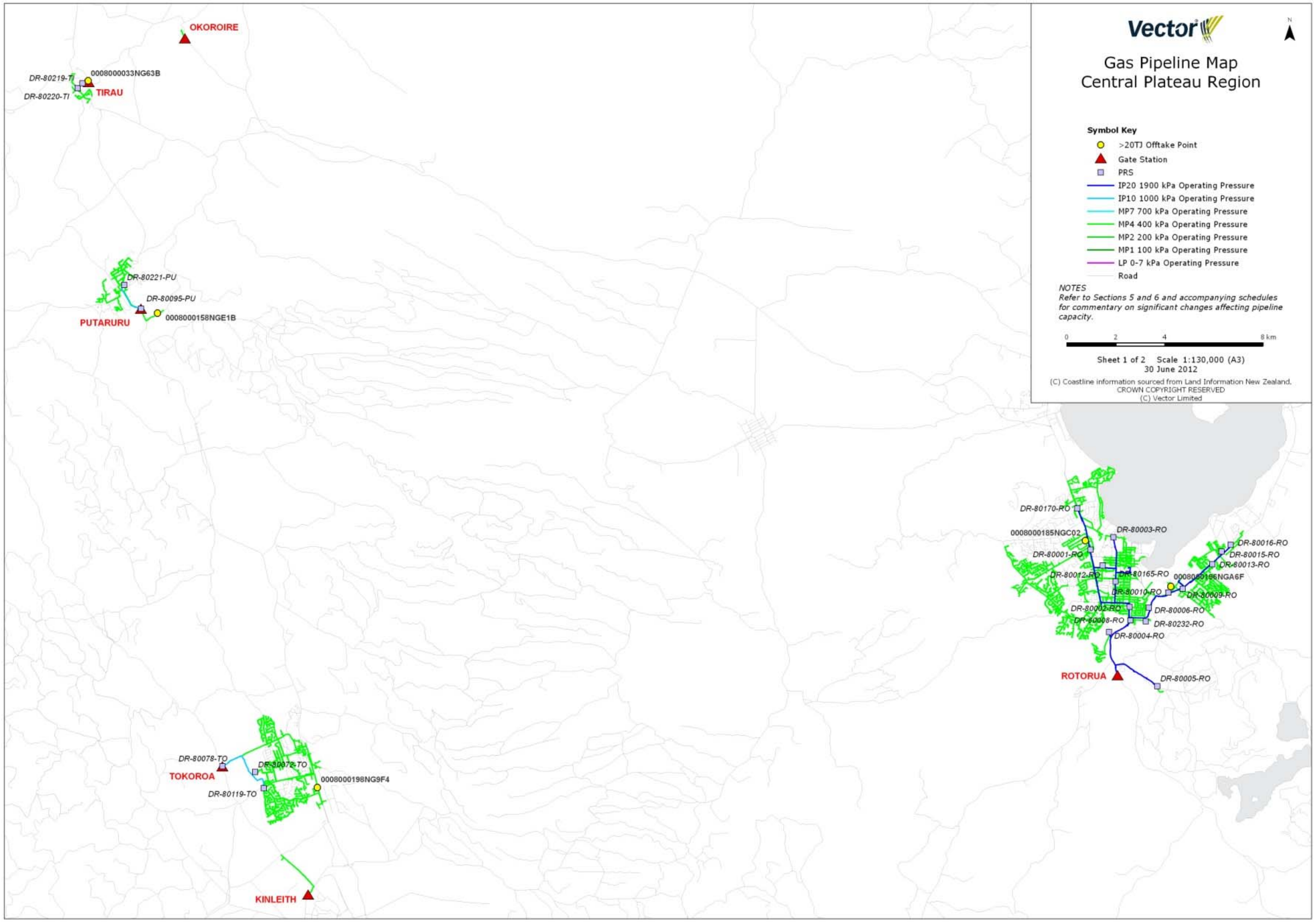
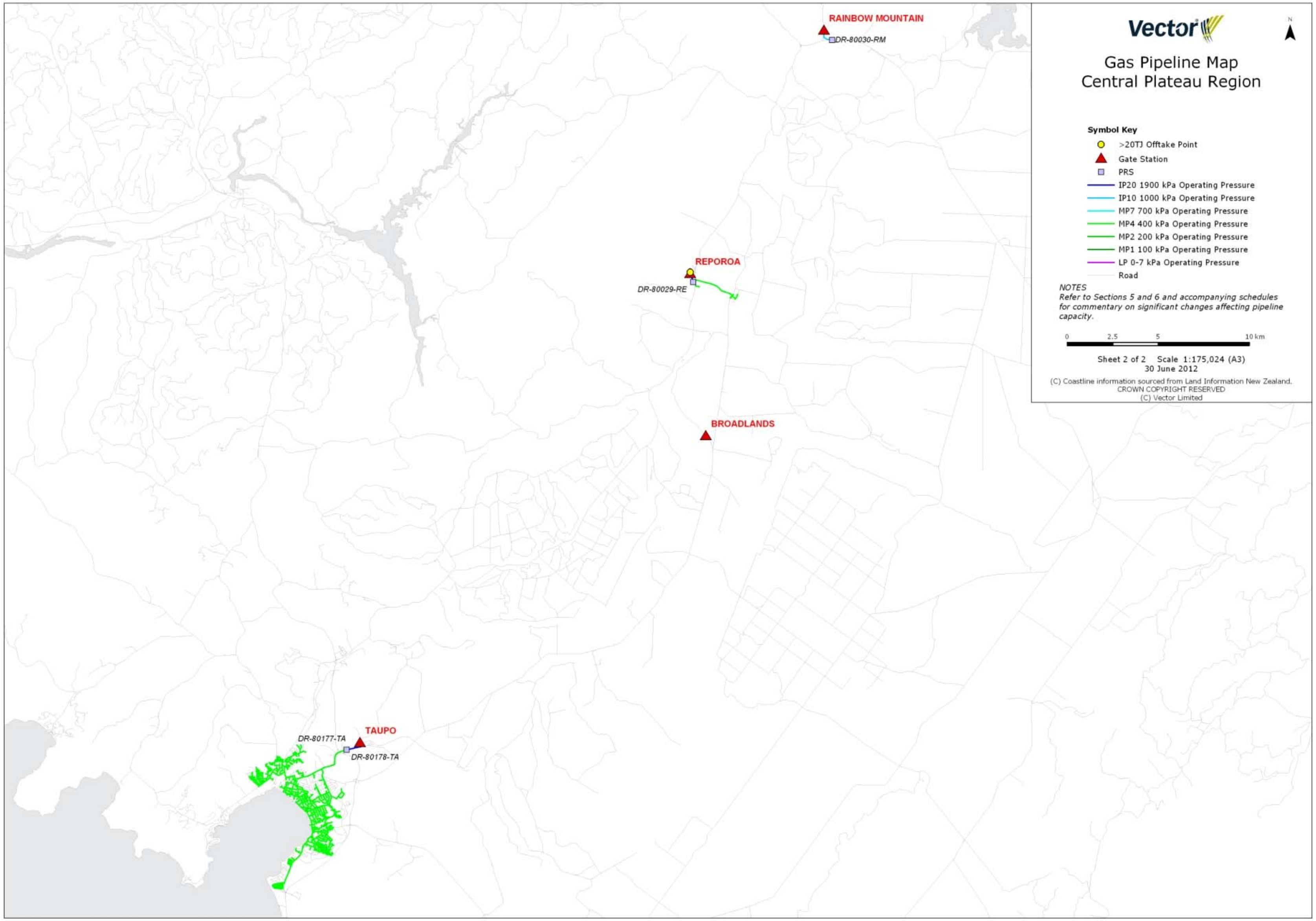
3.9.4 Central Plateau Region




RAINBOW MOUNTAIN
DR-80030-RM
REPOROA
DR-80029-RE
BROADLANDS
TAUPO
DR-80177-TA
DR-80178-TA
Vector
N
Gas Pipeline Map
Central Plateau Region
Symbol Key
>20TJ Offtake Point
Gate Station
PRS
IP20 1900 kPa Operating Pressure
IP10 1000 kPa Operating Pressure
MP7 700 kPa Operating Pressure
MP4 400 kPa Operating Pressure
MP2 200 kPa Operating Pressure
MP1 100 kPa Operating Pressure
LP 0-7 kPa Operating Pressure
Road
NOTES
Refer to Sections 5 and 6 and accompanying schedules for commentary on significant changes affecting pipeline capacity.
0
2.5
5
10 km
Sheet 2 of 2 Scale 1:175,024 (A3)
30 June 2012
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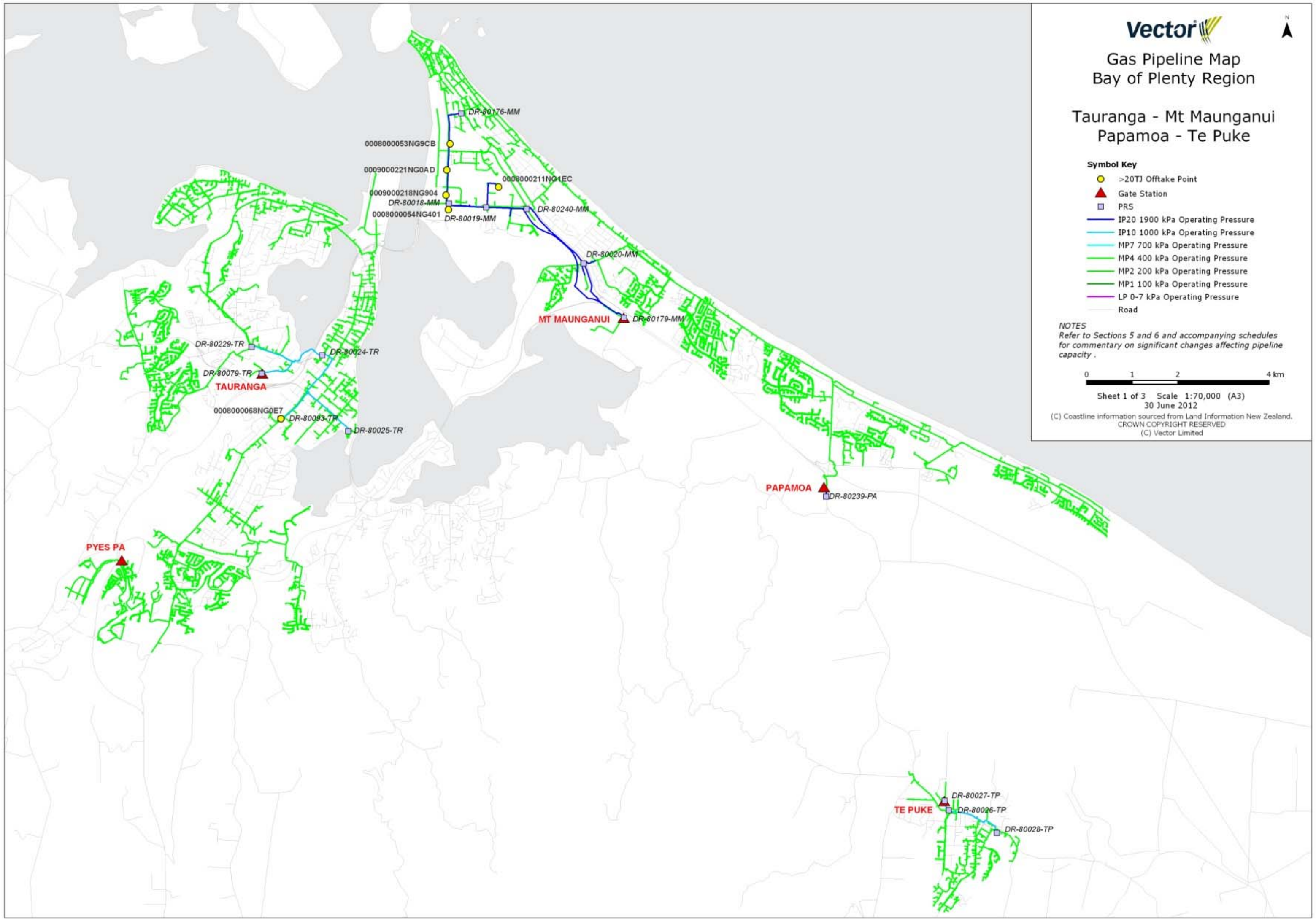
3.9.5 Bay of Plenty Region



NOTES
Refer to Sections 5 and 6 and accompanying schedules for commentary on significant changes affecting pipeline capacity .

Sheet 1 of 3 Scale 1:70,000 (A3)
30 June 2012

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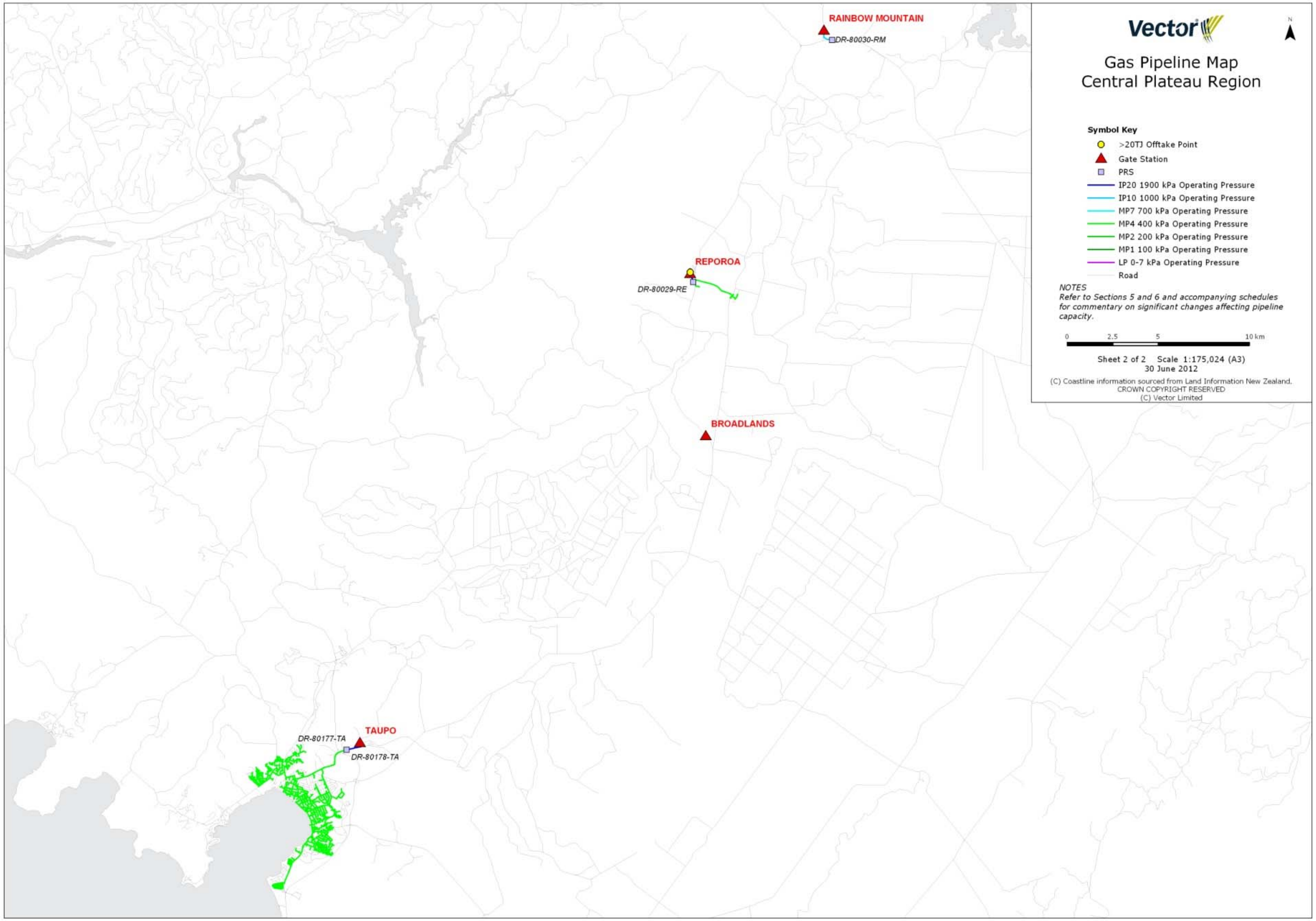
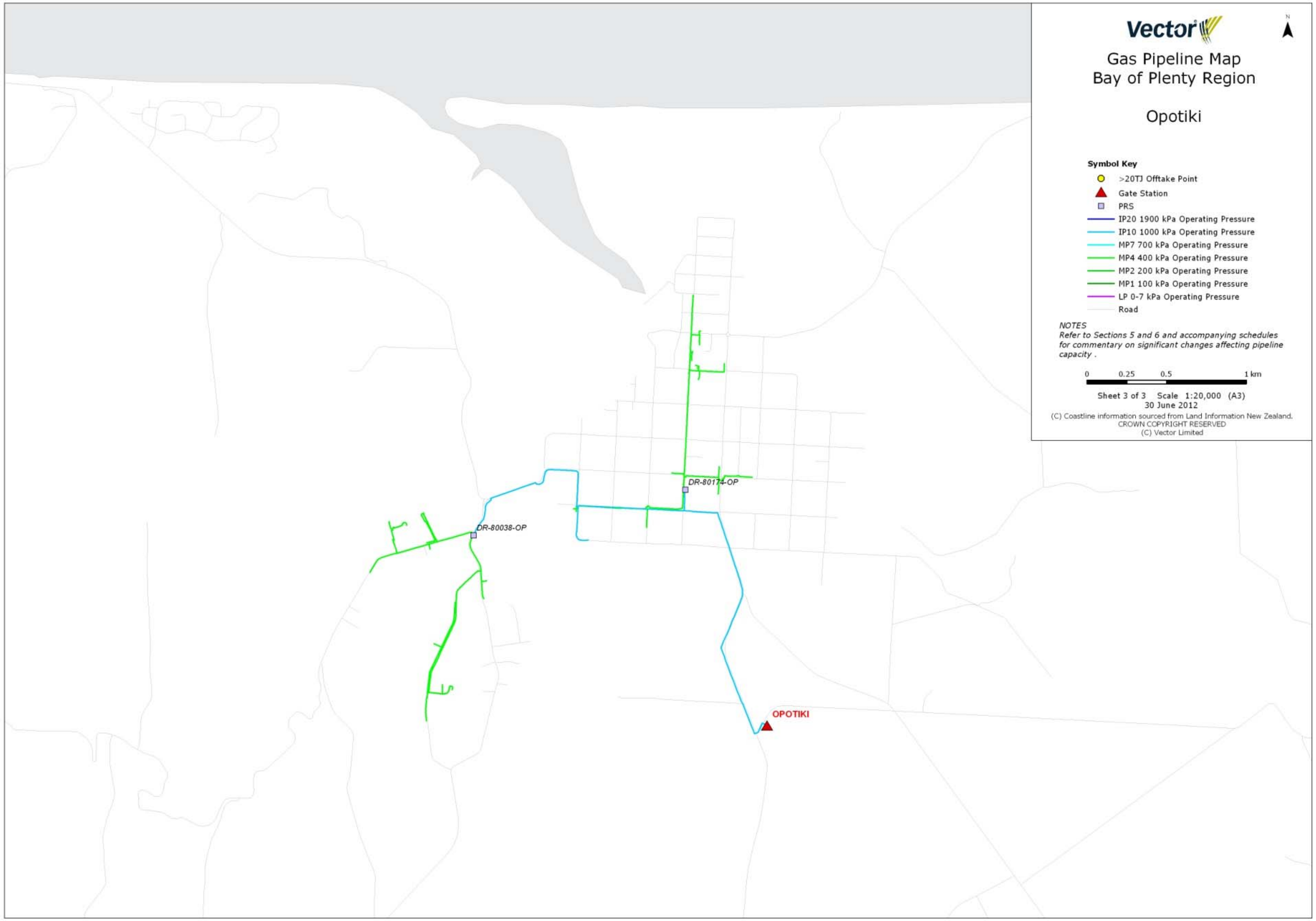


Gas Pipeline Map
Central Plateau Region

NOTES
Refer to Sections 5 and 6 and accompanying schedules for commentary on significant changes affecting pipeline capacity.

Sheet 2 of 2 Scale 1:175,024 (A3)
30 June 2012


Vector
N
Gas Pipeline Map
Bay of Plenty Region
Opotiki
Symbol Key
>20TJ Offtake Point
Gate Station
PRS
IP20 1900 kPa Operating Pressure
IP10 1000 kPa Operating Pressure
MP7 700 kPa Operating Pressure
MP4 400 kPa Operating Pressure
MP2 200 kPa Operating Pressure
MP1 100 kPa Operating Pressure
LP 0-7 kPa Operating Pressure
Road
NOTES
Refer to Sections 5 and 6 and accompanying schedules for commentary on significant changes affecting pipeline capacity .
0
0.25
0.5
1 km
Sheet 3 of 3 Scale 1:20,000 (A3)
30 June 2012
(C) Coastline information sourced from Land Information New Zealand.
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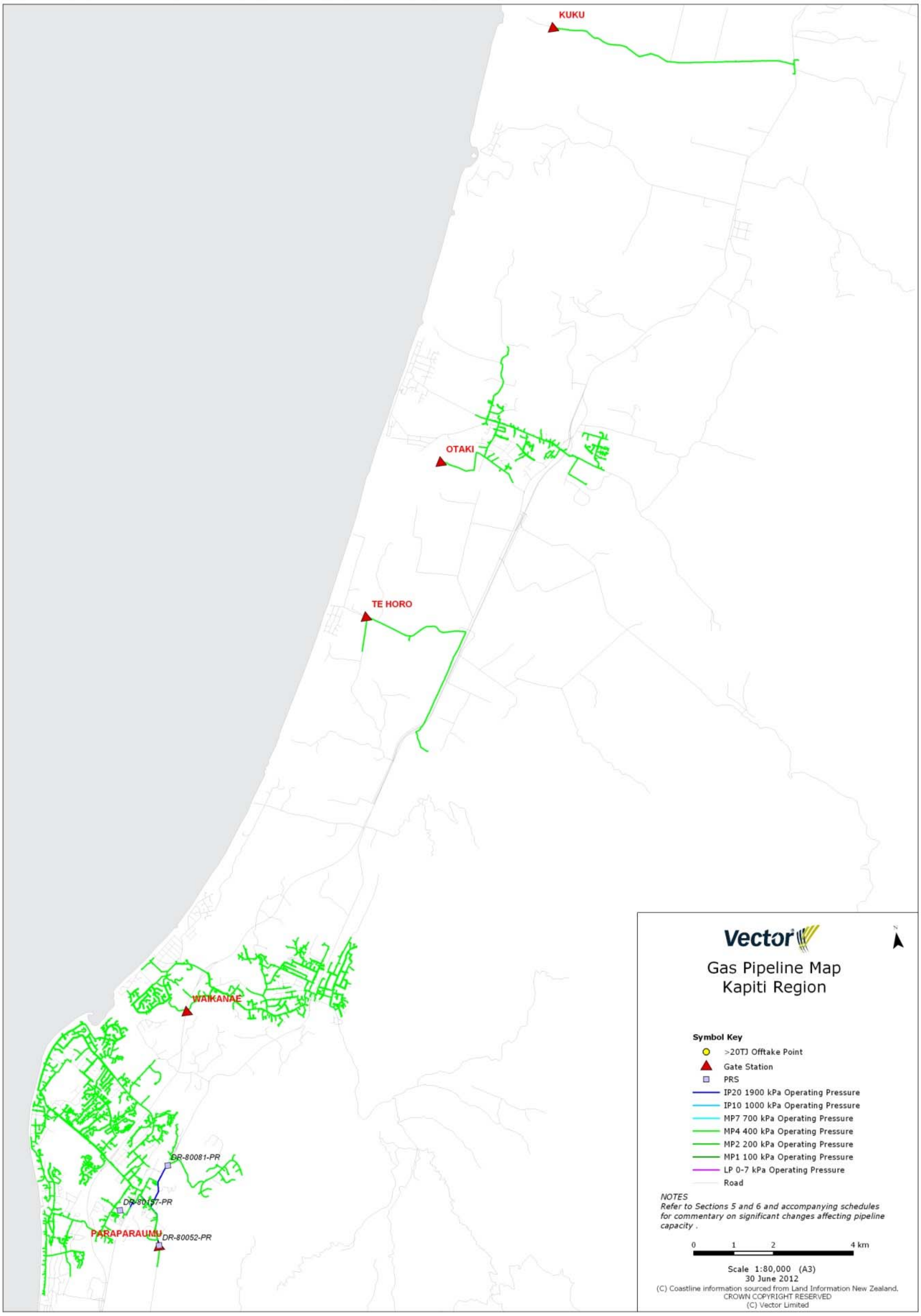
(C) Vector Limited
DR-80174-OP
DR-80038-OP
OPOTIKI

3.9.6 Gisborne Region

3.9.7 Kapiti Region



NOTES
Refer to Sections 5 and 6 and accompanying schedules for commentary on significant changes affecting pipeline capacity .

Scale 1:80,000 (A3)
30 June 2012

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Gas Distribution Asset Management Plan 2013 – 2023

Service Levels – Section 4

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List of Figures

4 Service Levels

This section describes the gas distribution business performance targets set under Vector's asset management strategy. Performance against these targets is also discussed.

4.1 Consumer Oriented Performance Targets

Vector is committed to providing a high standard of service and a safe, reliable and secure gas supply. This challenge requires effective and efficient network solutions to enable Vector to meet this goal with the optimum investment. As such, Vector recognises that communication is essential in order to improve and understand what services and products Vector's customers like, what they do not like and what they need.

Customers are widely consulted and are able to provide feedback about their expectations through a variety of contact points:

- Call centre representatives;
- Customer service team representatives;
- Operations and project representatives;
- Service provider/contracting representatives;
- Customer service feedback surveys;
- Customer engagement surveys;
- Social media and websites; and
- Dedicated account management for very large customers.

4.1.1 Customer Expectations

Keeping engaged and aligned with changing customer expectations is fundamental to optimal asset investment and asset management practices.

Customer performance targets are normally established through taking into account customer needs on a qualitative basis, due to the complexity and informational requirements of quantifying customer requirements, and relating them to network performance.

At present there is no evidence from the Vector customer-base to support increased (or reduced) levels of supply reliability, especially where these would require increased network charges to recover the additional costs. In the absence of other drivers, Vector's quality targets therefore coincide with the Commerce Commission's regulatory quality targets[1].

4.1.2 Customer Feedback

Vector obtains feedback from regular customer experience surveys, through which we contact a sample of customers[2] who have recently had a gas connection completed through Vector's connections services team.

The key survey results are reported as follows:

- The overall experience of getting gas installed (residential customers);

---

[1] Defined in the Decision No. NZCC 23 (http://www.comcom.govt.nz/assets/Gas/Information-Disclosure/Gas-Distribution-ID-Determination-1-October-2012-SIGNED.PDF)

[2] The sample size for the residential and commercial customer surveys vary each year but typically range between 450 to 550, and 175 to 225, respectively.

- Service laying/installation stage (residential and commercial customers); and
- Overall satisfaction with Vector through the connections process (residential and commercial customers).

Individual customers have different and diverse needs and expectations when requesting and connecting gas at their property. For some, the initial contact and professionalism is a key consideration. For others, the method and level of disruption of installation has real consequences. All aspects of the customer experience are reported through the detailed survey responses.

The results of these surveys provide a basis for setting Vector's customer service levels for connections, and guide continuous process and service improvements. The average rating score is expressed as a percentage.

Results for the overall and service laying performance for the Auckland and North Island[3] region networks are summarised in the following charts.

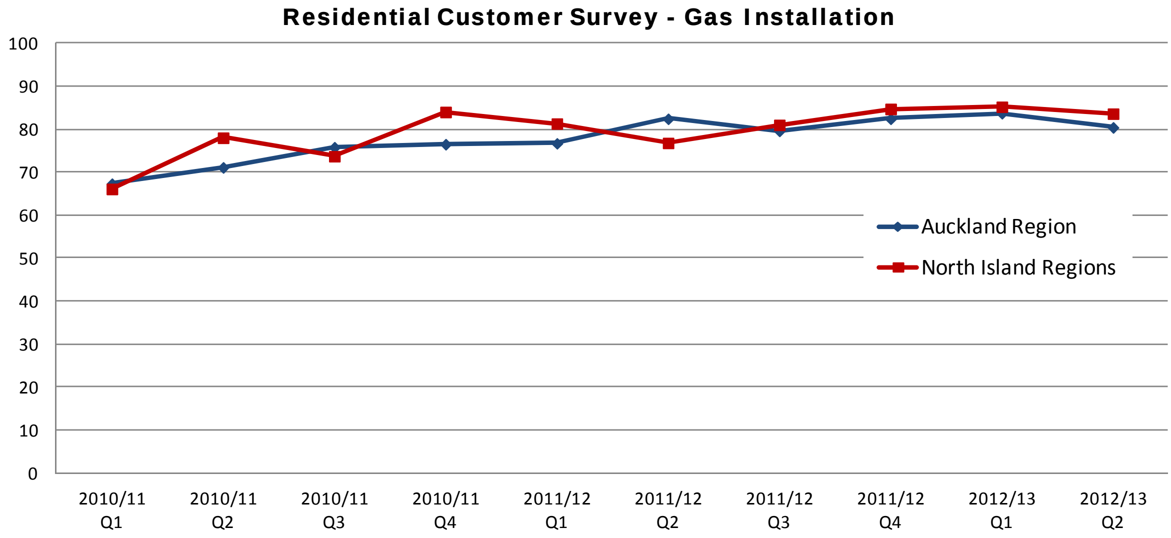

Figure 4-1 : Residential customers' satisfaction for getting gas installed by region

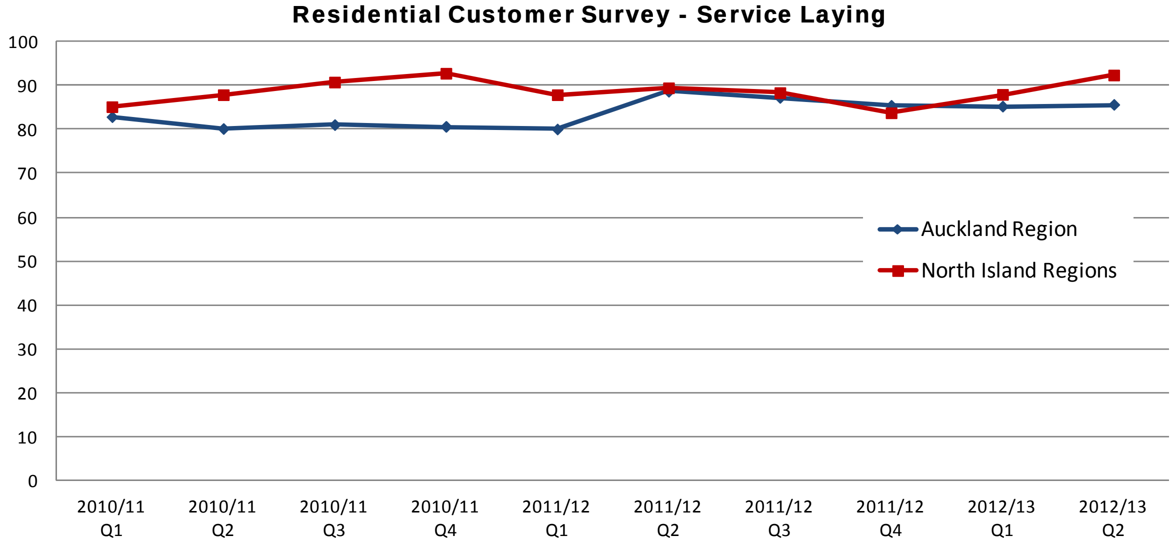

Figure 4-2 : Residential customers' satisfaction with service laying stage by region

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[3] The North Island region does not include the Auckland region. Refer to Section 3 for more details.

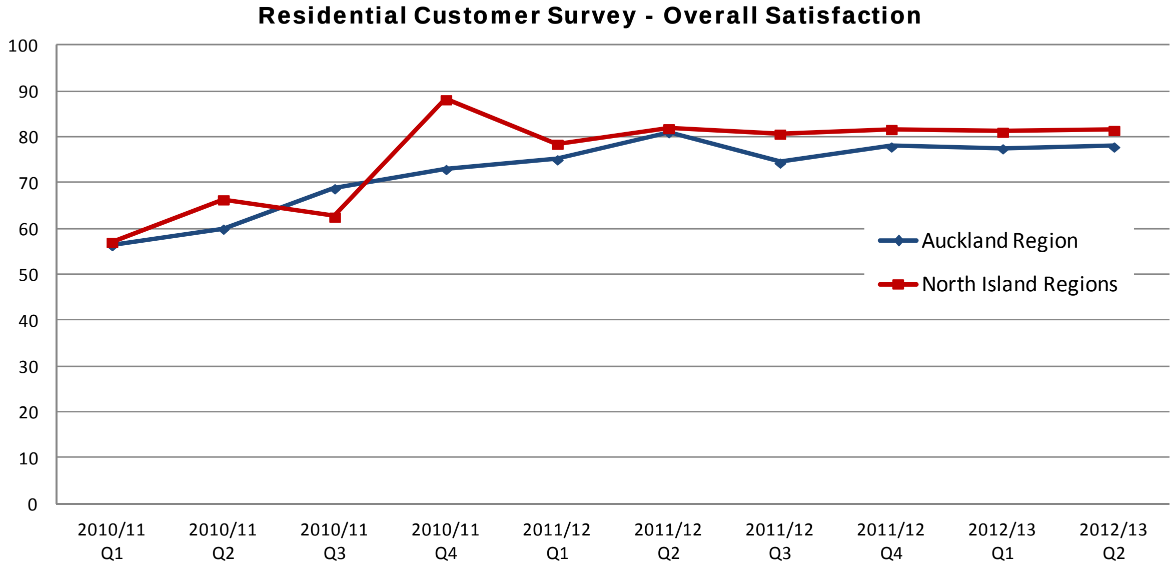

Figure 4-3 Residential customers' overall satisfaction with Vector through the connections process by region

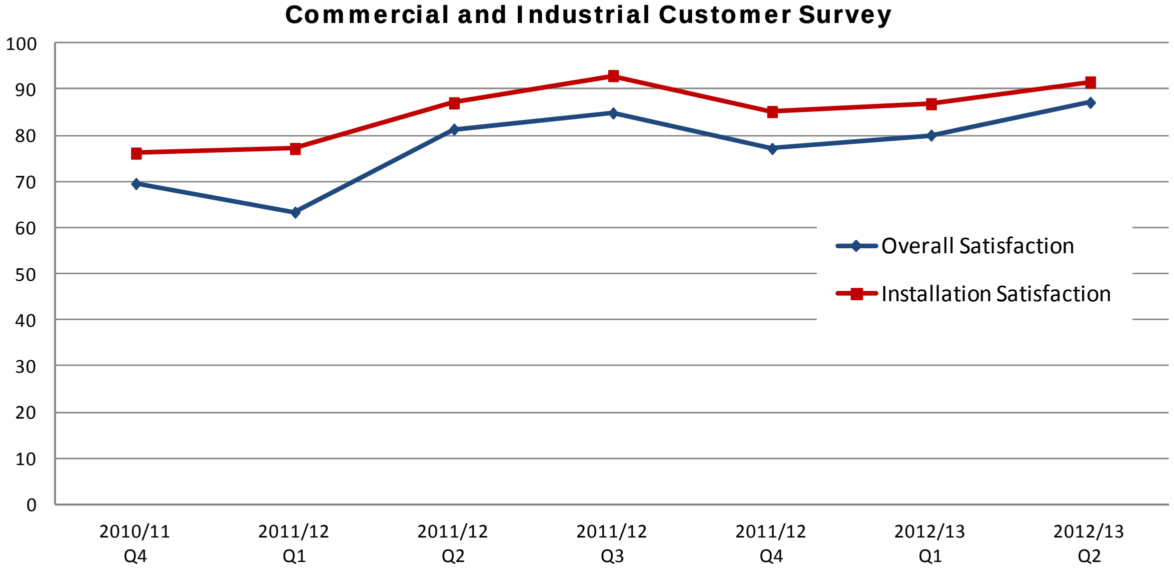

Figure 4-4 : Commercial and industrial customers' overall and installation satisfaction with Vector through the connections process

4.1.3 Customer Complaints

4.1.3.1 Overall Approach

Although Vector seeks to provide a high standard of service and a safe and reliable gas supply, there may be times when customers have concerns with their service. In these instances Vector's customer services team takes appropriate actions to manage these concerns, including:

- Logging all reported complaints in relation to the distribution network;
- Coordinating closely with all appropriate areas of the business in resolving the complaints; and

- Improving the customer experience, where appropriate and reasonable.

If the cause for concern or complaint is not immediately resolved, it is logged as a formal complaint with Vector's customer services team. The customer services team is responsible for complaint resolution, identifying trends and raising issues with the appropriate business units in order to implement permanent solutions and prevent recurrence, where appropriate.

Vector adheres to a formal complaint resolution process. Vector's preference is for proactive, consultative and direct engagement with customers via the customer services team. Vector's formal complaint process is as follows:

- Acknowledgement of receipt of the complaint by Vector;
- Providing the customer with an update and/or working to resolve the complaint; and
- If the complaint is not resolved within the stated timeframe, informing the customer of the reason for the delay and working towards resolution.

If Vector has not resolved the complaint within the timeframes specified by the Electricity and Gas Complaints Commission (EGCC, see below), or to the customer's satisfaction, then Vector notifies the customer of the option of taking the complaint to the EGCC.

4.1.3.2 Number of Complaints

The number of complaints performance indicator is calculated from the sum of complaints acknowledged divided by the average total number of customers.

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions results were 0.0011 and 0.0003 respectively, below Vector's target of 0.0013. The target is based on the average performance from FY2011 and FY2012 of the Auckland region. Table 4-1 shows the comparison of the average complaints per customer for the previous four years.

Financial Year	2008	2009	2010	2011	2012[4]	Target[5]
Auckland region	-	0.0006	0.0004	0.0014	0.0011	0.0013
North Island region	-	-	-	0.0003	0.0003	

Table 4-1 : Historical response for customer complaints

4.1.3.3 EGCC Customer Complaints

The EGCC is an independent body that facilitates resolution between the gas distribution business and the consumer if other means of resolution have failed. All customers have the option of contacting the EGCC directly if their complaint has not been resolved to their satisfaction. In 2011/12, no complaints about Vector's gas distribution networks were forwarded to the EGCC.

4.1.3.4 Answering Telephone Calls

Vector measures the proportion of calls made to Vector's emergency response telephone numbers that are answered within 30 seconds.

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[4] This equates to 102 complaints in the Auckland region and 21 complaints in the North Island region.

[5] The target is calculated using the performance results from the Auckland region for years 2011 to 2012.

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions performance was 94% and 96% respectively, exceeding Vector's target of 90%. The target is calculated using the performance results from the Auckland Region for years 2011 to 2012. Table 4-2 shows the comparison of all calls answered within 30 seconds for the previous four years.

Financial Year	2008	2009	2010	2011	2012	Target
Auckland region	-	77%	79%	83%	94%	90%
North Island region	-	-	-	-	96%	

Table 4-2 : Historical performance of answering telephone calls within 30 seconds

4.1.4 Emergency Response Time to Emergencies

4.1.1.1 Proportion of emergencies responded to within one hour

Targets and measures for Vector's response time to emergencies[6] (RTE) are recorded and reported as follows.

Targets

Table 4-3 shows the target proportion of RTE within one hour for the next 10 years which are set by the Commerce Commission[7].

Financial Year	2013	2014	2015	2016	2017	+5 yrs[8]
Proportion of RTE within one hour	80%	80%	80%	80%	80%	80%

Table 4-3 : Vector's RTE within one hour target

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions RTE within one hour was 97% and 86% respectively, as shown in Table 4-4 and Figure 4-5.

Financial Year	2008	2009	2010	2011	2012	Target
Auckland region	-	83%	90%	92%	97%	80%
North Island region	-	100%	93%	96%	86%	

Table 4-4 : Historical performance of RTE within one hour

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[6] An "emergency" is defined as one of the following events: an unplanned escape and/or ignition of gas that requires the active involvement of any emergencies service (i.e. fire service, ambulance); or an unplanned disruption in the supply of gas that affects more than five customers; or the need to evacuate premises as the result of escape or ignition of gas.

[7] The regulatory threshold target is defined in the Commerce Commission Gas Distribution Services Default Price-Quality Path Determination 2013 dated 28 February 2013 (http://www.comcom.govt.nz/assets/Gas/Gas-Default-Price-Quality-Path/Initial-DPP-for-GPB/2013-NZCC-4-Gas-Distribution-Services-Default-Price-Quality-Path-Determination-28-February-2013-.PDF)

[8] The Commerce Commission target for this period is yet to be confirmed.

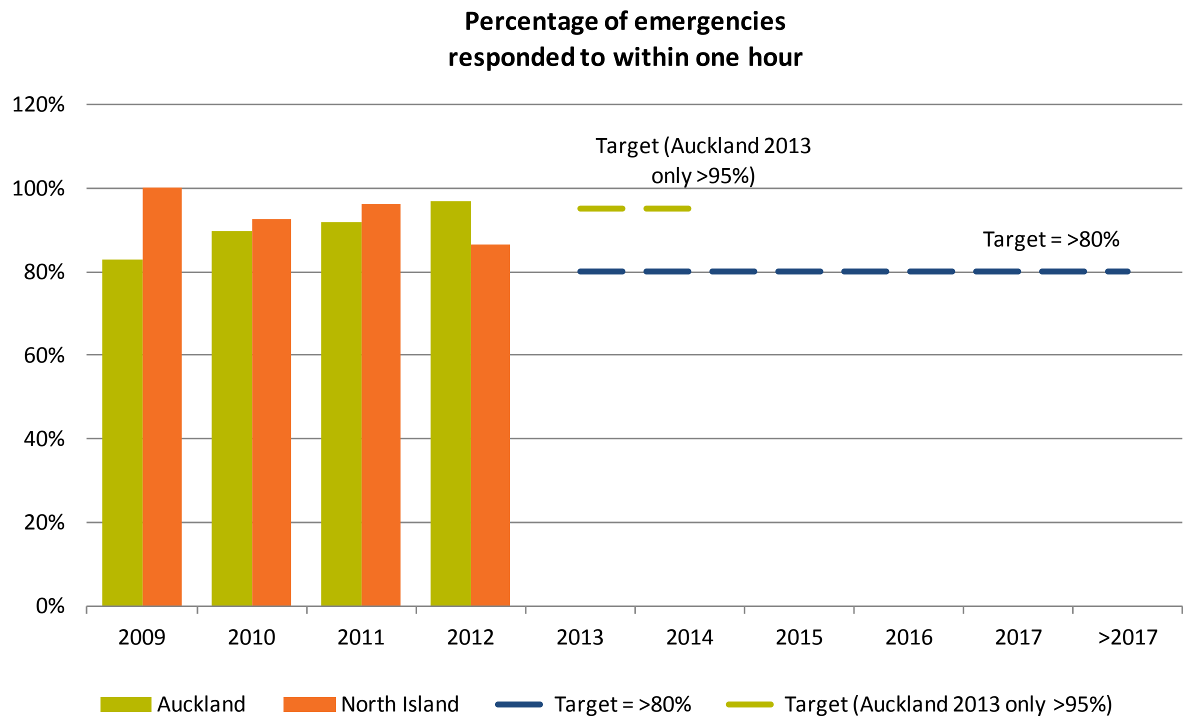

Figure 4-5 : RTE within one hour

4.1.1.2 Proportion of emergencies responded to within three hours

Targets and measures for Vector's RTE within three hours are recorded and reported as follows.

Targets

Table 4-5 shows the target proportion of RTE within three hours for the next 10 years, which as set by the Commerce Commission[9].

Financial Year	2013	2014	2015	2016	2017	+5 yrs[10]
Proportion of RTE within three hours	100%	100%	100%	100%	100%	100%

Table 4-5 : Vector's RTE within three hours

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions proportion of emergencies responded to within three hours was 100% and 100% respectively, as shown in Table 4-6 and Figure 4-6.

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[9] The regulatory threshold target is defined in the Commerce Commission Gas Distribution Services Default Price-Quality Path Determination 2013 dated 28 February 2013 (http://www.comcom.govt.nz/assets/Gas/Gas-Default-Price-Quality-Path/Initial-DPP-for-GPB/2013-NZCC-4-Gas-Distribution-Services-Default-Price-Quality-Path-Determination-28-February-2013-.PDF)

[10] The Commerce Commission target for this period is yet to be confirmed.

Financial Year	**2008**	**2009**	**2010**	**2011**	**2012**	**Target**
Auckland region	-	-	100%	100%	100%	100%
North Island region	-	-	100%	100%	100%	

Table 4-6 : Historical performance of RTE within three hours

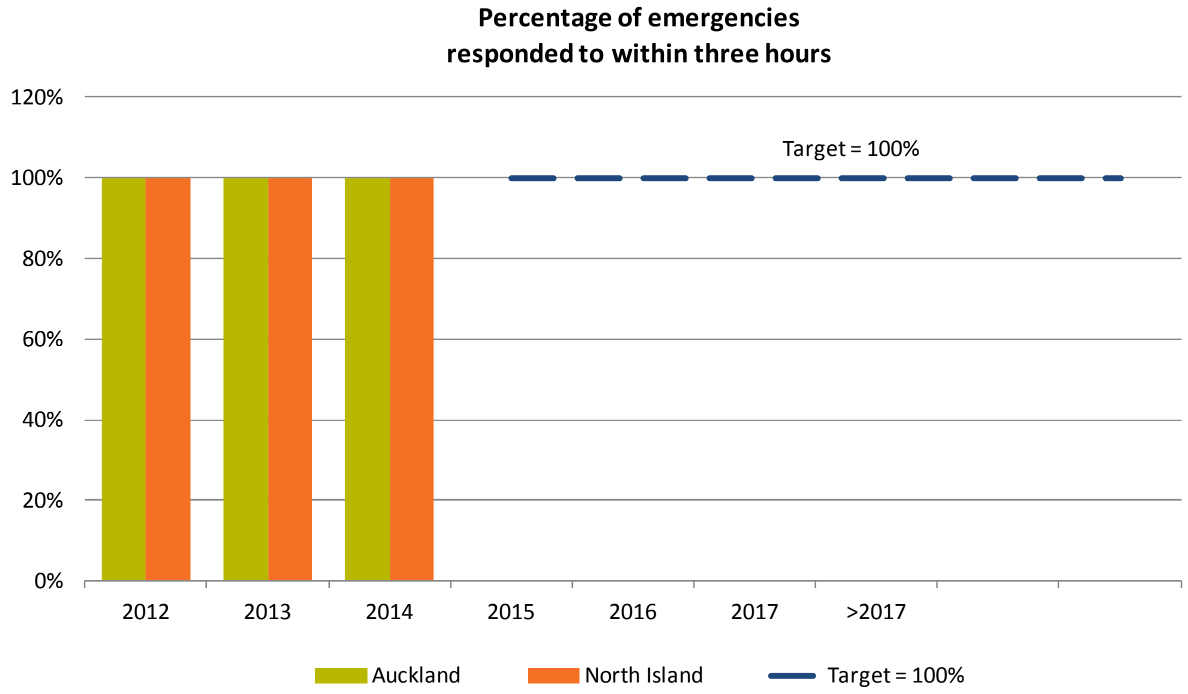

Figure 4-6 : RTE within three hours

4.2 Health, Safety and Environment

Vector's policy and overall approach to Health, Safety and Environment (HS&E) is described in Section 8.

In addition to the specific performance measures relating to HS&E that have been put in place with the FSPs, Vector monitors gas-related public safety incidents and incidents arising from its employees. These incidents are reviewed monthly to ensure lessons are captured and where appropriate, corrective actions are implemented.

Figure 4-7 below shows the long-term trend in lost time injuries at Vector (including Vector staff and FSPs) over the last eight years. The figures include both electricity and gas network activities.

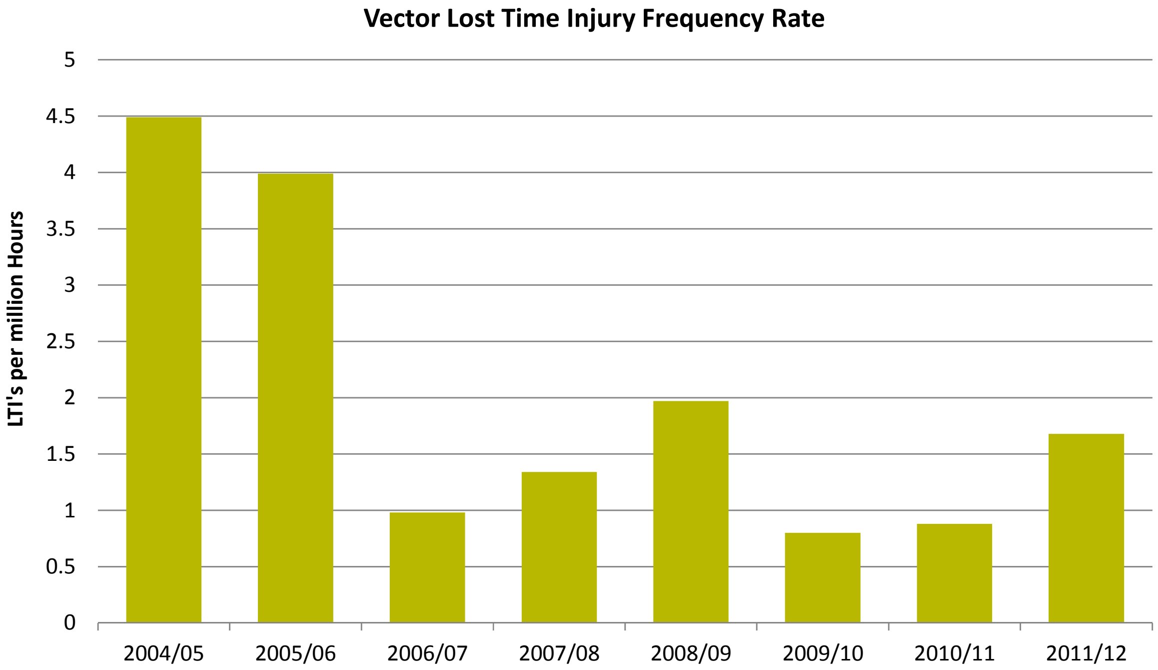

Figure 4-7 : Lost time injuries at Vector (including the electricity networks)

Note that activities performed in the Wellington electricity network (divested on 23 July 2008) are also included in this data.

Environmental incidents are also reported, recorded and investigated with any learnings and improvements shared with the FSPs at the safety leadership forum.

Vector Target

Vector's overall health and safety target is zero lost time injuries.

Vector's environmental target is full compliance with all requirements from local and regional councils, and to have no prosecutions based on breaches of environmental regulations or requirements.

To progress towards Vector's target of zero injuries in the workplace, Vector is:

- Continuing to place a strong focus on ensuring hazards, wherever possible, are eliminated during the asset design phase;
- Policies and procedures are in place that assist the workforce to deliver the right action at the right time; and
- Ensuring focus on personal behaviours to encourage an individual and team safety culture.

4.3 Supply Reliability

Supply reliability is the outcome of how often the gas supply gets interrupted, and how long it takes to restore supply once interrupted. Vector's goal is to ensure supply reliability performance targets are achieved in accordance with the Commerce Commission's regulatory thresholds[11] and customer expectations. In the context of average network supply reliability, the following nationally recognised measures are recorded and reported:

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[11] The regulatory threshold target is defined in the Commerce Commission Gas Distribution Services Default Price-Quality Path Determination 2013 dated 28 February 2013 (http://www.comcom.govt.nz/assets/Gas/Gas-

- SAIDI unplanned (System Average Interruption Duration Index) - the length of unplanned time in minutes that the average customer spends without supply over a year, measured in customer minutes per 1000 customers;
- SAIDI planned - the length of planned time in minutes that the average customer spends without supply over a year, measured in customer minutes per customer;
- SAIFI unplanned - the number of unplanned supply interruptions which the average customer experiences over a year, measured in customer interruptions per 1000 customers;
- SAIFI planned - the number of planned supply interruptions which the average customer experiences over a year, measured in customer interruptions per customer;
- CAIDI unplanned (Customer Average Interruption Duration Index) – the sum of the duration of each unplanned (excluding transmission) interruption, divided by the total number of unplanned (excluding transmission) interruptions;
- Outage events - the number of unplanned interruptions that affect more than five customers; and
- Outage events caused by third party damage - the number of unplanned interruptions that affect more than five customers which has been caused by third party damage.

4.3.1 Targets

Table 4-7 shows the supply reliability targets for the next 10 years.

Financial Year	2013	2014	2015	2016	2017	+5 yrs
SAIDI unplanned (minutes per 1000 customers)	121[12]	853	853	853	853	853
SAIDI planned (minutes per customer)[13]	5.8	5.8	0.4	0.4	0.4	0.4
SAIFI unplanned (interruptions per 1000	5.0	5.0	5.0	5.0	5.0	5.0
SAIFI planned (interruptions per customer)	0.009	0.009	0.009	0.009	0.009	0.009
CAIDI unplanned (minutes per interruption)	157	157	157	157	157	157
Outage events	9	9	9	9	9	9
Outage events caused by third party damage	8	8	8	8	8	8

Table 4-7 : Vector's supply reliability targets

Default-Price-Quality-Path/Initial-DPP-for-GPB/2013-NZCC-4-Gas-Distribution-Services-Default-Price-Quality-Path-Determination-28-February-2013-.PDF).

[12] Note that the targets changed from 1 July 2012 when both the Auckland and North Island regions became subject to new regulatory quality threshold targets. The former 95% target for Auckland region is retained for the Auckland region for the year ending 30 June 2013; performance in Auckland region is being maintained to this level.

[13] The FY14 and FY15 target is calculated using the performance results from the Auckland region for years 2011 to 2012. The target has been adjusted in 2015 to reflect the completion of the Auckland low pressure pipeline replacement.

4.3.2 SAIDI Unplanned

SAIDI unplanned measures the total unplanned time, on average, that a customer could expect to be without gas over the reporting period. It is a measure of unplanned interruptions, including third party damage and excludes interruptions directly resulting from unplanned interruptions on the transmission system. It is calculated by dividing the product of the number of interrupted customers and the duration of the interruption (in minutes), by the total number of customers connected to the network and further dividing by 1000.

SAIDI unplanned is driven by a combination of factors. These include the number of faults on the network, the number of customers affected by each fault, and the time taken to restore supply. These in turn are affected by external factors e.g. third party damages, the network design and construction standards, equipment standards, management and performance of field staff and condition of the network assets.

A significant influence on SAIDI (and SAIFI) unplanned is the damage caused to the gas network by non-Vector contractors conducting works not directly related to the gas network. Third party interference damage is a major cause of system interruptions. Though not all events caused by third party works result in interrupted gas supplies, they are potential safety hazards and could project a negative public image of natural gas (and of Vector).

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions SAIDI unplanned performance was 788 and 1,259 minutes per 1000 customers respectively, breaching the Auckland regulatory threshold target of 121.

The majority of Vector's unplanned SAIDI is caused by third party damage or equipment failure. Significant increases in SAIDI unplanned during the 2008 and 2012 period include:

- In July 2007, 75 customers in Takapuna lost supply due to damage to a mains pipeline;
- In August 2007, a district regulating station failed resulting in an interruption of 92 customers for 1,304 minutes;
- In June 2008, 182 customers lost supply in Otorohanga for 295 minutes; and
- In April 2012, 67 customers lost supply in Whangaparaoa for 550 minutes.

Notwithstanding that SAIDI exceeds the Commerce Commission threshold for the Auckland region; this does not indicate deterioration in the overall integrity of Vector's networks. Rather, the increase is a consequence of improved reporting accuracy, as described in detail in Vector's most recent Annual Quality Compliance Statement.[14]

Table 4-8 and Figure 4-8 show the comparison of SAIDI unplanned for the previous five years against the regulatory threshold expressed as a straight line target.

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[14] Refer to pages 6-8 of Vector's statement dated 1 May 2012 (http://vector.co.nz/sites/vector.co.nz/files/Vector%20Gas%20Compliance%20Annual%20Statement%202012%20Public.pdf)

Financial Year	2008	2009	2010	2011	2012	Target[15]
Auckland region (minutes per 1000 customers)	2337	431	438	924	788	853
North Island region (minutes per 1000 customers)	1155	432	262	335	1259	

Table 4-8 : Historical performance for SAIDI unplanned

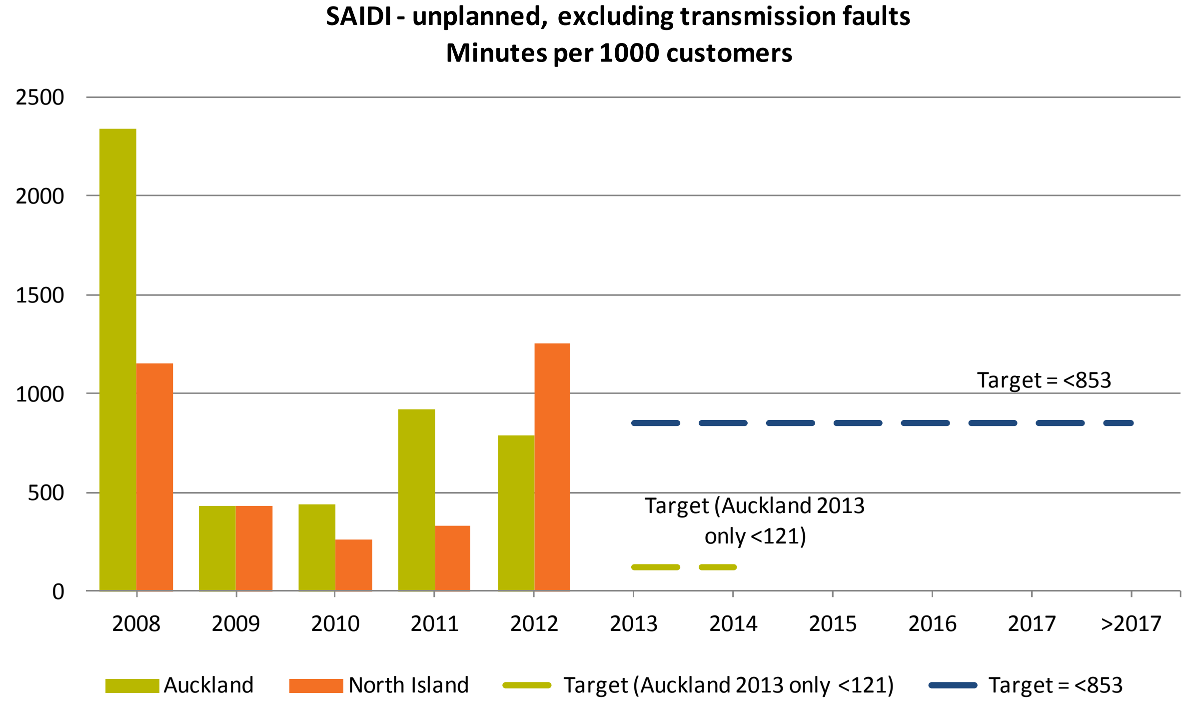

Figure 4-8 : Comparison of SAIDI unplanned against the regulatory threshold

4.3.3 SAIDI Planned

SAIDI planned measures the total planned time, on average, a customer could expect to be without gas over the reporting period resulting from planned outages. It is calculated by dividing the product of the number of interrupted customers and the duration of the planned interruption (in minutes), by the total number of customers connected to the network.

SAIDI planned is driven by the number of planned activities on the network, such as pipeline replacement or retailer gas meter relocates, the number of customers affected by each fault, and the time taken to restore supply. These in turn are affected by the network design and construction standards, equipment standards, management and performance of field staff and condition of the network assets.

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions SAIDI planned performance was 5.63 and 0.40 minutes per customer respectively. The increase in SAIDI planned during the year in the Auckland and North Island regions is a result of

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[15] Target is calculated using the performance results from the Auckland and North Island regions for years 2008 to 2012.

the pipeline replacement programmes underway in Auckland and Hamilton. Table 4-9 shows the comparison of SAIDI planned for the previous 4 years against Vector's target.

Financial Year	2008	2009	2010	2011	2012	Target[16]
Auckland region (minutes per customer)	0.72	0.39	3.30	6.00	5.63	5.8
North Island region (minutes per customer)	0.11	0.05	0.01	0.06	0.40	

Table 4-9 : Historical performance for SAIDI planned

4.3.4 SAIFI Unplanned

SAIFI unplanned measures the average number of occasions per year that an individual customer has experienced an interruption, including those due to third party damage, but excluding those directly resulting from interruptions of the transmission system. SAIFI unplanned is calculated by dividing the total number of unplanned interruptions on the network in the relevant year by the total number of customers connected to the network and further dividing by 1000.

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions SAIFI unplanned performance was 6.5 interruptions per 1000 customers in both regions, breaching the Auckland region regulatory threshold target of 4.4. Table 4-10 and Figure 4-9 shows the comparison of SAIFI unplanned for the previous five years against the regulatory threshold expressed as a straight line target.

Financial Year	2008	2009	2010	2011	2012	Target[17]
Auckland region (interruptions per 1000 customers)	7.3	3.8	4.8	7.1	6.5	5.0
North Island region (interruptions per 1000 customers)	5.1	3.0	2.9	3.3	6.5	

Table 4-10 : Historical performance for SAIFI unplanned

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[16] The target is calculated using the performance results from the Auckland region for years 2011 to 2012.

[17] The target is calculated using the performance results from the Auckland and North Island regions for years 2008 to 2012.

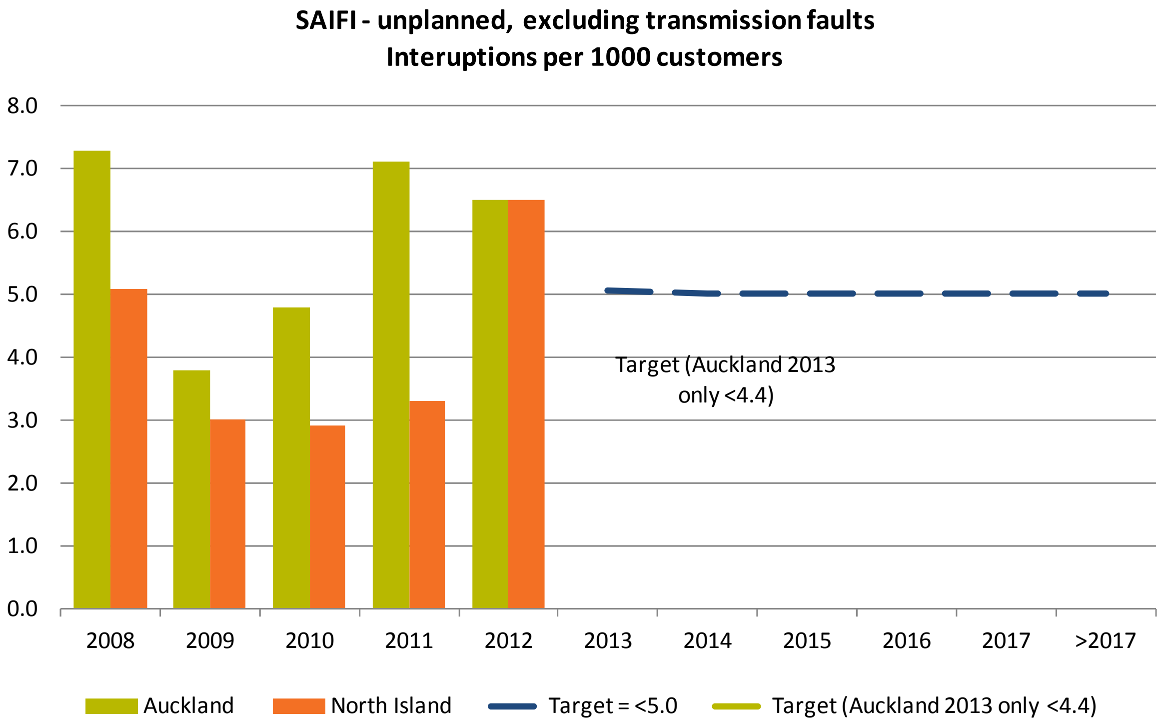

Figure 4-9 : Comparison of SAIFI unplanned against the regulatory threshold

4.3.5 SAIFI Planned

SAIFI planned measures the average number of occasions per year that an individual customer has experienced an interruption. SAIFI planned is calculated by dividing the total number of planned interruptions on the network in the relevant year by the total number of customers connected to the network.

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions SAIFI planned performance was 0.0170 and 0.0029 interruptions per customer respectively, resulting in a breach of the target in the Auckland region. Table 4-11 shows the comparison of SAIFI planned for the previous 5 years against Vector's target.

Financial Year	2008	2009	2010	2011	2012	Target[18]
Auckland region (interruptions per customer)	0.007	0.003	0.008	0.016	0.017	0.009
North Island region (interruptions per customer)	0.002	0.001	0.000	0.001	0.003	

Table 4-11 : Historical performance for SAIFI planned

4.3.6 CAIDI Unplanned

CAIDI unplanned means the average outage duration of an interruption of supply per customer who experienced an interruption in the period under consideration.

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[18] The target is calculated using the performance results from the Auckland region for years 2008 to 2012.

CAIDI unplanned is the product of the duration of each unplanned (excluding transmission) interruption, divided by the total number of unplanned (excluding transmission) interruptions.

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions CAIDI unplanned performance was 121 and 195 minutes per customer affected, respectively. Table 4-12 shows the comparison of CAIDI planned for the previous five years against Vector's target.

Financial Year	2008	2009	2010	2011	2012	Target[19]
Auckland region (minutes per interruption)	321	112	91	131	121	157
North Island region (minutes per interruption)	227	144	91	102	195	

Table 4-12 : Historical performance for CAIDI unplanned

4.3.7 Outage Events

Outage events are a count of the number of unplanned interruptions which affect more than five customers.

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions outage events (unplanned interruption that affects more than five customers) performance was 15 and 6 events respectively, below Vector's target of 9.

Table 4-13 below shows the comparison of outage events for the previous 4 years against Vector's target.

Financial Year	2008	2009	2010	2011	2012	Target[20]
Auckland region (events)	6	2	5	5	15	9
North Island region (events)	0	5	0	3	6	

Table 4-13 : Historical performance for outage events

4.3.8 Outage Events Caused by Third Party Damage

Outage events caused by third party damage is a count of the number of unplanned interruptions which affect more than five customers which has been caused by third party damage.

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions outage events caused by third party damage were 13 and 5 events respectively, resulting in a

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[19] The target is calculated using the performance results from the Auckland and North Island regions for years 2008 to 2012.

[20] The target is calculated using the performance results from the Auckland and North Island regions for years 2008 to 2012.

breach in the Auckland region against Vector's target of 8. Table 4-14 shows the comparison of outage events for the previous 5 years against Vector's target.

Financial Year	2008	2009	2010	2011	2012	Target[21]
Auckland region (events)	4	2	2	2	13	8
North Island region (events)	1	5	0	3	5	

Table 4-14 : Historical performance for outage events caused by third party damage

4.4 System Condition and Integrity

Vector's strategic goal is to ensure system condition and integrity performance targets are achieved in accordance with the Commerce Commission's regulatory thresholds and customer expectations. In the context of average network system condition and integrity, the following measures are recorded and reported:

- Satisfactory scheduled odour tests;
- Satisfactory scheduled odorant concentration tests;
- Public reported escapes;
- Third party damage events;
- Leakage survey; and
- Poor pressure due to network causes.

4.4.1 Targets

Table 4-15 shows the system condition and integrity targets for the next 10 years:

Financial Year	2013	2014	2015	2016	2017	+5 yrs
Satisfactory scheduled odour tests	98%	98%	98%	98%	98%	98%
Satisfactory scheduled odorant concentration tests	99%	99%	99%	99%	99%	99%
Public reported escapes	219.6	125	125	125	125	125
Third party damage events	0.067	0.067	0.067	0.067	0.067	0.067
Leak survey	10	10	10	10	10	10
Poor pressure due to network causes	23	23	23	23	23	23

Table 4-15 : System condition and integrity targets

4.4.2 Odorisation

The purpose of this measure is to ensure the odorant levels of gas conveyed through Vector's gas networks are maintained in accordance with the requirements of the Gas Regulations 1993 and the New Zealand standard NZS 5263 Gas detection and odorisation.

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[21] ibid footnote 20.

Monitoring the proportion of satisfactory scheduled odour and concentration levels enables Vector to measure the level of gas odour in the gas and identify when any corrective action is required. Vector uses two measures for odorisation compliance:

- Satisfactory scheduled odour tests; and
- Satisfactory odorant concentration tests.

4.4.2.1 Satisfactory Scheduled Odour Tests

This measure is calculated as a percentage of satisfactory odour level tests divided by the total number of scheduled odour level tests carried out. Satisfactory means the odour test result is at or below 0.9% gas-in-air.

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions percentage level of satisfactory scheduled odour tests was 97% and 100%, respectively, resulting in the Auckland network falling below the target and the North Island region above Vector's target of 98%. Table 4-16 shows the comparison of the percentage level of satisfactory scheduled odour tests for the previous 5 years against Vector's target.

Financial Year	2008	2009	2010	2011	2012	Target[22]
Auckland region	87%	95%	88%	91%	97%	98%
North Island region	99%	99%	99%	99%	100%	

Table 4-16 : Historical performance for satisfactory scheduled odour tests

4.4.2.2 Satisfactory Scheduled Odorant Concentration Tests

This measure is calculated as a percentage of satisfactory odorant concentration tests divided by the total number of scheduled odorant concentration tests carried out. Satisfactory means the odorant concentration test result is no less than 3 mg/m^3.

Performance

For the year ending 30 June 2012 both of Vector's gas networks achieved 100% satisfactory scheduled odorant concentration tests. This exceeded Vector's target of 99%. Table 4-17 shows the comparison of the percentage level of satisfactory scheduled odour tests for the previous five years against Vector's target.

Financial Year	2008	2009	2010	2011	2012	Target[23]
Auckland region	94%	97%	100%	100%	100%	99%
North Island region	100%	100%	99%	100%	100%	

Table 4-17 : Historical performance for satisfactory scheduled odorant concentration tests

4.4.3 Public Reported Escapes

Vector uses Public Reported Escapes (PRE) as its primary technical network service quality measure for operational purposes, as it is a critical safety measure and a reliable indicator

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[22] The target is calculated using the performance results from the Auckland and North Island regions for years 2008 to 2012.

[23] The target is calculated using the performance results from the Auckland and North Island regions for years 2008 to 2012.

of the condition of the network. This measure is impacted by a number of factors, including the effectiveness of renewal strategies, the condition and composition of assets, the level of odorant added (which increases the likelihood of PREs), and the extent and effectiveness of leakage surveys.

PRE is calculated by dividing the total number of confirmed public reported escapes of gas on the network (including mains, service pipes, valves, and pressure stations) in the relevant year by the total length of network (mains and services) and further dividing by 1000.

The monitoring of public reported events, the determination of their causes and the implementation of programmes directed at reducing them is internationally recognised as being fundamental to improving the safety and reliability of gas networks.

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions PRE performance was 70.3 and 46.6 PRE per 1000 km of system respectively, well below the regulatory threshold target of 219.6.

Table 4-18 and Figure 4-10 below shows the comparison of PRE for the previous five years against Vector's corporate target and the regulatory threshold for the Auckland region (the latter was set at a time when PRE was significantly higher, before Vector's current LP pipeline replacement programme).

Financial Year	2008	2009	2010	2011	2012	Target[24]
Auckland region	98.7	86.4	64.8	84.1	70.3	125.0
North Island region	51.8	48.7	53.2	21.8	46.6	

Table 4-18 : Historical performance for PRE

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[24] The former 219.6 target for the Auckland region is retained for the Auckland region for the year ending 30 June 2013 (as defined in the Commerce Commission Decision No. 657 (http://www.comcom.govt.nz/assets/Imported-industryregulation/Gas/CommissionReportsandDocuments/ContentFiles/ from-old-site/ Documents/comcom -decision657vectorauthorisation-oct2008.pdf). The PRE target for the North Island region for FY13 and in the Auckland regions for FY14 onwards is 125.

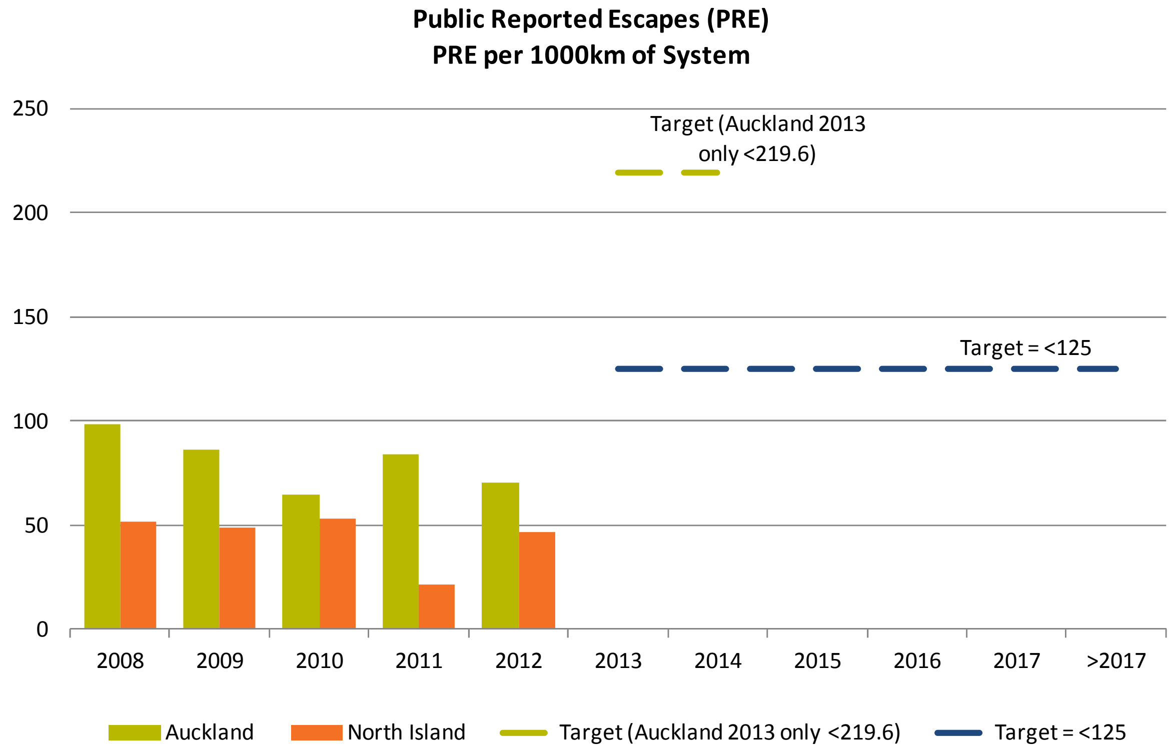

Figure 4-10 : Comparison of PRE against regulatory threshold

4.4.4 Third Party Damage Events

Third Party Damage (TPD) events to networks are a significant cause of gas escapes and customer supply interruptions. The levels of third party interference damage provide some indication of the network operator's level of success in communicating awareness to those who control and/or are directly engaged in any activities that put gas networks at risk. As described in Section 6, Vector has a number of strategies, such as public safety awareness communications programmes, which are designed to increase public and contractor awareness and reduce the number of third party incidents.

TPD events are calculated by adding up the total annual number of occurrences, where damage requiring repair has been caused to mains and services by third parties and dividing this by the number of gas mains and service pipes in use in that year.

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions TPD event performance was 0.052 and 0.054 TPD events per km of system respectively, resulting in a breach in the North Island region against Vector's target of 0.053. Table 4-19 shows the comparison of TPD for the previous 5 years against Vector's target.

Financial Year	2008	2009	2010	2011	2012	Target[25]
Auckland region (events per km)	0.088	0.061	0.057	0.055	0.052	0.053
North Island region (events per km)	0.046	0.041	0.035	0.039	0.054	

Table 4-19 : Historical performance for TPD events

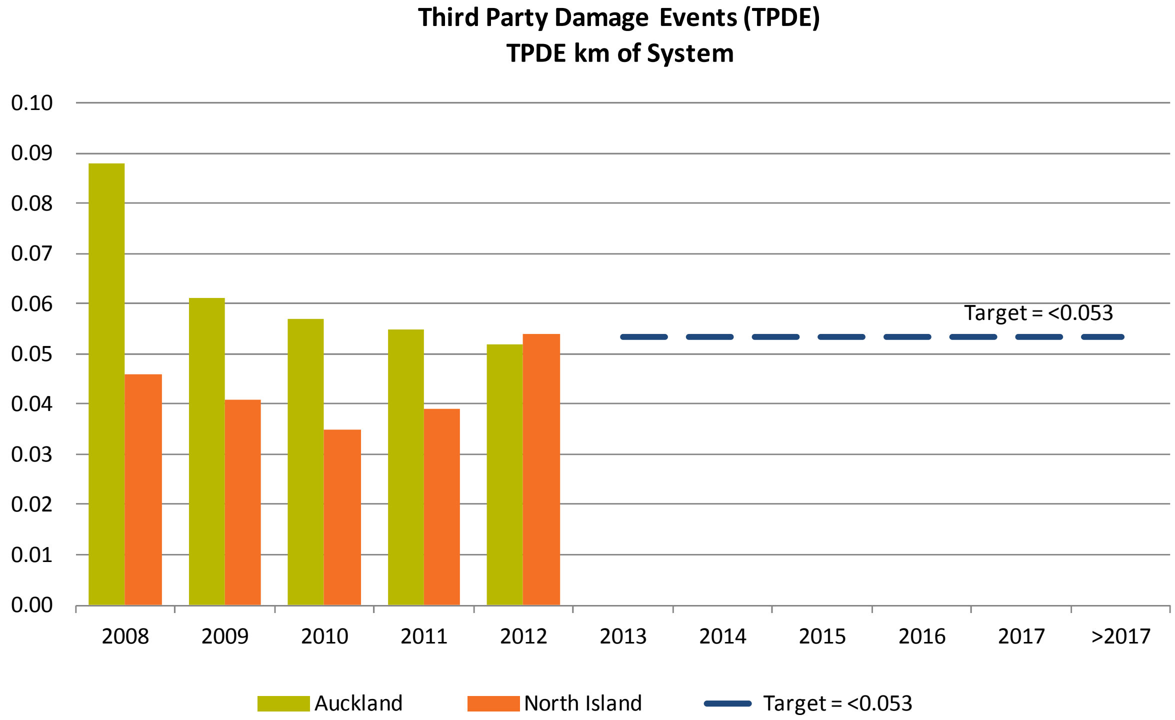

Figure 4-11 : Comparison of TPD events against Vector's target

4.4.5 Leakage Survey

Leakage surveys are a pro-active maintenance strategy that attempts to locate gas leaks in the network. Leaks detected by system surveys are a clear indicator of the condition of the network and the effectiveness of maintenance strategies. As described in section 6, renewal strategies play an important role in improving the condition of the gas distribution network and reducing the number of leaks. Vector surveys different parts of its network every year, taking five years to complete an entire network survey. It is therefore not meaningful to compare leak data on a yearly basis; a five year rolling average should be applied to any analysis of overall network condition.

Leak survey is calculated by adding up the number of leaks detected by routine survey and dividing this number into the total length of pipeline and further dividing by 1000.

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions' leak survey performance was 2.5 and 0.9 leaks per 1000km of system respectively, below Vector's target of 2.9. Table 4-20 shows the comparison of leaks detected by survey for the previous 5 years against Vector's target.

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[25] The target is calculated using the performance results from the Auckland and North Island regions for years 2008 to 2012.

Financial Year	2008	2009	2010	2011	2012	Target[26]
Auckland region (leaks per 1000km)	13.9	2.7	1.1	1.1	2.5	2.9
North Island region (leaks per 1000km)	1.6	3.1	0.0	0.6	0.9	

Table 4-20 : Historical performance for leakage survey

4.4.6 Poor Pressure Due to Network Causes

Poor pressure due to network causes is a count of the number of unplanned incidents where delivery pressure drops below contracted delivery requirements.

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions poor pressure performance was 1 and 0 events respectively, below Vector's target of 15 events per annum. Table 4-21 shows the comparison of leaks detected by survey for the previous five years against Vector's target.

Financial Year	2008	2009	2010	2011	2012	Target[27]
Auckland region	36	22	1	0	1	15
North Island region	0	12	2	0	0	

Table 4-21 : Historical performance for poor pressure due to network causes

4.4.7 Unaccounted for Gas

Unaccounted for Gas (UFG) is a combination of many unrelated factors. Its measurement and reporting has internationally been a traditional measure of gas network efficiency. In essence UFG reporting provides a measure of the effectiveness of the methods used in the management of gas networks and of their connected measurement systems.

The high levels of integrity built into the new gas networks have moved the primary component of UFG from system leakage to discrepancies between gas measurement systems and operational losses. The gas measurement systems connected to Vector's gas distribution networks are all managed by Vector Transmission or owned by gas retailers and these systems represent the largest single component of UFG. Thus to determine the value of UFG that is a result of Vector's gas distribution networks, the metering error component has to be determined and removed from the total figure. Without real time metering data being available from all measurement systems, accurate separation of the metering error component of UFG is impracticable.

For the reasons mentioned above, Vector's current position is that the measurement of UFG and the setting of target levels is not a process that will significantly add value to service levels or to the performance of the gas distribution networks.

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[26] The target is calculated using the performance results from the Auckland and North Island regions for years 2008 to 2012.

[27] ibid footnote 26.

Performance

For the year ending 30 June 2012, Vector's Auckland and North Island regions UFG performance was 0.63% and 0.87% respectively, below Vector's target of 1.22%. Table 4-22 shows the comparison of UFG performance for the previous 5 years against Vector's target.

Financial Year	2008	2009	2010	2011	2012	Target[28]
Auckland region	2.30%	2.72%	2.29%	1.27%	0.63%	1.22%
North Island region	0.31%	0.31%	0.31%	0.54%	0.87%	

Table 4-22 : Historical performance for UFG

4.5 Asset Utilisation

Asset utilisation in Vector's gas distribution network is defined as the ratio between the peak demand conveyed by an asset (such as a pipeline or a DRS) and the capacity of the asset. It is a measure of what an asset is actually delivering against what it is capable of delivering. Vector has chosen to monitor asset utilisation using a profile approach instead of a single average or median figure as this gives a more holistic picture of the network.

4.5.1 Pipeline Utilisation

In the case of pipeline utilisation, Vector determines the capacity of an individual pipeline or system by modelling the relationship between the nominal and minimum operating pressures, the diameter and the allowable pressure difference between inlet and outlet network pressures. Using this information, Vector is able to use system pressures as a proxy for pipeline utilisation. Section 5 provides further details on Vector's quality of supply criteria used to calculate pipeline utilisation levels and Schedule 12b Report on Forecast Utilisation specified in Appendix 4.

4.5.2 District Regulating Station Utilisation

Vector is in the process of developing its methodology to calculate the utilisation of its DRS population[29], across the Auckland and North Island regions. The methodology and data required to calculate the 'operating capacity' (i.e. the capacity based on the 'expected' inlet pressure of the DRS at that location), for each DRS is expected to be available by the end of FY2014. This will enable Vector to produce year-on-year utilisation profiles of its DRS population.

4.6 Network Security

Vector defines "security" as the ability to supply network load following a fault (or more than one fault) and can be categorised deterministically, or probabilistically.

Deterministic security operates in discrete levels, typically defined as having sufficient capacity to supply customers following a single fault ("N-1") or two faults ("N-2"). Probabilistic security takes into account load curves and the likelihood of faults as well, allowing for intermediate security levels between the discrete levels set by deterministic practices.

For Vector's gas distribution network deterministic criteria are used to gauge the adequacy of the network security levels. Shortcomings form the basis of further investigations to

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[28] The target is calculated using the performance results from the Auckland and North Island regions for years 2008 to 2012.

[29] The DRS population will include only those sites that have metering and telemetry equipment installed.

determine whether security enhancements are economic (refer to Section 5 for further details).

4.7 Works Performance Measures

4.7.1 Capital Works Delivery

Capital work is scheduled physically and financially from the time a project is in its proposal stage. Each project is split into a number of stage gates that state deliverables from defining the solution, through to final commissioning and close out.

Once a project has passed the solution defining stages and reaches the delivery stage, the physical and financial forecasts are reviewed and re-set as required. Project deliverables are then reviewed against forecasts.

To ensure focus remains on project deliverables Vector's FSPs have "profit at risk" KPIs associated with delivery against forecast.

Monthly forecasts are compiled for the whole programme of work and circulated at the Executive level. Actual against forecast is also tracked as part of the executive dashboard metrics.

Monthly reporting is designed to provide a "no surprises" environment, where projects with time or budget issues are highlighted at an early stage.

4.7.2 Field Operations Performance Assessment

A performance incentive scheme has been agreed with Vector's FSPs that is intended to:

- Measure the performance of Vector and the FSPs through the establishment of KPIs and PI (performance indicators) that provide appropriate incentives to deliver the required performance by both parties;
- Recognise that FSPs' entitlement to any incentive payment is dependent upon its performance as measured against indicators;
- Drive continuous improvement and efficiencies through the annual review of the indicators and the criteria for those indicators; and
- Recognise that Vector's performance within key processes is critical to the FSPs' ability to deliver overall results.

Systems have been developed and implemented to provide visibility to both Vector and FSPs on their respective performances against indicators that employ end-to-end measures.

For each indicator, there is a "meet" performance incentive level; in some cases there is an additional "not meet" disincentive criterion. KPIs and PIs have been established for Vector's FSPs in the following areas, which are described in more detail below:

- Network performance;
- Delivery and quality of works;
- Health, safety, environmental and people;
- Cost management and efficiency; and
- Information quality.

4.7.2.1 Network Performance

The network performance indicators comprises of three measures.

Table 4-23 describes the achievement criteria (meet) targets assigned to each network performance indicator.

Indicator	Description	Achievement Criteria
		Meet
KPI	PREs per 1000km of distribution systems (excludes PRE on Gas Measurement Systems (GMSs)).	≤128
PI	Unplanned interruptions per month (excluding third party damage) that affects more than 5 customers on rolling 12 month basis.	≤3
PI	Respond to emergency events	80% in <1 hour 100% in <3 hours

Table 4-23 : Vector's FSPs network performance targets

4.7.2.2 Delivery and Quality of Works

The PI for delivery and quality of works requires assessment of:

- Completion of all reactive, corrective, and planned maintenance works to the agreed plans within the agreed timeframes;
- Customer connections from customer initiation within the target periods defined below, or to the schedule agreed with the customer;
- Completing Vector initiated network projects within the agreed schedule; and
- Completion of works compliant to industry construction standards, Vector's network standards, national and local codes of practice, resource consents and other conditions without the need for corrective rework.

Vector Target

Customer connections targets:

- For gas connections, provide the quotation back to the customer within five business days of the application being made, and complete the installation within ten business days of the customer accepting the quote and all road access approvals, or on date agreed with the customer; and
- Complete the project within the timeframe agreed with the customer.

Value Added Services:

- Issue Maps;
- Complete gas pipeline locates and mark outs; and
- Complete on-site stand-overs and issue close approach consents.

4.7.2.3 Health, Safety, Environmental, and People (for FSPs)

This KPI is defined around minimising lost time injuries, incidents causing injury to a member of the public and environmental incidents resulting in an infringement notice. Implementing employee health initiatives and keeping employee competencies up to date are also included in the measure.

Health and safety management is a core element of Vector's strategic objective of operational excellence, and the target or standard for safety excellence is zero lost time injuries. Vector is continuing to work with its FSPs and contracting partners to identify effective ways to further improve the safety of its gas distribution networks.

4.7.2.4 Customer Experience

This is rated in terms of keeping appointment times, resolving any customer issues to ensure complaints are not made to the EGCC (taking into account adverse weather that may have affected Vector's ability to perform) and implementing behaviour-based customer service training to the agreed plan.

4.7.2.5 Cost Management and Efficiency

The cost management and efficiency KPI is based on the accuracy and timeliness of invoicing, and the accuracy of information provided to assist Vector with third party damage claims. There is also a target to deliver annual productivity improvements through developing and implementing initiatives that drive efficiencies in either Vector's or the FSP's business.

4.7.2.6 Information Quality

Finally, the information quality PI is determined by assessing the accuracy, completeness and timeliness of updates to Vector's information systems, before, during and after the completion of works. Special consideration is given to safety or other significant incidents caused by any network assets not being shown in the correct location in GIS.

Vector Target

The target times for updating Vector's information systems are:

Information type	Target
Services	15 business days after livening
Subdivisions	15 weeks after livening
Faulted asset repairs	15 business days after livening
Asset replacements	15 business days after replacement
Fault data	15 business day after fault resolution

Table 4-24 : Vector's FSP information quality targets

4.8 Process for Recording Reactive Fault Information

Operational responsibility for reactive fault information of Vector's gas distribution networks resides with the service operations team.

All reactive fault records are captured by Vector's FSPs in hard copy and electronic (Vector's CMS system) formats. Briefly, the process involves the following. Vector's customer service representatives at Telnet receive fault calls and raise service requests in Vector's CMS system, which are assigned to Vector's FSP. Vector's FSP receives the service requests through an electronic interface which automatically creates a task in the FSP's database. Tasks are dispatched to the field service crews electronically. The field service crews receive the task, record work progress status and work completion electronically; this information is then sent back through the electronic interface and the relevant fields in Vector's CMS system are populated.

Completion data critical to compliance reporting is captured electronically at the point of action, eliminating the need to duplicate data entry.

The following system integrity and reliability metrics are extracted from the CMS database for disclosure reporting:

- Emergency response
- SAIDI Unplanned
- SAIDI Planned
- SAIFI Unplanned
- SAIFI Planned
- CAIDI Unplanned
- Outage Events
- Outage Events Caused by Third Party Damage
- Public Reported Escapes
- Third Party Damage Events
- Leakage Survey
- Poor Pressure Due to Network Causes

To ensure data accuracy, each record is peer-reviewed by Vector's service operations team and/or the network performance analyst. In addition, Vector engages a third party auditor to review this process annually and conduct sample checks for accuracy.

Figure 4-12 shows how the reactive fault information is recorded and checked for completeness.

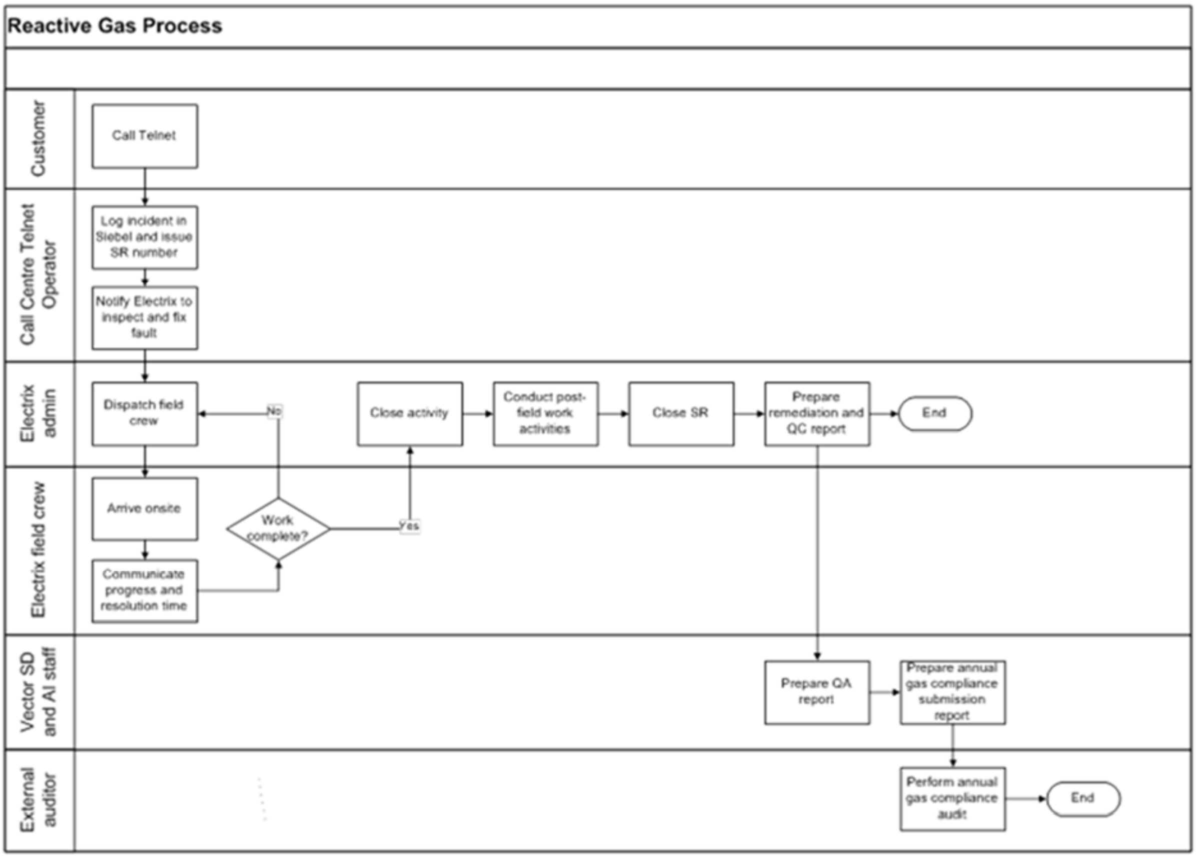

Figure 4-12 : Process for capture and QA of reactive fault information

Gas Distribution
Asset Management Plan
2013 – 2023

Network Development Planning– Section 5

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5 Network Development Planning

Network development refers to growth initiatives which:

- Extend the Vector gas distribution network to developing areas;
- Increase the capacity or supply levels of the existing network to cater for load growth or changing consumer demand;
- Provide new customer connections; or
- Address the relocation of existing services when required as a result of the activities of other utilities, requiring authorities[1] or customers.

5.1 Network Development Processes

Vector's network development process involves the modelling and planning of the gas distribution network, capital budgeting, prioritising the solutions programme and implementing the planning solutions.

5.1.1 Network Planning Process

Vector's primary objectives in network planning are to identify and prevent foreseeable network related security[2], capacity and quality (system pressure) problems in a safe, technically efficient and cost-effective manner. The planning process involves identifying and resolving:

- Supply quality, security or capacity issues that may prevent Vector from delivering its target service levels;
- Adequacy of supply to new developments or areas requiring gas connections;
- The need to relocate assets, when reasonably required by third parties; and
- Supply quality problems which can be identified from a wide range of sources, including network measurement and monitoring (system pressure), gas flow modelling and customer complaint databases.

