Jemena Asset Management Pty Ltd

Pipeline Management Plan Safety & Operating Plan

Jemena Gas Distribution Network Jemena Gas Pipeline Licence 1,2,3,7,8 Jemena Colongra Lateral Pipeline Licence 33

Protected



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History

Rev No	Date	Description of changes	Author
1	01/05/2018	First issue of the document	George Castline
2	04.07.2019	Re-issue following the new organisation structure as of 01.07.2019	George Castline
3	04/08/2020	Inclusion of technical specifications references collection	George Castline
4	01.09.2020	Minor update to satisfy development consent - Section 4.38 of the Environmental Planning & Assessment Act 1979 – Schedule 3 Part B, B2	George Castline
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6	07.04.2022	Updated Element 7 – removal of reference to APSC and updating of organisational chart Updated Appendix A to include operational WSGG	Jacques Commarmond
		Updated Appendix B – Safety Management Manual	
		Updated Appendix C - Minor updates detailing latest SGSPAA policies and procedures for emergency and change management Updated Appendix D – Removal of WSGG CSMP	
7	02/05/2023	Replaced reference to JCARS with OMNIA throughout the document.	Jacques Commarmond
		Updated 1.1 and 1.5 to reflect Malabar and WSGG	
		Updated Element 7 responsibilities, SAOP review period, included external auditor and organisation chart.	
		Updated Person In Charge for JGN NSW.	
		Updated reference to Gas Supply (Safety & Network Management) Regulation 2022.	
		Updated Appendix C - Compliance Assurance Matrix to reflect new <i>Gas Supply (Safety & Network Management)</i> <i>Regulation 2022.</i> Added AS2885 PIMP / AMS - Matrix for JGN & Evoenergy assets.	
		Updated Appendix A- "Asset Description" to include Malabar CTS as a receipt point for biomethane gas into the JGN Network	
		Minor grammatical changes throughout document.	
8	06/06/2024	Amended name from Western Sydney Green Gas (WSGG) to Western Sydney Hydrogen Hub (WSHH) throughout the document.	Jacques Commarmond
		Updated Appendix C - Compliance Assurance Matrix to AS2885.3:2022 and revised the requirements of how a "Pipeline Integrity Management Plan" is managed via Jemena's AMS.	
		Updated Element 3 – Operational Graphs	
		Updated Element 7 - Organisational Chart & Responsibilities	
9	17/12/2024	Amended Appendix A – "Asset Description" to include Kurri- Kurri off-take	Jacques Commarmond

		 Amended Appendix C – "Compliance Assurance Matrix" (Item 1) - Deletion of reference Jemena's Accountability model. Item (8) - Expansion of abnormal operations information. item 30.5) – inclusion of reference to PICARRO, JGN's new leakage management methodology for AS4645 assets. 	
10	15/04/2025	Amended Appendix A – Table 7 to show the revised "Restricted Operating Pressure" for the JGN Licenced Pipelines.	Jacques Commarmond

Owning Functional Area

Business Function Owner:	Future Networks, Asset Management & Operations (Gas)
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Appendix C	Compliance Assurance Matrix
Appendix D	Specific Jurisdiction Requirements

ABBREVIATIONS

ABBREVIATIONS

ALARP	As Low as Reasonably Practicable
AMP	Asset Management Plan
AMS	Asset Management System
IMT	Incident Management Team
APAIR	Asset Performance and Integrity Review
AS	Australian Standard
ASA	Asset Services Agreement
D&C	Design & Construction
DAMS	Distribution Management Services
ECMS	Enterprise Content Management System
EMP	Emergency Management Plan
EMT	Emergency Management Team
EVO	Evoenergy
FSA	Formal Safety Assessment
GIS	Geographic Information System
GSMRC	Gas Safety Management Review Committee
HAZOP	Hazards and Operability Study (HAZOP)
ISO	International Organization for Standardization
OMNIA	Jemena Governance, Compliance & Risk
NSW	New South Wales
0&M	Operation & Maintenance
SAOP / PMP	Safety and Operating Plan / Pipeline Management Plan referred to as safety case
SD	Service Delivery
SGSPAA	State Grid Singapore Power Australia Assets
SMS	Safety Management Study
WMS	Works Management System
WSHH	Western Sydney Hydrogen Hub Project