The diagram in Figure 5-1 shows the high level planning and programme implementation processes.

Knowledge of asset capacity and capability, together with an accurate demand forecast, enables an accurate assessment of the network's ability to deliver the required level of security and service. Input data comprising past demand trends, anticipated customer growth, technology trends, demographics, population growth, and industry trends are used to produce the demand forecast.

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[1] The main requiring authorities are local authorities, Kiwi Rail and NZTA.

[2] "Security" as used in a planning context means the security of the gas supply – i.e. the likelihood that supply may be lost.

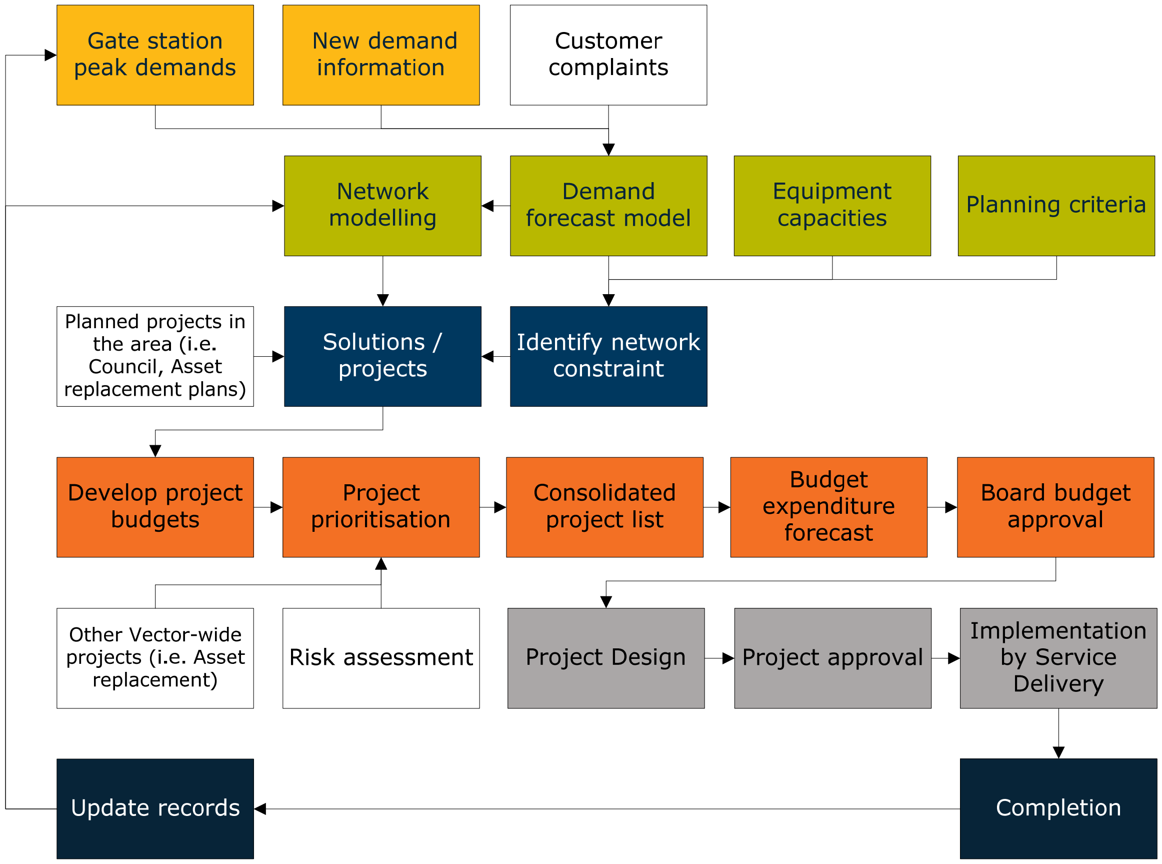

Figure 5-1 : Network development and implementation process

5.1.2 Project Implementation

An effective delivery of the capital works programme, based on an end-to-end delivery process has been established between Vector's Asset Investment (AI) and Service Delivery (SD) groups. The process tracks each project from conceptual design through to site construction and commissioning.

5.2 Planning Criteria and Assumptions

Network development planning is concerned with delivering network performance based on the availability of reserve capacity to a level of risk acceptable to the board, or as agreed with customers. Vector has a number of key policies, standards and guidelines underpinning its network planning approach. These policies, standards and guidelines cover the following areas:

- **Quality of supply standard:** Vector's quality of supply standard specifies the minimum levels of network pressure (including levels of redundancy) to ensure an appropriate level of supply service. Vector has adopted a 1-in-20 year winter incidence (i.e. severity) level, to ensure that distribution capacity shortfalls do not occur at an unacceptably high frequency;
- **Service level:** Established as part of the Use of Network Agreement with retailers and customers;
- **Technical standards:** Ensure optimum asset life and performance is achieved. They ensure that capital cost, asset ratings, maintenance costs and expected life are optimised to achieve lowest overall cost for Vector. Standardisation also reduces

design costs and minimises spare equipment holding costs, leading to lower overall project costs; and

- **Network parameters:** Including acceptable operating pressure levels, pipe sizes, flow rates, etc., providing an appropriate operating framework for the network. These will generally be aligned with industry norms.

These policies, standards and guidelines are based on the following principles:

- All network assets will be operated within acceptable standards;
- The design and operation of the network will not present a safety risk to staff, contractors, customers or the public;
- The network is designed to meet statutory requirements including acceptable pressure levels;
- Customers' reasonable gas supply requirements will be met.[3] In addition, the network is designed to include a prudent capacity margin to cater for foreseeable medium term load growth;
- Equipment is purchased and installed in accordance with network standards to ensure optimal asset life and performance; and
- Network investment will provide an appropriate commercial return for the business.

5.2.1 Quality of Supply

Vector recognises the importance of supply quality to its customers. The networks are designed to a supply quality level that ensures most modern gas-driven equipment can operate effectively. Strategies have been adopted to monitor and manage the impact of quality on the network. These include installation of pressure and flow monitoring equipment at gate stations, district pressure stations and customer sites and the application of modelling software and tools to predict the impact of supply quality on customers.

Vector has considered several factors in determining the quality of supply applicable to its gas distribution network. These include the degree of redundancy in different circumstances and supply pressure criteria which, when put together, build the over-arching quality of supply criteria.

Due to historical practices of predecessor organisations, Vector's gas distribution networks have been developed based on different criteria. Steps have been taken to progressively align the different criteria towards a single set of quality of supply and security criteria across all regions.

One of the long-term network development drivers is to increase asset utilisation, while retaining acceptable level of supply and security risks. This can be achieved through a combination of knowledge of the capability of network assets, and accurate network operating information (demand, pressure, etc.).

5.2.1.1 Supply Pressure Criteria

The capacity of an individual pipeline is determined by the operating pressure, the diameter and the allowable pressure difference between inlet and outlet. Meshed distribution systems work on the same principle, except that the pipelines are interconnected and that such distribution systems can be fed at multiple points.

Regulator stations have nominal outlet pressures which supply each discrete pressure system. As the distribution systems expand and demand grows, certain parts of the distribution systems, mostly particular feeder mains, can develop large pressure drops,

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[3] This includes customers with non standard requirements, where special contractual arrangements apply.

thus constraining downstream parts of the distribution systems. Vector therefore prepares regular system pressure monitoring surveys and distribution system analyses to identify such constraints and to reinforce distribution systems before operating pressures become insufficient.

The utilisation of a pipeline system can be inferred by examining pipeline pressures. It therefore follows that 'utilisation' may be used as a proxy measure to establish the acceptable operating limits for pipeline pressures.

Figure 5-2 below illustrates the relationship between gas flow (utilisation) and pressure drop for a typical gas pipeline.

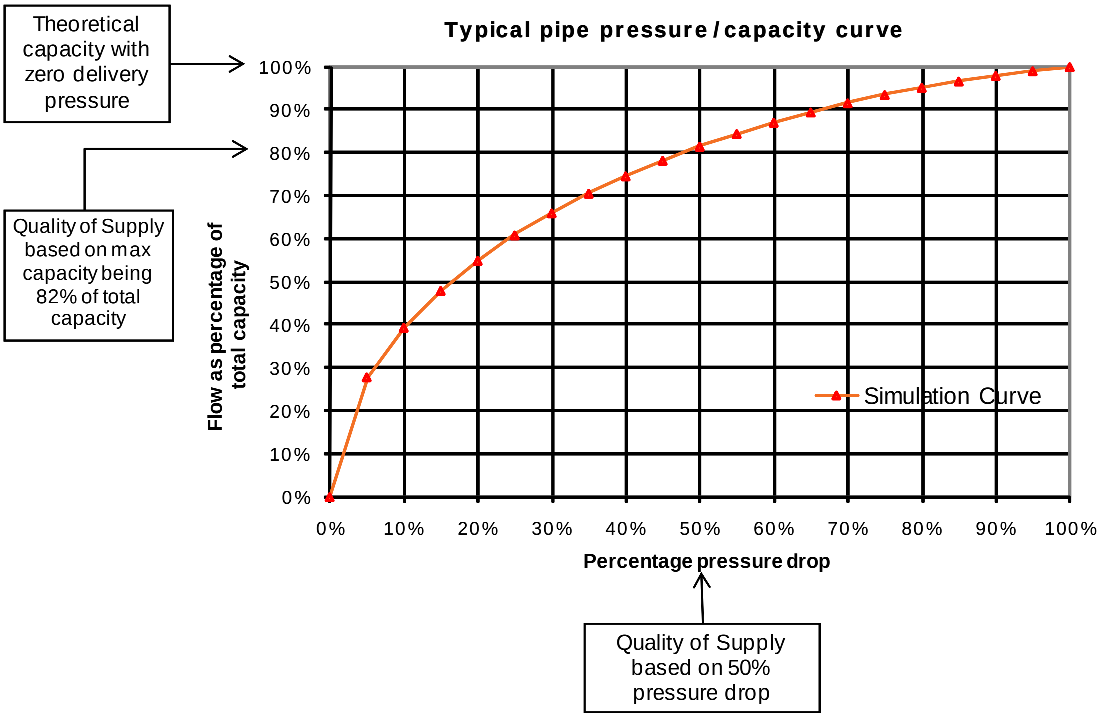

Figure 5-2 : Relationship of pressure and capacity

Examination of the above diagram shows that for a pressure drop of 50%, a pipeline system is delivering 82% of its gas delivery potential (and from an operation perspective is operating at its maximum utilisation level). It is important to note that each pressure system needs to be considered when examining pressure drops. This is due to the meshed nature of the network and the different characteristics each pressure system exhibits, i.e. mix of residential, commercial and industrial customers. The following sections describe the key points of Vector's quality of supply criteria.

a. Standard Operating Pressures

Vector has determined that under standard operating arrangements, pressure at any point on the network shall be no less than 50% of its Nominal Operating Pressure (NOP) and no more than 110% of its NOP[4].

b. Non-Standard Operating Pressures

In some cases non-standard minimum network pressures are used as a result of network configuration, cost efficiency or special agreements with customers. Vector's quality of supply criteria provides the minimum operating pressures that apply at the critical locations where non-standard conditions apply.

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[4] Vector's standard operating pressures are in line with international practice.

c. Contingency Conditions

During contingency conditions, network pressures may drop below those experienced during standard and non-standard operating conditions. In these situations, maintaining network pressure depends on the type of fault and the network configuration. Contingency provisions such as customer load shedding are used to maintain network pressure to the end users. Upon loss of a critical element in the supply chain, the following minimum network pressures shall be maintained using contingency provisions:

- Intermediate pressure (IP) networks shall be operating at no less than 40% of NOP;
- Medium pressure (MP) networks shall be operating at no less than 30% of NOP;
- In Auckland, low pressure networks shall be operating at no less than 1.2kPa; and
- In other areas, low pressure networks shall be operating at no less than 3kPa.

Note: Under contingency situations, networks are isolated to maintain safety to customers and the public.

5.3 Planning Methodology

As noted previously, the network planning process involves identifying and resolving:

- Upcoming supply quality, security or capacity issues that may prevent Vector from delivering its target service levels;
- Adequacy of supply to new developments or areas requiring gas connections; and
- The need to relocate assets when reasonably required by third parties.

In all cases, effective design requires consideration of the forecast planning demand, the capacity of equipment and the impact of the environment in which the equipment will operate.

The demand forecast model is aimed at providing an accurate picture of future demand growth (or decline) so investment decisions can be made with confidence. When used in conjunction with equipment ratings, it is possible to plan for the required quality of supply margins within the network. The quality of supply criteria is defined to reflect the levels of acceptable supply risk to Vector and its customers. This ensures that network investments are made on a consistent basis.The methodology used to assess equipment rating reflects the capacity of the equipment under field conditions, independent of the manner in which demand forecasts and quality of supply standards are developed.

5.3.1 Network and Asset Capacity

To enable the capacity of the delivery points (pressure systems) to be assessed, it is necessary to a have a reliable assessment of the capacities of the major network components. Major components include:

- Pipelines;
- Gate stations; and
- District regulating stations (DRS).

Determining the capacities of these network components requires a detailed assessment of each sub-component within the component. For example, in assessing the capacity of a DRS, ratings of the filter, meter, regulator and other accessories are also assessed to ensure the sub-component with the lowest rating – which determines the overall asset rating - is identified.

The following paragraphs describe how the capacities of the network components are assessed. In all cases, asset capacities are assessed at normal full-load ratings.

5.3.1.1 Pipelines

The analysis of pipeline capacity is complex due to the various pipeline types and network configurations. As mentioned beforehand[5], pipeline capacity can be determined by examining the relationship between system pressures, pipe diameter and the allowable minimum operating pressure (MinOP).

To help in determining the capacity of a pipeline or group of pipelines (pressure system), Vector uses the network modelling tool "SynerGEE[6]", a product of GL Noble Denton. SynerGEE is designed to model the gas network flow, pressure profile and capacity margins. This software tool is used 1) to determine the minimum pressure a pipeline system can sustain under load conditions, 2) for scenario analysis when considering development options, and 3) to assess the impact of changes to network operating parameters (such as increasing or reducing operating pressure in certain parts of the network) and to assess network risk.

5.3.1.2 Gate Stations

Vector takes its gas supply from the transmission system via gate stations (which are also operated and maintained by Vector[7]).

Gate station capacity is designed to meet the 10 year forecast load requirements at the station, based on minimum design inlet pressure and design outlet pressure and current load projections.

From a gas distribution perspective, there is a need to obtain a better understanding of the design capacity of most gate stations. Constraints at a gate station can impact on distribution investment decisions. Improved knowledge of the gate station capacities and constraints will lead to improved decisionmaking by offering a wider range of investment solutions.

5.3.1.3 District Regulating Stations

The purpose of a District Regulating Station (DRS) is to control the pressure in the downstream mains pipeline to which it is connected. Also, a DRS is designed with sufficient capacity to supply the 10 year forecast load, based on minimum design inlet pressure and design outlet pressure, and current load projections.

However, Vector is unable to determine accurately the capacity of a number of its DRSs. This legacy issue is a result of DRSs' regulator's orifice sizes not being recorded by predecessor organisations at the time of installation. To address this problem, an inspection programme has been developed to inspect all such regulators (spring loaded) and for the orifice size to be measured and recorded (refer to Section 6 for further details).

Vector's gas network distribution quality of supply criteria is based on maintaining an adequate supply pressure across the network. Historically, the North Island networks applied different design criteria from the Auckland network, i.e. minimum network pressures. As a result, Vector is reviewing the design capacity of the North Island network DRSs based on Vector's current gas distribution quality of supply criteria. Once this is

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[5] Section 5.2.

[6] SynerGEE is the product name provided by GL Noble Denton for gas network modelling and analysis. It features advanced pipeline simulation software along with the ease and familiarity of a windows-based operating system. Licensing add-on modules can extend SynerGEE's functionality. Currently, Vector has two server licences that can run both steady state and unsteady state modules.

[7] Note that the gas transmission asset management or asset details are separately disclosed in Vector's Gas Transmission AMP.

complete, the required work to ensure that the North Island networks meet Vector's criteria can be determined (refer to Section 6 for further details).

5.3.2 Project Prioritisation

The planning process results in a list of network projects and non-network solutions. These projects, along with other proposed projects for different asset investment purposes (e.g. asset replacement, customer connections, etc) are prioritised based on a risk matrix to obtain a pair-wise comparison (see Section 9). The risk matrix looks at operational, health and safety, environmental, legal, financial, reputational and regulatory risk factors to develop a "project necessity" rating or priority rating for the project.

The resulting list of projects becomes an input for the capital works programme. For network growth projects, the project priority is generally in the following order (from high to low):

- Avoiding quality of supply breaches that could lead to unsafe situations;
- Enhancing network efficiency (including works programme synergy); and
- Implementation of long-term development opportunities.

Refer to Section 9 for further details on project prioritisation.

5.4 Demand Forecasting

5.4.1 Demand Forecasting Methodology

A spreadsheet-based model has been developed for gas demand forecasting. The model covers the winter forecasts for the next 10 years.

Time-series analysis is used to develop a demand forecast at each gate station. Historical monthly flow data is summarised into a quarterly peak flow value. Input into the time-series was taken as the maximum flow of each quarter (Jan-Mar as Q1, Apr-Jun as Q2, etc). Some gate stations are equipped with two or three meters resulting in multiple meter readings. At these sites, the flows were either summed or the maximum value was used. Zero, anomalous or incomplete data has been excluded. In some cases[8], data was not available, and in these cases, Vector relies on its system pressure monitoring programmes to assess the demand on the network.

The time-series quarterly values are analysed for several factors: long-term trend, business cycle effects, seasonality, and unexplained, random variation. Because it is usually very difficult to isolate the business cycle effects, the method described here assumes the trend component has both long-term average and cyclical effects. The multiplicative model calculates the value using the formula:

Value = Trend x Seasonal x Random

The process of analysing time-series comprises two stages. The first stage is called 'decomposition' by applying moving averages to eliminate the irregular and seasonal variation in the data and identifying the long-run growth trend within the time-series. Secondly, historical flow data is seasonally adjusted and the trend of the adjusted quarterly flow values is extrapolated[9] and multiplied by an appropriate seasonal index to obtain the forecasted long-term gas demand at each gate station.

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[8] Gate station flow data for Papakura (non Auckland), Wellsford, Broadlands, Oakleigh, Matangi, Okoroire Springs, Te Rapa, Kuku and Te Horo is unavailable due to these gate stations having no transmission metering capability.

[9] The extrapolation uses a linear trend except where the trend results in negative values. In these cases, a zero load growth has been applied.

Using actual gate station flow data to 31 December 2010[10] and providing the results of the updated time series analysis, these allow the demand forecasts to be developed using maximum values for 2010 (year 0), and derived values for years 2013, 2017 and 2023.

Where the forecast indicates a decreasing growth rate, for the purposes of modelling the network, the 2010 actual flow data is applied to the forecast for years 2013 and 2017 and 2023, i.e. the demand forecast assumes zero growth.

5.4.1.1 Co-incident Factors

Where a gas network is supplied from two (or more) gate stations, the timing of the network peak gas flow may not coincide with either of the gates stations' flows[11]. In such cases, a co-incidence factor is calculated and applied to the growth trend. It is expressed as the maximum peak flow into the network divided by the sum of the individual peak flows of the two gate stations. Examples of these networks include Central Auckland, Hamilton, Te Awamutu, Mt Maunganui and Tauranga.

Similarly, a co-incident factor is also applied where two network systems are supplied by one gate station. These networks include the Auckland and North Island networks in Drury and Whangaparaoa, respectively.

5.4.1.2 Time Series Data Review

The historical gate station flow data and time series analysis has been reviewed and updated using the 2010 gate station flow data[12]. As expected, the review identified several minor data anomalies which were corrected, resulting in an improved forecast model. The following changes in the forecast methodology are noted:

- Where two or more gate stations supply one network system, i.e. Central Auckland, Hamilton, Te Awamutu and Tauranga, their flow rates have been added together to produce an aggregate time series analysis for the network system (as opposed to the individual gate stations). The co-incident factor is then applied to provide a co-incident peak demand forecast;
- The Mount Maunganui gate station forecast demand has been adjusted to take account of the closure of a large industrial consumer, which had a material impact on the time-series analysis. In addition, adjustments have been made to cater for confirmed requests[13] in the Mount Maunganui region. These adjustments provide for a more realistic demand forecast during the planning period; and
- Adjustments have been applied to the historical flow data for the Taupo, Te Puke and Tirau gate stations. In these cases, the realistic flow pattern over the past few years has been used.

5.4.2 Planning Under Uncertainty

A number of precautions are taken to mitigate the risks of making long-term investments in an uncertain environment. Apart from normal business risk avoidance measures, specific actions taken to mitigate the risks associated with investing in networks include the following.

- **Act prudently:** Make small incremental investments and defer large investments for as long as reasonably possible (replace DRS components rather than entire DRS).

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[10] Previous time series analysis for demand forecasting was carried out in 2008 based on actual gate station flow data up to 30 June 2007.

[11] The coincident and non-coincident demand is the same for gas distribution networks with a single gate station supply.

[12] Gate station flow data up to 31 December 2010 has been used.

[13] Vector has recently committed supplies to two industrial consumers, Marstel Terminals and Pacific Terminals in Hewletts Road in Mt Maunganui.

The small investments must, however, conform to the long-term investment plan for a region and not lead to future asset stranding.

- **Multiple planning timeframes:** Produce plans based on near, medium and long-term views. The near term plan is the most accurate and generally captures load growth for the next three years. This timeframe identifies short-term growth patterns, mainly leveraging off historical trends. It generally allows sufficient time for planning, approval and network construction to be implemented ahead of changing network demand.

  The medium-term plan covers the next ten years, and anticipates regional development trends such as land rezoning, new transport routes and larger infrastructure projects. The medium-term plan also captures behavioural changes such as the adoption of new technologies or global trends (eg. impact of climate change on consumer behaviour, energy conservation, etc).

  The Auckland Council has published a draft “Auckland Plan” to guide the development of the city in the next twenty to thirty years to accommodate the anticipated “medium” population growth to two million people by 2031. The “Auckland Plan” will supersede the Regional Growth Strategy (RGS) when it is formalised. A preliminary assessment of the “Auckland Plan” indicated that it is very similar in approach to the RGS with intense developments within the region’s urban limits and concentrated growth along transport corridors. A detailed assessment will be made when the “Auckland Plan” is formalised.

  The long-term plan looks at growth patterns within the region at the end of the current asset lifecycle, around 40 years out. A top-down approach is used to predict probable network loads within the region, from which the requirement for pressure system upgrades or new gate stations and DRSs are identified. The objective is less about developing accurate load forecasts and more about providing a long-term development plan, identifying likely future network requirements.

- **Review significant replacement projects:** For large network assets, rather than replace existing end-of-life assets with the modern equivalent, a review is carried out to confirm the continued need for the assets, as well as the optimal size and network configuration that will meet Vector’s needs for the next asset lifecycle.

5.4.2.1 Large Development Projects

Vector, as a requiring authority, receives early notification of resource consent applications. This allows Vector to keep abreast of imminent projects and commence early discussions with developers and consultants about proposed gas supply needs. For larger projects, in particular, the earlier planning commences, the more ability Vector has to optimise designs, obtain optimal procurement rates and maximise potential benefits arising from the synergy of these projects.

The additional loads expected from development projects are captured in the demand forecast, based on a best estimate of when this will be experienced, and hence the optimal point at which network augmentation will be required. Regular re-forecasting allows the timing of the individual projects to be re-evaluated and to adjust the forecasts accordingly.

In high growth areas, network augmentation may be brought forward somewhat, to ensure a larger network capacity buffer that allows for unexpected load increases or unexpected delays in the delivery of solutions.

5.4.3 Load Forecasts

As mentioned in Section 5.4.1.2, the time-series forecast has been completed using historical flow data up to December 2010[14]. The forecasting methodology and results have

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[14] The next load forecast is planned to be updated in FY2014.

been reviewed by Vector Gas Transmission to ensure a consistent approach across Vector's gas distribution and transmission systems.

Based on the available information and using the methodology described earlier, Figure 5-3 shows the load forecast for Vector's gas distribution networks in the Auckland and North Island pricing regions. Table 5-1 shows the projected annual and total growth rates at each of Vector's existing gate stations, which are applied in Vector's network models[15].

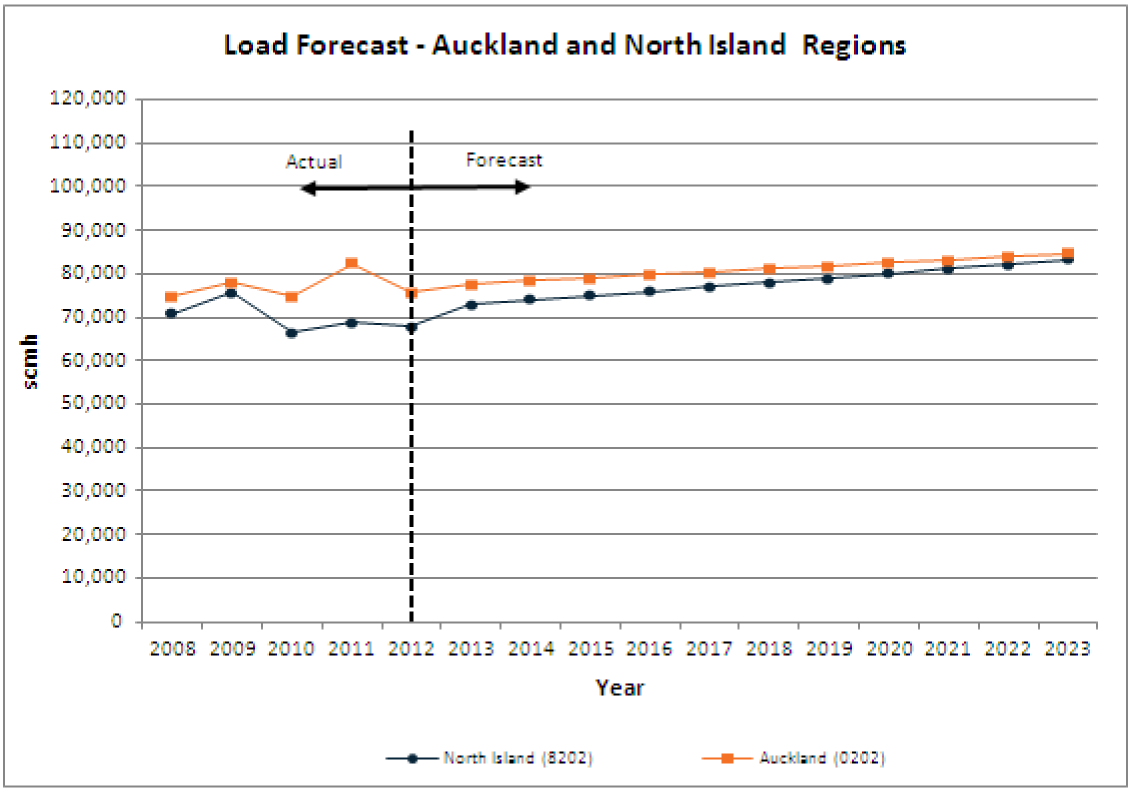

Figure 5-3 : Load forecast for Vector networks in Auckland and North Island pricing regions

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[15] Vector's network models are updated on a rolling 3 yearly cycle.

Region	Network system	Gate station / Network system	2009 Actual	2010 Actual	2011 Actual	2012 Actual	2013 Forecast	2014 Forecast	2015 Forecast	2016 Forecast	2017 Forecast	2018 Forecast	2019 Forecast	2020 Forecast	2021 Forecast	2022 Forecast	2023 Forecast	Annual growth	Total growth
Northland	Marsden Point	Marsden Point Gate Station	218	207	198	168	207	207	207	207	207	207	207	207	207	207	207	1.9%	23.0%
Northland	Oakleigh	Oakleigh Gate Station	No data																
Northland	Wellsford	Wellsford Gate Station	No data																
Northland	Whangarei	Whangarei Gate Station	1659	1028	1066	984	1100	1068	1037	1028	1028	1028	1028	1028	1028	1028	1028	0.4%	4.4%
Auckland	Alfriston	Alfriston Gate Station	203	194	157	140	194	194	194	194	194	194	194	194	194	194	194	3.0%	39.1%
Auckland	Auckland Central	Papakura Gate Station	21700	19444	23844	20203	19902	20074	20247	20419	20591	20763	20936	21108	21280	21453	21681	0.6%	7.3%
Auckland	Auckland Central	Westfield Gate Station	41044	43303	49938	48431	44323	44707	45090	45474	45858	46242	46625	47009	47393	47776	48285	0.0%	0.0%
Auckland	Auckland Central	Bruce McLaren Gate Station	1982	1908	1989	2142	1953	1970	1987	2004	2021	2037	2054	2071	2088	2105	2128	0.0%	0.0%
Auckland	Auckland Central	Henderson Gate Station	10646	10635	11274	10802	10885	10980	11074	11168	11262	11357	11451	11545	11639	11734	11859	0.9%	9.8%
Auckland	Auckland Central	Central Auckland Network System (co-incident)	74187	70946	78660	71933	73827	74466	75105	75744	76383	77022	77662	78301	78940	79579	80426	1.0%	11.8%
Auckland	Drury CT	Drury CT Network System	377	373	367	368	373	373	373	373	373	373	373	373	373	373	373	0.1%	1.2%
Auckland	Drury NC	Drury NC Network System	2051	1594	1960	1877	2266	2344	2422	2501	2579	2657	2735	2813	2891	2969	3074	4.6%	63.7%
Auckland	Drury CT & Drury NC	Drury Gate Station	2316	1786	2248	2141	2367	2423	2479	2537	2595	2653	2713	2772	2833	2894	2973	3.0%	38.9%
Auckland	Hunua	Hunua (Vector) Gate Station	803	858	804	801	858	858	858	858	858	858	858	858	858	858	858	0.6%	7.1%
Auckland	Kingseat	Kingseat Gate Station	27	22	22	19	22	22	22	22	22	22	22	22	22	22	22	1.2%	14.0%
Auckland	Pukekohe	Pukekohe Gate Station	394	358	375	626	402	403	404	405	406	406	407	408	409	410	411	0.0%	0.0%
Auckland	Ramarama	Ramarama Gate Station	248	250	257	255	252	255	258	261	264	267	271	274	277	280	284	1.0%	11.3%
Auckland	Tuakau	Tuakau Station Station	1389	1438	1494	1544	1481	1506	1531	1556	1581	1606	1630	1655	1680	1705	1730	1.0%	12.0%
Auckland	Warkworth	Warkworth Gate Station	2018	1899	1901	1871	2157	2244	2330	2417	2504	2590	2677	2763	2850	2937	3025	4.5%	61.7%
Auckland	Whangaparaoa CT	Whangaparaoa CT Network System	291	318	256	224	331	343	356	369	381	394	406	419	431	444	461	6.8%	105.9%
Auckland	Whangaparaoa NC	Whangaparaoa NC Network System	1163	969	1223	1344	1232	1279	1325	1372	1419	1465	1512	1559	1605	1652	1717	2.2%	27.7%
Auckland	Whangaparaoa CT & Whangaparaoa NC	Waitoki Gate Station	1319	1191	1332	1452	1441	1495	1550	1605	1659	1714	1768	1823	1878	1932	2008	3.0%	38.3%
Auckland	Papakura	Papakura Gate Station (GS-81002-PP) decommissioned																	
Auckland	Harrisville	Harrisville Gate Station	3156	3114	2972	3068	4235	4475	4714	4953	5192	5432	5671	5910	6150	6389	6628	7.3%	116.0%
Waikato	Cambridge	Cambridge Network System (excl. load of Hautapu DF)	1054	1084	1037	985	1084	1084	1084	1084	1084	1084	1084	1084	1084	1093	1091	0.9%	10.8%

Region	Network system	Gate station / Network system	2009 Actual	2010 Actual	2011 Actual	2012 Actual	2013 Forecast	2014 Forecast	2015 Forecast	2016 Forecast	2017 Forecast	2018 Forecast	2019 Forecast	2020 Forecast	2021 Forecast	2022 Forecast	2023 Forecast	Annual growth	Total growth
Waikato	Cambridge	Cambridge Gate Station	2681	2951	2928	3047	2951	2951	2951	2951	2951	2953	2986	3020	3053	3087	3082	0.1%	1.1%
Waikato	Hamilton	Hamilton - Te Kowhai Gate Station	6720	5169	5509	4978	5855	5935	6015	6095	6174	6254	6334	6414	6493	6573	6653	2.7%	33.7%
Waikato	Hamilton	Hamilton - Temple View Gate Station	9140	9064	9557	9698	10268	10407	10547	10687	10827	10967	11107	11247	11386	11526	11666	1.7%	20.3%
Waikato	Hamilton	Hamilton Network System (co-incident)	15329	13987	14829	14676	15849	16065	16281	16496	16712	16928	17144	17360	17576	17792	18008	1.9%	22.7%
Waikato	Horotiu	Horotiu Gate Station	1189	1044	960	983	1251	1271	1290	1309	1329	1348	1367	1387	1406	1425	1445	3.6%	47.0%
Waikato	Huntly	Huntly Gate Station	661	547	679	581	547	547	547	547	547	547	547	547	547	547	547	0.0%	0.0%
Waikato	Kiwitahi	Kiwitahi Gate Station	130	144	156	154	144	144	144	144	144	144	144	144	144	144	144	0.0%	0.0%
Waikato	Matangi	Matangi Gate Station	No data																
Waikato	Morrinsville	Morrinsville Gate Station	563	515	447	459	576	580	584	588	591	595	599	603	607	611	615	2.7%	33.9%
Waikato	Ngaruawahia	Ngaruawahia Gate Station	79	64	68	67	77	80	82	84	87	89	91	94	96	98	101	3.8%	50.8%
Waikato	Otorohanga	Otorohanga Gate Station	168	174	156	163	174	174	174	174	174	174	174	174	174	174	174	0.6%	7.0%
Waikato	Pirongia	Pirongia Gate Station	25	29	27	30	30	31	32	33	34	34	35	36	37	38	39	2.3%	28.6%
Waikato	Te Awamutu	Te Awamutu North - No.2 Gate Station	690	631	487	613	631	631	631	631	631	631	631	631	631	631	631	0.3%	3.0%
Waikato	Te Awamutu	Kihikihi Gate Station	1294	1229	653	692	1229	1229	1229	1229	1229	1229	1229	1229	1229	1229	1229	5.4%	77.7%
Waikato	Te Awamutu	Te Awamutu Network System (co-incident)	1369	1229	1067	1276	1229	1229	1229	1229	1236	1243	1249	1256	1263	1270	1276	0.0%	0.0%
Waikato	Te Kuiti North	Te Kuiti North Gate Station	294	368	291	241	368	368	368	368	368	368	368	368	368	368	368	3.9%	52.8%
Waikato	Te Kuiti South	Te Kuiti South Gate Station	925	910	910	933	910	910	910	910	910	910	910	910	910	910	910	0.0%	0.0%
Waikato	Waikeria	Waikeria Gate Station	223	256	401	206	266	274	282	289	297	305	312	320	328	335	343	4.8%	66.7%
Waikato	Waitoa	Waitoa Gate Station	2009	2004	2082	2119	2187	2250	2314	2377	2440	2504	2567	2630	2693	2757	2820	2.6%	33.1%
Central Plateau	Rainbow Mountain	Rainbow Mountain Gate Station	936																
Central Plateau	Reporoa	Reporoa Gate Station	2734	2715	2762	2646	2861	2827	2793	2759	2725	2715	2715	2715	2715	2715	2715	0.2%	2.6%
Central Plateau	Rotorua	Rotorua Gate Station	3765	3547	3763	3587	3671	3650	3629	3609	3588	3567	3547	3547	3547	3547	3547	0.0%	0.0%
Central Plateau	Taupo	Taupo Gate Station	1294	1228	1246	1186	1405	1450	1494	1539	1584	1629	1674	1718	1763	1808	1853	4.1%	56.2%
Central Plateau	Kinleith	Kinleith Gate Station	235	242	261	252	255	256	258	259	261	262	264	265	267	268	270	0.6%	7.1%
Central Plateau	Okoroire Springs	Okoroire Springs Gate Station	No data																
Central Plateau	Putaruru	Putaruru Gate Station	560	531	505	507	609	599	589	579	570	560	550	541	531	531	531	0.4%	4.8%

Region	Network system	Gate station / Network system	2009 Actual	2010 Actual	2011 Actual	2012 Actual	2013 Forecast	2014 Forecast	2015 Forecast	2016 Forecast	2017 Forecast	2018 Forecast	2019 Forecast	2020 Forecast	2021 Forecast	2022 Forecast	2023 Forecast	Annual growth	Total growth
Central Plateau	Tirau	Tirau Gate Station	57	57	56	55	68	71	75	79	82	86	89	93	96	100	103	6.0%	89.7%
Central Plateau	Tokoroa	Tokoroa Gate Station	868	812	805	803	815	812	812	812	812	812	812	812	812	812	812	0.1%	1.1%
Bay of Plenty	Edgecumbe	Edgecumbe Gate Station	6022	5769	5991	5903	5769	5769	5769	5769	5769	5769	5769	5769	5769	5769	5769	0.0%	0.0%
Bay of Plenty	Kawerau	Kawerau Network System (excl. loads of ex-Caxton & ex-Tasman)	162	139	134	141	139	139	139	139	139	139	139	139	139	139	139	0.0%	0.0%
Bay of Plenty	Kawerau	Kawerau Gate Station	6944	4056	3207	2732	4056	4056	4056	4056	4056	4056	4056	4056	4056	4056	4056	3.7%	48.5%
Bay of Plenty	Mt Maunganui	Mt Maunganui Gate Station	2960	2677	3195	3087	2677	2677	2677	2677	2677	2677	2677	2677	2677	2677	2677	0.0%	0.0%
Bay of Plenty	Mt Maunganui	Papamoa Gate Station	866	831	867	792	1170	1234	1298	1363	1427	1492	1556	1620	1685	1749	1813	7.8%	128.9%
Bay of Plenty	Mt Maunganui	Mt Maunganui Network System (co-incident)	3457	3190	3795	3624	3497	3555	3614	3672	3731	3789	3848	3906	3965	4023	4082	1.1%	12.6%
Bay of Plenty	Opotiki	Opotiki Gate Station	223	125	163	210	213	214	214	215	215	216	216	216	217	217	218	0.3%	3.6%
Bay of Plenty	Tauranga	Tauranga Station	2260	1967	2051	1745	2215	2245	2275	2305	2335	2365	2396	2426	2456	2486	2517	3.4%	44.2%
Bay of Plenty	Tauranga	Pyes Pa Station	307	290	787	777	327	331	335	340	344	349	353	358	362	367	371	0.0%	0.0%
Bay of Plenty	Tauranga	Tauranga Network System (co-incident)	2567	2257	2305	2254	2541	2576	2610	2645	2680	2714	2749	2783	2818	2852	2888	2.3%	28.1%
Bay of Plenty	Te Puke	Te Puke Gate Station	466	439	400	456	579	619	658	697	736	775	814	853	892	931	970	7.1%	112.6%
Bay of Plenty	Te Teko	Te Teko Gate Station	33				33	33	33	33	33	33	33	33	33	33	33		
Bay of Plenty	Whakatane	Whakatane Network System	557	533	573	540	533	533	533	533	533	533	533	533	533	533	533	0.0%	0.0%
Bay of Plenty	Whakatane	Whakatane Gate Station	4133	3061	3190	3410	3061	3061	3061	3061	3061	3061	3061	3061	3061	3061	3061	0.0%	0.0%
Gisborne	Gisborne	Gisborne Gate Station	3218	3111	2961	3489	3282	3307	3333	3358	3384	3409	3435	3460	3485	3511	3536	0.1%	1.4%
Kapiti	Kuku	Kuku Gate Station	No data																
Kapiti	Otaki	Otaki Gate Station	247	272	274	270	307	314	321	328	335	342	349	356	364	371	378	3.1%	40.1%
Kapiti	Paraparaumu	Paraparaumu Gate Station	1520	1485	1710	1493	1669	1718	1766	1814	1863	1911	1960	2008	2056	2105	2157	3.4%	44.5%
Kapiti	Te Horo	Te Horo Gate Station	No data																
Kapiti	Waikanae	Waikanae Gate Station	651	641	1129	807	691	706	722	738	753	769	784	800	816	831	849	0.5%	5.2%

Table 5-1 : Peak demand projection for the gate stations and network systems (in scmh)

5.5 Network Monitoring

Pressure monitoring is undertaken as part of ongoing pressure monitoring programmes. These programmes are designed to provide the necessary system performance data that would enable network modelling analysis to be carried out.

Various methods are utilised to collect the required network performance data, including:

- Manually downloaded or remotely downloaded (e.g. Cello units) portable electronic dataloggers;
- Telemetry data from gate stations, district regulating stations (DRS) or other Telenet installation;
- Gas customer time-of-use data obtained directly or indirectly from retailer gas measurement systems;
- Gas transmission SCADA system data; and
- Isolated readings obtained during peak loading conditions.

The Telenet SCADA system is mainly deployed in the Auckland region[16], and the Cello system on the North Island regions. Section 6 provides functional and physical descriptions of these systems.

5.6 Network Modelling

Most of Vector's network planning models have been created using data extracted from the GIS and billing systems. These models have been converted for use using the network modelling software SynerGEE.

Network models are validated by comparing the performance of the computer model to the actual physical performance of the gas distribution network. Where the computer model and actual network performance differs, the computer model is adjusted to reflect the actual conditions recorded from Vector's system pressure surveys[17] and SCADA information.

The total system flow[18] for each network model is then scaled to align with the actual peak flow. This alignment is applied evenly across the network by adjusting the existing loads in the model. This becomes the base model for the network or pressure system.

Vector has reviewed and completed the network models for all of its pressure systems in 2010 and 2011 using the 2007 load forecast data, and applied the forecast planning demand data to each pressure system.

The network modelling process is an important but time consuming process. Vector has a programme in place to update its network models on a three–yearly cycle.

5.7 Network Development Efficiencies

Significant efficiencies can often be incorporated in growth solutions that could allow conventional network investment to be considerably deferred without compromising capacity or quality of supply. In evaluating possible solutions, the following processes are undertaken to ensure an optimal investment decision:

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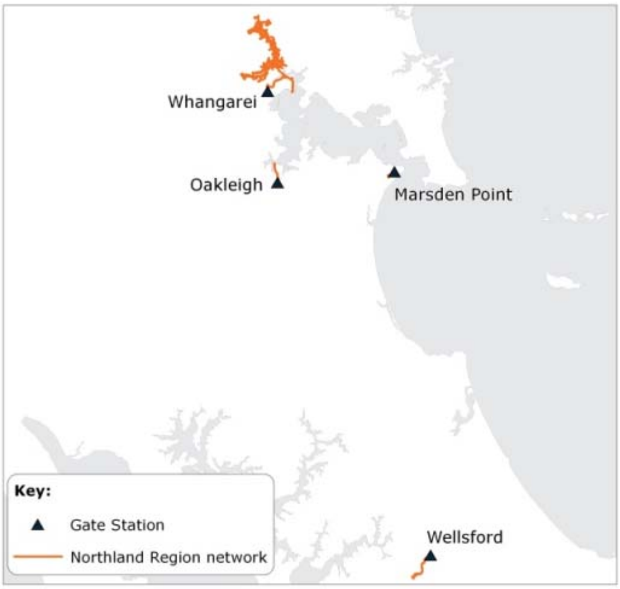
[16] One Telenet site has been installed at a DRS in the Mt Maunganui network system.

[17] System pressure survey is the process for capturing actual system pressure data and is performed during winter to ensure the system peak flow is considered as far as possible. The underlying assumption is that when the network is operating under its most onerous conditions, the network pressure will be at a minimum.

[18] The network models in this AMP use the 2007 load forecast data. When each network model is updated, the 2010 load forecast data will be used.

- Review the asset capacity rating for currency and accuracy of data;
- Consider installing system pressure data loggers to validate actual (rather than theoretical) system pressure data;
- Consider possible load transfer to alternative pipelines or DRSs (adjusting gate station and DRS regulator settings sometimes allows load diversity);
- Look for load diversity opportunities (mixing commercial and residential loads sometimes allows load diversity);
- Remove capacity constraints caused by individual asset components, to improve the overall capacity of a pipeline;
- Develop short-term solutions that could evolve into longer-term solutions without asset stranding; and
- Leverage off other projects to gain synergies, e.g. asset replacement, road re-alignment or new road construction activities.

5.8 Network Development Programme – Northland Region



Northland is New Zealand's least urbanised region, with only some 50% of the population of 149,600 living in urban areas. Of the towns in this region, Whangarei is the largest, with a population of 48,700. Seven other centres have populations of over 1,000: Kaitaia, Dargaville, Kaikohe, Paihia, Kerikeri, Taipa-Mangonui, and Kawakawa. The population is largely concentrated along the region's east coast.

5.8.1 Load Forecasts

The load forecast for the Northland region for the next 10 years is shown in Figure 5-4.

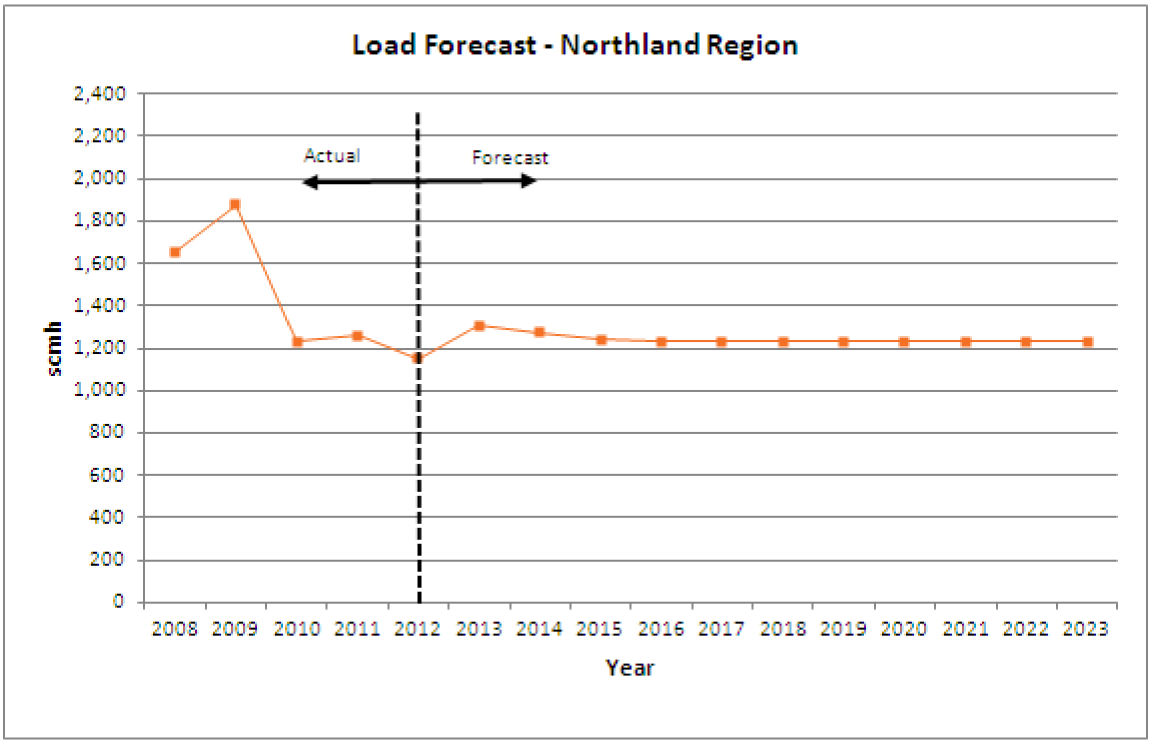


Figure 5-4 : Load forecast for Northland region

Table 5-1, Table 5-2 and Table 5-3 show the winter peak demand projection for the gate stations, DRSs and pressure systems for the Northland region.

5.8.1.1 Gate Stations

The Northland region takes supply from the following gate stations:

- Whangarei;
- Oakleigh;
- Marsden Point; and
- Wellsford.

The gate station winter peak demand statistics are summarised in Table 5-1.

5.8.1.2 District Regulating Stations

DRS	Pressure system	2013	2017	2023	Breach of design capacity	Comments
DR-80056-WE	Wellsford MP4	No data	No data	No data	No	DRS upgraded in FY2013
DR-80057-WG	Whangarei North MP	No data	No data	No data	No	Customer GMS
DR-80060-WG	Whangarei West MP4	190	199	215	No	DRS to be removed in FY2015
DR-80067-WG	Riverside MP4	57	60	65	No	
DR-80068-WG	Whangarei North MP	113	119	128	No	
DR-80069-WG	Whangarei North MP	141	148	160	No	DRS to be upgraded in FY2016 (refer to Section 6)
DR-80070-WG	Whangarei West MP4	59	62	67	No	DRS upgraded in FY2013
DR-80071-WG	Whangarei West MP4	254	267	289	Yes	DRS to be upgraded in FY2015
DR-80086-WG	Whangarei North MP	21	23	24	No	
DR-80090-WG	Whangarei West MP4	27	28	30	No	DRS to be upgraded in FY2016 (refer to Section 6)
DR-80096-WG	Port Whangarei MP4	8	9	9	No	
DR-80097-WG	Dyer St MP4	4	4	4	No	
DR-80231-WG	Pipiwai Rd MP4	32	34	37	No	
DR-80241-WG	Union East St MP4	351	368	398	No	

Table 5-2 : Northland region DRS capacity and peak demands (in scmh)

5.8.1.3 Pressure Systems

Pressure system	Network system	2013	2017	2023	Meets operating pressure criteria	Comments
Pipiwai Rd MP4	Whangarei	350	350	350	Yes	
Riverside MP4	Whangarei	345	345	344	Yes	
Whangarei North MP	Whangarei	340	340	338	Yes	
Whangarei West MP4	Whangarei	285	279	267	Yes	
Woodhill North MP4	Whangarei	27	28	30	Yes	
Dyer St MP4	Whangarei	350	350	350	Yes	
Union East St MP4	Whangarei	344	343	342	Yes	
Port Whangarei MP4	Whangarei	350	350	350	Yes	
Whangarei IP10	Whangarei	795	752	670	Yes	
Oakleigh IP20	Oakleigh	No data	No data	No data	No data	
Marsden Point MP7	Marsden Point	594	594	594	Yes	
Wellsford MP4	Wellsford	No data	No data	No data	No data	
Wellsford IP20	Wellsford	No data	No data	No data	No data	

Table 5-3 : Northland region pressure system capacity and peak demands (in kPa)

5.8.2 Whangarei Network System

The Whangarei system is supplied from the gas transmission system at one gate station, located in South Whangarei. The Whangarei network system consists of one IP pressure system, eight MP4 pressure system and 13 DRSs.

5.8.2.1 Consumer Growth and Demand Forecast

About 1,210 consumers are connected to the Whangarei network system, most of whom are residential customers. Around 16% are commercial/industrial gas users, eg. a hospital and bakeries.

Marketing projection indicates that both residential and commercial/industrial developments in this region are not very active. Demand growth is anticipated to be relatively flat over the planning period. However, some infill and new subdivisions are projected over the next five years, e.g., a new subdivision development sited in Corks Road with approximately 430 lots.

5.8.2.2 Gate Stations

The Whangarei gate station has a capacity of 1,600scmh and is currently operating at a nominal pressure of 1,000kPa. The gate station recorded a peak flow of 984scmh at 6:00pm on 12th July 2012.

5.8.2.3 District Regulating Stations

The Whangarei network system feeds 13 DRSs. The load forecast for each DRS is not anticipated to exceed the station capacity during the planning period. it is worth noting that some DRSs in the Whangarei network include low pressure filters.

Network modelling and scenario analysis indicates that potentially a maximum of four DRS can be rationalised during the planning period. In conjunction with the DRS rationalisation plan, the following MP4 links have been identified which will merge the Whangarei West, Whangarei North and the Woodhill North MP4 pressure systems:

- Construct approximately 50 metres of 50mm PE MP4 in Central Avenue between Whangarei West MP4 and Woodhill MP4;
- Construct approximately 210 metres of 50mm PE MP4 between Bank Street and Hunt Street; and
- Construct approximately 140 metres of 50mm PE MP4 PE in Central Avenue from First Street to Maunu Road /Water Street.

Whangarei IP10

The Whangarei IP10 pipeline receives gas from one gate station and provides the back-bone supply to the greater part of Whangarei. The IP10 network is capable of operating up to 1,700kPa, but is currently operating at 1,150kPa. This is due to the low pressure filters installed in some DRSs.

The Whangarei IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 1,659scmh resulting in a MinOP of 800kPa (80% of the NOP). Total forecast planning demand during the planning period is estimated to be 1,895scmh, resulting in a MinOP of 670kPa (67% of the NOP). However, several residential subdivisions proposed in Whangarei North (i.e. at the extremity of the Whangarei IP10 pressure system) may result in the system pressure at the extremities of the network dropping below Vector’s minimum pressure criteria.

To address this issue, retesting the IP10 pipeline and up-rating the NOP from 1,000kPa to 1,850kPa is scheduled to be completed in FY2023.

Union East Street MP4

The Union East Street MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 348scmh resulting in a MinOP of 344kPa (86% of the NOP). Total forecast planning demand during the planning period is estimated to be 398scmh, resulting in a MinOP of 342kPa (86% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Pipiwai Road MP4

The Pipiwai Road MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 32scmh resulting in a MinOP of 350kPa (88% of the NOP). Total forecast planning demand during the planning period is estimated to be 37scmh, resulting in a MinOP of 350kPa (88% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Riverside MP4

The Riverside Drive MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 57scmh resulting in a MinOP of 345kPa (86% of the NOP). Total forecast planning demand during the planning period is estimated to be 65scmh, resulting in a MinOP of 344kPa (86% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Whangarei North MP4

The Whangarei North MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 437scmh resulting in a MinOP of 341kPa (85% of the NOP). Total forecast planning demand during the planning period is estimated to be 499scmh, resulting in a MinOP of 338kPa (84% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

As part of Vector’s DRS rationalisation plan (described in Section 5.8.2.3), this pressure system will merge into the Woodhill North and Whangarei West MP4 pressure systems.

Whangarei West MP4

The Whangarei West MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 526scmh resulting in a MinOP of 286kPa (72% of the NOP). Total forecast planning demand during the planning period is estimated to be 601scmh, resulting in a MinOP of 267kPa (67% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

As part of Vector’s DRS rationalisation plan (described in Section 5.8.2.3), this pressure system will merge into the Woodhill North and Whangarei North MP4 pressure systems.

Dyer Street MP4

The Dyer Street MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 4scmh resulting in a MinOP of 350kPa (88% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 350kPa (88% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Port Whangarei MP4

The Whangarei West MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 8scmh resulting in a MinOP of 350kPa (88% of the NOP). Total forecast planning demand during the planning period is estimated to be 9scmh, resulting in a MinOP of 350kPa (100% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

A proposal to connect this pressure system into the Riversdale MP4 pressure system by constructing approximately 1,100 metres of 80mm MP4 PE pipeline in Port Road to DR-80096-WG has been reviewed and is not required during the planning period.

Woodhill North MP4

The Woodhill North MP4 pressure system operates at a NOP of 400kPa. No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

As part of Vector’s DRS rationalisation plan (described in 5.8.2.3), this pressure system will merge into the Whangarei West and the Whangarei North MP4 pressure systems during the planning period.

5.8.3 Oakleigh Network System

The Oakleigh network system is supplied from the transmission system at one gate station, located in Whittle Road, south of Oakleigh. This network system consists of one IP pressure system which is directly fed from the gate station.

5.8.3.1 Consumer Growth and Demand Forecast

The Oakleigh network system supplies gas to one residential consumer. No growth is anticipated within the planning period.

5.8.3.2 Gate Stations

The Oakleigh gate station is proposed to be decommissioned pending discussions with the residential consumer connected to the network. Vector proposes to offer the existing consumer an alternative energy solution.

5.8.3.3 District Regulating Stations

No DRS is installed in the Oakleigh network system.

5.8.3.4 Pressure Systems

Oakleigh IP20 Pressure System

No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.8.4 Marsden Point Network System

The Marsden Point network system is supplied from the transmission system at one gate station, located in Mair Road. This network system consists of one MP7 pressure system and is supplying gas to one industrial consumer.

5.8.4.1 Gate Stations

The Marsden Point gate station recorded a peak flow of 168scmh at 11:00pm on 6th October 2012.

5.8.4.2 Consumer Growth and Demand Forecast

The Marsden Point network system supplies gas to one industrial consumer located in Rama Road. It is expected that future gas demand will be driven by the growth of potential industrial activities in the area while residential demand will be minimal.

Demand growth is anticipated to be relatively flat over the planning period. However, the area of Marsden Point, One Tree Point and Ruakaka is undergoing substantial development which may result in higher load growth rate in the future.

5.8.4.3 District Regulating Stations

No DRSs are installed in the Marsden Point network system.

5.8.4.4 Pressure Systems

Marsden Point MP7 Pressure System

The Marsden Point MP7 pressure system operates at a NOP of 700kPa. The maximum flow into the system in the base year was 218scmh resulting in a MinOP of 594kPa (85% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 594kPa (85% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.8.5 Wellsford Network System

The Wellsford network system is supplied from the transmission system at one gate station, located in the northeast of Wellsford. This network system consists of one IP pressure system and one MP4 pressure system.

5.8.5.1 Consumer Growth and Demand Forecast

The Wellsford network system has a total of 24 consumers, comprising an even mix of residential and commercial/industrial premises.

Wellsford has a population of 1,665 people which is anticipated to grow to 1,736 in year 2021[19]. Demand for gas has been fairly flat over past few years. Very limited growth is anticipated within the planning period.

5.8.5.2 Gate Stations

Flow data for the Wellsford gate station is not available and Vector has no plans at this stage to collect this information.

5.8.5.3 District Regulating Stations

The Wellsford network system has one DRS which supplies gas to Wellsford MP4 pressure system.

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[19] Population projections by Ward, Main Urban Area and Planning Area Unit , August 2009, http://www.rodney.govt.nz/AboutRodney/Documents/Rodney_District_Population_Projections_Aug2009.pdf

5.8.5.4 Pressure Systems

Wellsford IP10

The Wellsford IP10 pressure system is supplied from a single gate station located North West of Wellsford with a NOP of 1,000kPa. The IP10 network is capable of operating up to 1,900kPa, but is currently operating at 1,200kPa. The maximum flow into the system in the base year was 9scmh resulting in a MinOP of 1200kPa (100% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Wellsford MP4

The Wellsford MP4 pressure system is supplied from DR-80056-WE located in Mobil Wellsford Energy Centre and operates at a NOP of 400kPa. The maximum flow into the system in the base year was 9scmh resulting in a MinOP of 349kPa (87% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.9 Network Development Programme – Auckland Region

Auckland is New Zealand's largest city with a current population of 1.5 million (about 32% of New Zealand population). This is expected to grow to around 2.2 million by 2041. Auckland's contribution to the country's Gross Domestic Product (GDP) is over 35%, the most of any region or city[20].

The Auckland Council, the region's governing body, was created and became operational in November 2010. It oversees all of Auckland from Wellford in the north and Pukekohe in the south and is responsible for planning, development, operations and services in the region.

The Auckland region has been divided into two systems for the purposes of Vector's gas distribution network:

- Auckland, and
- Auckland (previously owned by NGC).

This section of the development plan describes the assets associated with the Auckland assets in the Auckland region.

5.9.1 Load Forecasts

The load forecast for the Auckland region for the next 10 years is shown in Figure 5-5.

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[20] Information refers to the "Auckland Council Annual Report 2011/2012", http://www.aucklandcouncil.govt.nz/EN/planspoliciesprojects/reports/annual_report/Documents/annualreport20112012vol1.pdf

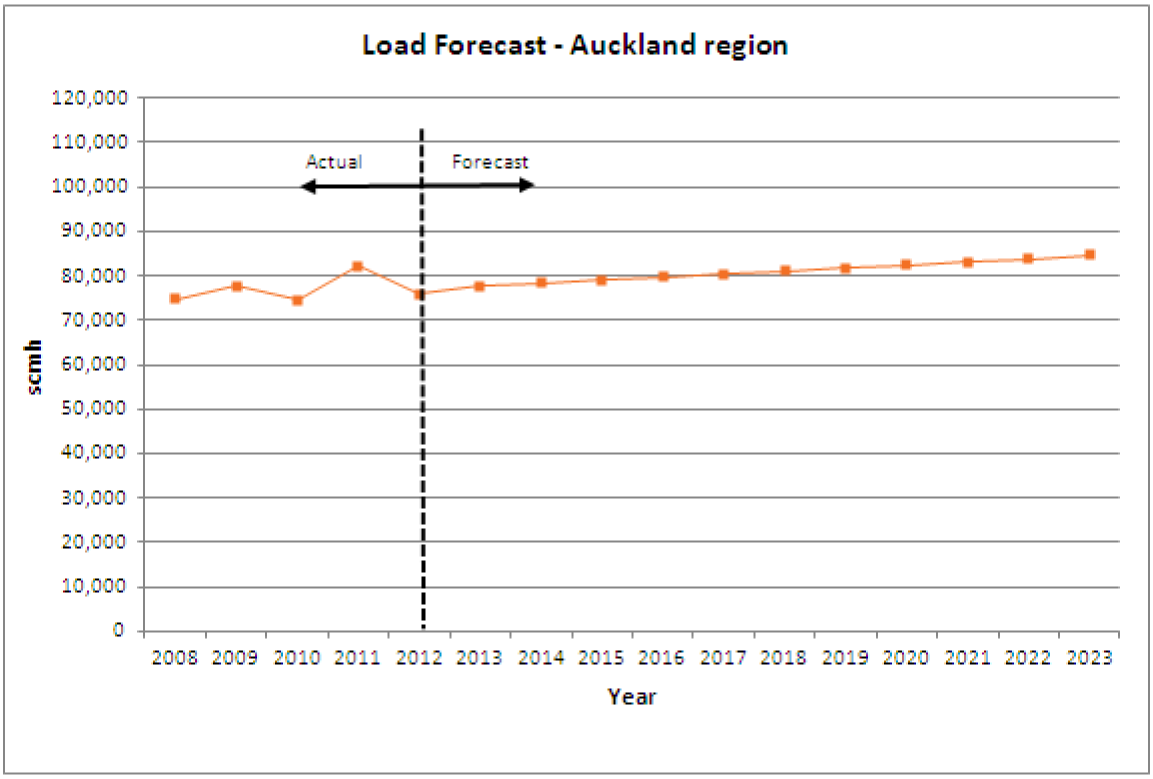

Figure 5-5 : Load forecast for the Auckland region

Table 5-1, Table 5-4 and Table 5-5 show the winter peak demand projection for the gate stations, DRSs and pressure systems for the Auckland region.

5.9.1.1 Gate Stations

The Auckland region takes supply from the following gate stations:

- Alfriston;
- Papakura;
- Westfield;
- Bruce McLaren;
- Henderson;
- Drury;
- Hunua;
- Kingseat;
- Pukekohe;
- Ramarama;
- Tuakau; and
- Whangaparaoa (CT)[21].

The gate station winter peak demand statistics are summarised in Table 5-1.

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[21] This site is not a gate station. Gas is metered at the interconnection point.

5.9.1.2 District Regulating Stations

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-00002-AK	Glendene MP4	103	109	119	No	
DR-00003-AK	Central Auckland MP4	89	94	102	No	
DR-00006-AK	Central Auckland MP4	250	264	287	No	
DR-00008-AK	Central Auckland MP4	44	47	51	No	
DR-00011-AK	Central Auckland MP4	138	146	158	No	
DR-00012-AK	Central Auckland MP4	328	346	376	No	
DR-00014-AK	Central Auckland MP4	394	416	452	No	
DR-00016-AK	Central Auckland MP4	2188	2308	2509	No	
DR-00018-AK	Central Auckland MP4	185	196	213	No	
DR-00021-AK	North Shore MP4	844	897	987	No	
DR-00022-AK	North Shore MP4	428	455	500	No	
DR-00023-AK	North Shore MP4	1012	1072	1173	No	
DR-00025-AK	North Shore MP4	1781	1880	2046	No	
DR-00026-AK	North Shore MP4	1005	1062	1156	No	

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-00032-AK	Central Auckland MP4	831	877	954	No	DRS to be relocated in FY2014
DR-00033-AK	Central Auckland MP4	705	744	809	No	DRS removed in FY2013
DR-00038-AK	Central Auckland MP4	238	252	274	No	
DR-00039-AK	Lansford Cres MP2	58	61	66	No	
DR-00041-AK	North Shore MP4	1312	1459	1774	Yes	DRS to be upgraded in FY2017
DR-00042-AK	North Shore MP4	1417	1541	1787	Yes	DRS to be upgraded in FY2017
DR-00046-AK	North Shore MP4	3784	3995	4327	Yes	DRS to be upgraded in FY2015
DR-00049-AK	Central Auckland MP4	7891	8324	9046	Yes	DRS to be upgraded in FY2017
DR-00050-AK	Central Auckland MP4	649	685	745	No	DRS relocated in FY2013
DR-00051-AK	Central Auckland MP4	990	1044	1136	No	
DR-00052-AK	Central Auckland MP4	1153	1216	1321	No	
DR-00053-AK	Central Auckland MP4	7995	8435	9169	Yes	DRS to be upgraded in FY2018
DR-00054-AK	Central Auckland MP4	643	679	738	No	DRS removed in FY2013
DR-00055-AK	Central Auckland MP4	1152	1215	1321	No	
DR-00057-AK	Central Auckland MP4	1326	1399	1521	Yes	DRS to be upgraded in FY2015

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-00057-AK	LP model not available	No data	No data	No data		LP outlet removed
DR-00061-AK	Central Auckland MP4	759	801	871	No	
DR-00061-AK	LP model not available	No data	No data	No data		LP outlet removed
DR-00062-AK	Central Auckland MP4	730	770	837	No	
DR-00062-AK	LP model not available	No data	No data	No data		LP outlet removed
DR-00063-AK	Central Auckland MP4	378	398	433	No	DRS removed in FY2013
DR-00063-AK	LP model not available	No data	No data	No data		LP outlet removed in FY2013
DR-00064-AK	Central Auckland MP4	243	257	279	No	
DR-00065-AK	Central Auckland MP4	799	843	916	No	
DR-00068-AK	Main Highway MP4	678	715	777		DRS will join the Central Auckland MP4
DR-00069-AK	Penrose MP2	619	653	710	No	
DR-00069-AK	LP model not available	No data	No data	No data		LP outlet removed
DR-00070-AK	Central Auckland MP4	903	952	1035	No	
DR-00070-AK	LP model not available	No data	No data	No data		LP outlet removed
DR-00071-AK	Station Rd (19) MP4	No data	No data	No data		DRS to be removed in 2014

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-00071-AK	LP model not available	No data	No data	No data		DRS to be removed in 2014
DR-00072-AK	Station Rd MP4	323	341	371	No	DRS will join Central Auckland MP4
DR-00073-AK	LP model not available	443	468	509		LP outlet to be upgraded to MP4 in 2014
DR-00074-AK	Central Auckland MP7	2902	2999	3166	Yes	DRS upgraded in FY2013
DR-00074-AK	Onehunga MP4	1909	2013	2188	Yes	DRS upgraded in FY2013. DRS will join into Central Auckland MP4.
DR-00075-AK	Central Auckland MP4	2033	1970	2259	Yes	DRS to be upgraded in 2014
DR-00076-AK	Penrose MP2	377	398	432	Yes	DRS upgraded in FY2013 (refer to Section 6)
DR-00078-AK	Mangere Bridge MP4	15	16	17	No	
DR-00083-AK	Central Auckland MP4	1185	1055	1210	No	
DR-00084-AK	Panmure MP1	38	40	44	No	DRS upgraded in FY2013 (refer to Section 6)
DR-00085-AK	Central Auckland MP4	1367	1442	1568	Yes	
DR-00090-AK	Central Auckland MP4	401	423	460	No	
DR-00091-AK	Holloway Pl MP4	793	837	910	No	
DR-00092-AK	Onehunga MP4	2606	2749	2989	No	DRS upgraded in 2012. DRS will join into Central Auckland MP4.
DR-00093-AK	Nuplex MP4	358	378	411	No	

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-00095-AK	East Auckland IP10	7041	7430	8075		DRS replaced in 2012. See DR-00244-AK.
DR-00095-AK	Westfield MP4	133	141	153		DRS removed in 2012
DR-00098-AK	Fairburn Rd MP4	No data	No data	No data	No	DRS will join into East Auckland MP4
DR-00100-AK	South Auckland MP7	4832	5099	5544	Yes	DRS to be upgraded in FY2017
DR-00100-AK	Mangere MP4	590	623	677	No	DRS will join East Auckland MP4
DR-00100-AK	LP model not available	No data	No data	No data		LP outlet to be removed in FY2014
DR-00101-AK	Mangere MP4	284	299	326	No	DRS will join into East Auckland MP4
DR-00104-AK	LP model not available	No data	No data	No data		LP outlet to be removed in FY2014
DR-00106-AK	Puhinui Crematorium MP4	38	40	43	No	
DR-00107-AK	Auckland Airport MP4	2143	2261	2458	No	
DR-00114-AK	Pakuranga MP4	16	17	18	No	DRS rebuilt in FY2013 (refer to Section 6)
DR-00115-AK	East Auckland MP4	621	655	618	No	
DR-00116-AK	East Auckland MP4	645	681	714	No	
DR-00117-AK	East Auckland MP4	3191	3365	3422	Yes	DRS to be upgraded in FY2015
DR-00120-AK	East Auckland MP4	1616	1705	1845	No	

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-00128-AK	East Auckland MP4	937	989	1075	No	
DR-00129-AK	East Auckland MP4	2452	2587	2812	Yes	DRS to be upgraded in FY2020
DR-00130-AK	Manukau MP2	310	327	355	No	
DR-00133-AK	Manurewa IP10	683	721	784	Yes	DRS to be upgraded in FY2014
DR-00133-AK	Manurewa North MP4	2146	2264	2460	Yes	DRS to be upgraded in FY2014
DR-00134-AK	Wattle Downs MP4	567	1026	1115	No	
DR-00135-AK	East Auckland MP4	981	846	919	No	DRS to be upgraded in FY2015
DR-00136-AK	East Auckland IP10	4308	4548	4947	Yes	DRS to be relocated in FY2014
DR-00136-AK	East Auckland MP4	1896	1969	2141	Yes	DRS to be relocated in FY2014
DR-00137-AK	Totara Heights MP1	442	466	507	Yes	DRS upgraded in FY2013 (refer to Section 6)
DR-00138-AK	Wattle Downs MP4	330	387	421	No	
DR-00139-AK	Manurewa North MP4	2037	2150	2337	Yes	DRS to be upgraded in FY2015
DR-00139-AK	Conifer Grove MP2	239	252	274	No	
DR-00141-AK	Manurewa South MP4	342	361	393	No	
DR-00142-AK	Manurewa South MP4	307	324	353	No	

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-00143-AK	Pukekohe MP4	470	493	531	No	
DR-00160-AK	East Auckland MP4	258	905	983	Yes	DRS to be upgraded in FY2021
DR-00162-AK	North Shore MP4	1009	1065	1157	No	
DR-00163-AK	East Auckland MP4	1933	1962	2133	Yes	DRS to be upgraded in FY2016
DR-00164-AK	Central Auckland MP4	3175	3349	3641	No	
DR-00169-AK	Central Auckland MP7	2634	2843	3185	Yes	DRS upgraded in FY2013
DR-00170-AK	Hingaia Rd MP4	77	81	88	No	
DR-00171-AK	Te Atatu MP4	355	375	407	No	
DR-00176-AK	North Harbour MP4	504	532	579	No	
DR-00177-AK	North Shore MP4	496	524	569	No	
DR-00178-AK	Central Auckland MP4	629	664	722	No	
DR-00178-AK	Sandringham LP	No data	No data	No data		LP outlet removed
DR-00179-AK	Wiri MP4	92	97	105	No	DRS to be upgraded in FY2017. DRS will join into Wattle Downs MP4.
DR-00180-AK	Waipuna Rd MP1	102	108	117	No	
DR-00181-AK	Monahan Rd MP1	57	60	66	No	

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-00183-AK	Mangere MP4	1833	1934	2102	Yes	DRS to be upgraded in FY2018. DRS will join into East Auckland MP4.
DR-00187-AK	North Shore MP4	709	748	814	No	
DR-00189-AK	North Shore MP4	1017	1152	1413	Yes	DRS to be upgraded in FY2015
DR-00196-AK	Auckland IP20	No data	No data	No data		To be commissioned when the North Harbour Pipeline needs uprating
DR-00209-AK	LP model not available	No data	No data	No data		DRS removed in FY2013
DR-00211-AK	LP model not available	No data	No data	No data		DRS to be removed in FY2014
DR-00214-AK	LP model not available	No data	No data	No data		DRS removed in 2012
DR-00218-AK	Herd Rd MP4	5	5	6	No	
DR-00220-AK	LP model not available	No data	No data	No data		DRS removed in FY2013
DR-00221-AK	LP model not available	No data	No data	No data		DRS removed in FY2013
DR-00222-AK	LP model not available	No data	No data	No data		DRS removed in FY2013
DR-00226-AK	LP model not available	No data	No data	No data	No	DRS supplies to 3 consumers
DR-00227-AK	LP model not available	No data	No data	No data	No	DRS supplies to 1 consumer
DR-00228-AK	Broadway Park MP2	39	41	45	No	
DR-00230-AK	LP model not available	No data	No data	No data		DRS to be removed in FY2014

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-00231-AK	LP model not available	No data	No data	No data		DRS removed in FY2013
DR-00233-AK	Universal Dr MP4	61	65	71	No	
DR-00238-AK	AU East Auckland MP4	561	592	643	No	DRS will join into East Auckland MP4.
DR-00240-AK	LP model not available	No data	No data	No data	No	DRS removed in FY2013
DR-00242-AK	LP model not available	No data	No data	No data		DRS removed in 2012
DR-00243-AK	North Shore MP4	No data	No data	No data		New DRS built in 2012
DR-00244-AK	East Auckland IP10	7041	7430	8075	No	New DRS built in 2012 and replaced DR-00095-AK

Table 5-4 : Auckland region DRS capacity and peak demands (in scmh)

5.9.1.3 Pressure Systems

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Alfriston MP4	Alfriston	203	203	203	Yes	
Bruce McLaren IP10	Auckland Central	1011	1009	924	Yes	
East Auckland IP10	Auckland Central	648	Failed[22]	Failed	No	System requires reinforcement in FY2014, FY2016 and FY2021

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[22] A failed result indicates that the system pressure could not be calculated in Vector's network modelling software (SynerGEE), indicating the network requires reinforcement.

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Manurewa IP10	Auckland Central	993	992	991	Yes	
Auckland IP20	Auckland Central	588	839	790	Yes	System requires reinforcement in FY2014, FY2016 and FY2021
Sandringham LP	Auckland Central	No data	No data	No data		System will merge into Central Auckland MP4 after completion of LP pipeline replacement
Mt Roskill LP	Auckland Central	No data	No data	No data		System will merge into Central Auckland MP4 after completion of LP pipeline replacement
Lappinton Rd LP	Auckland Central	No data	No data	No data		System will merge into Central Auckland MP4 after completion of LP pipeline replacement
Epsom LP	Auckland Central	No data	No data	No data		System will merge into Central Auckland MP4 after completion of LP pipeline replacement
Penrose LP	Auckland Central	No data	No data	No data		System will merge into Central Auckland MP4 after completion of LP pipeline replacement
Otahuhu LP	Auckland Central	No data	No data	No data		System will merge into East Auckland MP4 after completion of LP pipeline replacement
Papatoetoe LP	Auckland Central	No data	No data	No data		System will merge into East Auckland MP4 after completion of LP pipeline replacement
Albany South MP1	Auckland Central	No data	No data	No data		The ICPs in this system are not recorded in GIS
Panmure MP1	Auckland Central	34	34	34	Yes	
Waipuna Rd MP1	Auckland Central	29	28	27	Yes	

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Monahan Rd MP1	Auckland Central	28	28	26	Yes	
Totara Heights MP1	Auckland Central	73	70	64	Yes	
Broadway Park MP2	Auckland Central	200	200	200	Yes	
Lansford Cres MP2	Auckland Central	199	198	198	Yes	
Penrose MP2	Auckland Central	156	151	106	Yes	
Manukau MP2	Auckland Central	130	122	106	Yes	
Conifer Grove MP2	Auckland Central	186	185	182	Yes	
North Harbour MP4	Auckland Central	393	393	391	Yes	
North Shore MP4	Auckland Central	237	215	171	Yes	
Universal Dr MP4	Auckland Central	398	398	398	Yes	
Te Atatu MP4	Auckland Central	388	387	384	Yes	
Central Auckland MP4	Auckland Central	103	249	217	Yes	System requires reinforcement in FY2015 & FY2016

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Glendene MP4	Auckland Central	399	399	399	Yes	
Herd Rd MP4	Auckland Central	400	400	400	Yes	
Main Highway MP4	Auckland Central	No data	No data	No data	Yes	System will merge into Central Auckland MP4 after completion of LP pipeline replacement
Station Rd (19) MP4	Auckland Central	No data	No data	No data	Unknown	System will merge into Central Auckland MP4 after completion of LP pipeline replacement
Station Rd MP4	Auckland Central	No data	No data	No data	Yes	System will merge into Central Auckland MP4 after completion of LP pipeline replacement
Onehunga MP4	Auckland Central	No data	No data	No data	Yes	System will merge into Central Auckland MP4 after completion of LP pipeline replacement
Holloway Pl MP4	Auckland Central	396	396	395	Yes	
Nuplex MP4	Auckland Central	400	400	399	Yes	
Pakuranga MP4	Auckland Central	400	400	400	Yes	
Westfield MP4	Auckland Central	399	398	398	Yes	System merged into Mangere MP4 in 2012 following the completion of an MP4 pipeline link in Vestey Drive
East Auckland MP4	Auckland Central	136	194	233	No	System requires reinforcement in FY2014 & 2019
Mangere MP4	Auckland Central	No data	No data	No data	Yes	System will merge into East Auckland MP4 after completion of LP pipeline replacement

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Mangere Bridge MP4	Auckland Central	400	400	400	Yes	
Fairburn Rd MP4	Auckland Central	No data	No data	No data	Yes	System will merge into East Auckland MP4 after completion of LP pipeline replacement
Puhinui Crematorium MP4	Auckland Central	399	399	399	Yes	
Auckland Airport MP4	Auckland Central	130	189	158	No	System requires reinforcement in FY2014, FY2018 & FY2022
Wiri MP4	Auckland Central	359	354	346	Yes	
Wattle Downs MP4	Auckland Central	354	336	324	Yes	
Manurewa North MP4	Auckland Central	262	244	209	Yes	
Manurewa South MP4	Auckland Central	387	386	383	Yes	
Hingaia Rd MP4	Auckland Central	397	396	396	Yes	
Central Auckland MP7	Auckland Central	Failed[23]	602	591	No	System requires reinforcement in FY2014
South Auckland MP7	Auckland Central	591	579	556	Yes	

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[23] Ibid footnote 22

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Drury CT MP4	Drury CT	339	339	339	Yes	
Hunua MP4	Hunua	395	394	394	Yes	
Kingseat MP4	Kingseat	419	419	419	Yes	
Pukekohe IP10	Pukekohe	981	980	978	Yes	
Pukekohe MP4	Pukekohe	394	394	393	Yes	
Tuakau MP7	Tuakau	509	493	461	Yes	
Whangaparaoa CT MP4	Whangaparaoa CT	361	353	336	Yes	
Little Manly MP4	Whangaparaoa CT	No data	No data	No data	No data	

Table 5-5 : Auckland region pressure system capacity and peak demands (in kPa)

5.9.2 Alfriston Network System

The Alfriston network system is supplied from the transmission system at one gate station located in Phillip Road, southeast of Alfriston. This network system comprises one MP4 pressure system.

5.9.2.1 Consumer Growth and Demand Forecast

The Alfriston network system supplies one industrial consumer in Philip Road. Gas demand is expected to be relatively flat with an annual growth rate of around 3%.

5.9.2.2 Gate Stations

The Alfriston gate station recorded a peak flow of 140scmh at 9:00pm on 8th July 2012.

5.9.2.3 District Regulating Stations

No DRS is installed in the Alfriston network system.

5.9.2.4 Pressure Systems

Alfriston MP4

The Alfriston MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 203scmh resulting in a MinOP of 400kPa (100% of the NOP). Total forecast planning demand during the planning period is estimated to be 335scmh, resulting in the same MinOP of 400kPa (100% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.9.3 Auckland Central Network System

The Auckland Central network system is supplied from the transmission system at four gate stations. This network system consists of one IP20 pressure system, three IP10 pressure systems, two MP7 pressure systems, twenty-six MP4 pressure systems, five MP2 pressure systems, five MP1 pressure systems, seven LP pressure systems and 110 DRSs.

5.9.3.1 Consumer Growth and Demand Forecast

A total of 90,392 consumers are connected to the Auckland Central network system, around 6% or 5,569 of whom are commercial/industrial gas users. The Auckland Central network system is Vector’s largest network system in terms of the number of connections.

The Auckland region has a population of around 1.5 million. Latest population projections released by Statistics New Zealand suggest that the Auckland regional population could increase to 2.2 million by 2041[24].

Some parts of Auckland are projected to experience greater population growth than others. The Waitemata and Upper Harbour local board areas are projected to experience relatively high rates of growth at 88.9% and 85.6%, respectively (over 20 years). The actual numbers are relatively small, however, and the Howick local board, currently the largest population in the region, is projected to have the largest numerical increase - an extra 77,700 more people by 2031, an increase of 65% on 2006 numbers[25].

Auckland is projected to account for 60% of New Zealand's population growth, and the region would be home to 38% of New Zealand's population in 2031, compared with 33%

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[24] ibid footnote 20.

[25] Ibid.

in 2006. Within the region, the highest growth rates between 2006 and 2031 are expected to be in the Manukau and Rodney districts, at 1.7%[26].

It is expected that future gas demand will be driven by the population growth and potential industrial and commercial activities in Auckland. At present, examples of some large known development projects within the region include:

- Northern Strategic Growth Area (NorSGA), Westgate Town Centre and Northside Drive subdivision in Westgate;
- Subdivision development in Long Bay;
- Subdivision developments in Albany;
- Subdivision developments in Flat Bush and Flat Bush Town Centre;
- Subdivision developments in Takanini;
- Stonefield subdivision development in Mt Wellington;
- Tamaki Housing Project (Housing New Zealand) in Tamaki;
- Auckland International Airport Limited - The Landing Precinct Expansion; and
- Auckland Waterfront re-development, eg. Wynyard Quarter.

5.9.3.2 Gate Stations

The Auckland Central network system takes supply from the following four gate stations:

- **Taupaki:** (located west of Henderson): The gate station recorded a peak flow of 10,802scmh at 9:00am on 1st October 2012;
- **Bruce McLaren:** This gate station recorded a peak flow of 2,142scmh at 1:00pm on 1st October 2012;
- **Westfield:** (located south of Mount Wellington): This gate station recorded a peak flow of 48,431scmh at 9:00am on 30th May 2012; and
- **Papakura:** This gate station recorded a peak flow of 20,203scmh at 8:00am on 3rd May 2012.

The total system recorded a peak flow of 71,933scmh, which was recorded at 8:00am on 13th September 2012.

5.9.3.3 District Regulating Stations

The Auckland Central network system has 110 DRSs which supply gas to three IP10 pressure systems, two MP7 pressure systems, twenty-six MP4 pressure systems, five MP2 pressure systems, five MP1 pressure systems and seven LP pressure systems.

5.9.3.4 Pressure Systems

Auckland IP20

The Auckland IP20 pressure system operates at a NOP of 1,900kPa and provides supply to the greater part of metropolitan Auckland. It transports gas to the urban areas of Manukau, Auckland, North Shore and Waitakere and receives supply from four gate stations: Papakura, Westfield, Bruce McLaren and Taupaki.

The maximum flow into the system in the base year was 74,187scmh, resulting in a MinOP of 938kPa (49% of the NOP), thus falling below the MinOP criteria.

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[26] Ibid.

Vector has recently reviewed its options for reinforcing this pressure system. Two options have been considered:

- Install a new gate station at Waikumete; or
- Increase the NOP of the North Harbour Pipeline.

The first option of installing a new gate station requires a connection to the transmission network and a gate station that will supply a NOP of 1,900kPa at the extremity of the IP20 network.

The second option involves increasing the North Harbour Pipeline (rated to operate at 4,600kPa) system pressure to 3,000kPa. This would require the following:

- Separation of the Helensville Pipeline at the junction of Old North Road and the Riverhead to Kumeu Highway, and place a 3000kPa to 1,900kPa DRS in the corner of the adjacent paddock. Costs will include a DRS (probably without pre-heaters), a new HP inlet which will be subject to Lloyds Register survey, a new 1900kPa outlet and tie-in to the Helensville Pipeline, consents and land purchase; and
- Installation of a DRS in the existing Albany pig trap site to feed the 1,900kPa North Shore network. The site has been designed to accept this with minimal work. This will require purchase of a package DRS (most likely without pre-heaters), a new HP inlet which will be subject to Lloyds register survey and a new 1,900kPa outlet (both inlet and outlet have existing flanged connections ready to be reused).

The preferred solution is the installation of a new gate station at Waikumete in year 2013.

The completion of this reinforcement solution will provide a new 1,850kPa supply point at Waikumete. Modelling results indicate that a MinOP pressure of 927kPa (49% of the NOP) is identified in another part of the network (at DR-00136-AK) in 2014.

Total forecast planning demand for 2016 is estimated to be 89,471scmh, resulting in a modelled MinOP of 839kPa (44% of the NOP) and the system pressure falling below the MinOP criteria. System pressure failure would also occur at DR-00136-AK, resulting in the IP10 East Auckland system pressure falling below the MinOP criteria. To address this system pressure issue, the following reinforcement option will be investigated in 2016:

- Elevate the operating pressure at the Westfield gate station to 1,850kPa (refer to East Auckland IP10 section for more details).

This reinforcement solution would result in a modelled MinOP pressure of 923kPa (49% of the NOP) in 2016.

Total forecast planning demand during the planning period is estimated to be 97,279scmh, resulting in a modelled MinOP of 790kPa (42% of the NOP) and the system pressure falling below the MinOP criteria. Again, system pressure failure is anticipated at DR-00136-AK, resulting in the IP10 East Auckland system pressure falling below the MinOP criteria. To avoid this, the following reinforcement is planned in 2021:

- Construct a 200mm IP20 pipeline along Gilbert Ave and Alexander Crescent (refer to East Auckland IP10 section for more details). This reinforcement results in a MinOP pressure of 1,136kPa (60% of the NOP) in 2021.

Note: System pressure at NZ Sugar is anticipated to fall to 822kPa (43% of the NOP) with the above reinforcement in place. This is a result of the short length of the 25mm nominal service pipe currently in place. Resolving this constraint will be investigated during the planning period.

Bruce McLaren IP10

The Bruce McLaren IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 1,974scmh, resulting in a MinOP of 1,014kPa (100% of the NOP). Total forecast planning demand during the planning period is estimated to be 2,589scmh, resulting in a MinOP of 924kPa (92% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Manurewa IP10

The Manurewa IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 598scmh resulting in a MinOP of 994kPa (99% of the NOP). Total forecast planning demand during the planning period is estimated to be 784scmh, resulting in a MinOP of 991kPa (99% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

East Auckland IP10

The East Auckland IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 7,796scmh resulting in a MinOP of 705kPa (64% of the NOP). Total forecast planning demand for 2016 is estimated to be 9,403scmh, which would result in the MinOP falling below the minimum pressure criteria.

The following reinforcement option will be investigated in 2016:

- Elevate the operating pressure at the Westfield gate station to 1,850kPa (the original set point prior to system reconfiguration of the gas transmission gate station pressure setting changes in 2008). This reinforcement option would result in a modelled MinOP pressure of 619kPa (62% of the NOP) in 2016.

Total forecast planning demand during the planning period is estimated to be 10,222scmh, resulting in the MinOP again likely to fall below the minimum pressure criteria. The following reinforcement is planned:

- Construct a 200mm IP20 pipeline along Gilbert Ave and Alexander Crescent (approximately 1,000 metres) to DR-00116-AK. This reinforcement would results in a modelled MinOP pressure of 564kPa (56% of the NOP) in 2021.

A preliminary study has been undertaken regarding the provision of gas supply to a housing development project in East Tamaki. This project involves a Housing New Zealand led proposal to develop the Tamaki region, increasing dwellings from 5,000 to 10,000 and population from 17,000 to approximately 25,000 - 27,000 over the next 15-20 years.

Modelling work has confirmed that the East Auckland IP10 pressure system will require reinforcement if the housing project goes ahead. The following IP reinforcements are planned and will be subject to further study once more information is available.

- Construct approximately 3km of 180mm PE100 (operating pressure 875 kPa) IP10 gas main from DR-00244-AK at Westfield gate station along Mt Wellington Highway, Ellerslie-Panmure Highway to DR-00085-AK, and upgrade the capacity of DR-00244-AK located at the Westfield gate station; or
- Construct approximately 3km of 150mm IP20 steel pipeline from Westfield gate station along Mt Wellington Highway, Ellerslie-Panmure Highway to DR-00085-AK. Upgrade the capacity of DR-00085-AK and construct an IP20 to IP10/MP4 supply.

Central Auckland MP7

The Central Auckland MP7 pressure system operates at a NOP of 700kPa and supplies gas to the southern suburbs of central Auckland City. The maximum flow into the system in the base year was 4,844scmh, resulting in a MinOP of 620kPa (89% of the NOP). Total forecast planning demand for 2013 is estimated to be 5,536scmh, which would result in the MinOP falling below the minimum pressure criteria. The following reinforcement is planned:

- Install a new gate station at Waikumete (refer to IP20 Auckland for details). This reinforcement would result in a modelled MinOP pressure of 608kPa (87% of the NOP) in 2016.

Total forecast planning demand during the planning period is estimated to be 6,351scmh, which would result in a MinOP of 591kPa (84% of the NOP). No further constraints have therefore been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period (after the initial reinforcement).

The long-term network solution for the Central Auckland MP7 network is to elevate the NOP of the pipeline to 1,000kPa.

South Auckland MP7

The South Auckland MP7 pressure system operates at a NOP of 700kPa and supplies gas to an industrial area east of Mt Mangere. The maximum flow into the system in the base year was 4,228scmh resulting in a MinOP of 620kPa (89% of the NOP). Total forecast planning demand during the planning period is estimated to be 5,544scmh, which would result in a MinOP of 556kPa (79% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

In the long-term, it is proposed that the South Auckland MP7 network NOP be elevated to 1,000kPa.

Central Auckland MP4

The Central Auckland MP4 pressure system operates at a NOP of 400kPa and supplies gas to the Auckland central area bounded by the suburbs of Hillsborough, Avondale, St Heliers, and includes the Auckland and Newmarket central business districts.

The Central Auckland MP4 system is expanding and will progressively tie into the Main Highway MP4, Station Road (19) MP4, Station Road MP4 and Onehunga MP4 pressure systems, over the next two years. This is a result of the implementation of the Sandringham, Mt Roskill, Epsom and Penrose LP pipeline replacement projects which are planned to be completed in FY2014.

The maximum flow into the system in the base year was 34,059scmh, resulting in a MinOP of 200kPa (50% of the NOP). Total forecast planning demand for 2013 is estimated to be 45,727scmh, which would result in the MinOP falling below the minimum pressure criteria. The following reinforcements are planned and partly completed:

- Re-use or relay approximately 110 metres of 50mm MP4 PE pipeline between Rukutai Street and Te Arawa Street, Orakei (completed in FY2012);
- Construct approximately 230 metres of 100mm PE MP4 pipeline in Kohimarama Road between Whytehead Crescent and St Heliers Bay Road, Kohimarama (completed in FY2012);
- Interconnect the existing MP4 pipeline outside 4 Rankin Avenue and DR-00016-AK, New Lynn;
- Upgrade approximately 8 metres of MP4 service pipe supplying CSR Monier, 5 Clark Road, New Lynn; and
- Construct a new DRS (or upgrade DR-00049-AK) to supply the Auckland CBD.

Total forecast planning demand during the planning period is estimated to be 52,439scmh, which would result in a MinOP of 217kPa (54% of the NOP). No further constraints have been identified and the system pressure, following system reinforcements, is not forecast to fall below the MinOP criteria during the planning period.

In addition, the following projects are planned to enhance network security:

- Construct approximately 30 metres of 32mm PE MP4 pipeline link in Ruskin Street between 9 and 14 Ruskin Street, Parnell;
- Construct approximately 730 metres of 50mm MP4 PE pipeline link in Motions Road, Pt Chevalier; and
- Construct approximately 1,000 metres of 100mm PE MP4 pipeline link in Kohimarama Rd between Whytehead Crescent and Kepa Road, Kohimarama.

Auckland Airport MP4

The Airport MP4 system provides supply to the Auckland International Airport and domestic terminal complex and is currently supplied with natural gas via a single MP4 pipeline, running from the western end of Puhinui Road and over the Pukaki Creek bridge crossing. The MP4 supply is fed from DR-00107-AK located to the east of the Pukaki Creek bridge crossing, and is comprised predominantly of 100mm diameter pipe with a section of 150mm diameter pipe across Pukaki Creek.

The pipeline crossing the Pukaki Creek is owned by Auckland International Airport Limited (AIAL). Vector is contracted to maintain and operate the pipeline.

The Auckland Airport complex currently includes a number of sizable commercial loads and with the planned expansion of the airport complex, significant additional loads are forecast for the medium term. Potential for additional loads has been identified within the Airport complex and north of the Auckland airport development near the intersection of Ihumatao Road and George Bolt Memorial Drive, and The Landing Precinct Expansion off Landing Drive.

The Auckland Airport MP4 system operates at a nominal pressure of 400kPa. The maximum flow into the system in the base year was 1,875scmh, resulting in a minimum system pressure of 212kPa (53% of the NOP). Total forecast planning demand for 2013 is estimated to be 2,143scmh, which would result in the MinOP falling below the minimum pressure criteria. The following reinforcement is planned:

- Construct approximately 180 metres of 100mm PE MP4 pipeline in Tom Pearce Drive.