1 — SAFETY CASE PURPOSE AND OBJECTIVES

1. SAFETY CASE PURPOSE AND OBJECTIVES

This document is Jemena's Safety Case for its Gas Assets – also known as Safety & Operating Plan and Pipeline Management Plan. The document provides a summary of the approach to managing gas safety risks and is made up of the following seven elements:



This Safety Case describes the management system and supporting documentation to provide a framework for operating and maintaining the NSW assets in accordance with the provisions of the *Pipelines Act 1967, Pipelines Regulation 2023, Gas Supply Act 1996* and *Gas Supply (Safety and Network Management) Regulation 2022* in a safe, reliable and sustainable manner. The arguments and evidence for safety is assured by an appropriate Asset Management System operating under a controlled environment in accordance with the applicable gas legislation and regulatory instruments across various Australian jurisdictions.

The Safety Case represents a commitment by Jemena to ensure its assets are operated and maintained in a controlled environment with the purpose and objective that assure:

- The safety of the public and persons working on or near the gas assets
- The protection of property and environment
- The prevention of uncontrolled release of gas
- The commitment to prevent the delivery of out-of-spec Gas and
- The protection of the community from threats to safety arising from overpressure and the loss of supply.

1.1 PURPOSE

The purpose of this Safety Case is to demonstrate and communicate a convincing and evidence-based safety argument for the management of gas assets throughout their life cycle, providing a description of:

- The network, including network design, configuration, asset types, location and geography.
- Technical and management challenges related to the safety argument.
- The nature of gas safety risks faced by the business.
- The methodologies used to identify and assess network safety risks.
- Risk appetite which is "the amount and type of risk that the organisation is willing to take in order to meet its strategic objectives."

SAFETY CASE PURPOSE AND OBJECTIVES — 1

- How gas safety risks are controlled to minimise these risks within the risk appetite.
- Providing evidence of control effectiveness,
- The extent and role of asset management and safety management systems in ongoing management, monitoring and governance.

1.2 SAFETY CASE INTENDED AUDIENCE AND BENEFITS

The Safety Case is intended to inform and educate external stakeholders including government bodies, economic and technical regulators, local communities and customers. To facilitate understanding by external stakeholders who may have limited knowledge of gas technical matters. It provides a simple explanation of the nature of gas safety risks and Jemena's approach to risk management. The structure of the Safety Case aims to enable stakeholders to review particular areas of interest without reading the entire document. Table 1-1 provides a list of the safety case elements:

Table 1-1: Safety Case Elements

• Asset Description , providing a description of physical infrastructure that make the asset including in-built component or parts available for use in case of emergency with the purpose to prevent unintended consequences as well as maintain asset objectives.	up <u>Element 2</u>
 Operating Environment providing context related to: the stakeholders community expectations historical performances & trends and asset condition and integrity. 	<u>Element 3</u>
 Safety Risk Assessment and Management providing an overall framework of Jemena's Risk Identification Risk Management – application of resources and controls to risk processes Significant Risks – risk registers. 	<u>Element 4</u>
• Safety Management System describing the Safety Management System and supporting processes that Jemena has in place to provide for the safe and reliable operation of gas assets (transmission and distribution) in accordance wir Jemena's operational, societal and environmental objectives as well as legislatio industry standards and specific pipeline licence conditions.	<u>Element 5</u> th n,
• Emergency Management System providing the system for managing events which are impacting on the business and have been classified as being and emergency.	Element 6
• Governance (Management Review and Assurance) providing the basis by whi Jemena assures that its asset management systems have adequate processes ar systems in place to satisfy the safety case purpose and objectives, meets	ich <u>Element 7</u> nd

1 — SAFETY CASE PURPOSE AND OBJECTIVES

applicable statutory and regulatory requirements and maintains and improves Jemena reputation and stakeholder expectations.

1.3 OBJECTIVES

1.3.1 BUSINESS OBJECTIVE AND STRATEGIES

Jemena is committed to meeting its legislative and regulatory requirements to operate and maintain a safe and reliable asset in Australia.

Our key corporate objectives and strategies are:

- **Safety**: Embed a world class safety culture by implementing our People Safety and Environment (PSE) strategy to build and continuously improve leadership culture, manage Gas risks and safeguard the health and well-being of all personnel.
- **Customer**: Deliver energy services that are safe, reliable, affordable and responsive to our customers' preferences.
- **People**: Be a high performing and engaged workplace that attracts, develops and retains industry leaders.
- **Performance**: Deliver operational and financial efficiencies aligned to the business plan.
- **Growth**: Grow scale to be an influential market leader with strong customer, regulatory, stakeholder and community relationships. Deliver financial performance that is superior to our industry peers.