Total forecast planning demand for 2016 is estimated to be 2,261scmh, which would result in the MinOP falling below the minimum pressure criteria. The following reinforcement is planned:

- Construct approximately 300 metres of 100mm PE MP4 pipeline in Ray Emery Drive.

Total forecast planning demand during the planning period is estimated to be 2,458scmh, which would result in the MinOP falling below the minimum pressure criteria. The following reinforcement is planned:

- Construct approximately 360 metres of 100mm PE MP4 pipeline in Puhinui Road.

As the above reinforcements are planned to address the supply pressure constraint during the planning period, no further constraints have therefore been identified and the system pressure is not forecast to fall below the MinOP criteria after system reinforcement.

Mangere MP4

The Mangere MP4 system supplies gas to the suburbs of Mangere and Ihumatao areas at a nominal pressure of 400kPa. The maximum flow into the system in the base year was 3,580scmh, resulting in a MinOP of 233kPa (58% of the NOP). The Mangere MP4 pressure system will merge into the East Auckland MP4 pressure system following the completion of the Otahuhu and Papatoetoe LP pipeline replacement projects. This is expected to be completed in FY2014.

From a network development perspective, recent studies show that the Mangere MP4 system has the potential to provide a second supply to the Auckland International Airport complex. The following MP4 gas main link between the Mangere MP4 system and the Airport MP4 system is planned:

- Construct approximately 1.9km of 100mm PE MP4 pipeline from Westney Road along George Bolt Memorial Drive to Tom Pearce Drive.

Mangere Bridge MP4

The Mangere Bridge MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 13scmh resulting in a MinOP of 400kPa (100% of the NOP). Total forecast planning demand during the planning period is estimated to be 17scmh, resulting in a MinOP of 399kPa (99% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Fairburn Road MP4

The Fairburn Road MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 19scmh, resulting in a MinOP of 400kPa (100% of the NOP). The Fairburn Road MP4 pressure system will merge into the East Auckland MP4 pressure system following the completion of the Otahuhu and Papatoetoe LP pipeline replacement projects. This is expected to be completed in FY2014.

Glendene MP4

The Glendene MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 91scmh, resulting in a MinOP of 399kPa (99% of the NOP). Total forecast planning demand during the planning period is estimated to be 119scmh, resulting in a MinOP of 399kPa (99% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Herd Road MP4

The Herd Road MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 4scmh resulting in a MinOP of 400kPa (100% of the NOP). Total forecast planning demand during the planning period is estimated to be 6scmh, resulting in a MinOP of 400kPa (100% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

A section of 50mm PE MP4 pipeline from Hillsborough Road to Herd Road, Hillsborough is proposed, to link the Herd Road MP4 pressure system and the Auckland Central MP4 pressure system in Hillsborough Road, part of the Three Kings LP pipeline replacement project (completed in FY2012). The MP4 link will enable the removal of DR-00218-AK (a single DRS currently supplying gas to the Herd Road MP4 pressure system) if required during the planning period.

Hingaia Road MP4

The Glendene MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 67scmh, resulting in a MinOP of 397kPa (99% of the NOP). Total forecast planning demand during the planning period is estimated to be 88scmh, resulting in a MinOP of 396kPa (99% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Holloway Place MP4

The Glendene MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 694scmh, resulting in a MinOP of 397kPa (99% of the NOP). Total forecast planning demand during the planning period is estimated to be 910scmh, resulting in a MinOP of 395kPa (99% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Main Highway MP4

The Main Highway MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 22scmh, resulting in a MinOP of 400kPa (100% of the NOP).

The Main Highway MP4 pressure system will merge into the Central Auckland MP4 pressure system following completion of the Penrose LP pipeline replacement project in FY2014.

Manurewa North MP4

The Manurewa North MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 3,659scmh, resulting in a MinOP of 297kPa (74% of the NOP). Total forecast planning demand during the planning period is estimated to be 4,797scmh, resulting in a MinOP of 209kPa (52% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Manurewa South MP4

The Manurewa South MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 568scmh, resulting in a MinOP of 380kPa (95% of the NOP). Total forecast planning demand during the planning period is estimated to be 745scmh, resulting in a MinOP of 383kPa (96% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

North Harbour MP4

The North harbour MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 441scmh, resulting in a MinOP of 395kPa (98% of the NOP). Total forecast planning demand during the planning period is estimated to be 579scmh, resulting in a MinOP of 391kPa (98% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Investigation of a proposal to construct approximately 180 metres of 100mm PE MP4 pipeline (including a 25 metre bridge crossing) from SH17 to The Avenue, Albany Village has been undertaken. The proposal is planned to be completed during the planning period and will link the North Harbour MP4 pressure system with the North Shore MP4 pressure system. This project will improve the security of supply to the North Harbour MP4 pressure system.

North Shore MP4

The North Shore MP4 pressure system operates at a NOP of 400kPa and supplies gas to the North Shore area bounded by the suburbs of Beachhaven, Devonport and Torbay. The maximum flow into the system in the base year was 12,561scmh, resulting in a MinOP of 237kPa (59% of the NOP).

Total forecast planning demand during the planning period is estimated to be 17,693scmh, which would result in the MinOP falling below the minimum pressure criteria. The following reinforcement are planned:

- Construct approximately 750 metres of 100mm PE MP4 pipeline from Northcroft Street along Lake Road to Cameron Street, Takapuna;
- Construct a 50mm PE MP4 pipeline (road crossing) at the junction of Albert Road and Vauxhall Road, Devonport; and
- Construct a 50mm PE MP4 pipeline (road crossing) at the junction of Albert Road and Victoria Road, Devonport.

Following completion of the above reinforcement projects, no further constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

In addition, the following projects are planned to enhance network security and support potential growth opportunities:

- Construct approximately 3,300 metres of 100mm PE MP4 pipeline from Gills Road along Lonely Track Road to East Coast Road;
- Install a DRS (IP20/MP4) at the junction of East Coast Road and Glenvar Road, Glenvar;
- Install a DRS (IP10/MP4) in Corban Avenue, Henderson (completed in FY2012);
- Install 200mm PVC duct in conjunction with the SH16 upgrade (future proof) along Royal Road Bridge;
- Construct approximately 2,500 metres of 100mm PE MP4 pipeline from East Coast Road along Glenvar Road to Long Bay development, Long Bay;
- Construct approximately 225 metres of 50mm PE MP4 pipeline from Appleby Road along Albany Highway to house number 286, North Harbour;
- Construct 150mm PVC duct in Northside Drive bridge in conjunction with NorSGA development; and
- Construct approximately 3,800 metres of 100mm PE MP4 pipeline from East Coast Road along Okura River Road and Vaughans Road to Long Bay development, Long Bay.

Nuplex MP4

The Nuplex MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 313scmh, resulting in a MinOP of 400kPa (100% of the NOP). Total forecast planning demand during the planning period is estimated to be 411scmh, resulting in a MinOP of 399kPa (99% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Onehunga MP4

The Onehunga MP4 system supplies gas to the suburbs of Penrose and Onehunga areas at a nominal pressure of 400kPa. The maximum flow into the system in the base year was 4,061scmh, resulting in a MinOP of 351kPa (59% of the NOP).

The Onehunga MP4 pressure system will merge into the Central Auckland MP4 pressure system following completion of the Three Kings and Penrose LP pipeline replacement projects in FY2014.

Pakuranga MP4

The Pakuranga MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 14scmh, resulting in a MinOP of 400kPa (100% of the NOP). Total forecast planning demand during the planning period is estimated to be 18scmh, resulting in a MinOP of 400kPa (100% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Puhinui Crematorium MP4

The Puhinui Crematorium MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 33scmh, resulting in a MinOP of 399kPa (100% of the NOP). Total forecast planning demand during the planning period is estimated to be 43scmh, resulting in a MinOP of 399kPa (99% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

East Auckland MP4

The East Auckland MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 11,601scmh, resulting in a MinOP of 233kPa (58% of the NOP). Total forecast planning demand for 2013 is estimated to be 18,672scmh, which would result in the MinOP falling below the minimum pressure criteria. The following reinforcements are planned:

- Construct approximately 3,900 metres of 100mm PE MP4 pipeline in McKenzie Road, Ascot Road, Westney Road and Massey Road, Mangere (approximately 1,200 metres in McKenzie Road is planned to be commissioned in FY2014); and
- Construct 150mm and 200mm PVC ducts in George Road Drive and Kirkbride Road intersections, in conjunction with the SH20A upgrade project.

Total forecast planning demand for 2016 is estimated to be 19,699scmh, which would result in the MinOP falling below the minimum pressure criteria. The following reinforcement is planned:

- Construct approximately 75 metres of 50mm PE MP4 pipeline in Gillett Place from DR-00160-AK to Whitford Road, Botany Downs.

Total forecast planning demand during the planning period is estimated to be 21,412scmh, which would result in a MinOP of 233kPa (58% of the NOP). No further constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

In order to improve the security of supply, the following projects are planned:

- Construct approximately 400 metres of 100mm PE MP4 pipeline in Harris Road from Cryers Road to Ti Rakau Drive, Pakuranga;
- Construct approximately 190 metres of 100mm PE MP4 pipeline n Pakuranga Road to the intersection of Bucklands Beach Road, Highland Park; and
- Construct approximately 330 metres of 100mm PE MP4 in Smales Road between 18 and 40 Smales Road, East Tamaki.

The East Auckland MP4 pressure system is expanding and will be merged into the Mangere MP4 and Fairburn MP4 pressure systems. This is anticipated to occur over the next two years, in conjunction with the completion of the Otahuhu LP and Papatoetoe LP pipeline replacement projects.

Station Road (19) MP4

The Station Road (19) MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was unknown (consumer loads were unable to be ascertained). The Station Road (19) MP4 pressure system will merge into the Central Auckland MP4 pressure system following the completion of the Penrose LP pipeline replacement project in FY2014.

Station Road MP4

The Station Road MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 237scmh, resulting in a MinOP of 382kPa (96% of the NOP). The Station Road MP4 pressure system will merge into the Central Auckland MP4 pressure system following the completion of the Penrose LP pipeline replacement project in FY2014.

Te Atatu MP4

The Te Atatu MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 311scmh, resulting in a MinOP of 390kPa (98% of the NOP). Total forecast planning demand during the planning period is estimated to be 407scmh, resulting in a MinOP of 384kPa (96% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Universal Drive MP4

The Universal Drive MP4 pressure system[27] operates at a NOP of 400kPa. The maximum flow into the system in the base year was 53scmh, resulting in a MinOP of 400kPa (100% of the NOP). Total forecast planning demand during the planning period is estimated to be 70scmh, resulting in a MinOP of 398kPa (99% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Wattle Downs MP4

The Wattle Downs MP4 system supplies gas to the suburbs of Manurewa and Mahia Park areas at a NOP of 400kPa. The maximum flow into the system in the base year was 784scmh resulting in a MinOP of 359kPa (90% of the NOP). Total forecast planning demand during the planning period is estimated to be 1,536scmh, resulting in a MinOP of 324kPa (81% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Recent information indicates that the gas demand in the Wiri area will increase significantly over the next couple of years. To address this, the construction of approximately 1,200 metres of 100mm PE MP4 pipeline in Roscommon Road (linking the Wattle Downs MP4 and Wiri MP4) is planned in FY2014.

Westfield MP4

The Westfield MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 117scmh, resulting in a MinOP of 399kPa (100% of the NOP). Total forecast planning demand during the planning period is estimated to be 153scmh, resulting in a MinOP of 398kPa (99% of the NOP). No constraints have been

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[27] The Universal MP4 pressure system now includes the Paramount MP4 pressure system and is supplied by DR-00233-AK.

identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

In FY2012, a new DRS was constructed inside the Westfield gate station to replace DR-00095-AK, which use to supply both the Westfield MP4 and the East Auckland IP10 pressure systems. Approximately 260 metres of 100mm PE MP4 pipeline in Vestey Road was also completed as part of the DRS replacement project enabling the decommissioning of the entire DR-00095-AK. The completed MP4 link now joins the Westfield MP4 and the Central Auckland MP4 pressure systems.

Wiri MP4

The Wiri MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 80scmh, resulting in a MinOP of 368kPa (92% of the NOP). Total forecast planning demand during the planning period is estimated to be 105scmh, resulting in a MinOP of 346kPa (87% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Broadway Park MP2

The Broadway Park MP2 pressure system operates at a NOP of 200kPa. The maximum flow into the system in the base year was 34scmh, resulting in a MinOP of 199kPa (99% of the NOP). Total forecast planning demand during the planning period is estimated to be 45scmh, resulting in a MinOP of kPa (99% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Conifer Grove MP2

The Conifer Grove MP2 pressure system operates at a NOP of 200kPa. The maximum flow into the system in the base year was 209scmh, resulting in a MinOP of 189kPa (95% of the NOP). Total forecast planning demand during the planning period is estimated to be 274scmh, resulting in a MinOP of 182kPa (91% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Landsford Crescent MP2

The Landsford Crescent MP2 pressure system operates at a NOP of 200kPa. The maximum flow into the system in the base year was 50scmh, resulting in a MinOP of 199kPa (99% of the NOP). Total forecast planning demand during the planning period is estimated to be 66scmh, resulting in a MinOP of 198kPa (99% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Manukau MP2

The Manukau MP2 pressure system operates at a NOP of 200kPa. The maximum flow into the system in the base year was 270scmh, resulting in a MinOP of 147kPa (74% of the NOP). Total forecast planning demand during the planning period is estimated to be 355scmh, resulting in a MinOP of 106kPa (53% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Penrose MP2

The Penrose MP2 pressure system operates at a NOP of 200kPa. The maximum flow into the system in the base year was 870scmh, resulting in a MinOP of 166kPa (83% of the NOP). Total forecast planning demand during the planning period is estimated to be 1142scmh, resulting in a MinOP of 142kPa (71% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Albany South MP1

The Albany South MP1 pressure system operates at a NOP of 35kPa. It reticulates gas to Massey University Albany campus and is owned by Massey University. Therefore no load information is available for modelling. No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Monahan Road MP1

The Monahan MP1 pressure system operates at a NOP of 35kPa. The maximum flow into the system in the base year was 50scmh, resulting in a MinOP of 30kPa (86% of the NOP). Total forecast planning demand during the planning period is estimated to be 66scmh, resulting in a MinOP of 26kPa (74% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Panmure MP1

The Panmure MP1 pressure system operates at a NOP of 35kPa. The maximum flow into the system in the base year was 34scmh, resulting in a MinOP of 34kPa (97% of the NOP). Total forecast planning demand during the planning period is estimated to be 44scmh, resulting in a MinOP of 34kPa (97% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Totara Heights MP1

The Totara Heights MP1 pressure system operates at a NOP of 105kPa. The maximum flow into the system in the base year was 387scmh, resulting in a MinOP of 79kPa (79% of the NOP). Total forecast planning demand during the planning period is estimated to be 507scmh, resulting in a MinOP of 64kPa (61% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

In order to enhance the network security of the Totara Heights MP1 pressure system, the following project is planned:

- Upgrade part of the pressure system to MP4.

Waipuna Road MP1

The Waipuna Road MP1 pressure system operates at a NOP of 35kPa. The maximum flow into the system in the base year was 89scmh, resulting in a MinOP of 30kPa (86% of the NOP). Total forecast planning demand during the planning period is estimated to be 117scmh, resulting in a MinOP of 27kPa (77% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Sandringham LP

The Sandringham LP pressure system operates at a NOP of 3.5kPa. The maximum flow into the system in the base year was 241scmh, resulting in a MinOP of 3.1kPa (94% of the NOP).

The Sandringham LP pressure system is included in the planned LP pipeline replacement programme that replaces the cast iron pipes with polyethylene pipes and increases the system pressure to 400kPa (refer to Section 6 for further details).

Epsom LP

The Epsom LP pressure system operates at a NOP of 3.5kPa and provides supply to the suburbs of Epsom, Royal Oak and One Tree Hill.

This pressure system is included in the planned low pressure pipeline replacement programme that replaces the cast iron pipes with polyethylene pipes and increases the system pressure to 400kPa (refer to Section 6 for further details).

Mt Roskill LP

The Mt Roskill LP pressure system operates at a NOP of 3.5kPa.

This pressure system is included in the planned low pressure pipeline replacement programme that replaces the cast iron pipes with polyethylene pipes and increases the system pressure to 400kPa (refer to Section 6 for further details).

Lappington Road LP

The Lappington Road LP pressure system operates at a NOP of 3.5kPa. No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

This pressure system is included in the low pressure pipeline replacement programme that replaces the cast iron pipes with polyethylene pipes and increases the system pressure to 400kPa (refer to Section 6 for further details).

Otahuhu LP

The Otahuhu LP pressure system operates at a NOP of 3.5kPa. No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

This pressure system is included in the planned low pressure pipeline replacement programme that replaces the cast iron pipes with polyethylene pipes and increases the system pressure to 400kPa (refer to Section 6 for further details).

Papatoetoe LP

The Papatoetoe LP pressure system operates at a NOP of 3.5kPa. No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

This pressure system is included in the planned low pressure pipeline replacement programme that replaces the cast iron pipes with polyethylene pipes and increases the system pressure to 400kPa (refer to Section 6 for further details).

Penrose LP

The Penrose LP pressure system operates at a NOP of 3.5kPa. No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

This pressure system is included in the planned low pressure pipeline replacement programme that replaces the cast iron pipes with polyethylene pipes and increases the system pressure to 400kPa (refer to Section 6 for further details).

5.9.4 Drury CT Network System

The Drury CT network system is supplied from the transmission system at one gate station located in Waihoehoe Road. This network system consists of one MP4 pressure system.

5.9.4.1 Consumer Growth and Demand Forecast

A total of 31 consumers are connected to the Drury CT network system. Residential consumers comprise more than half of the customer base with the remaining being industrial and commercial users.

In general, it is expected that future gas demand will be driven by the growth of potential commercial/industrial activities[28] in the area, while residential demand is expected to be moderate.

Peak demand recorded over the past couple of years has decreased. An annual growth rate of around 0.1% is forecast.

5.9.4.2 Gate Stations

The Drury CT gate station recorded a peak flow of 368scmh at 5:00am on 30th June 2012.

5.9.4.3 District Regulating Stations

No DRS is installed in the Drury CT network system.

5.9.4.4 Pressure Systems

Drury CT MP4

The Drury MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 377scmh, resulting in a MinOP of 339kPa (85% of the NOP). Total forecast planning demand in 2021 is not anticipated to change, resulting in the same MinOP of 339kPa (85% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

A capacity request was recently processed for the development of a new business area next to the Drury quarry. The results of modelling analysis indicate that the existing network capacity of Drury CT MP4 pressure system can deliver a maximum of approximately 1,000 scmh of gas for this development.

5.9.5 Hunua Network System

The Hunua network system is supplied from the transmission system at one gate station located in Hunua Road. This network system consists of one MP4 pressure system.

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[28] Vector has been notified of a major business development which is planned to be constructed adjacent to the Drury quarry in 2015.

5.9.5.1 Consumer Growth and Demand Forecast

The Hunua network system supplies a total of four large commercial/industrial consumers. Peak demand recorded over the past couple of years has decreased. An annual growth rate of around 0.6% is forecast.

5.9.5.2 Gate Stations

The Hunua gate station recorded peak flow of 801scmh at 8:00am on 15th October 2011. This gate station also supplies gas to Nova's gas distribution system and Greymouth Petroleum's transmission pipeline.

5.9.5.3 District Regulating Stations

No DRS is installed in the Hunua network system.

5.9.5.4 Pressure Systems

Hunua MP4

The Hunua MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 803scmh, resulting in a MinOP of 396kPa (99% of the NOP). Total forecast planning demand during the planning period is estimated to be 1,273scmh, resulting in a MinOP of 394kPa (96% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.9.5.5 Development Plans

Vector Gas Transmission is currently investigating the upgrade of the Hunua gate station which may result in a new supply pressure of 340kPa.

Network modelling indicates that it may be possible to interconnect the Hunua MP4 pressure system into the Manurewa South MP4 pressure system. However, based on the proposed pressure setting of Hunua gate station, the potential benefit of interconnecting these two pressure systems will be marginal due to significant pressure drop at the eastern end of the combined pressure system.

To link the two pressure systems, a new 350 metre MP4 100mm PE pipeline from Calvert Street along Hunua Road to Settlement Road in Papakura is required.

5.9.6 Kingseat Network System

The Kingseat network system is supplied from the transmission system at one gate station located in Kingseat Road. This network system consists of one MP4 pressure system.

5.9.6.1 Consumer Growth and Demand Forecast

The Kingseat network system supplies five residential consumers and one commercial gas user. Kingseat's population[29] in 2006 was 669 and is expected to increase by 136%, to 1,009 in 2021.

Peak demand recorded over the past couple of years has been flat. An annual growth rate of around 1.2% is forecast.

5.9.6.2 Gate Stations

The Kingseat gate station recorded a peak flow of 19scmh at 9:00am on 30th June 2012.

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[29] Growth Projection, May 2009, Franklin District Council, http://www.franklin.govt.nz/LinkClick.aspx?fileticket=w%2fKmP3epp6s%3d&tabid=747

5.9.6.3 District Regulating Stations

No DRS is installed in the Kingseat network system.

5.9.6.4 Pressure Systems

Kingseat MP4

The Kingseat system south of Auckland consists of approximately 6km of 100mm steel and PE pipe operating at 400kPa. It was originally designed to supply gas to the Kingseat Hospital which was situated at the end of the pipeline. The hospital has since closed and there are no known significant emerging loads in the region. The system now only supplies a small amount of domestic load.

The Kingseat MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 27scmh, resulting in a MinOP of 419kPa (100% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 419kPa (100% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Due to limitations of the gate station regulator equipment, Vector Gas Transmission has requested to reduce the outlet supply pressure setting to 270kPa. It has been agreed that the proposed pressure setting is considered as a temporary solution and will be restored as and when new regulator equipment is upgraded.

5.9.7 Pukekohe Network System

The Pukekohe network system is supplied from the transmission system at one gate station located in Butcher Road. This network system comprises one IP10 pressure system, MP4 pressure system and one DRS.

5.9.7.1 Consumer Growth and Demand Forecast

The Pukekohe network system has approximately 195 consumers. The customers comprise about three quarters residential and the remaining quarter, a mix of commercial/industrial gas users. In 2012, gas supply to a new industrial customer at Crown Road in Paerata was committed and resulted in an increase in system peak demand.

Pukekohe's population in 2006 was 17,068 and is expected to increase by 51%, to 25,831 in 2021. The number of households is estimated to grow by 61%, from 5,912 in 2006 to 9,507 in 2021[30].

According to a recent growth strategy implementation report[31], an action plan is proposed to promote the intensification of residential and business development in Pukekohe, particularly in and around the town centre. The Pukekohe South growth area is identified for residential development. The report also addresses a plan for business growth in the wider Paerata and North Pukekohe areas. In terms of network development, the potential gas supply to these growth areas can be reticulated from either the Pukekohe or Drury NC network systems.

It is expected that future gas demand will be driven by the growth of population and potential industrial activities in Pukekohe. Total demand forecast for 2023 is anticipated to increase slightly over the planning period.

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[30] Pukekohe Futures: A Franklin District Growth Strategy Implementation Report, August 2010

[31] Ibid footnote 30.

5.9.7.2 Gate Stations

The Pukekohe gate station recorded a peak flow of 626scmh at 4:00pm on 28th March 2012.

5.9.7.3 District Regulating Stations

The Pukekohe network system has one DRS which supplies gas to the Pukekohe MP4 pressure system.

5.9.7.4 Pressure Systems

Pukekohe IP10

The Pukekohe IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 394scmh, resulting in a MinOP of 981kPa (98% of the NOP). Total forecast planning demand during the planning period is estimated to be 531scmh, resulting in a MinOP of 980kPa (98% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Pukekohe MP4

The Pukekohe MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 394scmh, resulting in a MinOP of 396kPa (99% of the NOP). Total forecast planning demand during the planning period is estimated to be 531scmh, resulting in a MinOP of 393kPa (98% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.9.7.5 Development Plans

Refer to Drury NC MP4 pressure system commentary in section 5.10.5.4.

5.9.8 Ramarama Network System

The Ramarama network system is supplied from the transmission system at one gate station located near Ararimu Road. This network system consists of one MP4 pressure system.

5.9.8.1 Consumer Growth and Demand Forecast

The Ramarama network system supplies gas to one small commercial customer and two large industrial consumers.

Peak demand recorded over the past couple of years has been relatively flat. An annual growth rate of around 1.0% is forecast.

5.9.8.2 Gate Stations

The Ramarama gate station recorded peak flow of 255scmh at 8:00am on 17th June 2012.

5.9.8.3 District Regulating Stations

No DRS is installed in the Ramarama network system.

5.9.8.4 Pressure Systems

Ramarama MP4

The Ramarama MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 248scmh, resulting in a MinOP of 355kPa (89% of the NOP). Total forecast planning demand during the planning period is estimated to be 359scmh, resulting in a MinOP of 329kPa (82% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.9.8.5 Development Plans

A study to investigate the benefits of integrating the Drury CT MP4 and Ramarama MP4 pressure systems has been completed. It was concluded that the benefit of deferring the upgrade of the Drury gate station by linking the Drury CT MP4 and Ramarama MP4 pressure systems is not material. The study found that no savings will be achieved because the network integration would then require an upgrade of the Ramarama gate station.

5.9.9 Tuakau Network System

The Tuakau network system is supplied from the transmission system at one gate station located in Bollard Road. This network system consists of one MP4 pressure system.

5.9.9.1 Consumer Growth and Demand Forecast

The Tuakau network system supplies a total of 12 consumers comprising 7 residential and 5 commercial/industrial gas users.

Over the past two years, Vector has received several requests for gas from existing and potential customers. However, these growth opportunities have been limited by the potential capacity constraints of the Tuakau gate station which has since been upgraded (see Section 5.9.9.2 for more details).

The peak demand recorded in 2010, 2011 and 2012 was 1,438scmh, 1,494scmh and 1,544scmh, respectively. An annual growth rate of around 1.0% is forecast. However, an area of land in the vicinity of the Tuakau gate station is now being developed for substantial business and industrial projects which may result in a higher load growth rate in the future.

5.9.9.2 Gate Stations

The Tuakau gate station recorded a peak flow of 1,544scmh at 8:00am on 10th July 2012.

To mitigate issues associated with the regulating equipment[32] at the Tuakau gate station, the delivery pressure supplying the Tuakau MP7 pressure system was temporarily reduced from 650kPa to 550kPa in 2010. Vector Gas Transmission completed the replacement of the regulating equipment for this gate station in May 2011 and has restored the supply pressure to the original setting of 700kPa.

5.9.9.3 District Regulating Stations

No DRS is installed in the Tuakau network system.

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[32] Pressure regulating equipment supplying the Tuakau MP7 pressure system is owned and operated by Vector Gas Transmission.

5.9.9.4 Pressure Systems

Tuakau MP7

The Tuakau MP7 system consists of a single pipeline operating at a NOP of 700kPa that is dominated by a large industrial customer.

The Tuakau MP7 pressure system operates at a NOP of 700kPa. The maximum flow into the system in the base year was 1,389scmh, resulting in a MinOP of 541kPa (77% of the NOP). Total forecast planning demand during the planning period is estimated to be 2,150scmh, resulting in a MinOP of 461kPa (66% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.9.10 Whangaparaoa CT Network System

The Whangaparaoa CT network system takes supply from the North Island region distribution system previously owned by NGC via an interconnection point in Wainui Road near Hibiscus Coast Highway (SH1). This network system consists of two MP4 pressure systems.

5.9.10.1 Consumer Growth and Demand Forecast

About 600 consumers are connected to the Whangaparaoa CT network system who are predominately residential consumers. Only around 7% are commercial users.

Peak demand recorded in 2012 was 224scmh. It is expected that future gas demand will be driven mainly by the growth of residential and commercial consumers while industrial demand will be minimal.

An annual growth rate of around 6.8% is forecast.

5.9.10.2 Gate Stations

Gas is metered and taken from an interconnection point which recorded a peak flow of 224scmh at 10:00am on 14th June 2012.

5.9.10.3 District Regulating Stations

No DRS is installed in the Whangaparaoa CT network system.

5.9.10.4 Pressure Systems

Little Manly MP4

The Little Manly MP4 supplies gas to 11 consumers in Tiri Road and Walbrook Road. Gas is supplied from the 50mm PE MP4 main located in Tiri Road of the Whangaparaoa NC MP4 pressure system.

Total forecast planning demand for the Little Manly MP4 pressure system is yet to be calculated but no constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Whangaparaoa CT MP4

The Whangaparaoa CT MP4 system takes gas from the interconnection point in Wainui Road and supplies gas to Silverdale, Orewa and the Whangaparaoa Peninsula at a nominal pressure of 400kPa.

The maximum flow into the system in the base year was 291scmh, resulting in a minimum system pressure of 380kPa (95% of the NOP). Total forecast planning demand during the planning period is estimated to be 504scmh, resulting in a MinOP of 336kPa (84% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.9.10.5 Development Plans

An initial investigation into the technical benefits of connecting the Whangaparaoa CT MP4 and the Whangaparaoa NC MP4 pressure systems has been completed. The current proposal involves connecting the two pressure systems together at approximately 20 locations in the Whangaparaoa and Gulf Harbour areas. Further investigation into the non-technical implications of connecting the pressure systems together will be completed in 2014.

5.10 Network Development Programme – Auckland Region (previously owned by NGC)

As mentioned beforehand, the Auckland region has been divided into two systems:

- Auckland, and
- Auckland (previously owned by NGC).

This section of the development plan describes the assets previously owned by NGC in the Auckland region.

5.10.1 Load Forecasts

The load forecast for the previously owned NGC assets in the Auckland region for the next ten years is shown in Figure 5-6.

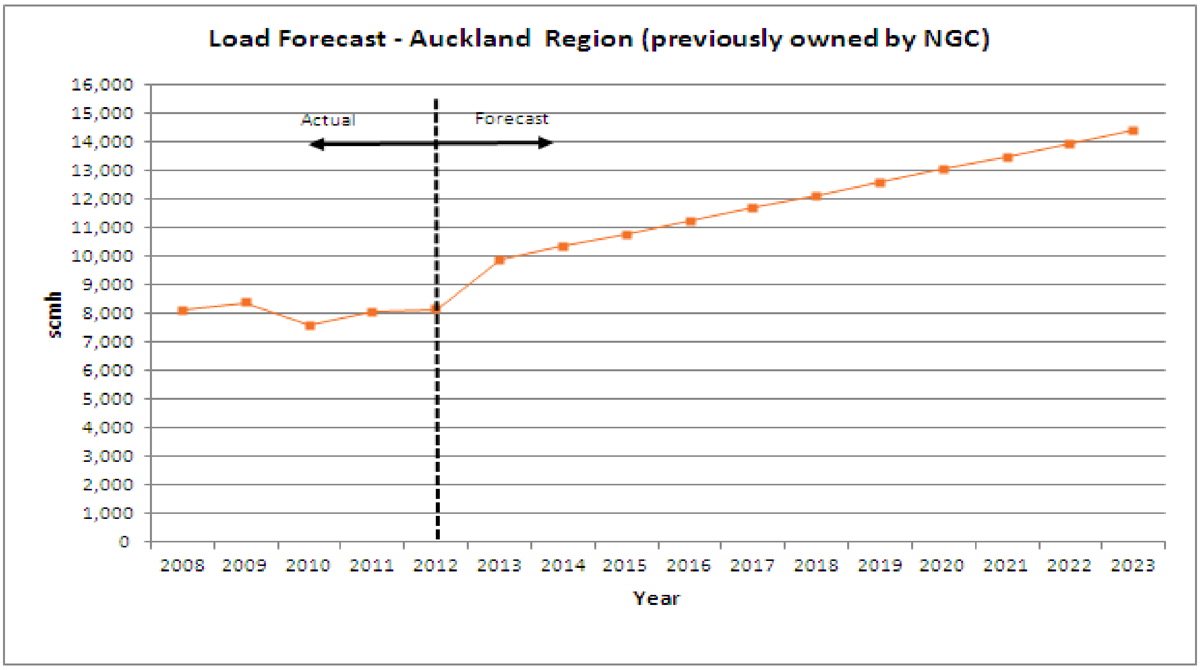

Figure 5-6 : Load forecast for Auckland region (previously owned by NGC)

Table 5-1, Table 5-6 and Table 5-7 below show the winter peak demand projection for the gate stations, DRSs and pressure systems for the Auckland region (previously owned by NGC).

5.10.1.1 Gate Stations

The Auckland distribution network in the greater Auckland region (previously owned by NGC) takes supply from the following gate stations:

- Warkworth;
- Waitoki;
- Drury;
- Papakura; and
- Harrisville.

The gate station winter peak demand statistics are summarised in Table 5-1.

5.10.1.2 District Regulating Stations

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-80075-WW	Warkworth MP4	475	513	591	No	
DR-80238-WP	Whangaparaoa NC MP4	1460	1648	1964	No	
DR-80243-WP	Waitoki MP4	3	4	4	No	

Table 5-6 : Auckland region (previously owned by NGC) DRS capacity and peak demands (in scmh)

5.10.1.3 Pressure Systems

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Warkworth MP4	Warkworth	337	335	330	Yes	
Waitoki MP4	Whangaparaoa NC	400	400	400	Yes	
Whangaparaoa NC MP4	Whangaparaoa NC	360	350	332	Yes	
Waitoki IP10	Whangaparaoa NC	871	864	849	Yes	
Papakura MP4	Papakura	363	359	352	Yes	
Drury NC MP4	Drury NC	257	227	151	Yes	To be reviewed in conjunction with the Drury CT network system
Harrisville MP7	Harrisville	404	353	231	Yes	System requires reinforcement

Table 5-7 : Auckland region (previously owned by NGC) pressure system capacity and peak demands (in kPa)

5.10.2 Warkworth Network System

The Warkworth network system is supplied from the transmission system at two gate stations, one located at the east end of Woodcocks Road and another at the west end of Woodcocks Road. This network system consists of one MP4 pressure system and one DRS.

5.10.2.1 Consumer Growth and Demand Forecast

About 258 consumers are connected to the Warkworth network system, most of whom are residential consumers. Only around 14% are commercial/industrial consumers, including a large industrial consumer, Southern Paprika, in Woodcocks Road.

Warkworth's population in 2006 was 3,273. According to the Auckland Council's population projections, Warkworth's population is expected to increase to 6,067 in 2021[33].

A recent economic report[34] discusses the future use of land decisions in Warkworth and provides an overview of Warkworth's business sector by the Auckland Council. The report anticpates baseline (business as usual) growth in the industrial sector and a high demand for land in Warkworth's office and retail sectors. In both cases, a substantial increase in demand in expected.[35]

An annual growth rate of around 4.5% is forecast.

5.10.2.2 Gate Stations

The Warkworth gate stations recorded a peak flow of 1,871scmh at 7:00am on 26th July 2012.

5.10.2.3 District Regulating Stations

The Warkworth network system has one DRS which supplies gas to Warkworth MP4 pressure system.

5.10.2.4 Pressure Systems

Warkworth MP4

The Warkworth MP4 pressure system operates at a NOP of 400kPa and is supplied from a single gate station located west of Warkworth and DR-80075-WW.

In 2007, a significant increase in load at Southern Paprika resulted in the Warkworth gate station being relocated further west, adjacent to the transmission pipeline and involved an additional 160mm PE MP4 system reinforcement. The redundant section of transmission pipeline between the two gate stations now operates at 1,400kPa and supplies DR-80075-WW (located at the gate station site at the west end of Woodcocks Road).

The maximum flow into the system in the base year was 2,018scmh, resulting in a MinOP of 336kPa (84% of the NOP). Total forecast planning demand during the planning period is estimated to be 2,511scmh, resulting in a MinOP of 330kPa (83% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

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[33] Supra Footnote 19

[34] Warkworth Business Land Needs, Covec Ltd (prepared for Rodney District Council), July 2010, http://www.rodney.govt.nz/YourCouncil/meetings/Documents/Agendas%20and%20Minutes%20for%202010/October/Item_2_Appendix_6_19_Oct_Warkworth_Business_Land_Needs_29_July_2010_FINAL.pdf

[35] Ibid., for further details, refer to the conclusions and recommendations of the report

5.10.3 Whangaparaoa NC Network System

The Whangaparaoa NC network system is supplied from the transmission system from one gate station located in Kahikatea Flat Road. This network system comprises one IP20 pressure system, two MP4 pressure systems and two DRSs.

5.10.3.1 Consumer Growth and Demand Forecast

The Whangaparaoa NC network system supplies gas to about 2,626 consumers in the suburbs of Orewa, Silverdale and Whangaparaoa Peninsula, the vast majority of whom are residential consumers. Only around 3% are commercial/industrial gas users, including Fulton Hogan in Flexman Place.

The Whangaparaoa NC network system also supplies gas to the Whangaparaoa CT network system from the interconnection point (meter station) located in Wainui Road near Hibiscus Coast Highway (SH1).

Hibiscus Coast had a population of 39,042 at the 2006 Census and is projected to grow to 55,737 in 2021 by a 43% increase[36]. It is made up of 14 Census Area Units (CAUs), which are grouped into three main parts - Orewa, Silverdale and Whangaparaoa Peninsula.

Orewa is a residential and business hub, serving as the town centre of the Hibiscus Coast. Silverdale is the main industrial centre. Growth in the residential, commercial and industrial sectors in the area is expected in the next few years. Although the Hibiscus Coast is a distinct urban area, separate from the North Shore, its population has strong links with the North Shore and other parts of greater Auckland for work, services, schooling and sport[37].

The peak demand recorded 2010, 2011 and 2012 was 969scmh, 1,223scmh and 1,344scmh, respectively. It is expected that future gas demand will be mainly driven by the growth of population in all areas of the Hibiscus Coast and potential industrial/commercial activities in the Silverdale area. An annual growth rate of around 2.2% is forecast.

5.10.3.2 Gate Stations

The Waitoki gate station recorded a peak flow of 1,452scmh at 9:00am on 27th June 2012.

5.10.3.3 District Regulating Stations

The network system has two DRSs which supply gas to two MP4 pressure systems.

5.10.3.4 Pressure Systems

Waitoki IP20

The Waitoki IP20 system supplies gas to the suburbs of Silverdale, Orewa and Whangaparaoa (including the Auckland network pressure system described in Section 5.9.10). The network is supplied from a single gate station located west of Silverdale and operates at a NOP of 1,900kPa, which was up-rated from a NOP of 1,000kPa in 2012.

Based on a previously analysed NOP of 1,000kPa, the maximum flow into the system in the base year was 1,319scmh, resulting in a MinOP of 876kPa (88% of the NOP). Total forecast planning demand during the planning period is estimated to be 1,968scmh, resulting in a MinOP of 849kPa (85% of the NOP). No constraints have been identified and

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[36] Supra Note 38

[37] Planning Rodney – Support Document, 2008, http://www.rodney.govt.nz/DistrictTownPlanning/Documents/Planning_Rodney/Support%20Doc%2018%20Oct%2008.pdf

the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Whangaparaoa NC MP4

The Whangaparaoa NC MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 1,316scmh, resulting in a MinOP of 366kPa (92% of the NOP). Total forecast planning demand during the planning period is estimated to be 1,964scmh, resulting in a MinOP of 332kPa (83% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

The following security enhancements are being considered:

- Construct approximately 600 metres of 80mm PE MP4 pipeline and approximately 700 metres of 100mm PE MP4 pipeline in Gulf Harbour Drive; or
- Interconnect the stranded Auckland asset at the end of the Whangaparaoa Peninsula into the Whangaparaoa MP4 pressure system.

Waitoki MP4

The Waitoki MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 3scmh, resulting in a MinOP of 400kPa (100% of the NOP). Total forecast planning demand during the planning period is estimated to be 4scmh, resulting in a MinOP of 400kPa (100% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.10.3.5 Development Plans

Refer to Whangaparaoa CT MP4 pressure system.

5.10.4 Papakura Network System

The Papakura network system is supplied from one DRS (DR-00170-AK) located inside the Papakura gate station near Hingaia Road. This network system consists of one MP4 pressure system.

5.10.4.1 Consumer Growth and Demand Forecast

About 266 consumers are connected to the Papakura network system who are predominately residential consumers. There are only two commercial/industrial users.

It is anticipated that future gas demand will be driven by new residential subdivision developments in the eastern part of Papakura and potential industrial activities in Karaka. At this point in time, no capacity constraints are foreseen.

5.10.4.2 Gate Stations

Vector Gas Transmission has completed the upgrading of the Papakura gate station and decommissioning of the Papakura NC gate station, which previously supplied the Papakura network system. Under the new configuration, the Papakura MP4 pressure system is now connected to the outlet of DR-00170-AK, located inside the Papakura gate station, and a new gas meter has been installed. In the future, Vector will be able to record pressure and flow data from this meter.

5.10.4.3 District Regulating Stations

No DRS is installed in the Papakura network system.

5.10.4.4 Pressure Systems

Papakura MP4

The Papakura MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 122scmh, resulting in a MinOP of 371kPa (93% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.10.4.5 Development Plans

The Papakura MP4 pressure system has been designed and constructed using PE100 pipe which can operate at MP7. The current operating pressure of this network is 400kPa but it is possible to increase the network pressure to operate at a NOP of 700kPa by installing a DRS (MP7/MP4) in Harbourside Drive, Papakura.

5.10.5 Drury NC Network System

The Drury NC network system is supplied from the transmission system at one gate station located in Waihoehoe Road. This network system consists of one MP4 pressure system.

5.10.5.1 Consumer Growth and Demand Forecast

A total of 29 consumers are connected to the Drury NC network system comprising 18 residential consumers and 11 commercial/industrial gas users.

As mentioned beforehand (refer to Section 5.9.7.1), business growth in the wider Paerata and north Pukekohe areas will provide an opportunity for additional gas requirements. Accordingly, it is expected that future gas demand will be driven by the growth of potential industrial activities while residential demand will be minimal within the planning period for the Drury NC network system.

The peak demand recorded in 2010, 2011 and 2012 was 1,594scmh, 1,960scmh and 1,877scmh, respectively. An annual growth rate of around 4.6% is forecast.

5.10.5.2 Gate Stations

The Drury gate station recorded a peak flow of 1,877scmh at 5:00am on 11th July 2012.

5.10.5.3 District Regulating Stations

No DRS is installed in the Drury NC network system.

5.10.5.4 Pressure Systems

Drury NC MP4

The Drury NC MP4 pressure system operates at a NOP of 400kPa[38]. The maximum flow into the system in the base year was 2,051scmh, resulting in a MinOP of 298kPa (72% of the NOP). Total forecast planning demand during the planning period is estimated to be 3,735scmh, which would result in a MinOP of 151kPa (38% of the NOP), therefore falling below the minimum system pressure criteria. To address this issue, the following reinforcements are planned:

- Increase the outlet pressure of the Drury gate station from 350kPa to 400kPa (or as far as technically viable when the gate station is upgraded by Vector Gas Transmission); and

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[38] Due to legacy practices, the current operating pressure of the Drury NC MP4 pressure system is 350kPa.

- Construct approximately 1,700 metres of 160mm PE MP4 from Drury gate station along Waihoehoe Road, Flanagan Road and Great South Road to the junction of Firth Street.

5.10.5.5 Development Plans

An investigation into connecting the Drury NC MP4 pressure system (part of the North Island region) and the Pukekohe MP4 pressure system (part of the Auckland region) was completed in 2013. The following reinforcement options will be investigated during the planning period:

- Install an IP10/MP4 DRS at the junction of Paerata Road and Butcher Road, Paerata; and
- Construct approximately 5.4km of 160mm PE MP4 gas main from Tuhimata Road along Paerata Road and Karaka Road to Gellert Road, Paerata.

5.10.6 Harrisville Network System

The Harrisville network system is supplied from the transmission system at one gate station located in Harrisville Road. This network system consists of one MP7 pressure system.

5.10.6.1 Consumer Growth and Demand Forecast

There are six consumers connected to the Harrisville network system. The consumers comprise five industrial/commercial users and one residential consumer.

Over the last two years, several enquiries have been made from potential industrial users within the Harrisville network system. However, growth is limited and subject to the upgrade of the Harrisville gate station (see Section 5.10.6.2). In addition, this network system is approaching its capacity and will require reinforcement in the future.

It is expected that future gas demand will be driven by the growth of potential industrial activities in the area while residential demand is anticipated to be minimal. Two new industrial connections with a total load of 385scmh, located in Harrisville and Jamieson Roads, have been processed recently.

The peak demand recorded in 2010, 2011 and 2012 was 3,114scmh, 2,972scmh and 3,068scmh respectively. An annual growth rate of around 7.3% is forecast.

5.10.6.2 Gate Stations

The Harrisville gate station recorded a peak flow of 3,068scmh at 7:00am on 30th June 2012. The capacity of the gate station is constrained by the heating equipment located within the gate station. Vector Gas Transmission has commenced the preliminary design for the upgrade of this gate station.

5.10.6.3 District Regulating Stations

No DRS is installed in the Harrisville network system.

5.10.6.4 Pressure Systems

Harrisville MP7

The Harrisville MP7 pressure system operates at a NOP of 700kPa. The maximum flow into the system in the base year was 3,156scmh, resulting in a MinOP of 480kPa (69% of the NOP). Total forecast planning demand during the planning period is estimated to be 6,405scmh, which would result in a MinOP of 231kPa (33% of the NOP), therefore falling below the minimum system pressure criteria.

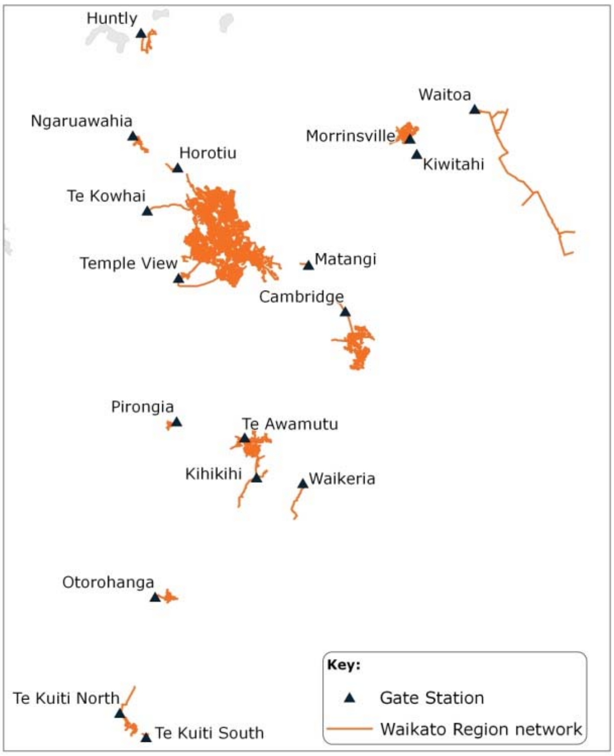
The following reinforcement options will be investigated in 2014:

- Elevate the Harrisville gate station outlet pressure from 550kPa to 650kPa (request has been made to Vector Gas Transmission at the design stage of the station upgrade project); and
- Install approximately 2,000 metres of 160mm MP7 PE pipeline along Jericho Road between Harrisville Road and 182 Jericho Road.

5.10.6.5 Development Plans

A study into the benefits of connecting the Harrisville MP7 pressure system to the Tuakau MP7 pressure system has been completed in 2013. The results indicate that there is no real benefit from joining these two pressure systems.

5.11 Network Development Programme – Waikato Region



The Waikato is the fourth largest region in New Zealand, covering 25,000 square kilometres. It stretches from the Bombay Hills and Port Waikato in the north down to the Kaimai Ranges and Mt Ruapehu in the south, and from Mokau on the west coast across to the Coromandel Peninsula in the east.

The Waikato region is comprised one city (Hamilton) and 11 districts (Franklin, Hauraki, Matamata-Piako, Otorohanga, Rotorua, South Waikato, Taupo, Thames-Coromandel, Waikato, Waipa and Waitomo), four of which lie across the regional boundary.

5.11.1 Load Forecasts

The load forecast for the Waikato region for the next ten years is shown in Figure 5-7.

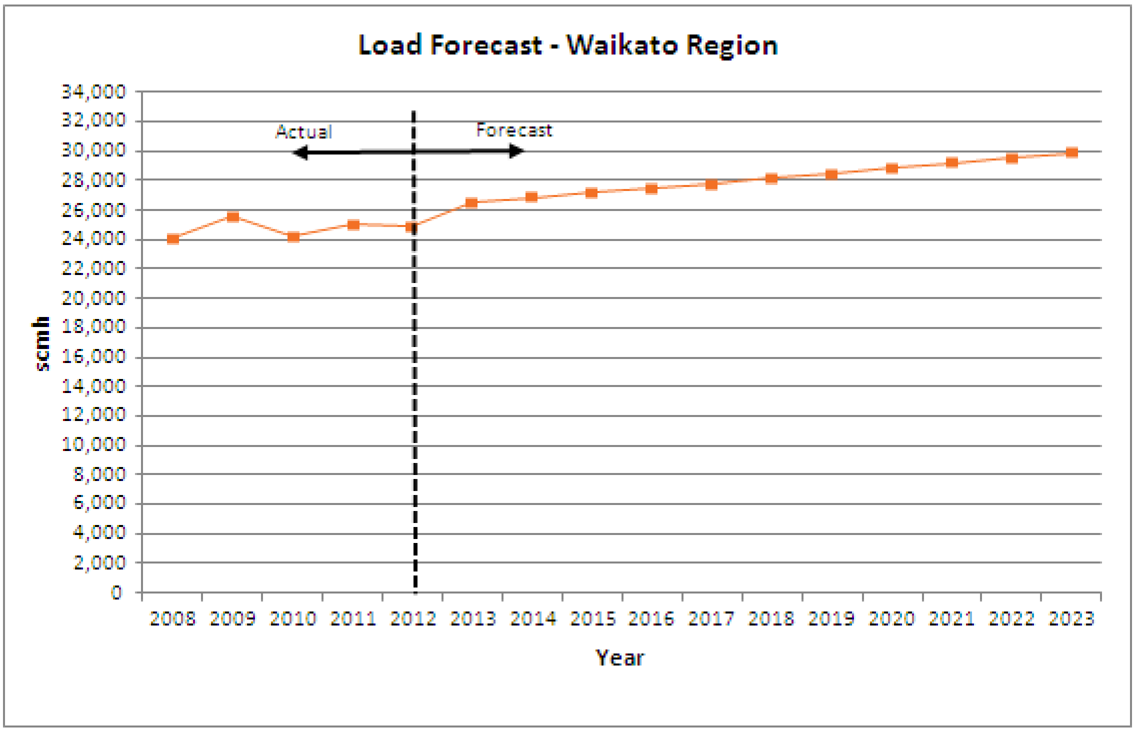


Figure 5-7 : Load forecast for Waikato region

Table 5-1, Table 5-8 and Table 5-9 below show the winter peak demand projection for the gate stations, DRSs and pressure systems for the Waikato region.

5.11.1.1 Gate Stations

The Waikato region takes supply from the following gate stations:

- Huntly;
- Ngaruawahia;
- Horotiu;
- Te Kowhai;
- Temple View;
- Matangi;
- Morrinsville;
- Kiwitahi;
- Waitoa;
- Cambridge;
- Te Awamutu North;
- Kihikihi;
- Waikeria;
- Pirongia;
- Otorohanga;
- Te Kuiti North; and
- Te Kuiti South.

The gate station winter peak demand statistics are summarised in Table 5-1.

5.11.1.2 District Regulating Stations

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-80100-HM	Hamilton MP4	1757			Yes	DRS to be upgraded in FY2018 (refer to Section 6)
DR-80101-HM	Hamilton MP4	1658			Yes	DRS to be upgraded in FY2019 (refer to Section 6)
DR-80102-HM	Hamilton MP4	298			Yes	DRS to be upgraded in FY2015 (refer to Section 6)
DR-80103-HM	Hamilton MP4	238			Yes	DRS to be upgraded in FY2016 (refer to Section 6)
DR-80104-HM	Hamilton East LP		85		No	DRS removed in FY2013
DR-80106-HM	Hamilton East LP		50		No	DRS removed in FY2013
DR-80107-HM	Frankton LP		101		No	DRS removed in FY2013
DR-80116-HM	Hamilton MP4	632			Yes	
DR-80120-HM	Hamilton West MP4	201	233	285	No	
DR-80122-HM	Hamilton MP4	3027			Yes	DRS to be upgraded in FY2015 (refer to Section 6)
DR-80123-HM	Hamilton West MP4	1942	2162	2527	No	
DR-80124-HM	Hamilton West MP4	909	991	1131	No	DRS rebuilt in 2012
DR-80129-HM	Pukete MP4	1158	1218	1311	Yes	DRS to be upgraded in FY2017 (refer to Section 6)

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-80130-HM	Pukete MP4	558	689	909	No	
DR-80132-HM	Hamilton MP1	25	54	75	No	
DR-80133-HM	Pukete MP4	724	791	905	No	DRS to be removed in 2014
DR-80133-HM	Hamilton MP1	4	23	35	No	DRS MP1 outlet to be removed in 2014
DR-80137-HM	Model not available	No data	No data	No data	No	
DR-80138-HM	Hamilton MP1	353	371	386	No	
DR-80139-HM	Pukete MP4	271	311	377	No	DRS to be upgraded in FY2016 (refer to Section 6)
DR-80140-HM	Frankton LP		30		No	
DR-80144-HM	Fairfield LP		46		No	DRS to be removed in FY2015
DR-80145-HM	Hamilton MP4	2863			Yes	DRS to be upgraded in 2014
DR-80146-HM	Fairfield LP		51		No	
DR-80147-HM	Fairfield LP		31		No	
DR-80149-HM	Temple View MP2	No data	No data	No data		No model
DR-80150-HM	Temple View MP2	No data	No data	No data		No model

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-80153-HM	Tuhikaramea Road MP1	No data	No data	No data		No model
DR-80156-HM	Hamilton East LP		75		No	
DR-80161-NG	Ngaruawahia MP2	79	84	93	No	
DR-80162-HU	Huntly East MP4	359	359	359	No	
DR-80163-HU	Huntly Central MP4	359	359	359	No	
DR-80169-KW	Kiwitahi MP4	130	130	130	No	
DR-80171-HM	Hamilton MP4	270			No	
DR-80172-HM	Hamilton MP4	1302			No	
DR-80173-HM	Hamilton MP7	1667	1850		No	
DR-80175-HM	Hamilton MP4	218			No	
DR-80202-TK	Seddon St MP4	8	8	8	No	DRS to be upgraded in FY2016 (Refer to Section 6)
DR-80203-TK	Te Kuiti MP4	78	78	78	No	
DR-80204-TK	Te Kuiti MP4	37	37	37	No	
DR-80205-TK	Te Kuiti MP4	55	55	55	No	DRS to be upgraded in 2014 (Refer to Section 6)

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-80207-TK	Hangatiki East Rd MP4	116	116	116	No	
DR-80209-KH	Kihikihi MP4	167	172	181	No	DRS to be upgraded in FY2017 (Refer to Section 6)
DR-80210-CA	Bruntwood MP4	2	2	2	No	
DR-80213-MO	Morrinsville MP4	228	228	228	No	DRS to be upgraded in FY2017 (Refer to Section 6)
DR-80214-MO	Morrinsville MP4	113	113	113	No	DRS to be upgraded in FY2017 (Refer to Section 6)
DR-80215-MO	Morrinsville West MP4	95	95	95	No	DRS to be upgraded in 2014 (Refer to Section 6)
DR-80217-MO	Morrinsville MP4	89	89	89	No	DRS to be removed in 2014
DR-80218-WI	Waitoa MP4	1245	1367	1568	No	
DR-80223-HU	Harris St MP4	4	4	4	No	DRS removed and replaced by DR-80253-HU in 2012
DR-80226-TW	Te Awamutu MP4	553	561	573	No	
DR-80244-CA	Cambridge MP4	280	289	304	No	
DR-80245-CA	Cambridge MP4	780	802	838	No	
DR-80246-HO	Horotiu MP4	296	323	366	No	
DR-80247-WI	Waitoa MP7	1026	1125	1292	No	

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-80249-HM	Hamilton East LP		98		No	
DR-80250-HM	Frankton LP		44		No	DRS removed in FY2013
DR-80252-HM	Hamilton West LP		64		No	
DR-80253-HU	Harris St MP4	4	4	4	No	
DR-80-254-HM	Fairfield LP					DRS built in 2012
DR-80-255-HM	Fairfield LP					DRS built in 2012
DR-80-256-HM	Fairfield LP					DRS removed in FY2013
DR-80-257-HM	Frankton LP					DRS built in 2012
DR-80-258-HM	Hamilton East LP					DRS built in 2012
DR-80-259-HM	Cameron Rd LP					DRS built in 2012
DR-80-260-HM	Cameron Rd					DRS built in 2012

Table 5-8 : Waikato region DRS capacity and peak demands (in scmh)

5.11.1.3 Pressure Systems

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Huntly East MP4	Huntly	280	280	280	Yes	
Huntly Central MP4	Huntly	280	280	280	Yes	
Harris St MP4	Huntly	350	350	350	Yes	
Huntly MP7	Huntly	683	683	683	Yes	
Ngaruawahia MP2	Ngaruawahia	195	195	195	Yes	
Ngaruawahia MP7	Ngaruawahia	422	422	422	Yes	
Horotiu MP4	Horotiu	321	317	307	Yes	
Horotiu IP10	Horotiu	1049	1046	1039	Yes	
Hamilton West MP4	Hamilton	237	212	161	No	Reinforcement in FY2021
Pukete MP4	Hamilton	223	195	135	No	Reinforcement in FY2019
Hamilton MP4	Hamilton	187	146	39	No	Reinforcement in FY2014
Tuhikaramea Rd MP1	Hamilton	No data	No data	No data		No model
Temple View MP2	Hamilton	No data	No data	No data		No model

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Foster Rd MP1	Hamilton	No data	No data	No data		No longer a pressure system as it is supplied by a new service regulator to two residential consumers
Hamilton MP1	Hamilton		40		Yes	
Hamilton MP7	Hamilton	643	641		Yes	
Hamilton IP10	Hamilton	607	452		No	Reinforcement in FY2016
Fairfield LP	Hamilton		2.1			
Frankton LP	Hamilton		1.5			
Hamilton West LP	Hamilton		2.7			
Hamilton East LP	Hamilton		1.9			
Matangi MP4	Matangi	No data	No data	No data		No model
Morrinsville MP4	Morrinsville	336	336	336	Yes	
Morrinsville West MP4	Morrinsville	326	326	326	Yes	
Morrinsville IP10	Morrinsville	934	934	934	Yes	
Kiwitahi MP4	Kiwitahi	309	309	309	Yes	
Waitoa MP4	Waitoa	220	180	255	No	Reinforcement in FY2015

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Waitoa MP7	Waitoa	641	631	613	Yes	Reinforced MP4 modelling result in FY2021
Waitoa IP20	Waitoa	1504	1471	1405	Yes	Reinforced MP4 modelling result in FY2021
Cambridge MP4	Cambridge	307	305	301	Yes	
Bruntwood MP4	Cambridge	350	350	350	Yes	
Cambridge IP20	Cambridge	1143	1104	1033	Yes	
Kihikihi MP4	Te Awamutu	343	343	342	Yes	
Te Awamutu MP4	Te Awamutu	306	303	299	Yes	
Kihikihi IP10	Te Awamutu	768	767	765	Yes	
Waikeria IP20	Waikeria	1692	1656	1581	Yes	
Pirongia MP4	Pirongia	No data	No data	No data		No model
Otorohanga MP4	Otorohanga	315	315	315	Yes	
Hangatiki East Rd MP4	Te Kuiti North	331	331	331	Yes	
Seddon St MP4	Te Kuiti North	350	350	350	Yes	
Te Kuiti MP4	Te Kuiti North	349	349	349	Yes	

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Te Kuiti North IP10	Te Kuiti North			310	Yes	
Te Kuiti South MP4	Te Kuiti South	894	894	894	Yes	
Te Kuiti South IP10	Te Kuiti South	810	810	810	Yes	

Table 5-9 : Waikato region pressure system capacity and peak demands

5.11.2 Huntly Network System

The Huntly network system is supplied from the transmission system at one gate station located in Hetherington Road. This network system comprises one MP7 pressure system, three MP4 pressure systems and three DRSs.

5.11.2.1 Consumer Growth and Demand Forecast

About 110 consumers are connected to the Huntly network system, 69% of whom are residential consumers. The rest are either commercial or industrial users.

Huntly's population in 2006 was 6,915 and is projected to increase by 29%, to 8,940 in 2021[39]. With respect to land use, Huntly will continue allocating land for aggregate and coal[40] use in the Waikato region.

It is expected that future gas demand will be driven by the growth of population and potential industrial activities in Huntly. Demand growth is anticipated to be relatively flat over the planning period.

5.11.2.2 Gate Stations

The Huntly gate station recorded a peak flow of 581scmh at 2:00am on 11th March 2012.

5.11.2.3 District Regulating Stations

The Huntly network system has three DRSs which supply gas to three MP4 pressure systems.

5.11.2.4 Pressure Systems

Huntly MP7

The Huntly MP7 pressure system operates at a NOP of 700kPa. The maximum flow into the system in the base year was 661scmh, resulting in a MinOP of 683kPa (98% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 683kPa (98% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Huntly East MP4

The Huntly East MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 359scmh, resulting in a MinOP of 345kPa (86% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Huntly Central MP4

The Huntly East MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 295scmh, resulting in a MinOP of 261kPa (65% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

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[39] Growth Strategy and Implementation Plan Summary 2009 – Future Proof, Waikato District Council, http://www.waikatodistrict.govt.nz/CMSFiles/56/5699a8aa-326c-4e96-af79-79ac9d1aa53a.pdf

[40] Ibid.

Harris St MP4

The Harris St MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 4scmh, resulting in a MinOP of 350kPa (88% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 350kPa (88% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.11.3 Ngaruawahia Network System

The Ngaruawahia network system is supplied from the transmission system from one gate station located in Brownlee Avenue. This network system comprises one MP7 pressure system, one MP4 pressure system and one DRS.

The Ngaruawahia MP7 pressure system is designed to operate at IP20 (MAOP 1,820kPa) but is currently operating at a lower pressure of 450kpa. The purpose of the lower operating pressure is to improve the accuracy of the transmission gate station meter and to minimise the effects of odorant fade in this network system.

5.11.3.1 Consumer Growth and Demand Forecast

About 158 consumers are connected to the Ngaruawahia network system. They consumers are predominately residential consumers; only around 4% are commercial/industrial gas users.

Ngaruawahia's population in 2006 was 5,120 and is projected to increase by 63%, to 8,340 in 2021[41].

It is expected that future gas demand will be driven primarily by the population growth with limited growth in the commercial/industrial sector. An annual growth rate of around 3.8% is forecast.

5.11.3.2 Gate Stations

The Ngaruawahia gate station recorded a peak flow of 67scmh at 7:00pm on 5th July 2012.

5.11.3.3 District Regulating Stations

The Ngaruawahia network system has one DRS which supplies gas to Ngaruawahia MP2 pressure system.

5.11.3.4 Pressure Systems

Ngaruawahia MP7

The Ngaruawahia MP7 pressure system operates at a NOP of 700kPa (currently operating at lower pressure of 450kPa). The maximum flow into the system in the base year was 79scmh, resulting in a MinOP of 423kPa (60% of the NOP). Total forecast planning demand during the planning period is estimated to be 84scmh, resulting in a MinOP of 422kPa (60% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

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[41] Supra Note 38

Ngaruawahia MP2

The Ngaruawahia MP2 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 79scmh, resulting in a MinOP of 348kPa (87% of the NOP). Total forecast planning demand during the planning period is estimated to be 84scmh, resulting in a MinOP of 347kPa (87% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.11.4 Horotiu Network System

The Horotiu network system is supplied from the transmission system at one gate station located in Horotiu Bridge Road. This network system comprises one IP10 pressure system, one MP4 pressure system and one DRS.

5.11.4.1 Consumer Growth and Demand Forecast

A total of 6 gas consumers are connected to the Horotiu network system. They comprise 4 large commercial/industrial consumers and 2 residential consumers.

Horotiu’s population in 2006 was 700 and is projected to increase by 43%, to 1,000 in 2021[42].

With respect to industrial land use, northern Horotiu will continue allocating land for dairy industry, logistics, warehousing and meat processing[43] in the Waikato region in the long term. In the short term, the Northgate Business Park, a 103-hectare industrial park in Horotiu, is being developed.

It is expected that future gas demand will be driven by the growth of potential industrial activities in the area while residential demand will be minimal. An annual growth rate of around 3.6% is forecast.

5.11.4.2 Gate Stations

The Horotiu gate station recorded a peak flow of 983scmh at 4:00pm on 17th January 2012.

5.11.4.3 District Regulating Stations

The Horotiu network system has one DRS which supplies gas to the Horotiu MP4 pressure system.

5.11.4.4 Pressure Systems

Horotiu IP10

The Horotiu IP10 pressure system has been designed and constructed with an MAOP of 1,900kPa and currently operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 1,189scmh, resulting in a MinOP of 1,056kPa (100% of the NOP). Total forecast planning demand during the planning period is estimated to be 1,193scmh, resulting in a MinOP of 1,039kPa (100% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

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[42] Supra Note 38

[43] Supra Note 38

Horotiu MP4

The Horotiu MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 230scmh, resulting in a MinOP of 332kPa (83% of the NOP). Total forecast planning demand during the planning period is estimated to be 366scmh, which would result in a MinOP of 307kPa (77% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.11.4.5 Development Plans

To support industrial and business growth in Horotiu, especially the development of Northgate Business Park, the following projects are planned:

- Up-rate the Horotiu IP10 to IP20 pressure system;
- Install a new IP20/MP4 DRS opposite to #5 Washer Road at SH1;
- Extend approximately 350 metres of 100mm PE MP4 from the new DRS to the junction of Horotiu Bridge Road and SH1; and
- Construct approximately 560 metres of 100mm PE MP4 along Horotiu Bridge Road between Washer Road and SH1.

5.11.5 Hamilton Network System

The Hamilton network system is supplied from the transmission system at two gate stations, located at Te Kowhai in the North West and Temple View in the South West of Hamilton. The Hamilton network system comprises one IP10 pressure system, one MP7 pressure system, three MP4 pressure systems, one MP2 pressure system, two MP1 pressure system, four LP pressure systems and 35 DRS's.

5.11.5.1 Consumer Growth and Demand Forecast

A total of 27,845 consumers are connected to the Hamilton network system. They are predominatly residential consumers; only around 4% are commercial/industrial gas users.

The population of Hamilton is projected to increase significantly from 134,400 in 2006[44] to 166,500 in 2019[45]. By 2051, it is expected to increase to 242,000[46]. Residential growth in the next ten years is anticipated to occur in the northern (Rotokaui and Rototuna) and southern (Peacock) parts of Hamilton[47].

According to the Rotokaui Structure Plan[48] released by the Hamilton City Council, the development area is anticipated to drive high growth in industrial and commercial loads over the planning period.

System peak demand in the Hamilton network in 2010, 2011 and 2012 was 13,987scmh, 14,829scmh and 14,676scmh respectively. An annual growth rate of around 1.9% is forecast.

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[44] 2006 census data.

[45] Hamilton City Council's 2009-19 Long-term Council Community Plan (http://hamilton.co.nz/file/fileid/18541).

[46] Refer footnote number 44.

[47] Refer Rotokaui Structure Plan, Rototuna Structure Plan and Peacock Structure Plan in http://www.hamilton.co.nz/our-council/council-publications/districtplans/proposeddistrictplan/chapter3/Pages/default.aspx

[48] The Rotokauri Structure Plan provides for urban growth with an estimated total population of between 16,000 and 20,000 people. Stage 1 development has commenced and comprises 280ha of industrial land, employment areas, and a neighbourhood centre. See http://www.hamilton.co.nz/our-council/council-publications/districtplans/proposeddistrictplan/chapter3/Pages/3-6-Rotokauri.aspx

5.11.5.2 Gate Stations

The Hamilton network system has two gate stations (Temple View and Te Kowhai). Vector takes an IP10 supply from both stations at a NOP of 1,000kPa. The 2012 peak demand in the Hamilton network system was 14,676scmh at 8:00pm on 14th June 2012. Temple View and Te Kowhai gate stations recorded flows of 9,698scmh and 4,978scmh, respectively.

5.11.5.3 District Regulating Stations

The Hamilton network system consists of 35 DRSs. The total number of DRSs in the Hamilton network system will reduce as a result of Vector's 3-year LP/MP1 steel pipeline replacement programme (refer to Section 6 for further details).

5.11.5.4 Pressure Systems

Hamilton IP10

The Hamilton IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 15,329scmh, resulting in a MinOP of 781kPa at DR-80100-HM (78% of the NOP). Total forecast planning demand during the planning period is estimated to be 17,576scmh, which would result in the MinOP falling below the minimum pressure criteria.

In order to maintain supply pressure quality, a number of options for reinforcement of the Hamilton IP10 pressure system (particularly the southern lateral near the University of Waikato) have been investigated. Amongst the options considered the following five warrant further assessment:

1. Upgrading the existing IP pipeline from Te Kowhai gate station to Avalon Drive from 1,200kPa to 1,900kPa.
2. Construct a new 150mm IP pipeline link from either DR-80145-HM or DR-80139-HM to DR-80100-HM.
3. Construct a new 150mm IP pipeline operating at 1,900kPa from Temple View gate station to the hospital or University area.
4. Construct a new 100mm IP pipeline from Matangi Gate Station to DR-80101-HM.
5. Construct a new 150mm IP pipeline from Horotiu Gate Station to DR-80145-HM.

Option (1) would provide an increase in pressure at the southern lateral of between 50kPa to 100kPa, depending on the regulator set pressure between the 1,900kPa and 1,200kPa systems at Avalon Drive. This would provide only a short-term improvement.

All other options have a higher capital cost due to the type of construction required. Options (2) and (3) provide the greatest capacity and security of supply advantage. Options (4) and (5) will result in major gate station upgrades and require consultation with Vector Gas Transmission with regards to the feasibility of these two options.

Hamilton MP7

The Hamilton MP7 pressure system operates at a NOP of 700kPa and feeds gas to DR-80171-HM, DR-80172-HM and DR-80175-HM. The maximum flow into the system in the base year was 1,424scmh, resulting in a MinOP of 644kPa (92% of the NOP).

Total forecast planning demand for 2016 is estimated to be 1,850scmh, which would result in a MinOP of 641kPa (92% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Hamilton West MP4

The Hamilton West MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 2,606scmh, resulting in a MinOP of 263kPa (66% of the NOP).

Total forecast planning demand during the planning period is estimated to be 3,943scmh, resulting in the MinOP falling below the minimum pressure criteria. The following reinforcements are planned:

- Install approximately 150 metres of 50mm PE MP4 in Avalon Drive from #27 Avalon Drive to #1 Livingstone Avenue; and
- Install approximately 100 metres of 50mm PE MP4 from #23 Roy Street to #26 Livingstone Avenue.

To support the growth of residential and industrial demand in Rotokauri, a new DRS is proposed below:

- Install a new IP10/MP4 at a location in Te Kowhai Road between Exelby Road and Ruffell Road.

DR-80123-HM supplies more than 60% of the total load. If DR-80123-HM failed, suburbs south of Grandview Road and north of Killarney Road / Tuhikaramea Road will fall below the minimum pressure criteria.

Pukete MP4

The MP4 Pukete pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 2,315scmh, resulting in a MinOP of 253kPa (63% of the NOP). Total forecast planning demand during the planning period is estimated to be 3,502scmh, resulting in the MinOP falling below the minimum pressure criteria.

The following reinforcements are planned:

- Construct approximately 650 metres of 80mm PE MP4 pipeline loop in Te Rapa Road from DR-80139-HM to Mahana Road; and
- Construct approximately 180 metres of 50mm PE MP4 in Te Papa Road from Bryant Road to #558 Te Rapa Road.

Contingency scenario analysis of the MP4 Pukete system suggests that if DR-80133-HM failed, supply south of Mears Road (apart from the connections in Te Papa Road) would be lost. Whilst DR-80129-HM provides significant load in the area, if it failed, DR-80130-HM would be able to supply adequate back up pressure. The only customer impacted is the Hamilton Waste Water Treatment Plant where metering pressure would drop below the specific minimum design pressure of 300kPa. However, the reduction in metering pressure is not anticipated to impact the operation of the treatment plant.

Hamilton MP4

The Hamilton MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 10,473scmh resulting in a MinOP of 229kPa (57% of the NOP).

Total forecast planning demand during the planning period is estimated to be 15,845scmh, resulting in the MinOP falling below the minimum pressure criteria. Industrial and residential growth is expected to occur north of the network system which is solely supplied by DR-80145-HM. However, reinforcement of the system pressure is expected in the south east area, mainly supplied by DR-80103-HM, DR-80101-HM and DR-80100-HM. The following reinforcements are planned during the planning period:

- Construct approximately 400 metres of 100mm PE MP4 in Cambridge Road from the outlet of DR-80101-HM to Hillcrest Road and tie into the existing 80mm steel; and
- Construct approximately 50 metres of 50mm PE MP4 at the intersection of Boundary Road and Heaphy Terrace and tie into the existing gas mains.

To support growth opportunities in the Rototuna area in Hamilton North, the following enhancement project is planned:

- Construct approximately 2,100 metres of 80mm PE MP4 in Gordonton Road between Wairere Drive and Thomas Road.

Contingency scenario analysis of the Hamilton MP4 pressure system suggests that DR-80145-HM is the only DRS at present supplying Hamilton North. Failure of this DRS would result in a significant loss of supply in the area. A reinforcement proposal to construct approximately 2,500 metres of 100mm PE MP4 to link DR-80130-HM to River Road (river crossing) is being considered.

Temple View MP2

The Temple View MP2 pressure system operates at a NOP of 200kPa. No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Tuhikaramea Road MP1

The Tuhikaramea Road MP1 pressure system operates at a NOP of 100kPa. No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Hamilton MP1

The Hamilton MP1 system operates at a NOP of 100kPa. Table 5-10 provides the results from the system pressure monitoring of the Hamilton MP1 pressure system in 2011. The minimum system pressure of 42kPa (42% of the NOP) was recorded on the network at 6:30pm on 16th August 2011 in Arcus Street.

Location	Actual System Pressure (kPa)	Time and Date
DR-80132-HM(Outlet)	67	8:30am 2nd July 2011
DR-80133-HM (Outlet)	71	8:00am 1st July 2011
10 Forest Lake Road	78	6:30pm 29th June 2011
39 Anne Street	61	6:30pm 16th August 2011
35 Arcus Street	42	6:30pm 16th August 2011
59 Cecil Street	58	6:30pm 16th August 2011
24 Cardrona Road	72	6:30pm 16th August 2011

Table 5-10: Minimum system pressure on the Hamilton MP1 pressure system

Parts of the Hamilton MP1 pressure system is scheduled to be replaced as part of Vector's 3-year LP/MP1 steel pipeline replacement program (refer to Section 6 for further details). The NOP has been reduced to 80kPa to ensure the over pressure protection devices are capable of maintaining no more that 110% of the system pressure MAOP of 105kPa.

As a result of the scheduled 3-year pipeline replacement program, the network configuration of the Hamilton MP1 pressure system will change. For this reason, the total forecast planning demand is yet to be calculated. Network modelling and analysis will be undertaken in conjunction with the project scope to ensure any capacity constraints are addressed in the design and network reconfiguration.

Foster Road MP1

The Foster Road MP1 pressure system is a very small system adjacent to Temple View gate station which supplies two residential consumers. It used to operate at a NOP of 100kPa and was fed by DR-80152-HM. In 2011, this DRS was replaced with a service regulator.

As a result, Foster Road MP1 pressure system is now updated as two MP4 service connections in Vector's GIS.

Fairfield LP

The Fairfield LP pressure system operates at a NOP of 7kPa. Table 5-11 provides the results from the system pressure monitoring of the Fairfield LP pressure system in 2012. The minimum system pressure of 4.2kPa (60% of the NOP) was recorded at 7:15am on 13th September 2012 in Casey Avenue.

Location	Actual System Pressure (kPa)	Time and Date
DR-80144-HM (Outlet)	5.8	6:45pm 9th July 2012
DR-80146-HM (Outlet)	6.6	6:45pm 9th July 2012
DR-80147-HM (Outlet)	6.5	6:45pm 9th July 2012
22 Claremont Avenue	4.0	7:00pm 8th July 2012
20 Balloch Street	3.8	9:30am 30th June 2012
1 Boundary Street	4.9	7:45pm 26th June 2012
41 Casey Avenue	4.2	7:15am 13th September 2012

Table 5-11 : Minimum system pressure on the Fairfield LP pressure system

Frankton LP

The Frankton LP pressure system operates at a NOP of 7kPa. Table 5-12 provides the results from the system pressure monitoring of the Frankton LP pressure system in 2012. The minimum system pressure of 5.2kPa (74% of the NOP) was recorded at 7:15am on 20th August 2012 in Lake Domain Drive.

Location	Actual System Pressure (kPa)	Time and Date
DR-80107-HM (Outlet)	6.7	7:15pm 18th July 2012
DR-80137-HM (Outlet)	6.6	5:45pm 18th July 2012
DR-80140-HM (Outlet)	6.6	7:15pm 18th July 2012
DR-80250-HM (Outlet)	6.6	4:45pm 20th July 2012

20 Stokes Cres	5.5	6:15pm 18th July 2012
91 Forest Lake Rd	5.5	7:15pm 8th August 2012
91C Lake Domain Drive	5.2	10:45am 20th August 2012

Table 5-12 : Minimum system pressure on the Frankton LP pressure system

Hamilton West LP

The Hamilton West LP pressure system operates at a NOP of 7kPa. Table 5-13 provides the results from the system pressure monitoring of the Hamilton West LP pressure system in 2012. The minimum system pressure of 3.5kPa (50% of the NOP) was recorded at 7:30am on 13th June 2012 in Valley Terrace.

Location	Actual System Pressure (kPa)	Time and Date
DR-80110-HM (Outlet)	4.7	7:15am 22nd June 2012
24 Valley Tce	3.5	7:30am 13th June 2012

Table 5-13 : Minimum system pressure on the Hamilton West LP pressure system

Hamilton East LP

The Hamilton East LP pressure system operates at a NOP of 7kPa. The minimum system pressure of 4.5kPa (64% of the NOP) was recorded on the network at 8:00am on 23rd August 2012 in Naylor, as indicated in Table 5-14.

Location	Actual System Pressure (kPa)	Time and Date
73 Naylor St	4.5	8:00am 23rd August 2012
85 Cameron Rd	6.2	2:00pm 23rd August 2012
132 Nixon Street	5.4	7:45am 13th September 2012

Table 5-14 : Minimum system pressure on the Hamilton East LP pressure system

Parts of the Fairfield LP, Frankton LP, Hamilton West LP and Hamilton East LP pressure systems are scheduled to be replaced as part of Vector's 3-year LP/MP1 steel pipeline replacement program (refer to Section 6 for further details). The NOP will be reduced to 5kPa to ensure the over pressure protection devices are capable of maintaining no more that 110% of the system pressure MAOP of 7kPa.

As a result of the scheduled 3-year pipeline replacement program, the network configuration of the Fairfield LP, Frankton LP, Hamilton West LP and Hamilton East LP pressure systems will change. For this reason, the total forecast planning demand is yet to be calculated. However, network modelling and analysis has been undertaken in conjunction with the development of the respective project scopes to ensure any capacity constraints are addressed in the design and network reconfiguration.

5.11.6 Matangi Network System

The Matangi network system is supplied from the transmission system from one gate station located in Tauwhare Road. This network system comprises one MP4 pressure system.

5.11.6.1 Consumer Growth and Demand Forecast

The Matangi network system supplies 37 residential consumers.

Matangi's population in 2006 was 350 and is projected to increase by 86%, to 650 in 2021[49].

It is expected that future gas demand will be driven by population growth with limited growth expected in the commercial/industrial sector.

5.11.6.2 Gate Stations

Flow data for the Matangi gate station is not available and Vector does not intend to collect this information at this point in time.

5.11.6.3 District Regulating Stations

No DRS is installed in the Matangi network system.

5.11.6.4 Pressure Systems

Matangi MP4

The Matangi MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 11scmh, resulting in a MinOP of 350kPa (100% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.11.7 Morrinsville Network System

The Morrinsville network system is supplied from the transmission system from one gate station located in the south of Morrinsville. This network system consists of one IP10 pressure system, two MP4 pressure system and four DRSs.

5.11.7.1 Consumer Growth and Demand Forecast

About 710 consumers are connected to the Morrinsville network system. They are predominately residential consumers; only around 7% are commercial consumers and there is one industrial gas user.

The population in Morrinsville in 2006 was 6,800 and is projected to increase by 13%, to 7,700 in 2021[50]. It is expected that future gas demand will be driven by population growth and potential commercial and industrial activities in Morrinsville.

The peak demand in 2012 was 459scmh. An annual growth rate of around 2.7% is forecast.

5.11.7.2 Gate Stations

The Morrinsville gate station recorded a peak flow of 459scmh at 8:00pm on 19th July 2012.

5.11.7.3 District Regulating Stations

The Morrinsville network system has four DRSs which supply gas to Morrinsville MP4 pressure system and Morrinsville West MP4 pressure system.

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[49] Supra Note 38

[50] Supra Note 38

5.11.7.4 Pressure Systems

Morrinsville IP10

The Morrinsville IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 563scmh, resulting in a MinOP of 934kPa (93% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 934kPa (93% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Morrinsville MP4

The Morrinsville MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 430scmh, resulting in a MinOP of 336kPa (84% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 336kPa (84% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Morrinsville West MP4

The Morrinsville West MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 95scmh resulting in a MinOP of 326kPa (82% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 326kPa (82% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.11.7.5 Development Plans

A recent DRS rationalisation study shows that by constructing the following MP4 PE pipelines, DR-80214-MO and DR-80217-MO can be removed from service, avoiding future DRS upgrade work. As a result, the Morrinsville MP4 and Morrinsville West MP4 pressure systems will be merged together and supplied by DR-80213-MO and DR-80215-MO which will be upgraded during the planning period.

- Construct approximately 140 metres of 50mm PE MP4 in Anderson Street and remove DR-80217-MO; and
- Construct approximately 60 metres of 50mm PE MP4 in Lorne Street and remove DR-80214-MO.

5.11.8 Kiwitahi Network System

The Kiwitahi network system is supplied from the transmission system from one gate station located in Morrinsville-Walton Road. This network system comprises one MP4 pressure system.

5.11.8.1 Consumer Growth and Demand Forecast

The Kiwitahi network system supplies one large commercial consumer and one large industrial gas user. The peak demand in 2012 was 154scmh and demand growth is anticipated to be flat over the planning period.

5.11.8.2 Gate Stations

The Kiwitahi gate station recorded peak flow of 154scmh at 11:00am on 4th September 2012.

5.11.8.3 District Regulating Stations

The Kiwitahi network system has one DRS which supplies gas to Kiwitahi MP4 pressure systems.

5.11.8.4 Pressure Systems

Kiwitahi MP4

The Kiwitahi MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 130scmh, resulting in a MinOP of 309kPa (77% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 309kPa (77% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.11.9 Waitoa Network System

The Waitoa network system is supplied from the transmission system from one gate station located in Wood Road. This network system consists of one IP20 pressure system, one MP7 pressure system, one MP4 pressure system and two DRSs.

5.11.9.1 Consumer Growth and Demand Forecast

A total of 46 consumers are connected to the Waitoa network system comprising 30 residential consumers and 14 commercial/industrial gas users. At system peak, the total gas demand from five major gas users takes 95% of the system total flow rate.

It is expected that future gas demand will be driven by the growth of potential industrial activities in the area while residential demand will be minimal. An annual growth rate of around 2.6% is forecast.

5.11.9.2 Gate Stations

The Waitoa gate station recorded peak flow of 2,119scmh at 1:00am on 13th June 2012.

5.11.9.3 District Regulating Stations

The Waitoa network system has two DRSs, one of which supplies gas to the Waitoa MP7 pressure system and another one supplies gas to the Waitoa MP4 pressure system.

5.11.9.4 Pressure Systems

Waitoa IP20

The Waitoa IP20 pressure system operates at a NOP of 1,900kPa. The maximum flow into the system in the base year was 2,009scmh, resulting in a MinOP of 1,357kPa (71% of the NOP). Total forecast planning demand during the planning period is estimated to be 2,860scmh, resulting in a MinOP of 1,405kPa (74% of the NOP, based on the MP4 reinforcement models during the planning period). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Waitoa MP7

The Waitoa MP7 pressure system operates at a NOP of 700kPa and supplies gas to Inghams in Waihekau Road. The maximum flow into the system in the base year was 307scmh, resulting in a MinOP of 643kPa (92% of the NOP). Total forecast planning demand during the planning period is estimated to be 1,292scmh, resulting in a MinOP of 613kPa (88%

of the NOP, based on the MP4 reinforcement models during the planning period). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Waitoa MP4

The Waitoa MP4 pressure system operates at a NOP of 400kPa and supplies gas to four large industrial consumers.

The maximum flow into the system in the base year was 1,702scmh, resulting in a MinOP of 153kPa (38% of the NOP). Total forecast planning demand during the planning period is estimated to be 2,423scmh, resulting in the MinOP falling below the minimum pressure criteria.

A short term system reinforcement solution of increasing the outlet pressure of DR-80218-HM from 380kPa to 400kPa was completed in 2012.

In order to maintain supply pressure quality, the following system reinforcements are planned:

- Extend approximately 5,000 metres of 160mm MP7 PE pipeline from the existing Waitoa MP7 pressure system to connect to a proposed MP7/MP4 DRS in Ngarua;
- Install a DRS (MP7/MP4) at Ngarua;
- Extend approximately 5,200 metres of 160mm MP7 PE pipeline to the south of Waitoa and relocate a proposed new DRS to a new location to the end of the MP7 network; and
- Relocate the above DRS installation further south to a new location.

5.11.10 Cambridge Network System

The Cambridge network is supplied from the transmission system from one gate station and consists of one IP20 pressure system, two MP4 pressure systems and three DRSs.

5.11.10.1 Consumer Growth and Demand Forecast

There are currently 1,915 consumers connected to the Cambridge network system. They are predominatey residential consumers; only around 5% are commercial/industrial gas users, including two large industrial consumers.

In 2006, Cambridge's residential population was 13,225, which is projected to increase to 17,500 by the year of 2021[51]. Over the next ten years, growth is anticipated from residential development in Cambridge North and industrial activity at Hautapu.

The Waipa District Council has approved future residential development for Cambridge North where new dwellings are expected to be between 2,200 and 2,950. It is also proposed that land to the east of Victoria Road will provide for a neighbourhood centre (providing for circa 3000 square metres local commercial land use)[52].

5.11.10.2 Gate Stations

The Cambridge gate station has a capacity of 2,500scmh and recorded a peak flow of 2,047scmh at 8:00am on 21st September 2012.

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[51] See Growth Strategy & Implementation Plan 2009, www.futureproof.org.nz

[52] See Cambridge Town Concept Plan Draft, October 2009, http://www.waipa2050.co.nz/UserFiles/File/town%20concept%20plans/19th%20october%202009%20update%20files/Cambridge%20Town%20Plan%20Report%20web.pdf

The actual Cambridge network system peak flow (i.e. the gate station flow less the Dairy factory load adjacent to the gate station) was 985scmh and recorded at 8:00am on 18th June 2012.

5.11.10.3 District Regulating Stations

The Cambridge network system consists of three DRSs.

5.11.10.4 Pressure Systems

Cambridge IP20

The Cambridge IP20 pressure system operates at a NOP of 1,900kPa. The maximum flow into the system in the base year was 1,867scmh, resulting in a MinOP of 1,154kPa (61% of the NOP).

Total forecast planning demand during the planning period is estimated to be 2,026scmh, resulting in a MinOP of 1,032kPa (54% of the NOP).

However, recent analysis of the potential load growth in Cambridge suggests that the system pressure will fall below the MinOP criteria during the planning period. Recently, Vector accepted a gas supply to a 280 lot residential subdivision in St Kilda Road which will be developed in various stages over the next five years. In addition, a couple of enquiries with considerable load requirements from prospective customers were received and have been processed recently. Gas demand is estimated to increase significantly over the next couple of years; hence, capacity constraints on the Cambridge IP20 are expected.

In order to meet the growth requirements in Cambridge, the following reinforcement options have been investigated:

IP20 pipeline option:

- Construct approximately 3,400 metres of 80mm IP20 steel pipeline from the Cambridge gate station along Zig Zag Road into Swayne Road; and
- Install a DRS (IP20/MP4) at 79 Swayne Road.

MP7 pipeline option:

- Construct approximately 4,050 metres of 110mm PE MP7 from the Cambridge gate station along Zig Zag Road and Watkins Road to the junction of St Kilda Road;
- Construct approximately 1,400 metres of 110mm PE MP7 in Swayne Road between Zig Zag Road and #79 Swayne Road; and
- Install two MP7/MP4 DRS at 79 Swayne Road and at the junction of Watkins Road and St Kilda Road.

From the options considered, the IP20 pipeline reinforcements have been selected and included in the 10 year planning period.

Cambridge MP4

The Cambridge MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 1,052scmh, resulting in a MinOP of 308kPa (77% of the NOP).

Total forecast planning demand during the planning period is estimated to be 1,142scmh, resulting in a MinOP of 301kPa (75% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Bruntwood MP4

The Bruntwood MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 2scmh, resulting in a MinOP of 350kPa (88% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 350kPa (88% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.11.11 Te Awamutu Network System

The Te Awamutu network system is supplied from the transmission system from two gate stations, located at Te Awamutu and Kihikihi. The Te Awamutu network system consists of one IP10 pressure system, two MP4 pressure systems and two DRSs.

5.11.11.1 Consumer Growth and Demand Forecast

Te Awamutu network system supplies about 1,386 consumers, around 54% of whom are commercial/industrial gas users. The annual growth rate is anticipated to be flat over the planning period.

5.11.11.2 Gate Stations

The Te Awamutu network system has two gate stations (Te Awamutu and Kihikihi). Vector takes an MP4 supply from Te Awamutu gate station and IP10 supply from Kihikihi gate station at a NOP of 400kPa and 1,000kPa, respectively. The 2012 peak demand in the Te Awamutu network system was 1,276scmh at 7:00pm on 13th June 2012. Te Awamutu and Kihikihi gate stations recorded flows of 613scmh and 663scmh respectively.

5.11.11.3 District Regulating Stations

The Te Awamutu network system has two DRSs which supply gas to the Te Awamutu MP4 pressure system and the Kihikihi MP4 pressure system.

5.11.11.4 Pressure Systems

Kihikihi IP10

The Kihikihi IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 679scmh, resulting in a MinOP of 770kPa (77% of the NOP). Total forecast planning demand during the planning period is estimated to be 754scmh, resulting in a MinOP of 765kPa (77% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Te Awamutu MP4

The Te Awamutu MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 536scmh, resulting in a MinOP of 312kPa (78% of the NOP). Total forecast planning demand during the planning period is estimated to be 573scmh, resulting in a MinOP of 299kPa (75% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Kihikihi MP4

The Kihikihi MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 153scmh, resulting in a MinOP of 344kPa (86% of the

NOP). Total forecast planning demand during the planning period is estimated to be 181scmh, resulting in a MinOP of 342kPa (86% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.11.12 Waikeria Network System

The Waikeria network system is supplied from the transmission system from one gate station located in Higham Road. This network system comprises one IP20 pressure system currently supplying gas to one large customer at the end of the system.

5.11.12.1 Consumer Growth and Demand Forecast

The Waikeria network system supplies only one large commercial consumer. An annual growth rate of around 4.8% is forecast.

5.11.12.2 Gate Stations

The Waikeria gate station recorded a peak flow of 206scmh at 12:00pm on 28th June 2012.

5.11.12.3 District Regulating Stations

No DRS is installed in the Waikeria network system.

5.11.12.4 Pressure Systems

Waikeria IP20

The Waikeria IP20 pressure system operates at a NOP of 1,900kPa. The maximum flow into the system in the base year was 223scmh, resulting in a MinOP of 1,761kPa (93% of the NOP). Total forecast planning demand during the planning period is estimated to be 540scmh, resulting in a MinOP of 1,581kPa (83% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.11.13 Pirongia Network System

The Pirongia network system is supplied from the transmission system from one gate station located in Pirongia Road. This network system comprises one MP4 pressure system.

5.11.13.1 Consumer Growth and Demand Forecast

A total of 50 consumers are connected to the Pirongia network system comprising 47 residential consumers and 3 small commercial gas users. An annual growth rate of around 2.3% is forecast.

5.11.13.2 Gate Stations

The Pirongia gate station recorded a peak flow of 30scmh at 7:00pm on 18th June 2012.

5.11.13.3 District Regulating Stations

No DRS is installed in the Pirongia network system.

5.11.13.4 Pressure Systems

Pirongia MP4

The Pirongia MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 20scmh, resulting in a MinOP of 317kPa (79% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.11.14 Otorohanga Network System

The Otorohanga network system is supplied from the transmission system from one gate station located in Waitomo Valley Road. This network system comprises one MP4 pressure system.

5.11.14.1 Consumer Growth and Demand Forecast

About 180 consumers are connected to the Otorohanga network system. They are mainly residential consumers; around 21% are commercial/industrial gas users. An annual growth rate of around 0.6% is forecast.

5.11.14.2 Gate Stations

Otorohanga gate station recorded a peak flow of 163scmh at 10:00am on 11th July 2012.

5.11.14.3 District Regulating Stations

No DRS is installed in the Otorohanga network system.

5.11.14.4 Pressure Systems

Otorohanga MP4

The Otorohanga MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 168scmh, resulting in a MinOP of 315kPa (78% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 315kPa (78% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.11.15 Te Kuiti North Network System

The Te Kuiti North network system is supplied from the transmission system from one gate station located in the northwest of Te Kuiti. This network system consists of one IP10 pressure system, three MP4 pressure systems and five DRSs.

5.11.15.1 Consumer Growth and Demand Forecast

A total of 152 consumers are connected to the Te Kuiti North network system. They are mainly residential consumers; around 23% are commercial/industrial gas users. An annual growth rate of around 3.9% is forecast.

5.11.15.2 Gate Stations

The Te Kuiti North gate station recorded a peak flow of 241scmh at 8:00am on 13th September 2012.

5.11.15.3 District Regulating Stations

The Te Kuiti North network system has five DRSs which supply gas to three MP4 pressure systems.