Further details of Jemena's business objectives and strategies can be found in the Jemena Business Plan 2015-2020.

1.3.2 SAFETY CASE OBJECTIVES

The objectives of the Safety Case are to:

- Present a set of reasoned safety arguments and evidence that the asset is operated and maintained in a safe, reliable and sustainable manner within a controlled operating environment in accordance with applicable legislative and regulatory instruments across various jurisdictions in Australia,
- Describe the controls that are applied to eliminate or mitigate these risks to asset safety, people and environmental to acceptable levels.
- Inform stakeholders of the context, operating environment and challenges faced in identifying, assessing and controlling gas safety risk.

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1.4 SCOPE

The scope of the Safety Case is for Jemena gas assets as described in Appendix A.

This Safety Case addresses the requirements of AS2885 and AS4645 series of standards and includes information as required by the relevant legislative and regulatory requirements.

1.5 ABOUT JEMENA

Jemena Limited owns and operates a diverse portfolio of energy and water infrastructure assets across the east coast of Australia. With more than \$9 billion worth of major utility infrastructure, Jemena supplies millions of households and businesses with essential everyday services.

The following Table 1-2 lists 100 per cent ownership by Jemena Limited: Table 1-2: Jemena Assets

Asset	Description
Northern Gas Pipeline	The Northern Gas Pipeline (NGP) is a underground, natural gas pipeline, 622 kilometres (km) in length commissioned in 2019. The pipeline connects the Amadeus Gas Pipeline (AGP) at the Warrego Compressor Station in the Northern Territory (NT) to the Carpentaria Gas Pipeline (CGP) at Mount Isa in Queensland (QLD). The pipeline is 457 km traversing land in the Northern Territory and 165 km in Queensland.
Jemena Gas Network (JGN)	Established in 1837, the 25,000 km system delivers gas to more than 1.5 million homes, businesses and industrial customers in New South Wales.
Queensland Gas Pipeline	627 km pipeline delivers gas from the Surat/Cooper Basin to the Gladstone and Rockhampton markets.
Eastern Gas Pipeline	797 km pipeline delivers gas from Victoria's Gippsland Basin to Sydney, the ACT and regional New South Wales.
Vic Hub	The is an interconnect facility and 2km pipeline located in Longford enabling gas to flow between the EGP and the Australian Pipeline Association Victorian Declared Transmission System.
Darling Downs Pipeline	The pipeline is three interconnected gas transmission pipelines in the Darling Downs region in South East Queensland that operate as a single pipeline network and span 292km in length.
Colongra Gas Transmission and Storage Facility	pipeline and compressor station transports and stores gas for Delta Electricity's 667 MW gas fired peaking generator.
Jemena Electricity Network	The 6,301 km system delivers electricity to more than 327,000 homes and business in north-west Melbourne.
Roma North Pipeline	This is a 5.2km pipeline. This start of line compressor station includes two reciprocating compressors, two screw compressors and a gas dehydration system. The end of line metering facility ties into the Comet Ridge to Wallumbilla Pipeline (adjacent to the Queensland Gas Pipeline).
Atlas Gas Pipeline	Pipeline Licence PPL2040 is a 60.48km long DN200 high pressure pipeline transporting Coal Seam Gas from Senex's Atlas gas fields in the Surat Basin into the Darling Downs Pipeline.
Malabar Biomethane Plant	Plant generating biomethane gas at the Sydney Water Wastewater Treatment Plant which is then injected into the JGN secondary system at Banksmeadow.
Western Sydney Hydrogen Hub (WSHH)	Western Sydney Hydrogen Hub packaged facility transforms electrical energy from the power grid into hydrogen gas, which is then injected at small percentages in the JGN secondary system at Horsley Park.

1 — SAFETY CASE PURPOSE AND OBJECTIVES

Jemena Limited is 60% owned by State Grid of China (SG) and 40% by Singapore Power (SP) via State Grid Singapore Power Australian Assets (SGSPAA) Pty Ltd. Figure 1-1 provides the company structure.