5.11.15.4 Pressure Systems

Te Kuiti North IP10

The Te Kuiti North IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 294scmh, resulting in a MinOP of 894kPa (89% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 894kPa (89% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Hangatiki East Road MP4

The Hangatiki East Road MP4 pressure system operates at a NOP of 400kPa and is fed from a DRS inside the Te Kuiti North gate station. The maximum flow into the system in the base year was 116scmh, resulting in a MinOP of 331kPa (83% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 331kPa (83% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Seddon St MP4

The Seddon Street MP4 pressure system operates at a NOP of 400kPa and supplies Te Kuiti township via three DRSs. The maximum flow into the system in the base year was 8scmh, resulting in a MinOP of 350kPa (88% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 350kPa (88% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Te Kuiti MP4

The Te Kuiti MP4 pressure system operates at a NOP of 400kPa and is supplied from one DRS. The maximum flow into the system in the base year was 170scmh, resulting in a MinOP of 349kPa (87% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 349kPa (87% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.11.16 Te Kuiti South Network System

The Te Kuiti South network system is supplied from the transmission system from one gate station located in SH30 near Beros Road. This network system consists of one IP10 pressure system, one MP4 pressure system and one DRS.

5.11.16.1 Consumer Growth and Demand Forecast

A total of 23 consumers are connected to the Te Kuiti South network system comprising 13 residential consumers and 10 commercial/industrial gas users.

It is expected that future gas demand will be driven mainly by industrial users with minimal residential growth. Peak demand in 2012 was 933scmh and total demand forecast for 2023 is not anticipated to change.

5.11.16.2 Gate Stations

The Te Kuiti South gate station recorded a peak flow of 933scmh at 11:00am on 5th May 2012.

5.11.16.3 District Regulating Stations

No DRS is installed in the Te Kuiti South network system.

5.11.16.4 Pressure Systems

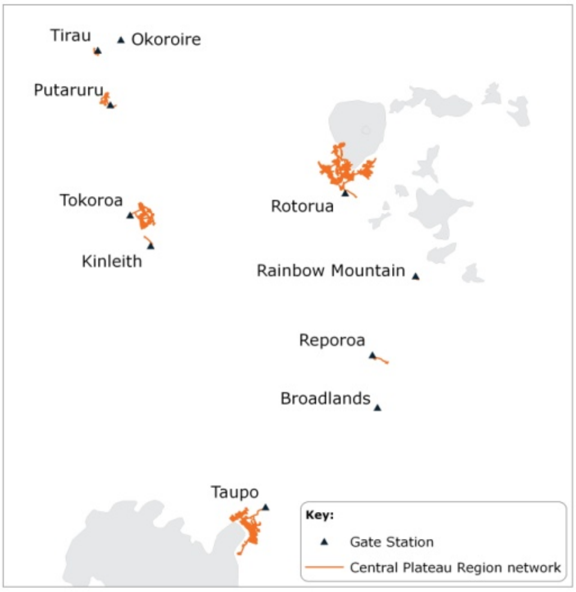
Te Kuiti South IP10

The Te Kuiti South IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 50scmh, resulting in a MinOP of 810kPa (81% of the NOP). Total forecast planning demand during the planning period is estimated to be 68scmh, resulting in a MinOP of 810kPa (81% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Te Kuiti South MP4

The Te Kuiti South MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 875scmh, resulting in a MinOP of 338kPa (82% of the NOP). Total forecast planning demand during the planning period is estimated to be 1,184scmh, resulting in a MinOP of 310kPa (78% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.12 Network Development Programme – Central Plateau Region



The Central Plateau is an extensive area of high but level country whose underlying rocks and soils are of volcanic origin; hence, it is sometimes referred to as the Volcanic Plateau. It lies in the central part of the North Island extending from Ruapehu and Lake Taupo in the south towards the Bay of Plenty in the north-east.

5.12.1 Load Forecasts

The load forecast for the Central Plateau region for the next ten years is shown in Figure 5-8.

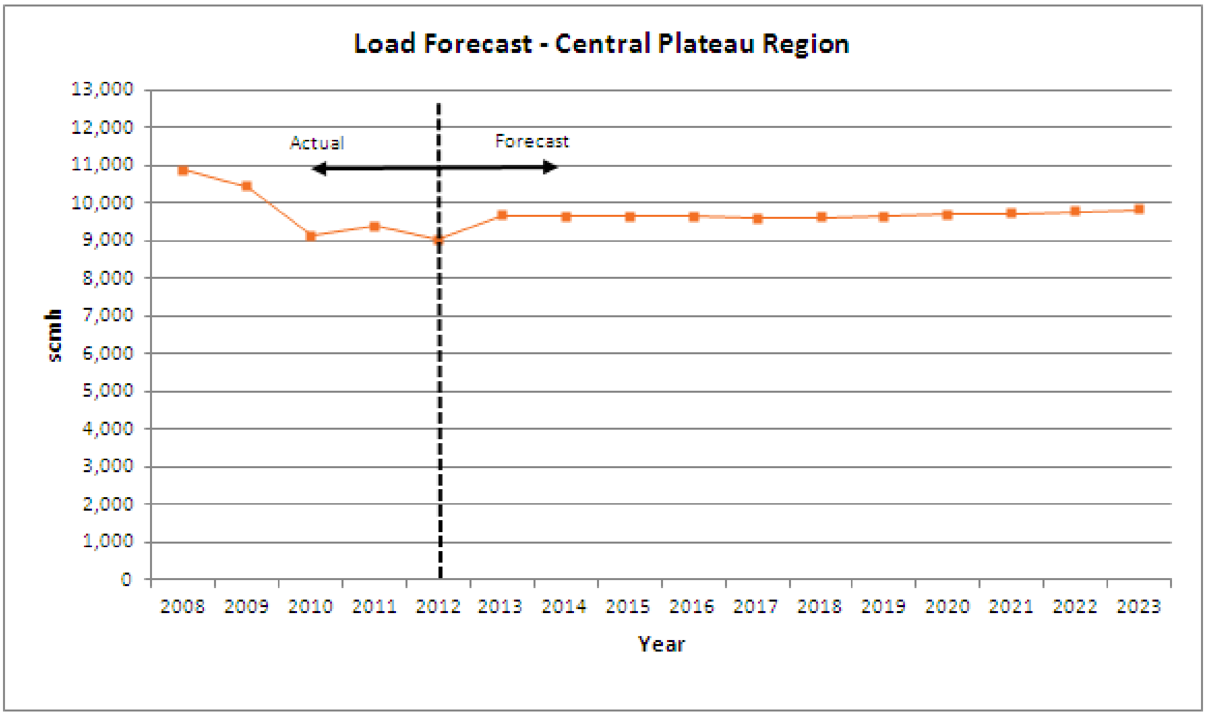


Figure 5-8 : Load forecast for Central Plateau region

Table 5-1, Table *5-15* and Table 5-16 below show the winter peak demand projection for the gate stations, DRSs and pressure systems for the Central Plateau region.

5.12.1.1 Gate Stations

The Central Plateau region takes supply from the following gate stations:

- Okoroire Springs;
- Tirau;
- Putaruru;
- Kinleith;
- Tokoroa;
- Rotorua;
- Rainbow Mountain;
- Reporoa; and
- Taupo;

The gate station winter peak demand statistics are summarised in Table 5-1.

5.12.1.2 District Regulating Stations

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-80001-RO	Rotorua MP4	546	549	554	No	DRS rebuilt in 2012
DR-80002-RO	Rotorua MP4	345	347	350	Yes	DRS to be removed in 2014
DR-80003-RO	Rotorua MP4	235	237	239	No	DRS to be upgraded in FY2017
DR-80004-RO	Tihiotonga MP4	45	45	46	No	DRS removed in FY2013
DR-80005-RO	Waipa MP4	219	220	222	No	
DR-80006-RO	Rotorua MP4	287	289	292	No	DRS to be upgraded in 2014 (refer to Section 6)
DR-80007-RO	Rotorua MP4	343	345	349		DRS removed in 2012
DR-80008-RO	Rotorua MP4	187	188	190	No	DRS to be removed in 2014
DR-80009-RO	Rotorua East MP4	215	217	219	Yes	DRS upgraded in FY2013 (Refer to Section 6)
DR-80010-RO	Rotorua East MP4	192	193	195	No	
DR-80012-RO	Rotorua MP4	144	145	146	No	
DR-80013-RO	Rotorua East MP4	63	63	64	No	
DR-80015-RO	Rotorua East MP4	34	35	35	No	DRS removed in FY2013

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-80016-RO	Rotorua East MP4	16	17	17	No	
DR-80029-RE	Reporoa MP4	27	28	31	No	
DR-80030-RM	Rainbow Mountain MP4	1	1	1	No	DRS removed in FY2013
DR-80072-TO	Tokoroa MP4	126	126	126	No	DRS rebuilt in 2012
DR-80078-TO	Tokoroa MP4	444	444	444	No	DRS rebuilt in 2012
DR-80095-PU	Putaruru MP4	626	650	689	No	
DR-80119-TO	Tokoroa MP4	703	703	703	No	DRS rebuilt in 2012
DR-80165-RO	Rotorua MP4	217	219	221	Yes	DRS to be removed in 2014
DR-80170-RO	Rotorua MP4	135	136	137	No	
DR-80177-TA	Taupo MP4	No data	No data	No data	No	Replaced DR80080-TA in 2010
DR-80178-TA	Taupo MP4	No data	No data	No data	No	Replaced DR-80080-TA in 2010
DR-80219-TI	Tirau MP4	4	4	4	No	DRS rebuilt in 2012
DR-80220-TI	Tirau MP4	53	53	53	No	DRS rebuilt in 2012
DR-80221-PU	Putaruru MP4	168	174	184	No	

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-80232-RO	FRI MP4	294	296	299	Yes	DRS to be upgraded in FY2017
DR-80233-RO	Rotorua MP4	157	158	160		DRS removed in 2012
DRS (NEW)	Taupo MP7 (Proposed)		1075	1249		Proposed
DRS (NEW)	Taupo MP4 (Proposed)		1075	1249		Proposed

Table 5-15 : Central Plateau region DRS capacity and peak demands (in scmh)

5.12.1.3 Pressure Systems

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Okoroire MP4	Okoroire	No data	No data	No data		No model
Tirau MP4	Tirau	349	349	349	Yes	
Tirau IP10	Tirau	1006	1006	1006	Yes	
Putaruru MP4	Putaruru	301	298	291	Yes	
Putaruru IP10	Putaruru	942	942	940	Yes	
Kinleith MP4	Kinleith	292	292	292	Yes	

Pressure System	**Network System**	**2013**	**2017**	**2023**	**Meets operating pressure criteria**	**Comments**
Tokoroa MP4	Tokoroa	828	828	828	Yes	
Tokoroa IP10	Tokoroa	227	213	199	Yes	
Tihiotonga MP4	Rotorua	348	348	348	Yes	
Rotorua East MP4	Rotorua	277	276	274	Yes	
FRI MP4	Rotorua	220	219	216	Yes	
Rotorua MP4	Rotorua	298	298	297	Yes	
Waipa MP4	Rotorua	333	333	332	Yes	
Rotorua IP20	Rotorua	1218	1211	1201	Yes	
Rainbow Mountain MP4	Rainbow Mountain	No data	No data	No data		No model
Rainbow Mountain IP10	Rainbow Mountain	1085	1085	1085	Yes	
Reporoa MP4	Reporoa	348	348	347	Yes	
Reporoa IP20	Reporoa	1428	1428	1428	Yes	
Taupo MP4	Taupo	269	255	194	No	Reinforcement in 2014.

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Taupo MP7 (Proposed)	Taupo	610	604	589		New MP7 pressure system to be constructed in 2014
Taupo IP20	Taupo	1712	1712	1711	Yes	

Table 5-16 : Central Plateau region pressure system capacity and peak demands (in kPa)

5.12.2 Okoroire Network System

The Okoroire network system is supplied from the transmission system from one gate station located in Somerville Road. This network system comprises one MP4 pressure system.

5.12.2.1 Consumer Growth and Demand Forecast

The Okoroire network system supplies one residential consumer and one large commercial gas user. Gas demand is not anticipated to change within the planning period.

5.12.2.2 Gate Stations

Flow data for the Okoroire gate station is not available and collecting this information is not intended at this point in time.

5.12.2.3 District Regulating Stations

No DRS is installed in the Okoroire network system.

5.12.2.4 Pressure Systems

Okoroire MP4

The Okoroire MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 8scmh, resulting in a MinOP of 300kPa (100% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.12.3 Tirau Network System

The Tirau network system is supplied from the transmission system from one gate station located in Okoroire Road. This network system consists of one IP10 pressure system, one MP4 pressure system and two DRSs.

5.12.3.1 Consumer Growth and Demand Forecast

A total of 76 consumers are connected to the Tirau network system, comprising 59 residential consumers and 17 commercial/industrial gas users. An annual growth rate of around 6% is forecast.

5.12.3.2 Gate Stations

The Tirau gate station recorded a peak flow of 55scmh at 7:00pm on 5th July 2012.

5.12.3.3 District Regulating Stations

The Tirau network system has two DRSs which supply gas to the Tirau MP4 pressure system.

5.12.3.4 Pressure Systems

Tirau IP10

The Tirau IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 57scmh, resulting in a MinOP of 1,006kPa (100% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 1,006kPa (100% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Tirau MP4

The Tirau MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year results in a MinOP of 349kPa (87% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 349kPa (87% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.12.4 Putaruru Network System

The Putaruru network system is supplied from the transmission system from one gate station located in Bridge Street. This network system consists of one IP10 pressure system, one MP4 pressure system and two DRSs.

5.12.4.1 Consumer Growth and Demand Forecast

There are 350 consumers connected to the Putaruru network system with around 11% of commercial/industrial gas users. An annual growth rate of around 0.4% is forecast.

5.12.4.2 Gate Stations

The Putaruru gate station recorded a peak flow of 507scmh at 8:00pm on 14th June 2012.

5.12.4.3 District Regulating Stations

The Putaruru network system has two DRSs which supply gas to the Putaruru MP4 pressure system.

5.12.4.4 Pressure Systems

Putaruru IP10

The Putaruru IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 560scmh resulting in a MinOP of 948kPa (95% of the NOP). Total forecast planning demand during the planning period is estimated to be 873scmh, resulting in a MinOP of 940kPa (94% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Putaruru MP4

The Putaruru MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 560scmh resulting in a MinOP of 325kPa (81% of the NOP). Total forecast planning demand during the planning period is estimated to be 873scmh, resulting in a MinOP of 291kPa (73% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.12.5 Kinleith Network System

The Kinleith network system is supplied from the transmission system from one gate station located near the junction of Old Taupo Road and Kinleith Road. This network system consists of one MP4 pressure system.

5.12.5.1 Consumer Growth and Demand Forecast

The Kinleith network system supplies 5 residential consumers and 2 large industrial gas users. An annual growth rate of around 0.6% is forecast.

5.12.5.2 Gate Stations

The Kinleith gate station recorded a peak flow of 252scmh at 1:00pm on 6th July 2012. The gate station that supplies the Kinleith MP4 is located in the same site as the supply to Kinleith Mills.

5.12.5.3 District Regulating Stations

No DRS is installed in the Kinleith network system.

5.12.5.4 Pressure Systems

Kinleith MP4

The Kinleith MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 235scmh, resulting in a MinOP of 267kPa (67% of the NOP). Total forecast planning demand during the planning period is estimated to be 354scmh, resulting in a MinOP of 199kPa (49% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.12.6 Tokoroa Network System

The Tokoroa network system is supplied from the transmission system from one gate station located in Baird Road near Old Taupo Road. This network system consists of one IP10 pressure system, one MP4 pressure system and three DRSs.

5.12.6.1 Consumer Growth and Demand Forecast

About 1,025 consumers are connected to the Tokoroa network system. They are mainly residential consumers; only 11% are commercial/industrial gas users.

Demand growth is forecast to be relatively flat during the planning period. However, Vector has noted that gas demand may increase as a result of a new development at the Tokoroa Industrial Park in Browning Street.

5.12.6.2 Gate Stations

The Tokoroa gate station recorded a peak flow of 803scmh at 8:00am on 24th May 2012.

5.12.6.3 District Regulating Stations

The Tokoroa network system has three DRSs which supply gas to the Tokoroa MP4 pressure system.

5.12.6.4 Pressure Systems

Tokoroa IP10

The Tokoroa IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 869scmh resulting in a MinOP of 873kPa (73% of the NOP).

Total forecast planning demand in 2013 is expected to be 1,274scmh, resulting in a MinOP of 582kPa (49% of the NOP). System pressure is forecast to fall below the MinOP criteria during the planning period.

The following reinforcement was completed in FY2013:

- Uprate the Tokoroa IP10 pressure system to IP20 (including the upgrade of the Tokoroa gate station), and upgrade DR-80072-TO, DR-80078-TO and DR-80119-TO.

The pressure up-rating of the Tokoroa IP10 pressure system from 1,000kpa to a new NOP of 1,900kpa will result in a 62% increase in capacity. With this reinforcement in place, no further constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Tokoroa MP4

The Tokoroa MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system results in a MinOP of 267kPa (67% of the NOP).

Total forecast planning demand in 2013 results in a system MinOP of 291kPa (73% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.12.7 Rotorua Network System

The Rotorua network system is supplied from the transmission system from one gate station located in the south of Rotorua in SH5. This network system consists of one IP20 pressure system, five MP4 pressure systems and 16 DRSs.

5.12.7.1 Consumer Growth and Demand Forecast

About 3,968 consumers are connected to the Rotorua network system. They are predominately residential consumers; only around 10% are commercial/industrial gas users.

Rotorua’s population was 68,100 at the 2006 Census. The population is forecast to reach 71,986 in 2021 and 75,359 by 2051[53].

Household occupancy is forecast to trend down from 3 people per occupied dwelling in 2001 to 2.67 in 2021, and 2.6 in 2051. The number of households is anticipated to increase from 26,493 in 2006 to 29,988 in 2021, and continue to grow to 32,058 in 2051[54].

The eastern suburbs show continued growth through to 2021 whilst the city experiences a reduction in population numbers. It is also believed that Hamurana, Ngongotaha and northern planning units will experience steady growth[55].

To support the growth of the industrial and commercial activities, the Rotorua District Council forecasts that an additional 44 hectares of industrial/employment land will be needed by 2021 and a further 29 hectares by 2051, while an additional 8 hectares of retail/commercial land will be needed by 2021 and a further 5 hectares by 2051[56].

It is expected that future gas demand will be driven by the growth of potential commercial/industrial activities in Rotorua. The annual growth is anticipated to be flat over the planning period.

5.12.7.2 Gate Stations

The Rotorua gate station recorded a peak flow of 3,587scmh at 8:00am on 13th June 2012.

5.12.7.3 District Regulating Stations

The Rotorua network system has 16 DRSs which supply gas to five MP4 pressure systems.

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[53] Rotorua District Council Ten Year Plan 2009-2019 Part A (About Rotorua District), http://www.rdc.govt.nz/YourCouncil/CouncilDocuments/AnnTYPs/~/media/RDC/Files/CouncilDocuments/Plans/TYP0919/PartA/V1_PartA_About%20Rotorua%20District.ashx

[54] Ibid.

[55] Ibid.

[56] Ibid.

A recent study into the utilisation of DRSs has found that DR-80007-RO and DR-80015-TO can be removed from service (these DRS's were scheduled to be upgraded due to integrity issues). In addition, DR-80233-TO has been decommissioned in conjunction with the Rotorua Lake Road four-laning project.

In addition, two further DRSs in the Rotorua East MP4 pressure system and potentially up to five DRSs in the Rotorua MP4 pressure system can be decommissioned. A cost-benefit analysis will be completed in FY2014.

The planned upgrade of DR-80004-RO (a sole DRS that supplies the Tihiotonga MP4 pressure system) can be avoided by constructing a section of MP4 PE pipeline along Hemo Road (SH5) to link the Tihiotonga MP4 and Rotorua MP4 pressure systems.

5.12.7.4 Pressure Systems

Rotorua IP20

The Rotorua IP20 pressure system operates at a NOP of 1,900kPa. The maximum flow into the system in the base year was 3,765scmh, resulting in a MinOP of 1,268kPa (67% of the NOP). Total forecast planning demand during the planning period is estimated to be 4,008scmh, resulting in a MinOP of 1,201kPa (63% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Tihiotonga MP4

The Tihiotonga MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 43scmh, resulting in a MinOP of 348kPa (87% of the NOP). Total forecast planning demand during the planning period is estimated to be 46scmh, resulting in a MinOP of 348kPa (87% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

As a result of joining the Tihiotonga MP4 pressure system to the Rotorua MP4 pressure system, the following project is planned.

- Construct approximately 900 metres of 50mm PE MP4 along Hemo Road (SH5) (FY2014)

Rotorua East MP4

The Rotorua East MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 497scmh, resulting in a MinOP of 283kPa (70% of the NOP). Total forecast planning demand during the planning period is estimated to be 530scmh, resulting in a MinOP of 276kPa (69% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

FRI MP4

The FRI MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 281scmh, resulting in a 233MinOP of kPa (58% of the NOP). Total forecast planning demand during the planning period is estimated to be 299scmh, resulting in a MinOP of 216kPa (54% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Rotorua MP4

The Rotorua MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 2,476scmh, resulting in a MinOP of 303kPa (76% of the NOP). Total forecast planning demand during the planning period is estimated to be 2,638scmh, resulting in a MinOP of 297kPa (74% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Waipa MP4 Pressure System

The Waipa MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 209scmh, resulting in a MinOP of 334kPa (84% of the NOP). Total forecast planning demand during the planning period is estimated to be 222scmh, resulting in a MinOP of 332kPa (83% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.12.8 Rainbow Mountain Network System

The Rainbow Mountain network system is supplied from the transmission system from one gate station located in Okaro Road. This network system consists of one IP10 pressure system, one MP4 pressure system and one DRS.

5.12.8.1 Consumer Growth and Demand Forecast

The Rainbow Mountain network system (including gate station, DRS and pressure systems) has been scheduled to be decommissioned as a result of the single industrial gas user no longer requiring gas.

5.12.8.2 Gate Stations

Flow data for the Rainbow Mountain gate station is not available and collection of this information is not intended at this point in time.

District Regulating Stations

The Rainbow Mountain network system has one DRS which supplies gas to the Rainbow Mountain MP4 pressure systems.

5.12.8.3 Pressure Systems

Rainbow Mountain IP10

The Rainbow Mountain IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in unavailable and the pressure system is scheduled to be decommissioned in 2014.

Rainbow Mountain MP4

The Rainbow Mountain MP4 pressure system is fed by DR-80030-RM and currently delivers gas to a residential consumer.

No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

This pressure system has been planned to be decommissioned in 2014.

5.12.9 Reporoa Network System

The Reporoa network system is supplied from the transmission system from one gate station located in Parekarangi. This network system consists of one IP20 pressure system, one MP4 pressure system and one DRS.

5.12.9.1 Consumer Growth and Demand Forecast

A total of 24 consumers are connected to the Reporoa network system comprising 16 residential consumers and 8 commercial consumers and one large industrial gas user. At system peak, the large industrial user demands more than 99% of the total network system flow.

Peak demand recorded over the past couple of years has gradually decreased. An annual growth rate of around 0.2% is forecast.

5.12.9.2 Gate Stations

The Reporoa gate station recorded peak flow of 2,646scmh at 7:00am on 7th November 2012. There is an industrial consumer supplied directly from the Reporoa gate station, i.e. not connected to the IP20 network. For modelling accuracy, the load from the industrial user is deducted from the total gate station flow when modelling the Reporoa network system.

5.12.9.3 District Regulating Stations

The Reporoa network system has one DRS which supplies gas to the Reporoa MP4 pressure system.

5.12.9.4 Pressure Systems

Reporoa IP20

The Reporoa IP20 pressure system operates at a NOP of 1,900kPa. The maximum flow into the system in the base year was 2,734scmh, resulting in a MinOP of 1,425kPa (75% of the NOP). Total forecast planning demand during the planning period is estimated to be 4,596scmh, resulting in a MinOP of 1,420kPa (75% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Reporoa MP4

The Reporoa MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 18scmh, resulting in a MinOP of 349kPa (87% of the NOP). Total forecast planning demand during the planning period is estimated to be 31scmh, resulting in a MinOP of 347kPa (87% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.12.10 Taupo Network System

The Taupo network system is supplied from the transmission system from one gate station located in Rakaunui Road. This network system consists of one IP20 pressure system, one MP4 pressure system and two DRS.

5.12.10.1 Consumer Growth and Demand Forecast

About 2,137 consumers are connected to the Taupo network system. They are predominately residential consumers; only around 10% are commercial/industrial gas users.

Taupo's district's population in 2010 was 34,000. Population has increased at a rate of 1.8% since the 2006 Census year. Growth projections show that Taupo's population is anticipated to reach around 35,000 by 2021, before stabilising from that point over the following decade[57].

The estimated number of houses in Taupo in March 2010 was 19,061. Latest Statistics NZ projections indicate household/dwelling numbers in Taupo will increase 14% over the 2010-2031 period[58].

Significant residential subdivision developments are anticipated in the Wharewaka East (980 units) and Eastern Urban Land (2,200 units) areas, located south of Taupo. With respect to industrial land use, the Taupo District Council has identified three industrial growth areas: Centennial/Rakaunui Road, Broadlands Road & State Highway 5 and the Taupo airport land, which will promote industrial activity[59].

Over the next ten years, a major residential subdivision and a diverse range of industrial activities are anticipated to drive the increase in gas usage in the Taupo district. An annual growth rate of around 4.1% is forecast.

5.12.10.2 Gate Stations

The Taupo gate station recorded a peak flow of 1,186scmh at 7:00pm on 3rd July 2012.

5.12.10.3 District Regulating Stations

The Taupo network system has two DRSs which supply gas to the Taupo MP4 pressure systems. As part of the reinforcement options, one of the DRSs will be set to provide an MP7 outlet for the proposed Taupo MP7 pressure system.

5.12.10.4 Pressure Systems

Taupo IP20

The Taupo IP20 pressure system operates at a NOP of 1,900kPa. The maximum flow into the system in the base year was 1,294scmh, resulting in a MinOP of 1,712kPa (90% of the NOP). Total forecast planning demand during the planning period is estimated to be 1,997scmh, resulting in a MinOP of 1,712kPa (90% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Gas supply to a major industrial consumer (estimated load over 4,000scmh) located at the extremity of the Taupo IP20 pressure system was disconnected in 2006, resulting in a significant decrease in gas flow.

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[57] Taupo District Economic Trends Update Report, June 2010, http://www.taupodc.govt.nz/Global/Enterprise/Reports/Taupo%20District%20Economic%20Profile%20and%20Trends%20Report%20June%202010.pdf

[58] Ibid footnote 57.

[59] Taupo Urban Commercial and Industrial Structure Plan, adopted 25th January 2011, http://www.taupodc.govt.nz/Documents/Policy/Taupo%20Urban%20Commercial%20and%20Industrial%20Structure%20Plan/Taupo%20Urban%20Commercial%20and%20Industrial%20Structure%20Plan%20-%2025%20Jan%202011%20(Part%20B%20for%20web)%232.pdf

Taupo MP4

The Taupo MP4 pressure system operates at a NOP of 400kPa. A section of MP7 PE pipeline has been constructed and is interlinked to this MP4 system. The maximum flow into the system in the base year was 1,294scmh, resulting in a MinOP of 272kPa (68% of the NOP). Total forecast planning demand in 2016 is estimated to be 1,775scmh, resulting in the system pressure falling below the MinOP criteria. The following system reinforcements are planned:

- Construct a 125mm diameter PE MP7 pipeline approximately 3,400 metres long from Centennial Drive along A C Baths Avenue, Taharepa Road, into Kiddle Drive junction of Birch Street; and
- Construct and install a new DRS (MP7/MP4) at Birth Street and Kiddle Drive.

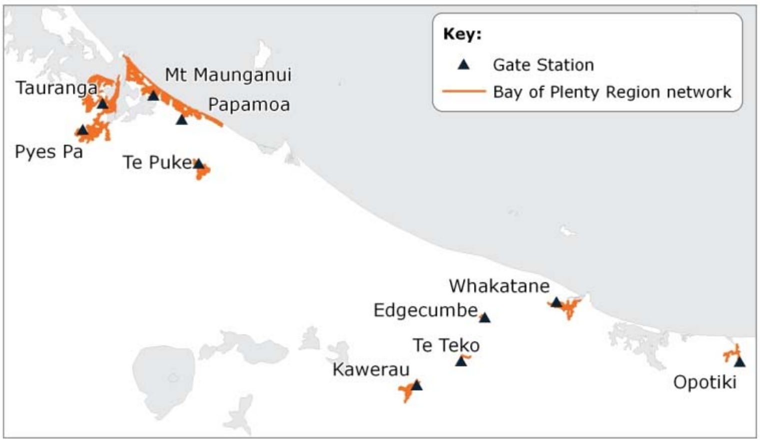
With the above reinforcements in place, the system MinOP would be 255kPa (64% of the NOP).

Total forecast planning demand during the planning period is estimated to be 1,997scmh, resulting in a MinOP of 194kPa (49% of the NOP). System pressure is forecast to marginally fall below the MinOP criteria during the planning period. Further reinforcement options will be developed once the planned projects are implemented.

5.12.10.5 Development Plans

As a result of the reinforcements listed above, a new MP7 pressure system will be created, which is anticipated to be commissioned over the next five years.

5.13 Network Development Programme – Bay of Plenty Region



The Bay of Plenty region stretches from the base of the Coromandel Peninsula in the west to Cape Runaway in the east. The region is bounded by the Kaimai and Mamaku Ranges in the west and extends inland to the sparsely populated forest lands around Rotorua, Kawerau and Murupara.

5.13.1 Load Forecasts

The load forecast for the Bay of Plenty region for the next ten years is shown in Figure 5-9.

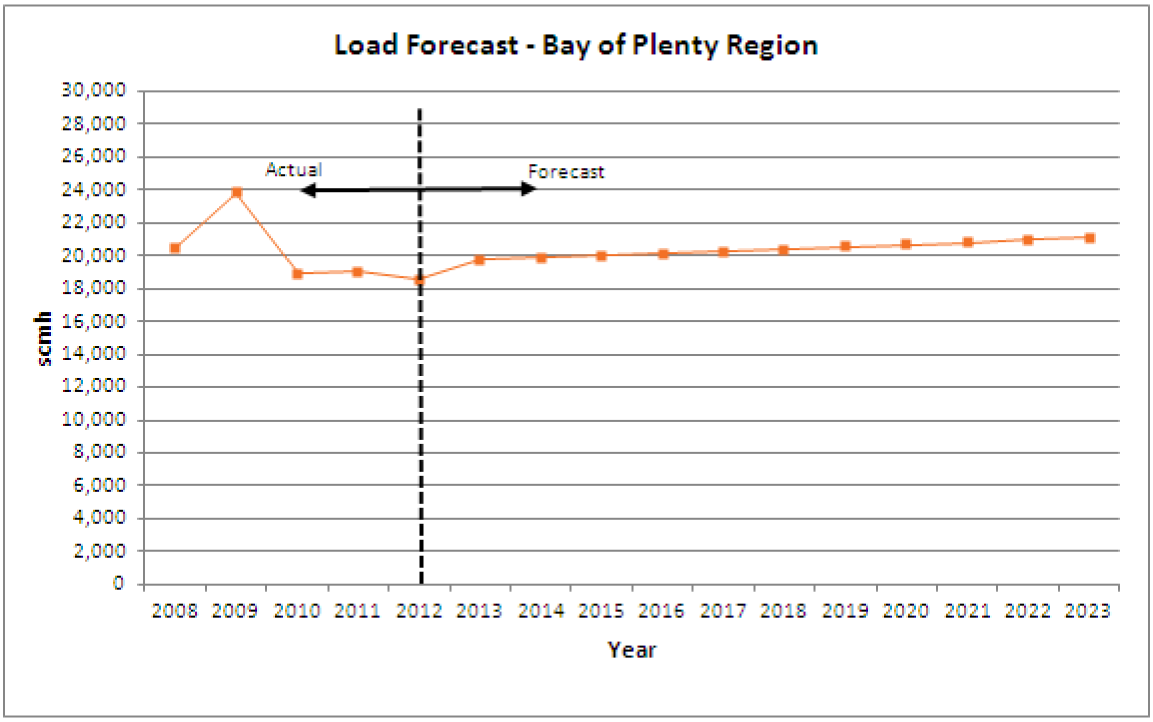


Figure 5-9 : Load forecast for Bay of Plenty region

Table 5-1, Table 5-17 and Table 5-18 show the winter peak demand projection for the gate stations, DRSs and pressure systems for the Bay of Plenty region.

5.13.1.1 Gate Stations

The Bay of Plenty region takes supply from the following gate stations:

- Tauranga;

- Pyes Pa;
- Mt Maunganui;
- Papamoa;
- Te Puke;
- Kawerau;
- Te Teko;
- Edgecumbe;
- Whakatane; and
- Opotiki;

The gate station winter peak demand statistics are summarised in Table 5-1.

5.13.1.2 District Regulating Stations

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-80018-MM	Mt Maunganui MP4	1640	1645	1653	No	DRS rebuilt in 2011
DR-80019-MM	Mt Maunganui MP4	372	373	376	Yes	DRS upgraded in FY2013
DR-80020-MM	Mt Maunganui MP4	398	399	401	No	DRS to be rebuilt in FY2016 (refer to Section 6)
DR-80024-TR	Tauranga MP4	1429	1463	1522	No	
DR-80025-TR	Tauranga MP4	42	50	63	No	DRS to be upgraded in 2014 in conjunction with Tauranga IP pressure up-rate
DR-80026-TP	Te Puke MP4	327	327	327	No	
DR-80027-TP	Washer Rd MP4	63	63	63	No	
DR-80028-TP	Te Puke MP4	76	76	76	No	
DR-80031-KA	Kawerau MP4	47	47	47	Yes	DRS upgraded in FY2013 (refer to Section 6)
DR-80032-KA	Kawerau MP4	107	107	107	No	DRS to be upgraded in 2014 (refer to Section 6)
DR-80033-TT	Te Teko MP4	36	41	48	No	DRS upgraded in FY2013 (refer to Section 6)
DR-80034-WH	Whakatane MP4	750	750	750	Yes	DRS upgraded in FY2013
DR-80035-WH	Whakatane MP4	522	522	522	Yes	DRS upgraded in FY2013 (refer to Section 6)

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-80038-OP	Hospital Hill MP4	105	113	127	No	DRS to be upgraded in FY2015 (refer to Section 6)
DR-80079-TR	Birch Ave MP4	185	194	211	Yes	DRS to be upgraded in 2014 in conjunction with Tauranga IP pressure up-rate
DR-80093-TR	Tauranga MP4	549	615	725	Yes	DRS to be upgraded in 2014 in conjunction with Tauranga IP pressure up-rate
DR-80174-OP	Opotiki MP4	105	113	127	No	DRS upgraded in FY2013 (refer to Section 6)
DR-80176-MM	Mt Maunganui MP4	144	147	153	No	Replaced in 2010
DR-80179-MM	Tip Lane MP4	85	85	86	No	Replaced in 2011
DR-80229-TR	Tauranga MP4	188	222	279	No	DRS to be upgraded in 2014 in conjunction with Tauranga IP pressure up-rate
DR-80239-MM	Mt Maunganui MP4	619	622	625	No	
DR-80240-MM	Mt Maunganui MP4	357	358	359	No	
DR-80248-KA	Paora St MP4	6	6	6	No	
DR-80251-WH	Mill Rd MP4	510	510	510	Yes	DRS to be upgraded in FY2015 (refer to Section 6)

Table 5-17 : Bay of Plenty region DRS capacity and peak demands (in scmh)

5.13.1.3 Pressure Systems

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Tauranga MP4	Tauranga	249	237	215	Yes	
Birch Ave MP4	Tauranga	328	326	322	Yes	Merged into Tauranga MP4 in 2011
Tauranga IP10	Tauranga	802	760	674	Yes	
Tip Lane MP4	Mt Maunganui	305	305	305	Yes	
Mt Maunganui MP4	Mt Maunganui	311	311	310	Yes	
Papamoa IP20	Mt Maunganui	1608	1608	1608	Yes	
Mt Maunganui IP20	Mt Maunganui	1182	1174	866	No	System requires reinforcement in FY2021
Washer Rd MP4	Te Puke	350	350	350	Yes	
Te Puke MP4	Te Puke	325	325	325	Yes	
Te Puke IP10	Te Puke	965	965	965	Yes	
Paora St MP4	Kawerau	350	350	350	Yes	
Kawerau MP4	Kawerau	346	346	346	Yes	
Kawerau IP10	Kawerau	622	622	622	Yes	

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Te Teko MP4	Te Teko	350	350	350	Yes	
Te Teko IP10	Te Teko	719	719	719	Yes	
Edgecumbe MP4	Edgecumbe	360	360	360	Yes	
Edgecumbe IP20	Edgecumbe	1921	1921	1920	Yes	
Mill Rd MP4	Whakatane	295	295	295	Yes	
Whakatane MP4	Whakatane	221	221	221	Yes	
Whakatane IP20	Whakatane	1508	1508	1508	Yes	
Hospital Hill MP4	Opotiki	No data	No data	No data		No model
Opotiki MP4	Opotiki	No data	No data	No data		No model
Opotiki IP10	Opotiki	1109	1106	1100	Yes	

Table 5-18 : Bay of Plenty region pressure system capacity and peak demands (in kPa)

5.13.2 Tauranga Network System

The Tauranga network system is supplied from the transmission system from two gate stations, located at Te Reti in the central Tauranga and Pyes Pa in the South West. The Tauranga network system consists of one IP10 pressure system, one MP4 pressure system and five DRSs.

5.13.2.1 Consumer Growth and Demand Forecast

About 4,527 consumers are connected to the Tauranga network system. They are predominately residential consumers; only around 8% are commercial/industrial gas users.

The 2006 Census showed Tauranga's residential population was 103,635, which is projected to increase to 142,295 by the year 2021.

Tauranga is one of the fastest growth areas in the North Island and has experienced particularly strong growth in the last few years. At present, the Grasshopper development (Tauiko Business Estate) is the largest project in the region, with Pyes Pa area also planned to be developed continuously over the next few years. The distribution network is maturing and network capacity will have to be reviewed on a regular basis in the coming years.

The highest load growth is expected to occur around the Grasshopper, Pyes Pa and Bethlehem areas. There is also an expectation of some new major industrial and commercial loads requiring connections in the next ten years.

An annual growth rate of around 2.3% is forecast.

5.13.2.2 Gate Stations

The Tauranga network system has two gate stations (Tauranga and Pyes Pa). Vector gas distribution takes an IP10 supply from Tauranga gate station at a NOP of 1,000kPa and an MP4 supply from Pyes Pa gate station at a NOP of 400kPa. The 2012 peak demand in the Tauranga network system was 2,254scmh at 9:00am on 13th June 2012. Tauranga and Pyes Pa gate stations recorded flows of 1,745scmh and 509scmh respectively.

5.13.2.3 District Regulating Stations

The Tauranga network system consists of five DRSs which supply gas to one MP4 pressure system.

5.13.2.4 Pressure Systems

Tauranga IP10

The Tauranga IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 2,260scmh, resulting in a MinOP of 911kPa (91% of the NOP).

Total forecast planning demand during the planning period is estimated to be 3,224scmh, resulting in a MinOP of 674kPa (67% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Although the current demand forecast indicates no constraints in the IP10 system, network modelling of the IP and MP4 pressure systems indicates that these pressure systems have only sufficient capacity to meet current loads, including recently committed loads plus projected incremental base-load growth up to 2015. Beyond this time, the system becomes constrained and is forecast to fall below the MinOP criteria during the planning period.

Options to improve the system capacity have been considered and the preferred option, to up-rate the IP10 system to 1,700kPa, was selected.

The proposal involved decommissioning and re-testing the pipeline prior to pressure up-rating to 17bar. In order to decommission the IP10 pipeline for testing, additional MP links have been identified to allow the existing MP systems to be supplied from the Tauranga and Pyes Pa gate stations. Prior to the decommissioning of the Tauranga IP10 system, the following PE MP4 links have been constructed to allow the Tauranga MP4 and Birch Avenue MP4 systems to be supplied from DR-80079-TR (located within the Tauranga gate) and the Pyes Pa gate station. The completion of the MP4 links will further improve the network pressure and security of supply on the Tauranga MP4 system.

- Approximately 430 metres of 50mm PE pipeline in Waihi Rd, to tie-in with the existing 50mm PE pipeline at the intersection of Birch Road and Waihi Road, and the existing 50mm NB PE system at the intersection of Judea Road and Waihi Road;
- Approximately 1100 metres of 100mm PE in Bradley Avenue and Freeburn Road, Pyes Pa to tie-in to the planned 100mm PE pipeline at the Grasshopper MP development and to the existing 100mm MP pipeline located in Pyes Pa Road; and
- Approximately 350 metres of 100mm PE pipeline along Pyes Pa Road and Cameron Road, Barkes Corner to bypass an existing section of 50mm pipeline.

The decommissioning and pressure re-testing work was successfully completed in FY2012. During decommissioning, and to facilitate the pressure increase, additional inlet valves were installed at three DRS sites. To accommodate the pressure increase, all DRSs in the Tauranga network system and the Tauranga gate station will be upgraded in FY2014 and FY2015. Following completion of the DRS and gate station upgrades, the Tauranga IP10 operating pressure will be increased to 1,700kPa in FY2015.

The pressure up-rating of the Tauranga IP10 pressure system from 1,000kPa to a new NOP of 1,900kPa resulted in a 100% increase in capacity. In addition, DR-800098-TR was also removed as part of the pressure re-testing project, achieving further operational efficiency.

Tauranga MP4

The Tauranga MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 2,087scmh, resulting in a MinOP of 281kPa (70% of the NOP). Total forecast planning demand during the planning period is estimated to be 2,980scmh, resulting in a MinOP of 215kPa (54% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

The following planned PE MP4 links will provide further network security and enhance supply capacity to meet new industrial and commercial load requirements over the planning period:

- Construct approximately 360 metres of 100mm PE pipeline and 400 metres of 50 PE pipeline in Condor Drive to link Oropi to Pyes Pa;
- Construct approximately 700 metres of 100mm PE pipeline between Oropi Road and Windermere Drive, and overlay approximately 1,000 metres of 50mm PE pipeline to replace several sections of 10mm PE pipeline in Windermere Drive / College Place in order to reinforce the network in Ohauiti area; and
- Construct approximately 1,500 metres of 80mm PE pipeline between Bellevue and Bethlehem.

Birch Avenue MP4 (Integrated into Tauranga MP4)

This Birth Avenue MP4 pressure system is now linked to the Tauranga MP4 pressure system following completion of the PE MP4 link in Waihi Road Judea.

5.13.3 Mt Maunganui Network System

The Mt Maunganui network system is supplied from the transmission system from two gate stations, Mt Maunganui gate station and Papamoa gate station. The Maunganui network system consists of two IP20 pressure system, two MP4 pressure systems and seven DRSs.

5.13.3.1 Consumer Growth and Demand Forecast

About 4,313 consumers are connected to the Mt Maunganui network system. They are predominately residential consumers; only around 5% are commercial/industrial gas users.

Major industrial and commercial activities are expected in the northern part of Mt Maunganui. Growth and change in gas demand will be very much dependent on the business development in this area.

The Papamoa East area provides an important opportunity for Tauranga City Council to provide green field urban development. The estimated population for Papamoa East is around 25,000 should the development potential be fully realised. Urban development would occur over a period of 20-30 years, with the first part catering for a population of around 9,200. An urban design structure plan is presented for Wairakei (Part 1), setting out how low and medium density residential land, business land and open space land will be laid out. Services structure planning provides the main roading network for the Wairakei area and locations of necessary bulk infrastructure. The timing and way development occurs will depend on landowner responses, influencing the ultimate resident population.

An annual growth rate of around 1.1% is forecast.

5.13.3.2 Gate Stations

The Mt Maunganui network system has two gate stations (Mt Maunganui and Papamoa). Vector takes an IP20 supply from both stations at a NOP of 1,900kPa. The 2012 peak demand in the Mt Maunganui network system was 3,624scmh at 7:00pm on 25th June 2012. Mt Maunganui and Papamoa gate stations recorded peak flows of 2,920scmh and 704scmh, respectively.

5.13.3.3 District Regulating Stations

The Mt Maunganui network system consists of seven DRSs which supply gas to two MP4 pressure systems.

Mt Maunganui IP20

The Mt Maunganui IP20 pressure system operates at a NOP of 1900kPa. The maximum flow into the system in the base year was 2,960scmh, resulting in a MinOP of 1,486kPa (78% of the NOP).

Total forecast planning demand during the planning period is estimated to be 4,266scmh, resulting in a MinOP of 866kPa (46% of the NOP), therefore falling below the minimum system pressure criteria.

To improve the performance and capacity of the DRSs in Mt Maunganui, DR-80018-MM, DR-80240-MM, DR-80019-MM and DR-80021-MM (completed with new DR-80176-MM) have been upgraded.

The following long-term reinforcement options are being considered:

- Up-rate the IP20 pipeline from Mt Maunganui gate station to Hewletts Road. This option also requires the upgrade of Mt Maunganui gate station and installation of a new DRS near Hewletts Road; and
- Create IP20 pipeline loops. Possible solution would be to construct approximately 2,400 metres of 80mm IP20 steel pipeline along Newton Street, Hull Road into Totara Road Mt Maunganui.

Papamoa IP20

The Papamoa IP20 pressure system operates at a NOP of 1,900kPa. The maximum flow into the system in the base year was 497scmh, resulting in a MinOP of 1,613kPa (85% of the NOP). Total forecast planning demand during the planning period is estimated to be 685scmh, resulting in a MinOP of 1,606kPa (85% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

To support the growth opportunities in the Papamoa East areas, the following network development projects have been identified during the planning period:

- Construct approximately 500 metres of 300mm PVC ducts (for future proof) and approximately 800 metres of 225mm MP7 PE pipeline in Domain Road;
- Construct approximately 2,800 metres of 160mm MP7 PE pipeline in Tara Road and Parton Road;
- Construct approximately 1,000 metres of 180mm MP7 PE pipeline in Parton Road;
- Construct approximately 1,700 metres of 225mm MP7 PE pipeline in Tara Road;
- Install a DRS (MP7/MP4) at the junction of Parton Road and Papamoa Beach Road; and
- Install a DRS (IP20/MP7) inside Papamoa gate station.

Mt Maunganui MP4

The Mt Maunganui MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 2,781scmh, resulting in a MinOP of 325kPa (81% of the NOP). Total forecast planning demand during the planning period is estimated to be 3,567scmh, resulting in a MinOP of 300kPa (75% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Tip Lane MP4

The Tip Lane MP4 pressure system operates at a NOP of 400kPa and is supplied by DR-80227-MM. The maximum flow into the system in the base year was 67scmh, resulting in a MinOP of 314kPa (76% of the NOP). Total forecast planning demand during the planning period is estimated to be 86scmh, resulting in a MinOP of 299kPa (75% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

A capacity request to supply the Tauranga Indoor Sports and Exhibition Centre Games in Truman Lane was approved and DR-80227-MM was upgraded in 2010.

5.13.4 Te Puke Network System

The Te Puke network system is supplied from the transmission system from one gate station located in Washer Road. This network system consists of one IP10 pressure system, two MP4 pressure systems and three DRSs.

5.13.4.1 Consumer Growth and Demand Forecast

About 617 consumers are connected to the Te Puke network system. They are predominately residential consumers; only around 9% are commercial/industrial gas users.

Te Puke's population in 2006 was 521 and is projected to increase by 34% to 700 in 2021 and by 60% by 2051. Residential development in Te Puke continues to grow but is limited to protect versatile and productive horticultural land[60]. Industrial land is progressively being developed which will provide up to 50 hectares of usable land by 2021. An example of this is the major industrial subdivision in the Te Puke West Industrial area. It is expected that future gas demand will be driven by the potential commercial and industrial activities, while new residential demand will be minimal.

An annual growth rate of around 7.1% is forecast.

5.13.4.2 Gate Stations

The Te Puke gate station recorded a peak flow of 456scmh at 9:00pm on 18th June 2012.

5.13.4.3 District Regulating Stations

The Te Puke network system has three DRSs which supply gas to the Te Puke MP4 pressure system and the Washer Road MP4 pressure system.

5.13.4.4 Pressure Systems

Te Puke IP10

The Te Puke IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 466scmh, resulting in a MinOP of 965kPa (97% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 965kPa (97% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Te Puke MP4

The Te Puke MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 403scmh, resulting in a MinOP of 325kPa (81% of the NOP).

Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 325kPa (81% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

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[60] Smart Growth Strategy 2051 (Revised May 2007), West Bay of Plenty, http://www.smartgrowthbop.org.nz/SmartGrowth-Western-Bay-of Plenty/Strategy_IDL=2_IDT=1052_ID=4797 .html

Washer Road MP4

The Washer Road MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 63scmh, resulting in a MinOP of 350kPa (88% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 350kPa (88% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.13.5 Kawerau Network System

The Kawerau network system is supplied from the transmission system from one gate station located in East Bank Road. This network system consists of one IP10 pressure system, two MP4 pressure systems and three DRSs.

5.13.5.1 Consumer Growth and Demand Forecast

About 257 consumers are connected to the Kawerau network system. They are predominately residential consumers; only around 8% are commercial/industrial gas users. An annual growth rate of around 3.7% is forecast.

5.13.5.2 Gate Stations

The Kawerau gate station recorded a peak flow of 2,732scmh at 11:00pm on 11th August 2012.

5.13.5.3 District Regulating Stations

The Kawerau network system has three DRSs which supply gas to the Paora St MP4 pressure system and the Kawerau MP4 pressure system.

5.13.5.4 Pressure Systems

Kawerau IP10

The Kawerau IP10 pressure system operates at a NOP of 1,000kPa and is fed from the Kawerau gate station which comprises three steel pipeline laterals. One lateral distributes gas to the Paora St MP4 and Kawerau MP4, while the other two supply gas to two large industrial consumers.

The maximum flow of the section of IP10 pipeline feeding into the Paora Street MP4 and Kawerau MP4 systems in the base year was 162scmh, resulting in a MinOP of 622kPa (62% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 622kPa (62% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

The maximum flow of the section of IP10 pipeline feeding into the Kawerau (ex-Caxton) in the base year was 3834scmh, resulting in a MinOP of 622kPa (62% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 622kPa (62% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

The maximum flow of the section of IP10 pipeline feeding into the Kawerau (ex-Tasman) in the base year was 3044scmh, resulting in a MinOP of 635kPa (64% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 635kPa (64% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Paora St MP4

The Paora MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 6scmh, resulting in a MinOP of 350kPa (88% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 350kPa (88% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Kawerau MP4

The Kawerau MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 154scmh, resulting in a MinOP of 346kPa (87% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 346kPa (87% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.13.6 Te Teko Network System

The Te Teko network system is supplied from the transmission system from one gate station located in Tahuna Road. This network system consists of one IP10 pressure system, one MP4 pressure system and one DRS.

5.13.6.1 Consumer Growth and Demand Forecast

The Te Teko network system supplies 3 residential consumers and 4 commercial gas users. Total demand forecast is not anticipated to change during the planning period.

5.13.6.2 Gate Stations

The Te Teko gate station recorded a peak flow of 33 scmh at different time in 2009. Station flow data from 2010 to 2012 is not available on Vector OATIS[61].

5.13.6.3 District Regulating Stations

The Te Teko network system has one DRS which supplies gas to the Te Teko MP4 pressure system.

5.13.6.4 Pressure Systems

Te Teko IP10

The Te Teko IP10 pressure system operates at a NOP of 1,000kPa. The maximum flow into the system in the base year was 33scmh, resulting in a MinOP of 720kPa (72% of the NOP). Total forecast planning demand during the planning period is estimated to be 68scmh, resulting in a MinOP of 719kPa (72% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Te Teko MP4

The Te Teko MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 23scmh, resulting in a MinOP of 400kPa (100% of the NOP). Total forecast planning demand during the planning period is estimated to be 48scmh, resulting in a MinOP of 350kPa (88% of the NOP). No constraints have been

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[61] OATIS stands for Open Access Transmission Information System.

identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.13.7 Edgecumbe Network System

The Edgecumbe network system is supplied from the transmission system from one gate station located in Awakeri Road. This network system consists of one IP20 pressure system and one MP4 pressure system. The Edgecumbe IP20 and the Edgecumbe MP4 pressure systems are metered separately inside the gate station.

5.13.7.1 Consumer Growth and Demand Forecast

The Edgecumbe network system supplies 5 residential consumers and 5 commercial/industrial gas users. Demand growth is anticipated to be flat over the planning period.

5.13.7.2 Gate Stations

The Edgecumbe gate station recorded a peak flow of 5,903scmh at 5:00pm on 26th December 2012, during which time zero flow was recorded to the Edgecumbe MP4 pressure system.

5.13.7.3 District Regulating Stations

No DRS is installed in the Edgecumbe network system.

5.13.7.4 Pressure Systems

Edgecumbe IP20

The Edgecumbe IP20 pressure system operates at a NOP of 1,900kPa and connects to two large consumers. The maximum flow into the system in the base year was 6,022scmh, resulting in a MinOP of 1,921kPa (99% of the NOP). Total forecast planning demand during the planning period is estimated to be 6,151scmh, resulting in a NOP of 1,920kPa (99% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Edgecumbe MP4

The Edgecumbe MP4 pressure system operates at a NOP of 400kPa (currently operating at a lower pressure of 360kPa). The maximum flow into the system in the base year was 10scmh resulting in a MinOP of 360kPa (100% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 360kPa (100% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.13.8 Whakatane Network System

The Whakatane network system is supplied from the transmission system from one gate station located in Mill Road. This network system consists of one IP20 pressure system, two MP4 pressure systems and three DRSs.

There is an industrial consumer directly located adjacent to the Whakatane gate station from which gas is directly fed to this factory. The peak flow of 3,241scmh was recorded at 5:00pm on 24th February 2012.

For the Whakatane IP20 pressure system, the peak flow of 540scmh at 9:00am on 20th July 2012 was calculated based on the available hourly flow data of the industrial gas user.

5.13.8.1 Consumer Growth and Demand Forecast

About 453 consumers are connected to the Whakatane network system. They are predominately residential consumers; only around 20% are commercial/industrial gas users.

Demand growth was flat over the last few years. However, the Whakatane hospital (an existing 20TJ gas user) is anticipated to increase its demand (as a result of redevelopment in 2013/2014 to about 660scmh).

5.13.8.2 Gate Stations

The Whakatane gate station recorded a peak flow of 3,410scmh at 3:00pm on 29th August 2012. As noted above, there is an industrial consumer supplied directly from the Whakatane gate station whose supply does not enter the IP20 network. Thus its load is subtracted from the gate station meter from a modelling perspective.

5.13.8.3 District Regulating Stations

The Whakatane network system has three DRSs which supply gas to the Whakatane MP4 pressure system and Mill Road MP4 pressure system. Additional load from the Whakatane hospital has been confirmed, resulting in DR-80034-WH becoming constrained. Upgrading work to increase the capacity of DR-80034-WH has been completed in FY2013.

5.13.8.4 Pressure Systems

Whakatane IP20

The Whakatane IP10 pressure system operates at a NOP of 1,900kPa. The maximum flow into the system in the base year was 4,133scmh, resulting in a MinOP of 1,508kPa (79% of the NOP).

Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 1,508kPa (79% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Whakatane MP4

The Whakatane MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 1,272scmh resulting in a MinOP of 221kPa (55% of the NOP).

Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 221kPa (55% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Mill Road MP4

The Mill Road MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 510scmh, resulting in a MinOP of 295kPa (74% of the NOP). Total forecast planning demand during the planning period is not anticipated to change, resulting in the same MinOP of 295kPa (74% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.13.9 Opotiki Network System

The Opotiki network system is supplied from the transmission system from one gate station located in Factory Road. This network system consists of one IP10 pressure system, two MP4 pressure systems and two DRSs.

5.13.9.1 Consumer Growth and Demand Forecast

About 112 consumers are connected to the Opotiki network system. They are predominately residential consumers; only around 27% are commercial/industrial gas users. Opotiki's population has 9,000 people. Approximately half of the resident population lives in the Opotiki township with the other half living in smaller outlying communities. The resident population of the Opotiki District is expected to increase by around 10% (1% per annum) to reach 10,040 by 2016. Over the past three years there has been a steady increase in both the number of consents issued by the Opotiki Council and the value of the building consents[62].

The economy is driven primarily by agriculture, with 410 farms accounting for a total land area of 75,660ha, 38% of which is allocated for beef and dairy farming, 29% for planted forests, and 1% for horticulture units. The majority of horticultural land is planted in kiwifruit and there are plans for further developments in this industry[63].

It is expected that future gas demand will be driven by the population growth and potential industrial activities in Opotiki. The total demand forecast is anticipated to be relatively flat during the planning period.

5.13.9.2 Gate Stations

The Opotiki gate station recorded peak flow of 210scmh at 9:00am on 10th October 2012. There is an industrial consumer supplied directly from the Opotiki gate station, i.e. not connected to the IP20 network. For modelling accuracy, the load from the industrial consumer is deducted from the total gate station flow when modelling the Opotiki network system.

5.13.9.3 District Regulating Stations

The Opotiki network system has two DRSs which supply gas to the Opotiki MP4 pressure system and the Hospital Hill MP4 pressure system.

5.13.9.4 Pressure Systems

Opotiki IP10

The Opotiki IP10 pressure system operates at a NOP of 1,200kPa. The maximum flow into the system in the base year was 223scmh, resulting in a MinOP of 1,120kPa (94% of the NOP). Total forecast planning demand during the planning period is estimated to be 377scmh, resulting in a MinOP of 1,010kPa (85% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Opotiki MP4

No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

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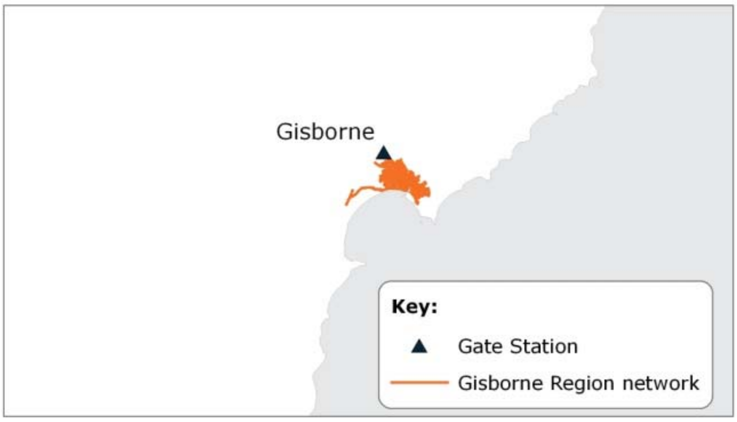
[62] See Opotiki District Council website, http://www.odc.govt.nz/AboutOpotiki/Pages/AboutOpotiki.aspx

[63] Ibid.

Hospital Hill MP4

No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.14 Network Development Programme – Gisborne Region



The region is located in the north-eastern corner of the North Island and is also referred to as the East Cape or East Coast or Eastland region. It is a sparsely inhabited and isolated region, with small settlements mainly clinging to small bays along the eastern shore such as Tokomaru Bay and Tolaga Bay.

5.14.1 Load Forecasts

The load forecast for the Gisborne region for the next ten years is shown in Figure 5-10.

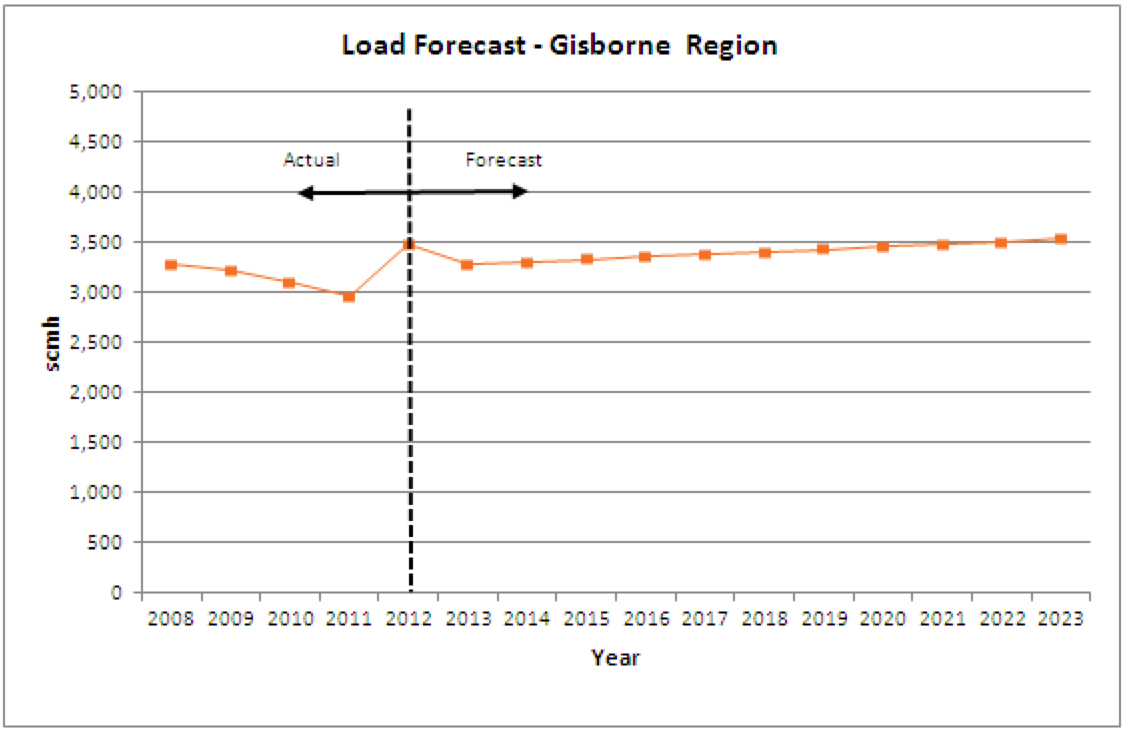


Figure 5-10 : Load forecast for Gisborne region

Table 5-1, Table 5-19 and Table 5-20 show the winter peak demand projection for the gate stations, DRSs and pressure systems for the Gisborne region.

5.14.1.1 Gate Stations

The Gisborne region takes supply from the following gate station:

- Gisborne.

The gate station winter peak demand statistics are summarised in Table 5-1.

5.14.1.2 District Regulating Stations

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-80039-GS	Gisborne MP4	60	66	78	No	
DR-80040-GS	Gisborne MP4	525	555	606	No	DRS to be upgraded in FY2014
DR-80041-GS	Gisborne MP4	200	210	228	No	DRS to be upgraded in FY2015
DR-80042-GS	Gisborne MP4	79	89	107	No	
DR-80043-GS	Gisborne MP4	0	0	0	No	
DR-80045-GS	Gisborne MP4	94	107	128	No	
DR-80046-GS	Gisborne MP4	76	82	91	No	
DR-80234-GS	Attlee Pl LP	3	3	3	No	DRS to be upgraded in FY2015 (refer to Section 6)

Table 5-19 : Gisborne region DRS capacity and peak demands (in scmh)

5.14.1.3 Pressure Systems

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Attlee Pl LP	Gisborne	7	7	7	Yes	
Gisborne MP4	Gisborne	287	280	269	Yes	
Gisborne IP20	Gisborne	1038	948	759	Yes	Reinforcement in FY2020

Table 5-20 : Gisborne region pressure system capacity and peak demands (in kPa)

5.14.2 Gisborne Network System

The Gisborne network is supplied from the transmission system from one gate station and consists of one IP20 network, one MP4 network and one LP network.

5.14.2.1 Consumer Growth and Demand Forecast

About 3,364 consumers are connected to the Gisborne network system. They are predominately residential; only around 9% are commercial/industrial gas users.

The 2006 Census data states that the population of Gisborne region is about 44,500, with about 42,000 of the population living in Gisborne City[64].

According to the Gisborne Urban Development Strategy[65], large population increases are unlikely. Development is focused within the existing urban area to capitalise on possible benefits of future population growth and to insulate the community against the impact of any population decline. 50% of dwellings built over the last 7 years were within existing residential areas, 14% in rural lifestyle areas and 36% in green field locations.

Urban development is expected to be limited to the existing urban areas and the fringe areas of Taruheru, Kaiti, Sponge Bay and Wainui. Ample land is available within these areas for infill housing and new development. More housing will be required within the existing urban area to accommodate the expected increase in numbers of households regardless of any total population growth[66].

The Gisborne District Council also recognises that a compact city helps to future proof the Gisborne urban area. Varied and intensive housing styles will be facilitated. Redevelopment will be encouraged in and around the suburban commercial hubs[67].

Gas demand is expected to be driven by infill housing, medium density and commercial developments over the next ten years. Total forecast planning demand for 2023 is expected to be 3,536scmh.

Vector has recently committed to supply gas to two commercial and industrial consumers with a combined load of 750scmh. These proposed services will likely connect to the Gisborne MP4 in FY14. It is anticipated that the system peak of the Gisborne network system will significantly over the next few years.

5.14.2.2 Gate Stations

The Gisborne gate station recorded a peak flow of 3,489scmh at 7:00am on 28th March 2012.

5.14.2.3 District Regulating Stations

The Gisborne network system has eight DRSs, seven of which supply the Gisborne MP4 pressure system, and one supplies the Attlee LP pressure system.

5.14.2.4 Pressure Systems

Gisborne IP20

The Gisborne IP20 pressure system operates at a NOP of 1,900kPa. The maximum flow into the system in the base year was 3,218scmh, resulting in a MinOP of 1,201kPa (63%

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[64] See Gisborne District Council web site, http://www.gdc.govt.nz/our-district/

[65] Gisborne Urban Development Strategy adopted in May 2009, http://www.gdc.govt.nz/assets/Strategies/Urban-Development-Strategy/Urban%20Development%20Strategy%20Adopted%20May%202009.pdf

[66] Ibid.

[67] Ibid.

of the NOP). Total forecast planning demand during the planning period is estimated to be 4,148scmh, resulting in a MinOP of 759kPa (40% of the NOP). System pressure is forecast to fall below the MinOP criteria during the planning period. The following reinforcements are planned:

- Upgrade the metering and regulator equipment at the Gisborne gate station to allow an increase in the outlet pressure from 1,700kPa to 1,840kPa; and
- Construct approximately 1,400 metres of 100mm IP20 steel pipeline in Lytton Road between Aberdeen Road and Manuka Street, Te Hapara.

Gisborne MP4

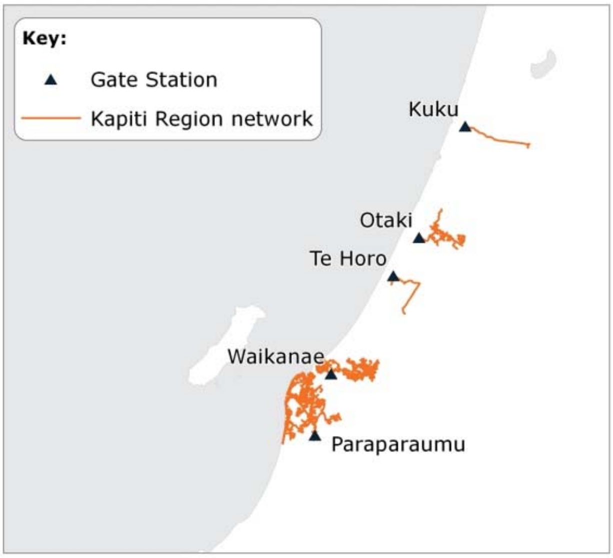
The Gisborne MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 860scmh, resulting in a MinOP of 300kPa (75% of the NOP). Total forecast planning demand during the planning period is estimated to be 1,238scmh, resulting in a MinOP of 269kPa (67% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Attlee Pl LP

The Attlee Pl LP pressure system is a carry-over from when gas was manufactured before natural gas was available in Gisborne. At the time it was considered more cost effective to install a DRS rather than renew a section of pipes on private property.

The Attlee Pl LP pressure system operates at a NOP of 7kPa. The maximum flow into the system in the base year was 2scmh, resulting in a MinOP of 7kPa (100% of the NOP). Total forecast planning demand during the planning period is estimated to be 3scmh, resulting in a MinOP of 7kPa (100% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.15 Network Development Programme – Kapiti Region



Along the Kapiti Coast, numerous small towns are located adjacent to each other, many of them occupying spaces close to popular beaches. From the north, these include Otaki, Waikanae, Paraparaumu, the twin settlements of Raumati Beach and Raumati South, Paekakariki and Pukerua Bay, the last of which is a northern suburb of Porirua. Each of these settlements has a population of between 2,000 and 10,000, making this a moderately heavily populated coastline.

5.15.1 Load Forecasts

The load forecast for the Kapiti region for the next ten years is shown in Figure 5-11.

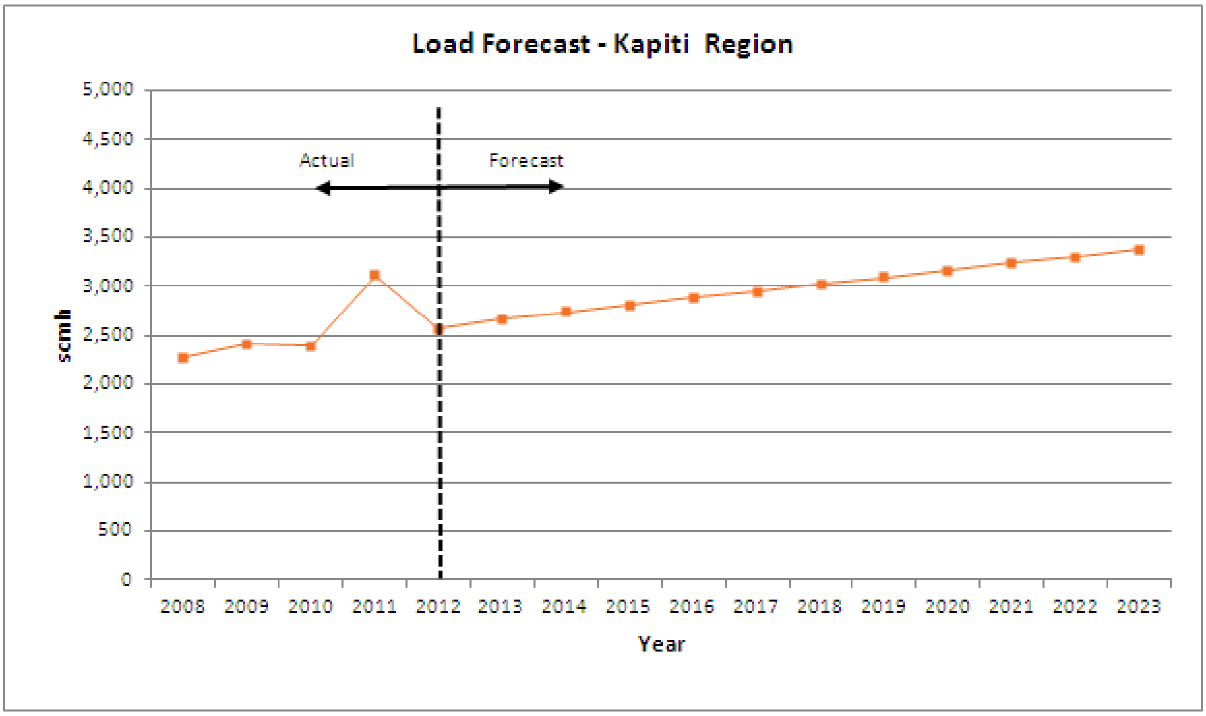


Figure 5-11 : Load forecast for Kapiti region

Table 5-1, Table 5-21 and Table 5-22 show the winter peak demand projection for the gate stations, DRSs and pressure systems for the Kapiti region.

5.15.1.1 Gate Stations

The Kapiti region takes supply from the following gate station:

- Kuku;

- Otaki;
- Te Horo;
- Waikanae; and
- Paraparaumu.

The gate station winter peak demand statistics are summarised in Table 5-1.

5.15.1.2 District Regulating Stations

DRS	Pressure System	2013	2017	2023	Breach of design capacity	Comments
DR-80052-PR	Paraparaumu MP4	374	415	288	No	
DR-80081-PR	Nikau Valley MP4	57	63	266	No	
DR-80157-PR	Paraparaumu MP4	1354	1500	1038	Yes	DRS to be upgraded in FY2014

Table 5-21 : Kapiti region DRS capacity and peak demands (in scmh)

5.15.1.3 Pressure Systems

Pressure System	Network System	2013	2017	2023	Meets operating pressure criteria	Comments
Kuku MP2	Kuku	No data	No data	No data	No data	No model
Otaki MP4	Otaki	312	310	305	Yes	
Te Horo MP4	Te Horo	No data	No data	No data	No data	No model
Waikanae MP4	Waikanae	246	233	214	Yes	
Nikau Valley MP4	Paraparaumu	343	342	Failed	Yes	Reinforcement in FY2016, FY2021
Paraparaumu MP4	Paraparaumu	232	203	Failed	Yes	Reinforcement in FY2016, FY2021
Paraparaumu IP20	Paraparaumu	619	395	Failed	Yes	Reinforcement in FY2015, FY2021

Table 5-22 : Kapiti region pressure system capacity and peak demands (in kPa)

5.15.2 Kuku Network System

The Kuku network system is supplied from the transmission system from one gate station located in Kuku Beach Road. This network system consists of one MP2 pressure system.

5.15.2.1 Consumer Growth and Demand Forecast

A total of 31 consumers are connected to the Kuku network system comprising 28 residential consumers and 3 commercial gas users. Gas demand is not anticipated to change within the planning period.

5.15.2.2 Gate Stations

Flow data for the Kuku gate station is not available and collecting this information is not intended at this point in time.

5.15.2.3 District Regulating Stations

No DRS is installed in the Kuku network system.

5.15.2.4 Pressure Systems

Kuku MP2

The Kuku pressure system used to operate at MP4 pressure but now operates at MP2. The maximum flow into the system in the base year was 6scmh, resulting in a MinOP of 200kPa (100% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.15.3 Otaki Network System

The Otaki network system is supplied from the transmission system from one gate station located in the southwest of Otaki. This network system consists of one MP4 pressure system.

5.15.3.1 Consumer Growth and Demand Forecast

About 402 consumers are connected to the Otaki network system. They are predominately residential consumers; only around 11% are commercial gas users. It is expected that future gas demand will be driven by the population growth and potential commercial activities in Otaki.

An annual growth rate of around 3.1% is forecast.

5.15.3.2 Gate Stations

The Otaki gate station recorded a peak flow of 270scmh at 9:00am on 2nd July 2012.

5.15.3.3 District Regulating Stations

No DRS is installed in the Otaki network system.

5.15.3.4 Pressure Systems

Otaki MP4

The Otaki MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 247scmh resulting in a MinOP of 321kPa (80% of the NOP). Total forecast planning demand during the planning period is estimated to be 336scmh, resulting in a MinOP of 304kPa (76% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.15.4 Te Horo Network System

The Te Horo network system is supplied from the transmission system from one gate station located in Te Horo beach Road near Pukenamu Road. This network system consists of one MP4 pressure system.

5.15.4.1 Consumer Growth and Demand Forecast

The Te Horo network system supplies 13 residential consumers and 2 commercial gas users. Gas demand is not anticipated to change within the planning period.

5.15.4.2 Gate Stations

Flow data for the Te Horo gate station is not available and due to no foreseeable constraints in the network, collecting this information is not intended at this point in time.

5.15.4.3 District Regulating Stations

No DRS is installed in the Te Horo network system.

5.15.4.4 Pressure Systems

Te Horo MP4

The Te Horo MP4 pressure system operates at a NOP of 400kPa[68]. The maximum flow into the system in the base year was 7scmh, resulting in a MinOP of 290kPa (72% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

5.15.5 Waikanae Network System

The Waikanae network system is supplied from the transmission system from one gate station located in the west of Waikanae. This network system consists of one MP4 pressure system.

5.15.5.1 Consumer Growth and Demand Forecast

About 1,491 consumers are connected to the Waikanae network system. They are predominately residential consumers; only around 3% are commercial gas users. It is expected that future gas demand will be driven by the population growth and potential commercial activities in Waikanae.

An annual growth rate of around 0.5% is forecast.

5.15.5.2 Gate Stations

The Waikanae gate station recorded a peak flow of 807scmh at 7:00pm on 31st May 2012.

5.15.5.3 District Regulating Stations

No DRS is installed in the Waikanae network system.

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[68] The current supply pressure available from the Te Horo gate station is 290kPa.

5.15.5.4 Pressure Systems

Waikanae MP4

The Waikanae MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 651scmh, resulting in a MinOP of 260kPa (65% of the NOP). Total forecast planning demand during the planning period is estimated to be 940scmh, resulting in a MinOP of 214kPa (54% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

In addition, the following projects will be investigated during the planning period:

- Construct approximately 2,800 metres of 90mm MP7 PE pipeline from Waikanae gate station along Kauri Road, Puriri Road, Greenaway Road, and Park Avenue to Ngarara Road junction of Belvedere Avenue. Upgrade Waikanae gate station with MP7 outlet;
- Install a new DRS (MP7/MP4) in Ngarara Road junction of Belvedere Avenue; and
- Construct approximately 600 metres of 50mm PE MP4 pipeline from Bevedere Avenue to David Street.

5.15.6 Paraparaumu Network System

The Paraparaumu network system is supplied from the transmission system from Paraparaumu gate station located in Valley Road. The Paraparaumu network system consists of one IP20 pressure system, two MP4 pressure system and three DRSs.

5.15.6.1 Consumer Growth and Demand Forecast

About 3,363 consumers are connected to the Paraparaumu network system. They are predominately residential consumers; only around 5% are commercial/industrial gas users.

The Paraparaumu network has been reinforced in the last couple of years, and now has sufficient capacity for growth until 2015. The network requires further reinforcement between years 2016 and 2021.

An annual growth rate of around 3.4% is forecast.

5.15.6.2 Gate Stations

The Paraparaumu gate station recorded a peak flow of 1,493scmh at 9:00am on 3rd July 2012.

5.15.6.3 District Regulating Stations

The Paraparaumu network system has three DRSs which supplies gas to two MP4 pressure systems.

5.15.6.4 Pressure Systems

Paraparaumu IP20

The Paraparaumu IP20 pressure system operates at a NOP of 1,900kPa. The maximum flow into the system in the base year was 1,520scmh, resulting in a MinOP of 808kPa (67% of the NOP). Total forecast planning demand for 2016 and 2021 are estimated to be 2,026scmh and 2,354scmh, resulting in the MinOP falling below the minimum pressure criteria during the planning period.

The following reinforcements have been identified:

- Up-rate the Paraparaumu IP20 pressure system from the current operating pressure of 1,350kPa to 1,800kPa (including the upgrade of the Paraparaumu gate station and DRS upgrades); and
- Construct approximately 2,800 metres of 125mm MP7 PE pipeline (including a bridge crossing) from Waikanae gate station (including station upgrade) and install a MP7/MP DRS (in Mazengarb Rd and Ratanui Rd) and connect into the Paraparaumu MP4 pressure system.

  Note: The Waikanae gate station is planned to be relocated in FY14 in order to facilitate the construction of the NZTA M2PP expressway project. Design and planning of the new gate station by Vector Gas Transmission has commenced.

Nikau Valley MP4

The Nikau Valley MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 345scmh, resulting in a MinOP of 333kPa (86% of the NOP). No constraints have been identified and the system pressure is not forecast to fall below the MinOP criteria during the planning period.

Paraparaumu MP4

The Paraparaumu MP4 pressure system operates at a NOP of 400kPa. The maximum flow into the system in the base year was 1,437scmh, resulting in a MinOP of 265kPa (66% of the NOP). Total forecast planning demand during the planning period is estimated to be 2,284scmh, resulting in the MinOP falling below the minimum pressure criteria during the planning period. The following reinforcements are planned:

- Construct approximately 1,900 metres of 100mm MP4 PE pipeline from the proposed MP7/MP4 DRS (in Mazengarb Rd and Ratanui Rd) along Ratanui Road to Mazengarb Road;
- Construct approximately 530 metres of 100mm MP4 PE pipeline in Raumati Road in conjunction with the NZTA M2PP project; and
- Install a 200mm PVC duct (future proof) in conjunction with NZTA M2PP expressway project.

Network constraints have been identified on the IP20 pressure system in 2016 and 2021, resulting in the MinOP falling below the minimum pressure criteria during the planning period.

The following reinforcement, which can also improve the Paraparaumu IP20, is planned. This pipeline proposal interconnects the Paraparaumu MP4 and Nikau Valley MP4 pressure systems.

- Construct approximately 580 metres of 100mm MP4 PE pipeline from DR-80081-PR in SH1 to Tutanekai Street.

5.15.6.5 Development Plans

Subject to the above reinforcements proceeding, a new Waikanae gate station will provide a second supply source to the Paraparaumu MP4 pressure system.

5.16 Network Development Programme

Table 5-23 and Table 5-24 summarise the forecast project programme for development of the gas distribution network. The table below shows the current target implementation dates for these projects.

Expenditure Description ($'000)	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
MP Reinforcements (Unknown)	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
SH20A Upgrade - George Road Drive / Kirkbride Road Intersection					$17					
Mckenzie Road along Ascot Road, Kirkbride Road and Massey Road (100nb PE MP4)	$336					$536				
Link at Roscommon Road, Wiri - 1.2km of 100nb MP4	$122									
76 Hillsborough Road to 10 Herd Road (240m of 50nb PE to Central Auckland MP4)						$65				
SH16 - Royal Road (200mm PVC duct for future proof)						$43				
SH17 - 100nb PE and Bridge Crossing to The Avenue, North Shore		$104								
Auckland Airport Reinforcement - 180m of 100nb PE MP4 in Tom Pearce Drive	$37									
Auckland Airport Reinforcement - 300m of 100nb PE MP4 in Ray Emery Drive					$61					
Auckland Airport Reinforcement - 180m of 100nb PE MP4 in Puhinui Road									$73	
Kohimarama Rd between Kepa Road and Whytehead Cr (1000m of 100nb PE MP4 Link)								$201		
Interconnection of MP4 gas mains near house no. 4 Rankin Avenue and DR0016, New Lynn		$29								

Expenditure Description ($'000)	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Upgrade of 25nb PE MP4 service to 50nb PE, CRS Monier, New Lynn			$12							
Ruskin Street between houses nos. 9 and 14, Parnell (approx. 30m of 32nb PE MP4)							$22			
Motions Road, Pt Chevalier (730m of 50nb PE MP4)						$133				
Harris Rd from Cryers Rd to Ti Rakau Dr, Pakuranga (400m of 100nb PE MP4)			$219							
Pakuranga Rd to int. of Bucklands Beach Rd, Highland Park (190m of 100nb PE MP4)									$44	
Smales Road between houses nos. 18 and 40, East Tamaki (330m of 100nb PE MP4)									$49	
From East Coast Road along Blenvar Road to Long bay development (2500m of 100nb PE)					$262					
Northcroft Street along Lake Rd to Cameron Street, Takapuna (750m of 100nb PE MP4)							$212			
50nb PE road crossing at Albert Road / Victoria Road, Devonport							$9			
50nb PE road crossing at Albert Road / Vauxhall road, Devonport, North Shore							$4			
NorSGA Development, Hobsonville - Northside Drive Bridge (future proof ducts 200mm PVC)	$100									
IP Reinforcements: Unknown	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Upgrade DR0049 in CBD, Auckland				$300						
Upgrade DR0135		$204								

Expenditure Description ($'000)	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
New Waikumete Gate Station IP link	$65									
Upgrade DRS002 Glenview for the Bruce Mclaren to Waikumete Gate Station link		$100								
Bruce Mclaren to Waikumete Gate Station IP pipeline along Great North Road	$1,250	$1,250								
IP reinforcement: 200nb IP20 steel main along Gilbert Rd and Alexander Cres. to DR0116					$660	$660				
IP reinforcement: 150mm pipeline extension to reinforce the 875kPa line in Glendowie							$2,000	$2,000	$1,249	
IP reinforcement: Upgrade DR0085									$250	
New (IP20/MP4) DRS J/O East Coast Road and Glenvar Road, Glenvar, North Shore									$220	
DRS upgrade project to address capacity issue	$50	$50	$50	$50	$50	$250	$250	$250	$250	$250
Upgrade DR075 Ellerslie Racecoure	$200									
Upgrade DR0117 EastTamaki MP		$200								
Upgrade DR0163 Kerwyn Ave MP			$200							
Upgrade DR0179 Wiri MP4				$200						
Upgrade DR183 Coronation Road					$200					

Expenditure Description ($'000)	**Forecast FY14**	**Forecast FY15**	**Forecast FY16**	**Forecast FY17**	**Forecast FY18**	**Forecast FY19**	**Forecast FY20**	**Forecast FY21**	**Forecast FY22**	**Forecast FY23**
Carry over	$50									
Provisional budget for commercial requests that support new customer growth initiatives	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Westney Rd along George Bolt Memorial Dr. to Tom Pearce Dr. (1.9km of 100nb PE MP4)				$342						
Albany Highway to 286 Appleby Road, North Harbour - 225m of 50nb PE MP4		$27								
East Coast Rd along Okura River Rd and Vaughans Rd to Long Bay development (3.8km of 100nb PE MP4)								$478		
TOTAL EXPENDITURE	**$2,510**	**$2,264**	**$781**	**$1,192**	**$1,550**	**$1,987**	**$2,797**	**$3,229**	**$2,435**	**$550**

* *Figures are in 2014 dollars ($'000);*

Table 5-23 : Network development expenditure forecast for Vector's Auckland region (financial years)

Expenditure forecasts ($'000)	**Forecast FY14**	**Forecast FY15**	**Forecast FY16**	**Forecast FY17**	**Forecast FY18**	**Forecast FY19**	**Forecast FY20**	**Forecast FY21**	**Forecast FY22**	**Forecast FY23**
MP Reinforcement - Unknown	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Tauranga - Oropi Rd to Pyes Pa Rd link - 360m of 100 mm PE and 400m of 50mm PE in Condor Drive		$88								
Reinforcement in Ohauiti area Tauranga. Solution will be various links. 700 mtrs of 100mm PE and 1,000 mtrs of 50mm PE links.			$265							
Tauranga - Bellevue to Bethlehem 1500m of 80 PE in Carmichael Rd and Millers Rd									$133	
Mt Maunganui (Papamoa) - 1000m of 180mm 7 bar PE in Parton Road							$309			
Mt Maunganui (Papamoa) - 500m of 300mm PVC duct in Domain Road (future proof)		$125								
Mt Maunganui (Papamoa) - 800m of 225mm 7 bar PE in Domain Road					$272					
Mt Maunganui (Papamoa East) - 1700m of 225mm 7 bar PE (subject to growth) Tara Road						$514				
Mt Maunganui (Papamoa) - MP7 / MP4 DRS at J/O Parton Rd and Papamoa Beach Rd								$251		
Paraparaumu bridge crossing (PVC duct future proof)		$30								
Paraparaumu 125mm 7 bar PE bridge crossing				$52						
Paraparaumu extension from Waikanae gate station (2800m of 125mm 7 bar PE)				$708						

Expenditure forecasts ($'000)	**Forecast FY14**	**Forecast FY15**	**Forecast FY16**	**Forecast FY17**	**Forecast FY18**	**Forecast FY19**	**Forecast FY20**	**Forecast FY21**	**Forecast FY22**	**Forecast FY23**
Waikanae gate station upgrade	$150				$117					
Paraparaumu reinforcement - New MP7 / MP4 DRS					$258					
Paraparaumu reinforcement - 1900m of 100 PE MP4 from the proposed MP7/MP4 DRS along Ratanui Rd to Mazengarb Rd						$200	$100			
Taupo MP4 reinforcements - 3400m of 125mm 7 bar PE								$446	$446	
Taupo MP4 reinforcements –New MP7/MP4 DRS in Kiddle Drive J/O Birch Street										$258
Paraparaumu reinforcements - 580m of 100mm MP4 PE main from DRS081 in SH1 to Tutanekai St		$134								
Waitoa MP4 reinforcements (160mm MP7 PE 5000m initial extension)		$607	$607							
Waitoa MP4 reinforcements (further extension of 160mm MP7 PE 5200m)								$631	$631	
Waitoa MP4 reinforcement (MP7/MP4 DRS at Ngarua)				$150						
Waitoa MP4 reinforcement (MP7/MP4 DRS at Ngarua) - Relocation south									$170	
IP Reinforcement - Unknown	$100	$100	$100	$100	$100	$100	$100	$100	$100	$200
Mt Maunganui IP20 loop - 2400m in Newton St and Hull Rd.							$800	$800	$876	
Mt Maunganui (Papamoa) - IP20 / MP7 DRS inside Papamoa Gate Station							$243			

Expenditure forecasts ($'000)	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Whangarei IP reinforcement - IP uprating to 17 bar									$1,246	
Whangarei IP reinforcement - DRS upgrades										$1,248
Whangarei IP reinforcement - Gate station upgrade										$240
Tauranga IP upgrade - Gate station upgrade		$253								
Tauranga IP upgrade - Upgrade DRS079, DRS229 and DRS093	$450									
Cambridge – New pipeline 3.4km of 80mm IP from GS plus 5.5km of 110mm MP7 from GS						$1,200	$1,200	$1,107		
Cambridge - 2 new DRS									$253	
Hamilton IP reinforcement - IP pipeline uprating to 17 bar		$918								
Hamilton IP reinforcement – Upgrade DRS130 and DRS145			$396							
Hamilton IP reinforcement - New IP20/IP10 DRS				$240						
Hamilton IP reinforcement - Te Kowhai gate station upgrade				$240						
Hamilton IP reinforcement: DRS139 in Te Rapa to DRS100 (7 km of 225mm PE IP10)					$784	$784	$784			
DRS upgrade project to address capacity issue	$50	$150	$150	$150	$150	$150	$150	$150	$150	$150

Expenditure forecasts ($'000)	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Upgrade DRS157, Paraparaumu	$150									
Provisional budget for commercial requests that support new customer growth initiatives.	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Whangarei MP4 Link: Central Ave between Whangarei West and Woodhill		$6								
Whangarei MP4 Link: Between Bank Street and Hunt Street - 210m of 50nb PE MP4		$25								
Whangarei MP4 Link: Central Ave from First St to Maunu Rd/Water St (140m of 50nb PE)		$17								
Drury NC reinforcement: Drury gate station along Waihoehoe Rd, Flanagan Rd and Great South Rd to the junction of Firth St (1.7km of 160mm PE MP4)			$367							
Horotiu: Up-rate the operating presure of Horotiu IP20 pressure system							$114			
Horotiu: Install IP10/MP4 DRS opposite to #5 Washer Road at SH1								$240		
Horotiu:From the new DRS to the junction of Horotiu Bridge Rd and SH1 (350m of 100nb PE MP4)									$63	
Horotiu: Horotiu Bridge Road between Washer Rd and SH1 (560m of 100nb PE MP4)										$101
Morrinsville MP4 Link - Anderson St (to remove DR-80217-MO FY2014) - 140m of 50nb PE	$17									
Morrinsville MP4 Link - Lorne St (to remove DR-80214-MO FY2017) - 60m of 50nb PE				$7						

Expenditure forecasts ($'000)	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Gisborne IP Reinforcement - Upgrade Gisborne gate station						$240				
Gisborne IP Reinforcement - Lytton Road between Aberdeen Road and Manuka Street, Te Hapara - 1.4km of 100mm IP20							$1,680			
Hamiton West MP4 Reinforcement - Avalon Drive to Livingstone Avenue - 150m of 50nb PE MP4			$18							
Hamilton West MP4 Reinforcement - Roy Street to Livingstone Avenue - 100m of 50nb PE MP4			$12							
Hamilton West MP4 Reinforcement - Install new DRS in Te Kowhai Road						$240				
Hamilton Pukete MP4 Reinforcement - Te Rapa Road from DR-80139-HM to Mahana Road - 650m of 80nb PE MP4						$94				
Hamilton Pukete MP4 Reinforcement - Te Papa Road from Bryant Road to #558 Te Rapa Road - 180m of 50nb PE MP4						$22				
Hamilton MP4 - 400m of 100nb PE in Cambridge Rd from DR-80101-HM to Hillcrest Road, Hamilton			$72							
Hamilton MP4 - Boundary Road and Heaphy Terrace - 50m of 50nb PE MP4				$6						
Hamilton MP4 - Gordonton Road between Wairere Drive and Thomas Road - 2.1km of 80nb PE MP4										$302
Paraparaumu IP reinforcement - Retest IP pipeline		$210								
Paraparaumu IP reinforcement – Upgrade DRS052 and DRS081			$312							

Expenditure forecasts ($'000)	**Forecast FY14**	**Forecast FY15**	**Forecast FY16**	**Forecast FY17**	**Forecast FY18**	**Forecast FY19**	**Forecast FY20**	**Forecast FY21**	**Forecast FY22**	**Forecast FY23**
Paraparaumu IP reinforcement – Upgrade gate station		$240								
TOTAL EXPENDITURE	**$1,117**	**$3,103**	**$2,499**	**$1,853**	**$1,881**	**$3,744**	**$5,680**	**$3,925**	**$4,268**	**$2,699**

* *Figures are in 2014 dollars ($'000);*

Table 5-24 : Network development expenditure forecast for Vector's North Island regions (financial years)

5.17 Asset Relocation

Vector’s gas distribution network assets are required to be relocated from time to time to make way for work carried out by other infrastructure service providers or landowners (Requiring Authorities). Infrastructure projects could be initiated by other utilities (such as Transpower and Kiwi Rail) or roading authorities such as New Zealand Transport Authority (NZTA) and local councils. Vector is obliged by law to relocate its assets when requested by these bodies. The process and funding of such relocation work is governed by the Gas Act 1992 and the Government Roading Powers Act 1989.

The timing of these projects is driven by the authority concerned and generally without the level of advance notice or detailed scope normally associated with growth projects. Information about projects more than one year in advance is generally not available for all but the large multi-year projects. In this respect relocation forecasts are based on continuation of the current level of relocation activity.

A list of known infrastructure projects that require relocation of Vector gas distribution network assets is provided in Table 5-25 and Table 5-26.