Figure 1-1: Company Structure

1.6 SAFETY RISK ASSESSMENT AND RISK MANAGEMENT PHILOSOPHY

Gas safety risks may arise from a number of issues including failure or deterioration of an asset. On a pragmatic basis, Jemena will seek to remove the risk and if this is not possible, will mitigate the risk to an acceptable level. Jemena draws on its safety management policies, philosophies and commitments to risk management. Accordingly, the policies aim at the following:

- Managing assets without compromising employees, contractors and public safety as per the Jemena Health and Safety Policy and Compliance with the Law Policy.
- Managing assets in an environmentally sustainable manner in support of the Jemena Environmental Policy.
- Complying with all relevant regulatory and legislative requirements.
- Meeting stakeholder and customer expectations.
- Ensuring that asset management plans deliver against corporate and business plan objectives in conjunction with risk management approaches.
- Applying the Jemena risk management approach to asset management and related activities; and
- Facilitating continual improvement in the safety, reliability and performance of our assets, through the establishment, maintenance and governance of effective asset and safety management systems.

SAFETY CASE PURPOSE AND OBJECTIVES — 1

Jemena's asset management philosophy is the coordinated activity Jemena undertakes to realise value from assets. It involves the balancing of costs, opportunities and risks against performance of assets to achieve Jemena's Business Plan. An effective AMS enables Jemena to direct, coordinate and control asset management activities throughout an asset's lifecycle. It facilitates an optimal mixture of capital investments, operations, maintenance, resourcing, risks, performance, sustainability and good governance. In order to drive good practice asset management throughout Jemena, a systematic, documented AMS has been established which is consistent with the requirements outlined in ISO 55001, and in alignment with the IAM's 'Asset Management – An Anatomy'.

Jemena is certified to the international standard ISO 55001:2014 - *Asset Management-Management Systems* (by around 2018) which is underpinned by ISO 31000 Risk Management (a global standard for risk management). ISO 55001 emphasizes identifying and controlling risks affecting internal and external stakeholders of the defined asset portfolio, while looking for opportunities for continuous improvement throughout the asset life cycle.

1.7 RISK APPETITE

Our *Risk appetite* is the amount and type of risk that Jemena is willing to take in order to meet our objectives.

Jemena's risk appetite is determined by the Board and underpinned by our legislative obligations.

Jemena's risk appetite is reflected in the Jemena corporate risk matrix which is a table used during risk assessment to define the various levels of risk as the product of the harm probability categories and harm severity categories. (Refer to Table 1-3: Risk acceptability, prioritisation and escalation for further details).

In general, risks are identified and analysed via workshops which allow the subject matter experts to define the risks, consequences and likelihoods which in turn is used to assign the risk rating. Once the risk is analysed, to meet the risk appetite, attempts are first made to eliminate the risk and only when the risk cannot be eliminated then the risks are then mitigated using appropriate strategies.

The prioritisation of risk for attention across the different levels of management is set out in the Table 1-3 below in conjunction with AS2885 and AS4645 risk management frameworks.

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Risk Rating	Acceptability	Action	Timing
EXTREME	Generally Intolerable. Cannot be accepted except under extraordinary circumstances with approval at Board-level.	Requires immediate action. Highest priority to treat risk. Senior level monitoring.	Action plans prepared and normally implemented within 1 month. Status of risk should be monitored monthly.
HIGH	ALARP or Tolerable Region. Must drive risks towards Broadly Acceptable Region. Risks only tolerable if further risk reduction is impracticable and cost of reducing the risk is grossly disproportionate to the benefits gained.	Requires immediate attention – must manage with senior level monitoring. Includes Jemena Executive Team oversight of Unlikely Likelihood, Catastrophic Consequence Events.	Action plans prepared and normally implemented within 3 months. Status of risk should be monitored monthly.
SIGNIFICANT		Requires Management attention with a degree of priority. Includes Jemena Executive Team oversight of Rare Likelihood, Catastrophic Consequence Events. High level monitoring.	Action plans prepared and normally implemented within 6 months. Status of risk should be monitored every 6 months.
MODERATE	Broadly Acceptable Region Risk reduction may be disproportionate to benefits gained	Requires routine to periodic monitoring.	Action plans prepared and normally implemented within 6 months. Status of risk should be monitored at least every 6 months.
LOW		"Business as usual" - should be reviewed at least annually. Managed by routine policies and procedures.	Ongoing control as part of a management system. Risk Facilitators to maintain register of Low risks and reassess annually.

Table 1-3: Risk acceptability, prioritisation and escalation

SAFETY CASE PURPOSE AND OBJECTIVES — 1

1.8 RISK BASED ASSET MANAGEMENT

Jemena's Risk Management process applies the principle and requirements of AS/NZS ISO 31000 to its Risk Management.