Expenditure Description ($'000)	**Forecast FY14**	**Forecast FY15**	**Forecast FY16**	**Forecast FY17**	**Forecast FY18**	**Forecast FY19**	**Forecast FY20**	**Forecast FY21**	**Forecast FY22**	**Forecast FY23**
Carry over	$400									
Albany Highway: Schanpper Road to Albany Stadium	$172	$245	$245							
Ameti Project Ellerslie Panmure Highway	$184	$175	$140							
FBSR Murphys Road Intersection Upgrade – Flat Bush.	$59									
Glenfield Road Widening - Stage 4, Glenfield.										
George Bolt Drive/Kirkbride, Mangere – Intersection Upgrade, Mangere.	$49	$84								
Hunua #4 Trunk Watermain Project, Auckland Regions.	$245	$350	$700							
Smales-Allens-Springs-Harris Roads, Intersection Upgrade. Manukau.	$172	$210								
Te Atatu Corridor - carriageway realignment, Henderson.	$43	$123								
Wairau / Taharoto Widening, Takapuna.	$81									
Waterview Tunnel (Maiaro to SH16)	$1,315	$542	$145							
Dominion Road Upgrade	$123	$175	$175	$175	$175	$250	$250			
Federal Road	$10									
Redoubt Road - Mill Road	$123	$175								

Expenditure Description ($'000)	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Kyle road			$88	$88						
AMETI Phase 2 Sylvia Park Bus Lanes Project	$25	$217								
AMETI Phase 2 Roundabout to Bridge		$175	$175	$175						
Don Mckinnon Drv, Albany, intersection upgrades,	$25	$245	$245							
Other relocations			$350	$1,400	$1,750	$2,500	$2,500	$2,500	$2,500	$2,500
TOTAL EXPENDITURE	**$3,022**	**$2,715**	**$2,263**	**$1,838**	**$1,925**	**$2,750**	**$2,750**	**$2,500**	**$2,500**	**$2,500**

* *Figures are in 2014 dollars ($'000);*

Table 5-25 : Asset relocation programme for Vector's Auckland regions

Expenditure Description ($'000)	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Carry over	$125									
Whangaparaoa Road Widening, Whangaparaoa.	$66									
Wairere Drive/Crosby Road, Hamilton.	$74									
Hairni Link 4 Laning, Tauranga.	$140	$210	$210	$210						

Expenditure Description ($'000)	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Hamilton By-pass: - Bypass Motorway, Waikato.	$73									
Wellington Northern Corridor-MacKays to Peka Peka Expressway.	$200	$500	$500							
Limmer & Te Kowhai Road, Hamilton, Part of Ring Road	$100	$500								
Tuhikaramea Rd, Hamilton	$98	$140								
Bethlehem to Waihi Road interchange, Tauranga	$49									
Waikao Expressway Cambridge section	$123									
Other			$70	$350	$560	$800	$800	$800	$800	$800
TOTAL EXPENDITURE	**$1,046**	**$1,350**	**$780**	**$560**	**$560**	**$800**	**$800**	**$800**	**$800**	**$800**

* *Figures are in 2014 dollars ($'000);*

Table 5-26 : Asset relocation programme for Vector's North Island regions

5.18 Customer Connections

Customer connection growth investment has been driven by increasing number of connections, primarily in the residential subdivision market. The industrial and commercial sector has grown more modestly. Growth in connections is primarily attitibutable to greenfield subdivision developments which are partially funded by developer contributions, with developers carrying the uptake risk.

5.18.1 Residential Market

There has been a decline in average billed consumption per ICP over the past five years (-3.2%). The main driver of this decline is believed to be the increased penetration of heat pumps. This substitution of space heating solutions has also been observed in the bottled LPG heating solutions market.

Vector's research suggests that heat pump substitution of new gas central heating will continue. However, it is the demand for gas hot water appliances that underpins gas connection growth in the residential market and this trend is also expected to continue.

Currently, 65% of all new connections within the Auckland network and 80% within the North Island network (excl. Auckland) are from the new build market. Compared with electricity, cooking and hot water heating are more economic using natural gas for a new build customer, whilst heat pumps are generally cheaper than gas central heating, and offer a cooling function. Hence, a customer building a new home is likely to take up both natural gas and heat pumps.

In existing homes, a decision to install natural gas is mainly triggered when a renovation is in progress and heating options are being considered. The retro fit market is much less attractive for natural gas. The payback on conversion to natural gas is longer than for new builds due to higher capital costs associated with the re-fit. This is a significant barrier to gas uptake.

Vector's analysis also shows that some customers look beyond the financial benefits of gas when considering energy choices, e.g. a lifestyle choice. They are attracted to the "warm and cosy home" and "hot water when I need it" propositions of natural gas. These propositions will continue to drive customers to choose gas over electricity in some circumstances.

The new build market remains Vector's strongest opportunity for volume growth through additional customers based on the value of gas hot water and cooking solutions.

5.18.2 Subdivision Reticulation

Over the past year, there has been an increase in the number of residential gas subdivisions where electricity and gas are jointly reticulated (namely within the Auckland network area). This is due to improvements in Vector's processes along with the developers being more aware of the value in reticulating gas and electricity at the same time.

General market conditions indicate an increasing number of enquiries from developers reflecting the widely reported housing shortage in Auckland. It is anticipated that the level of enquiries will increase as developers look to address this demand for residential properties with customer appealing energy solutions, such as gas hot water and appliances.

The North Island subdivision market has also shown signs of an upturn; however as the gas network is not complimented by an electricity network, gas reticulation is in direct competition with electricity rather than being complimentary. Additionally, the gas market in the North Island is increasingly competitive.

Vector is anticipating an increase in subdivision reticulation activity; new connections are forecast to remain flat in the short – medium term, as potential subdivision activity will not be translated into new connections for 2-3 years. Given the fragile global economic environment and focus on the energy sector, a prudent approach to forecasting new gas connections is appropriate.

Current uptake of gas connections in residential reticulated subdivisions sits at 60%.

5.18.3 Business Market

There has been a decline in the average billed consumption per ICP over the past five years (-4.8%), reflecting the impact of the global financial uncertainity. Commercial connections have grown by 1.9%, however usage has dropped by 2.8% over this time.

Vector's forecast outlook is for moderate growth in total volumes and higher growth in connections resulting in an ongoing gradual decline in average billed consumption per ICP.

New commercial opportunities, particularly in the dairy and forestry sectors are continually being explored. Vector is optimistic that a number of these opportunities will be secured and translated into new revenue streams.

5.18.4 Customer Connections Forecast

Table 5-27 shows Vector's forecast customer connections in the residential and commercial markets.

Gross Customer Connections	**Forecast FY14**	**Forecast FY15**	**Forecast FY16**	**Forecast FY17**	**Forecast FY18**	**Forecast FY19**	**Forecast FY20**	**Forecast FY21**	**Forecast FY22**	**Forecast FY23**
Auckland Region	2,079	2,079	2,079	2,074	2,074	2,074	2,074	2,074	2,049	2,049
North Island Regions	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320	1,320
TOTAL CUSTOMER CONNECTION	3,399	3,399	3,399	3,394	3,394	3,394	3,394	3,394	3,369	3,369

Table 5-27 : Customer connections forecast for Vector’s Auckland and North Island regions

5.19 Long-term Development Plans

Traditionally, the method used for developing the network has been a bottom up approach. This has enabled the planner to plan the network in phases from the existing configuration based on projected demand (and other relevant information). The risk of this incremental approach is that the development will be significantly influenced by localised information available for the short term (three to five years) to medium term (five to ten years). This could result in short-term financially attractive solutions being adopted where better economic long-term solutions may be available.

Network modelling and long-term demand forecast information has been used to establish a very long-term vision for Vector's regional intermediate pressure network systems. The vision is presented in the form of a "target" network configuration in year 2050 that reflects the potential security and capacity needs of Vector's customers. This offers guidance to the planner for the ongoing development of the network and enables the planner to take a holistic long-term view to ensure that the network is not developed in a piecemeal fashion. Any duplication and redundancy can be minimised.

The plan takes into account the current and future land use where additional transmission facilities, such as additional gate stations, may be required to reinforce the gas distribution networks.

5.19.1 Concept Network Architecture

A high level concept network architecture has been developed to help guide network planners in the development of the gas distribution networks. The concept network architecture, shown in Figure 5-12, proposes that all IP pipelines have a NOP of 1,900kPa or 1,000kPa, and provide supply into the MP pipelines at a nominal operating pressure of 400kPa. These network systems provide supply to consumer's Gas Measurement Systems (GMS).

In the long term, improvements in plastic pipe materials may allow plastic pipe systems to operate at 1,000kPa.

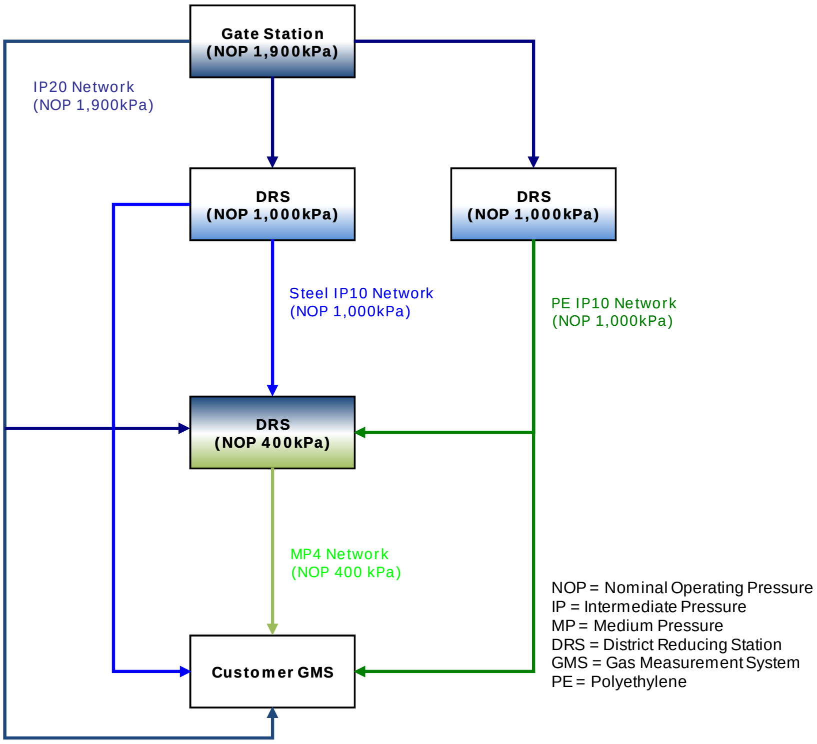

Figure 5-12 : Long-term network architecture (high level concept)

The following sections provide a summary of the envisaged long-term network architecture for the IP networks located in Auckland, Hamilton, Tauranga and Mt Maunganui. Other regions will be added as network development models (including load forecast information) become available.

5.19.2 Auckland Central Network System

The long-term load distribution at Auckland shows the potential demand growth can be accommodated by:

- Increasing the capacity of the section of IP20 pipeline between DR-00116-AK and DR-00136-AK or construct a new 200mm IP20 pipeline from the existing Flat Bush gate station (or construct a new gate station) to DR-00117-AK (year 2030);
- Increasing the NOP of the East Auckland IP10 pressure system from 875kPa to 1,900kPa from DR-00136-AK to DR-00160-AK (year 2030);
- Increasing the NOP of the East Auckland IP10 pressure system from 875kPa to 1,000kPa from DR-00244-AK to DR-00160-AK and DR-00164-AK (year 2030);
- Increasing the NOP of the Favona MP7 network from 700kPa to 1,000kPa (year 2030);
- Increasing the NOP of the Central Auckland MP7 network from 700kPa to 1,000kPa (year 2030);
- Increasing the NOP of the high pressure transmission pipeline located in North Harbour from 1,850kPa to 3,000kPa and installing two new DRS's in North Harbour (year 2030);
- Installing a section of IP20 pipeline from the Waikumete gate station to DR-00169-AK (year 2040), and

- Further consideration of increasing the NOP of the entire East Auckland IP10 pipeline is required (year 2040).

Figure 5-13 below shows the proposed long-term plan for the IP networks in the Auckland Central network system.

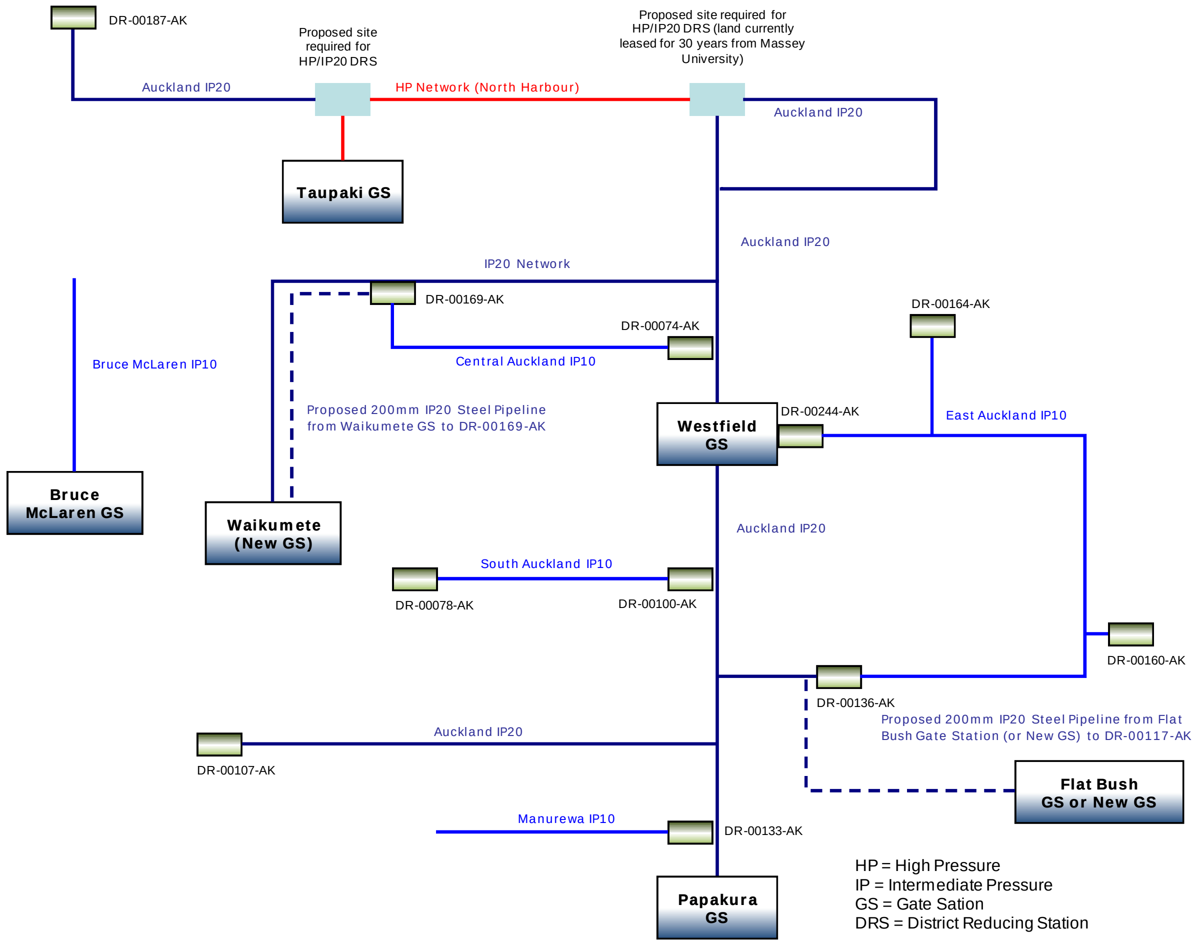

Figure 5-13 : Long-term network architecture: Auckland Central network system

5.19.3 Hamilton

The long-term load distribution in Hamilton shows that the potential demand growth can be accommodated by:

- Constructing a new 225mm IP10 PE pipeline from DR-80100-HM to DR-80139-HM (year 2016);
- Increasing the NOP of the Hamilton IP10 pressure system from 1,000kPa to 1,900kPa and installing a new DRS in Avalon Drive. If it is not possible to increase the NOP of the Hamilton IP20 network then a new IP20 steel pipeline could be constructed from the existing Horotiu gate station to DR-80129-HM (year 2030);
- Constructing a new 180mm MP7 PE pipeline from Collins Road (near DR-80175-HM) to Peacocke (year 2030);
- Constructing a new 180mm IP10 PE pipeline from Matangi gate station to DR-80139-HM (year 2040); and

- Increasing the available capacity of the Matangi gate station[69] (year 2040).

Figure 5-14 below shows the proposed long-term plan for the IP networks in the Hamilton network system.

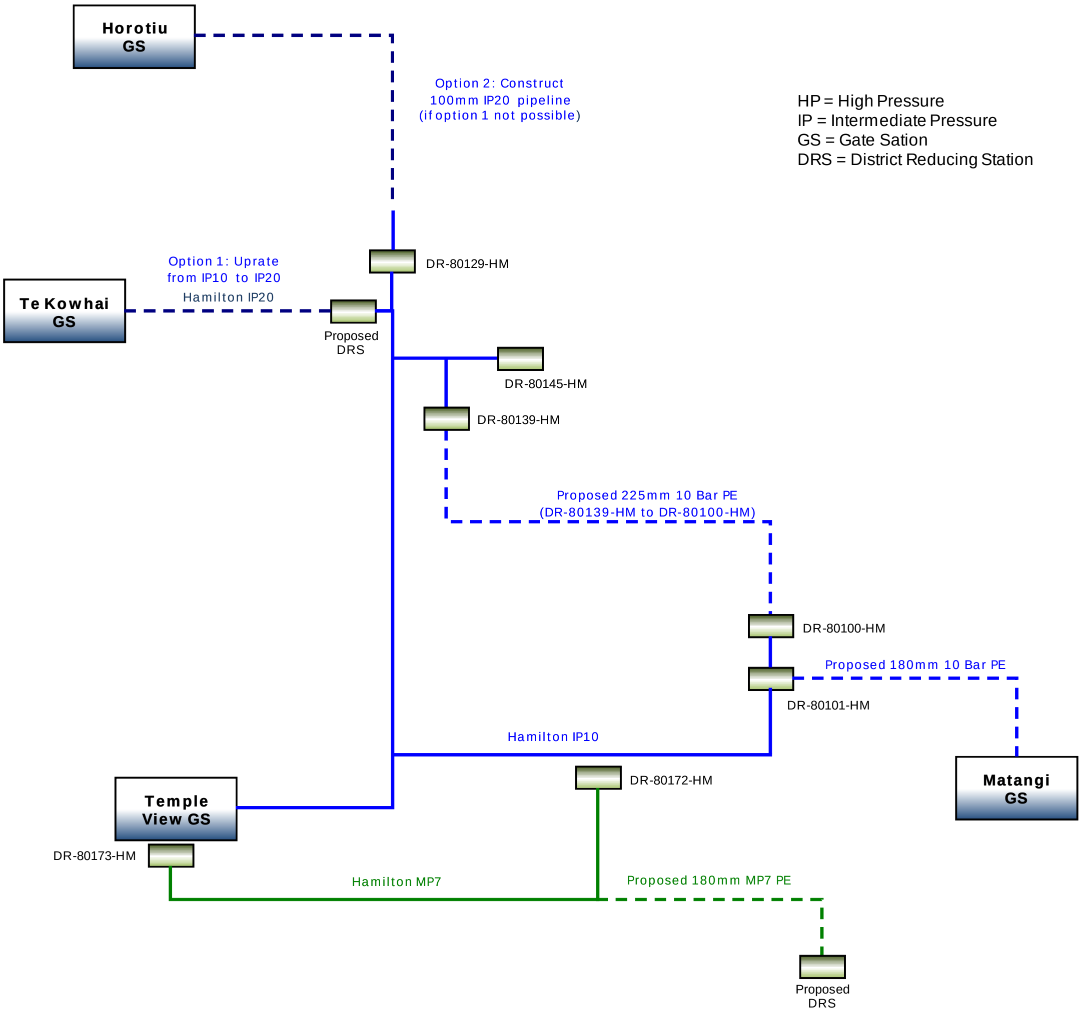

Figure 5-14 : Long-term network architecture: Hamilton network system

5.19.4 Tauranga

The long-term load distribution in Tauranga shows the potential demand growth can be accommodated by:

- Constructing the MP4 reinforcements described in Section 5.13.2. (Note these MP4 pressure system reinforcements were completed in FY2012 to enable the existing IP10 pipeline to be pressure tested and up-rated to IP20);
- Constructing a new IP10 125mm PE pipeline (approximately 3,200 metres) from near DR-80229-TR from Waihi Road, along Bellevue Road into Windsor Road and Charles Street, ending at 422 Ngatai Road. In addition, construct IP20/IP10 and IP10/IP4 DRS's near DR-80229-TR and 422 Ngatai Road respectively (year 2030);

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[69] Subject to transmission system capacity being available.

- Constructing a new IP20 80mm steel pipeline loop (approximately 1,000 metres) along Waihi Road between Birth Avenue and a proposed IP20/IP10 DRS near DR-80229-TR. This is intended to improve system pressure; and
- Constructing a new IP10 160mm PE pipeline (approximately 8,000 metres) along Cambridge Road from Pyes Pa gate station to the proposed IP10 125mm PE pipeline (described above) to improve security of supply. Note that additional MP4 DRS reinforcement could be provided at various locations along this pipeline. An alternative option is to relocate the proposed IP20/IP10 DRS to Birch Avenue/Waihi Road and extend the IP10 pipeline. This option replaces the need to construct the IP20 80mm steel pipeline described above and replace it with a more cost effective IP10 PE pipeline (year 2040).

Figure 5-15 below shows the proposed long-term plan for the IP and MP networks in the Tauranga network system.

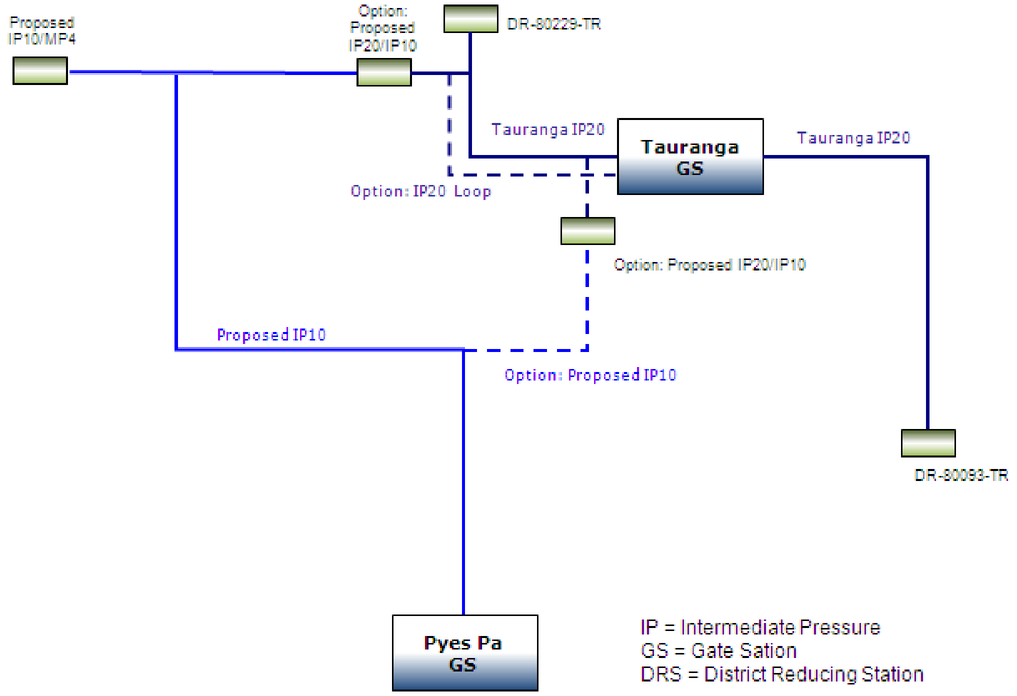

Figure 5-15 : Long-term network architecture: Tauranga network system

5.19.5 Mt Maunganui

The long-term load distribution in Mt Maunganui shows the potential demand growth can be accommodated by:

- Constructing either a new 80mm IP20 PE pipeline from the Mt Maunganui gate station to Hewletts Road or from Hewletts Road along Newton Street, Hull Road into Totara Road (year 2021). An alternative option is to increase the operating pressure of the existing Mt Maunganui IP20 pressure system;
- Constructing a new 225/180mm IP10 (or MP7) PE pipeline along Dominion Road and Tara Road, to the new developments proposed in Papamoa East (year 2030); and
- Constructing a new 180mm IP10 (or MP7) PE pipeline from stage 1 to stage 2 of the Papamoa East developments (year 2040).

Figure 5-16 below shows the proposed long-term plan for the IP and MP networks in the Mt Maunganui network system.

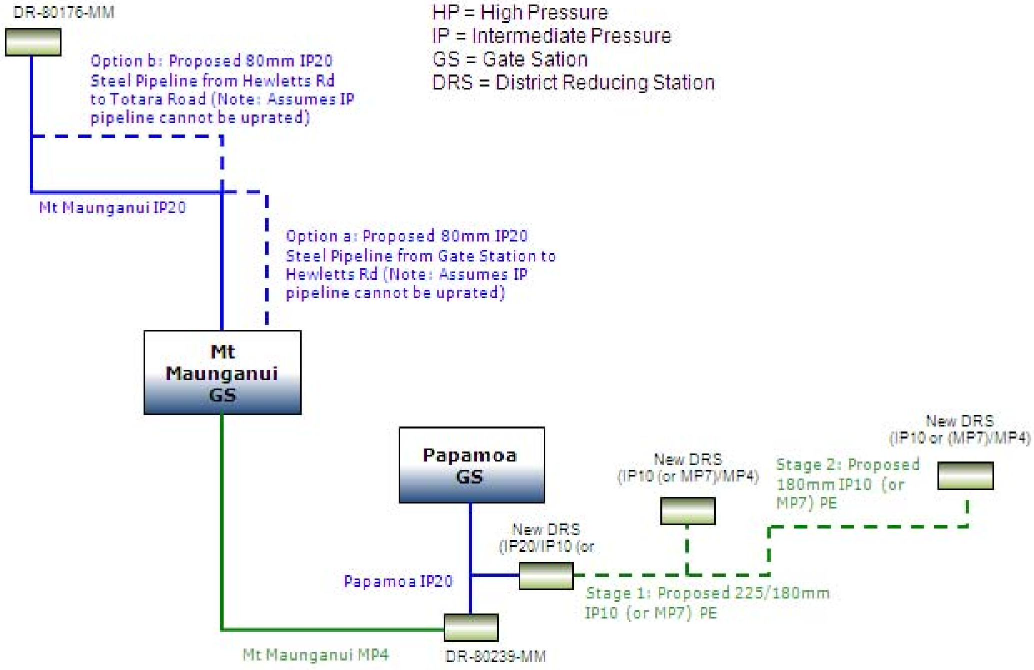

Figure 5-16 : Long-term network architecture: Mt Maunganui network system

5.20 Network Development Forecast Capex Expenditure

Table 5-28 and Table 5-29 provide Vector's network development capex budget forecasts for the Auckland and North Island regions respectively for the next 10 years.

Expenditure Description ($'000)	**Forecast FY14**	**Forecast FY15**	**Forecast FY16**	**Forecast FY17**	**Forecast FY18**	**Forecast FY19**	**Forecast FY20**	**Forecast FY21**	**Forecast FY22**	**Forecast FY23**
Mains Extensions/Subdivsions	$2,510	$2,510	$2,510	$2,510	$2,510	$2,510	$2,481	$2,481	$2,481	$2,481
Service Connections - Residential	$3,721	$3,721	$3,721	$3,711	$3,711	$3,711	$3,711	$3,711	$3,664	$3,664
Service Connections - Commercial	$515	$515	$515	$515	$515	$515	$515	$515	$515	$515
Customer Easements	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30
Reinforcement - MP	$794	$360	$431	$542	$540	$977	$447	$879	$587	$200
Reinforcement - IP	$1,715	$1,904	$350	$650	$1,010	$1,010	$2,350	$2,350	$1,849	$350
Relocations	$3,022	$2,715	$2,263	$1,838	$1,925	$2,750	$2,750	$2,500	$2,500	$2,500
TOTAL EXPENDITURE	**$12,308**	**$11,756**	**$9,820**	**$9,796**	**$10,242**	**$11,503**	**$12,284**	**$12,466**	**$11,626**	**$9,740**

Table 5-28 : Network development expenditure forecast for Vector's Auckland regions (financial years)

Expenditure Description ($'000)	**Forecast FY14**	**Forecast FY15**	**Forecast FY16**	**Forecast FY17**	**Forecast FY18**	**Forecast FY19**	**Forecast FY20**	**Forecast FY21**	**Forecast FY22**	**Forecast FY23**
Mains Extensions/Subdivsions	$1,798	$2,084	$1,798	$1,798	$1,798	$1,798	$1,798	$1,798	$1,798	$1,798
Service Connections - Residential	$1,659	$1,659	$1,659	$1,659	$1,659	$1,659	$1,659	$1,659	$1,659	$1,659
Service Connections - Commercial	$206	$206	$206	$206	$206	$206	$206	$206	$206	$206
Customer Easements	$30	$30	$30	$30	$30	$30	$30	$30	$30	$30
Reinforcement - MP	$217	$1,231	$1,174	$1,124	$730	$1,029	$609	$897	$1,011	$861
Reinforcement - IP	$900	$1,871	$1,325	$730	$1,151	$2,714	$5,071	$3,029	$3,256	$1,838
Relocations	$1,046	$1,350	$780	$560	$560	$800	$800	$800	$800	$800
TOTAL EXPENDITURE	**$5,856**	**$8,432**	**$6,972**	**$6,107**	**$6,135**	**$8,236**	**$10,174**	**$8,419**	**$8,761**	**$7,192**

Table 5-29 : Network development expenditure forecast for Vector's North Island regions (financial years)

5.21 Opportunities for Improvement

During the course of preparing this AMP the following more significant improvements are intended:

5.21.1 Load and Energy Forecasts

As noted in Section 5.4, Vector is improving its gas demand and energy consumption forecasting model. This is intended to be completed in 2014.

5.21.2 Transmission / Distribution Data Exchange

Gas transmission and distribution interface at gas gate stations. Constraints at gate station can impact on distribution investment decisions. Improved knowledge of the gate station capacities and constraints will lead to improved decision making by offering a wider range of solutions from which to choose the least cost option.

Gas Distribution
Asset Management Plan
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Asset Maintenance and Renewal Planning – Section 6

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6 Asset Maintenance and Renewal Planning

6.1 Overview

This section covers Vector's life cycle asset maintenance and renewal plans, and the policies, criteria, assumptions, data and processes used to prepare these.

Vector's gas distribution network is designed and built to deliver gas safely to the service level standards set out in the connection agreements with its customers. In order to achieve this safety and level of service at optimum cost, the fixed assets have to be kept in good operating condition. This is achieved by way of renewing (replacing), and maintaining assets (regular maintenance).

Safety is the key consideration in the design, construction and maintenance of Vector's gas networks and accordingly Vector manages its gas distribution networks in accordance with relevant acts, regulations and industry standards. In particular the Gas Act, Gas (Safety and Measurement) Regulations, NZS 5263 Gas Detection and Odorisation, and NZS 5258 Gas Distribution Networks require Vector to maintain and operate a safe and reliable network.

Although Vector strives to maintain the integrity of its gas networks at levels in line with good industry practice, some leakage and escapes occur on all utility networks (e.g. gas, water and wastewater services etc), including on Vector's gas networks from time to time. Vector's networks are subject to ongoing monitoring as part of preventive maintenance programmes that are carried out in accordance with industry code requirements. To provide assurance to government regulators and the general public, Vector is required to monitor and disclose reliability and quality performance measures including public reported escapes (PRE's) and system interruptions. Additionally Vector is subject to periodic audits by the Energy Safety division of the Ministry of Business, Innovation and Employment (MBIE).

Vector's long-term asset maintenance strategy is to achieve the optimal trade-off between capital expenditure (capex) and operational expenditure (opex), while maintaining a safe, efficient and reliable network. Achieving this requires a balance between effective maintenance and judicious asset renewal.

6.1.1 Legislative requirements

Vector's gas distribution assets have been designed and constructed and are operated in accordance with the following principal Acts, Regulations and industry codes:

- Gas Act 1992 and Gas Amendment Act;
- Health and Safety in Employment Act ;
- Gas (Safety and Measurement) Regulations;
- Civil Defence and Emergency Management Act;
- Hazardous Substances and New Organisms Act;
- NZS 7901 Electricity and Gas Industries – Safety Management Systems for Public Safety;
- AS/NZS 4645.1 Gas Network Management;
- AS/NZS 2885 Pipelines – Gas and liquid petroleum; and
- NZS 5263 Gas detection and odorisation.

These Acts, Regulations and industry codes include both prescriptive and performance based requirements which have been embedded into Vector's suite of design, construction, maintenance and material specification technical standards. The purpose of the Vector technical standards is to provide a comprehensive reference source for use by Vector personnel and others involved in the design, construction and maintenance of natural gas networks. Vector has outsourced the construction and maintenance of its gas distribution network to Field Service Providers (FSPs), and Vector's technical standards form part of the contract with the FSPs.

6.1.2 Vector’s Maintenance and Refurbishment Approach

Vector is required by the Gas Act to design, construct, maintain and operate its gas distribution networks in accordance with the Gas (Safety and Measurement) Regulations 2010. This regulation cites both NZS 5258 and AS/NZS 4645 as a means of compliance. Vector has up until now adopted NZS 5258 as its means of compliance, however this standard has not been updated since 2003 and no further updates of this standard are planned. For this reason there is a move within the wider NZ gas industry toward adopting AS/NZS 4645. Vector is currently reviewing its suite of technical standards (and amending where required) with a view to adopting AS/NZS4645 as its means of compliance during 2013/14 FY.

Vector has developed a comprehensive suite of asset maintenance standards that describe its approach to maintaining and refurbishing various asset categories. There are clearly significant differences required in the approach to different asset types, but as a broad rule the maintenance standards provide the following:

- The required asset inspection frequency;
- The routine and special maintenance activities required to be carried out during these inspections; and
- Condition testing that needs to be carried out and the required response to the test results.

In general, Vector’s philosophy is to keep its assets in use for as long as they can be operated safely, technically and economically. The maintenance and renewal policies support this goal by intervening to ensure optimal asset performance.

In a small number of cases (such as meters used for network monitoring), assets that have low impact on the gas distribution network’s integrity and performance are allowed to exceed their design life.

6.1.3 Vector’s Asset Renewal Approach

Assets are only renewed when:

- Assets are irreparably damaged;
- The operational and/or maintenance costs over the remaining life of the asset are disproportionate to that of replacement;
- There is an imminent risk of asset-failure; and/or
- Assets become obsolete and hence impossible or inefficient to operate and maintain.

Asset renewal is therefore in general condition-based rather than age-based.

Optimisation of capital investment and maintenance costs is an important part of Vector’s capital investment efficiency drive. This requires comprehensive evaluation of the condition, performance and risk associated with the assets, to provide a clear indication of the optimal time for assets’ renewal. Often it may be more efficient to extend the life of asset to beyond normal predicted asset life, by servicing or refurbishing the assets.

Asset condition evaluation is based on Vector’s field service provider’s (FSP’s) surveys, observations, test and defect work schedules. The asset performance evaluation is based on asset fault records and reactive maintenance records.

Once an asset is identified for replacement, Vector’s prioritisation methodology is applied to determine the ranking of replacement projects. This methodology is based on assessing the criteria giving rise to the need for replacement, the importance of the asset in question, the impact should the asset fail and the likelihood of such failure. Other important factors considered are the health and safety risk, risk to assets, risk to Vector's reputation, potential financial impacts and potential effects on the environment. The final project prioritisation list (that incorporates scoring based on conditions and performance as well as risk assessment), along with budgetary estimates forms the basis of the annual renewal budgets for each fiscal year.

It is essential to gain and maintain relevant information on the performance of assets in the field in order to undertake accurate assessments. The field data is currently collected and held by our FSPs. Vector has commissioned a Systems Applications and Processes (SAP) based plant maintenance system during 2010. This system enables preventative and corrective maintenance data to be directly fed into Vector's databases, based on the activities of our FSPs.

The investigation data, field data and fault records collected and maintained in Vector's databases are increasingly being used to conduct asset condition/performance and risk assessments, informing our renewal programmes.

Asset renewal expenditure forecasts for each expenditure category are based on actual historical costs for similar renewal project types. The majority of asset renewal work is carried out by Vector's contracted FSP's (refer Section 2), and all major projects are managed through a competitive bid process to ensure that competitive pricing is achieved.

6.2 Maintenance Planning Processes, Policies and Criteria

This section presents the planning processes, policies and criteria for managing Vector's network assets. Vector's strategic focus drives the asset integrity strategies:

Operational excellence:

- Ensure the network operation is safe and reliable;
- Ensure network investments and operating activities are efficient;
- Maintain the existing assets in good and safe working order until new assets are built or until they are no longer required; and
- Strive for continual innovation and efficiency improvements in how assets are maintained and operated.

Customer service:

- Ensure the safety of the public, our staff and our FSPs;
- Ensure assets are designed**,** operated and maintained to the required level of standard to provide the targeted level of service; and
- Ensure an appropriate level of response to customer concerns, requests and enquiries.

Cost efficiency:

- Strive to achieve the optimal balance between capital and operational costs;
- Coordinate asset replacement and new asset creation programmes; and
- Apply innovative approaches to solutions, development and project execution.

6.2.1 Asset Maintenance Standards and Schedules

Vector's asset maintenance standards are prepared by the Asset Investment (AI) group – in particular by the integrity teams forming part of the engineering group. Asset inspections and maintenance work is carried out by FSPs, under the direction of Vector's Service Delivery (SD) group.

Vector has developed maintenance standards for each major class of assets. The standards form a key part of Vector's schedule for planned maintenance. The purpose of these standards, in conjunction with the schedules of maintenance work, is to ensure assets operate safely and deliver their designed outcomes with regard to life and performance.

As part of the asset maintenance standards, the frequency of inspection and reporting per asset category has also been defined. This forms the basis of Vector's asset maintenance schedule.

Vector's maintenance standards are kept on Vector's secure websites and are available to personnel engaged in maintenance activities, as well as for our FSPs. The FSPs must comply with the standards and inspection schedules for each class of assets.

The standards are updated on an "as-you-go basis", so any new findings or updates are incorporated in Vector's standards as soon as they are reviewed by the asset management team, and signed off. Vector's FSPs contribute to and form an integral part of this continual improvement process.

Progress against the maintenance schedules and the associated maintenance costs are monitored on a monthly basis. Any concerns identified during asset inspections are recorded in a database. FSPs recommend the priorities for the remedial works for defects, which are then reviewed by Vector prior to issuing orders for the work. Maintenance priorities are based on costs, risks and safety criteria.

In making decisions on repairing or replacing the assets Vector will consider recommendations submitted by the FSPs, as well as the factors discussed above. The long-term plans supported by trend analysis for an asset will also be taken into account when assessing whether it should be maintained or replaced.

Root cause analysis is normally undertaken as a result of faulty equipment. If this identifies systemic faults or performance issues with a particular type of asset, and if the risk exposure warrants it, a project will be initiated to carry out the appropriate remedial actions on a class of assets. The assets and maintenance standards are also amended to reflect the learning from such root cause analysis.

6.2.2 Maintenance Categories

Maintenance works at Vector are categorised in three main categories:

- Preventive maintenance is defined by Vector's standards and is work intended to identify issues before they occur. The frequency of performing the preventive maintenance work (per asset group) is defined in the maintenance standards, flowing through into the contractors' schedule;
- Corrective maintenance work is the work that flows from the preventive activities, site inspections, testing and observations by Vector's contractors or any party that reports on potential issues relating to our network's conditions or performance; and
- Reactive maintenance work is undertaken following customers' complaints, accidents or any other work that is to rectify damage to the assets caused by unforeseen circumstances.

In addition, Vector also has categories for third party services maintenance and for maintenance management services.

The maintenance categories are further explained below.

6.2.2.1 Reactive Maintenance

Reactive maintenance is considered to encapsulate all maintenance activities that relate to the repair and restoration of supply, and the safeguarding of life and property (targets and measures for Vector's responses to Emergencies are detailed in Section 4). It primarily involves:

- Safety response and repair or replacement of any part of the network components damaged due to environmental factors or third parties interference; and
- Remediation or isolation of unsafe network situations.

6.2.2.2 Preventive Maintenance

Preventive maintenance covers activities defined through the maintenance standards, and relates to the following:

- Provision of network patrols, inspection and condition detection tasks, sampling and maintenance service work; and
- The coordination of shutdowns and decommissioning, and re-commissioning and restoration, along with the capture and management of all defined data.

Table 6-1 below provides a summary of preventive maintenance activities by asset class, together with appropriate standards and document references.

Asset Class / Category	Activity Standard	Preventive Maintenance Description
Leakage survey	GNS-0019	6 monthly - cast iron pipes[1] located under hard-paved surfaces in close proximity to buildings
Leakage survey	GNS-0019	Annual - distribution systems adjacent to public buildings, hospitals, schools and business districts; Identified higher risk areas (Auckland International Airport, Auckland Harbour Bridge), steel pipelines without operating cathodic protection systems
Leakage survey	GNS-0019	2 yearly – all other cast iron pipelines[2]; Service pipes located inside or under buildings; Distribution mains systems comprised predominantly of pre-1985 PE
Leakage survey	GNS-0019	4 yearly - all other pipes located under hard-paved surfaces in close proximity to buildings; Shallow IP mains
Leakage survey	GNS-0019	8 yearly - stainless-steel service pipe installations; All road and rail crossings; Balance of distribution system, including service connections
Above ground steel pipework	GNS-0014	Annual – above ground corrosion inspection
Cathodic protection	GNS-0015	2 monthly – inspection of impressed current transformer/rectifier sites
Cathodic protection	GNS-0015	2 monthly - inspection of drainage bonds

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[1] Vector is implementing a replacement programme to complete the replacement of all remaining LP cast iron pipelines by 2013/14 FY.

[2] Ibid footnote 1.

Asset Class / Category	Activity Standard	Preventive Maintenance Description
Cathodic protection	GNS-0015	3 monthly, 6 monthly and annual - inspect & test on and instant-off pipe/soil potential in major urban, urban and rural areas
Cathodic protection	GNS-0015	3 monthly and 6 monthly – inspect & test "On" pipe/soil potential in rural and urban areas
Cathodic protection	GNS-0015	3 monthly, 6 monthly and annual - electrical test of galvanic anodes in major urban, urban and rural areas
Cathodic protection	GNS-0015	3 monthly, 6 monthly and annual - test electrical isolation at casing test points in major urban, urban and rural areas
Gate Station and DRS	GNS-0012	3 monthly - below ground DRS operational check
Gate Station and DRS	GNS-0012	6 monthly - above ground operational check
Gate Station and DRS	GNS-0012	3 yearly – all DRS; full inspection and confirmation of settings and function
Odorant checks	GNS-0020	Monthly - gate station odorant and odorant concentration tests
Odorant checks	GNS-0020	3 monthly – extremity point ICP and designated DRS odorant and odorant concentration tests
Valves	GNS-0013	Annual - full service of emergency and designated valves, and partial service of other designated plug valves
Valves	GNS-0013	2 yearly – full service of other designated ball valves, and partial service of other plug valves; Audit of a sample of service riser valves
Telenet	GNS-0016	Annual – inspections of master station, field sites and repeater station
Telenet	GNS-0016	4 yearly - intrinsic safety inspections of field sites
Patrols	GNS-0021	3 monthly – visual inspection of above ground pipework, vent pipes and ducted crossings
Patrols	GNS-0021	Annual – visual inspection of service pipes inside/under buildings
Service regulators	GNS-0073	Annual – visual inspection of below ground installations
Service regulators	GNS-0073	2 yearly – visual inspection of above ground installations
Critical spares and equipment	GNS-0078	Monthly – visual inspection
Critical spares and equipment	GNS-0078	Annual – condition assessment of all critical spares and equipment; Review of inventory lists to determine level of inventory held is appropriate

Asset Class / Category	Activity Standard	Preventive Maintenance Description
Critical spares and equipment	GNS-0078	5 to 10 yearly - manufacture's check/refurbishment of all major items of equipment
Ground temperature	-	Monthly - monitoring of ground temperature at key reference sites (Rotorua and Taupo)

Table 6-1 : Preventive maintenance schedules and standards

6.2.2.3 Corrective Maintenance

Corrective maintenance catches the follow up maintenance repair and component replacement requirements resulting from:

- Assets identified from planned inspections or service work to be in poor condition, requiring repair;
- Poor condition or unserviceable assets identified via one-off coordinated network inspections or identified through proximity capital works;
- Removal of graffiti, painting and repair of buildings and asset enclosures, removal of decommissioned assets, one-off type inspection and condition detection tasks outside of planned maintenance standards; and
- Coordination of shutdowns and associated restoration, along with the capture and management of all defined data.

Corrective maintenance activities are managed using SAP Plant Maintenance defect notifications. Defect notifications are assigned a priority ranking (based on risk and asset criticality) which defines the timeframe within which the repair should be completed.

6.2.2.4 Third Party Services

Third party services maintenance activities describe third party directed requests such as the following:

- Issuing maps and site plans to indicate the location of network assets;
- Asset location services, including the marking out of assets, safe work practice site briefings, worksite observer, urgent safety checks, safety disconnections;
- Issuing close approach consents; and
- Disconnection and reconnection associated with customers' property movements and any concerns relating to non-compliance with gas regulations.

6.2.3 Asset Maintenance and Field Services Provider Management Process

Vector has, through a competitive process, engaged a contractor to maintain its gas distribution networks. Electrix Ltd is Vector's maintenance contractor for the gas distribution networks. The maintenance contract drives the preventive, corrective and reactive maintenance works programmes, based on the requirements set by Vector's maintenance standards.

The relationship with Electrix Ltd is managed by Vector's Service Delivery (SD) group. The maintenance contract defines the responsibilities, obligations and key performance indicators (KPIs) to complete scheduled works. Vector's AI group works closely with the SD group to keep abreast of any issues with regards to the contractors' obligations and performance. The maintenance standards form part of the maintenance contract and contractors must comply with them when performing their duties.

Vector has a comprehensive preventive maintenance approach across its network asset base. The delivery of all of these maintenance activities in accordance with prescribed maintenance standards (see Table 6-1), is closely monitored and adjusted by SD on a monthly basis, to ensure the agreed annual target volumes are complied with. Extensive monthly feedback is obtained on actual versus planned progress, KPI performance, causality and issues impacting progress or performance, new risks, action plans and focal points for the coming months.

The overall effectiveness of the programme is evaluated by contract KPI performance and the roll up to Vector's corporate performance metrics, of which safety, environmental compliance, public, employee and contractor safety are the core measures.

Figure 6-1 below describes the flow of work and responsibilities in maintaining Vector's assets.

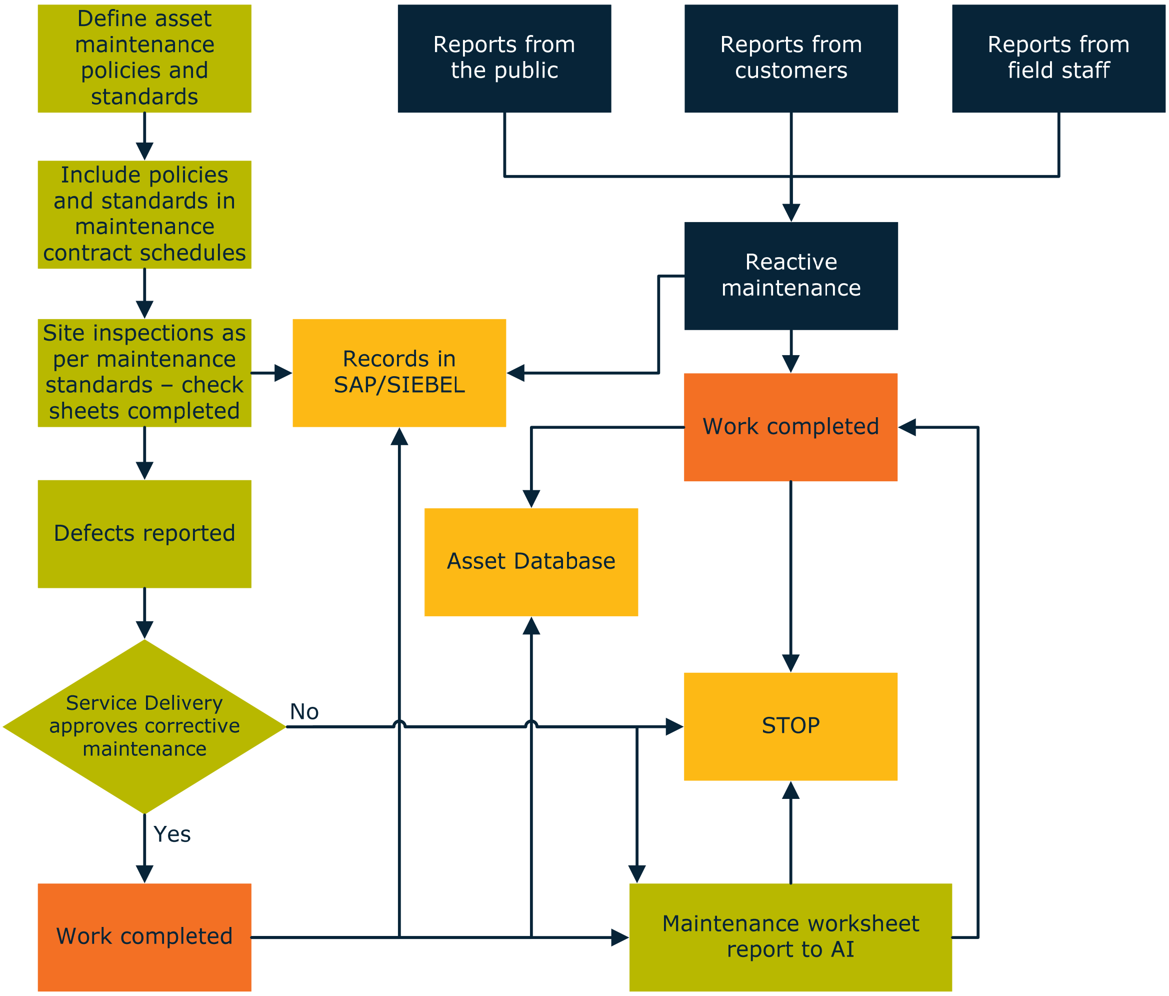

Figure 6-1 : Asset maintenance processes

6.2.4 Forecast Maintenance Budgets

Vector's maintenance expenditure forecast for the financial years ending 30 June each year from 2014 to 2023 for Vector's Auckland and North Island regions is set out in Table 6-2 and Table 6-3. The direct maintenance forecasts for each expenditure category are further disaggregated by asset category in the Table 6-4 to Table 6-5.

Expenditure description ($,000)	**Forecast FY14**	**Forecast FY15**	**Forecast FY16**	**Forecast FY17**	**Forecast FY18**	**Forecast FY19**	**Forecast FY20**	**Forecast FY21**	**Forecast FY22**	**Forecast FY23**
Preventative Maintenance	$1,274	$1,273	$1,304	$1,278	$1,341	$1,333	$1,350	$1,368	$1,386	$1,404
Corrective Maintenance	$875	$872	$848	$845	$841	$838	$835	$832	$829	$826
Reactive Maintenance	$1,955	$1,955	$1,955	$1,955	$1,955	$1,955	$1,955	$1,955	$1,955	$1,955
Third Party Services	$671	$671	$671	$671	$671	$671	$671	$671	$671	$671
TOTAL EXPENDITURE	**$4,774**	**$4,769**	**$4,777**	**$4,748**	**$4,807**	**$4,796**	**$4,810**	**$4,825**	**$4,840**	**$4,855**

Table 6-2 : Asset integrity opex expenditure forecast for Vector's Auckland region (financial years)

Expenditure description ($,000)	**Forecast FY14**	**Forecast FY15**	**Forecast FY16**	**Forecast FY17**	**Forecast FY18**	**Forecast FY19**	**Forecast FY20**	**Forecast FY21**	**Forecast FY22**	**Forecast FY23**
Preventative Maintenance	$1,098	$1,116	$1,133	$1,101	$1,119	$1,134	$1,150	$1,165	$1,180	$1,195
Corrective Maintenance	$322	$321	$320	$319	$319	$318	$317	$316	$316	$315
Reactive Maintenance	$2,234	$2,234	$2,234	$2,234	$2,234	$2,234	$2,234	$2,234	$2,234	$2,234
Third Party Services	$444	$444	$444	$444	$444	$444	$444	$444	$444	$444
TOTAL EXPENDITURE	**$4,098**	**$4,115**	**$4,132**	**$4,099**	**$4,116**	**$4,131**	**$4,145**	**$4,160**	**$4,174**	**$4,189**

Table 6-3 : Asset integrity opex expenditure forecast for Vector's North Island region (financial years)

Expenditure description ($,000)	**Forecast FY14**	**Forecast FY15**	**Forecast FY16**	**Forecast FY17**	**Forecast FY18**	**Forecast FY19**	**Forecast FY20**	**Forecast FY21**	**Forecast FY22**	**Forecast FY23**
Pipelines	$3,109	$3,080	$3,080	$3,020	$3,045	$3,021	$3,021	$3,021	$3,021	$3,022
District regulator and metering stations	$271	$266	$262	$257	$253	$248	$244	$240	$236	$232
Valves	$699	$699	$699	$699	$699	$699	$699	$699	$699	$699
Special crossings	$182	$182	$182	$182	$182	$182	$182	$182	$182	$182
Monitoring and control systems	$244	$262	$279	$297	$315	$333	$352	$370	$389	$407
CP systems	$234	$246	$261	$278	$299	$299	$299	$299	$299	$299
Other	$34	$34	$14	$14	$14	$14	$14	$14	$14	$14
TOTAL EXPENDITURE	**$4,774**	**$4,769**	**$4,777**	**$4,748**	**$4,807**	**$4,796**	**$4,810**	**$4,825**	**$4,840**	**$4,855**

Table 6-4 : Asset integrity opex expenditure forecast for Vector's Auckland region (financial years) by asset category

Expenditure description ($,000)	**Forecast FY14**	**Forecast FY15**	**Forecast FY16**	**Forecast FY17**	**Forecast FY18**	**Forecast FY19**	**Forecast FY20**	**Forecast FY21**	**Forecast FY22**	**Forecast FY23**
Pipelines	$3,064	$3,064	$3,064	$3,014	$3,014	$3,014	$3,014	$3,015	$3,015	$3,015
District regulator and metering stations	$374	$373	$372	$371	$370	$368	$367	$366	$365	$364
Valves	$282	$282	$282	$282	$282	$282	$282	$282	$282	$282
Special crossings	$139	$139	$139	$139	$139	$139	$139	$139	$139	$139
Monitoring and control systems	$125	$141	$156	$172	$187	$203	$218	$234	$250	$265
CP systems	$106	$109	$111	$114	$116	$116	$116	$116	$116	$116
Other	$7	$7	$7	$7	$7	$7	$7	$7	$7	$7
TOTAL EXPENDITURE	**$4,098**	**$4,115**	**$4,132**	**$4,099**	**$4,116**	**$4,131**	**$4,145**	**$4,160**	**$4,174**	**$4,189**

Table 6-5 : Asset integrity opex expenditure forecast for Vector's North Island region (financial years) by asset category

6.3 Asset Integrity Activities

6.3.1 Mains and Service Pipelines

6.3.1.1 Functional Description

Vector's gas distribution network mains pipes are used to transport natural gas from gate station delivery points to the individual service pipes that supply the customer's gas measurement system (GMS).

Vector's distribution network is comprised of 173 discrete pressures systems which operate at pressures ranging from LP (0-7 kPa) to IP (>700-2000 kPa) within the following nominal operating pressure bands:

• LP	Up to or equal to 7 kPa
• MP1	Greater than 7 kPa but less than or equal to 110 kPa
• MP2	Greater than 110 kPa but less than or equal to 210 kPa
• MP4	Greater than 210 kPa but less than or equal to 420 kPa
• MP7	Greater than 420 kPa but less than or equal to 700 kPa
• IP10	Greater than 700 kPa but less than or equal to 1000 kPa
• IP20	Greater than 1000 kPa but less than or equal to 2000 kPa

The majority of Vector's "bulk" gas distribution assets are operated in the IP20 range of 1,000 to 2,000 kPa. The selection of these pressures has, in the majority of cases, been made in historical times and has been justified on an economic basis (consideration of gas volumes, transmission distances, delivery pressures etc).

In all but the larger supply areas, the regional IP systems are used to transport large volumes of gas from gate stations to the areas where it is to be used. The IP system generally forms the principal "backbone" of the distribution networks with laterals radiating from them to supply adjacent areas.

The distribution assets which are used to directly supply the majority of gas consumers operate in the MP4 range of 210 to 420 kPa. LP systems typically operate between 3 kPa and 5 kPa and comprise the older parts of the distribution system supplying residential and small commercial loads.

Separate Use of Networks Agreements (UNAs) are in place between Vector and the various gas retailers for Vector's Auckland and North Island networks. The UNA for the Auckland network stipulates maximum and minimum delivery pressures as measured at the inlet valve on the consumer gas measurement system (GMS), whereas the UNA for the North Island network (which at the time included ownership of GMS's) stipulates delivery pressures as measured at the outlet of the customer GMS. The two UNAs are currently under review with the intent of harmonising the terms of the two UNAs and replacing them with a single UNA.

6.3.1.2 Physical Description

Distribution systems are defined as those parts of the gas network that extend from the outlet valve of the gate station delivery point to the inlet valve on the customer GMS. For the purposes of this AMP distribution systems are further stratified into network systems which are defined as discrete systems of interconnected (via DRS installations) pressure systems which are supplied via one or more gate stations.

Vector's distribution system comprises 56 network systems located in the Northland, greater Auckland, Waikato, Bay of Plenty, Gisborne and Kapiti regions of the North Island. The network systems are supplied via 63 gate stations with the Auckland Central network being supplied via 4 gate stations (a fifth gate station is currently under construction and will be commissioned in 2013/14 FY), and the Hamilton, Te Awamutu, Tauranga and Mt Maunganui networks each being supplied via 2 gate stations.

Pipelines operating at nominal pressures of IP10 and above are constructed of welded steel.

Pipelines operating at a nominal pressure of MP7 are predominantly constructed of welded steel, with a small quantity being constructed from PE100 material.

Pipelines systems operating at nominal pressures in the range of MP1 to MP4 are predominantly constructed of PE80 with a small quantity being constructed from welded steel.

LP systems are predominantly constructed from cast iron[3] and PE80 material, with a small amount being constructed of steel.

Welded steel pipelines are coated (e.g. extruded high density polyethylene) and typically utilise cathodic protection (CP) systems to provide additional corrosion protection.

The MAOP (maximum allowable operating pressure) of steel pipelines is dependent on pipe and fitting types, and is typically in the region of either 1000kPa or 1900kPa. The MAOP of PE pipelines is dependent on the PE type (e.g. PE80 or PE 100) and standard dimension ratio (SDR) rating. Typical MAOP for PE80 pipelines is 400kPa, and 700kPa for PE100 pipelines. In some cases the pipeline MAOP may exceed its current nominal operating pressure – e.g. the North Harbour Pipeline section of the Auckland IP20 system was constructed as a HP pipeline and has a MAOP of 4,600kPa.

The North Harbour Pipeline is operated as part of the IP20 system within the Auckland network. The pipeline is managed and maintained as a HP pipeline under a separate pipeline management plan in accordance with the requirements of the Health and Safety in Employment Regulations (Pipelines) Regulations 1999 and is certified by Lloyds Register.

6.3.1.3 Summary Statistics

The Auckland network system includes approximately 3,680 km of mains pipeline comprised of the following material types:

- 1% cast iron pipe;
- 87% PE80 pipe; and
- 12% steel pipe.

The North Island network includes approximately 3,340 km of mains pipeline comprised of the following material types:

- 2% PE100 pipe;
- 87% PE80 pipe; and
- 11% steel pipe.

Cast iron pipelines remain in use on the Auckland network only. They date from the late 1880s and are confined to LP systems[4].

Steel pipelines date from the 1930s with most of it having been installed from the 1970s onward.

PE80 pipelines date from the 1970s with the majority of it having been installed since the 1980s.

PE100 pipelines date from the late 1990s.

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[3] Ibid footnote 1.

[4] Ibid footnote 1.

6.3.1.4 Age Profiles

The age profile of the North Island network mains pipelines is given in Figure 6-2 and for the Auckland network in Figure 6-3. The age profile of the North Island network service pipelines is given in Figure 6-4 and for the Auckland network in Figure 6-5.

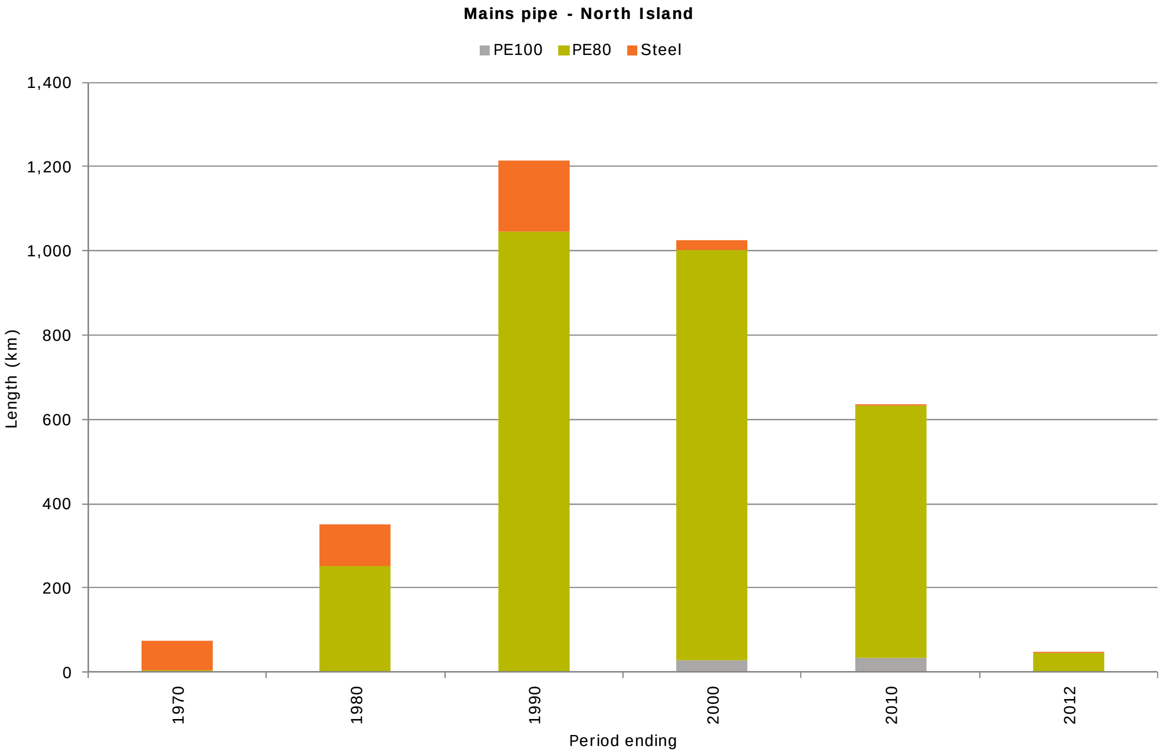

Figure 6-2 : Mains pipeline age profile - North Island network

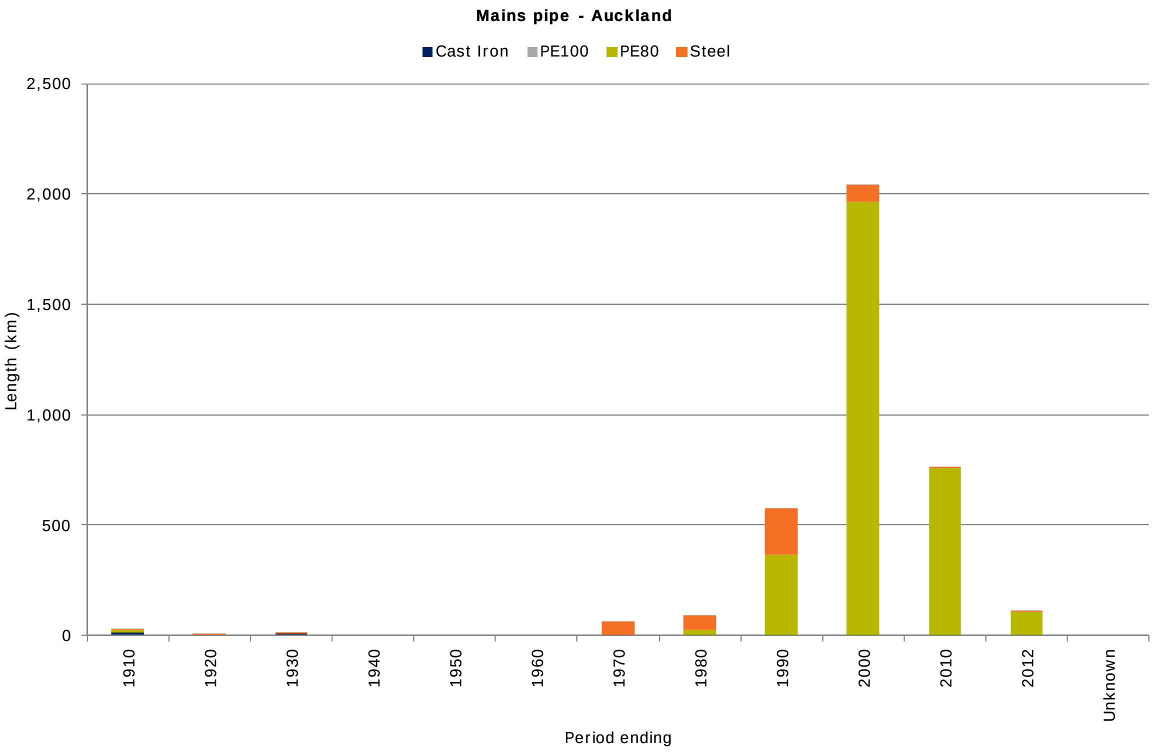

Figure 6-3 : Mains pipeline age profile - Auckland network

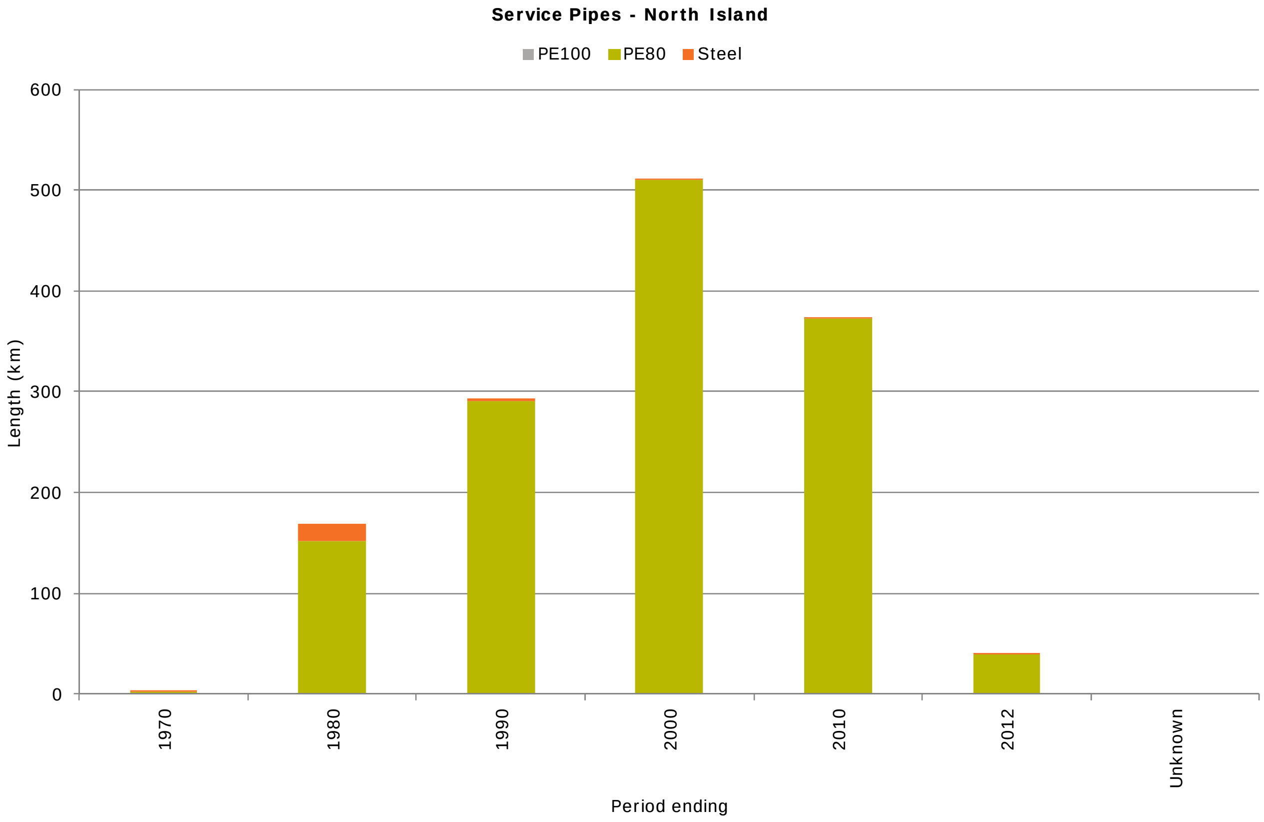

Figure 6-4 : Service pipeline age profile – North Island network

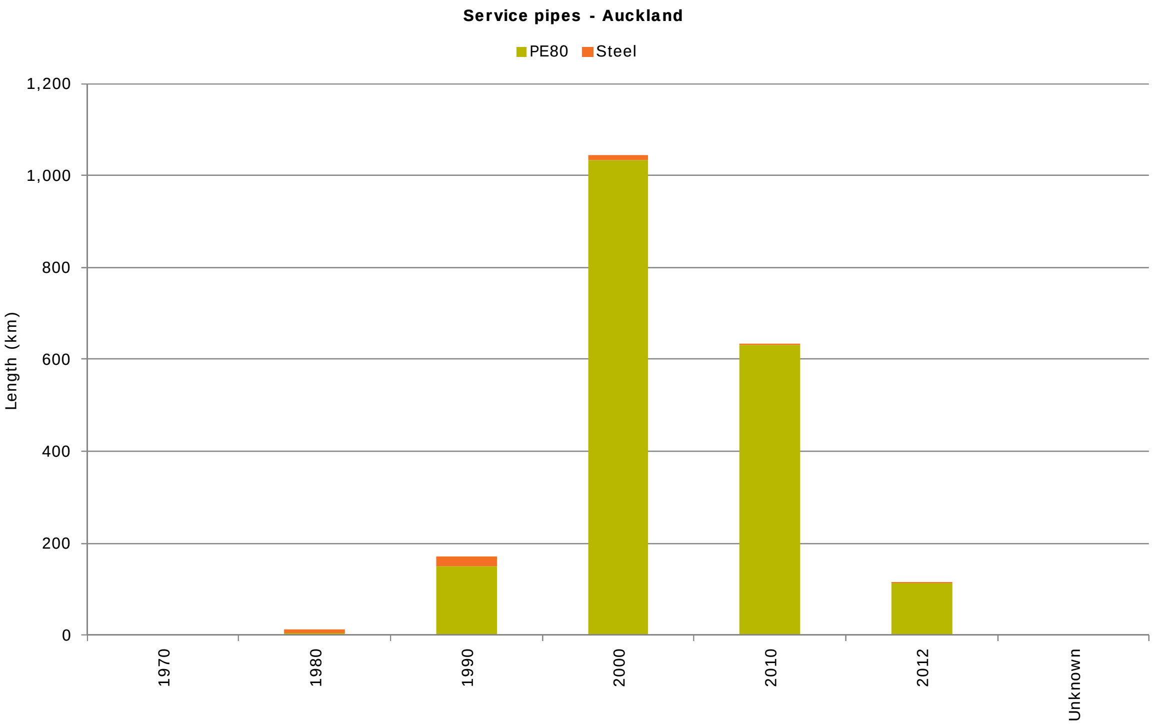

Figure 6-5 : Service pipeline age profile - Auckland network

For valuation purposes the following standard lives for mains pipes have been applied:

- PE – 60 years;
- Pre-1985 PE – 40 years;
- Steel IP – 70 years; and
- Steel MP – 60 years.

6.3.1.5 Condition, Performance and Risks - Steel Pipes

Condition of Assets

The majority of underground steel pipeline systems in use on both the Auckland and North Island networks are protected from corrosion by means of pipe coatings and the application of cathodic protection (CP) systems (refer below for non-protected steel pipelines). The average age of these pipelines is approximately 30 years. The standard life for steel pipelines (as used for ODV valuation purposes) is 60 years for MP pipelines and 70 years for IP pipelines. With the exception of MP1 and LP steel pipelines in Hamilton, the overall condition of the pipelines is good and no programmed replacement of these pipelines is envisaged within the standard life of the asset.

Performance of Assets

With the exception of MP1 and LP steel pipelines in Hamilton, the replacement of underground steel pipelines is expected to continue to be of a corrective nature, targeting specific locations and addressing localized issues rather than a large scale replacement programme.

Risks

North Harbour Pipeline Operated in Accordance with NZS 5223

The North Harbour Pipeline is managed and maintained as a HP pipeline in accordance with the requirements of the Health and Safety in Employment Regulations (Pipelines) Regulations 1999. These regulations require HP pipelines to be designed, constructed, operated and maintained in accordance with AS 2885, or NZS 5223 or ASME B31. When the pipeline was commissioned in the late 1990s NZS 5223 was adopted as the standard to which the pipeline would be certified, and the pipeline has been operated (and certified) in accordance with NZS 5223 ever since.

In the interim period AS 2285 has undergone major reviews and updates and is now considered by the wider gas industry to be best practice. By contrast NZS 5223 has had no changes made to it and there are no plans within the industry to review or update this standard in the future. Vector is therefore carrying out a review of the pipeline's design, construction and operation standards with a view to adopt AS 2885 as the standard to which this pipeline will be operated and certified to. It is anticipated that the adoption of AS 2885 will be completed by the end of the 2013/14 FY.

Pigging of North Harbour Pipeline

AS 2885 requires the pigging of pipelines to be considered along with other threat mitigation measures as part of its pipeline integrity management requirements. Pigs can be used to clean or dewater the pipeline, and inspection pigs can be used to provide information on the condition of the pipeline and the extent and location of any problem. As the North Harbour Pipeline has never been pigged since it was commissioned in the late 1990s, a risk assessment is currently being carried out to determine if a pigging programme should be implemented. The review is anticipated to be completed in the 2013/14 FY.

Steel Systems without Cathodic Protection

NZS5258:2003 Gas Distribution Networks stipulates that steel pipelines (except for pipelines with short design lives) shall be provided with CP and pipeline coatings. Whilst the majority of the steel pipelines within the Auckland and North Island networks have adequate CP, there are some sections of pipeline which need upgrading and this is underway:

- Isolated sections of steel pipe exist throughout the remaining Auckland LP pipeline systems, and it is believed little, if any, CP exists on these sections of pipe (the total length of pipe is estimated to be approximately 3 km). All of these pipeline sections will be either decommissioned or replaced by the end of the 2013/14 FY period as part of the Auckland LP pipeline replacement programme;
- Small isolated sections of MP4 steel pipeline without CP have been identified within the Auckland network. Upgrade projects to install CP on these sections of pipeline were completed during the 2012/13 FY;
- The Hamilton MP4 gas distribution system includes approximately 62 km of unprotected mains steel pipeline. The pipelines are located within the following pressure systems:
    - Hamilton West MP4;
    - Hamilton MP4; and
    - Pukete MP4.

  The majority of the Hamilton MP4 steel system was laid in the 1970s. Historical records indicate that this system originally had working CP systems, however regular CP monitoring ceased in the late 1980s. To assess the viability of restoring working CP on the MP4 steel system, a pilot project was initiated for the Melville area of the Hamilton MP4 pressure system. The Melville area includes a mixture of steel and PE materials and was seen as having characteristics typical of the balance of the Hamilton MP4 steel network. The project commenced in August 2010 and was completed in May 2012 at which time CP protection had been restored to approximately 90% of the system. Based on the success of the Melville project, a 4 year programme (2011/12 to 2014/15 FY periods) to complete the upgrade of the remaining Hamilton MP4 steel CP system is being implemented; and

- The Hamilton MP1 and LP gas distribution systems each include approximately 15 km of unprotected mains steel pipeline. The pipelines are located within the following pressure systems:

  - Hamilton MP1;
  - Frankton LP;
  - Hamilton East LP; and
  - Fairfield LP.

  The majority of these pipelines were installed in the late 1960s through to the late 1970s; none of the pipelines have ever had CP systems installed on them. The commissioning of these pipelines without CP is attributable to the fact that the installation of CP systems was not mandatory under the industry codes (e.g. B31.8-1968) that were in place at that time. To be compliant with the requirements of NZS5258:2003 Vector is installing effective CP systems on the LP and MP1 steel pipelines, or either replace them with new (e.g. PE) pipelines or decommission them.

  Recent analysis of Hamilton PRE data indicates that the PRE associated with the LP and MP1 steel mains is predominantly due to pipe corrosion or repair clamps or gibault fittings that were installed as part of previous repairs. (Note that the legacy practice of using repair clamps or gibault fittings for permanent repairs has now been curtailed. Modern techniques such as electrofusion jointing have been adopted). Because of the LP and MP1 steel pipeline integrity issues described above, the retrofitting of a working CP system was not considered to be a cost effective or practical option.

  In 2011 Vector carried out a review of a range of options to identify any alternative strategies which may be applicable to addressing risks associated with the steel LP and MP1 networks. The options included:

  - Decommission the LP and MP1 steel networks, and leave the decision, and financing, of alternative energy options to consumers;
  - Decommission the LP and MP1 steel networks and replace existing reticulated natural gas connections with bottled LPG; or
  - Undertake a pipeline replacement programme to replace the LP and MP1 steel networks.

  The review concluded a pipeline replacement option provided the best outcomes, and a 3-year pipeline replacement programme (2011/12 FY to 2014/15 FY) was subsequently approved and is being implemented.

  The existing LP & MP1 networks are a mixture of steel and PE pipelines, and the replacement programme therefore follows two distinct methodologies. In areas where there is a relatively high concentration of steel pipelines, the entire area will be upgraded to operate at MP4 and be incorporated into the adjacent MP4 systems. In areas where there are individual sections or small pockets of steel mains, a like-for-like approach will be adopted - individual steel pipelines will be replaced with a similar size PE pipeline, and the operating pressure will remain unchanged. Table 6-6 below shows the individual LP and MP1 steel pipeline replacement projects that make up the complete 3 year programme.

Steel Replacement Project	FY Period
Hamilton West LP	Completed
Hamilton East LP	Completed
Frankton LP	Completed
Hamilton MP1 South	Completed
Fairfield LP South	Completed
Hamilton MP1 North	2013/14
Hamilton MP1 Central	2013/14
Fairfield LP North	2014/15

Table 6-6 : Hamilton LP and MP1 steel pipeline replacement programme

In order to mitigate the risks associated with unprotected steel pipelines, Vector's leakage survey standard GNS-0019 requires these sections of the distribution system to be surveyed on an annual cycle. Any escapes of gas detected by the survey are repaired on an as required basis. These measures have been further strengthened by an amendment to GNS-0019 which requires all Hamilton LP and MP1 steel pipelines to be surveyed on a 3 monthly cycle, and all Auckland LP systems to be surveyed on a 6 monthly cycle.

Small Diameter Steel Pipes

The Hamilton MP4 distribution system includes approximately 8.5 km of steel mains pipe with a nominal diameter of 25mm or less. A further 2.5 km of small diameter steel mains is located within the Hamilton MP1 and LP distribution systems, but these will be replaced as part of the 3 year Hamilton MP1 and LP pipeline replacement programme.

As stoppling equipment is not available (either locally or internationally) for 25mm diameter pipe or less, the isolation of sections of small-diameter steel pipe can only be achieved via the use of isolation valves already installed on these pipelines, or by the operation of isolation valves (and/or the installation of stopples) on the larger diameter upstream pipelines.

The small-diameter steel mains pipeline in Hamilton is comprised of pipeline sections that range in length from a few metres, supplying a handful of customers, to several hundred metres in length, supplying 40 to 50 customers. As many of the small-diameter mains sections do not have isolation valves fitted, in the event that a section needed to be isolated it is likely the isolation could only be achieved by operating isolation valves on the larger diameter upstream system and/or carrying out a stopple operation on the upstream system.

This situation inevitably increases the risks associated with responding to emergency situations, and could significantly increase the number of service connections affected by an outage. In order to mitigate the risk, a replacement programme is being developed (in conjunction with the Hamilton MP4 steel CP system upgrade programme) for the 2014 FY period to target the replacement of higher risk pockets of small diameter steel mains and to determine the need for additional isolation valves.

6.3.1.6 Condition, Performance and Risks - PE pipes

Condition of Assets

The average age of PE mains pipelines on the Auckland network is approximately 15 years, and for the North Island network the average age is approximately 20 years. The standard life (as used for ODV valuation purposes) for pre-1985 PE is 40 years and the standard life for modern PE is 60 years.

Although issues have been identified with pre-1985 PE systems (refer below), the majority of the total PE mains systems are comprised of modern PE (i.e. 97% of the Auckland network PE, and 86% of North Island network PE). The overall condition of the pipelines is good, and therefore notwithstanding some issues relating to pre-1985 PE systems, no programmed replacement of these pipelines is envisaged within the standard life of the assets.

Performance of Assets

PE pipelines have been in use on both the Auckland and North Island networks since the 1970s. Early PE systems (i.e. pre-1985) exhibited premature brittle-like issues (refer below for issues relating to pre-1985 PE), but modern PE has been found to be very durable. Isolated problems have been found with PE butt joints (refer below) used on earlier PE systems and some larger diameter modern PE systems.

Risks

Pre-1985 PE

The Auckland network includes approximately 85 km of pre-1985 PE mains of which 37 km (44%) operates at MP4, 32 km (38%) at MP2 and the balance at MP1 and LP. The North Island network includes approximately 425 km of pre-1985 PE mains of which 378 km (89%) operates at MP4 and the balance at LP and MP1.

PE pipe manufactured up to the mid-1980s is known to be susceptible to premature brittle-like issues due to the resin type that was in use at the time of manufacture. The issues occur as a result of stress intensification brought on by the PE pipe being exposed to excessive shear and/or bending forces while in service.

Vector’s risk mitigation controls include a targeted leakage survey strategy, the monitoring and regular analysis of faults related to pre-1985 PE pipelines, and targeted pipeline replacement based on the results of the analysis.

This strategy is in line with the recommendations of a report published by the US National Transportation Safety Board in 1998 titled ‘Brittle-like cracking in plastic pipe for gas service[5]. The report is recognised internationally and concluded that much of the plastic pipe manufactured and used for gas service from the 1960s through to the early 1980s may have been susceptible to premature brittle-like incidents when subjected to stress intensification. One of the key recommendations made in the report was for gas operators to closely monitor the performance of older plastic piping and to identify and replace in a timely manner any of the piping that indicates poor performance. In the USA the risks associated with pre-85 PE failure have been covered off by a 2009 amendment to the US Federal Pipeline Safety Regulations which requires all US gas distribution pipeline operators to develop and implement integrity management programmes.

Another avenue being explored to reduce the risks associated with pre-1985 PE pipeline is to identify any section of pre-1985 pipeline that has been duplicated with a more recent type of pipe. As these sections are identified, the viability of decommissioning the pre-1985 PE pipeline and transferring any service connections to the adjacent pipeline will be assessed.

Analysis carried out to date on Vector’s distribution systems indicates the current performance of pre-1985 PE pipe is not markedly different to modern PE and, therefore, a pre-1985 PE pipeline replacement programme is not warranted at this time. Pre-1985 PE pipe performance will continue to be monitored and replacement will occur on an as

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[5] http://www3.ntsb.gov/publictn/1998/SIR9801.pdf

required basis in the short to medium-term unless there is a marked change in incident rates.

Butt Fusion Joints

Butt fusion jointing of PE pipes was the standard method of jointing PE pipe when PE pipe was first introduced on the Auckland and North Island networks in the early 1970s. This jointing technique continued until the introduction of electrofusion (EF) jointing in the mid to late 1980s - although butt fusion jointing is still considered viable (using electronic controlled processes) for larger diameter pipes, due to the cost benefits it can provide.

Poor quality control and jointing techniques used in the early 1970s and 1980s has resulted in some butt fusion joint issues. This legacy issue has resulted in a higher risk for PE butt joints.

It is estimated that the Auckland distribution network includes approximately 37 km of MP4, 32 km of MP2 and 16 km of LP/MP1 older PE mains that utilise butt joints, and that the North Island network includes approximately 378 km of MP4 and 47 km of LP/MP1 older PE mains that utilise butt joints.

Vector's risk mitigation controls include scheduled leakage survey. PE butt joints are currently replaced on an as required basis and no proactive replacement programme is anticipated unless there is a marked change in butt joint incidents.

6.3.1.7 Condition, Performance and Risks - Cast Iron Pipes

Condition

Vector's Auckland network currently includes approximately 40 km of LP mains pipeline of which approximately 75% is comprised of cast iron pipes (there is no record of any cast iron mains in use on Vector's North Island network). The average age of the LP mains pipeline system is approximately 70 years, and it distributes gas to approximately 1,050 customers.

Cast iron pipelines are typically constructed from 3 metre sections of bell and spigot pipe joined via a caulked hemp and lead joint or other mechanical type joints. Although cast iron pipe possesses good resistance to corrosion, joints may fault over time as a result of the different physical characteristics of natural gas (i.e. drier) compared to the original coal gas that was in use when the pipes were first installed. Ground movement (due to subsidence, road works, effects of increased traffic volumes etc) can also damage the joints and cause fractures in the pipe. The incidents can result in gas escapes, water ingress and poor pressure problems.

Performance

LP cast iron pipeline systems have been identified as key contributors to gas escapes from Vector's Auckland gas distribution networks, as measured by Publicly Reported Escapes of gas (PRE). They also contribute disproportionately to the risk of customer supply loss.

A further LP safety issue can arise from poor pressure problems. Some older customer appliances are not fitted with flame failure devices and in the event of inadequate supply pressure the appliance flame may be extinguished and a gas-in-building incident could result. Poor pressure is typically caused by the ingress of water into aging cast iron pipes (thereby reducing available system capacity) or from inadequate LP system capacity. Almost 80% of the remaining Auckland LP mains system was installed over 50 years ago, and over the decades the demand on the system has increased significantly due to infill residential housing developments, commercial growth and the introduction of high demand modern appliance (e.g. continuous flow hot water systems).

Figure 6-6 compares the past and present performance of Vector's Auckland network with the performance of comparable US gas networks (of a similar size to Vector's Auckland network) based on data sourced from the US Office of Pipeline Safety for the 2011 period. The diagram demonstrates that gas escape rates on the Auckland network for the 2011/12 FY period have been brought down to a level below the median of the reference US gas networks. The diagram also compares the gas escape rates on the Auckland network for the 2006/07 FY period and demonstrates a marked improvement over the 5 year period. This improvement is considered to be largely attributable to the ongoing LP pipeline replacement programme.

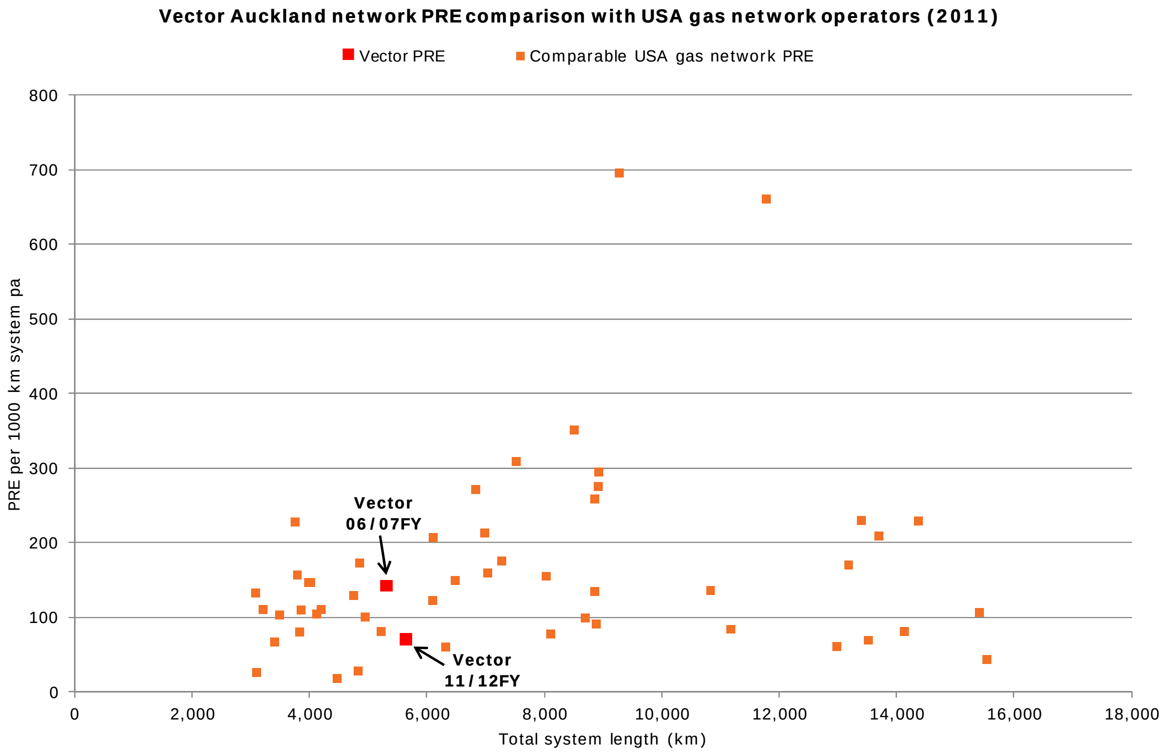

Figure 6-6 : Vector PRE trend compared with USA utilities

Risks

NZS5258:2003 requires Vector to adopt an As Low as Reasonably Practicable (ALARP) standard to addressing the risks associated with low pressure networks. Vector’s pipeline replacement strategy and priorities have been based on this standard and this is the standard practice adopted internationally.

In 2004, Vector developed a pipeline replacement strategy which recommended the completion of all remaining LP pipeline replacement.

In 2009, Vector carried out a review of a range of options to identify any alternative strategies which may be applicable to addressing risks associated with LP networks. The options included:

- Convert LP customers to LPG;
- Convert LP customers to electricity; and
- Continue with LP pipeline replacement.

Continuation of the replacement option was recommended on the basis that it was practically achievable, provided appropriate risk mitigation, and that no practical alternatives existed to manage the risk effectively.

In July 2010, a two stage LP pipeline replacement programme was awarded to Electrix Ltd. Each stage of the programme covered a 2 year period.

Stage 1 of the programme has been completed. Stage 2 is currently underway and is expected to be completed in 2013/14 FY. Table 6-7 shows the individual LP pipeline replacement projects that make up the complete 4 year programme.

Programme Stage	LP Project	FY Period
1	Balmoral	Completed
	Greenwoods Cnr	Completed
	Mt Roskill	Completed
	Royal Oak	Completed
	Three Kings	Completed
	Oranga	Completed
	Otahuhu Stage 2	Completed
	Te Papapa	Completed
	St Lukes	Completed
2	Lappington Rd	Completed
	Onehunga	Completed
	Onehunga Nth	Completed
	Otahuhu Stage 3	2013/14
	Greenlane	2013/14
	Papatoetoe	2013/14

Table 6-7 : Auckland LP pipeline replacement programme

6.3.1.8 Condition, Performance and Risks - Non-Standard Pipe Material

Condition of Assets

All network extensions or alterations are now constructed from approved steel or PE materials. However in the past (particularly before the introduction of natural gas) a range of other materials was used e.g. galvanised steel, asbestos, spiral welded steel etc. Although the presence of similar materials on the older parts of the Auckland and North Island networks have not been encountered, there remains a small chance some small quantities remain in operation. Vector will continue to record and improve its asset data information for non-standard pipe materials at the time when new connections or on-site inspections are undertaken.

Performance of Assets

Non-standard material types are not compatible with modern materials, and this has construction implications for pipeline alterations or repair. They also present possible H&S risks due to the integrity of the material.

Risks

Nylon

In the early 1980's nylon pipes were installed in several parts of the Auckland distribution network. These systems quickly became obsolete due to the introduction of polyethylene pipe in the mid 1980's. Fittings compatible with the nylon systems can no longer be purchased thereby necessitating the use of water fittings to affect repairs. In most cases these fittings are modified to accommodate the existing nylon and PE pipes. In addition, nylon pipes are brittle and cannot be squeezed off in case of an emergency.

GIS records indicate that the Auckland network now includes only a small remaining quantity (140m) of nylon mains pipe, which operates at MP4 (there is no nylon pipe in the North Island network). GIS records also indicate that there is approximately 3 km of nylon service pipe currently in use for approximately 200 service connections. The nylon service pipes operate at MP4 and are located throughout the suburbs of Ponsonby, St Marys Bay and Parnell and adjacent suburbs, with some located on the North Shore and Epsom and surrounding suburbs.

Vector monitors the performance of nylon pipe through regular analysis of fault data. At-risk sections are prioritised for replacement based on an assessment of the risks associated with the pipeline section.

The level of risk presented by the remaining nylon pipe is considered low. Analysis of fault data has not identified a higher incidence of faults for nylon pipes when compared to PE systems.

Currently no systematic pipeline replacement projects are planned for nylon pipes, and replacement will be carried out on an as required basis.

Stainless Steel

During a period of high growth in late 1995 through to early 1997 almost 15,000 new service connections were installed on the Auckland distribution network. This high volume of work, coupled with limited available resources, resulted in an increase in the number of non-compliant service installations.

A subsequent audit of the services installed during this period identified several problems, and in particular the use of stainless steel pipe in non-compliant situations. As part of the follow-up to the audit, all identified non-compliant installations were either replaced or made compliant, and all stainless steel service pipes on the Auckland distribution system are subject to an annual leakage survey.

In 2010, Vector reviewed its leakage survey standard and revised the leakage survey frequencies based on a risk assessment. An analysis of PRE data indicated that the performance of the remaining stainless steel service pipes was no different to the performance of other service types. The leakage survey frequency for stainless steel service pipes was therefore extended from an annual survey to an eight year survey to align it with the leakage survey frequency used for the majority of the network.

The use of stainless steel service pipes is typically confined to commercial and high-rise building installations, where the use of underground service pipes is not practicable. Currently there are approximately 230 stainless steel service connections in use on the Auckland distribution system, and less than 10 in use on the North Island network.