Jemena is committed to risk-based asset management. Risk management is implemented at all functional levels to the appropriate risk appetite to meet the business and safety case objectives. Jemena has a well-developed Corporate Risk Management process tailored to meet all contingencies, in alignment with the Jemena Group Risk Management Manual. These procedures ensure that strategic, tactical and operational decision making is applied consistently across the organization.

Risk assessment is the overall process of risk identification, risk analysis and risk evaluation. Risk assessments are usually completed in workshops attended by managers, subject matter experts, employees and contractors.

The risk assessments are documented within a risk register and they are updated and reassessed periodically to ensure that the risks and their controls are current, relevant and reliable.



Jemena's Risk Management Framework is shown in Figure 1-2:

1 — SAFETY CASE PURPOSE AND OBJECTIVES

Figure 1-2: Risk Management Framework

The General Manager, Internal audit and Risk **(IA & RISK)** supports the Executive Risk and Management Committee, Managing Director and Risk, Health, Safety & Environment Committee (RHSEC) in their governance roles and has a dual reporting line, with a solid line reporting relationship to the RHSEC and a dotted line reporting to the SGSPAA Managing Director. The Risk Manager is responsible for ensuring regular and structured communication between all External Service providers, Risk Facilitators and the Jemena Risk team.

The following sub-committees' function under the RHSEC, which evaluate all relevant risks:

- Health Safety and Environment Council (HSEC) deals with health, safety and environmental risks.
- Asset Management System Review Committee AMS Management Review
- Gas Safety Management Review Committee (GSMRC) deals with gas risks.

The Managing Director SGSPAA uses the above committees to facilitate the development of a common risk management approach across SGSPAA by:

- Implementing a Risk Management Framework.
- Sharing information that has broad applicability across all areas of the business
- Reporting on the progress of implementing the Risk Management Framework
- Chairing the Executive Risk Management Committee.
- Integrating risk management as part of business-as-usual activities.

SGSPAA recognises that effective risk management requires three key pillars to be in place, namely:

- SGSPAA Board and Senior Management oversight.
- Sound risk management policies and procedures.
- Active participation by all personnel to risk management practices.

The SGSPAA Board has corporate governance responsibilities and meets on a monthly basis to discuss risk prioritisation, escalation, risk management and reporting requirements to fulfil Jemena's safety objectives and legal requirements.

Figure 1-3 below represents the arrangements for senior management oversight of the Risk Management Platform.

SAFETY CASE PURPOSE AND OBJECTIVES — 1



Figure 1-3 Enterprise Risk Management Framework

1.9 OVERVIEW OF RISKS FACED BY JEMENA

For the purpose identifying and efficiently managing risk, Jemena adopts the following six risk categories:

- **Strategic Risk** Risks that prevent Jemena from achieving its strategic objectives and impacts the business model.
- **Financial Risk** Risks associated with inadequate financial management or a loss arising from changes in the financial market variables.
- **Safety Risk, including Gas Safety Risk** Risks associated with Workplace Health and Safety, including physical and mental harm to any person contributed by Jemena's assets or personnel.
- **Operational Risk** Risks which have adverse impacts on quality, cost and performance of the gas safety resulting from failed processes, policies, systems and people or from external events. They can broadly be sub-classified as risks associated with Asset Management, Asset Security, Technical, Project Management, Environment, Disaster Recovery, Emergency Management, Commercial Management, Human Resources, Business Continuity, Information & Communication Technology and Regulatory and Compliance.

1 — SAFETY CASE PURPOSE AND OBJECTIVES

- **Regulatory Risk-** Risks associated with additional scrutiny by a regulator or risks from regulatory/legislative changes or uncertainty emerging from any such changes.
- **Reputational Risk-** Risks attributed to negative publicity that impacts the brand, image or confidence of stakeholders in the business.

1.10 GAS SAFETY RISKS

For the purpose of identifying, assessing and controlling gas safety risk, the following risk categories are considered significant and underpinned by this safety case.:

- Uncontrolled release of gas
- Overpressure of downstream gas supply
- Delivery of 'out of spec' gas quality
- Loss of Supply

2. ASSET DESCRIPTION



The asset description is documented as required by AS4645 and AS2885 for the specific assets and describes the activities, or operation, and configuration of the asset and details technical and other control measures identified as a result of safety assessment of the assets.

The asset description is outlined as follows:

- 1. Overview Map Typically a GIS Map and any additional imagery.
- 2. Pipeline system specification.
- 3. Facility Components.
- 4. Operating parameters.