Third Party Strikes

Third party incidents account for a substantial proportion of the total number of reported gas escapes that occur on Vector's Auckland and North Island networks – in the 2011/12 FY period, third party incidents accounted for approximately 42% of total recorded gas escapes.

Vector has ongoing public safety awareness communications programmes on gas, which are designed to increase public and contractor awareness and reduce the number of third party incidents. These include:

- Promoting safe work practices to external contractors whose work brings them in close proximity to Vector's networks i.e. council and water service contractors; and
- Vector is a founding member of the beforeudig service (www.beforeudig.co.nz) which allows contactors to obtain plans from Vector and a number of other asset owners simply by making a single enquiry.

These programmes are further complemented by programmes operated by Vector's service provider (Electrix) which include:

- A close approach consent system to authorise and control all proposed excavation works within a restriction zone adjacent to pipelines operating at pressures of 700 kPa or greater and all strategic MP and LP pipelines;
- Provision of advice on good work practices and an outline of the hazards to be aware of at the time of issuing a consent;
- Standover works in the vicinity of critical (high risk) pipelines; and
- Carrying out targeted company visits to take employees through a gas safety presentation.

In order to mitigate the risk of third party damage to critical pipeline assets, pipelines have been classified as "strategic" where the consequence of a third party strike event is considered to be serious or the likelihood of such an event is considered to be high. This classification allows Vector's service provider to review beforeudig service plan-requests that effect strategic pipelines and determine if a close approach permit or on-site supervision will be required.

Further details of Vector's health and safety practices, as they relate to Vector's asset base and asset management, can be found in Section 8 of the AMP.

Shallow pipes

A section of IP10 pipeline located in Hamilton has been identified as having insufficient depth of cover at a number of locations. A preliminary survey indicates that a 1.2 km section of 150 NB steel pipeline located in Tuhikaramea Road has a depth of cover ranging from 100mm to 900mm. The minimum depth of cover required when the pipeline was originally installed was 600mm. An engineering consultant has been engaged to undertake an analysis of the peat soil in which the pipeline is located to determine if the lack of cover is a result of peat shrinkage and associated surface subsidence, or is due to other factors. A report on their findings will include recommendations on appropriate mitigation measures, and is expected to be available for implementation in 2013/14 FY.

Vector's risk mitigation plans for each of the remaining sites include the evaluation of the following options:

- Increasing the depth of cover by placing additional soil etc over the pipe;
- Installing additional signage along the pipeline routes;
- Periodic notifications to affected landowners;
- Installation of protective barriers/slabbing;
- Lowering of the pipe along its existing alignment; and
- Relaying the pipe in a new alignment.

Vector will continue to record and improve its asset data information for potential legacy shallow pipelines at the time when new connections or on-site inspections are undertaken.

Pipes Under Buildings

NZS5258 stipulates that mains and IP service pipes cannot be installed or operated under buildings. Where the installation of LP or MP service pipe under a building cannot be avoided, special measures (e.g. gas tight conduits) must be employed to mitigate the risk.

Periodically, mains or service pipes located under building are identified. These situations typically result from the property owner not being aware of the existence of the pipeline, or its actual location when undertaking building work.

When these situations are identified, negotiations with the property owner are undertaken to relocate the pipeline. Vector will continue to record and improve its asset data information for potential pipes under buildings at the time when on-site inspections are undertaken.

Mains on Private Land

Gas mains located within private properties are exposed to a higher than normal risk of damage as well as a higher risk of being built over. Pipelines located on private property are typically protected by an easement, or if installed prior to 1992, by the pre-existing rights provisions of the Gas Act 1992.

Incidents of buildings being erected over gas mains (which require the relocation of the main) do occur occasionally, and although incidents of damage to gas mains on private property are rare, there have been some near misses. These risks are typically brought about by the property owner or occupier not being aware of the existence of the gas main, its actual location or their obligations under the provisions of the property easement or the Gas Act 1992.

Vector's risk mitigations include the development of an easement strategy for mains located in private land, and the development of a property occupier notification scheme. The easement strategy and property occupier notification scheme is expected to be finalised and implemented during the 2013/14 FY.

Inactive Service Pipes

Up until recently, Vector's technical standard GNS-0022 Decommissioning of facilities required service pipes that have been inactive for a period of five years to be physically disconnected from the gas main and decommissioned. A recent review of the standard determined that this requirement was unnecessary from both a financial and a H&S perspective, and the standard is currently being amended to require all service pipes that have been inactive for a period of 5 years to be physically disconnected only where the cost to maintain the service pipe is disproportionate to the cost of disconnecting it or where a risk assessment indicates that the service should be disconnected.

This requirement is designed to meet the NZS5258 requirement that procedures "adequate for the future safety of the public" must be in place for the decommissioning of inactive mains and service pipelines.

Recent analysis of Gentrack billing and GIS data indicates approximately 1500 ICP connections on the Auckland network have been inactive for at least 5 years. Analysis of the North Island network has not been carried out to date due to difficulties accessing historical billing data, however a similar situation is expected to exist on that network.

Vector's risk mitigations involve the development of a new periodic inspection strategy for inactive service pipes. The purpose of the new periodic inspection is to assess the condition of each inactive service pipe and/or riser and assess the risk of damage from property owners or third parties. The inspection would also present an opportunity for the property owner to be advised of the presence of an inactive service pipe on their property thus mitigating the risk of third party damage. Where pipeline damage or the risk of damage is identified appropriate corrective action would be initiated as required. The periodic inspection strategy is expected to be finalised and implemented by the end of the 2013/14 FY.

GIS Pipeline Data

Following a recently completed project to align the SAP PM models for the Auckland and North Island networks, asset data for both networks is now held jointly within the GIS and SAP PM systems. Historically GIS has been the repository of asset information as well as spatial information, however SAP PM is now being developed as the master technical asset register and GIS will hold a minimum set of attribute data only. A review of the data being held between the GIS and SAP PM systems has been carried out to identify addition asset information that should be held within SAP PM, and it is expected that the additional SAP PM classification and characteristic data will be loaded during the 2013/14 FY.

Inspection and Defect Records

Preventive maintenance activities for the Auckland and North Island networks are scheduled within SAP PM. The system records the scheduled and completion dates for all preventive maintenance activities.

A project to align the SAP PM models for the Auckland and North Island networks was completed in 2012. This has simplified the analysis and reporting of preventive and corrective maintenance activities.

Tsunami risk

Various regional councils (e.g. Auckland Council, Northland Regional Council, Bay of Plenty Regional Council) have contracted the National Institute of Water and Atmospheric Research (NIWA) to undertake studies on the risk of tsunami inundation that face their respective communities. Vector has access to the results of these studies through its participation in the Engineering Lifelines Groups that operate in those areas.

The tsunami studies look at tsunami threats from remote sources (e.g. South American origin) and local/regional sources (i.e. Tonga-Kermadec and Southern New Hebrides tectonic faults). The studies show that tsunami threats from remote sources have a return period of 50-100 years and represent the most probable tsunami risk, while tsunami threats from local/regional sources have a return period 500-2000 years but represent the most devastating tsunami hazard for New Zealand. The studies also show that the tsunami hazard is considerably higher for the east coast of New Zealand than that posed to the west coast.

The largest impact on the Auckland region’s east coast is on Great Barrier Island. Omaha, Orewa and surrounding areas also have a high risk of inundation over significant areas. Further into the Hauraki Gulf, this risk lessens as the areas are sheltered by outlying islands. In most other areas, the inundation is confined to narrow coastal strips. There are relatively few gas distribution assets located within the inundation areas, and there are no critical above-ground assets at risk.

The largest impact on the Northland region occurs predominantly on the east coast with particularly significant impacts at Bland Bay, Helena Bay, Tauranga Bay, Taupo Bay, Te Ngaire and Hihi. Gas distribution assets located within the inundation areas are confined to the Whangarei and Marsden Point areas. The effected distribution assets comprise distribution pipelines and three DRS sites. Although gas distribution pipelines are buried, their condition could be compromised due to the removal of surface cover and undermining etc. Some of the effected distribution pipelines are attached to bridge-crossings and the condition of these pipelines could be compromised due to damage to the bridge structure. Further analysis to determine appropriate mitigation measures has still to be completed.

The largest impact on the Bay of Plenty region occurs on the open coast areas from Waihi Beach in the west to Opotiki in the east. These areas have a high risk of inundation. Vector has gas distribution assets located within these inundation areas (particularly in the Mt Maunganui and Papamoa areas and the Whakatane and Opotiki areas) and will undertake further analysis in 2013/14 FY to identify the specific assets at risk and determine appropriate risk mitigation measures.

A tsunami risk also exists for Vector's Gisborne network and analysis will be undertaken to assess the level of risk and determine appropriate mitigation measures in 2013/14 FY.

Volcanic risk

Any volcanic activity would likely have a devastating effect on the gas distribution network. Evidence from overseas volcanic activity provides clear examples of the magnitude and impact of such activity. Further studies are planned in 2013/14 FY to assess this risk and determine any mitigation measures to protect against such events.

6.3.1.9 Maintenance Programme

Preventive maintenance cycles for mains and service pipelines have been determined based on regulatory and industry code requirements, risk management principles and good industry practice. Preventive maintenance of mains and service pipelines is carried out in accordance with the periodic cycles stipulated in the technical standards listed in Table 6-8.

Technical Standard	Periodic Maintenance Activities
GNS-0014 Maintenance of above ground corrosion protection systems	• Annual inspections of all above ground steel pipework
GNS-0015 Maintenance of below ground corrosion protection systems	• 2 Monthly inspection of impressed current transformer-rectifier installations to record output current and voltage • 2 monthly inspection of drainage bonds to check their satisfactory operation • 3 monthly, 6 monthly and annual inspections of CP test points to measure on and instant-off pipe to soil potentials in major urban, urban and rural areas respectively • 3 monthly and 6 monthly inspections of CP test points to measure "On" pipe to soil potentials in rural and urban areas respectively • 3 monthly, 6 monthly and annual inspections of galvanic anodes to check their satisfactory operation in major urban, urban and rural areas respectively • 3 monthly, 6 monthly and annual inspections of isolation between buried or submerged pipelines and other underground metallic structure (including associated protective casings) in major urban, urban and rural areas respectively
GNS-0019 Leakage survey	• 6 monthly leakage survey of cast iron pipes[6] located under hard-paved surfaces in close proximity to buildings • Annual leakage survey of distribution systems adjacent to public buildings, hospitals and schools; All distribution systems in designated central business districts; Identified higher risk areas (e.g. Auckland International Airport, Auckland Harbour Bridge); All steel pipelines without operating cathodic protection systems • 2 yearly leakage survey of all other cast iron pipelines[7]; Service pipes located inside or under buildings;

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[6] Ibid footnote 1.

[7] Ibid footnote 1.

Technical Standard	Periodic Maintenance Activities
	Distribution mains systems comprised predominantly of pre-1985 PE - 4 yearly leakage survey of all other pipes located under hard-paved surfaces in close proximity to buildings; Shallow IP mains - 8 yearly leakage survey of all known stainless-steel service pipe installations; All areas where movement of pipe is anticipated including all aboveground or underground road and rail; All remaining portions of the distribution system, including services
GNS-0020 Odourisation system maintenance	- Monthly odorant checks at all gate stations - 3 Monthly odorant checks at ICP risers at key system extremity points and designated DRS
GNS-0021 Patrolling	- 3 monthly inspection of all above ground pipework, vent pipes, ducted crossings and gate stations - Annual inspection of service pipes located inside or under buildings
GNS-0026 Syphon maintenance	- Annual inspection plan agreed between FSP and Vector
Ground Temperature Checks (Rotorua and Taupo)	- Monthly monitoring of ground temperature at key reference sites

Table 6-8 : Maintenance standards for mains and service pipes

Preventive maintenance activities on mains and service pipelines may identify the need for corrective maintenance work including the repair of pipeline mounts, brackets, corrosion, pipeline coating repairs, and civil works (excavation and backfilling) associated with undertaking this work.

6.3.1.10 Replacement Programme

The sections below provide a description of the projects or expenditure planned for the relevant budget nodes for the forecast period.

ARP4 – LP Pipeline Replacement (Auckland)

See discussion in Section 6.3.1.7. Vector is implementing a replacement programme to complete the replacement of all remaining LP cast iron pipelines by 2013/14 FY.

ARP4 – LP and MP1 Unprotected Steel Replacement (Hamilton)

See discussion in Section 6.3.1.5. The Hamilton MP1 and LP gas distribution systems each include approximately 15 km of unprotected mains steel pipeline. Vector is implementing a three year pipeline replacement programme (2012/13 FY to 2014/15 FY) to complete the replacement of all Hamilton MP1 and steel pipelines.

ARP4 – Replacement of Small Diameter Steel Mains

The Hamilton distribution system includes approximately 11 km of MP4, MP1 and LP steel mains pipe with a nominal diameter of 25 mm or less which is difficult to sectionalise in the event of an emergency where supply needs to be isolated.

The 2013/14 FY budget includes an allowance for a project to target the replacement of high risk pockets of small diameter steel mains and to determine the need for additional isolation valves.

ARP4 - Shallow IP Pipe

One location remains where a section of the Hamilton IP10 pressure system has been confirmed as having insufficient cover. The 10 year capital expenditure forecast includes allowances in the 2013/14 FY period to undertake investigation and mitigation measures for the shallow pipelines located in Tuhikaramea Road. Work on lowering a second location (450 metres of 100 NB steel IP main in Cobham Drive) was completed during 2012.

ASC1 - Wiri MP2 Pipeline Rationalisation

As a result of an earlier partial system upgrade, the Wiri MP2 system has been partially overlaid with a MP4 system. To address the H&S risks associated with the inadvertent interconnection of the MP2 and MP4 systems, a project to transfer existing MP2 connections to the adjacent MP4 system and decommission the existing MP2 system (which is predominantly pre-1985 PE) was completed in the 2012/13 FY.

ASC1 – Unspecified

Periodically sections of mains and service pipeline will be identified that need to be replaced (on an as required basis) due to safety or compliance issues. Examples include pipes located under buildings, or pipes of non-compliant material specification. The expenditure forecast for this item is based on historical expenditure.

RRP1 - Including Reactive Pre-1985 PE Replacement

Periodically sections of mains and service pipeline will be identified that need to be replaced (on an as required basis) due to integrity issues. Examples include the replacement of sections of pre-1985 PE pipe or sections of butt fusion jointed PE main. The expenditure forecast for this item is based on historical expenditure.

RRP1 - Pre-1985 PE Replacement at Higher Risk Locations

The 10 year forecast capital expenditure forecast includes allowances in the 2013/14 FY and 2014/15 FY periods to undertake analysis and mitigation measures on pre-1985 PE pipelines located on the Auckland network in higher risk zones – e.g. CBD areas.

6.3.2 Special Crossings

6.3.2.1 Functional Description

Special crossings are locations where a section of pipeline is installed aboveground in order to cross over a roadway, river or railway etc. The aboveground crossing enables the gas distribution pipeline route to negotiate obstacles presented by the presence of a roadway, river or railway etc where a belowground crossing is not practical.

6.3.2.2 Physical Description

There are approximately 75 special crossings located on the Auckland network and approximately 85 special crossings located on the North Island network.

Special crossings are typically attached to road or rail bridge structures, although in a few cases special crossings are attached to dedicated pipe bridge structures. Special crossings are typically comprised of either PE or steel carrier pipe. Where the carrier pipe is PE it is encased in a steel or PVC duct in order to provide physical and ultraviolet protection to the carrier pipe. The duct is typically attached to the bridge structure by means of galvanised steel fittings. Where the carrier pipe is steel it is typically either painted or wrapped (to provide corrosion protection) and attached directly to the bridge structure by means of galvanised steel fittings and rollers.

6.3.2.3 Age Profiles

The age profile of special crossings is broadly the same as the age profile of mains pipes for the Auckland and North Island networks - i.e. the age profile data for mains pipes is inclusive of special crossing carrier pipe data.

For valuation purposes the standard life for special crossings is 60 years.

6.3.2.4 Condition of Assets

The condition of special crossings is generally good. At any given time there are a number of sites that require minor work to address minor surface corrosion etc, and a small number of sites that require more substantive repairs - e.g. sand blasting and repainting. These repairs are carried out as part of routine corrective maintenance operations.

Ensuring adequate access to the special crossing to carry out maintenance inspections is an ongoing challenge at some special crossing sites. This can be due to the physical design of the bridge structure (e.g. the carrier pipe is encased within the structure), or the need to obtain approval (i.e. from the structure owner or operator) to gain access to the bridge structure.

6.3.2.5 Performance of Assets

Apart from some upgrade work to improve seismic resilience at 4 special crossing sites (refer Replacement Programme section below), no major upgrades of special crossings are planned. Maintaining the integrity of special crossing will continue to be carried out on a corrective basis targeting specific issues.

6.3.2.6 Risks

Special crossings installed over waterways (particularly estuaries) and high-volume roads (e.g. motorways) are exposed to a harsh physical environment which can compromise the integrity of pipeline coatings and support brackets. Where above ground crossings are attached to bridges, additional risks are present due to the potential impact on the general public in the event of a pipeline incident or due to corrective maintenance activities. Targeted maintenance inspections are carried out to mitigate the risks associated with these crossings.

In 2012, Vector engaged a seismic specialist to undertake a review of critical gas distribution infrastructure to assess the selected assets for compliance with the seismic provisions of NZS1170. The review included four bridge crossings - two located in Auckland and one each in Hamilton and Whakatane. Recommendations to improve the seismic resilience of the bridge crossings are being reviewed and will be prioritised (based on a risk assessment) and implemented during the 2013/14 FY.

6.3.2.7 Maintenance Programme

Preventive maintenance cycles for special crossings have been determined based on industry code requirements, risk management principles and good industry practice. Depending on whether or not a special crossing includes a steel carrier pipe, preventive maintenance is carried out in accordance with the technical standards listed in Table 6-9 below:

Technical Standard	Periodic Maintenance Activities
GNS-0014 Maintenance of above ground corrosion protection systems	• Annual inspections of above ground steel pipework to check for pipeline coating deterioration or disbondment.
GNS-0021 Patrolling	• Three monthly inspections of special crossings to check the condition of pipework and equipment supports.

Table 6-9 : Maintenance Programme for Special Crossings

Preventive maintenance activities on special crossings may identify the need for corrective maintenance work including the repair of pipeline mounts, brackets, corrosion, pipeline coating repairs, and civil works (excavation and backfilling) associated with undertaking this work.

6.3.2.8 Replacement Programme

Special crossing upgrade work is planned for the 2013/14 FY to address the recommendations made in the 2012 seismic review of critical gas distribution infrastructure (refer section 6.3.2.6 above). In addition, a small annual expenditure provision has been made to allow for the replacement of pipe brackets and supports as required due to integrity issues. Apart from seismic upgrade work that may be identified in future seismic reviews, no other major special-crossing upgrade work is planned.

6.3.3 Telemetry

6.3.3.1 Functional Description

The telemetry systems used by Vector to monitor its gas distribution networks comprise the Telenet supervisory control and data acquisition (SCADA) system, and the Cello system. The Telenet SCADA system is currently deployed predominantly on the Auckland network, with one site installed on the North Island network at Mt Maunganui and another installed in Hamilton. The Cello system is currently deployed at permanent monitoring sites on the North Island network only.

Access to Telenet data is provided via the PI archiving system, and access to the Cello data is provided via a proprietary PMAC database.

The telemetry systems provide remote monitoring of critical inlet/outlet pressures, temperatures and flow rates, and corrected and uncorrected metering data. The telemetry monitors data at gate stations, DRSs and major gas customer sites, and also provides remote control facilities for the operation of IP20 valves located at either end of the Auckland harbour bridge.

6.3.3.2 Physical Description

Telenet System

The Telenet system was originally commissioned in the late 1990s and 67 field sites are currently operational. Telenet installations provide pressure and flow monitoring at DRS and other locations on a number of pressure systems throughout the greater Auckland area, including:

- Auckland IP20;
- Bruce McLaren IP10;
- Central Auckland MP4;

- Central Auckland MP7;
- East Auckland IP10;
- East Auckland MP4;
- Mangere MP4;
- Mt Maunganui IP20;
- North Shore MP4;
- South Auckland MP7;
- Pukekohe MP4; and
- Mt Maunganui IP20.

The Telenet system incorporates the two different telemetry configurations which utilise either Kingfisher or GPRS equipment.

Kingfisher System

This configuration utilises Kingfisher RTUs which are polled half-hourly by the Kingfisher master RTU (located at Vector's offices in Newmarket) using radio (via radio repeater stations) and dial-up communications. Data retrieved from the field RTUs is immediately passed from the master RTU to the Foxboro SCADA system and to the PI archiving system. A project to migrate the Foxboro SCADA to Vector's existing Power TG system is underway and is expected be completed during 2013/14 FY. At the completion of the migration project the telemetry data will pass to the PI archiving system via the PowerTG SCADA.

Alarm thresholds for critical pressures, temperatures and flow rates are held within the field RTUs. If the RTU detects a breach of any of the threshold values it will initiate a refresh of the data held on the master RTU for that site. Alarm settings held within the Foxboro SCADA system allowing the alarm status of these sites to be monitored.

The system utilises three radio repeaters. Co-site agreements are in place for each of the sites which are located at:

- Sky Tower, Hobson St, Auckland;
- Titirangi Tennis & Squash Rackets Club, 1 Ava Avenue, Titirangi; and
- Pukekohe Hill, Pukekohe Scenic reserve, Anzac Rd, Pukekohe.

A project to migrate the northern electricity SCADA from the Foxboro SCADA system to the Siemens Power TG system (and retire the Foxboro SCADA system) has been initiated and is expected to be completed in 2013/14 FY. As a full SCADA solution is not seen as imperative for gas distribution at the present time, only the Harbour Bridge IP20 valve control functions will be migrated to the PowerTG SCADA system. Monitoring of the remainder of the telemetry sites will be carried out using the PI system utilising its enhanced functionality to provide text and/or email alerts (alarms) for threshold breaches at key sites.

GPRS Modem Configuration

This configuration utilises a Mercury electronic gas volume corrector/PT board configuration and uses the Vodafone GPRS mobile data network communications service. Data is returned from the field sites every 5 minutes and is temporarily held in the PowerTG SCADA server (located at Vector's offices in Newmarket) from which it is immediately transferred to the PI archiving system.

Cello System

Permanent Cello installations currently provide pressure monitoring at DRS and other locations on the following pressure systems within the North Island network:

- Fairfield LP
- Frankton LP
- Hamilton East LP
- Hamilton East MP4
- Hamilton IP10
- Hamilton MP1
- Hamilton MP7
- Hamilton West LP
- Whangaparaoa MP4

The Cello system is comprised of GSM remote data loggers that use SMS messages for communication, and a receiving PC which has proprietary PMAC software and a GSM modem installed. The receiving PC is currently located at Vector's New Plymouth Bell Block office from where the logger data is accessed, analysed and distributed using the proprietary PMAC software.

The Cello is a self-contained (i.e. GSM modem and battery pack) and intrinsically safe unit that can monitor flow and pressure and initiate alarms and is used extensively in the UK. The units log data at a rate set by the operator (typically 15 minutes) and transmit the data at intervals varying from days (typically for metering) to hourly or daily (typically DRS monitoring). The rate of data transmission has an impact on battery life, and as a general rule a single pressure Cello unit logging data at a 10 minute interval and sending data on a daily basis (i.e. one SMS message) will yield a battery life of approximately 5 years.

Ten Cello units were initially purchased in 2006, followed by another 10 in 2011 and 30 in 2012. Ten are permanently installed at key DRS and system extremity point locations and the balance are used as portable data loggers for winter gauging or performance analysis purposes. A further 60 Cello units were purchased during the 2012/13 FY; 30 of these units will be used for general data logging purposes (e.g. as part of the winter gauging programme) and replace aging data loggers, and the balance will be deployed to permanent monitoring sites on both the Auckland and North Island networks.

6.3.3.3 Age Profiles

The age profile of Vector's network Telenet assets is given in Figure 6-7.

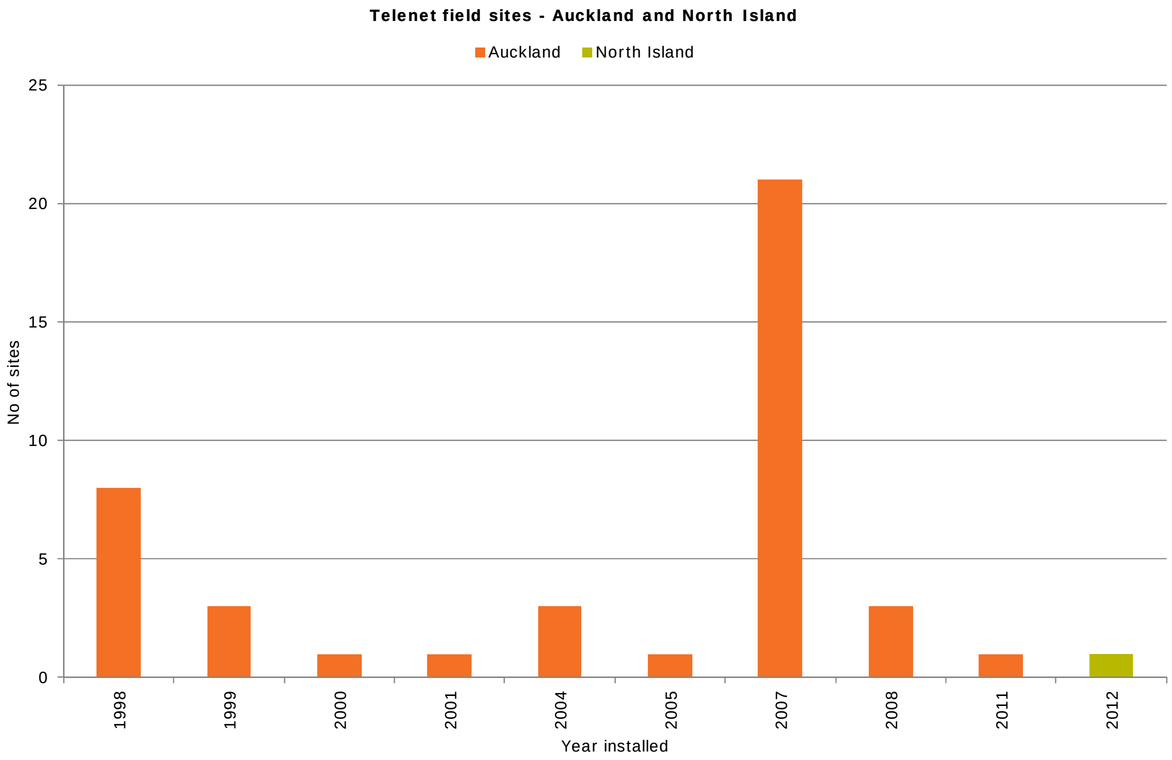

Figure 6-7 : Age profile - Telenet assets

The standard ODV purposes life for telemetry equipment is 7 years.

In 2006 four Cello units were installed at permanent monitoring sites on the North Island network at Hamilton, and in 2012 a further six Cello units were installed at permanent monitoring sites on the North Island network at Hamilton Whangaparaoa.

6.3.3.4 Condition, Performance and Risks - Cello System

Condition of Assets

Cello units have been installed on the North Island Hamilton and Whangaparaoa networks to monitor system pressures at key DRS sites (inlet and outlet pressures) as well as at critical system extremity points. Alarm thresholds have been set and SMS messages are generated to key Vector and service provider staff if the alarm thresholds are breached. The field equipment is approaching six years of age and is in good working condition.

Performance of Assets

The Cello system performs reliably and adequately.

Risks

Cello data is currently archived to a proprietary PMAC database and can only be accessed via the shared network in Vector's New Plymouth Bell Block office using proprietary PMAC software. With the planned wider deployment of Cello units onto the Auckland and North Island networks, the ability to access all telemetry data via a single interface will become crucial. A project has therefore been initiated to develop an interface between the PMAC system and the corporate PI archiving system to allow automatic uploading of Cello data from the PMAC system into the PI system. This work will be carried out as part of a larger project to develop a telemetry monitoring system to generate text and/or email alerts (alarms) for threshold breaches and is expected to be completed during the 2013/14 FY.

6.3.3.5 Condition, Performance and Risks - Telenet Kingfisher Configuration

Condition of Assets

Most of the telemetry equipment installed at Telenet Kingfisher sites was originally purchased and installed in 1998 and is therefore at or near the end of its expected service life. Similarly the original powder coated RTU field cabinets are approximately 10 years old and nearing the end of their service life.

Performance of Assets

The Kingfisher system performs well and reliably. It utilises thirty minute polling (compared to five minute polling for the GPRS configuration), which is at the upper end of the desired polling rate, however this is a limitation of the radio configuration.

Risks

Monitoring of Alarms

Following Vector's decision to retire the Foxboro SCADA system, the PI system has been adopted as the primary tool for monitoring Vector's gas distribution telemetry system. The latest release of PI provides an enhanced level of functionality which will be utilised to develop alarm capabilities using text and/or email alerts for threshold breaches at key sites. A project to develop the necessary interfaces and functionality to provide text and/or email alerts (alarms) is expected to be completed during the 2013/14 FY.

RTU Cabinets

The original Telenet Kingfisher RTU cabinets were of a powder coated type and as these are now approximately 12 years old, they are starting to corrode. To address this issue, the Telenet design standard has been amended to stipulate stainless steel cabinets instead. Corroded cabinets are replaced as asset replacement projects, and the quantity replaced annually is expected to increase over time.

Aging Telemetry Equipment

The majority of the telemetry equipment (e.g. RTU and radio transceiver equipment etc) installed at the Telenet Kingfisher sites was originally purchased and installed in 1998 and is therefore at or near the end of its expected service life. Telemetry equipment is replaced as part of corrective maintenance, and the frequency of equipment faults is expected to increase over time.

Redundant Equipment at Customer Monitoring Sites

The original Telenet project plan initiated in 1998 included the installation of telemetry equipment at approximately 100 customer sites throughout the wider Auckland area in order to provide a time-of-use metering service to gas retailers. However, the service was never embraced by the retailers, and most of the sites became disconnected from the telemetry system over a period of time. In 2006 a programme was initiated to decommission all remaining customer sites and remove any installed telemetry equipment in order to eliminate any associated health and safety risks (e.g. related to power supplies or antenna poles). Most sites have now had all telemetry equipment removed, and the equipment installed at the few remaining sites will be removed during the 2013/14 FY.

6.3.3.6 Condition, Performance and Risks - Telenet GPRS Configuration

Condition of Assets

The majority of the GPRS configuration telemetry field equipment was installed in 2007 and is in good working order. Problems with corrosion of Mercury Mini-AT corrector casing have been encountered and these have been addressed through the corrector supplier.

Performance of Assets

This telemetry configuration provides five minute polling which has proved valuable in fault finding and contingency situations. GPRS signal strength is relatively weak in some localities within the Auckland distribution network area, and amplifier equipment is being investigated in 2013/14 FY for the few effected sites.

Risks

Alarm Setup

Approximately 40% of the Telenet sites utilize a GPRS configuration. Currently there is no alarm facility available to these sites. This is expected to be resolved as part of the monitoring-of-alarms project (described in section 6.3.3.5) which will provide text and/or email alerts (alarms) for threshold breaches.

Electronic Volume Correctors

The Telenet GPRS configuration currently utilizes a single electronic volume corrector type (and associated peripherals). This configuration has been used since 2007 and since that time a number of equipment faults have occurred with either the corrector or its associated peripherals. Where possible this equipment has been repaired or replaced under warranty, however the longer term use of this type of corrector is under review and a recently released alternative product has been evaluated and approved.

6.3.3.7 Condition, Performance and Risks – Telemetry General

Condition of Assets

Refer to previous sections for the condition of Cello, Telenet/Kingfisher and Telenet/GPRS configuration equipment.

Performance of Assets

Refer to previous sections for the performance of Cello, Telenet/Kingfisher and Telenet/GPRS configuration equipment.

Risks

Telemetry Development Strategy

The majority of the current Telenet installations (Auckland network) were installed in conjunction with a DRS rebuild programme that was running in parallel with the original Telenet project in the late 1990s. Subsequent to that a further 25 Telenet installations were made at DRS sites that already had metering equipment installed and were deemed to be key monitoring sites. The monitoring provided at these sites can be considered to be real-time monitoring as it provides 30 minute updates for the Kingfisher sites, and 5 minutes updates for the GPRS sites. From an operational perspective this level of monitoring can pay substantial dividends when contingency events occur (e.g. the New Lynn event[8] in late 2008), and it aligns with the requirements of NZS5258 to provide remote monitoring in accordance with operational requirements.

However, the costs of installing real-time monitoring has escalated significantly over recent years, and the option of making more use of lower cost alternatives (e.g. Cello units) has been explored. While there is clearly a need for real-time monitoring at key sites, the use of lower cost Cello style solutions at other sites can significantly increase the level of monitoring available on the Auckland network and in particular the North Island network.

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[8] This event involved damage by Kiwirail to the IP20 pipeline.

The following guidelines have been developed to assist in determining what type of telemetry monitoring should be considered for DRS and system extremity point monitoring:

- Real time telemetry monitoring will be considered for all DRS that meet the following criteria:
    - The DRS is supplied from an MP7, IP10 or IP20 pressure system; and
    - The position of the DRS relative to the overall configuration of the pressure system provides a key pressure-monitoring location for that pressure system; and/or
    - The DRS has a peak throughput in excess of 500 scmh and/or it supplies 1000 ICPs or more;
- Real time telemetry will be considered for system extremity monitoring points where the ability to monitor real-time system pressure data during a contingency event is considered to be critical; and
- The use of the Cello monitoring will be considered for DRS sites and system extremity monitoring points where the availability of real time load flow and/or system pressure data is not considered to be critical, but where the availability of flow and/or pressure data is considered vital for planning purposes.

Approximately 45% of DRS on the Auckland network have Telenet real-time monitoring installed, however to date no permanent Cello installations exist on the Auckland network. On the North Island network, ten permanent Cello installations provide remote data logging of system pressure and flow with daily uploads from 3 key DRS sites and 7 system extremity locations. The first real-time telemetry monitoring site on the North Island network was completed in 2012.

The operational support provided by the Cello system is limited to the generation of alarms when pressure thresholds have been breached, and the Cellos are therefore of limited operational value for managing contingency situations due to their inability to provide real-time monitoring. However the ongoing deployment of additional Cello sites is planned for both the Auckland and North Island networks with the long term aim of providing network monitoring to most pressure systems within the Auckland network and most network systems within the North Island network. Additional deployment of telemetry monitoring (in line with the guidelines above) is planned for both the Auckland and North Island networks, with the installation of real-time telemetry typically being carried out in conjunction with major DRS upgrade projects.

Both the real-time and Cello solutions have the capability to provide additional functionality over what is currently available. Functionality provided by the current telemetry systems include:

- Real-time monitoring of system pressure, temperature, flow and associated alarm status (Telenet);
- Remote control of critical IP valves (Telenet); and
- Remote data logging of system pressure and flow with daily uploads, and generation of SMS notifications when alarm thresholds are breached (Cello).

Areas of expanded functionality will be pursued where a cost benefit analysis indicates that there are net benefits to be gained. Examples of areas where this functionality could be expanded include:

- Monitoring of a DRS slam-shut sensor;
- Monitoring of unauthorized entry to DRS station;
- Detection of gas escapes at DRS stations; and
- Remote monitoring of CP sites.

6.3.3.8 Maintenance Programme

Cello units are maintained on an as required basis in accordance with the manufacturer's recommendation. Cello batteries have a nominal service life of approximately 5 years - the unit initiates a low battery alarm when the battery is reaching the end of its service life allowing a battery change to be scheduled. The Cello unit pressure transducers do not require periodic calibration as they do not drift.

Preventive maintenance cycles for Telenet have been determined based on industry code requirements, risk management principles and good industry practice. Preventive maintenance of the Telenet system is carried out in accordance with the periodic cycles stipulated in the following technical standard:

Technical Standard	Periodic Maintenance Activities
GNS-0016 Telenet maintenance	• Annual maintenance inspections of Telenet master station, field sites and repeater station installations
	• 4 yearly intrinsic safety inspections of Telenet equipment installed in hazardous zones

Table 6-10 : Maintenance Programme for Telenet field equipment

Preventive maintenance activities on Telenet field equipment may identify the need for corrective maintenance work, which could typically include the replacement of RTU cabinets (due to corrosion damage), or the replacement of faulty electronic correctors, modems etc.

6.3.3.9 Installation / Replacement Programme

There is no telemetry equipment replacement programme scheduled for the duration of the planning period. Individual equipment components will continue to be replaced on an as required basis as and when they fail.

The installation of new Telenet sites is typically carried out in conjunction with major DRS upgrade or installation projects. The deployment of two Telenet installations and 10 Cello installations (at DRS and/or system extremity sites) per year are planned for the duration of the planning period for each of the Auckland and North Island networks.

The ongoing replacement of corroded powder coated RTU cabinets with stainless steel cabinets will continue on an as required basis throughout the planning period.

The replacement of aging RTU and radio transceiver equipment will continue to be carried out on an as required basis.

6.3.4 Critical Spares and Equipment

6.3.4.1 Functional Description

A stock of critical spares and equipment is maintained so the repair of a network fault is not hindered by the lack of availability of required parts or equipment. Critical spares and equipment items for Vector's Auckland and North Island networks are owned by Vector and held on its behalf by its FSP; Electrix. Whenever new equipment is introduced to the network an evaluation is made of the necessary critical spares and equipment items required to be retained to support the repair of any equipment.

The majority of the critical spares and equipment items are held in Electrix's main depots in Albany and Hamilton, with small inventories also being held at Electrix's regional depots in Whangarei, Mt Maunganui, Rotorua, Taupo, Gisborne and Kapiti.

Separate lists of critical spares and equipment are maintained for each of the FSP's emergency depots. The lists have been developed over a period of time and are the result of collaboration between Vector's AI and SD staff and Vector's FSP. When new critical spares and equipment items are required they are typically sourced via Vector's FSP; Electrix. Where the scale of a proposed purchase warrants it (e.g. the purchase of a major equipment item), direct purchase by Vector would be carried out.

6.3.4.2 Physical Description

The critical spares and equipment lists include items that are low volume (turnover) or high cost, or have long lead times for purchase, or are no longer produced (obsolete) or where the level of risk associated with not holding a spare is considered high.

The list for the Auckland network is comprised predominantly of fittings and equipment related to steel pipelines (e.g. TDW drilling and stoppling equipment, repair clamps, spherical tees, valves etc), with some critical items for larger diameter PE systems (e.g. 280mm fittings) etc.

The list for the North Island network also includes DRS spares (e.g. Cocon cartridges, regulators) regulator overhaul kits, valves and PE fittings etc. The need for the wider range of items included in the North Island network list is due to the relatively longer lead times to obtain replacement parts from key suppliers due to the geographic spread of the North Island network.

6.3.4.3 Age Profile

The age profile of the critical spares and equipment stock is not accurately known due to legacy data capture processes. However, some of the major equipment items are known to be at least 25 years old.

For ODV purposes the standard life for critical spares (i.e. excluding critical equipment) is 50 years.

6.3.4.4 Condition, Performance and Risks - Critical Spares and Equipment

Condition

The general condition of the critical spares and equipment is adequate. Some of the equipment (e.g. TD Williamson drilling equipment used for hot tap operations on live steel gas mains) is at least 25 years old and its current condition reflects the relatively high level of service.

Performance

A range of critical spares and equipment is held. The performance of the critical equipment items is adequate, although in some cases the type of equipment held currently limits the range of specialized fittings that can be used e.g. completion plugs. The compatibility of equipment with the range of specialized fittings currently available will be considered when planning the replacement of existing, or the acquisition of additional, items of critical equipment.

Risks

A replacement programme for critical spares and equipment has not been formalised. An audit of the condition of critical spares and equipment will be carried out in the 2013/14 FY to determine whether a replacement programme for key items is required.

The recently completed project to align the SAP PM models for the Auckland and North Island networks provides an opportunity to use SAP PM to manage critical spares and equipment records for key items, thus improving visibility of those items. A review of the full inventory of critical spares and equipment items will be completed during the 2013/14 FY and key critical spares and equipment items will be captured into SAP PM.

6.3.4.5 Maintenance Programme

Preventative maintenance inspection and periodic audit cycles have been determined based on risk management principles and good industry practice. Preventive maintenance of critical spares and equipment is carried out in accordance with the periodic cycles stipulated in the following technical standard:

Technical Standard	Periodic Maintenance Activities
GNS-0078 Maintenance of critical spares and equipment	• Monthly – visual inspection
	• Annual – condition assessment of all critical spares and equipment; Review of inventory lists to determine level of inventory held is appropriate
	• 5 to 10 yearly - manufacture's check/refurbishment of all major items of equipment

Table 6-11 : Maintenance Programme for critical spares and equipment

6.3.4.6 Replacement Programme

The development of a refurbishment/replacement programme for critical spares and equipment is expected to be completed in the 2013/14 FY. A nominal annual expenditure provision has been made for the replacement of unspecified critical spares and equipment on an as required basis.

The purchase of two sets of PE stoppling equipment will be investigated in the 2013/14 FY. The equipment would be held in the Auckland and Hamilton depots and would be used for pipeline isolation operations on larger diameter pre-1985 PE mains pipes – i.e. instead of carrying out a squeeze-off operation. The use of this equipment would mitigate the risks associated with brittle-like cracking failures on pre-1985 PE pipe.

6.3.5 Pressure Reducing Stations

6.3.5.1 Functional Description

Pressure reducing stations are those parts of a gas system that link two pressure levels in gas networks, through pressure regulators. They are the points of input to a pressure level and comprise the following three types:

- Gate stations;
- District regulator stations (DRS); and
- Service regulators.

Pressure stations linking the gas transmission system and a gas distribution network are known as gate stations. HP equipment (pressure regulating equipment, custody transfer metering, etc) within the gate station is operated and maintained by Vector Gas Transmission, whereas distribution system equipment (i.e. check-metering where installed, and associated valves and pipework etc) within the gate station is operated and maintained as part of Vector's distribution networks.

Where a pressure station links two gas distribution pressure networks, it is known as a district regulating station (DRS). These are operated and maintained by the Vector gas distribution team.

A service regulator is used to regulate the flow of gas (reduce the pressure) to individual or a small number of consumer premises, and is installed upstream and separate from the customer GMS. Service regulators are owned and maintained by Vector.

The purpose of DRS and gate stations are to automatically control the pressure in the downstream mains, and meet the following service and performance standards:

- Have the capacity to supply the forecast load based on minimum design inlet pressure and design outlet pressure and current load projections;
- Be twin stream with each stream meeting the forecast load capacity;
- have adequate over-pressure protection – preferably automatic shut off (ASO) devices;
- Be accessible at all times and be able to be isolated external to the enclosure;
- Have a 35 year minimum life (same as standard life used for ODV purposes);
- Pilot loaded regulator DRSs should maintain delivery pressure at ±5% of set point;
- Spring loaded regulator DRSs should maintain delivery pressure at ±10% of set point;
- Normal operation should maintain delivery pressure at or below MAOP at all times;
- Under fault conditions, delivery pressure should be maintained at or below MAOP for LP systems and at or below 110% MAOP for MP and IP systems;
- Each DRS is to have an inlet and outlet isolation valve located at least 5 metres away from the enclosure; and
- DRSs must comply with Vector standards and legislative requirements.

6.3.5.2 Physical Description

There are 63 gate stations feeding 57 distribution networks; These 57 distribution networks contain 247 DRS which comprise the following elements:

- Remote (fire stop) inlet and outlet isolation valves (in most sites);
- Inlet and outlet valves;
- Filters;
- Regulators;
- Over-protection control – slam shut mechanism or relief valves;
- Metering (in some sites);
- Telemetry (in some sites); and
- Enclosure – varies from wire mesh to solid timber/concrete block building.

DRSs are generally twin stream units. Due to legacy design practices, some second streams are not filtered and are a standby stream rather than a full capacity stream. DRSs are generally above ground, but a growing number of factory-built underground DRSs are being installed by Vector.

Approximately 285 service regulators remain in service on the Auckland network. The average age of the service regulators is 21 years, with the majority installed between the mid 1980s and the mid 1990s. Existing service regulators are mostly installed in small pits below ground, however all new service regulators are installed above ground. Service regulators are typically installed in situations where it is not possible (or considered impractical) to locate the GMS outside of the customer's premises. A service regulator is typically comprised of a small-capacity pressure regulator along with upstream and downstream isolation valves.

6.3.5.3 Age Profiles

Figure 6-8 shows the age profile for the DRS on the Auckland and North Island networks. For ODV purposes the standard life for DRS is 35 years.

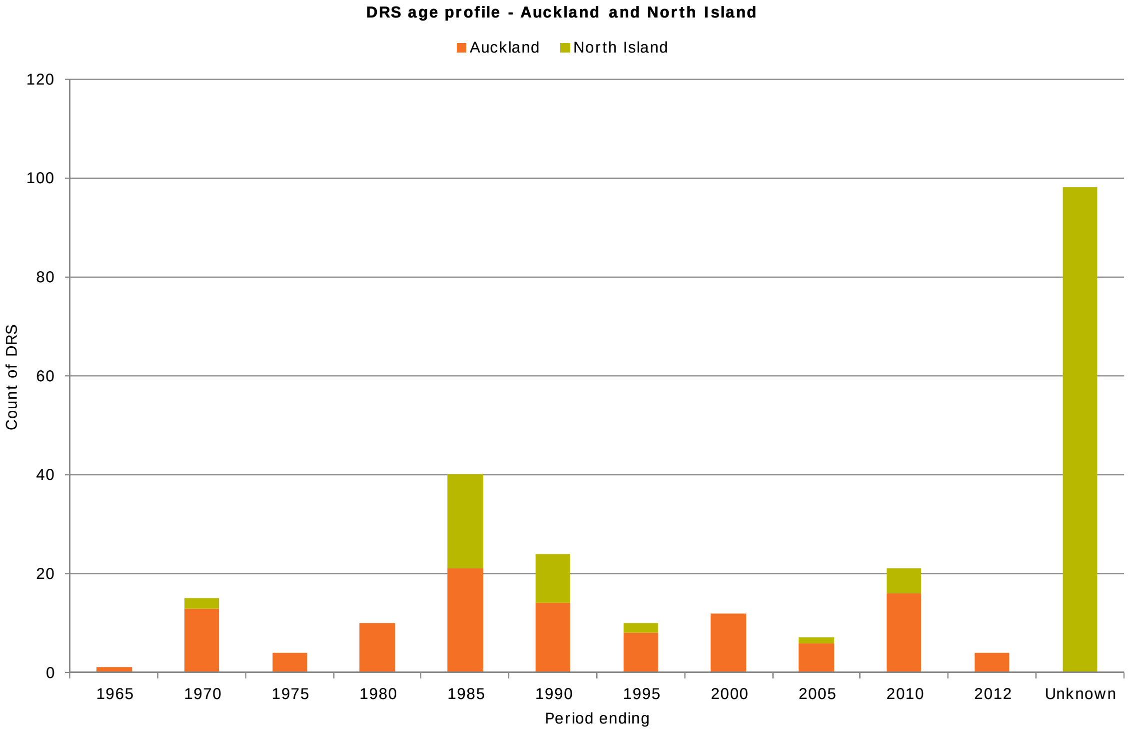

Figure 6-8 : District regulating stations: Age profile of Assets

Figure 6-9 shows the age profile for the service regulators on the Auckland and North Island networks. For ODV purposes the standard life for service regulators is 35 years.

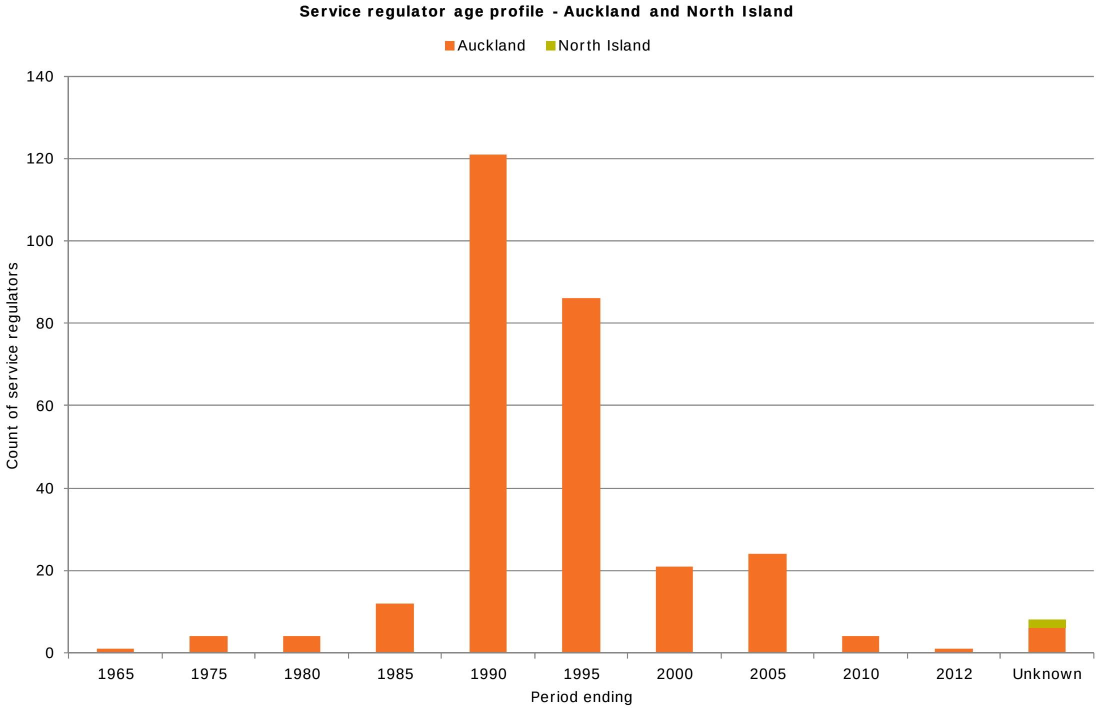

Figure 6-9 : Service regulators: Age profile of Assets

6.3.5.4 Condition, Performance and Risks - DRS

Condition of Assets

An initial field audit of all DRS was undertaken during the 2009/10 FY. The audit assessed the condition and status of each DRS and covered the following general areas:

- Enclosure dimensions, amount below ground, enclosure type and ventilation provided;
- Confirmation the reliefs valves vented to a safe location;
- Inlet and outlet fire valves present and accessible;
- The condition of the enclosure and ease of access/egress; and
- The condition of DRS equipment – i.e. regulators, pipework, filter, relief valve, meter and corrector.

A condition assessment rating was assigned for each of the DRS components based on the audit results. The assessment rating was based on a 7 point scale where 1 is very poor condition and 7 is good condition. The integrity register has been updated on an ongoing basis (as DRS upgrades are completed) and the graph below indicates that currently 3% of DRS have an average condition assessment rating of 4 or less. These DRS are considered to be high priority for replacement or refurbishment.

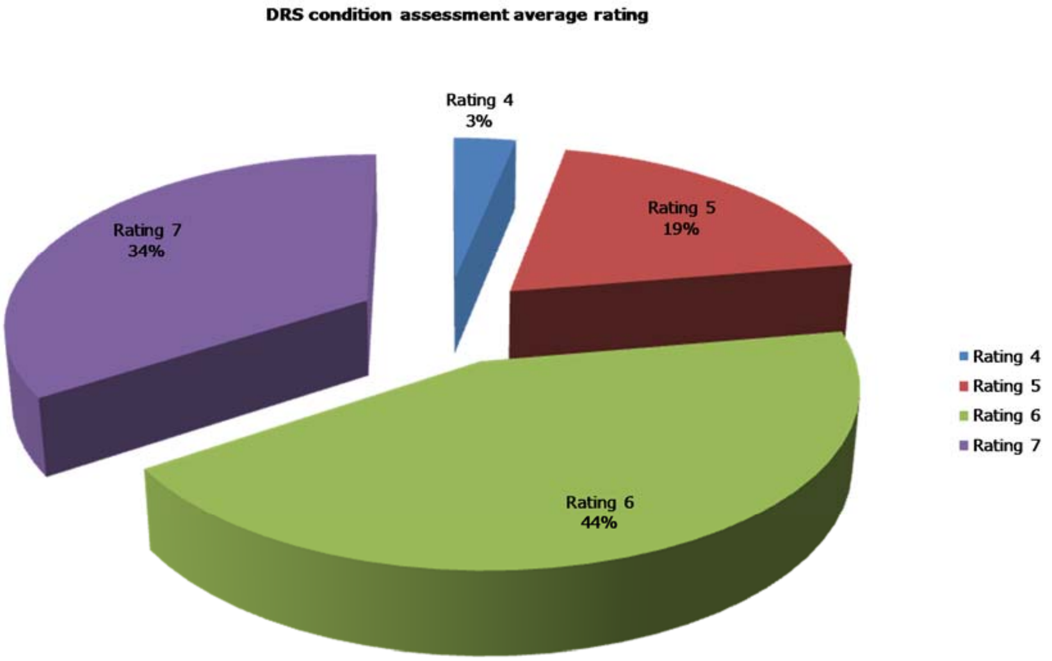

Figure 6-10 : DRS condition assessment

The relative priority of individual DRS for replacement or refurbishment has been further assessed by considering the relative number of low condition-assessment ratings assigned to each DRS. DRS that have a relatively high number of compliance issues are considered to have the highest priority for replacement or refurbishment.

The ongoing condition assessments form the basis of Vector's DRS upgrade programme to address the integrity issues identified. The average integrity score for all stations has shown a steady improvement over the period, and the count of integrity ratings of less than 4 has shown a significant decrease (improvement) over the period.

Performance of Assets

A number of DRS sites have insufficient ventilation. However, as code requirements on ventilation have changed over the years, the date of installation (or upgrade) must be compared with the relevant code of practice. Those sites that do not comply with the code of practice at the time of installation are being bought up to the current code of practice. Those complying with the then applicable code of practice (but not meeting current code requirements) have been assessed and prioritised for upgrading.

Due to legacy practices, there are a number of sites where the relief valves are not piped and there are also some sites where the vent pipe ends within 1 metre of a building. These sites have been prioritised according to risk and are currently scheduled to be addressed by the end of the 2013/14 FY.

A risk assessment has been carried out on those sites that do not have both an inlet and outlet valve. The high-risk sites will be programmed to have the valves installed. Replacement of the lower risk sites should be programmed with other site works.

There are number of sites where the DRS enclosure is located within 1 metre of another building. These sites need to be evaluated to determine if there are any openings into the building within 1 metre (or directly above) the enclosure, or to determine where the hazardous zones are. If there is a hazardous zone within 1 metre of an opening then options to alter or restrict the hazardous zone are to be considered and implemented.

In 2012, Vector engaged a seismic specialist to undertake a review of critical gas distribution infrastructure to assess the selected assets for compliance with the seismic provisions of NZS1170. The review included three gate stations (two located in Auckland and one in Hamilton), and five DRS sites (three in Auckland, and one each in Hamilton and Rotorua). Recommendations to improve seismic resilience have been reviewed and prioritised according to risk, and work to address the recommendations is expected to be completed by the end of the 2013/14 FY.

Risks

Obsolete Regulators

There are 12 known DRSs (all in the North Island network) that have obsolete regulators. Spare parts are no longer available and thus they cannot be easily maintained. A five year plan to replace these regulators is in place which is anticipated to be completed in year 2014. At the same time, the DRSs will be bought up to current standards where necessary. The order of replacement is based on criticality of the DRS to maintain network supply at appropriate levels of service, and the condition of the DRS. As part of the review, network analysis is undertaken to confirm the need for the DRS.

The obsolete regulators are confined to certain models of Sprague and Fisher regulators. Rockwell 461-57S regulators were previously also listed as obsolete regulators but spare parts have been sourced and successfully trialled by Vector Gas Transmission. A similar trial is currently underway on distribution regulators. To date the replacement parts are performing satisfactorily. Should the trial be unsuccessful then these regulators will be added back to the list of obsolete regulators.

Inadequate Pressure Relief Capacity

Over-pressure protection in the North Island network is often provided by installing full capacity relief valves. With the increase in capacity caused by installing larger regulator orifices/ports, coupled with installing vent pipes on relief valves, some sites may no longer have full capacity relief. Currently there are approximately 65 DRS sites whose relief capacity will need to be upgraded (currently planned to be completed by the end of the

2017/18 FY. Where appropriate, the installation of automatic shut off (ASO) devices will be considered.

Capacity Not Known

There are approximately 10 known DRSs where the capacity cannot be given as the data on the regulator's orifice size is not known. This data will be gathered as part of ongoing routine preventive maintenance inspections.

Gas Distribution Supply Criteria

Vector's gas distribution quality of supply criteria is based on a general 50% pressure drop across the network. In the past, the North Island network had different design criteria. The design capacity of North Island network DRSs is being reviewed against Vector's current gas distribution quality of supply criteria. From this, the required work to ensure the North Island network meets Vector's gas distribution quality of supply criteria can be determined.

Changes to Codes of Practice

Prior to the gazetting of NZS5258:2003 the installation of a pressure monitoring regulator in series with an active regulator met the definition of safety device for protection against over-pressure control in networks. That is, the monitor regulator provided acceptable protection for the active regulator. However, the code now requires both regulators to be protected.

NZS5258:2003 states that the code is not retrospective unless making substantial modifications to existing installations. A risk assessment will be carried on those sites that do not meet the current NZS5258 requirements (for new installations) for network over-pressure protection. For those sites which are assessed as high risk, the installations will be bought up to the current standard. Sites with a low risk will have this issue linked with other works required on the site and programmed accordingly.

Pressure Reducing Stations with Standby Streams

There are 26 known DRS sites that are twin stream but where the streams are not similar in terms of performance or quality of supply. Generally one stream has monitor/active pilot loaded 50 NB regulators while the second stream has a single spring loaded 25 NB regulator. The second stream is a standby stream and is meant to be valved off at all times except when maintaining the other stream. An audit and assessment of these type of sites has been carried out to determine if this action (i.e. valving off the second stream) compromises the ability to supply, and the relief capacity if the main stream malfunctions.

Currently 6 sites have the bypass valved off and a further 5 sites can have the bypass valved off. A further 15 sites are to be upgraded or decommissioned by 2018.

6.3.5.5 Condition, Performance and Risks – Service Regulators

Condition of Assets

Service regulators are mostly sited underground in small pits close to the main in the street. These pits are vulnerable to filling with water, allowing water ingress into the regulator relief hole.

Since 2000 several service regulator audits and removal projects have been undertaken, and the population of service regulators has been reduced from in excess of 700 to approximately 285 currently. The condition of service regulators is monitored by means of annual (for belowground service regulators) and biennial (for aboveground service regulators) preventive maintenance inspections. Service regulator replacement candidates are identified through SAP PM inspection records, fault reports or an assessment of other risk factors – e.g. the service regulator location relative to buildings, roadways etc.

Performance of Assets

In some locations underground service regulators are affected by the ingress of water, silt or other debris that over time leads to corrosion and impaired regulator performance. This can result in gas escapes from corroded fittings and pipework, and can allow unacceptable over-pressure gas into downstream systems (and venting gas to atmosphere). This legacy issue only applies to the Auckland network.

Risks

Service regulator pits are vulnerable to water ingress which increases the risk of corrosion of the regulator fittings and the risk of water ingress into the regulator relief hole. This can potentially cause the loss of supply, resulting in a safety issue and a costly maintenance problem.

An ongoing removal programme targets higher risk belowground service regulator sites. Belowground service regulators are removed where possible or relocated aboveground. Replacement candidates are identified through SAP PM inspection records, fault reports or an assessment of other risk factors - e.g. the service regulator location relative to buildings, roadways etc.

6.3.5.6 Maintenance Programme

DRS and Gate Stations

DRS and gate station maintenance is carried out in accordance with Vector’s technical standard GNS-0012 Maintenance of gate and district pressure reducing stations.

All underground sites are inspected quarterly, and all above ground sites are inspected six-monthly. The integrity of the site and enclosure is reviewed and all defects recorded. Operation of equipment is checked and variations outside normal conditions are remedied. Remedial actions are recorded.

In addition to the above, on an annual basis the set points of all equipment are checked and confirmed as within operating parameters. Any variations outside normal conditions are remedied. Remedial actions are recorded and all valves are actuated.

Maintenance records are reviewed on an annual basis. Trends are used to confirm the appropriateness of maintenance cycles and drive replacement programmes.

Service Regulators

All underground sites are inspected annually, and all above ground sites are inspected biennially in accordance with Vector’s technical standard GNS-0073 Service regulator maintenance. The integrity of the site and enclosure is reviewed and all defects recorded. Operation of equipment is checked and any variations outside normal conditions are remedied. Remedial actions are recorded.

6.3.5.7 Replacement Programme

The replacement of gate station, DRS and service regulator assets is based on an assessment of the following criteria:

- Condition: Physical deterioration is excessive i.e. beyond economic maintenance. This includes the enclosure;
- Functional changes: Obsolete equipment – spare parts no longer available and equipment is not operating correctly; equipment malfunction leads to replacement; third party interference; inadequate/poor design;

- Site changes: Fire stop valves in carriageway; new/altered surrounding buildings compromising egress, ventilation and access to fire stop valves; vent pipes too close to new/altered buildings; risk consequence/frequency for DRS increased; flooding; and
- Code/standard changes: Legacy plant layout etc does not meet current codes of practice/Vector standards.

A DRS replacement/refurbishment programme has been implemented based on the criteria described above and the results of the initial DRS audit carried out in 2009/10 and subsequent condition assessments. The programme prioritises sites according to condition and risk. Specific replacement/refurbishment projects have been scheduled over the period up until 2018, although the programme is ongoing beyond that period. The replacement programme targets the replacement or refurbishment of approximately 30 DRS of which approximately 90% are on the North Island network. The programme includes those DRS that have been assigned an average condition assessment rating of 4 or less or which have a relatively high number of technical or regulatory compliance issues.

Where a DRS replacement or refurbishment candidate is scheduled for removal as part of a pipeline replacement programme or as a result of a system rationalisation study or is scheduled to be relocated as part of a relocation project, the replacement or refurbishment of that DRS is deferred.

The condition assessment rating was based on the following key assessments:

- Compliance assessment:
    - Fire valve rating
    - Relief valve rating
    - Relief venting rating
    - Ventilation rating
- Condition assessment:
    - Regulator obsolescence rating
    - Vector technical standards rating
    - Condition of fittings, equipment and enclosure

Priority is also given to those DRS where the design capacity will be exceeded and to those DRS which contain obsolete equipment. The scope of individual upgrades range from the complete rebuilding of a DRS to the replacement of individual DRS components as determined by the latest condition assessment.

The service regulator replacement programme is risk-based and ongoing. Service regulators identified for removal (or replacement above ground) are prioritised based an ALARP risk assessment. Service regulator replacement candidates are identified through SAP PM inspection records, fault reports and other sources. The service regulator replacement programme will target the replacement of 5 to 10 of the highest priority service regulators per annum.

6.3.6 Valves

6.3.6.1 Functional Description

Distribution system valves are comprised of inline mains and service valves (to control the flow of gas within the system) and blow down valves (to depressurise sections of the system in the event of an emergency).

Valve types currently in use include ball valves, plug valves and gate valves. Due to their design, ball valves are relatively maintenance free whereas the other types require some measure of periodic maintenance to prevent issues and to ensure they remain operable.

Specifically valves are expected to achieve the following level of service and performance standards:

- Mains are to have sufficient valves to isolate consumers in blocks of 500 to 1,000;
- Installation at every 2,000 metres in PE systems with MAOP greater than 420 kPa;
- All IP services are to be fitted with an isolation valve;
- All services that enter a building at other than the GMS location, or pass through a space where gas could accumulate and become a hazard, or cross private property to supply another property, or is one of several extending to different floors of a building, are to be fitted with isolation valves;
- Each service shall end with an isolation valve(s) and shall be upstream of the GMS;
- Valves are to be installed to isolate high risk areas, such as CBD areas, bridges and rail crossings (note that these valves may be automatic shutoff valves);
- Valves are easily accessible, operable and leak free; and
- Valves comply with Vector's standards and legislative requirements.

6.3.6.2 Physical Description

There are 3,369 inline mains and service valves in the Auckland network, and 1,284 inline mains and service valves in the North Island network. A breakdown of quantities by operating pressure is shown in Table 6-12.

Pressure category	North Island	Auckland
LP 0-7 kPa	1	13
MP1 7-110 kPa	31	84
MP2 110-210 kPa	3	132
MP4 210-420 kPa	983	2,177
MP7 420-700 kPa	27	331
IP10 700-1000 kPa	103	304
IP20 1000-2000 kPa	136	328
Total	1,284	3,369

Table 6-12 : Operating pressure of valves used in the Vector networks

Information on valve types (i.e. ball, plug etc) installed on the Auckland and North Island networks is not currently available as it was not historically held in either the GIS or SAP-PM systems (refer Risk section below). Over 40% of mains valves installed on the Auckland network are thought to be plug valves, whereas the quantity of plug valves installed on the North Island network is unknown.

Mains and service valves are typically installed below ground. The majority are direct-buried and access to the valve is provided via a valve sleeve. In some cases (e.g. on larger diameter mains) valves are installed in pits or above ground. Below ground valves are generally operated by a purpose made valve key, whereas above ground valves are typically operated by a hand wheel and gearbox mechanism. Note that the reference to mains valves excludes valves that are installed above ground at gate station and DRS sites; these valves are operated and maintained as part of the station equipment.

6.3.6.3 Age Profiles

The age profile of the valves is shown in Figure 6-11.

For ODV purposes the standard life for valves is 35 years.

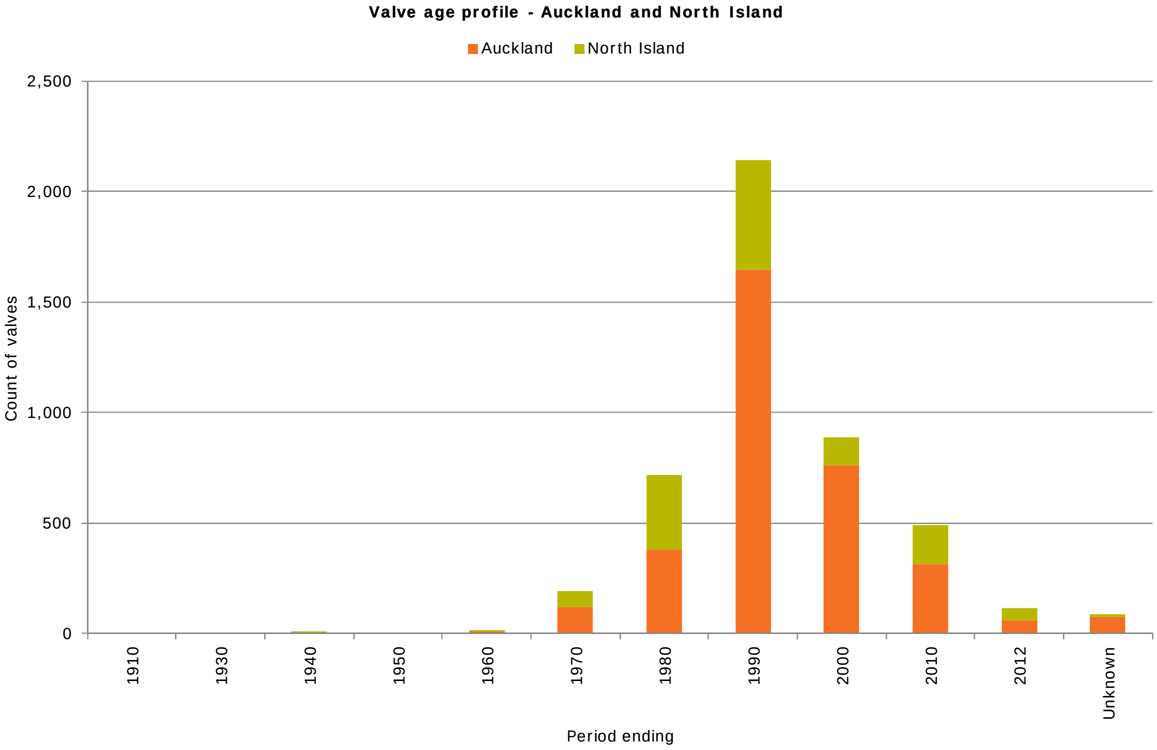

Figure 6-11 : Age profile of valves

6.3.6.4 Condition, Performance and Risks

Condition of Assets

Ball valves are typically in good condition and operate adequately.

Plug valves represent a significant operational and maintenance problem due to:

- The need for continual greasing to overcome seizing problems;
- The grease drying out; and
- Wads of grease contaminating downstream facilities.

Some valve sites are susceptible to the access sleeve filling up with debris. This has to be cleaned out before the valve can be maintained.

In some cases older valves are no longer able to be located. This is typically due to road alterations or re-sealing which result in obscured valve locations. This is an ongoing problem and in order to mitigate the risk, the deployment of electronic locator balls is being considered.

Performance of Assets

Ball valves have been used since the mid-1980s and are considered to be reliable and relatively maintenance free.

The use of plug valves ceased around the mid-1980s. Plug valves require a higher level of maintenance, because of their design, which includes regular greasing to prevent the valve seizing and/or leaking.

Risks

Under Pressure Shut-off Valves

Occasionally a road controlling authority has insisted that an under-pressure shut-off (UPSO) valve be fitted on the upstream side of a pipeline attached to a bridge. Of the four known UPSO valves, only two are able to be maintained. The other two were not fitted with an appropriate means of testing/tripping.

Following a review of a recent incident involving the activation of one of these valves, a risk assessment of the remaining UPSO valves that cannot currently be maintained will be carried out during the 2014 FY to determine if the replacement of the UPSO valves with ball valves is warranted.

The current maintenance standard GNS-0013 Valve maintenance is currently being amended to include provision for the testing of UPSO valves.

Valve Activation

The maintenance programme for ball valves requires valves to be partially operated to confirm that the valve is operable, whereas the maintenance programme for plug valves requires only valves that are “designated emergency valves” to be partially operated.

The reason for different maintenance practices for ball and plug valves is that plug valves can be prone to seizing and by limiting the partial movement operation to critical valves only, the risk of a plug valve seizing in a partially closed position is reduced. However this approach does increase the risk of a plug valve that is not subject to a periodic partial movement operation seizing during an emergency operation. International practice is being researched during the FY2014 FY to determine an appropriate maintenance strategy for plug valves.

Blow Down Valves – North Island Network

It is a NZS5258:2003 requirement that section blow down valves be installed on intermediate and medium pressure networks where shown to be necessary by risk assessment. Due to legacy practices, blow down valves have never been considered for the North Island networks. Risk assessments will be carried out on a system by system basis as part of a long term network isolation study (refer below) to determine if additional blow down valves are necessary.

Riser Plug Valves

Prior to the introduction of ball valves in the early 1990s, a plug type riser valve was used for residential and small commercial connections. Because of its mechanical design, this type of valve is prone to seizing and gas escapes.

In order to mitigate this risk associated with riser plug valves, annual audits of approximately 1000 to 2000 riser valves are undertaken. The audits target areas known to have relatively high populations of plug type riser valves, and are carried out in accordance with Vector’s technical standard GNS-0013 Valve maintenance.

Sectional Isolation Valves

It is a NZS5258:2003 requirement that sectional isolation valves be installed to facilitate the safe operation of the gas distribution network.

A long-term network isolation study of high risk areas (such as CBD areas) is underway to determine if there are sufficient isolation valves to ensure the safe operation under normal or emergency conditions.

Unknown Valve Types

Information on valve types has historically not been captured in the GIS or SAP-PM systems. This impacts on preventive maintenance scheduling as different valve types (e.g. ball or plug etc) require different types of maintenance activity. Over 40% of mains valves on the Auckland network are thought to be plug valves, whereas the quantity of plug valves installed on the North Island network is unknown. A review of available valve data will be undertaken and uploaded into SAP-PM where possible. This will be carried out as part of a larger programme to upload asset data into SAP-PM and is expected to be completed during 2014 FY.

6.3.6.5 Maintenance Programme

Valve maintenance is carried out in accordance with Vector's technical standard GNS-0013 Valve maintenance. Mains, service and service riser valves are inspected as follows:

- 12 Monthly - all designated emergency valves; All other MP and IP mains plug valves; All mains and service valves located within business districts; and
- 24 Monthly - all other HP, MP and IP mains ball valves; All MP and IP service valves not located within business districts; Any LP mains and service valves designated to be included in the valve maintenance programme. A sample of approximately 1,000 service riser valves (in areas known to include higher concentrations of plug type riser valves) are to be inspected.

The integrity of the site and access to the valve is checked, as well as the presence of gas escapes. The operation of the valve (excluding plug valves that are not designated emergency valves) is also tested. All defects are recorded and prioritised for rectification.

6.3.6.6 Installation / Replacement Programme

In general valves are expected to last the lifetime of the network system to which they are connected. However, valves will be replaced on an as required basis where:

- The valve cannot be practically actuated;
- Excessive gas escapes are evident;
- In the case of plug valves, the amount of lubricant being installed is compromising the operation of the downstream network; or
- The cost of maintenance outweighs the cost of replacing/relocating the valve.

The ongoing network isolation study has identified the need for additional valves on key pipeline systems to ensure their safe operation under normal or emergency conditions. The installation of an additional valve on the Auckland IP20 system and an additional valve on the Hamilton IP10 system was completed in the 2012/13 FY period, and the installation of additional valves on the Auckland and North Island networks (i.e. one each) are planned for the 2013/14 FY period.

6.3.7 Cathodic Protection

6.3.7.1 Functional Description

Underground steel plant is protected against corrosion by the provision of a protective coating (e.g. high density polythene) and the application of either an impressed current or sacrificial anode CP system. CP systems are intended to meet the following level of service and performance standards:

- Provide an instant off potential of more negative than 850 mV;

- Provide an instant off potential less negative than 1,200 mV when measured with a copper/copper sulphate reference electrode; and
- Comply with Vector standards and legislative requirements.

6.3.7.2 Physical Description

The CP systems on the Auckland and North Island networks comprise:

- 13 impressed current CP (ICP) systems – i.e. 8 on the Auckland network and 5 on the North Island network;
- A further 3 ICP systems that are operated and maintained by Vector Gas Transmission but which also provide CP protection to the North Island network;
- Approximately 35 sacrificial anode CP systems – predominantly on the North Island network with some on the Auckland network; and
- A number of other small sacrificial anode systems protecting pockets of steel pipe, bridge crossings etc on the Auckland and North Island networks.

6.3.7.3 Age Profiles

For ODV purposes the standard life for CP assets is 20 years. A breakdown of the age profile for CP systems is indicated in Figure 6-12.

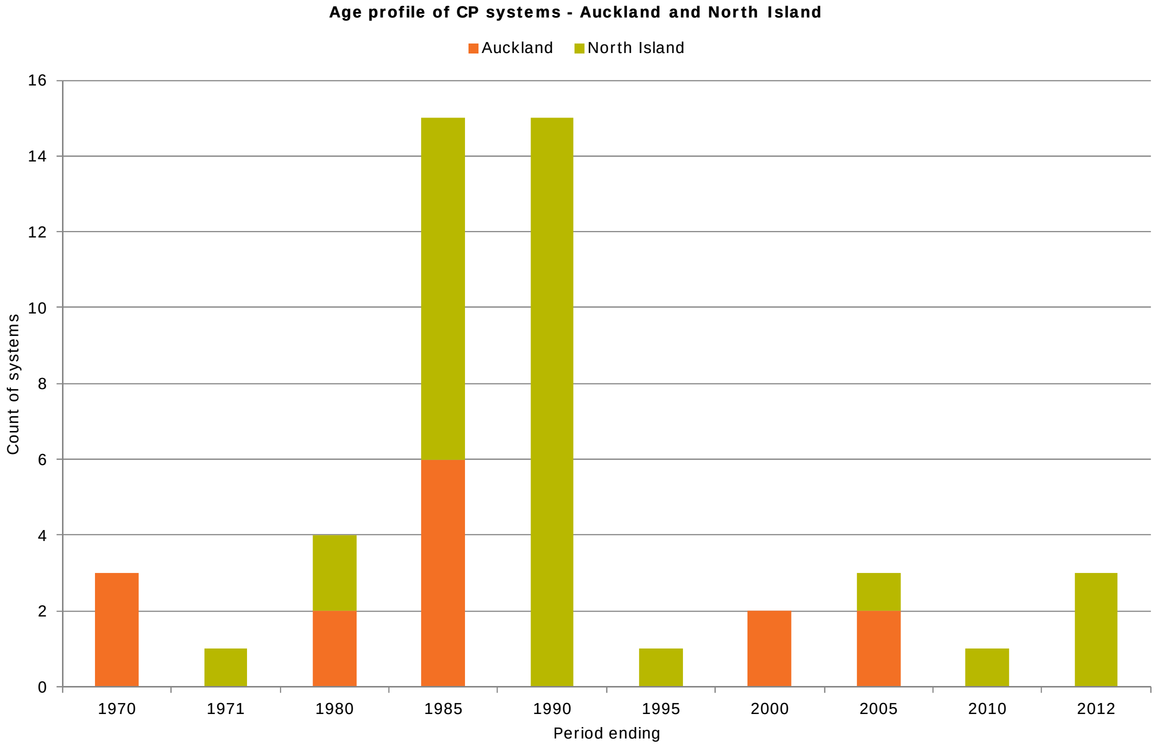

Figure 6-12 : Age profile of cathodic protection systems

Note that the age profile above does not include ICP systems operated and maintained by Vector Gas Transmission, or a number of the small sacrificial anode systems.

6.2.2.1 Condition, Performance and Risks

Condition of Assets

Apart from the exceptions noted below, the condition of the overall CP system is considered adequate.

Approximately 65 km of MP4 steel pipelines in Hamilton still remain with inadequate or no CP. This is due in part to the fact that the anodes that were installed as part of the original sacrificial-anode systems have been virtually consumed. In 2010 a pilot project was initiated on the Melville section (approximately 28 km) of the Hamilton MP4 steel pipeline system to assess the viability of restoring a working CP system to the pipeline. The pilot project was completed in May 2012 at which point CP protection had been restored to approximately 90% of the Mellville pipelines (further corrective work is being undertaken to achieve 100% protection). This project confirmed the viability of restoring CP to the remainder of the Hamilton MP4 steel pipelines and a 4 year programme (2011/12 to 2014/15) was initiated.

Performance of Assets

Approximately 10 locations have been identified on the Auckland network where steel pipelines appear to have no CP protection or poor CP protection. The locations typically relate to small isolated pockets of steel system and total approximately 3.5 km of steel mains pipeline. These issues have been rectified in the 2012/13 FY.

Two similar issues had previously been identified on the North Island network and have since been addressed.

Six locations have been identified on the Auckland network and nine locations on the North Island network where the installed CP systems do not allow instant-off testing to be carried out. This issue relates to sacrificial-anode systems only and is due to the inability to synchronously interrupt the CP system (typically because the location of the buried anodes is unknown, or because of the existing anode configuration) to allow instant-off testing to be carried out. These issues have been rectified in the 2012/13 FY.

Figure 6-13 shows (for each region and for the total network) the percentage of steel pipeline that currently has CP protection, and the percentage of pipeline that currently has on/instant-off CP testing. It shows that with the exception of the Waikato region, all regions have good levels of CP protection and good levels of instant-off CP testing.

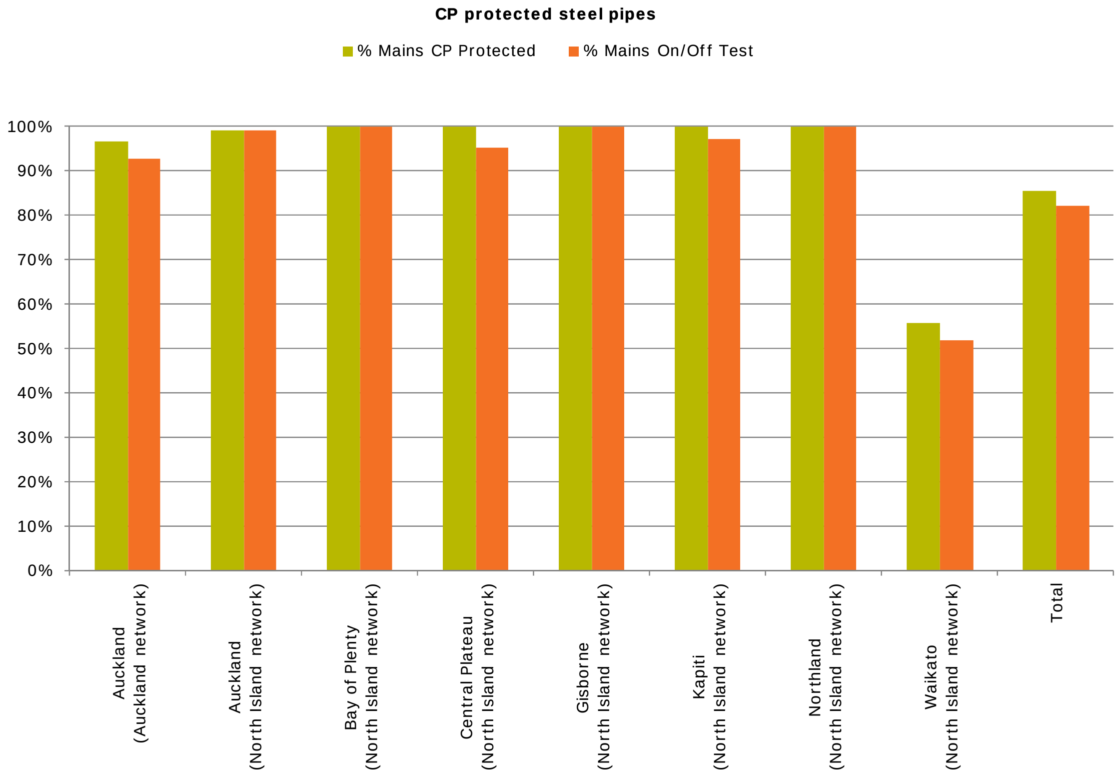

Figure 6-13 : Percentage of cathodically protected steel pipelines

The low percentage of CP protection in the Waikato region is due primarily to the low level of CP protection on the Hamilton steel systems – of approximately 200 km of steel mains pipeline, approximately 95 km currently does not have working CP.

Approximately 30 km of the unprotected Hamilton steel mains operate at LP or MP1. Because these pipelines have never had working CP installed and because of their age, a 3 year pipeline replacement programme is now underway for the Hamilton MP1 and LP steel pipelines (refer to Section 6.3.1.5).

The balance of the unprotected Hamilton steel mains (i.e. approximately 65 km) operate at MP4. A 4 year CP upgrade programme (refer above) is underway to restore CP to the Hamilton MP4 steel pipelines. The programme will include the installation of two additional ICP systems and associated transformer rectifier and ground bed equipment.

Risks

Interference / Stray Currents

Watercare is undertaking a significant upgrade of its CP systems in Auckland. A joint programme between Vector and Watercare to install interference test points was initiated in late 2010 and is ongoing.

Third Party Issues

Short circuits are an ongoing problem in a number of areas in Auckland and Hamilton, particularly the CBDs. They are generally due to faulty insulation joints or to the steel pipes touching other utility assets. Due to the nature of the problem and their location they are difficult and time consuming to identify and expensive to remedy. These short-circuits can take months/years to locate and are causing excessive current drain, which may contribute to early failure of the CP systems.

When GMSs are replaced on steel services, the insulation joints are sometimes not properly reinstated. These can also cause excessive current drain and may be contributing to early failure of the CP systems. To address this risk a CP insulating joint tag has been developed. The tag is designed to be installed on GMS risers to warn anyone working on the GMS or the riser that an insulating joint is required on the outlet of the riser valve. The requirement to use the tag will be included in the next revision of Vector’s technical standard GNS-0059 Construction of below ground corrosion protection systems.

Incomplete Inspection

The measurement of instant on/off potentials in some of the networks is not being carried out on some sacrificial anode systems. This is a legacy issue arising from the historical difficulty in obtaining these readings on distributed sacrificial anode systems. Although “on” readings are being taken and these give an indication of CP protection, they do not meet the requirements of NZS5258:2003.

To allow instant on/off testing to be carried out on these systems, additional anodes and test points must be installed. Six projects were completed in the 2012/13 FY to address these issues on the Auckland network, and nine projects were completed in the 2012/13 FY to address these issues on the North Island network.

Test Point Spacing

A recent high level review of Vector’s CP test point spacing indicates that on some sections of both the Auckland and North Island networks the test point spacing may not meet the requirements of AS2832.1 Cathodic protection of metals. A more detailed review of the required spacing (compared to the current spacing) is being undertaken and additional test points will be installed where required over a 5 year period (2012/13 FY to 2016/17 FY).

Cased Crossings

There are a number of cased crossings of steel pipelines. Cased crossings are typically installed on steel pipelines which cross under railway lines or major roads etc, and consist of a larger diameter steel duct through which the steel carrier pipe has been installed. Rail and road operators sometimes insist on the installation of cased crossings on the basis that the casing will vent gas away from the rail or road crossing in the event of a fault on the steel carrier pipe.

Cased crossings are generally avoided because the casing can shield the pipeline from its CP. In the event that water, or another electrically conducting medium, enters the casing, the steel pipeline may be exposed to risk of corrosion. In some cases the actual casings do not have CP, thus over time they will corrode which may lead to problems with water etc entering the casing.

The current checks made to cased crossings are to confirm that the CP voltage readings are different from the pipeline readings, and that their readings do not alter while an instant on/off potential survey is carried out. This confirms that the casing and the steel pipeline are not touching. A review will be carried out during the 2013/14 FY to confirm that all cased sites are being monitored.

6.3.7.4 Maintenance Programme

CP maintenance is carried out in accordance with Vector's technical standard GNS-0015 Maintenance of below ground corrosion protection systems:

- All impressed current installations are inspected every two months. The output current and voltage are to be recorded;
- All drainage bonds are inspected every two months. Electrical connections are inspected to ensure satisfactory operation;
- All galvanic installations are inspected three monthly, six monthly and annually in major urban, urban and rural areas respectively. Inspect to ensure satisfactory operation;
- All test points are tested three monthly, six monthly and annually in major urban, urban and rural areas respectively. The on and instant off pipe to soil potential measurements with respect to a copper/copper sulphate reference electrode is to be recorded;
- All test points are tested three monthly and six monthly in urban and rural areas respectively. The on pipe to soil potential measurements with respect to a copper/copper sulphate reference electrode is to be recorded; and
- Electrical isolation points are tested three monthly, six monthly and annually in major urban, urban and rural areas respectively. Any electrical isolation between buried or submerged pipelines and other underground metallic structure are to be tested to ensure they are electrically isolated from each other.

Specific maintenance requirements relating to the monitoring of interference test points will be developed and implemented during 2013/14 FY.

6.3.7.5 Replacement Programme

In general, impressed current systems are expected to last the lifetime of the network system to which they are attached. However, they will be replaced where the cost of maintenance outweighs the cost of replacing them.

Sacrificial anode systems will be replaced when the anodes have been consumed, or when the CP current requirement exceeds the capacity of the anode system. This may be due to coating deterioration (it is usually more cost effective to increase current to protect coating defects than repair coating defects) or an increase in network size which is beyond the capacity of a sacrificial anode system.

The replacement programmes for the Auckland and North Island networks include an annual provision for the replacement of CP assets as required e.g. installation of surge diverters, installation of new ground beds, upgrade of existing ground beds, replacement of expired sacrificial anodes, relocation of at-risk test points etc.

Projects have been completed in 2012/13 FY to install CP protection on a number of small isolated pockets of unprotected steel system on the Auckland network, and upgrade a number of small sacrificial-anode CP systems on both the Auckland and North Island networks to enable instant-off testing to be carried out.

A five year programme (2012/13 FY to 2016/17 FY) is underway to install additional CP test points as required to meet the test point spacing requirements of AS2832.1 for "suburban and high-rise" areas.

A four year CP upgrade programme commenced in the 2011/12 FY to address the lack of CP on the Hamilton MP4 steel system. Stage 1 of the programme targeted the Melville system and was used as a pilot project to confirm the viability of a four year programme. Table 6-13 below shows the individual MP4 CP upgrade projects that make up the complete four year programme.

Hamilton MP4 CP Upgrade Project	FY Period
Melville	Completed
Hamilton CBD	Completed
Hamilton West	Completed
Hamilton South East	Completed
Hamilton North East	2013/14
Hamilton Balance	2014/15

Table 6-13 : Hamilton MP4 CP upgrade programme

6.3.8 Asset Renewal and Replacement Programme

All asset replacement projects and programmed replacement works have been identified for the planning period. The forecast asset renewal and replacement programme for the planning period is summarised in Table 6-14 and Table 6-15 for the Auckland and North Island networks, respectively.

Expenditure Description ($'000)	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Installation of new Telenet sites	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60
Installation of remote pressure monitoring facilities at nominated sites	$50	$40	$40	$40	$40	$40	$40	$40	$40	$40
Purchase of remote pressure monitoring facilities at nominated sites			$40	$40	$40	$40	$40			
Replacement of CP assets as required	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
Installation of new CP interference-monitoring test points	$60									
Installation of additional test points to meet class location requirements of AS2832.1	$35	$35	$35	$35						
District regulator station upgrades	$50	$150	$150	$150	$150	$150	$150	$150	$150	$150
Replace DR0133 Dalgety Drive (IP to MP stream)	$150									
Auckland LP pipeline replacements	$4,839									
Line Road LP steel pipeline replacement	$140									
Street regulator removal	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
Unknown asset safety and compliance issues	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Strategic Spares	$300	$20	$20	$20	$20	$20	$20	$20	$20	$20
Reactive replacement	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Targeted replacement of pre-1985 PE pipe	$200	$200								
Riser valve replacements	$50									

Expenditure Description ($'000)	**Forecast FY14**	**Forecast FY15**	**Forecast FY16**	**Forecast FY17**	**Forecast FY18**	**Forecast FY19**	**Forecast FY20**	**Forecast FY21**	**Forecast FY22**	**Forecast FY23**
Seismic work required as a result of review	$100	$100								
RTU replacement programme	$25	$25	$25	$25	$25	$25	$25	$0	$0	$0
Carry over	$158									
Installation of isolation valves	$150	$150	$150							
Replacement of bridge crossing brackets and supports	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
TOTAL EXPENDITURE	**$6,717**	**$1,130**	**$870**	**$720**	**$685**	**$685**	**$685**	**$620**	**$620**	**$620**

Table 6-14 : Asset renewal and replacement programme for Auckland network

Expenditure Description ($'000)	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Installation of new Telenet sites	$60	$60	$60	$60	$60	$60	$60	$60	$60	$60
Installation of remote pressure monitoring facilities at nominated sites	$40	$40	$40	$40	$40	$40	$40	$40	$40	$40
Replacement of CP assets as required	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
5 year program to restore the Hamilton MP CP system to a fully compliant condition	$228	$80								
Restore CP to Hamilton MP4 CS services	$100	$350								
Replacement of the unprotected steel services associated with the MP4 steel	$75	$75								
Installation of impressed current CP anode beds for Hamilton MP4 system	$70	$30								
Installation of additional test points to meet class location requirements of AS2832.1	$65	$65	$65	$65						
District regulator station upgrades					$50	$50	$250	$250	$250	$250
Replace DRS215, Morrinsville	$150									
Upgrade DRS006 Rotorua	$150									
Replace relief valves DRS207, Te Kuiti North	$100									
Upgrade DRS032, Kawerau	$100									
Upgrade DRS040, Gisborne	$150									
Replace DRS234, Gisborne		$100								
Upgrade DRS071, Whangarei		$90								

Expenditure Description ($'000)	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Upgrade DRS038, Opotiki		$90								
Replace DRS122, Hamilton		$200								
Upgrade DRS102, Hamilton		$100								
Upgrade DRS103, Hamilton			$100							
Upgrade DRS202, Te Kuiti			$100							
Upgrade DRS069, Whangarei			$100							
Upgrade DRS020, Mount Maunganui			$100							
Upgrade DRS090, Whangarei			$100							
Replace regulators in DRS139, Hamilton			$50							
Upgrade DRS129, Hamilton				$100						
Upgrade DRS213, Morrinsville				$100						
Upgrade DRS214, Morrinsville				$100						
Upgrade DRS0003, Rotorua				$90						
Install filters DRS232, Rotorua				$20						
Upgrade DRS209, Kihikihi				$100						
Replace DRS100, Hamilton					$200					

Expenditure Description ($'000)	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Replace DRS101, Hamilton						$200				
Replacement of small-diameter steel MP mains in Hamilton	$50									
Hamilton LP pipeline replacement		$1,617								
Hamilton MP1 pipeline replacement	$3,154									
Address shallow pipeline in Tuhikaramea Dr, Hamilton	$800									
Unknown asset safety and compliance issues	$80	$80	$80	$80	$80	$80	$80	$80	$80	$80
Strategic Spares	$300	$10	$10	$10	$10	$10	$10	$10	$10	$10
Reactive replacement	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Targeted replacement of pre-1985 PE pipe	$200	$200								
Seismic work required as a result of review	$100	$100								
Carry over	$427									
Installation of isolation valves	$150	$150	$150							
Replacement of bridge crossing brackets and supports	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
Riser valve replacements	$162	$162	$100	$100	$100					
TOTAL EXPENDITURE	**$6,911**	**$3,799**	**$1,255**	**$1,065**	**$740**	**$640**	**$640**	**$640**	**$640**	**$640**

Table 6-15 : Asset renewal and replacement programme for North Island network

6.4 Capital Expenditure Forecasts

Based on the renewal requirements described in Section 6.2 and after applying the prioritisation criteria (described in Section 9), the proposed network integrity (asset renewal or replacement) capex programme for the Auckland and North Island networks for the next ten years is outlined in Table 6-16 and Table 6-17 respectively.