Refer to Appendix A for details.

3 — OPERATING ENVIRONMENT

3. OPERATING ENVIRONMENT



Jemena operates in an environment defined by its asset characteristics, ownership and control, stakeholders, regulatory objectives and financial considerations. The operating environment is crucial in managing asset safety, reliability and sustainability, enabling the business to remain focussed on the key gas safety risks. Refer 1.10

Jemena's operations aim to meet expectations and commitments as set out by the following business drivers and in compliance with applicable legislative and regulatory requirements:

- Stakeholders / Community expectations.
- Performances & trends.
- Asset condition and integrity.

3.1 STAKEHOLDERS / COMMUNITY EXPECTATIONS

Ownership, operation and maintenance of public utility gas asset infrastructure places *inherent* (implied) and *stated* expectations that are manifested under stakeholder and community expectations.

Jemena stakeholders include investors, technical and commercial regulators, emergency services, voluntary subscription entities, the local communities and customers, retailors, market determinants, contractors and employees.

The 'stated' requirements are nominally dictated by the various gas safety codes and the legislative requirements. In addition, the 'inherent' requirements are captured through various consultative and communication channels with the community/public and other stakeholders. This allows Jemena to respond to changes or emerging business needs and remain focussed to evolving operating environments.

The asset management system is the system by which these expectations are satisfied. The system allows a process for effective decision (strategic, tactical and operational) making and deployment of activities to operate and maintain assets satisfying stakeholder and community expectations

3.2 HISTORICAL PERFORMANCE AND TRENDS

Jemena demonstrates performance to the technical or other regulators and internal management with regards to gas safety through reports and dashboards, including a set of requirements by the regulators as

OPERATING ENVIRONMENT — 3

well as those established internally. Appropriate elements of reported data are collated and maintained by the various jurisdictional technical regulators. The comparative benchmarking data shown in this section were provided by Energy Networks Australia and made available to stakeholders participating in the collation of data. These are used to assist towards planning and assessments needs. Gas Networks and Pipelines reports reflect status of distribution and transmission assets respectively to the community.

These reports on performance and trends can be accessed from Energy Networks Australia and includes a status summary of the following performance measures. Other available reports on performance and trends can be accessed from the respective regulatory entity websites (<u>https://energy.nsw.gov.au/government-and-regulation/Reports</u>) and includes a status summary of the following performance measures.

- Asset Information.
- Network Integrity and Safety information.
- Network Reliability and Consumer Related Matters.
- High Pressure (unlicensed) Pipelines Activities.
- Accidents Escapes and Ignition.
- Operational Performance.

Key parameters reported in the "Energy Network Australia National Benchmarking Report" include the following. Note that the 2018/19 graphs represented in the following are the most recently reported.

- Unaccounted for Gas Figure 3-1,
- **Reliability and Safety** (Unplanned Outages Figure 3-2)
- **Compliance with Priority A Incidents** (Figure 3-3),
- Repaired Public Reported Gas Leaks (Figure 3-4)
- **Third Party Damages** (Figure 3-5)

Feedback included in the publicly available reports notes that the network operations continue to manage the assets in a safe and reliable manner.

3 — OPERATING ENVIRONMENT









OPERATING ENVIRONMENT — 3







Note: Jemena and Evoenergy reported all the reported leaks as 'Mains' in 2018-19. These are broken down into other categories for the succeeding years.

Figure 3-4 Repaired Public Reported Gas Leaks

3 — OPERATING ENVIRONMENT





Internally, Jemena monitors and reports monthly on key performance indicators for each asset. The measures enable to response to any changes to the operating environment with appropriate asset management intervention to ensure its core business objectives. These performance indicators include:

- Asset Safety.
- Asset Performance.
- Emergency Response and Customer Outages.
- Asset Condition.
- Control Effectiveness.
- Network Imbalance.

3.3 ASSET CONDITION AND INTEGRITY

Asset safety and performance can be impacted in many ways along the lifecycle of the asset. These include a range of issues from poor design and construction to inadequate maintenance or operational procedures through to third party activities. The case for safety of the assets must therefore consider these various aspects that affect asset condition and integrity and thereby to asset safety. The process of assessing this done through periodical monthly monitoring and reporting as referred in section 3.2 and internal reporting through the annual Asset Performance and Integrity Review (APAIR) process. APAIR allows the effective application of asset management strategies and plans to meet its core business strategy and objectives and help maintain asset safety within the operating environment i.e., exposure and proximity to communities, impacts to environment and people safety working with or near gas assets.

SAFETY RISK ASSESSMENT AND MANAGEMENT — 4

4. SAFETY RISK ASSESSMENT AND MANAGEMENT



Gas asset safety risk assessment and management is performed using the following structured methodologies.

- Safety Management Study.
- Formal Safety Assessment.
- Hazard and Operability Study (HAZOP).

To establish the 'line-of-sight' from the perspective of AMS, the Strategic Business Objective level risks are flowed down into asset specific risks and maintained via the asset risk register loaded in the Jemena Governance, Compliance and Risk System (OMNIA).

AMS risks are periodically evaluated to determine if they are at ALARP or at a level that is within the risk appetite taking into consideration a robust control effectiveness assessment. These assessments occur through a combination of self-evaluation and facilitated workshops.

The requirements to assess asset safety is underpinned by:

- Asset Risk Management Guideline JEM-AM-GU-0007.
- Safety Management Manual GAS-999-OM-HSE-001.

Table 4-1 summarises the various safety assessments applied within the business.

4 — SAFETY RISK ASSESSMENT AND MANAGEMENT

Table 4-1 Safety Assessments

Safety Assessment	Purpose/ Intent	Reference
Asset Risk Register ISO 31000	Platform to capture risk against each asset class	JEM AM GU 0007
Formal Safety Assessment (FSA) AS 4645	A process to identify gas distribution network threats and hazards and assess the risk of these threats and determine controls required to meet the acceptable risk level	GAS-999-PR-RM-001
Hazards and Operability Study (HAZOP) AS 2885, AS 61882	A structured and systematic technique to identify and assess hazards inherent in the design, operation and maintenance of the facilities	JEM AM PR 0018
Safety Management Studies (SMS), AS 2885	A process to identify pipeline system threats and hazards and assess the risk of these threats and determine controls required to meet the acceptable risk level	GAS-999-PR-RM-002

Embedded in this document are links to the original source documents of the safety assessments. These documents are maintained by relevant functional groups and are subject to periodical audits by the regulator.

Refer to appendix B and D for further information.

5. SAFETY MANAGEMENT SYSTEM



Jemena's safety management system is described in **Safety Management Manual GAS-999-OM-HSE-001**. Please refer Appendix B

5.1 ASSET MANAGEMENT SYSTEM OVERVIEW

Jemena has an overall Asset Management System (AMS) within which Safety Management is a key element. The Asset Management System provides the principal framework for the organisation to direct, coordinate and control asset management activities and provides assurance that Jemena's operational, societal and environmental objectives are achieved on a consistent basis. It brings together the external influences, asset management drivers, business values and selected strategies to deliver sustained performance for the benefit of all stakeholders.

Jemena's approach to asset management is explained in detail in Asset Management System Manual JEM-AM-MA-0001.

The overall Asset Management System document hierarchy is summarised in Figure 5:1which details the document hierarchy that transforms Jemena's strategic objectives into the required actions that underpin the asset management function. Figure 5:1 also shows secondary documents that support the strategy and planning documents.

5 — SAFETY MANAGEMENT SYSTEM



Figure 5:1: Jemena Asset Management System Document Hierarchy

5.2 SAFETY MANAGEMENT PROCESS

The overall Safety Management process is defined in the context of the level 2 processes, shown in Figure 5:2 below.





5 — SAFETY MANAGEMENT SYSTEM

5.2.1 ASSET BUSINESS STRATEGY DEVELOPMENT

5.2.1.1 Asset Business Strategy

The Asset Business Strategy (ABS) translates Jemena's organisational objectives including safety into individual Asset objectives, e.g., profitability, cash flows, desired performance, current and expected performance, etc. It is also, used to confirm with customers whether the Asset is meeting their expectations.

5.2.2 ASSET PLANNING AND PRIORITISATION

Asset specific activities are prioritised and planned in accordance with Asset Investment strategy as well as the results of asset condition and performance assessments and risk assessments to ensure the safe operation of the assets. The planning and prioritisation cascades down from Asset Class Strategies (ACS), Asset Investment Plans (AIP), Capital and Operational Work Plans (COWP) to Delivery Plans as described in the following sections. This includes engineering assessments, business plans, minor business plans etc as required for the size of the work.

Once works are approved, the work is passed to Service Delivery, via a confirmed Scope of Work, within the Works Management System.