Expenditure description ($,000)	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Cathodic Protection	$145	$85	$85	$85	$50	$50	$50	$50	$50	$50
DRS Replacement	$387	$250	$150	$150	$150	$150	$150	$150	$150	$150
Asset Replacement - Pipeline	$5,279	$250	$50	$50	$50	$50	$50	$50	$50	$50
Asset Performance	$145	$125	$165	$165	$165	$165	$165	$100	$100	$100
Safety, Compliance and Environment	$361	$300	$300	$150	$150	$150	$150	$150	$150	$150
Strategic Spares and Equipment	$300	$20	$20	$20	$20	$20	$20	$20	$20	$20
Reactive Replacement	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
TOTAL EXPENDITURE	**$6,717**	**$1,130**	**$870**	**$720**	**$685**	**$685**	**$685**	**$620**	**$620**	**$620**

Table 6-16 : Asset integrity capex expenditure forecast for Vector's Auckland region (financial years)

Expenditure description ($,000)	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Cathodic Protection	$665	$650	$115	$115	$50	$50	$50	$50	$50	$50
DRS Replacement	$750	$680	$550	$510	$250	$250	$250	$250	$250	$250
Asset Replacement - Pipeline	$4,766	$2,028	$150	$150	$150	$50	$50	$50	$50	$50
Asset Performance	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
Safety, Compliance and Environment	$230	$230	$230	$80	$80	$80	$80	$80	$80	$80
Strategic Spares and Equipment	$300	$10	$10	$10	$10	$10	$10	$10	$10	$10
Reactive Replacement	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
TOTAL EXPENDITURE	**$6,911**	**$3,798**	**$1,255**	**$1,065**	**$740**	**$640**	**$640**	**$640**	**$640**	**$640**

Table 6-17 : Asset integrity capex expenditure forecast for Vector's North Island region (financial years)

Gas Distribution
Asset Management Plan
2013 – 2023

Systems and Processes – Section 7

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7 Systems, Processes and Data

7.1 Asset Information Management Background

This section describes the information systems and associated business processes Vector maintains and operates to manage its asset data.

Vector's day-to-day operation involves specialists and teams within Vector and its Field Service Providers (FSPs) undertaking a wide variety of business functions such as financial forecasting, network planning, project management, asset valuation, maintenance management, asset inspection and condition monitoring.

These business functions are supported by data, systems and business processes. The following diagram (Figure 7-1) illustrates the relationships between business teams, functions, information systems and data: many functions are dependent on the same systems or indeed the same source data.

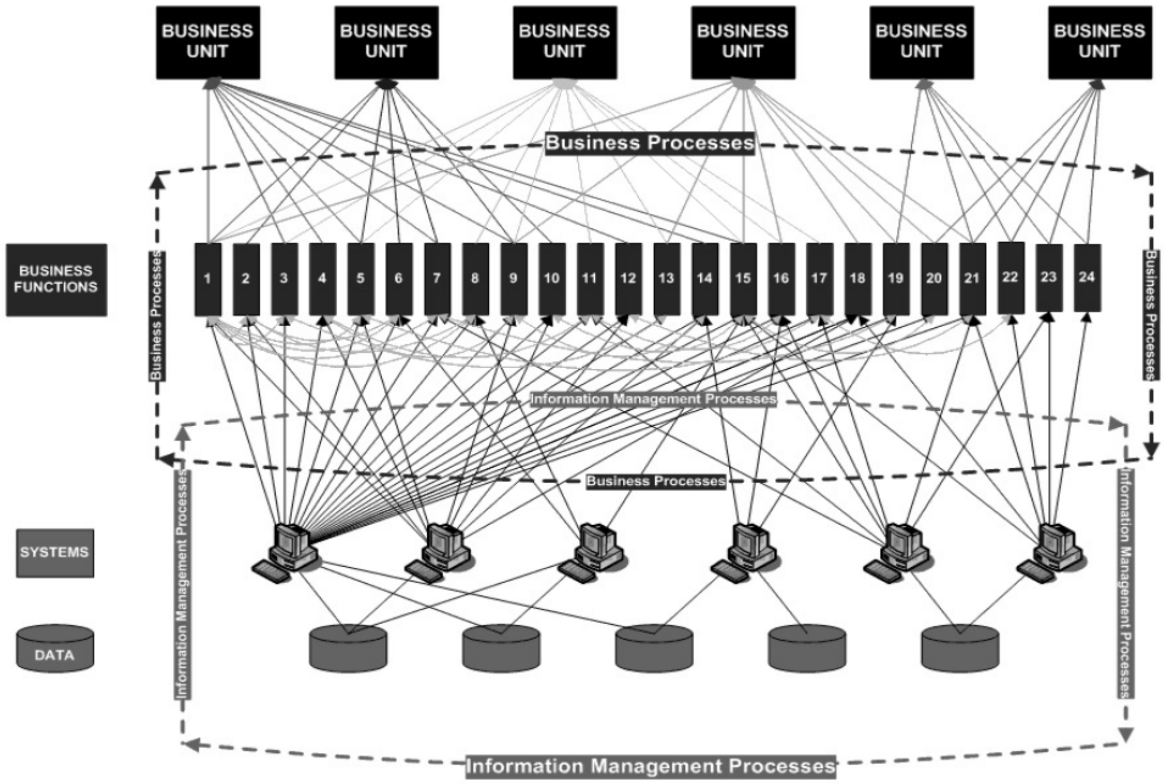


Figure 7-1 : Information Management Framework

To establish effective management of data and Information Systems (IS), Vector has created a Corporate Data Catalogue (CDC), which holds a reference definition of data sets managed by Vector and held in its corporate systems, including those required to support asset management. For each data set, the master system and owner is identified. In addition, the CDC provides an assessment at the enterprise level of each data set in terms of quality, security, sensitivity and criticality and the basis for identifying fitness for purpose of data.

Recently, Vector has supplemented the CDC by applying a Data Source Verification (DSV) methodology to those data sets that support external reporting purposes, such as compliance statements and information disclosures. DSV is a detailed field-by-field analysis to determine the quality and completeness of each data field in terms of its acceptance as a source for reporting requirements.

In many cases data flow diagrams are developed in conjunction with DSV analysis to provide a systems perspective on the verification of source to output. For auditability reasons, Vector uses the UML 2.0 standard for data flow diagrams. The outputs of the DSV analyses provide a basis for prioritising actions where necessary to address specific issues of data quality or completeness.

Vector's FSPs employ their own IS to manage activities related to their core functions such as works management, resource scheduling and mobile data capture. These form critical links in the upstream information supply chain. The data sets held in the FSPs' systems are managed by Vector's FSPs on Vector's behalf in accordance to Vector's asset information policies and standards and the wider provisions of the contractual arrangements between Vector and the FSPs. As asset information process framework is being developed that defines, for each step in the end-to-end asset management process a set of controls for asset information from source to output including:

- Asset information policies;
- Asset information business process maps;
- Business rules/work instructions for asset information;
- Asset information standards;
- "Owners" and "responsible persons" for the execution of each asset information process;
- Operational level asset information systems; and
- Asset management reporting methodology (described in section 7.3).

The framework will be maintained and updated in line with the requirements of Vector's asset management practices, including emerging external reporting obligations.

7.2 Asset Information Systems

Vector's asset data is held by a dozen or more primary or enterprise systems which are built around Vector's corporate Enterprise Resource Planning (ERP) System. By establishing the Asset Lifecycle Information System (ALIS) in its ERP System Vector has adopted an enterprise asset management approach, in which gas distribution assets are managed through their entire lifecycle, in common with other network fixed assets, notably those of Vector's electricity and gas transmission businesses.

The enterprise systems are supplemented by a number of standalone databases, typically PC-based tools with no programmatic data feeds to or from enterprise systems. In addition, Vector manages a highly developed real-time data system (SCADA), the design, operation and future direction of which is described in depth in Sections 5 and 6.

Each asset information system has a specific purpose, and is the master repository, providing the ultimate, sole source of truth for a specific data set, as summarised in Table 7-1.

ERP	Event Mgt	Geospatial	Billing	Other Enterprise System	Real-Time System	Standalone System	SPs' Systems

Asset Information Systems	**Financial information**	**Asset / network characteristics**	**Transactional history**	**Location**	**Connectivity**	**Customer service**
Fixed Asset Register (FAR)	★	✓				
Asset Valuation Register	★	✓				
Asset Lifecycle Information System (ALIS)	★	★	★	✓		✓
Geographic Information System (GIS)		✓		★	★	✓
Landbase				★		
Network Model and Analyser (NMA)		★			✓	✓
Real-Time Data Historian			★		✓	✓
Customer Management System (CMS)	★		★	✓		★
Billing System	★		★	★	✓	✓
SCADA		✓	✓		★	★
Document Management System		★	✓		✓	
Incident Management System			★			✓
Risk Management System		★				
Asset Management Reporting Systems (AMR)	✓	✓	✓	✓	✓	✓

Master (source data) repository	★
Secondary reference	✓

Table 7-1 : Vector's asset information systems

Figure 7-2 illustrates the current organisation of Vector's asset information systems. Overlapping blocks indicate where systems are integrated, notably within the ERP System as a whole and between the ALIS and Geographic Information System (GIS). In addition, the Real-Time Data Historian is interfaced to SCADA. A number of one and two-way data exchanges also exist between several of the enterprise systems and between the ALIS and the FSPs' Works Management Systems.

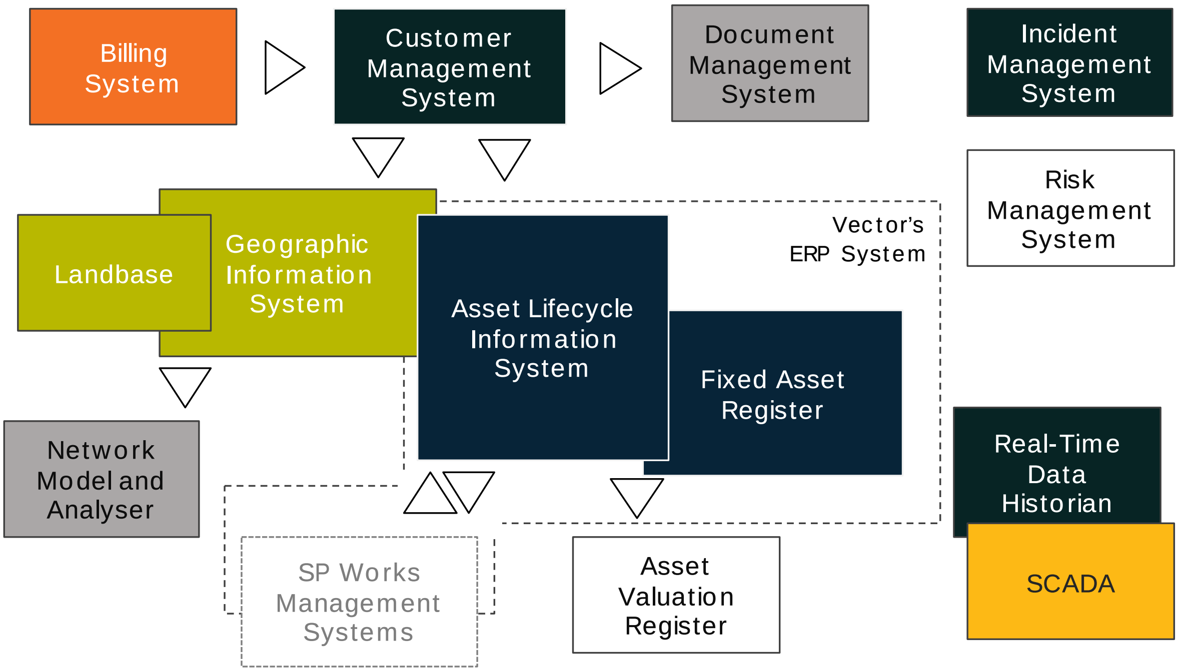


Figure 7-2 : Vector's asset information systems landscape: current state

The following sections describe the functionality of each system. Section 7.2.5 describes the linkages within Vector's ERP system and related systems.

7.2.1 Asset Lifecycle Information System (ALIS)

The primary purpose of the ALIS is to maintain, in the Technical Asset Master (TAM) register, a complete inventory of all network physical assets, including strategic spares, as the master record of all static information (attributes or characteristics) about Vector's network physical assets, with the exception of geospatial information and connectivity.

As a core operational application, the ALIS is continually updated by asset data specialists within Vector's FSPs through an as-building process in which attribute data is captured and partially transferred to GIS and geospatial data is captured in GIS and transferred back to ALIS. These activities are controlled by asset data standards, business rules, work instructions and the relevant provisions of the contractual agreement between Vector and the FSPs.

In line with the objective of optimising our lifecycle asset management capability, the ALIS has been designed to hold the planned maintenance regime for each asset, according to the relevant engineering standard.

The secondary purpose of the ALIS is to capture, from Vector's FSPs, the transactional history of each asset record, in terms of inspection and maintenance activities and defects. Data is provided continually from the FSPs' Works Management Systems via a file upload facility; master data is also downloadable from the ALIS.

7.2.2 Fixed Asset Register (FAR)

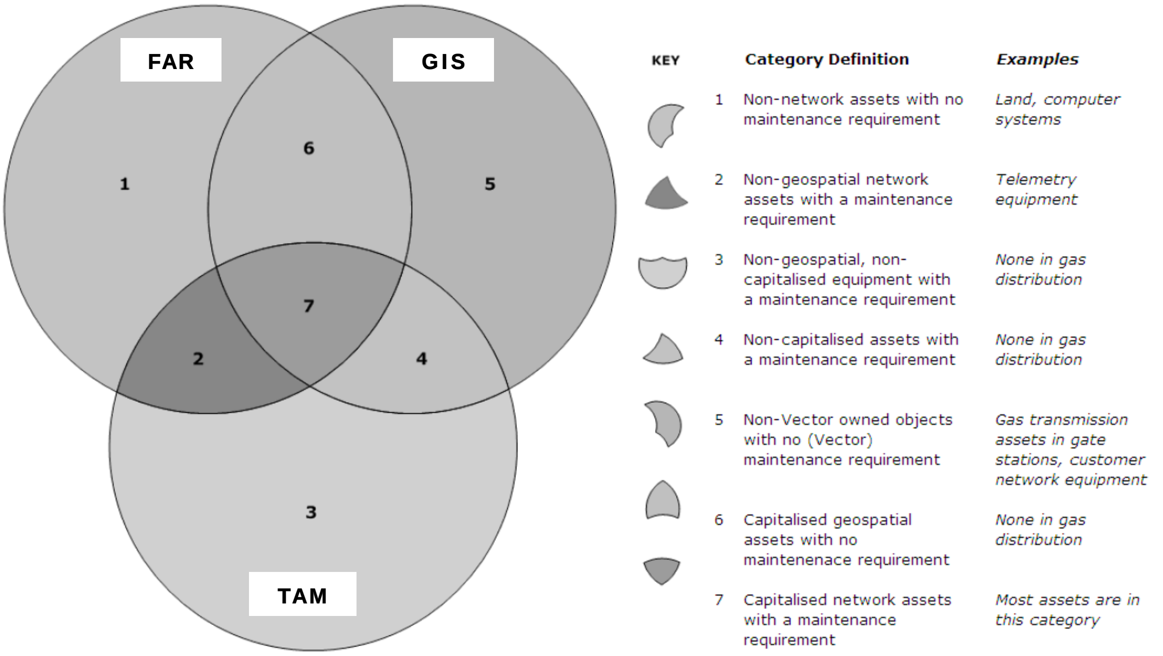
The FAR holds the master register of financial fixed assets, providing the basis for depreciation, taxation, valuation and financial reporting, and is linked with the TAM, being continuously updated by the TAM as assets are commissioned, refurbished and decommissioned.

7.2.3 Geographic Information System (GIS)

A geospatial model of Vector's gas distribution networks between the gas transmission system off-take points and the customer isolation valves is maintained in a proprietary database. The model is continually updated by Vector's FSPs via the ALIS, and by direct input, as described above. GIS acts as the master register for asset geospatial information and default network connectivity.

The base data in Vector's GIS is made accessible to third parties as a reference for underground service locations, and for other purposes including the coordination of works within Vector and externally.

Most gas distribution network fixed assets are recorded in all three of the TAM, FAR and GIS registers, as defined by category seven in Figure 7-3. However, as shown in the diagram, the GIS excludes certain asset types and there in some special cases, assets are not recorded in the TAM; the GIS also holds information about non-Vector assets. The category definitions are unambiguous and governed by asset data policies standards and business rules.



KEY		Category Definition	*Examples*
	1	Non-network assets with no maintenance requirement	*Land, computer systems*
	2	Non-geospatial network assets with a maintenance requirement	*Telemetry equipment*
	3	Non-geospatial, non-capitalised equipment with a maintenance requirement	*None in gas distribution*
	4	Non-capitalised assets with a maintenance requirement	*None in gas distribution*
	5	Non-Vector owned objects with no (Vector) maintenance requirement	*Gas transmission assets in gate stations, customer network equipment*
	6	Capitalised geospatial assets with no maintenenance requirement	*None in gas distribution*
	7	Capitalised network assets with a maintenance requirement	*Most assets are in this category*

Figure 7-3 : Categorisation of asset data in the TAM, FAR and GIS registers

7.2.4 Customer Management System (CMS)

Vector's CMS is a core operational application in which a full record of network faults and other customer information is captured by Vector's FSPs. This includes certain asset-related technical information as well as the operational and customer information more conventionally associated with a CMS. In order to enable reporting and analysis of this information from an asset management perspective, whenever a specific asset is associated with a network fault event, the service request (SR) number from CMS is cross-referenced against the technical object record in the ALIS.

7.2.5 Overview of ERP and Related System Links

The organisation within Vector's ERP system and the interfaces between the ALIS and the GIS, the CMS and Vector's FSPs' Works Management Systems are shown in more detail in Figure 7-4. This arrangement, together with the supporting business processes, offers a number of advantages in terms of asset lifecycle information management, as described below:

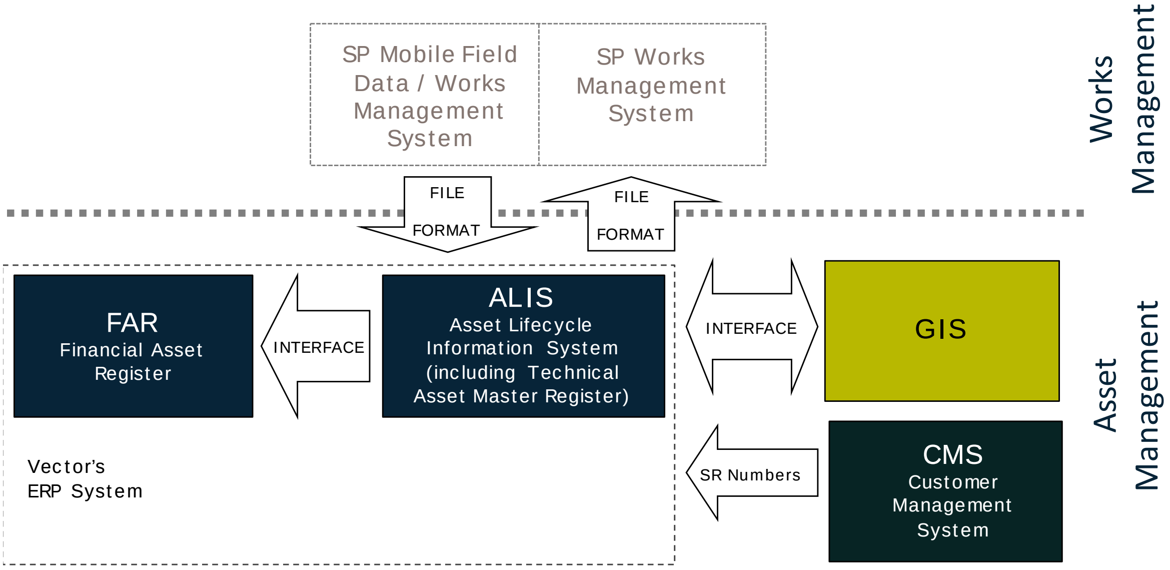


Figure 7-4 : Asset management / works management: organisation of information systems

- By linking the TAM register (within the ALIS) and the FAR, via an inherent ERP system interface, Vector's technical and financial registers are able to be maintained in synch. Geospatial asset information in the GIS is maintained in synch with the ALIS, and hence also with the FAR. In this way, regulatory, statutory and other audit compliance is supported;
- Faults information is captured in the CMS; by cross-referencing the service request (SR) numbers from the CMS into the ALIS, a complete transactional history of maintenance information is available at the asset (or network segment) level. This supports investment decisions related to network upgrading, asset replacement / refurbishment and the optimisation of operational / capital expenditure; and
- Finally, by providing a relatively loose form of integration with the FSPs' works management systems, via a specified set of file formats for up-loading and down-loading to and from the ALIS, the minimum possible degree of constraint is imposed on the FSPs' choice of mobile data capture technology. The link itself provides for improved oversight of works management.

7.2.6 Landbase

Vector has a long-term contract with an external organisation for the provision of a comprehensive, managed national land and property information database. This "landbase" is derived in turn from over 100 different sources, and enables Vector to have confidence that the information in the GIS is accurately mapped, and to leverage relevant up-to-date contextual information.

7.2.7 Asset Valuation Register

Vector's regulatory asset valuation register is derived from the data maintained in the FAR, TAM and GIS, in accordance with the guidelines set down by the Commerce Commission. The register is maintained in a standalone PC-based database.

7.2.8 Document Management System

Vector network standards and technical specifications have been developed for design, construction, operation and maintenance of the network, and are the subject of continuous improvement.

Key documents are accessible via Vector's intranet. Engineering drawings and related technical documents from network projects are maintained in a proprietary document management system.

More generally, Vector operates a corporate document management system as a secure, centralised repository for key documents such as contracts, certificates and reports.

7.2.9 Network Modelling Software

Vector's gas distribution network is modelled with SynerGEE Gas software. The gas transmission system is modelled with the SynerGEE Unsteady State Module application, so that scenarios across Vector's entire gas transmission and gas distribution network can be built in a single consistent model. This enables us to undertake a wide range of systems studies on the network in its present state and to model the potential impact of changes to the network configuration or to the network load.

The gas network model is updated semi-manually on a periodic basis through the extraction and manipulation of shape files from ArcGIS.

Due to the relatively slow rate of change of the gas networks, it is not presently considered necessary to develop an interface to enable the programmatic update of the network model from the core GIS application.

7.2.10 Customer Connections

Vector maintains a database of all Installation Control Points (ICPs) in the Gentrack system, which is indirectly linked to its GIS and CMS.

7.2.11 Billing System

Vector's billing system records all metered revenue data, and includes a database of all Installation Control Points (ICPs). The database is linked to the GIS and to the central gas registry.

7.2.12 SCADA

Vector's gas network is monitored in real time (and a small number of sites are also controlled) using the SCADA system, which is described in detail in Sections 5 and 6.

A very large archive database of historical time-series data is maintained in an OPC (Object linking and embedding for Process Control) formatted repository, which captures data transmitted across the SCADA system from telemetry points located at DRSs and other key points around the gas network. A separate system is used to capture data from mobile data loggers in the winter gauging programme. This information is used to provide asset utilisation information and support decision-making in network planning and operational control.

The PI system was upgraded recently to enable advanced calculations to be performed practically in real-time, and transmittal of notifications to FSPs and others, either directly, or via SAP-PM. By combining time-series data with the TAM data in SAP-PM, Vector's ability to execute certain condition-based/risk-based asset maintenance strategies is enhanced.

Pressure and load data at gate stations on the transmission system is captured in the OATIS system for network planning and critical contingency management purposes.

7.3 Asset Management Reporting

Whilst Vector's corporate Business Intelligence (BI) toolset includes a range of professional reporting applications for the reporting, visualisation and analysis of asset data, traditionally, Vector's approach to BI in the asset management context has been one of ad-hoc extraction of data directly out of a single operational system, such as the ERP or CMS, into a standalone PC-based database or spreadsheet.

In some cases, notably for the analysis and thematic mapping of geospatial information, specialised BI tools have been employed.

In order to maximise the value available from Vector's asset information systems, an asset management reporting strategy is being implemented using BI tools in a framework based on the asset management lifecycle, as illustrated in section 2.11. Reporting requirements for decision making and other purposes are identified across the asset management lifecycle, drawing on data from several operational systems. In addition to the operational sources shown, a significant amount of relevant data is also sourced from outside of Vector, including for example geospatial, meteorological and other contextual data, so that intelligence is gained from a blend of internal and external data sets.

Following this approach, at the "condition and performance reporting" stage of the framework, BI tools have been used to develop a suite of network reliability reports, based on data from Vector's outage records and CMS.

The objective is to make information accessible by hosting/posting data (for example, via Vector's intranet) rather than by sharing or sending large amounts of data around Vector. The approach involves an iterative and collaborative engagement with users to identify requirements which are often not fully understood at the outset and builds the data into a seamless (rather than monolithic) repository of asset data. A key objective is to eliminate dependence on "human data warehouses."

In this way, by exploiting the functionality of all BI tools to export to spreadsheets, Vector is encouraging self-service of data by asset management specialists and teams thereby enabling rapid data extraction, visualisation and analysis to support better, faster decision-making.

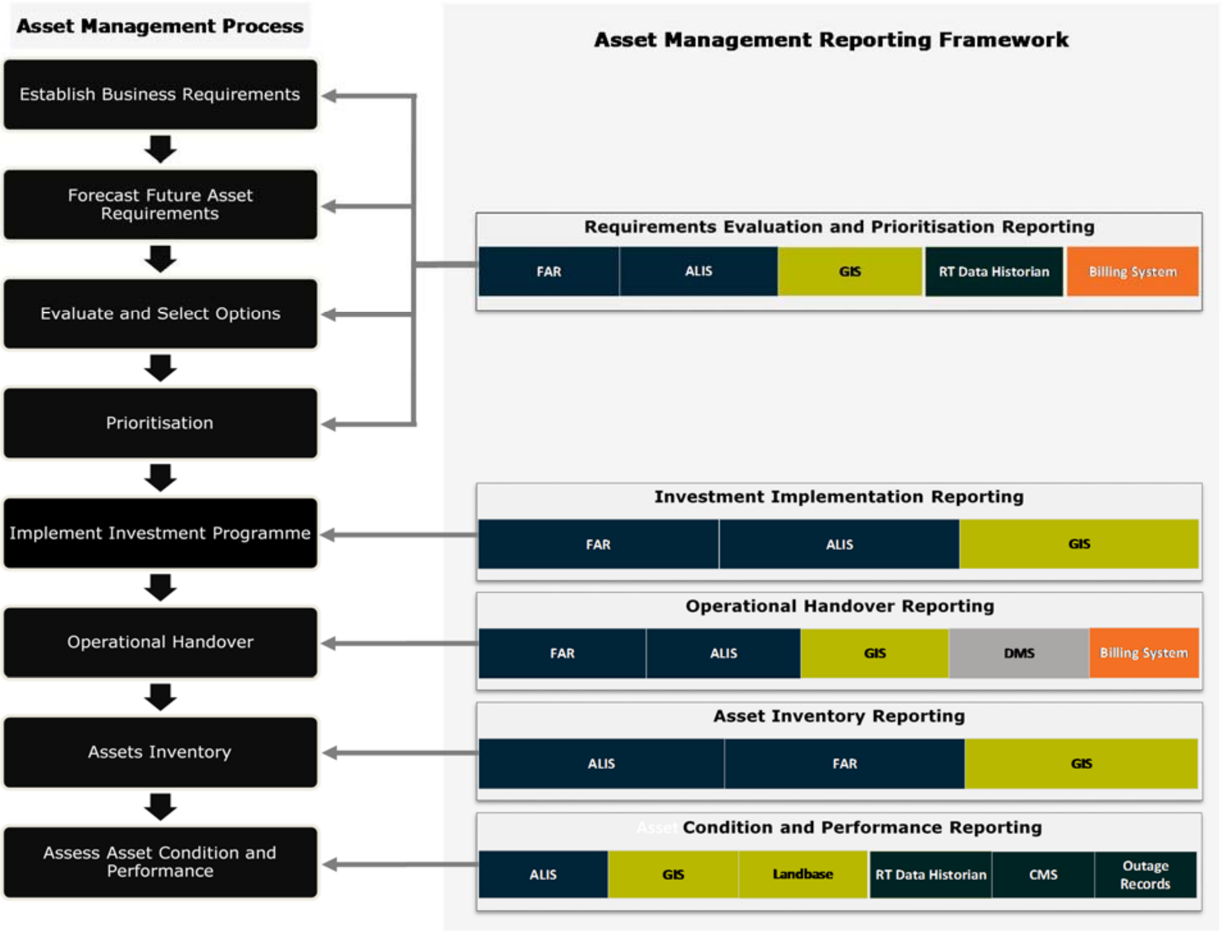


Figure 7-5 : Proposed asset management reporting framework

7.4 Improvement Initiatives

Vector, in common with other providers of integrated infrastructure solutions, is by its nature complex and has, over time, acquired additional layers of complexity in the way its systems, processes and data is structured and managed. In order to address the challenges this presents, and in line with Vector's goals of operational excellence, cost efficiency and customer and regulatory outcomes (Section 2), Vector is adopting a more unified approach to managing asset information.

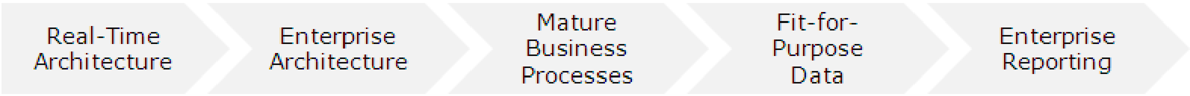


Figure 7-6 : Vector's holistic approach to asset information

This approach has led to the development of a programme of initiatives with the objectives summarised in Table 7-2.

Focus	Objectives
Asset information	• Retiring or consolidating disparate datasets, particularly those in stand-alone systems • Ensuring, through the CDC (and where appropriate, through the application of DSV methodology) that all data is fit-for-purpose in terms of its ownership, definition, quality, completeness, accuracy, security and sourcing • Improving and simplifying how data is transformed into information • Continuing to cleanse data through a prioritised programme of improvement initiatives • Achieving full connectivity (allowing tracing from customer to supply)
Business processes	• Developing a framework of mature and consistent policies, business processes, work instructions and standards with the objective of simplifying the end-to-end management of asset information • Ensuring ownership and quality assurance along the information supply chain by closing the "information loop" • Addressing communication within and between business units to avoid duplication of effort
Information systems	• Extracting the maximum value from information systems • Consolidating information systems • Delivering integrated solutions, and developing simple user interfaces • Marking targeted improvements to address "band-aids" and "work-arounds" • Enhanced approach to reporting

Table 7-2 : Asset information objectives

In order to deliver the programme, a 10-year asset information systems roadmap has been developed that addresses these areas of focus and covers the core IS environments supporting the gas distribution network business: the ALIS environment, Geospatial / Network Information (GNI) systems environment, and Real-Time / Operational (RTO) systems environment. Vector's holistic approach, as illustrated in Figure 7-7 below, is to develop integrated solutions at all levels, rather than simply at the application level.

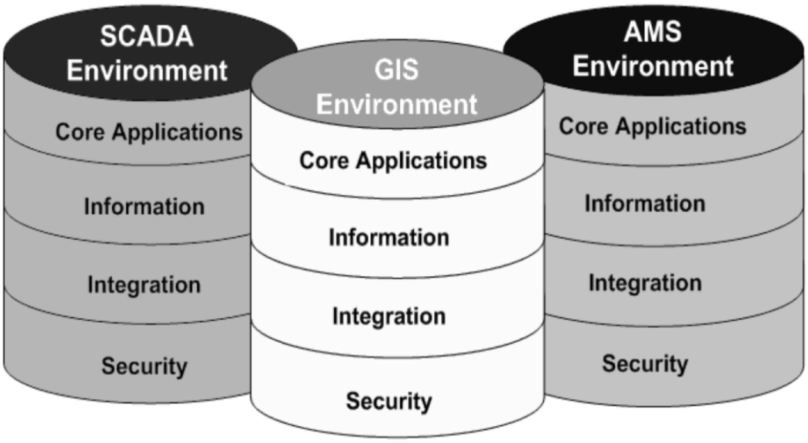


Figure 7-7 : Core IS environments

For the ALIS, GNI and RTO environments, this approach is designed to support implementation of a number of specific improvements, as summarised in Table 7-3 below.

System	Planned Improvements
ALIS	• Extending the functionality of the ALIS and related ERP and other systems • Exploiting market developments in ERP system functionality • Improving the usability for infrequent users, for example by improving the user interface • Developing capability in equipment performance analysis • Streamlining the interface with the GIS
GIS	• Eliminating excessive customisation in order to simplify maintenance and reduce the cost and complexity of upgrades • Simplification of the data model • Streamlining the interface with the ALIS (minimising double handling and duplication of data) • Exploiting the full functionality of the system, for example use of GIS for design work (rather than importing and re-drawing from computer aided drawing systems) • Supporting closer alignment with network model / analyser • Development of on-line mapping and spatial analysis
SCADA	• System upgrade • Consolidate network monitoring into historian

Table 7-3 : Proposed developments in Vector's core IS environments

Supporting these initiatives, Vector's approach to developing its overall enterprise environment is focussed on: systems integration, facilitating the electronic provision of data to/from Vector's FSPs, developing a corporate approach to reporting based on the enterprise BI toolset, and upgrading Vector's CMS and Billing Systems.

These developments will result in the gradual deployment of a much more integrated structure for Vector's asset information systems as indicated in Figure 7-8. The initiatives follow from the strategic direction for Vector's asset information systems described in Figure 7-9.

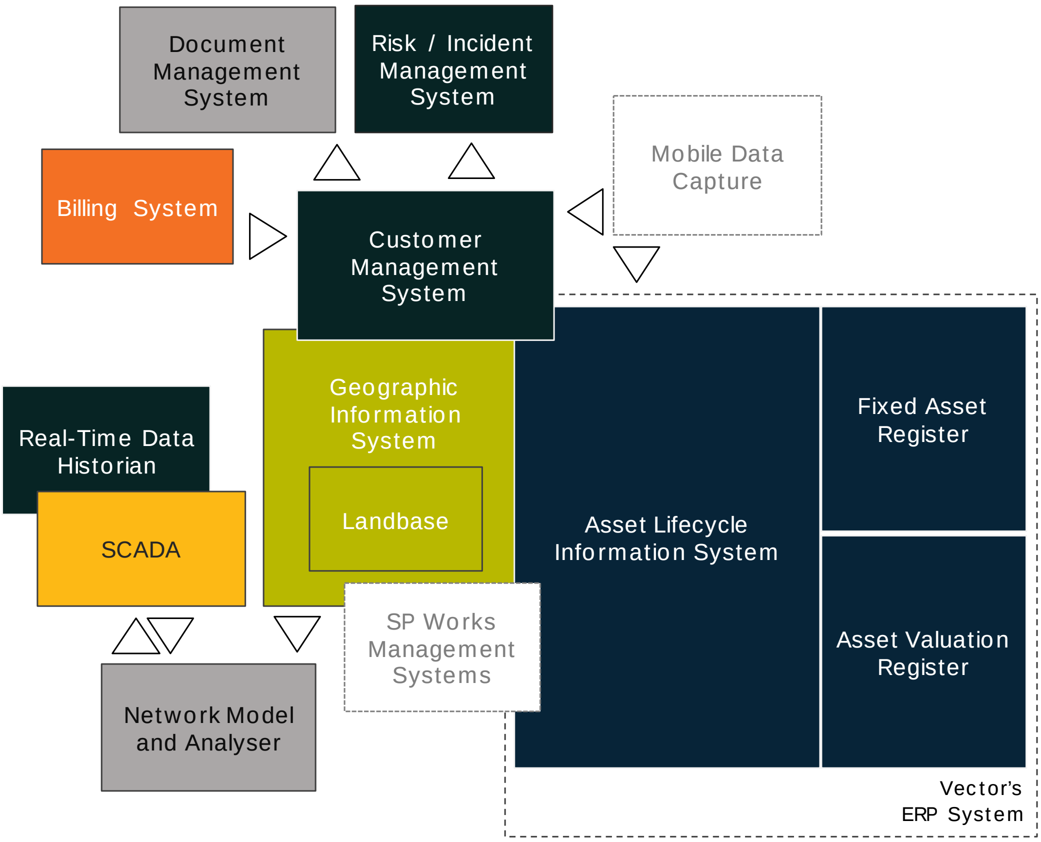


Figure 7-8 : Proposed integration of gas distribution asset information systems

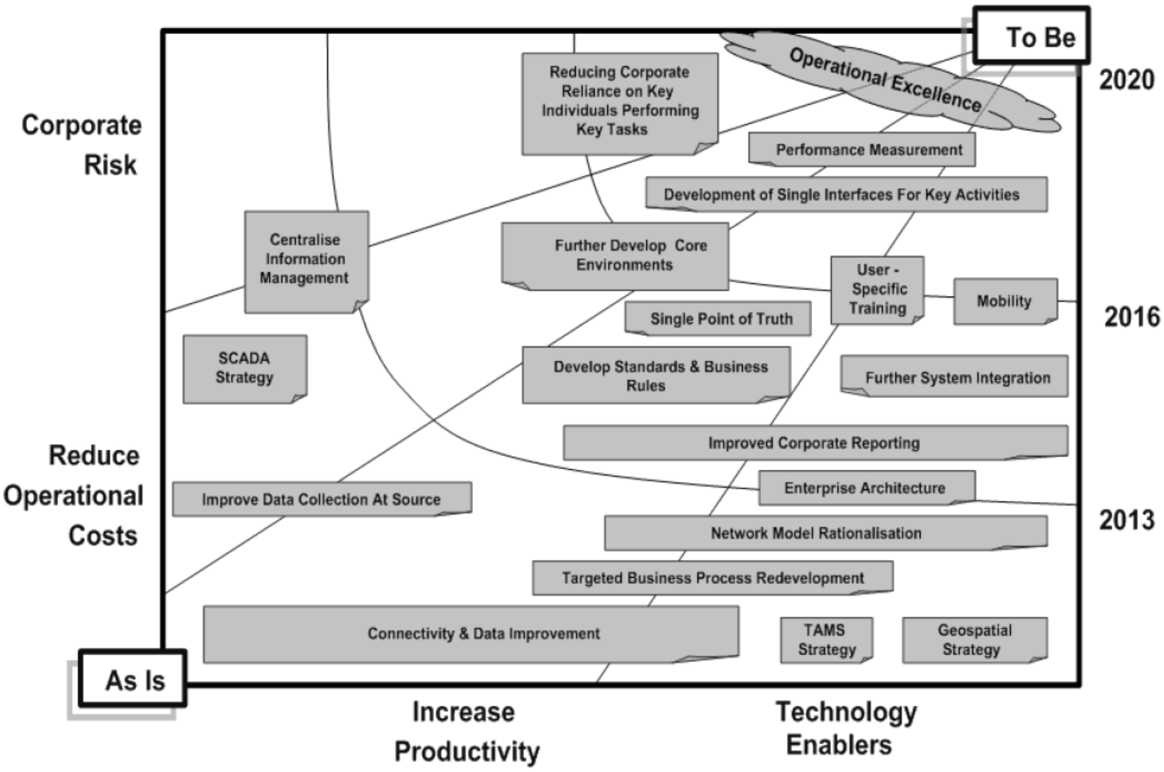


Figure 7-9 : Indicative strategic direction for Vector's asset information systems

7.5 Asset Data Quality Improvements

Alongside investments in asset information systems, Vector continues to improve asset information. Where limitations have been identified at the data set level (described in the CDC, see section 7.1), initiatives are put in place to address the root causes and remediate data. These initiatives are managed by an asset information improvement plan, which includes the following initiatives related to the gas distribution network.

Initiative	Legacy data	System level data	Process or standard	Resource	Target date
Formalise process for managing updates to CDC including DSV methodology where required			✓	Low	2014
Correct or populate inaccurate and missing spatial location data in GIS (including necessary Landbase adjustments)	✓		✓	Medium	2014
Substantially rectify incomplete or inaccurate gas distribution asset attribute data in ALIS	✓			Medium	2014
Provide access to all major asset lifecycle data sets from Vector's AMR systems	✓	✓	✓	Medium	2015
Simplify the management of linear assets in ALIS		✓	✓	High	2016

Table 7-4 : Asset Data Quality Improvement Plan

7.6 Expenditure Forecast

Table 7-5 summarises Vector's projected capital expenditure in the asset management IT component of Non-Network Assets (figures are June 2014 real values).

Budget and expenditure forecasts ($'000)	**Forecast FY14**	**Forecast FY15**	**Forecast FY16**	**Forecast FY17**	**Forecast FY18**	**Forecast FY19**	**Forecast FY20**	**Forecast FY21**	**Forecast FY22**	**Forecast FY23**
Network monitoring project	$40	$0	$0	$0	$0	$0	$0	$0	$0	$0
Others	$250	$300	$300	$300	$300	$300	$300	$300	$300	$300
TOTAL CAPITAL EXPENDITURE	**$290**	**$300**	**$300**	**$300**	**$300**	**$300**	**$300**	**$300**	**$300**	**$300**

Table 7-5 : Forecast capital expenditure on asset information systems (non-network assets)

Gas Distribution
Asset Management Plan
2013 – 2023

Risk Management– Section 8

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8 Risk Management

8.1 Risk Management Policies

Risk management is integral to Vector's asset management process. Vector's risk management policy sets out Vector's intentions and directions with respect to risk management including its objectives and rationale. Vector's goal is to maintain robust and innovative risk management practices, consistent with the ISO31000 standard and implement those practices in a manner appropriate for a leading New Zealand publicly-listed company that supplies critical infrastructure and manages potentially hazardous products.

Vector's core operational capabilities, such as asset, operational and investment management, are supported by robust risk management decision-making, processes and culture. Risk and assurance management also underpin Vector's ability to meet its compliance obligations. Gas industry codes require risk management to be a continuous process at all stages throughout the life-cycle of Vector's gas distribution network. The primary principle in managing asset and infrastructure risk is to reduce the risks to as low as reasonably practical (ALARP). Vector takes this responsibility seriously and has stringent risk management processes in place covering hazard identification, risk assessment and the monitoring and review of hazards.

The risk management capability is built on a risk management process which requires risks to be identified and analysed, assessed and managed. This means understanding both the nature of a risk and its level. This includes identifying the cause and effect of a risk, the potential likelihood of a risk occurring and the potential impact(s) of a risk. Following this, the overall risk exposure is agreed which involves identifying and evaluating any controls in place to manage the risk. A 'control' is any policy, practice or device which is in place to modify (reduce) a risk. The risk exposure is determined from an evaluation against Vector's risk management framework and a decision made as to whether the level of risk is acceptable. If it is not acceptable a 'treatment' is developed and prioritised against others. In terms of asset management these often become security of supply or asset integrity capital projects, or become the basis for work practice decisions. The effectiveness of the controls and the delivery of these projects are subject to ongoing monitoring. The consequences and likelihood of failure or non-performance of assets, the current controls to manage these, and required actions to mitigate risks, are all documented, understood and evaluated by Vector as part of the asset management process.

The acceptable level of asset-risk will differ depending on the impact, should an asset fail, on the gas distribution supply or its potential for harm. Risk analysis covers a range of risks from those that could occur at a relatively high frequency but with low impact, such as small scale third party interference, through to low probability events with high impact, such as the total loss of a gate station for an extended period.

Risks associated with assets are primarily managed by a combination of:

- Reducing the probability of failure through the capital and maintenance work programme and enhanced work practices; and
- Reducing the impact of failure through the application of appropriate network security standards, robust network design supported by contingency and emergency plans.

8.2 Risk Accountability and Authority

8.2.1 Vector Risk Structure

Figure 8-1 shows Vector's risk management structure and reporting lines.

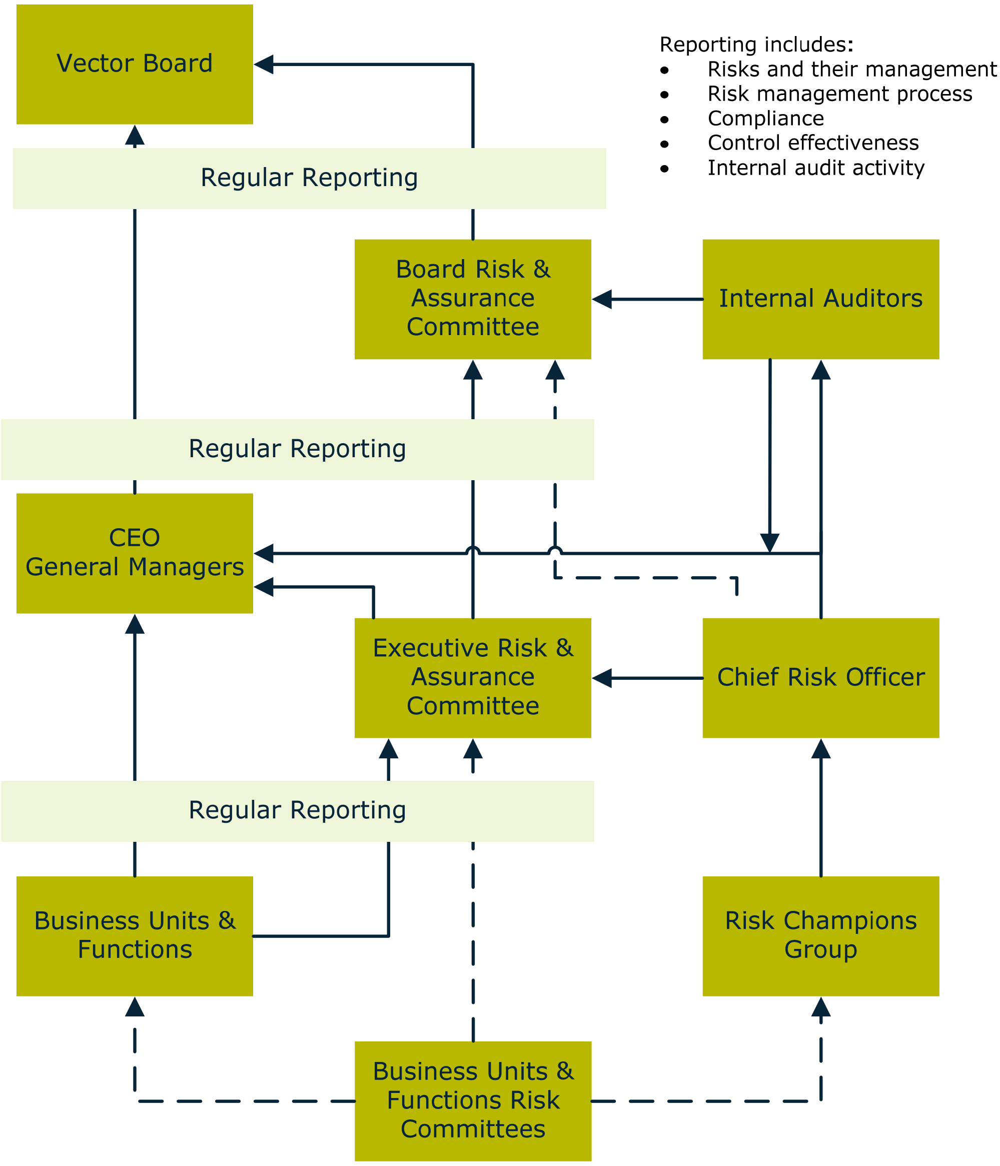


Figure 8-1 : Vector's risk management structure

The following paragraphs describe the accountabilities and authorities of the committees within the risk management structure.

8.2.2 Board Risk and Assurance Committee

Vector's board has overall accountability for risk management. This responsibility (excluding security of supply risks which remain a full board responsibility) has been delegated to the Board Risk and Assurance Committee (BRAC) which provides oversight of Vector's risk and assurance framework and performance.

The BRAC meets four times a year to review Vector's risk context, key risks and key controls, which include the internal audit and insurance programmes.

8.2.3 Executive Risk and Assurance Committee

The Vector executive has established an Executive Risk and Assurance Committee (ERAC) to provide specific focus and leadership on risk management. The committee has the overarching responsibility of ensuring risk management and assurance in Vector is appropriate in terms of scope and strategy, as well as implementation and delivery.

Vector has also established a business continuity management steering committee made up of a mixture of executive and management with specific related responsibility to focus on the development and management of Business Continuity Management (BCM) throughout Vector including the operation of the gas distribution networks.

8.2.4 Management and Business Areas

The group general managers and their direct reports have responsibility for ensuring that sustainable risk management and assurance practices are developed and effectively implemented within each of Vector's business groups.

Asset related risks and their control and mitigation measures are largely the responsibility of the Asset Investment (AI) and Service Delivery (SD) groups. The AI group oversees network asset management strategy and performance and includes the development of standards for the gas distribution network and its component assets.

The SD group manages the operational delivery of the strategy. This includes delivery in the field of the requisite levels of maintenance and capital expenditure (capex) so the network meets the stated reliability, safety, environmental and performance standards. The SD group also manages the safe and reliable operation of the network to predefined levels.

8.2.5 Risk Champions

Risk champions have the responsibility of facilitating risk management practices in their business groups by:

- Ensuring, in conjunction with the risk-owners, that their risk registers are accurate and up to date;
- Completing general risk management reporting requirements within their business groups;
- Ensuring effective risk management meetings are conducted in their areas (and cross-functionally as appropriate); and
- Ensuring appropriate risk communication and induction is undertaken in their business groups.

8.2.6 Chief Risk Officer

Vector appointed a Chief Risk Officer in July 2012. The Vector Chief Risk Officer is part of the Vector executive leadership and is responsible for the development of the Enterprise Risk Management (ERM) framework, including all supporting business systems, policies and processes. The risk management framework is approved by the BRAC.

The role includes, amongst other things, the monitoring and reporting of progress against the ERM plan and overall delivery of risk management and assurance, as well as communicating on risk management and assurance issues across Vector.

8.2.7 Staff

Each staff member is responsible for ensuring they understand the risk management practice in Vector and how it applies to them. This includes being actively engaged in the identification of new risks and ensuring these are appropriately acknowledged.

Individual staff may have specific responsibilities for the ownership and management of a specific risk, control or treatment depending on their roles.

8.3 Risk Management Process and Analysis

8.3.1 Risk Management Process

The Vector ERM framework is aligned to and based upon AS/NZS ISO31000:2009. The current risk management process adopted by Vector is shown in Figure 8-2 below. The Chief Risk Officer is currently undertaking a review of the Vector ERM framework and it is anticipated that changes focused on continuous improvement of the framework will occur over the next 12 months.

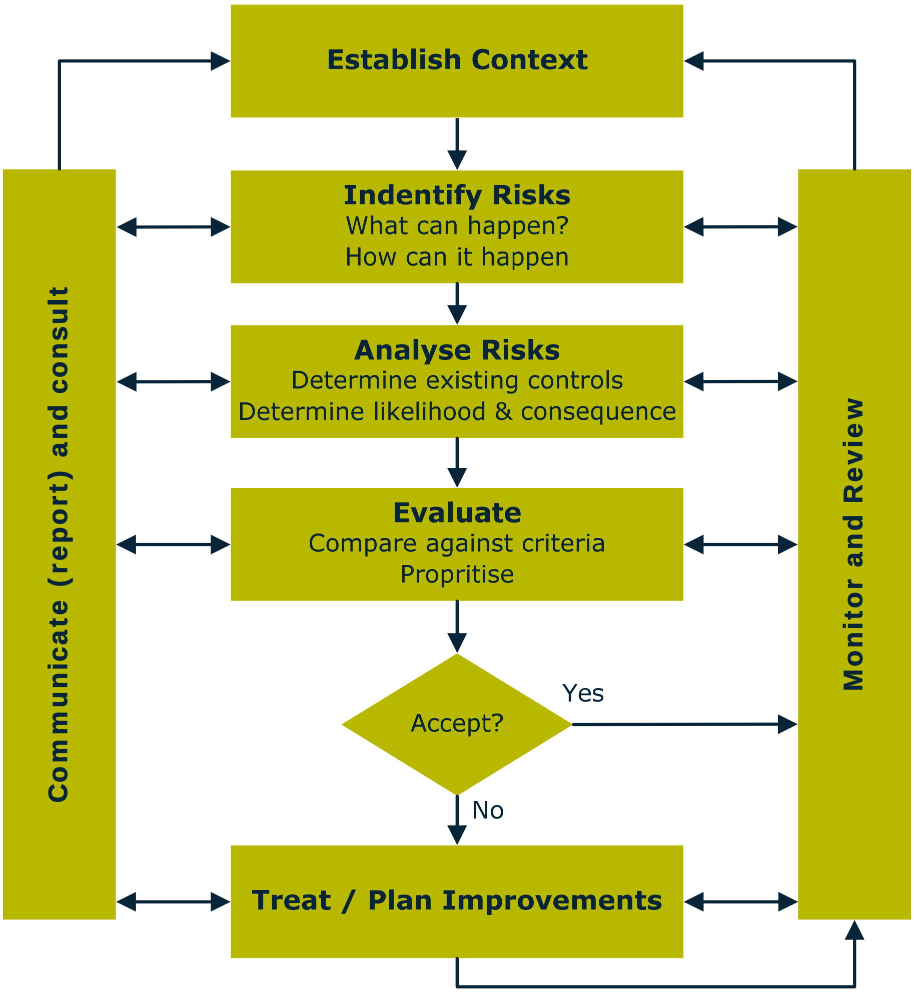
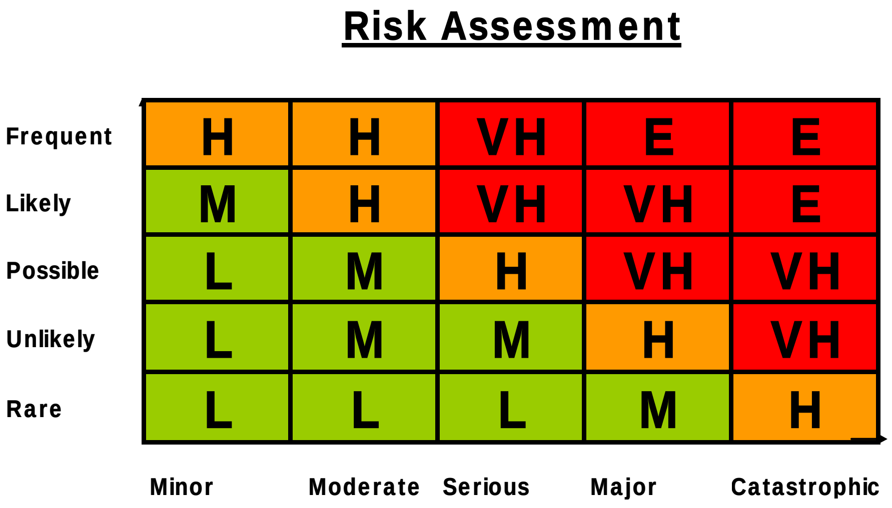


Figure 8-2 : Vector's risk management process (based on ISO31000: 2009)

The level of a risk is determined by considering the combination of the "likelihood" and "consequences" of the risk occurring given current controls. This is then compared to Vector's risk assessment matrix shown in Figure 8-3 below. The overall risk exposure is used as a key factor in determining whether the risk is acceptable and driving the need and priority of any subsequent action.

Risks which have "catastrophic" or "major" risk consequences include those which could lead to loss of life, cause serious damage to the environment, create a major loss of gas distribution supply, lead to major financial loss or have a significant impact on Vector's reputation.

Vector has controls in place to manage key risks and has internal review processes associated with these controls. A key component of the assurance process is Vector's internal audit programme which provides assurance around controls, including Vector-wide 'risk management' and BCM governance. The Internal Audit programme is overseen by the BRAC.



Risk Assessment

	Minor	Moderate	Serious	Major	Catastrophic
Frequent	H	H	VH	E	E
Likely	M	H	VH	VH	E
Possible	L	M	H	VH	VH
Unlikely	L	M	M	H	VH
Rare	L	L	L	M	H

Risk Assessment Using Consequence And Likelihood

L = Low
M = Moderate
H = High
VH = Very High
E = Extreme

Red = Board Attention
Orange = Executive Attention
Green = Management Attention

Figure 8-3 : Vector's risk assessment matrix

8.3.2 Network and Asset Risk Management

The management of the gas distribution network assets is underpinned by the risk management principles described above. The AI group which oversees network asset management and performance uses these principles in the development of standards for the gas distribution network and its component assets.

The SD group manages the operational delivery of the strategy. This includes delivery in the field of the requisite levels of maintenance and capital development so the network meets the stated risk rated reliability, safety, environmental and performance standards. The SD group also manages the safe and reliable operation of the network to predefined levels.

The AI and SD groups both have an integrated approach to risk management and their respective responsibilities in relation to it, which encompasses:

- Identifying and assessing risks;
- Managing and maintaining controls;
- Developing and implementing treatments proportionate to the risk involved;
- Monitoring risks, the effectiveness of controls and progress of treatments;
- Maintaining up to date risk registers which clearly identify risks, the ownership of the risks, possible outcomes and mitigation measures; and

- Reporting these risks, controls and treatments to the ERAC and BRAC as appropriate.

Regular risk meetings are held at all levels of Vector, and within the AI and SD groups, at which the existing risk registers are reviewed, potential risk scenarios discussed, and new risks, including those that have a low probability of occurrence but a high level of impact, identified for inclusion in the risk registers (along with the appropriate mitigation measures).

Apart from the regular risk meetings, risks are also identified during the annual planning and routine operational processes. The network development and asset replacement processes identify situations where network security in parts of the network may be vulnerable to high impact low probability events. Procedures are in place to record incidents occurring on the network during the course of daily operation. Mitigating action plans are then developed to reduce the impact of such events. These incidents are then recorded in the Risk and Incidents Management System (RIMS) along with the appropriate mitigation measures. Section 8.4 documents Vector's business continuity approach to mitigate the effect of high impact events on the business.

8.3.2.1 Risk Recording

All risks are recorded to ensure that they are visible and actively managed. Vector's risk registers identify risks and capture their management at different levels of detail and at different levels of responsibility, taking a tiered approach. These are routinely reviewed and reported on.

The risk registers report absolute risk classification (i.e. excluding any organisational controls) and the risk classification with controls and treatments in place. The treatments are initiatives which are undertaken primarily to reduce the risk. These risks are managed at various levels, as appropriate, within Vector. The findings are reflected in Vector's asset planning outcomes. The most significant risks have visibility through to the ERAC and to the BRAC. Table 8-1 below shows the key information requirements for risks in Vector's risk registers.

Heading		**Description**
Unique ID number		Unique code for each risk
Risk Event/ Description	Short name	Short name for the risk to ease communication
	Full name and consequence	Full name defines the event or circumstance and the consequences which emanate from this risk
Risk Ownership	Function / Business Unit	Reporting unit
	Owner	Name of owner of risk
Causes		Causes of the risk occurring
Effects		Impacts of the risk occurring
Original Risk	Consequence	Likely impact with no controls in place
	Probability / Likelihood	Likelihood of risk occurring with no controls in place
Existing Preventative Controls	Control name	A brief description linked to the causes
	Control owner	Name of the control owner

Heading		**Description**
	Control effectiveness	A measure of the effectiveness of the control
Existing Detective and Corrective Controls	Control name	A brief description linked to the effects
	Control owner	Name of the control owner
	Control effectiveness	A measure of the effectiveness of the control
Current Risk	Consequence	Likely impact with existing controls in place
	Probability / Likelihood	Likelihood of risk occurring with existing controls in place
Mitigations	Mitigation name	A brief description of the future management action
	Mitigation owner	Name of the mitigation owner
	Completion date	Date when mitigation is scheduled to be complete
Rationale		A brief description of the reasons for the mitigation actions
Target Risk	Consequence	Likely impact with mitigations in place
	Probability / Likelihood	Likelihood of risk occurring with mitigations in place

Table 8-1 : Risk register headings

Vector is in the process of changing its approach in the presentation of risks from a spreadsheet risk register into a bow tie format. The bow tie format is well established, particularly in the petrochemical industry, and has four principal benefits:

- It drives rigour in reporting risks – controls are clearly identified as such and loss of a control is less likely to be incorrectly identified as a risk;
- It clearly distinguishes between preventive and mitigating controls, allowing priority to be placed on preventive controls (in accordance with established control hierarchies);
- Where there is little influence over a risk, it reinforces the requirements for contingency controls, which have ancillary benefits in protecting against unforeseen risks: and
- It provides a very clear and easily understood depiction of the risk landscape, supporting a culture where all staff are able to understand and support risk management.

All bow ties from different business units will be collated by the Chief Risk Officer to allow a clear enterprise wide risk picture to be presented. This allows for the appropriate level of focus, support and resource from across Vector to be applied to those areas where risks are highest, as well as for shared knowledge and understanding of good practice across Vector.

8.3.2.2 Integrated Risk Management – Our Aspiration

Vector continues to look to enhance the integration of the risk management process into its core planning and prioritisation activities. It is recognised many of the risk control or mitigation measures require capital investments, and capital investment is largely driven by risk-associated factors.

Anticipated asset and infrastructure risks identified in the risk register that can be treated by capital investment are included in the 10 year capital works programme (capital expenditure forecasts). These projects are identified by the risk identification number (from the risk register).

Other residual risks are controlled / mitigated through maintenance programme of works. These projects are part of the corrective or reactive maintenance programme.

Vector is looking to improve the standardisation of risk descriptions, assessments, evaluations and the prioritisation of treatments and is investigating enhanced computer-based platforms to aid in their overall analysis and management.

Vector is also intending to develop an overall risk-performance measurement structure which will be used to measure, track and report over time the effectiveness of the management of individual risks and the overall risk management process itself (and specifically asset-related risk management).

Components of this integrated risk-management suite are currently being investigated or tested and it is anticipated to have the full system in place by 2014.

8.3.2.3 Incident Management and Reporting

Vector recognises the requirement for accurate, effective and efficient reporting and management of incidents is an important input into the risk analysis and management. This process is a significant source of information on the nature and level of risks and the effectiveness of controls. Incident reporting and management is a key component of Vector’s health, safety and environmental management system (HSEMS Standard 9). To enhance reporting Vector has developed and implemented a centralised database called RIMS (Risk and Incident Management System).

Incident investigations provide a key mechanism to gain insight into the root causes of incidents and provides a valuable opportunity to trend, learn, improve, and avoid similar events in future. In managing incidents, Vector’s priorities are to:

- Stabilise and manage the immediate situation. Depending on the event this includes ensuring the safety of its employees, contractors and members of the public; limiting damage to assets; limiting environmental harm, and preserving operations;
- Communicating the incident to appropriate internal staff and external authorities, agencies and organisations (where required);
- As appropriate, (in accordance with HSEMS 9) investigate the incident and prepare an incident report that considers all of the contributing factors, identifies the root cause(s) and recommends corrective actions as appropriate;
- Carry out any corrective actions; and
- Close out the incident.

Vector also provides a weekly report to the executive team and senior managers, showing all incidents rated with the potential significance rating of “serious or above” This report is reviewed as the first agenda item on the weekly executive meeting every Monday.

The Corporate HSE team is now focusing on understanding the HSE culture across Vector.

8.4 Business Continuity Management

8.4.1 Business Continuity Policies

Vector requires an appropriate level of BCM capability in order to meet:

- Its obligations as the owner of “lifeline” utility businesses; such that it is able to function to the fullest possible extent (even though this may be at a reduced level during and after an emergency);
- Customer expectations that service disruptions will be minimised; and
- Shareholders’ expectations in terms of protecting value if a disruptive event occurs.

To deliver this Vector has developed a BCM policy which requires that following a range of possible events, emergencies and crises Vector can:

- Minimise their impact on people, operations, assets and reputation;
- Maintain services to the fullest possible extent; and
- Recover to a business as usual position as quickly as reasonably practicable.

To deliver this Vector has established, and maintains, a robust BCM capability. Critical components are live tested on a regular basis to assess the ability to accommodate physical, business and personnel changes. Sufficient personnel are trained to manage serious situations and cope if key people are unavailable.

Vector extends the requirement to maintain a robust and workable BCM capability to its key external service providers that are relied upon by Vector to support its operations.

8.4.2 BCM Responsibilities

The overall BCM framework and plan is developed and monitored by the Chief Risk Officer. Vector’s overall BCM capability and programme activities are overseen by a BCM steering committee. Additional oversight is provided by the BRAC and the ERAC.

The head of each business and functional unit is responsible for maintaining the appropriate BCM capability and compliance requirements for their areas. All employees are responsible for contributing to the maintenance of the BCM capability and to assist with the emergency/crisis response and recovery efforts in a real situation.

8.4.3 Business Continuity Capability

To deliver on its BCM policy Vector, as a whole and within its individual functional and business units, as appropriate:

- Undertakes Business Impact Analysis (BIA) and reviews of key disruptive events and recovery timeframes to determine BCM capability requirements;
- Ensures it has in place the appropriate level of BCM capability to be able to respond when a disruptive event occurs. This capability consists of:
  - People;
  - Plans; and
  - Infrastructure;
- Reviews and updates this capability annually (or as required if material external or internal changes have occurred) and has a full review scheduled on an appropriate timescale;
- Ensures the BCM capability extends to third parties where they are key agents in the delivery of an activity for Vector;
- Requires a BCM associated programme of testing to be planned and delivered; and
- Ensures it has appropriate:
  - BCM communication/awareness processes in place;
  - Levels of BCM training; and

  - Monitoring and reporting.

8.4.4 Business Continuity Plans

With respect to individual Business Continuity Plans (BCP) Vector's policies require appropriate governance aspects to be in place as well as each plan to have certain components.

With respect to governance each BCP:

- Has an owner. The owner has responsibility for the plan and all aspects of the capability around the plan;
- Is developed by those who are associated with the activity and who are named in the Plan;
- Is reviewed on a regular basis or when required if significant external or internal changes occur; and
- Has a programme for testing the combination of:
  - People;
  - Plan;
  - Infrastructure; and
  - Has an appropriate associated training and communication plan.

With respect to components, each BCP:

- Identifies which individuals/groups are notified of an event, including naming appropriate alternates, and having an appropriate escalation process defined;
- Identifies third parties that are required to support a given activity and identifies planning around their disruption;
- Outlines key activities to be undertaken;
- Provides key information required to make the implementation of the Plan achievable, such as:
  - Contact lists (internal and external);
  - Maps/plans/drawings/instructions/flow charts;
  - Criticality information;
  - List of required associated equipment; and
  - Appropriate check lists; and
- Has appropriate metadata, specifying:
  - Owner;
  - Versions; and
  - Date last reviewed and by whom.

8.4.5 Civil Defence and Emergency Management

Vector is classed as a "lifeline utility" under the Civil Defence and Emergency Management Act 2002 (CDEM) and is required to be "able to function to the fullest possible extent, even if this may be at a reduced level, during and after an emergency". Vector also is required to have plans regarding how it will function during and after an emergency and to participate in the development of a CDEM strategy and BCPs.

Vector has a number of BCPs in place as well as an overall crisis plan.

Vector participates in CDEM emergency exercises on a regular basis to ensure CDEM protocols are understood as well as to test aspects of Vector emergency and BCP plans.

Vector has in place individual emergency response plans for major events and a National Civil Defence Emergency Management Plan that sits above these plans for use in the event of a declared civil defence emergency.

Vector participates in a number of Lifeline Groups across the country. Membership in the lifeline groups helps ensure Vector keeps abreast of developments in the CDEM area and that it is fully prepared for emergencies arising from identified threats including volcanic eruption, tsunami, earthquake, tropical cyclones and storms, both in general and in particular as they relate to its gas distribution assets.

A key area of focus for Vector is to better utilise information from the lifelines groups around the country into Vector's asset management process.

Vector is also a member of the National Engineering Lifelines Committee and keeps abreast of national issues and initiatives through this forum.

8.4.6 BCP and Emergency Response Plans

Vector has a number of plans to cover emergency situations. These plans are reviewed and updated regularly to ensure they are current. Examples of the plans are:

- Crisis management plan
- Emergency response plan
- Vector emergency communications plan
- GANZ mutual aid plan
- Vector pandemic health plan
- Call Centre BCP

These plans are further described below.

8.4.6.1 Crisis Management Team Plan

The crisis management team plan identifies procedures for a crisis affecting Vector, its customers and/or its employees, contractors and other stakeholders. The plan and procedures outlined in this document identify how Vector will manage the consequences of a crisis. It is designed to establish clear lines of communication and reporting, as well as action guidelines for Vector.

While the crisis management team plan procedures have been developed to cover a broad set of circumstances, Vector is mindful that every crisis has its own unique set of circumstances, which will require good judgement from Vector employees to be managed effectively.

The crisis management team plan is not intended to cover operational emergency response requirements, as these are covered by the relevant emergency response plans. The plan is designed to support those plans, better enable staff to fulfil their roles as efficiently and safely as possible, and to ensure the wider public implications of an emergency are identified and addressed.

8.4.6.2 Emergency Response Plan

The gas distribution emergency response plan outlines Vector's response to emergencies associated with the gas distribution networks. It is aligned with the New Zealand Coordinated Incident Management System (CIMS). The plan does not detail specific actions to be taken by every person, as each emergency incident will require different actions to take place. It has been produced to ensure people understand their responsibilities once an emergency has been declared.

Incidents occurring on Vector’s gas assets or associated with Vector’s gas distribution business can be extremely varied in nature. Remedial actions and resource requirements can therefore be equally varied.

The emergency response plan aims to ensure:

- Effective communications between all parties involved in the resolution of the emergency; and
- Preparedness of resources available to Vector that may be required for the resolution of the emergency.

8.4.6.3 Vector Crisis Communications Plan

The Vector crisis communications plan has been written to ensure that, in any emergency, crisis or business continuity event affecting Vector, Vector's customers, the affected community and other stakeholders are kept well-informed and up-to-date of:

- The status of the crisis;
- Any actions they can or should take to mitigate the effect or consequences of the emergency; and
- When the situation is expected to be (or is) resolved.

The plan is designed as a template that can be tailored to the management response requirements determined by the particular nature of the emergency, crisis or business continuity event. It is designed to provide a consistent, robust and scalable approach to communications.

8.4.6.4 Mutual Aid Plan

The Gas Association of New Zealand (GANZ) has a mutual aid plan to aid response to a significant network outage, in which gas utility operators and companies agree to assist each other if requested to do so. The Mutual Aid Plan has provision to provide assistance for equipment, material and personnel for the repair phase of the emergency. Vector is a party to this plan.

8.4.6.5 Vector Pandemic Health Plan

As a lifeline utility, the CDEM Act (2002) requires Vector to be able to function to the fullest possible extent during and after an emergency.

The objective of this plan is to manage the impact of a pandemic on Vector’s employees and its business to ensure continuation of network operations through two main strategies including the containment of disease by reducing spread within Vector’s offices and facilities, and maintenance of essential services if containment is not possible.

8.4.6.6 Call Centre Business Continuity Plan

The core business of Telnet Services, Vector’s call centre provider, relies heavily on various computer and telephony technologies that, by their very nature, have the potential to fail.

The purpose of the call centre BCP is to assess the potential risks and planned workarounds for those risks in order that Telnet’s core business can continue in the event of any failure or disaster. In addition to the general BCP/DR strategy employed at Telnet, there are a number of specific provisions as part of Telnet’s relationship with Vector to provide additional services to ensure the continuity of service around handling of safety critical and emergency calls.

8.4.6.7 Critical Spares

A stock of spares is maintained for critical components of the network so that fault repair is not hindered by the lack of availability of required parts. Whenever new equipment is introduced to the network an evaluation is made of the necessary spares required to be retained to support the repair of any equipment failures. Refer to Section 6 for further details.

8.5 Insurance

The Treasury function manages the placement of insurance for Vector.

Vector's approach to its insurance programme has been to balance risk and cost and has involved regular review of the financial risk appetite of Vector. This translates into a programme whereby Vector seeks cover for low probability major or catastrophic events, and carries as an operational expense the cost of other events which have a lesser financial impact. With respect to the latter category, risk mitigation activity is undertaken to reduce the likelihood of these events through proactive maintenance programmes and thorough management processes.

8.6 Health and Safety

8.6.1 Health and Safety Policy

Vector's health and safety policy states the commitments and requirements for health and safety. Vector conducts its business activities in such a way as to protect the health and safety of employees, contractors, members of the public and visitors in and within the vicinity of Vector's work environment and those people in the vicinity of its assets. Vector is committed to continual and progressive improvement in its health and safety performance and ensures it has sufficient, competent resources and effective systems at all levels of Vector to fulfil this commitment.

Any work conducted on and around Vector's assets by external parties, including its service providers, is also required to be conducted in line with Vector's health and safety policy and the Vector's Health, Safety and Environment Management System (HSEMS).

Vector's health and safety policy objectives are to:

- Provide a safe and healthy work place for all staff, contractors, the public and visitors;
- Ensure health and safety considerations are part of all business decisions;
- Monitor and continuously improve health and safety performance;
- Communicate with staff, contractors, customers, and stakeholders on health and safety matters;
- Operate in a manner that minimises health and safety hazards; and
- Encourage safe and healthy lifestyles, both at work and at home.

To achieve this Vector:

- As a minimum, meets all relevant legislation, standards and codes of practice for the management of health and safety;
- Identifies, assesses and controls workplace hazards;
- Accurately reports, records and learns from all incidents and near misses;
- Has established health and safety goals at all levels within Vector, and regularly monitors and reviews the effectiveness of Vector's HSEMS;

- Consults, supports and encourages participation from its people on issues that have the potential to affect their health and safety;
- Promotes its leaders', employees' and contractors' understanding of the health and safety responsibilities relevant to their roles;
- Provides information and advice on the safe and responsible use of Vector's products and services;
- Suspends activities if safety would be compromised; and
- Takes all practicable steps to ensure Vector's contractors work in line with this policy.

8.6.2 Health and Safety Practices

All Vector employees and contractors working for Vector are responsible for ensuring their own safety and the safety of others by adhering to safe work practices, making appropriate use of plant and equipment (including using protective clothing and equipment) and promptly reporting incidents, near misses and hazards to Vector.

Vector's HSEMS defines the high level essentials necessary to maintain an incident free environment. This is documented in a set of 11 health and safety standards. Beneath these standards are more detailed "key requirement" documents that provide more specific detail on specialised activities such as confined space entry, working at heights etc.

These standards and key requirement documents allow each business unit to develop their own safe work method statements or procedures. This approach is necessary for Vector and its Field Service Providers (FSPs) to have the flexibility to manage their business units in a manner that identifies and eliminates incidents.

Key elements of Vector's health and safety practices, as they relate to assets and asset management, include the following:

- Wherever practicable Vector will eliminate, isolate or minimise hazards or control risks to As Low As Reasonably Practicable (ALARP), so as to ensure the safety and health of personnel, the public, the environment;
- The identification of safety and health hazards and the assessment of their associated risks to ensure they are managed to an acceptable level during their operation or associated activities;
- Vector practices preventative maintenance strategies to all critical plant and equipment to ensure continued safe, environmentally sound, economic and effective operation. In addition, Vector ensures the reliability of critical safety backup equipment, protective devices and key operating equipment is maintained;
- Safety considerations are incorporated into Vector's design standards and asset selection criteria;
- Appropriate safety equipment is installed, inspected and maintained and staff are competent to identify items in need of repair or replacement;
- All FSPs working for Vector are required, as a minimum, to comply with Vector's safe work practices whilst carrying out any work on the network. FSPs are also required to report all employee and third party incidents related to work on the Vector network, together with their investigations and corrective and preventive actions;
- Vector monitors gas distribution related public safety and employee/contractor safety incidents. These incidents are reviewed monthly to ensure lessons are captured and shared with its FSPs; and

- Ongoing public safety awareness communications programmes on gas distribution are undertaken. These include:
    - Promoting safe work practices extensively to external contractors whose work brings them in close proximity to Vector's networks, i.e. council and water service contractors, arborists. As well as protecting the contractors themselves, the programme aims to protect the community from hazards and ensure an ongoing safe and reliable gas supply to Vector's customers. Vector provides free services and resources to help contractors work safely around Vector's networks, including free network maps, on-site mark outs and supervision, safety guides and presentations. To ensure it is easy to get in touch with Vector, Vector has dedicated freephone numbers;
    - Vector is also a founding member of the "before-u-dig service" (www.beforeudig.co.nz). "Before-u-dig" enables contactors to obtain plans from a number of asset owners like Vector, simply by making one enquiry, rather than calling each asset owner individually;
    - Vector runs an interactive Natural Gas safety programme in Taranaki schools. The programme focuses on the history, processing and benefits of natural gas, as well as educating children on the potential danger in their backyards and in their homes; and
    - Wayne "Buck" Shelford also fronts a public safety campaign for Vector. He highlights to Kiwi DIYers the dangers around digging in their back yards and urges people to get professionals to carry out initial digging work.

A full review is currently being undertaken of Vector's health and safety framework in order to identify potential improvement opportunities. Vector continually strives for excellence in safety performance and recognises the importance of a robust, well structured safety framework to assist in delivering an incident and injury free workplace.

8.6.3 Safety Management System for Public Safety

The Gas (Safety and Measurement) Regulations came into force on 4 May 2010. A key change for asset owners within the gas and electricity industries is the requirement to operate an accredited safety management system that incorporates process for the safety of the public and public property.

Vector's gas distribution network has been audited against the requirements of NZS7901. Vector has subsequently received certification that the gas distribution networks operate under an accredited safety management system, which incorporates public safety and the protection of public property.

The accreditation is effective for 3 years, with annual monitoring required every year.

8.6.4 Good Governance Practices Guideline for Managing Health and Safety Risks

Following the Pike River Tragedy, the Ministry of Business Innovation & Employment and the Institute of Directors have published a new good governance practices guideline for managing health and safety risks. The purpose of the guideline is to provide health and safety governance and to:

- Demonstrate how directors can influence health and safety performance;
- Provide a framework for how directors can lead, plan, review and improve health and safety;
- Assist directors to identify whether their health and safety management systems are at a standard and quality that is effective in minimising risk; and

- Encourage directors to create strong, objective lines of reporting and communication to and from the board.

Vector is currently reviewing the guideline document and is well positioned to meet the requirements for managing Vector's health and safety risks.

8.7 Environmental Management

8.7.1 Environmental Policy

Vector's environmental policy confirms its commitment to managing the environmental impact of its businesses, and ensuring as a minimum, compliance with legislation, standards and any resource consents held by Vector. Vector conducts its operations in such a way as to respect and protect the natural environment and sensitive sites and is committed to continual and progressive improvement in its environmental performance. Sufficient competent resources and effective systems are provided at all levels of Vector to fulfil this commitment. Vector also requires all employees and service providers working for Vector to proactively manage their employees and work for Vector in line with this policy.

Vector's environmental policy is to:

- Ensure environmental considerations are part of all business decisions;
- Meet or exceed all relevant environmental legislation, regulations or codes;
- Participate and work with government and other organisations to create responsible laws, regulations, standards and codes of practice to protect the environment;
- Monitor and continuously improve Vector's environmental performance;
- Operate in a manner that minimises environmental and social impacts;
- Take appropriate action where there is a negative impact on the environment and a material breach of the Resource Management Act 1991; and
- Communicate with employees, contractors, customers and other relevant stakeholders on environmental matters.

To achieve this Vector:

- Has plans in place to avoid, remedy or mitigate any adverse environmental effects of its operations; and
- Focuses on responsible energy management and will practice energy efficiency throughout all of its premises, plant and equipment, where possible.

The long-term operational objectives of Vector are to:

- Utilise fuel as efficiently as practicable;
- Mitigate, where economically feasible, fugitive emissions and in particular greenhouse gas emissions;
- Wherever practicable use ambient and renewable energy; and
- Work with its customers to maximise energy efficiency.

8.7.2 Environmental Practices

Vector also puts significant emphasis on environmental management and continues improving its environmental management in partnership with Vector's FSPs. Vector's key practices in this regard include the following:

- Vector continually explores opportunities for minimising waste generation and, when identified, pursues economically viable opportunities consistent with business priorities and community expectations. All wastes generated from operations are effectively managed and disposed of in a cost effective manner in compliance with statutory requirements;

- When addressing environmental issues, consideration is given to both long-term impacts of waste disposal and to potential long-term issues;
- One of Vector's key performance indicators (KPIs) is to avoid any activity that would cause Vector to be in breach of the Resource Management Act 1991;
- Vector's HSEMS includes minimum acceptable standards on environmental management and a focus on eliminating damage; and
- Environmental incidents are accurately reported, recorded and investigated with any learnings and improvements shared across Vector's FSPs at the safety leadership forum.

Gas Distribution Asset Management Plan 2013 – 2023

Summary of Expenditure Forecast – Section 9

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9 Expenditure Forecast and Reconciliation

This section summarises how the capital, operating and maintenance forecast expenditures are compiled, including prioritisation of expenditures.

As indicated in Section 2 of this AMP, while this AMP also satisfies regulatory requirements, its main purpose is as a working guideline for the management of Vector's gas distribution network assets. As Vector operates to a June financial year all its budgeting, financial and management reporting activities align with the June year. The forecasts contained in Sections 5, 6, 7 and 9 of this AMP are presented on a real 2014[1] New Zealand dollars basis, for Vector financial (July – June) years – which is the input required into Vector's budgeting and financial forecasting processes.

The Gas Distribution Information Disclosure Determination 2012 requires Vector to disclose the financial information in real 2013 dollars and in regulatory years (ending 30th June[2]). These figures are presented in the Report on Forecast Capital Expenditure (Information Disclosure Schedule 11a, Appendix 1 of this AMP) and the Report on Forecast Operational Expenditure (Information Disclosure Schedule 11b, Appendix 2 of this AMP). These two reports also contain the expenditure forecasts expressed in nominal dollars as required by the Information Disclosure Determination.

The price inflation factors used to convert the constant price forecasts to nominal forecasts are explained in Section 9.5. It should be noted that the capital expenditure forecasts given in the AMP are prepared in accordance with Generally Accepted Accounting Principles (GAAP) and are different from the forecasts given in Schedule 11a which are presented as expenditure on assets as required by the Commerce Commission ID Determination. Given the many variants in reporting financial information, the reader is cautioned when comparing the expenditure information in this AMP and the associated appendices.

While the expenditure forecasts in this AMP are the best estimates available at the time of preparing this plan they will be subject to change in future as circumstances change and projects are reviewed.

The forecasts contained in this AMP would need to be reviewed if Vector applied to the Commerce Commission for a customised price-quality path (CPP). A CPP application is required to include certain information on capex, opex and demand. Vector would need to ensure its capex and opex forecasts were aligned for the period of the CPP, and that they meet the requirements of the CPP Input Methodology.

9.1 Capital Expenditure

9.1.1 Capital Expenditure Forecast

Vector's gas distribution capex forecast for the next ten financial years (ending 30th June) is presented in Table 9-1.[3] The capex forecasts for the Auckland and North Island regions are also included (Table 9-2 and Table 9-3).

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[1] FY2014 is the first year of the planning period of the disclosure AMP, commencing on 1 July 2013 and is the year when the AMP is publicly disclosed.

[2] The Vector financial year coincides with the regulatory disclosure year.

[3] The totals in Tables 9-1 to 9-3 below are slightly lower than the sum-totals for the individual projects described in sections 5 and 6 of this AMP. This reflects efficiencies arising from Vector's portfolio-management approach.

Budget and Expenditure Forecasts FY	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Customer connection	$10,470	$10,756	$10,470	$10,460	$10,460	$10,460	$10,430	$10,430	$10,383	$10,383
System growth	$3,729	$5,307	$3,400	$3,159	$3,551	$5,717	$8,598	$7,275	$6,598	$3,369
Asset replacement and renewal	$12,908	$4,228	$1,585	$1,545	$1,185	$1,085	$1,085	$1,060	$1,060	$1,060
Asset relocations	$4,068	$4,065	$3,043	$2,398	$2,485	$3,550	$3,550	$3,300	$3,300	$3,300
Quality of supply	$617	$759	$420	$127	$120	$253	$120	$80	$306	$80
System Fixed Assets Total	**$31,793**	**$25,116**	**$18,917**	**$17,688**	**$17,801**	**$21,065**	**$23,783**	**$22,145**	**$21,647**	**$18,192**
Non-system fixed assets (Asset IT)	$290	$300	$300	$300	$300	$300	$300	$300	$300	$300
Asset Capital Expenditure Total	**$32,083**	**$25,416**	**$19,217**	**$17,988**	**$18,101**	**$21,365**	**$24,083**	**$22,445**	**$21,947**	**$18,492**

* Figures are in 2014 real New Zealand dollars ($,000)

** The year reference indicates the end date of the Vector financial year

*** The forecasts are inclusive of cost of finance and in line with Vector's business practice

Table 9-1 : Capital expenditure forecast for Vector

Budget and Expenditure Forecasts FY	**Forecast FY14**	**Forecast FY15**	**Forecast FY16**	**Forecast FY17**	**Forecast FY18**	**Forecast FY19**	**Forecast FY20**	**Forecast FY21**	**Forecast FY22**	**Forecast FY23**
Customer connection	$6,777	$6,777	$6,777	$6,767	$6,767	$6,767	$6,737	$6,737	$6,690	$6,690
System growth	$2,569	$2,193	$841	$1,252	$1,610	$1,914	$2,857	$3,289	$2,403	$610
Asset replacement and renewal	$6,347	$780	$580	$580	$545	$545	$545	$520	$520	$520
Asset relocations	$3,022	$2,715	$2,263	$1,838	$1,925	$2,750	$2,750	$2,500	$2,500	$2,500
Quality of supply	$310	$421	$230	$80	$80	$213	$80	$40	$134	$40
System Fixed Assets Total	**$19,026**	**$12,886**	**$10,690**	**$10,516**	**$10,927**	**$12,188**	**$12,969**	**$13,086**	**$12,246**	**$10,360**

* Figures are in 2014 real New Zealand dollars ($,000)

** The year reference indicates the end date of the Vector financial year

*** The forecasts are inclusive of cost of finance and in line with Vector's business practice

Table 9-2: Capital expenditure forecast for Auckland Region

Budget and Expenditure Forecasts FY	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Customer connection	$3,693	$3,980	$3,693	$3,693	$3,693	$3,693	$3,693	$3,693	$3,693	$3,693
System growth	$1,160	$3,114	$2,559	$1,907	$1,941	$3,803	$5,741	$3,986	$4,195	$2,759
Asset replacement and renewal	$6,561	$3,448	$1,005	$965	$640	$540	$540	$540	$540	$540
Asset relocations	$1,046	$1,350	$780	$560	$560	$800	$800	$800	$800	$800
Quality of supply	$307	$338	$190	$47	$40	$40	$40	$40	$173	$40
System Fixed Assets Total	**$12,767**	**$12,230**	**$8,227**	**$7,172**	**$6,875**	**$8,876**	**$10,814**	**$9,059**	**$9,401**	**$7,832**

* Figures are in 2014 real New Zealand dollars ($,000)

** The year reference indicates the end date of the Vector financial year

*** The forecasts are inclusive of cost of finance and in line with Vector's business practice

Table 9-3: Capital expenditure forecast for North Island Region

9.1.2 Capital Expenditure Categories

The expenditure categories contained in the forecasts are based on the Gas Distribution Information Disclosure Determination 2012 as follows:

9.1.2.1 Customer Connection

Customer connection is the gross capital expenditure for the establishment of a new customer connection point or alterations to an existing customer connection point. This expenditure category includes gross capital expenditure relating to:

- Connection assets and/or parts of the network for which the expenditure is recoverable in total, or in part, by a contribution from the customer requesting the new or altered connection point; and
- Gas injection and off-take points of connection.

Capital contributions for this type of work are accounted for separately. Expenditures under this category are discussed in more detail in Section 5 of this AMP.

9.1.2.2 System Growth

System growth is the gross capital expenditure to provide additional capacity on a part of the network to meet a change in demand, or additional investment to maintain current security and/or quality of supply standards due to the increased demand. This expenditure category includes gross capital expenditure associated with SCADA and telecommunications assets.

Expenditures under this category are discussed in more detail in Section 5 of this AMP.

9.1.2.3 Asset Replacement and Renewal

Asset replacement and renewal refers to the gross capital expenditure required to maintain network asset integrity so as to maintain the current security and/or quality of supply standards and includes expenditure as a result of:

- The progressive physical deterioration of the condition of network assets or their immediate surrounds;
- The obsolescence of network assets;
- Preventative replacement programmes, consistent with asset life-cycle management policies; or
- The need to ensure the ongoing physical security of the network assets.

Expenditures under this category are discussed in more detail in Section 6 of this AMP.

9.1.2.4 Asset Relocation

Asset relocation refers to the gross capital expenditure required to relocate assets due to third party requests, such as for the purpose of allowing road widening or similar needs. Capital contributions for this type of work are accounted for separately.

Expenditures under this category are discussed in more detail in Section 5 of this AMP.

9.1.2.5 Reliability, Safety and Environmental

Safety, reliability and the environmental impact of installations are key priorities in the design or maintenance of Vector' assets and, as such, form primary inputs into our asset management processes. However, in particular instances the need may arise in specific parts of the network to enhance safety or reliability, or to mitigate a (potential) negative environmental impact. Expenditure on such works is covered under the following sub-categories:

Quality of Supply

The primary purpose of this expenditure is to maintain the security and/or quality of supply performance of the network. This may include expenditure, in specific parts of the network where intervention is required, to reduce the:

- Interruption/fault rate;
- Average time that customers are affected by planned and/or unplanned interruptions; or
- Number of consumers affected by planned and/or unplanned interruptions.

Legislative and Regulatory

The primary purpose of this expenditure is to create or modify network assets as a result of a new regulatory or legal requirement.

Other Reliability, Safety and Environmental

The primary purpose of this expenditure is to maintain network reliability or safety or to mitigate the environmental impacts of the network, but is not included in either of the quality of supply or legislative and regulatory categories.

Expenditures under this category are discussed in Sections 5 and 6 of the AMP.

9.1.2.6 Non-network Capex

Non-network asset expenditure relates to the expenditure required to provide gas pipeline services but is not directly related to any gas network asset, and includes expenditure on or in relation to:

- Information and technology systems;
- Asset management systems;
- Office buildings, depots and workshops;
- Office furniture and equipment;
- Motor vehicles;
- Tools, plant and machinery; or
- Any other items treated as non-network assets under Generally Accepted Accounting Practice (GAAP).

For the purpose of this Asset Management Plan, only expenditures on asset management systems, information and technologies are included. These expenditures are discussed in more detail in Section 7 of this AMP. Other expenditures such as corporate IT, office furniture, etc are excluded from this AMP. It should be noted that the forecasts provided under Schedule 11a of the Information Disclosure (Appendix 1 of this AMP) include **all** non-network asset expenditures (on an allocation basis) and not just the asset management systems, information and technologies discussed in Section 7 of this AMP.

9.2 Maintenance and Operations Expenditure

Vector consistently looks for new opportunities and ways of improving our operating efficiency. Vector is considering a move to a more clearly defined asset manager and service provider structure that is consistent with the related party rules as set out in the Commerce Commission's Input Methodologies and the Information Disclosure Determination. We believe this could deliver value both to Vector and our consumers. The forecasts of operational expenditure in this section take account of the forecast costs associated with the new business arrangements.

Vector's gas distribution maintenance (direct operational) expenditure forecast for the disclosure years ending 30th June from 2014 to 2023 are set out in Table 9-4. The maintenance expenditure forecasts for the Auckland and North Island regions are also included (Table 9-5 and Table 9-6). The expenditure forecasts are presented in June 2014 real New Zealand dollars and relate to the direct maintenance, inspection and field operation of assets to maintain network and asset integrity and their capability to deliver the level of service in accordance with Vector's asset management strategies. These expenditures do not include categories that are of an indirect/business support nature.

The expenditure forecasts presented in this table has been classified based on the expenditure categories defined in the Gas Distribution Information Disclosure Determination 2012. The forecast under the System Operations and Network Support category contains direct expenditure only (indirect components of this category is not included). The forecast for this category presented in the Information Disclosure schedule 11b however contains both direct and indirect expenditures and is therefore different from the figures in this section of the AMP.

9.2.1 Operating Expenditure Categories

Vector's direct operating expenditure is grouped under the following categories as defined in the Gas Distribution Information Disclosure Determination 2012.

9.2.1.1 Service Interruption and Emergency

This expenditure is provided for attending to any unplanned instantaneous event or incident that impairs the normal operation of network assets. This includes reactive work (either temporary or permanent) undertaken in the immediate or short term in response to an unplanned event. This category also includes the direct cost of providing a service to respond to reported gas escapes, loss of supply and low pressure reports, make the network safe, repair leaks, rechecks, restore supply, provide for 24/7 response, non-productive time for response teams and back-up assistance required to restore supply. It also includes operational support used during the outage or emergency response and any necessary response to events arising upstream. It does not include expenditure on activities performed proactively to mitigate the impact such an event would have should it occur.

Planned follow-up activities resulting from an event which were unable to be permanently repaired in the short term are to be included under routine and corrective maintenance and inspection category.

Budget and Expenditure Forecasts	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Service interruptions incidents and emergencies	$4,149	$4,149	$4,149	$4,149	$4,149	$4,149	$4,149	$4,149	$4,149	$4,149
Routine and corrective maintenance and inspection	$4,704	$4,716	$4,760	$4,698	$4,774	$4,778	$4,807	$4,836	$4,865	$4,895
Asset replacement and renewal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
System operations and network support	$20	$20	$0	$0	$0	$0	$0	$0	$0	$0
Business support	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Direct Operational Expenditure Total	**$8,873**	**$8,885**	**$8,909**	**$8,847**	**$8,923**	**$8,927**	**$8,956**	**$8,985**	**$9,014**	**$9,044**

* Figures are in 2014 real New Zealand dollars ($,000);

** The year reference indicates the end date of the Vector financial year

Table 9-4: Direct Operational Expenditure Forecast for Vector

Budget and Expenditure Forecasts	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Service interruptions incidents and emergencies	$1,935	$1,935	$1,935	$1,935	$1,935	$1,935	$1,935	$1,935	$1,935	$1,935
Routine and corrective maintenance and inspection	$2,820	$2,815	$2,842	$2,813	$2,872	$2,861	$2,876	$2,890	$2,905	$2,920
Asset replacement and renewal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
System operations and network support	$20	$20	$0	$0	$0	$0	$0	$0	$0	$0
Business support	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Direct Operational Expenditure Total	**$4,774**	**$4,769**	**$4,777**	**$4,748**	**$4,807**	**$4,796**	**$4,810**	**$4,825**	**$4,840**	**$4,855**

* Figures are in 2014 real New Zealand dollars ($,000);

** The year reference indicates the end date of the Vector financial year

Table 9-5: Direct Operational Expenditure Forecast for Auckland region

Budget and Expenditure Forecasts	Forecast FY14	Forecast FY15	Forecast FY16	Forecast FY17	Forecast FY18	Forecast FY19	Forecast FY20	Forecast FY21	Forecast FY22	Forecast FY23
Service interruptions incidents and emergencies	$2,214	$2,214	$2,214	$2,214	$2,214	$2,214	$2,214	$2,214	$2,214	$2,214
Routine and corrective maintenance and inspection	$1,884	$1,901	$1,918	$1,885	$1,902	$1,916	$1,931	$1,946	$1,960	$1,975
Asset replacement and renewal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
System operations and network support	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Business support	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Direct Operational Expenditure Total	**$4,098**	**$4,115**	**$4,132**	**$4,099**	**$4,116**	**$4,131**	**$4,145**	**$4,160**	**$4,174**	**$4,189**

* Figures are in 2014 real New Zealand dollars ($,000);

** The year reference indicates the end date of the Vector financial year

Table 9-6: Direct Operational Expenditure Forecast for North Island region

9.2.1.2 Routine and Corrective Maintenance and Inspection

This category of expenditure is for activities specified in planned or programmed inspection, testing and maintenance work schedules including:

- Fault rectification work that is undertaken at a time or date subsequent to any initial fault response and restoration activities;
- Routine inspection;
- Functional and intrusive testing of assets, plant and equipment including critical spares and equipment;
- Helicopter, vehicle and foot patrols, including negotiation of landowner access;
- Asset surveys;
- Environmental response;
- Painting of network assets;
- Outdoor and indoor maintenance of stations, including weed and vegetation clearance, lawn mowing and fencing;
- Maintenance of access tracks, including associated security structures and weed and vegetation clearance;
- Customer-driven maintenance; and
- Notices issued.

9.2.1.3 Asset Replacement and Renewal

Asset replacement and renewal opex refers to the expenditure required to maintain network asset integrity so as to maintain the current security and/or quality of supply standards and includes expenditure as a result of:

- The progressive physical deterioration of the condition of network assets or their immediate surrounds;
- The obsolescence of network assets;
- Preventative replacement programmes, consistent with asset life-cycle management policies; or
- The need to ensure the ongoing physical security of the network assets.

Expenditures under the above three categories are discussed in more detail in Section 6 of this AMP.

9.2.2 Support Costs

In addition to the above three direct expenditure categories, the Gas Distribution Information Disclosure Determination 2012 also defines two categories of operational expenditures that are related to the management of the gas distribution business but are not directly related to the maintenance and inspection of network assets. A description of these two expenditure categories is included in the following two sections. These two categories are a combination of internal / staff costs and external costs and are disclosed separately under Schedule 11b of the Information Disclosure regime, and do not form part of the AMP direct opex forecasts.

9.2.2.1 Business Support

Business support costs include operational expenditure associated with the following corporate activities:

- HR and training (other than operational training);
- Finance and regulation including compliance activities, valuations and auditing;
- CEO and director costs;
- Legal services;
- Consulting services (excluding engineering/technical consulting);
- Property management;
- Corporate communications;
- Corporate IT;
- Industry liaison and participation;
- Commercial activities including pricing, billing, revenue collection and marketing; and
- Liaison with the gas transmission business, customers and gas retailers.

9.2.2.2 System Operations and Network Support

System operations and network support costs include indirect operational expenditures for the management of the network and include expenditure relating to control centre and office-based system operations, including:

- Asset management planning including preparation of the AMP, load forecasting, network modeling;
- Network and engineering design (excluding capitalized design costs for capital projects);
- Network policy development (including the development of environmental, technical and engineering policies);
- Standards and manuals for network management;
- Network record keeping and asset management databases including GIS;
- Outage recording;
- Connection and customer records/customer management databases;
- Customer queries and call centre (not associated with direct billing);
- Operational training for network management and field staff;
- Operational vehicles and transport;
- IT & telecoms for network management (including IT support for asset management systems);
- Day to day customer management including responding to queries on new connections, disconnections and reconnections;
- Engineering and technical consulting;
- Network planning and system studies;
- Logistics (procurement) and stores; and
- Network asset site expenses and leases.

9.3 Assumptions for Preparing Expenditure Forecasts

While the 10 year expenditure forecasts have been prepared based on the best information at Vector's disposal, it should be noted gas distribution businesses in New Zealand are still experiencing a period of significant economic volatility. Factors that may materially influence investments levels going forward include:

- Economic cycles and the impact of these on gas demand. GDP figures published by Statistics NZ over the past three years ending June 2012 show three recent years of moderate to low growth (2.0%, 1.5% and 0.7% for the years ending June 2012, 2011 and 2010) following a year of negative growth (-1.8% for the year ending June 2009). Other economic indicators such as consumer and business confidence, unemployment rate and housing construction are also pointing towards a cautious recovery. During the same period, gas delivered through the Vector network recorded growth rates[4] of 4.1%, -0.4% and -1.8%, respectively. Overseas, various economies are facing uncertainties caused by state debt burden, the fading effect of economic stimulus packages and low consumer confidence leading to low rates of job creation and economy activities. Despite the early signs of increased economic activities in the United States, the protracted downturn in Europe is affecting the economic growth in China and Australia, New Zealand's top trading partners. The impact of this on New Zealand's export earnings and therefore the state of its economy is still uncertain;
- On the local front, the Government has brought forward a number of roading and infrastructure projects around the North Island. The increased level in roading and infrastructure activities by local and central government agencies caused a corresponding increase in asset relocation requirements. These projects have been included in the latest expenditure forecast;
- Building consent statistics published by Statistics New Zealand show that the number of building consents approvals dropped significantly since 2007/08 and has never recovered over the past three years. The impact of this low level of building activities is that growth in residential gas connection is expected to be slow in the next year or two. Depending on the manner in which Auckland's unitary plan is adopted, this rate may pick up materially. The situation is being monitored.
- The rebuilding of Christchurch and the Government's infrastructure programme (such as the Ultra Fast Broadband project) is likely to put significant pressure on construction resources both in terms of availability of the required skills and costs of construction. Ultra Fast Broadband roll-out is also adding network operating costs through increased interference and strikes of the gas network;
- The Part 4 regulation can impact on both the opex and capex. The requirement to meet the regulated service quality standards can impact on the required opex and capex levels. The Commerce Commission's operation of Part 4 can also impact on the ability and incentives to innovate and to invest, including in replacement, upgraded, and new assets; and to improve efficiency and provide services at a quality that reflects consumer demands; and
- It is also not clear whether the regulatory regime and/or customer expectations will support investment in capacity, security and quality improvements or energy efficiency. The quality requirements for gas distribution businesses focus only on the time to attend to emergencies rather than supply quality improvements under normal operation.

In addition to those discussed above, Vector has also observed other factors that have historically caused major variations between forecast and actual expenditure:

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[4] Figures based on Vector's information disclosure.

- While long term customer connection numbers have been relatively stable, annual figures can vary significantly. This is driven by factors outside Vector's control;
- Gas demand, which is a prime driver for network investment, is closely linked to residential customer behavior (which is sensitive to the weather), commercial and industrial customer consumption and new connection numbers which are related to economic conditions;
- The timing of large customer and relocation projects is very uncertain, and Vector often experiences significant discrepancies between previously requested timelines, which drives the AMP cost estimates, and actual construction periods; and
- Vector is continually improving the manner in which it collects, store and analyse asset information data. As better and more information become available, this sometimes identifies a need for accelerated (or decelerated) asset renewal.

9.4 Prioritisation of Expenditure

Section 2 of this AMP explains the relationship between Vector's goals and strategies, its asset management and investment strategies and policies and how these are used to guide the capital and maintenance works programme.

Section 5 of this AMP details the planning policies and standards, industry information, load growth assumptions, asset capacities, network operations information and network data required for the preparation of a ten year network development plan. A ten year expenditure projection on customer and growth works programme has been prepared, based on the network development plan. An asset relocation programme is also identified based on information available from roading and local authorities.

Section 6 of this AMP details the asset inspection, maintenance, replacement and refurbishment policies and standards. A replacement and refurbishment programme has been prepared for each asset category, based on these policies and standards and taking into account the information on asset age and condition and unit rates (material and labour). Following from this works programme, a ten year capital and operating expenditure projection on maintenance and replacement has been prepared.

An expenditure prioritisation process has been developed in line with Vector's strategies and goals to ensure those projects of the highest importance and with the highest cost-benefit are implemented. A four band prioritisation matrix[5] has been developed to rank all projects identified in Section 5 and Section 6, as illustrated in Table 9-7 below. The four priority bands are:

1. Vital investments;
2. Critical investments;
3. Essential investments; and
4. Beneficial investments.

The prioritisation process involves assigning a priority band to each of the value drivers for each project based on an understanding of the purpose, value and risk of the project. The value drivers[6] as illustrated in Table 9-7 are:

- Health, safety and environmental;
- Security and capacity;
- Customer connections;

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[5] This prioritisation matrix is used for Vector's Electricity Business and Gas Distribution Business.

[6] The value drivers are not listed in any order of priority.

- Network reliability and asset performance;
- Brand and reputation;
- Legal compliance;
- Financial performance; and
- Operational performance improvement.

The highest priority band will be chosen as the score for the project. The projects are then ranked according to the scores, with a ranking of one being the highest priority. Projects and programmes with a ranking of 1 to 3 are selected as the main expenditure forecast (refer to Table 9-7).

Rank	Security & Capacity	Customer Connections	Network Reliability & Asset Performance	Brand & Reputation	Legal Compliance	Health, Safety & Environment	Financial Performance	Operational Performance Improvement
1. Vital investments	Mitigate capacity breach leading to asset damage Mitigate capacity breach to widespread or critical areas	Mitigate capacity breach to critical customer	Reactive replacement of critical assets	Avoid potentially serious reputation damage	Avoid serious breach of technical regulations Avoid serious breach of HSE or environmental legislation	Mitigate imminent serious HSE or environmental threats	Mitigate extreme and very high risks	Mitigate critical cyber security breach
2. Critical investments	Mitigate security breach to widespread or critical areas Mitigate capacity breach	Satisfy contractual obligations (critical customers) New connections and capacity increase (critical customers)	Replacement of severely deteriorated assets with high risk and high consequence of failure Reactive replacement of assets required for network operation	Avoid potential reputation damage	Regulatory compliance (including Industry Participation Code, environmental, HSE, etc) Asset relocation as required by statute	Mitigate anticipated serious environmental or HSE threats	Mitigate high impact direct risks	Mitigate serious cyber security breach
3. Essential investments		Customer capacity and security requests Customer funded projects	Replacement of rapidly deteriorating assets or assets at the end of technical life with increased risk of failure. High consequence of failure Medium term mitigation against natural disasters Reliability improvements (to widespread or critical areas)		Regulatory improvement Mitigate breach of technical regulations (pressure, etc) in localised areas	Medium term safety & environmental improvement	Assets costing more to maintain and operate than to replace	Technology trials. Enhance operational efficiency Asset relocation required by requiring authorities

Rank	Security & Capacity	Customer Connections	Network Reliability & Asset Performance	Brand & Reputation	Legal Compliance	Health, Safety & Environment	Financial Performance	Operational Performance Improvement
4. Beneficial investments			Asset condition deteriorating gradually with increased risk of failure Steady state asset replacement programmes. Reliability improvements.			Long term safety & environmental improvement	Safeguard future options Discretionary initiatives that are NPV>0.	Asset relocation requested by consumers and land owners Enhance supply quality. Improve asset management and operational practices.

Table 9-7: Asset investment Prioritisation matrix

9.5 Price Escalation Factors

Vector is required under Clause 2.6 of the Gas Distribution Information Disclosure Determination 2012 to disclose its Forecast Capital and Operational Expenditure as set out in Schedules 11a and 11b. Schedules 11a and 11b require the expenditure forecasts to be presented in both constant price and nominal terms.

Clause 3.9 of the Attachment A of the Gas Distribution Information Disclosure Determination 2012 requires the assumptions used in the price inflator to be recorded in the AMP. Table 9-8 below shows the price inflation factors used to convert constant price forecasts to nominal forecasts.

Inflation Factor	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23
Inflation Factor	0.3%	3.4%	2.7%	3.4%	3.1%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%

Table 9-8: Inflation factors

Gas Distribution Asset Management Plan 2013 – 2023

Appendices

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Gas Distribution Asset Management Plan 2013 – 2023

Appendix 1

Schedule 11a: Report on Forecast Capital Expenditure

Company Name	**Vector**
AMP Planning Period	**1 July 2013 – 30 June 2023**

SCHEDULE 11a: REPORT ON FORECAST CAPITAL EXPENDITURE

This schedule requires a breakdown of forecast expenditure on assets for the current disclosure year and a 10 year planning period. The forecasts should be consistent with the supporting information set out in the AMP. The forecast is to be expressed in both constant price and nominal dollar terms. Also required is a forecast of the value of commissioned assets (i.e., the value of RAB additions)
GDBs must provide explanatory comment on the difference between constant price and nominal dollar forecasts of expenditure on assets in Schedule 14a (Mandatory Explanatory Notes).
This information is not part of audited disclosure information.

sch ref														
7				*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
8			for year ended	**30 Jun 13**	**30 Jun 14**	**30 Jun 15**	**30 Jun 16**	**30 Jun 17**	**30 Jun 18**	**30 Jun 19**	**30 Jun 20**	**30 Jun 21**	**30 Jun 22**	**30 Jun 23**
9		**11a(i): Expenditure on Assets Forecast**		**$000 (nominal dollars)**										
10		Consumer connection		10,322	10,446	11,021	11,097	11,427	11,712	12,005	12,270	12,577	12,834	13,155
11		System growth		649	3,689	5,391	3,572	3,421	3,942	6,505	10,027	8,697	8,084	4,231
12		Asset replacement and renewal		9,933	12,858	4,326	1,677	1,685	1,325	1,243	1,274	1,276	1,308	1,341
13		Asset relocations		1,215	4,006	4,112	3,184	2,585	2,747	4,022	4,123	3,928	4,026	4,127
14		Reliability, safety and environment:												
15		Quality of supply		425	613	775	444	139	134	289	141	96	377	101
16		Legislative and regulatory		-	-	-	-	-	-	-	-	-	-	-
17		Other reliability, safety and environment		20	-	-	-	-	-	-	-	-	-	-
18		**Total reliability, safety and environment**		445	613	775	444	139	134	289	141	96	377	101
19		**Expenditure on network assets**		22,564	31,612	25,625	19,974	19,257	19,860	24,064	27,835	26,574	26,629	22,955
20		Non-network assets		1,693	1,708	1,960	1,872	1,786	1,459	1,546	1,599	1,624	1,544	1,583
21		**Expenditure on assets**		24,257	33,320	27,585	21,846	21,043	21,319	25,610	29,434	28,198	28,173	24,538
22														
	plus	Cost of financing		48	192	184	137	124	129	179	220	203	200	158
24	*less*	Value of capital contributions		3,253	4,501	4,662	4,065	3,721	3,877	4,778	4,892	4,819	4,928	5,051
25	*plus*	Value of vested assets		-	-	-	-	-	-	-	-	-	-	-
26		**Capital expenditure forecast**		21,052	29,011	23,107	17,918	17,446	17,571	21,011	24,762	23,582	23,445	19,645
27														
28		Value of commissioned assets		23,423	29,011	23,107	17,918	17,446	17,571	21,011	24,762	23,582	23,445	19,645
29														
30				*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
31			for year ended	**30 Jun 13**	**30 Jun 14**	**30 Jun 15**	**30 Jun 16**	**30 Jun 17**	**30 Jun 18**	**30 Jun 19**	**30 Jun 20**	**30 Jun 21**	**30 Jun 22**	**30 Jun 23**
32				**$000 (in constant prices)**										
33		Consumer connection		10,322	10,105	10,382	10,105	10,095	10,095	10,095	10,067	10,067	10,022	10,022
34		System growth		649	3,569	5,078	3,253	3,023	3,398	5,470	8,226	6,961	6,312	3,223
35		Asset replacement and renewal		9,933	12,438	4,075	1,527	1,488	1,140	1,046	1,046	1,021	1,021	1,021
36		Asset relocations		1,215	3,876	3,873	2,899	2,284	2,368	3,382	3,382	3,144	3,144	3,144
37		Reliability, safety and environment:												
38		Quality of supply		425	593	730	404	122	115	243	115	77	295	77
39		Legislative and regulatory		-	-	-	-	-	-	-	-	-	-	-
40		Other reliability, safety and environment		20	-	-	-	-	-	-	-	-	-	-
41		**Total reliability, safety and environment**		445	593	730	404	122	115	243	115	77	295	77
42		**Expenditure on network assets**		22,564	30,581	24,138	18,188	17,012	17,116	20,236	22,836	21,270	20,794	17,487
43		Non-network assets		1,693	1,652	1,846	1,705	1,578	1,258	1,300	1,312	1,300	1,206	1,206
44		**Expenditure on assets**		24,257	32,233	25,984	19,893	18,590	18,374	21,536	24,148	22,570	22,000	18,693
45		**Subcomponents of expenditure on assets (where known)**												
46		Research and development		-	-	-	-	-	-	-	-	-	-	-
47														

		Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5	CY+6	CY+7	CY+8	CY+9	CY+10
49	for year ended	**30 Jun 13**	**30 Jun 14**	**30 Jun 15**	**30 Jun 16**	**30 Jun 17**	**30 Jun 18**	**30 Jun 19**	**30 Jun 20**	**30 Jun 21**	**30 Jun 22**	**30 Jun 23**
50	**Difference between nominal and constant price forecasts**	**$000**										
51	Consumer connection	-	341	639	992	1,332	1,617	1,910	2,203	2,510	2,812	3,133
52	System growth	-	120	313	319	398	544	1,035	1,801	1,736	1,772	1,008
53	Asset replacement and renewal	-	420	251	150	197	185	197	228	255	287	320
54	Asset relocations	-	130	239	285	301	379	640	741	784	882	983
55	Reliability, safety and environment:											
56	Quality of supply	-	20	45	40	17	19	46	26	19	82	24
57	Legislative and regulatory	-	-	-	-	-	-	-	-	-	-	-
58	Other reliability, safety and environment	-	-	-	-	-	-	-	-	-	-	-
59	**Total reliability, safety and environment**	-	20	45	40	17	19	46	26	19	82	24
60	**Expenditure on network assets**	-	1,031	1,487	1,786	2,245	2,744	3,828	4,999	5,304	5,835	5,468
61	Non-network assets	-	56	114	167	208	201	246	287	324	338	377
62	**Expenditure on assets**	-	1,087	1,601	1,953	2,453	2,945	4,074	5,286	5,628	6,173	5,845

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11a(ii): Consumer Connection

		Current Year CY	CY+1	CY+2	CY+3	CY+4	CY+5
72	for year ended	**30 Jun 13**	**30 Jun 14**	**30 Jun 15**	**30 Jun 16**	**30 Jun 17**	**30 Jun 18**
73	*Consumer types defined by GDB**	**$000 (in constant prices)**					
74	Mains Extensions/Subdivsions	3,994	4,158	4,435	4,158	4,158	4,158
75	Service Connections - Residential	5,288	5,193	5,193	5,193	5,183	5,183
76	Service Connections - Commercial	1,037	696	696	696	696	696
77	Customer Easements	3	58	58	58	58	58
78		-	-	-	-	-	-
79	** include additional rows if needed*						
80	**Consumer connection expenditure**	10,322	10,105	10,382	10,105	10,095	10,095
81	*less* Capital contributions funding consumer connection	1,798	1,766	1,793	1,766	1,764	1,764
82	**Consumer connection less capital contributions**	8,524	8,339	8,589	8,339	8,331	8,331

11a(iii): System Growth

84	**Intermediate pressure**						
85	Main pipe	9	1,435	2,467	543	191	1,573
86	Service pipe	-	-	-	-	-	-
87	Stations	338	1,067	1,145	1,060	1,129	495
88	Line valve	-	-	-	-	-	-
89	Special crossings	-	96	-	-	-	16
90	**Intermediate Pressure total**	347	2,598	3,612	1,603	1,320	2,084
91	**Medium pressure**						
92	Main pipe	216	856	1,351	1,523	1,444	952
93	Service pipe	-	-	-	12	-	-
94	Stations	68	-	-	-	144	247
95	Line valve	-	-	-	-	-	-
96	Special crossings	-	-	-	-	-	-
97	**Medium Pressure total**	284	856	1,351	1,535	1,588	1,199
98	**Low Pressure**						
99	Main pipe	-	-	-	-	-	-
100	Service pipe	-	-	-	-	-	-
101	Line valve	-	-	-	-	-	-
102	Special crossings	-	-	-	-	-	-
103	**Low Pressure total**	-	-	-	-	-	-
104	**Other assets**						
105	Monitoring and control systems	18	115	115	115	115	115
106	Cathodic protection systems	-	-	-	-	-	-
107	Other assets (other than above)	-	-	-	-	-	-
108	**Other total**	18	115	115	115	115	115

109							
110	**System growth expenditure**	649	3,569	5,078	3,253	3,023	3,398
111	*less* Capital contributions funding system growth	-	-	-	-	-	-
112	**System growth less capital contributions**	649	3,569	5,078	3,253	3,023	3,398

120							
121	for year ended	*Current Year CY* **30 Jun 13**	*CY+1* **30 Jun 14**	*CY+2* **30 Jun 15**	*CY+3* **30 Jun 16**	*CY+4* **30 Jun 17**	*CY+5* **30 Jun 18**

122 11a(iv): Asset Replacement and Renewal

123	**Intermediate pressure**	**$000 (in constant prices)**					
124	Main pipe	306	1,060	10	10	10	10
125	Service pipe	-	-	-	-	-	-
126	Stations	672	903	607	675	636	385
127	Line valve	10	-	-	-	-	-
128	Special crossings	-	96	96	96	96	96
129	**Intermediate Pressure total**	988	2,059	713	781	742	491
130	**Medium pressure**						
131	Main pipe	2,975	2,930	752	366	366	366
132	Service pipe	29	1,040	72	-	-	-
133	Station	146	48	145	48	48	48
134	Line valve	264	204	156	96	96	96
135	Special crossings	43	-	-	-	-	-
136	**Medium Pressure total**	3,457	4,222	1,125	510	510	510
137	**Low Pressure**						
138	Main pipe	3,347	2,991	1,062	-	-	-
139	Service pipe	1,318	2,145	496	-	-	-
140	Line valve	-	-	-	-	-	-
141	Special crossings	-	-	-	-	-	-
142	**Low Pressure total**	4,665	5,136	1,558	-	-	-
143	**Other assets**						
144	Monitoring and control systems	30	24	24	24	24	24
145	Cathodic protection systems	788	708	636	193	193	96
	Other assets (other than above)	5	289	19	19	19	19
147	**Other total**	823	1,021	679	236	236	139
148							
149	**Asset replacement and renewal expenditure**	9,933	12,438	4,075	1,527	1,488	1,140
150	*less* Capital contributions funding asset replacement and renewal	-	-	-	-	-	-
151	**Asset replacement and renewal less capital contributions**	9,933	12,438	4,075	1,527	1,488	1,140
152							

153 11a(v): Asset Relocations

154	*Project or programme**						
155		-	-	-	-	-	-
156		-	-	-	-	-	-
157		-	-	-	-	-	-
158		-	-	-	-	-	-
159		-	-	-	-	-	-
160	** include additional rows if needed*						
161	All other asset relocations projects or programmes	1,215	3,876	3,873	2,899	2,284	2,368
162	**Asset relocations expenditure**	1,215	3,876	3,873	2,899	2,284	2,368
163	*less* Capital contributions funding asset relocations	1,455	2,588	2,598	1,935	1,523	1,578
164	**Asset relocations less capital contributions**	(240)	1,288	1,275	964	761	790

172			*Current Year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
173		for year ended	**30 Jun 13**	**30 Jun 14**	**30 Jun 15**	**30 Jun 16**	**30 Jun 17**	**30 Jun 18**

173 11a(vi): Quality of Supply

174								
175		*Project or programme**	**$000 (in constant prices)**					
176			-	-	-	-	-	-
177			-	-	-	-	-	-
178			-	-	-	-	-	-
179			-	-	-	-	-	-
180			-	-	-	-	-	-
181		** include additional rows if needed*						
182		All other quality of supply projects or programmes	425	593	730	404	122	115
183		**Quality of supply expenditure**	425	593	730	404	122	115
184	*less*	Capital contributions funding quality of supply	-	-	-	-	-	-
185		**Quality of supply less capital contributions**	425	593	730	404	122	115
186								

187 11a(vii): Legislative and Regulatory

188		*Project or programme*						
189			-	-	-	-	-	-
190			-	-	-	-	-	-
191			-	-	-	-	-	-
192			-	-	-	-	-	-
193			-	-	-	-	-	-
194		** include additional rows if needed*						
195		All other legislative and regulatory projects or programmes	-	-	-	-	-	-
196		**Legislative and regulatory expenditure**	-	-	-	-	-	-
197	*less*	Capital contributions funding legislative and regulatory	-	-	-	-	-	-
198		**Legislative and regulatory less capital contributions**	-	-	-	-	-	-

199 11a(viii): Other Reliability, Safety and Environment

200		*Project or programme**						
201			-	-	-	-	-	-
202			-	-	-	-	-	-
203			-	-	-	-	-	-
204			-	-	-	-	-	-
205			-	-	-	-	-	-
206		** include additional rows if needed*						
207		All other reliability, safety and environment projects or programmes	20	-	-	-	-	-
208		**Other reliability, safety and environment expenditure**	20	-	-	-	-	-
209	*less*	Capital contributions funding other reliability, safety and environment	-	-	-	-	-	-
210		**Other Reliability, safety and environment less capital contributions**	20	-	-	-	-	-

211 11a(ix): Non-Network Assets

212 Routine expenditure

213		*Project or programme**						
214			-	-	-	-	-	-
215			-	-	-	-	-	-
216			-	-	-	-	-	-
217			-	-	-	-	-	-
218			-	-	-	-	-	-
219		** include additional rows if needed*						
220		All other routine expenditure projects or programmes	-	-	-	-	-	-
221		**Routine expenditure**	-	-	-	-	-	-

222	**Atypical expenditure**						
223	*Project or programme**						
224		-	-	-	-	-	-
225		-	-	-	-	-	-
226		-	-	-	-	-	-
227		-	-	-	-	-	-
228		-	-	-	-	-	-
229	** include additional rows if needed*						
230	All other atypical expenditure projects or programmes	1,693	1,652	1,846	1,705	1,578	1,258
231	**Atypical expenditure**	1,693	1,652	1,846	1,705	1,578	1,258
232							
233	**Non-network assets expenditure**	1,693	1,652	1,846	1,705	1,578	1,258

Schedule 11a Explanatory Notes

The box below provides commentary specific to the difference between nominal and constant price capital expenditure forecasts. It is provided in the same format as required for Box 1, Schedule 14a of the Gas Distribution Information Disclosures, which will be fully disclosed within 6 months of the end of the disclosure year.

Commentary on difference between nominal and constant price capital expenditure forecasts

Vector has used the NZIER (New Zealand Institute of Economic Research) June 2013 PPI (Producer Price Index-outputs) forecast from 2013 to 2017. Thereafter we have assumed a long-term inflation rate of 2.5%. The constant price capital expenditure forecast is then inflated by the above mentioned PPI forecast to nominal price capital expenditure forecasts.

Additional explanatory notes pertaining to Schedule 11a are provided in the box below, in the format required for Schedule 15 of the Gas Distribution Information Disclosures:

Additional explanatory comment on disclosed information

Although a substantial proportion of Vector's annual expenditure is to address safety, reliability, regulatory, legislative, quality and environmental aspects, these aspects are not costed separately in projects with multiple business drivers. For projects of this nature, this expenditure is therefore rolled-up into other capex categories such as Asset Replacement and Renewal.

Gas Distribution Asset Management Plan 2013 – 2023

Appendix 2

Schedule 11b: Report on Forecast Operational Expenditure

Company Name **Vector**
AMP Planning Period **1 July 2013 – 30 June 2023**

SCHEDULE 11b: REPORT ON FORECAST OPERATIONAL EXPENDITURE

This schedule requires a breakdown of forecast operational expenditure for the disclosure year and a 10 year planning period. The forecasts should be consistent with the supporting information set out in the AMP. The forecast is to be expressed in both constant price and nominal dollar terms.
GDBs must provide explanatory comment on the difference between constant price and nominal dollar operational expenditure forecasts in Schedule 14a (Mandatory Explanatory Notes).
This information is not part of audited disclosure information.

sch ref													
7			*Current year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
8		for year ended	**30 Jun 13**	**30 Jun 14**	**30 Jun 15**	**30 Jun 16**	**30 Jun 17**	**30 Jun 18**	**30 Jun 19**	**30 Jun 20**	**30 Jun 21**	**30 Jun 22**	**30 Jun 23**
9	**Operational Expenditure Forecast**		**$000 (in nominal dollars)**										
10	Service interruptions, incidents and emergencies		4,217	4,149	4,261	4,408	4,543	4,657	4,773	4,892	5,015	5,140	5,269
11	Routine and corrective maintenance and inspection		3,727	4,704	4,843	5,057	5,144	5,359	5,497	5,668	5,845	6,027	6,216
12	Asset replacement and renewal		-	-	-	-	-	-	-	-	-	-	-
13	**Network opex**		7,944	8,853	9,104	9,465	9,687	10,016	10,270	10,560	10,860	11,167	11,485
14	System operations and network support		3,422	4,146	4,582	4,719	4,864	4,985	5,110	5,238	5,369	5,503	5,640
15	Business support		7,011	8,210	9,080	9,392	9,680	9,922	10,171	10,425	10,685	10,953	11,226
16	**Non-network opex**		10,433	12,356	13,662	14,111	14,544	14,907	15,281	15,663	16,054	16,456	16,866
17	**Operational expenditure**		18,377	21,209	22,766	23,576	24,231	24,923	25,551	26,223	26,914	27,623	28,351
18			*Current year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
19		for year ended	**30 Jun 13**	**30 Jun 14**	**30 Jun 15**	**30 Jun 16**	**30 Jun 17**	**30 Jun 18**	**30 Jun 19**	**30 Jun 20**	**30 Jun 21**	**30 Jun 22**	**30 Jun 23**
20			**$000 (in constant prices)**										
21	Service interruptions, incidents and emergencies		4,217	4,014	4,014	4,014	4,014	4,014	4,014	4,014	4,014	4,014	4,014
22	Routine and corrective maintenance and inspection		3,727	4,550	4,562	4,605	4,544	4,619	4,622	4,650	4,678	4,707	4,735
23	Asset replacement and renewal		-	-	-	-	-	-	-	-	-	-	-
24	**Network opex**		7,944	8,564	8,576	8,619	8,558	8,633	8,636	8,664	8,692	8,721	8,749
25	System operations and network support		3,422	4,011	4,316	4,297	4,297	4,297	4,297	4,297	4,297	4,297	4,297
26	Business support		7,011	7,942	8,553	8,553	8,553	8,553	8,553	8,553	8,553	8,553	8,553
27	**Non-network opex**		10,433	11,953	12,869	12,850	12,850	12,850	12,850	12,850	12,850	12,850	12,850
28	**Operational expenditure**		18,377	20,517	21,445	21,469	21,408	21,483	21,486	21,514	21,542	21,571	21,599
29	**Subcomponents of operational expenditure (where known)**												
30	Research and development		-	-	-	-	-	-	-	-	-	-	-
	Insurance		228	239	254	263	265	265	265	265	265	265	265
32													
33			*Current year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*	*CY+6*	*CY+7*	*CY+8*	*CY+9*	*CY+10*
34		for year ended	**30 Jun 13**	**30 Jun 14**	**30 Jun 15**	**30 Jun 16**	**30 Jun 17**	**30 Jun 18**	**30 Jun 19**	**30 Jun 20**	**30 Jun 21**	**30 Jun 22**	**30 Jun 23**
35	**Difference between nominal and real forecasts**		**$000**										
36	Service interruptions, incidents and emergencies		-	135	247	394	529	643	759	878	1,001	1,126	1,255
37	Routine and corrective maintenance and inspection		-	154	281	452	600	740	875	1,018	1,167	1,320	1,481
38	Asset replacement and renewal		-	-	-	-	-	-	-	-	-	-	-
39	**Network opex**		-	289	528	846	1,129	1,383	1,634	1,896	2,168	2,446	2,736
40	System operations and network support		-	135	266	422	567	688	813	941	1,072	1,206	1,343
41	Business support		-	268	527	839	1,127	1,369	1,618	1,872	2,132	2,400	2,673
42	**Non-network opex**		-	403	793	1,261	1,694	2,057	2,431	2,813	3,204	3,606	4,016
43	**Operational expenditure**		-	692	1,321	2,107	2,823	3,440	4,065	4,709	5,372	6,052	6,752

Schedule 11b Explanatory Notes

The box below provides commentary specific to the difference between nominal and constant price operational expenditure forecasts. It is provided in the same format as required for Box 2, Schedule 14a of the Gas Distribution Information Disclosures, which will be fully disclosed within 6 months of the end of the disclosure year.

Commentary on difference between nominal and constant price operational expenditure forecasts

Vector has used the NZIER (New Zealand Institute of Economic Research) June 2013 PPI (Producer Price Index-outputs) forecast from 2013 to 2017. Thereafter we have assumed a long-term inflation rate of 2.5%. The constant price operational expenditure forecast is then inflated by the above mentioned PPI forecast to nominal price operational expenditure forecasts.

Additional explanatory notes pertaining to Schedule 11b are provided in the box below, in the format required for Schedule 15 of the Gas Distribution Information Disclosures:

Additional explanatory comment on disclosed information

Insurance costs (row 31 of Schedule 11b) have been presented in nominal dollars. Although the Schedule requests these values in constant price terms, our insurance broker has advised that this is not possible, as no standard inflation index such as CPI is appropriate for use in the insurance industry. Insurance costs in constant price terms can therefore not be credibly forecast.

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Appendix 3

Schedule 12a: Report on Asset Condition

Company Name **Vector**

AMP Planning Period **1 July 2013 – 30 June 2023**

SCHEDULE 12a: REPORT ON ASSET CONDITION

This schedule requires a breakdown of asset condition by asset class as at the start of the forecast year. The data accuracy assessment relates to the percentage values disclosed in the asset condition columns. Also required is a forecast of the percentage of units to be replaced in the next 5 years. All information should be consistent with the information provided in the AMP and the expenditure on assets forecast in Schedule 11a.

sch ref											
7					**Asset condition at start of planning period (percentage of units by grade)**						
8	**Operating Pressure**	**Asset category**	**Asset class**	**Units**	**Grade 1**	**Grade 2**	**Grade 3**	**Grade 4**	**Grade unknown**	**Data accuracy (1–4)**	**% of asset forecast to be replaced in next 5 years**
9	Intermediate Pressure	Main pipe	IP PE main pipe	km	-	-	-	-	-	4	-
10	Intermediate Pressure	Main pipe	IP steel main pipe	km	-	-	-	100.00%	-	3	-
11	Intermediate Pressure	Main pipe	IP other main pipe	km	-	-	-	-	-	4	-
12	Intermediate Pressure	Service pipe	IP PE service pipe	km	-	-	-	-	-	4	-
13	Intermediate Pressure	Service pipe	IP steel service pipe	km	-	-	81.31%	18.69%	-	3	-
14	Intermediate Pressure	Service pipe	IP other service pipe	km	-	-	-	-	-	4	-
15	Intermediate Pressure	Stations	Intermediate pressure DRS	No.	1.04%	14.51%	50.26%	34.20%	-	4	14.36%
16	Intermediate Pressure	Line valve	IP line valves	No.	0.11%	2.66%	80.91%	0.44%	15.87%	3	0.10%
17	Intermediate Pressure	Special crossings	IP crossings	No.	-	13.64%	68.18%	15.91%	2.27%	3	0.40%
18	Medium Pressure	Main pipe	MP PE main pipe	km	-	-	-	100.00%	-	3	0.05%
19	Medium Pressure	Main pipe	MP steel main pipe	km	-	4.06%	36.67%	59.27%	-	3	4.06%
20	Medium Pressure	Main pipe	MP other main pipe	km	-	100.00%	-	-	-	3	-
21	Medium Pressure	Service pipe	MP PE service pipe	km	-	-	-	100.00%	-	3	0.22%
22	Medium Pressure	Service pipe	MP steel service pipe	km	-	36.65%	63.35%	-	-	3	4.19%
23	Medium Pressure	Service pipe	MP other service pipe	km	-	-	100.00%	-	-	3	-
24	Medium Pressure	Stations	Medium pressure DRS	No.	-	5.36%	58.93%	35.71%	-	4	1.96%
25	Medium Pressure	Line valve	MP line valves	No.	0.05%	0.94%	78.23%	0.58%	20.20%	3	0.10%
26	Medium Pressure	Special crossings	MP special crossings	No.	-	6.48%	75.00%	13.89%	4.63%	3	0.90%
27	Low Pressure	Main pipe	LP PE main pipe	km	-	-	-	100.00%	-	3	21.20%
28	Low Pressure	Main pipe	LP steel main pipe	km	-	100.00%	-	-	-	3	100.00%
29	Low Pressure	Main pipe	LP other main pipe	km	-	100.00%	-	-	-	3	100.00%
30	Low Pressure	Service pipe	LP PE service pipe	km	-	-	43.59%	56.41%	-	3	53.40%
31	Low Pressure	Service pipe	LP steel service pipe	km	-	100.00%	-	-	-	3	100.00%
32	Low Pressure	Service pipe	LP other service pipe	km	-	100.00%	-	-	-	3	100.00%
33	Low Pressure	Line valve	LP line valves	No.	-	-	45.83%	-	54.17%	3	-
34	Low Pressure	Special crossings	LP special crossings	No.	-	-	100.00%	-	-	3	-
35	All	Monitoring & control systems	Remote terminal units	No.	-	15.15%	77.27%	7.58%	-	3	-
36	All	Cathodic protection systems	Cathodic protection	No.	3.70%	20.37%	75.93%	-	-	4	10.85%

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Appendix 4

Schedule 12b: Report on Forecast Utilisation

Company Name **Vector**
AMP Planning Period **1 July 2013 – 30 June 2023**

SCHEDULE 12b: REPORT ON FORECAST UTILISATION

This Schedule requires a breakdown of current and forecast utilisation (for heavily utilised pipelines) consistent with the information provided in the AMP and the demand forecast in schedule S12c.

sch ref

Forecast Utilisation of Heavily Utilised Pipelines

sch ref	Region	Network	Pressure system	Nominal operating pressure (NOP) (kPa)	Minimum operating pressure (MinOP) (kPa)	Total capacity at MinOP (scmh)	Remaining capacity at MinOP (scmh)	Unit	Utilisation *Current Year CY* y/e 30 Jun 13	*CY+1* y/e 30 Jun 14	*CY+2* y/e 30 Jun 15	*CY+3* y/e 30 Jun 16	*CY+4* y/e 30 Jun 17	*CY+5* y/e 30 Jun 18	Comment
11	Auckland	Auckland Central	AU Auckland IP20	1,900	950	74,647	820	scmh	73,827	74,466	75,105	75,744	76,383	77,022	Remaining capacity at MinOP is available in East Tamaki area. Refer Note 4 for other explanatory information.
12								kPa	1,186	1,173	1,160	1,147	1,133	1,120	
13	Auckland	Auckland Central	AU North Shore MP4	400	200	14,920	104	scmh	14,816	14,964	15,114	15,265	15,418	15,572	Remaining capacity at MinOP is available in Devonport area. Refer Note 5 for other explanatory information.
14								kPa	236	233	229	225	220	216	
15	Auckland	Auckland Central	AU Central Auckland MP4	400	200	45,825	98	scmh	45,727	46,184	46,646	47,113	47,584	48,060	Remaining capacity at MinOP is available in South Titirangi area. System reinforcement is planned in 2015 and 2016. Refer to Notes 5, 8 and 10 for other explanatory information.
16								kPa	265	262	259	256	253	250	
17	Auckland	Auckland Central	AU East Auckland MP4	400	200	13,402	143	scmh	13,259	18,993	19,183	19,375	19,569	19,764	Remaining capacity at MinOP is available in Pakuranga East area. System reinforcement is planned to implement in 2014. Refer Notes 5, 9 and 10 for other explanatory information.
18								kPa	237	265	262	259	256	252	
19	Auckland	Auckland Central	AU Auckland Airport MP4	400	200	2,143	-	scmh	2,143	2,164	2,186	2,208	2,230	2,252	Remaining capacity at MinOP is nil. System reinforcement is planned in 2014 and 2018. Refer Notes 5 and 10 for other explanatory information.
20								kPa	129	211	206	201	196	207	
21	Auckland	Harrisville	HR Harrisville MP7	700	350	4,618	383	scmh	4,235	4,475	4,714	4,953	5,192	5,432	Remaining capacity at MinOP is available at Bombay east area. System reinforcement options will be investigated in 2014 (possible upgrade of gate station by Vector Transmission). Refer Notes 4 for other explanatory information.
22								kPa	425	410	394	376	357	337	
23	Waikato	Hamilton	HA Hamilton West MP4	400	200	3,080	28	scmh	3,052	3,110	3,169	3,229	3,291	3,353	Remaining capacity at MinOP is available in Nawton east area. Refer Note 6 for other explanatory information.
24								kPa	236	232	228	224	219	215	
25	Waikato	Hamilton	HA Pukete MP4	400	200	2,786	76	scmh	2,710	2,761	2,814	2,867	2,922	2,977	Remaining capacity at MinOP is available in Te Rapa east area. System reinforcement is planned in 2019. Refer Notes 6 and 10 for other explanatory information.
26								kPa	223	218	214	209	203	198	
27	Waikato	Waitoa	WT Waitoa MP4	400	200	1,702	-	scmh	1,702	1,702	1,746	1,792	1,838	1,886	Remaining capacity at MinOP is available nil. System reinforcement is planned in 2015. Refer Notes 7 and 10 for other explanatory information.
28								kPa	152	152	250	242	234	226	
	Gisborne	Gisborne	GS Gisborne IP20	1,900	950	3,597	315	scmh	3,282	3,307	3,333	3,358	3,384	3,409	Remaining capacity at MinOP is available at Matawhero south area. Refer Note 4 for other explanatory information.
								kPa	1,179	1,170	1,161	1,152	1,142	1,133	
29	Kapiti	Paraparaumu	PR Paraparaumu IP20	1,900	950	1,669	-	scmh	1,669	1,717	1,766	1,814	1,862	1,911	Remaining capacity at MinOP is nil. System reinforcement is planned in 2015. Refer Notes 4 and 10 for other explanatory information.
30								kPa	747	712	1,357	1,336	1,314	1,291	

* *Current year utilisation figures may be estimates. Year 1–5 figures show the utilisation forecast to occur given the expected system configuration for each year, including the effect of any new investment in the pressure system.*

Disclaimer for supply enquiries

The information in this table contains modelled estimates of utilisation and capacity. Any interested party seeking to invest in supply from Vector's distribution networks should contact their retailer and confirm availability of capacity.

Notes and assumptions

1. A heavily utilised pressure system is identified based on its estimated flow rate at system peak in 2013 greater than or equal to 500 scmh and its utilisation greater than or equal to 40%. The utilisation of a pressure system is obtained from the formula: [1 – (system minimum pressure/nominal operating pressure)] *100%.
2. Remaining capacity at MinOP in the current year is estimated based on the level at which the minimum operating pressure is reached. To provide an appropriate operational margin to account for variable consumption patterns, forecast errors and network operational problems, Vector's quality of supply standard sets the MinOP at 50% of the rated pressure (or 82% of the pipeline capacity) for a pressure system (based on standard operating pressures). By setting the MinOP of a pressure system and examining the modelled flows at various extremity points in the model, a minimum flow value among one of these points is selected to represent the remaining capacity at MinOP of the pressure system being studied.
3. A forecast model of a pressure system is obtained by applying either its forecast flow rate or an annual growth rate in each forecast year; and scaling its loads evenly to give the system total flow. The result of system minimum pressure is simulated on this basis.
4. Forecast system flow is populated from the respective network system as tabulated in Table 5.1 of Section 5 - Network Development Planning of Gas Distribution Asset Management Plan 2013 - 2023.
5. Forecast system flow is based on an annual growth rate of 1% for Central Auckland network system as tabulated in Table 5.1 of Section 5 - Network Development Planning of Gas Distribution Asset Management Plan 2013 - 2023.
6. Forecast system flow is based on an annual growth rate of 1.9 % for Hamilton network system as tabulated in Table 5.1 of Section 5 - Network Development Planning of Gas Distribution Asset Management Plan 2013 - 2023.
7. Forecast system flow is based on an annual growth rate of 2.6% for Waitoa network system as tabulated in Table 5.1 of Section 5 - Network Development Planning of Gas Distribution Asset Management Plan 2013 - 2023.
8. AU Central Auckand MP4, AU Onehunga MP4, AU Main Highway MP4, AU Station Road MP4, AU Station Road (19) MP4 pressure system will merge together after completion of LP pipeline programme in FY2014.
9. AU East Auckland MP4, Mangere MP4, AU Fairburn MP4 and AU Westfield MP4 pressure system will merge together after completion of LP pipeline replacement in FY2014.
10. Details of performance, capacity and system reinforcement are described in Section 5 - Network Development Planning of Gas Distribution Asset Management Plan 2013 - 2023.
11. The table would provide a snapshot in time of capacity at the date of its preparation, and the figures will change over time. It can therefore be used for consumer guidance only. In addition, the capacity limits included are for the most constrained part of each particular pressure system, and more capacity may be available at other points on the network. Consumers considering taking gas from a network and need an accurate assessment of capacity available at the required off-take point, will have to contact Vector. Vector will prepare a dedicated model that will provide an accurate assessment of available gas capacity at the date of the request.

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Appendix 5

Schedule 12c: Report on Forecast Demand

Company Name	**Vector**
AMP Planning Period	**1 July 2013 – 30 June 2023**

SCHEDULE 12c: REPORT ON FORECAST DEMAND

This schedule requires a forecast of new connections (by consumer type), peak demand and energy volumes for the disclosure year and a 5 year planning period. The forecasts should be consistent with the supporting information set out in the AMP as well as the assumptions used in developing the expenditure forecasts in Schedule 11a and Schedule 11b and the capacity and utilisation forecasts in Schedule 12b.

sch ref							
7	**12c(i) Consumer Connections**						
8	**Number of ICPs connected in year by consumer type**						
9		*Current year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
10		**30 Jun 13**	**30 Jun 14**	**30 Jun 15**	**30 Jun 16**	**30 Jun 17**	**30 Jun 18**
11	*Consumer types defined by GDB*						
12	Residential	3,136	3,090	3,090	3,090	3,086	3,086
13	Commercial	330	309	309	309	308	308
14							
15							
16							
17	**Total**	3,466	3,399	3,399	3,399	3,394	3,394
18							
19	**12c(ii): Gas Delivered**	*Current year CY*	*CY+1*	*CY+2*	*CY+3*	*CY+4*	*CY+5*
18		**30 Jun 13**	**30 Jun 14**	**30 Jun 15**	**30 Jun 16**	**30 Jun 17**	**30 Jun 18**
19	Number of ICPs at year end	156,908	159,527	162,146	164,765	167,379	169,993
20	Maximum daily load (GJ/day)	88,261	93,708	94,506	95,286	96,049	96,794
21	Maximum monthly load (GJ/month)	2,264,618	2,323,468	2,343,437	2,362,968	2,382,064	2,400,735
22	Number of directly billed ICPs (at year end)	1	1	1	1	1	1
23	Total gas conveyed (GJ/annum)	21,810,158	22,163,676	22,358,013	22,548,245	22,734,395	22,916,553
24	Average daily delivery (GJ/day)	59,591	60,722	61,255	61,776	62,116	62,785
25							
26	Maximum monthly amount of gas entering network (GJ/month)	2,264,618	2,323,468	2,343,437	2,362,968	2,382,064	2,400,735
27	Load factor	80.26%	79.49%	79.51%	79.52%	79.53%	79.55%

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Appendix 6

Schedule 13: Report on Asset Management Maturity

Company Name **Vector**
AMP Planning Period **1 July 2013 – 30 June 2023**
Asset Management Standard Applied

SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY

This schedule requires information on the GDB'S self-assessment of the maturity of its asset management practices.

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
3	Asset management policy	To what extent has an asset management policy been documented, authorised and communicated?	2			Widely used AM practice standards require an organisation to document, authorise and communicate its asset management policy (eg, as required in PAS 55 para 4.2 i). A key pre-requisite of any robust policy is that the organisation's top management must be seen to endorse and fully support it. Also vital to the effective implementation of the policy, is to tell the appropriate people of its content and their obligations under it. Where an organisation outsources some of its asset-related activities, then these people and their organisations must equally be made aware of the policy's content. Also, there may be other stakeholders, such as regulatory authorities and shareholders who should be made aware of it.	Top management. The management team that has overall responsibility for asset management.	The organisation's asset management policy, its organisational strategic plan, documents indicating how the asset management policy was based upon the needs of the organisation and evidence of communication.
10	Asset management strategy	What has the organisation done to ensure that its asset management strategy is consistent with other appropriate organisational policies and strategies, and the needs of stakeholders?	2			In setting an organisation's asset management strategy, it is important that it is consistent with any other policies and strategies that the organisation has and has taken into account the requirements of relevant stakeholders. This question examines to what extent the asset management strategy is consistent with other organisational policies and strategies (eg, as required by PAS 55 para 4.3.1 b) and has taken account of stakeholder requirements as required by PAS 55 para 4.3.1 c). Generally, this will take into account the same polices, strategies and stakeholder requirements as covered in drafting the asset management policy but at a greater level of detail.	Top management. The organisation's strategic planning team. The management team that has overall responsibility for asset management.	The organisation's asset management strategy document and other related organisational policies and strategies. Other than the organisation's strategic plan, these could include those relating to health and safety, environmental, etc. Results of stakeholder consultation.
11	Asset management strategy	In what way does the organisation's asset management strategy take account of the lifecycle of the assets, asset types and asset systems over which the organisation has stewardship?	2			Good asset stewardship is the hallmark of an organisation compliant with widely used AM standards. A key component of this is the need to take account of the lifecycle of the assets, asset types and asset systems. (For example, this requirement is recognised in 4.3.1 d) of PAS 55). This question explores what an organisation has done to take lifecycle into account in its asset management strategy.	Top management. People in the organisation with expert knowledge of the assets, asset types, asset systems and their associated life-cycles. The management team that has overall responsibility for asset management. Those responsible for developing and adopting methods and processes used in asset management	The organisation's documented asset management strategy and supporting working documents.
26	Asset management plan(s)	How does the organisation establish and document its asset management plan(s) across the life cycle activities of its assets and asset systems?	2			The asset management strategy need to be translated into practical plan(s) so that all parties know how the objectives will be achieved. The development of plan(s) will need to identify the specific tasks and activities required to optimize costs, risks and performance of the assets and/or asset system(s), when they are to be carried out and the resources required.	The management team with overall responsibility for the asset management system. Operations, maintenance and engineering managers.	The organisation's asset management plan(s).

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
3	Asset management policy	To what extent has an asset management policy been documented, authorised and communicated?	The organisation does not have a documented asset management policy.	The organisation has an asset management policy, but it has not been authorised by top management, or it is not influencing the management of the assets.	The organisation has an asset management policy, which has been authorised by top management, but it has had limited circulation. It may be in use to influence development of strategy and planning but its effect is limited.	The asset management policy is authorised by top management, is widely and effectively communicated to all relevant employees and stakeholders, and used to make these persons aware of their asset related obligations.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
10	Asset management strategy	What has the organisation done to ensure that its asset management strategy is consistent with other appropriate organisational policies and strategies, and the needs of stakeholders?	The organisation has not considered the need to ensure that its asset management strategy is appropriately aligned with the organisation's other organisational policies and strategies or with stakeholder requirements. OR The organisation does not have an asset management strategy.	The need to align the asset management strategy with other organisational policies and strategies as well as stakeholder requirements is understood and work has started to identify the linkages or to incorporate them in the drafting of asset management strategy.	Some of the linkages between the long-term asset management strategy and other organisational policies, strategies and stakeholder requirements are defined but the work is fairly well advanced but still incomplete.	All linkages are in place and evidence is available to demonstrate that, where appropriate, the organisation's asset management strategy is consistent with its other organisational policies and strategies. The organisation has also identified and considered the requirements of relevant stakeholders.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
11	Asset management strategy	In what way does the organisation's asset management strategy take account of the lifecycle of the assets, asset types and asset systems over which the organisation has stewardship?	The organisation has not considered the need to ensure that its asset management strategy is produced with due regard to the lifecycle of the assets, asset types or asset systems that it manages. OR The organisation does not have an asset management strategy.	The need is understood, and the organisation is drafting its asset management strategy to address the lifecycle of its assets, asset types and asset systems.	The long-term asset management strategy takes account of the lifecycle of some, but not all, of its assets, asset types and asset systems.	The asset management strategy takes account of the lifecycle of all of its assets, asset types and asset systems.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
26	Asset management plan(s)	How does the organisation establish and document its asset management plan(s) across the life cycle activities of its assets and asset systems?	The organisation does not have an identifiable asset management plan(s) covering asset systems and critical assets.	The organisation has asset management plan(s) but they are not aligned with the asset management strategy and objectives and do not take into consideration the full asset life cycle (including asset creation, acquisition, enhancement, utilisation, maintenance decommissioning and disposal).	The organisation is in the process of putting in place comprehensive, documented asset management plan(s) that cover all life cycle activities, clearly aligned to asset management objectives and the asset management strategy.	Asset management plan(s) are established, documented, implemented and maintained for asset systems and critical assets to achieve the asset management strategy and asset management objectives across all life cycle phases.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
27	Asset management plan(s)	How has the organisation communicated its plan(s) to all relevant parties to a level of detail appropriate to the receiver's role in their delivery?	2			Plans will be ineffective unless they are communicated to all those, including contracted suppliers and those who undertake enabling function(s). The plan(s) need to be communicated in a way that is relevant to those who need to use them.	The management team with overall responsibility for the asset management system. Delivery functions and suppliers.	Distribution lists for plan(s). Documents derived from plan(s) which detail the receivers role in plan delivery. Evidence of communication.
29	Asset management plan(s)	How are designated responsibilities for delivery of asset plan actions documented?	3			The implementation of asset management plan(s) relies on (1) actions being clearly identified, (2) an owner allocated and (3) that owner having sufficient delegated responsibility and authority to carry out the work required. It also requires alignment of actions across the organisation. This question explores how well the plan(s) set out responsibility for delivery of asset plan actions.	The management team with overall responsibility for the asset management system. Operations, maintenance and engineering managers. If appropriate, the performance management team.	The organisation's asset management plan(s). Documentation defining roles and responsibilities of individuals and organisational departments.
31	Asset management plan(s)	What has the organisation done to ensure that appropriate arrangements are made available for the efficient and cost effective implementation of the plan(s)? (Note this is about resources and enabling support)	3			It is essential that the plan(s) are realistic and can be implemented, which requires appropriate resources to be available and enabling mechanisms in place. This question explores how well this is achieved. The plan(s) not only need to consider the resources directly required and timescales, but also the enabling activities, including for example, training requirements, supply chain capability and procurement timescales.	The management team with overall responsibility for the asset management system. Operations, maintenance and engineering managers. If appropriate, the performance management team. If appropriate, the performance management team. Where appropriate the procurement team and service providers working on the organisation's asset-related activities.	The organisation's asset management plan(s). Documented processes and procedures for the delivery of the asset management plan.
33	Contingency planning	What plan(s) and procedure(s) does the organisation have for identifying and responding to incidents and emergency situations and ensuring continuity of critical asset management activities?	3			Widely used AM practice standards require that an organisation has plan(s) to identify and respond to emergency situations. Emergency plan(s) should outline the actions to be taken to respond to specified emergency situations and ensure continuity of critical asset management activities including the communication to, and involvement of, external agencies. This question assesses if, and how well, these plan(s) triggered, implemented and resolved in the event of an incident. The plan(s) should be appropriate to the level of risk as determined by the organisation's risk assessment methodology. It is also a requirement that relevant personnel are competent and trained.	The manager with responsibility for developing emergency plan(s). The organisation's risk assessment team. People with designated duties within the plan(s) and procedure(s) for dealing with incidents and emergency situations.	The organisation's plan(s) and procedure(s) for dealing with emergencies. The organisation's risk assessments and risk registers.

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Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
27	Asset management plan(s)	How has the organisation communicated its plan(s) to all relevant parties to a level of detail appropriate to the receiver's role in their delivery?	The organisation does not have plan(s) or their distribution is limited to the authors.	The plan(s) are communicated to some of those responsible for delivery of the plan(s). OR Communicated to those responsible for delivery is either irregular or ad-hoc.	The plan(s) are communicated to most of those responsible for delivery but there are weaknesses in identifying relevant parties resulting in incomplete or inappropriate communication. The organisation recognises improvement is needed as is working towards resolution.	The plan(s) are communicated to all relevant employees, stakeholders and contracted service providers to a level of detail appropriate to their participation or business interests in the delivery of the plan(s) and there is confirmation that they are being used effectively.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
29	Asset management plan(s)	How are designated responsibilities for delivery of asset plan actions documented?	The organisation has not documented responsibilities for delivery of asset plan actions.	Asset management plan(s) inconsistently document responsibilities for delivery of plan actions and activities and/or responsibilities and authorities for implementation inadequate and/or delegation level inadequate to ensure effective delivery and/or contain misalignments with organisational accountability.	Asset management plan(s) consistently document responsibilities for the delivery of actions but responsibility/authority levels are inappropriate/ inadequate, and/or there are misalignments within the organisation.	Asset management plan(s) consistently document responsibilities for the delivery actions and there is adequate detail to enable delivery of actions. Designated responsibility and authority for achievement of asset plan actions is appropriate.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
31	Asset management plan(s)	What has the organisation done to ensure that appropriate arrangements are made available for the efficient and cost effective implementation of the plan(s)? (Note this is about resources and enabling support)	The organisation has not considered the arrangements needed for the effective implementation of plan(s).	The organisation recognises the need to ensure appropriate arrangements are in place for implementation of asset management plan(s) and is in the process of determining an appropriate approach for achieving this.	The organisation has arrangements in place for the implementation of asset management plan(s) but the arrangements are not yet adequately efficient and/or effective. The organisation is working to resolve existing weaknesses.	The organisation's arrangements fully cover all the requirements for the efficient and cost effective implementation of asset management plan(s) and realistically address the resources and timescales required, and any changes needed to functional policies, standards, processes and the asset management information system.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
33	Contingency planning	What plan(s) and procedure(s) does the organisation have for identifying and responding to incidents and emergency situations and ensuring continuity of critical asset management activities?	The organisation has not considered the need to establish plan(s) and procedure(s) to identify and respond to incidents and emergency situations.	The organisation has some ad-hoc arrangements to deal with incidents and emergency situations, but these have been developed on a reactive basis in response to specific events that have occurred in the past.	Most credible incidents and emergency situations are identified. Either appropriate plan(s) and procedure(s) are incomplete for critical activities or they are inadequate. Training/ external alignment may be incomplete.	Appropriate emergency plan(s) and procedure(s) are in place to respond to credible incidents and manage continuity of critical asset management activities consistent with policies and asset management objectives. Training and external agency alignment is in place.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
37	Structure, authority and responsibilities	What has the organisation done to appoint member(s) of its management team to be responsible for ensuring that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s)?	3			In order to ensure that the organisation's assets and asset systems deliver the requirements of the asset management policy, strategy and objectives responsibilities need to be allocated to appropriate people who have the necessary authority to fulfil their responsibilities. (This question, relates to the organisation's assets eg, para b), s 4.4.1 of PAS 55, making it therefore distinct from the requirement contained in para a), s 4.4.1 of PAS 55).	Top management. People with management responsibility for the delivery of asset management policy, strategy, objectives and plan(s). People working on asset-related activities.	Evidence that managers with responsibility for the delivery of asset management policy, strategy, objectives and plan(s) have been appointed and have assumed their responsibilities. Evidence may include the organisation's documents relating to its asset management system, organisational charts, job descriptions of post-holders, annual targets/objectives and personal development plan(s) of post-holders as appropriate.
40	Structure, authority and responsibilities	What evidence can the organisation's top management provide to demonstrate that sufficient resources are available for asset management?	3			Optimal asset management requires top management to ensure sufficient resources are available. In this context the term 'resources' includes manpower, materials, funding and service provider support.	Top management. The management team that has overall responsibility for asset management. Risk management team. The organisation's managers involved in day-to-day supervision of asset-related activities, such as frontline managers, engineers, foremen and chargehands as appropriate.	Evidence demonstrating that asset management plan(s) and/or the process(es) for asset management plan implementation consider the provision of adequate resources in both the short and long term. Resources include funding, materials, equipment, services provided by third parties and personnel (internal and service providers) with appropriate skills competencies and knowledge.
42	Structure, authority and responsibilities	To what degree does the organisation's top management communicate the importance of meeting its asset management requirements?	3			Widely used AM practice standards require an organisation to communicate the importance of meeting its asset management requirements such that personnel fully understand, take ownership of, and are fully engaged in the delivery of the asset management requirements (eg, PAS 55 s 4.4.1 g).	Top management. The management team that has overall responsibility for asset management. People involved in the delivery of the asset management requirements.	Evidence of such activities as road shows, written bulletins, workshops, team talks and management walk-abouts would assist an organisation to demonstrate it is meeting this requirement of PAS 55.
45	Outsourcing of asset management activities	Where the organisation has outsourced some of its asset management activities, how has it ensured that appropriate controls are in place to ensure the compliant delivery of its organisational strategic plan, and its asset management policy and strategy?	2			Where an organisation chooses to outsource some of its asset management activities, the organisation must ensure that these outsourced process(es) are under appropriate control to ensure that all the requirements of widely used AM standards (eg, PAS 55) are in place, and the asset management policy, strategy objectives and plan(s) are delivered. This includes ensuring capabilities and resources across a time span aligned to life cycle management. The organisation must put arrangements in place to control the outsourced activities, whether it be to external providers or to other in-house departments. This question explores what the organisation does in this regard.	Top management. The management team that has overall responsibility for asset management. The manager(s) responsible for the monitoring and management of the outsourced activities. People involved with the procurement of outsourced activities. The people within the organisations that are performing the outsourced activities. The people impacted by the outsourced activity.	The organisation's arrangements that detail the compliance required of the outsourced activities. For example, this this could form part of a contract or service level agreement between the organisation and the suppliers of its outsourced activities. Evidence that the organisation has demonstrated to itself that it has assurance of compliance of outsourced activities.

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Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
37	Structure, authority and responsibilities	What has the organisation done to appoint member(s) of its management team to be responsible for ensuring that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s)?	Top management has not considered the need to appoint a person or persons to ensure that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s).	Top management understands the need to appoint a person or persons to ensure that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s).	Top management has appointed an appropriate people to ensure the assets deliver the requirements of the asset management strategy, objectives and plan(s) but their areas of responsibility are not fully defined and/or they have insufficient delegated authority to fully execute their responsibilities.	The appointed person or persons have full responsibility for ensuring that the organisation's assets deliver the requirements of the asset management strategy, objectives and plan(s). They have been given the necessary authority to achieve this.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
40	Structure, authority and responsibilities	What evidence can the organisation's top management provide to demonstrate that sufficient resources are available for asset management?	The organisation's top management has not considered the resources required to deliver asset management.	The organisations top management understands the need for sufficient resources but there are no effective mechanisms in place to ensure this is the case.	A process exists for determining what resources are required for its asset management activities and in most cases these are available but in some instances resources remain insufficient.	An effective process exists for determining the resources needed for asset management and sufficient resources are available. It can be demonstrated that resources are matched to asset management requirements.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
42	Structure, authority and responsibilities	To what degree does the organisation's top management communicate the importance of meeting its asset management requirements?	The organisation's top management has not considered the need to communicate the importance of meeting asset management requirements.	The organisations top management understands the need to communicate the importance of meeting its asset management requirements but does not do so.	Top management communicates the importance of meeting its asset management requirements but only to parts of the organisation.	Top management communicates the importance of meeting its asset management requirements to all relevant parts of the organisation.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
45	Outsourcing of asset management activities	Where the organisation has outsourced some of its asset management activities, how has it ensured that appropriate controls are in place to ensure the compliant delivery of its organisational strategic plan, and its asset management policy and strategy?	The organisation has not considered the need to put controls in place.	The organisation controls its outsourced activities on an ad-hoc basis, with little regard for ensuring for the compliant delivery of the organisational strategic plan and/or its asset management policy and strategy.	Controls systematically considered but currently only provide for the compliant delivery of some, but not all, aspects of the organisational strategic plan and/or its asset management policy and strategy. Gaps exist.	Evidence exists to demonstrate that outsourced activities are appropriately controlled to provide for the compliant delivery of the organisational strategic plan, asset management policy and strategy, and that these controls are integrated into the asset management system	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
48	Training, awareness and competence	How does the organisation develop plan(s) for the human resources required to undertake asset management activities - including the development and delivery of asset management strategy, process(es), objectives and plan(s)?	2			There is a need for an organisation to demonstrate that it has considered what resources are required to develop and implement its asset management system. There is also a need for the organisation to demonstrate that it has assessed what development plan(s) are required to provide its human resources with the skills and competencies to develop and implement its asset management systems. The timescales over which the plan(s) are relevant should be commensurate with the planning horizons within the asset management strategy considers e.g. if the asset management strategy considers 5, 10 and 15 year time scales then the human resources development plan(s) should align with these. Resources include both 'in house' and external resources who undertake asset	Senior management responsible for agreement of plan(s). Managers responsible for developing asset management strategy and plan(s). Managers with responsibility for development and recruitment of staff (including HR functions). Staff responsible for training. Procurement officers. Contracted service providers.	Evidence of analysis of future work load plan(s) in terms of human resources. Document(s) containing analysis of the organisation's own direct resources and contractors resource capability over suitable timescales. Evidence, such as minutes of meetings, that suitable management forums are monitoring human resource development plan(s). Training plan(s), personal development plan(s), contract and service level agreements.
49	Training, awareness and competence	How does the organisation identify competency requirements and then plan, provide and record the training necessary to achieve the competencies?	2			Widely used AM standards require that organisations to undertake a systematic identification of the asset management awareness and competencies required at each level and function within the organisation. Once identified the training required to provide the necessary competencies should be planned for delivery in a timely and systematic way. Any training provided must be recorded and maintained in a suitable format. Where an organisation has contracted service providers in place then it should have a means to demonstrate that this requirement is being met for their employees. (eg, PAS 55 refers to frameworks suitable for identifying competency requirements).	Senior management responsible for agreement of plan(s). Managers responsible for developing asset management strategy and plan(s). Managers with responsibility for development and recruitment of staff (including HR functions). Staff responsible for training. Procurement officers. Contracted service providers.	Evidence of an established and applied competency requirements assessment process and plan(s) in place to deliver the required training. Evidence that the training programme is part of a wider, co-ordinated asset management activities training and competency programme. Evidence that training activities are recorded and that records are readily available (for both direct and contracted service provider staff) e.g. via organisation wide information system or local records database.
50	Training, awareness and competence	How does the organization ensure that persons under its direct control undertaking asset management related activities have an appropriate level of competence in terms of education, training or experience?	3			A critical success factor for the effective development and implementation of an asset management system is the competence of persons undertaking these activities. organisations should have effective means in place for ensuring the competence of employees to carry out their designated asset management function(s). Where an organisation has contracted service providers undertaking elements of its asset management system then the organisation shall assure itself that the outsourced service provider also has suitable arrangements in place to manage the competencies of its employees. The organisation should ensure that the individual and corporate competencies it requires are in place and actively monitor, develop and maintain an appropriate balance of these competencies.	Managers, supervisors, persons responsible for developing training programmes. Staff responsible for procurement and service agreements. HR staff and those responsible for recruitment.	Evidence of a competency assessment framework that aligns with established frameworks such as the asset management Competencies Requirements Framework (Version 2.0); National Occupational Standards for Management and Leadership; UK Standard for Professional Engineering Competence, Engineering Council, 2005.
53	Communication, participation and consultation	How does the organisation ensure that pertinent asset management information is effectively communicated to and from employees and other stakeholders, including contracted service providers?	3			Widely used AM practice standards require that pertinent asset management information is effectively communicated to and from employees and other stakeholders including contracted service providers. Pertinent information refers to information required in order to effectively and efficiently comply with and deliver asset management strategy, plan(s) and objectives. This will include for example the communication of the asset management policy, asset performance information, and planning information as appropriate to contractors.	Top management and senior management representative(s), employee's representative(s), employee's trade union representative(s); contracted service provider management and employee representative(s); representative(s) from the organisation's Health, Safety and Environmental team. Key stakeholder representative(s).	Asset management policy statement prominently displayed on notice boards, intranet and internet; use of organisation's website for displaying asset performance data; evidence of formal briefings to employees, stakeholders and contracted service providers; evidence of inclusion of asset management issues in team meetings and contracted service provider contract meetings; newsletters, etc.

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Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
48	Training, awareness and competence	How does the organisation develop plan(s) for the human resources required to undertake asset management activities - including the development and delivery of asset management strategy, process(es), objectives and plan(s)?	The organisation has not recognised the need for assessing human resources requirements to develop and implement its asset management system.	The organisation has recognised the need to assess its human resources requirements and to develop a plan(s). There is limited recognition of the need to align these with the development and implementation of its asset management system.	The organisation has developed a strategic approach to aligning competencies and human resources to the asset management system including the asset management plan but the work is incomplete or has not been consistently implemented.	The organisation can demonstrate that plan(s) are in place and effective in matching competencies and capabilities to the asset management system including the plan for both internal and contracted activities. Plans are reviewed integral to asset management system process(es).	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
49	Training, awareness and competence	How does the organisation identify competency requirements and then plan, provide and record the training necessary to achieve the competencies?	The organisation does not have any means in place to identify competency requirements.	The organisation has recognised the need to identify competency requirements and then plan, provide and record the training necessary to achieve the competencies.	The organisation is the process of identifying competency requirements aligned to the asset management plan(s) and then plan, provide and record appropriate training. It is incomplete or inconsistently applied.	Competency requirements are in place and aligned with asset management plan(s). Plans are in place and effective in providing the training necessary to achieve the competencies. A structured means of recording the competencies achieved is in place.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
50	Training, awareness and competence	How does the organization ensure that persons under its direct control undertaking asset management related activities have an appropriate level of competence in terms of education, training or experience?	The organization has not recognised the need to assess the competence of person(s) undertaking asset management related activities.	Competency of staff undertaking asset management related activities is not managed or assessed in a structured way, other than formal requirements for legal compliance and safety management.	The organization is in the process of putting in place a means for assessing the competence of person(s) involved in asset management activities including contractors. There are gaps and inconsistencies.	Competency requirements are identified and assessed for all persons carrying out asset management related activities - internal and contracted. Requirements are reviewed and staff reassessed at appropriate intervals aligned to asset management requirements.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
53	Communication, participation and consultation	How does the organisation ensure that pertinent asset management information is effectively communicated to and from employees and other stakeholders, including contracted service providers?	The organisation has not recognised the need to formally communicate any asset management information.	There is evidence that the pertinent asset management information to be shared along with those to share it with is being determined.	The organisation has determined pertinent information and relevant parties. Some effective two way communication is in place but as yet not all relevant parties are clear on their roles and responsibilities with respect to asset management information.	Two way communication is in place between all relevant parties, ensuring that information is effectively communicated to match the requirements of asset management strategy, plan(s) and process(es). Pertinent asset information requirements are regularly reviewed.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
59	Asset Management System documentation	What documentation has the organisation established to describe the main elements of its asset management system and interactions between them?	3			Widely used AM practice standards require an organisation maintain up to date documentation that ensures that its asset management systems (ie, the systems the organisation has in place to meet the standards) can be understood, communicated and operated. (eg, s 4.5 of PAS 55 requires the maintenance of up to date documentation of the asset management system requirements specified throughout s 4 of PAS 55).	The management team that has overall responsibility for asset management. Managers engaged in asset management activities.	The documented information describing the main elements of the asset management system (process(es)) and their interaction.
62	Information management	What has the organisation done to determine what its asset management information system(s) should contain in order to support its asset management system?	2			Effective asset management requires appropriate information to be available. Widely used AM standards therefore require the organisation to identify the asset management information it requires in order to support its asset management system. Some of the information required may be held by suppliers. The maintenance and development of asset management information systems is a poorly understood specialist activity that is akin to IT management but different from IT management. This group of questions provides some indications as to whether the capability is available and applied. Note: To be effective, an asset information management system requires the mobilisation of technology, people and process(es) that create, secure, make available and destroy the information required to support the asset	The organisation's strategic planning team. The management team that has overall responsibility for asset management. Information management team. Operations, maintenance and engineering managers	Details of the process the organisation has employed to determine what its asset information system should contain in order to support its asset management system. Evidence that this has been effectively implemented.
63	Information management	How does the organisation maintain its asset management information system(s) and ensure that the data held within it (them) is of the requisite quality and accuracy and is consistent?	2			The response to the questions is progressive. A higher scale cannot be awarded without achieving the requirements of the lower scale. This question explores how the organisation ensures that information management meets widely used AM practice requirements (eg, s 4.4.6 (a), (c) and (d) of PAS 55).	The management team that has overall responsibility for asset management. Users of the organisational information systems.	The asset management information system, together with the policies, procedure(s), improvement initiatives and audits regarding information controls.
64	Information management	How has the organisation's ensured its asset management information system is relevant to its needs?	2			Widely used AM standards need not be prescriptive about the form of the asset management information system, but simply require that the asset management information system is appropriate to the organisations needs, can be effectively used and can supply information which is consistent and of the requisite quality and accuracy.	The organisation's strategic planning team. The management team that has overall responsibility for asset management. Information management team. Users of the organisational information systems.	The documented process the organisation employs to ensure its asset management information system aligns with its asset management requirements. Minutes of information systems review meetings involving users.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
59	Asset Management System documentation	What documentation has the organisation established to describe the main elements of its asset management system and interactions between them?	The organisation has not established documentation that describes the main elements of the asset management system.	The organisation is aware of the need to put documentation in place and is in the process of determining how to document the main elements of its asset management system.	The organisation in the process of documenting its asset management system and has documentation in place that describes some, but not all, of the main elements of its asset management system and their interaction.	The organisation has established documentation that comprehensively describes all the main elements of its asset management system and the interactions between them. The documentation is kept up to date.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
62	Information management	What has the organisation done to determine what its asset management information system(s) should contain in order to support its asset management system?	The organisation has not considered what asset management information is required.	The organisation is aware of the need to determine in a structured manner what its asset information system should contain in order to support its asset management system and is in the process of deciding how to do this.	The organisation has developed a structured process to determine what its asset information system should contain in order to support its asset management system and has commenced implementation of the process.	The organisation has determined what its asset information system should contain in order to support its asset management system. The requirements relate to the whole life cycle and cover information originating from both internal and external sources.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
63	Information management	How does the organisation maintain its asset management information system(s) and ensure that the data held within it (them) is of the requisite quality and accuracy and is consistent?	There are no formal controls in place or controls are extremely limited in scope and/or effectiveness.	The organisation is aware of the need for effective controls and is in the process of developing an appropriate control process(es).	The organisation has developed a controls that will ensure the data held is of the requisite quality and accuracy and is consistent and is in the process of implementing them.	The organisation has effective controls in place that ensure the data held is of the requisite quality and accuracy and is consistent. The controls are regularly reviewed and improved where necessary.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
64	Information management	How has the organisation's ensured its asset management information system is relevant to its needs?	The organisation has not considered the need to determine the relevance of its management information system. At present there are major gaps between what the information system provides and the organisations needs.	The organisation understands the need to ensure its asset management information system is relevant to its needs and is determining an appropriate means by which it will achieve this. At present there are significant gaps between what the information system provides and the organisations needs.	The organisation has developed and is implementing a process to ensure its asset management information system is relevant to its needs. Gaps between what the information system provides and the organisations needs have been identified and action is being taken to close them.	The organisation's asset management information system aligns with its asset management requirements. Users can confirm that it is relevant to their needs.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
69	Risk management process(es)	How has the organisation documented process(es) and/or procedure(s) for the identification and assessment of asset and asset management related risks throughout the asset life cycle?	3			Risk management is an important foundation for proactive asset management. Its overall purpose is to understand the cause, effect and likelihood of adverse events occurring, to optimally manage such risks to an acceptable level, and to provide an audit trail for the management of risks. Widely used standards require the organisation to have process(es) and/or procedure(s) in place that set out how the organisation identifies and assesses asset and asset management related risks. The risks have to be considered across the four phases of the asset lifecycle (eg, para 4.3.3 of	The top management team in conjunction with the organisation's senior risk management representatives. There may also be input from the organisation's Safety, Health and Environment team. Staff who carry out risk identification and assessment.	The organisation's risk management framework and/or evidence of specific process(es) and/ or procedure(s) that deal with risk control mechanisms. Evidence that the process(es) and/or procedure(s) are implemented across the business and maintained. Evidence of agendas and minutes from risk management meetings. Evidence of feedback in to process(es) and/or procedure(s) as a result of incident investigation(s). Risk registers and assessments.
79	Use and maintenance of asset risk information	How does the organisation ensure that the results of risk assessments provide input into the identification of adequate resources and training and competency needs?	3			Widely used AM standards require that the output from risk assessments are considered and that adequate resource (including staff) and training is identified to match the requirements. It is a further requirement that the effects of the control measures are considered, as there may be implications in resources and training required to achieve other objectives.	Staff responsible for risk assessment and those responsible for developing and approving resource and training plan(s). There may also be input from the organisation's Safety, Health and Environment team.	The organisations risk management framework. The organisation's resourcing plan(s) and training and competency plan(s). The organisation should be able to demonstrate appropriate linkages between the content of resource plan(s) and training and competency plan(s) to the risk assessments and risk control measures that have been developed.
82	Legal and other requirements	What procedure does the organisation have to identify and provide access to its legal, regulatory, statutory and other asset management requirements, and how is requirements incorporated into the asset management system?	3			In order for an organisation to comply with its legal, regulatory, statutory and other asset management requirements, the organisation first needs to ensure that it knows what they are (eg, PAS 55 specifies this in s 4.4.8). It is necessary to have systematic and auditable mechanisms in place to identify new and changing requirements. Widely used AM standards also require that requirements are incorporated into the asset management system (e.g. procedure(s) and	Top management. The organisations regulatory team. The organisation's legal team or advisors. The management team with overall responsibility for the asset management system. The organisation's health and safety team or advisors. The organisation's policy making team.	The organisational processes and procedures for ensuring information of this type is identified, made accessible to those requiring the information and is incorporated into asset management strategy and objectives
88	Life Cycle Activities	How does the organisation establish implement and maintain process(es) for the implementation of its asset management plan(s) and control of activities across the creation, acquisition or enhancement of assets. This includes design, modification, procurement, construction and commissioning activities?	3			Life cycle activities are about the implementation of asset management plan(s) i.e. they are the "doing" phase. They need to be done effectively and well in order for asset management to have any practical meaning. As a consequence, widely used standards (eg, PAS 55 s 4.5.1) require organisations to have in place appropriate process(es) and procedure(s) for the implementation of asset management plan(s) and control of lifecycle activities. This question explores those aspects relevant to asset creation.	Asset managers, design staff, construction staff and project managers from other impacted areas of the business, e.g. Procurement	Documented process(es) and procedure(s) which are relevant to demonstrating the effective management and control of life cycle activities during asset creation, acquisition, enhancement including design, modification, procurement, construction and commissioning.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
69	Risk management process(es)	How has the organisation documented process(es) and/or procedure(s) for the identification and assessment of asset and asset management related risks throughout the asset life cycle?	The organisation has not considered the need to document process(es) and/or procedure(s) for the identification and assessment of asset and asset management related risks throughout the asset life cycle.	The organisation is aware of the need to document the management of asset related risk across the asset lifecycle. The organisation has plan(s) to formally document all relevant process(es) and procedure(s) or has already commenced this activity.	The organisation is in the process of documenting the identification and assessment of asset related risk across the asset lifecycle but it is incomplete or there are inconsistencies between approaches and a lack of integration.	Identification and assessment of asset related risk across the asset lifecycle is fully documented. The organisation can demonstrate that appropriate documented mechanisms are integrated across life cycle phases and are being consistently applied.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
79	Use and maintenance of asset risk information	How does the organisation ensure that the results of risk assessments provide input into the identification of adequate resources and training and competency needs?	The organisation has not considered the need to conduct risk assessments.	The organisation is aware of the need to consider the results of risk assessments and effects of risk control measures to provide input into reviews of resources, training and competency needs. Current input is typically ad-hoc and reactive.	The organisation is in the process ensuring that outputs of risk assessment are included in developing requirements for resources and training. The implementation is incomplete and there are gaps and inconsistencies.	Outputs from risk assessments are consistently and systematically used as inputs to develop resources, training and competency requirements. Examples and evidence is available.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
82	Legal and other requirements	What procedure does the organisation have to identify and provide access to its legal, regulatory, statutory and other asset management requirements, and how is requirements incorporated into the asset management system?	The organisation has not considered the need to identify its legal, regulatory, statutory and other asset management requirements.	The organisation identifies some its legal, regulatory, statutory and other asset management requirements, but this is done in an ad-hoc manner in the absence of a procedure.	The organisation has procedure(s) to identify its legal, regulatory, statutory and other asset management requirements, but the information is not kept up to date, inadequate or inconsistently managed.	Evidence exists to demonstrate that the organisation's legal, regulatory, statutory and other asset management requirements are identified and kept up to date. Systematic mechanisms for identifying relevant legal and statutory requirements.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
88	Life Cycle Activities	How does the organisation establish implement and maintain process(es) for the implementation of its asset management plan(s) and control of activities across the creation, acquisition or enhancement of assets. This includes design, modification, procurement, construction and commissioning activities?	The organisation does not have process(es) in place to manage and control the implementation of asset management plan(s) during activities related to asset creation including design, modification, procurement, construction and commissioning.	The organisation is aware of the need to have process(es) and procedure(s) in place to manage and control the implementation of asset management plan(s) during activities related to asset creation including design, modification, procurement, construction and commissioning but currently do not have these in place (note: procedure(s) may exist but they are inconsistent/incomplete).	The organisation is in the process of putting in place process(es) and procedure(s) to manage and control the implementation of asset management plan(s) during activities related to asset creation including design, modification, procurement, construction and commissioning. Gaps and inconsistencies are being addressed.	Effective process(es) and procedure(s) are in place to manage and control the implementation of asset management plan(s) during activities related to asset creation including design, modification, procurement, construction and commissioning.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
91	Life Cycle Activities	How does the organisation ensure that process(es) and/or procedure(s) for the implementation of asset management plan(s) and control of activities during maintenance (and inspection) of assets are sufficient to ensure activities are carried out under specified conditions, are consistent with asset management strategy and control cost, risk and performance?	3			Having documented process(es) which ensure the asset management plan(s) are implemented in accordance with any specified conditions, in a manner consistent with the asset management policy, strategy and objectives and in such a way that cost, risk and asset system performance are appropriately controlled is critical. They are an essential part of turning intention into action (eg, as required by PAS 55 s 4.5.1).	Asset managers, operations managers, maintenance managers and project managers from other impacted areas of the business	Documented procedure for review. Documented procedure for audit of process delivery. Records of previous audits, improvement actions and documented confirmation that actions have been carried out.
95	Performance and condition monitoring	How does the organisation measure the performance and condition of its assets?	3			Widely used AM standards require that organisations establish implement and maintain procedure(s) to monitor and measure the performance and/or condition of assets and asset systems. They further set out requirements in some detail for reactive and proactive monitoring, and leading/lagging performance indicators together with the monitoring or results to provide input to corrective actions and continual improvement. There is an expectation that performance and condition monitoring will provide input to improving asset management strategy, objectives and plan(s).	A broad cross-section of the people involved in the organisation's asset-related activities from data input to decision-makers, i.e. an end-to end assessment. This should include contactors and other relevant third parties as appropriate.	Functional policy and/or strategy documents for performance or condition monitoring and measurement. The organisation's performance monitoring frameworks, balanced scorecards etc. Evidence of the reviews of any appropriate performance indicators and the action lists resulting from these reviews. Reports and trend analysis using performance and condition information. Evidence of the use of performance and condition information shaping improvements and supporting asset management strategy, objectives and plan(s).
99	Investigation of asset-related failures, incidents and nonconformities	How does the organisation ensure responsibility and the authority for the handling, investigation and mitigation of asset-related failures, incidents and emergency situations and non conformances is clear, unambiguous, understood and communicated?	3			Widely used AM standards require that the organisation establishes implements and maintains process(es) for the handling and investigation of failures incidents and non-conformities for assets and sets down a number of expectations. Specifically this question examines the requirement to define clearly responsibilities and authorities for these activities, and communicate these unambiguously to relevant people including external stakeholders if appropriate.	The organisation's safety and environment management team. The team with overall responsibility for the management of the assets. People who have appointed roles within the asset-related investigation procedure, from those who carry out the investigations to senior management who review the recommendations. Operational controllers responsible for managing the asset base under fault conditions and maintaining services to consumers. Contractors and other third parties as appropriate.	Process(es) and procedure(s) for the handling, investigation and mitigation of asset-related failures, incidents and emergency situations and non conformances. Documentation of assigned responsibilities and authority to employees. Job Descriptions, Audit reports. Common communication systems i.e. all Job Descriptions on Internet etc.
105	Audit	What has the organisation done to establish procedure(s) for the audit of its asset management system (process(es))?	2			This question seeks to explore what the organisation has done to comply with the standard practice AM audit requirements (eg, the associated requirements of PAS 55 s 4.6.4 and its linkages to s 4.7).	The management team responsible for its asset management procedure(s). The team with overall responsibility for the management of the assets. Audit teams, together with key staff responsible for asset management. For example, Asset Management Director, Engineering Director. People with responsibility for carrying out risk assessments	The organisation's asset-related audit procedure(s). The organisation's methodology(s) by which it determined the scope and frequency of the audits and the criteria by which it identified the appropriate audit personnel. Audit schedules, reports etc. Evidence of the procedure(s) by which the audit results are presented, together with any subsequent communications. The risk assessment schedule or risk

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
91	Life Cycle Activities	How does the organisation ensure that process(es) and/or procedure(s) for the implementation of asset management plan(s) and control of activities during maintenance (and inspection) of assets are sufficient to ensure activities are carried out under specified conditions, are consistent with asset management strategy and control cost, risk and performance?	The organisation does not have process(es)/procedure(s) in place to control or manage the implementation of asset management plan(s) during this life cycle phase.	The organisation is aware of the need to have process(es) and procedure(s) in place to manage and control the implementation of asset management plan(s) during this life cycle phase but currently do not have these in place and/or there is no mechanism for confirming they are effective and where needed modifying them.	The organisation is in the process of putting in place process(es) and procedure(s) to manage and control the implementation of asset management plan(s) during this life cycle phase. They include a process for confirming the process(es)/procedure(s) are effective and if necessary carrying out modifications.	The organisation has in place process(es) and procedure(s) to manage and control the implementation of asset management plan(s) during this life cycle phase. They include a process, which is itself regularly reviewed to ensure it is effective, for confirming the process(es)/ procedure(s) are effective and if necessary carrying out modifications.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
95	Performance and condition monitoring	How does the organisation measure the performance and condition of its assets?	The organisation has not considered how to monitor the performance and condition of its assets.	The organisation recognises the need for monitoring asset performance but has not developed a coherent approach. Measures are incomplete, predominantly reactive and lagging. There is no linkage to asset management objectives.	The organisation is developing coherent asset performance monitoring linked to asset management objectives. Reactive and proactive measures are in place. Use is being made of leading indicators and analysis. Gaps and inconsistencies remain.	Consistent asset performance monitoring linked to asset management objectives is in place and universally used including reactive and proactive measures. Data quality management and review process are appropriate. Evidence of leading indicators and analysis.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
99	Investigation of asset-related failures, incidents and nonconformities	How does the organisation ensure responsibility and the authority for the handling, investigation and mitigation of asset-related failures, incidents and emergency situations and non conformances is clear, unambiguous, understood and communicated?	The organisation has not considered the need to define the appropriate responsibilities and the authorities.	The organisation understands the requirements and is in the process of determining how to define them.	The organisation are in the process of defining the responsibilities and authorities with evidence. Alternatively there are some gaps or inconsistencies in the identified responsibilities/authorities.	The organisation have defined the appropriate responsibilities and authorities and evidence is available to show that these are applied across the business and kept up to date.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
105	Audit	What has the organisation done to establish procedure(s) for the audit of its asset management system (process(es))?	The organisation has not recognised the need to establish procedure(s) for the audit of its asset management system.	The organisation understands the need for audit procedure(s) and is determining the appropriate scope, frequency and methodology(s).	The organisation is establishing its audit procedure(s) but they do not yet cover all the appropriate asset-related activities.	The organisation can demonstrate that its audit procedure(s) cover all the appropriate asset-related activities and the associated reporting of audit results. Audits are to an appropriate level of detail and consistently managed.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Score	Evidence—Summary	User Guidance	Why	Who	Record/documented Information
109	Corrective & Preventative action	How does the organisation instigate appropriate corrective and/or preventive actions to eliminate or prevent the causes of identified poor performance and non conformance?	2			Having investigated asset related failures, incidents and non-conformances, and taken action to mitigate their consequences, an organisation is required to implement preventative and corrective actions to address root causes. Incident and failure investigations are only useful if appropriate actions are taken as a result to assess changes to a businesses risk profile and ensure that appropriate arrangements are in place should a recurrence of the incident happen. Widely used AM standards also require that necessary changes arising from preventive or corrective action are made to the asset management system.	The management team responsible for its asset management procedure(s). The team with overall responsibility for the management of the assets. Audit and incident investigation teams. Staff responsible for planning and managing corrective and preventive actions.	Analysis records, meeting notes and minutes, modification records. Asset management plan(s), investigation reports, audit reports, improvement programmes and projects. Recorded changes to asset management procedure(s) and process(es). Condition and performance reviews. Maintenance reviews
113	Continual Improvement	How does the organisation achieve continual improvement in the optimal combination of costs, asset related risks and the performance and condition of assets and asset systems across the whole life cycle?	2			Widely used AM standards have requirements to establish, implement and maintain process(es)/procedure(s) for identifying, assessing, prioritising and implementing actions to achieve continual improvement. Specifically there is a requirement to demonstrate continual improvement in optimisation of cost risk and performance/condition of assets across the life cycle. This question explores an organisation's capabilities in this area—looking for systematic improvement mechanisms rather that reviews and audit (which are separately examined).	The top management of the organisation. The manager/team responsible for managing the organisation's asset management system, including its continual improvement. Managers responsible for policy development and implementation.	Records showing systematic exploration of improvement. Evidence of new techniques being explored and implemented. Changes in procedure(s) and process(es) reflecting improved use of optimisation tools/techniques and available information. Evidence of working parties and research.
115	Continual Improvement	How does the organisation seek and acquire knowledge about new asset management related technology and practices, and evaluate their potential benefit to the organisation?	2			One important aspect of continual improvement is where an organisation looks beyond its existing boundaries and knowledge base to look at what 'new things are on the market'. These new things can include equipment, process(es), tools, etc. An organisation which does this (eg, by the PAS 55 s 4.6 standards) will be able to demonstrate that it continually seeks to expand its knowledge of all things affecting its asset management approach and capabilities. The organisation will be able to demonstrate that it identifies any such opportunities to improve, evaluates them for suitability to its own organisation and implements them as appropriate. This question explores an organisation's approach to this	The top management of the organisation. The manager/team responsible for managing the organisation's asset management system, including its continual improvement. People who monitor the various items that require monitoring for 'change'. People that implement changes to the organisation's policy, strategy, etc. People within an organisation with responsibility for investigating, evaluating, recommending and implementing new tools and techniques, etc.	Research and development projects and records, benchmarking and participation knowledge exchange professional forums. Evidence of correspondence relating to knowledge acquisition. Examples of change implementation and evaluation of new tools, and techniques linked to asset management strategy and objectives.

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SCHEDULE 13: REPORT ON ASSET MANAGEMENT MATURITY (cont)

Question No.	Function	Question	Maturity Level 0	Maturity Level 1	Maturity Level 2	Maturity Level 3	Maturity Level 4
109	Corrective & Preventative action	How does the organisation instigate appropriate corrective and/or preventive actions to eliminate or prevent the causes of identified poor performance and non conformance?	The organisation does not recognise the need to have systematic approaches to instigating corrective or preventive actions.	The organisation recognises the need to have systematic approaches to instigating corrective or preventive actions. There is ad-hoc implementation for corrective actions to address failures of assets but not the asset management system.	The need is recognized for systematic instigation of preventive and corrective actions to address root causes of non compliance or incidents identified by investigations, compliance evaluation or audit. It is only partially or inconsistently in place.	Mechanisms are consistently in place and effective for the systematic instigation of preventive and corrective actions to address root causes of non compliance or incidents identified by investigations, compliance evaluation or audit.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
113	Continual Improvement	How does the organisation achieve continual improvement in the optimal combination of costs, asset related risks and the performance and condition of assets and asset systems across the whole life cycle?	The organisation does not consider continual improvement of these factors to be a requirement, or has not considered the issue.	A Continual Improvement ethos is recognised as beneficial, however it has just been started, and or covers partially the asset drivers.	Continuous improvement process(es) are set out and include consideration of cost risk, performance and condition for assets managed across the whole life cycle but it is not yet being systematically applied.	There is evidence to show that continuous improvement process(es) which include consideration of cost risk, performance and condition for assets managed across the whole life cycle are being systematically applied.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.
115	Continual Improvement	How does the organisation seek and acquire knowledge about new asset management related technology and practices, and evaluate their potential benefit to the organisation?	The organisation makes no attempt to seek knowledge about new asset management related technology or practices.	The organisation is inward looking, however it recognises that asset management is not sector specific and other sectors have developed good practice and new ideas that could apply. Ad-hoc approach.	The organisation has initiated asset management communication within sector to share and, or identify 'new' to sector asset management practices and seeks to evaluate them.	The organisation actively engages internally and externally with other asset management practitioners, professional bodies and relevant conferences. Actively investigates and evaluates new practices and evolves its asset management activities using appropriate developments.	The organisation's process(es) surpass the standard required to comply with requirements set out in a recognised standard. The assessor is advised to note in the Evidence section why this is the case and the evidence seen.

Schedule 17 Certification for Year-beginning Disclosures

Clause 2.9.1

We, Michael Stiassny and

James Carmichael, being directors of Vector Limited certify that, having made all reasonable enquiry, to the best of our knowledge:

a) the following attached information of Vector Limited prepared for the purposes of clause 2.6.1, 2.6.3(2)(b), and 2.6.5(2) of the Gas Distribution Information Disclosure Determination 2012 in all material respects complies with that determination.

b) The prospective financial or non-financial information included in the attached information has been measured on a basis consistent with regulatory requirements or recognised industry standards.

Carmichael

Director

Director

11 september 2013

Date