5.2.2.1 Asset Class Strategy

The Asset Class Strategy (ACS) explains the approach and principal methods by which each asset class contributes to delivering Asset Management objectives as stated in relevant ABSs, considering the age, criticality and condition profile of the class. It may also include scenario analysis for various strategies (e.g. replacement vs. refurbishment, non-asset solutions, etc), and demonstrates how the Asset Management activities for the asset class are to be prioritised or optimised to achieve Asset Management objectives (as defined in ABS).

5.2.2.2 Asset Investment Plan (AIP)

Each AIP is a response to one or more ACS, and it defines an optimum set of Asset Management activities (OpEx & CapEx with budgetary financial information) to achieve Asset Management objectives set for the Asset as defined in the relevant ACSs. The AIP sets out proposed costs and activities for the next 7 years as a feed to corporate planning and forecasting.

The content of the AIP in our new format has been substantially reduced to provide the list of proposed projects in the programs of work and explanatory notes on the prioritisation of competing programs of work and any mitigation actions required to maintain targeted risk levels.

5.2.2.3 Capital & Operational Work Plan (COWP)

The COWP contains details on optimised capital and operational expenditures for next two years, linking each expenditure item to one or more Asset objective(s). It sets out the detailed programs of work, resource requirements and costs that feed the Jemena business planning and budgeting process.

5.2.2.4 Delivery Plan

The delivery plan describes how our Service Delivery function will deliver to requirements of COWP including management of supply contracts, resource planning, etc. It provides assurance to Senior Management and the Board that our proposed business plan and budget can be delivered.

SAFETY MANAGEMENT SYSTEM — 5

5.2.3 ASSET PERFORMANCE AND INTEGRITY MANAGEMENT

All field work is completed by Service Delivery under the Works Management System, as directed by Asset Planning and Prioritisation process and/or Technical Specifications. As a result of these activities, Asset Records are prepared as specified by the Work Codes or as defined by an AM prepared Scope of Work.

These asset records are provided to AM who carry out a series of assessment to confirm the asset condition and performance (Asset Performance and Integrity Management). These assessments are described in the following sections.

As a result of these assessments, anomalies (technical risk items that may require corrective action to ensure continued safe operation) are identified and are risk assessed to determine criticality. These are recorded and tracked in the Risk Registers.

Facility risk assessments are also performed as asset information is updated. The risk assessments include Safety Management Studies, Formal Safety Assessments and HAZOPs. These are described in detail in Appendix B.

5.2.3.1 Asset Condition Assessment Report

Asset condition assessments evaluate how the condition of the assets has changed over time in comparison to set targets. For example, the level of corrosion observed during inspections. The condition of the asset includes not only the physical condition but also the age and criticality of the asset.

The condition assessment reports help to inform the expected life expectancy of the asset, when preventative actions are required and if there is a need to be make changes to the frequency of inspections.

5.2.3.2 Asset Performance Assessment Report

The performance report compares the performance of the Asset Classes against set targets and identifies trends in performance. Examples of the performance measures assessed include:

- engineering investigations and incident report findings.
- plant availability.
- failure rates or frequencies.
- Asset Performance
- reliability.
- asset-specific costs.
- mean time between failure.
- plant defects and cause codes.
- corrective maintenance rates.
- Major Incidents

5 — SAFETY MANAGEMENT SYSTEM

5.2.3.3 Asset Control Assessment Report

Controls are processes or actions designed to eliminate, control or mitigate key business risks. The asset control assessment report evaluates the annual compliance to these controls and effectiveness of the control. This is achieved by reviewing:

- OMNIA.
- PM compliance.
- internal and external audits
- work in backlog; and
- rework.

5.2.3.4 Risk Register

Asset Class registers are used to record and track all "Above appetite risks" which are under active management. These are stored in OMNIA by agreement with the ACM.

The risk register and identified risks are used to underpin the asset class strategy considerations to ensure the safe operation of the gas assets

Risks and controls are owned by the ACMs.

5.2.4 TECHNICAL SPECIFICATIONS

Technical Specifications are the suite of documentation defining the minimum technical requirements for the creation and management of gas assets to meet Jemena safety and performance objectives and legislative requirements. These specifications underpin the safety management process by ensuring "industry practices" are adopted in all design, construction, inspection, maintenance, assessment and repair activities carried out by Jemena.

Specifications are prepared by Asset Management to address the following:

- Design and construction of pipelines, facilities and networks.
- Operational monitoring, control and response of pipelines and networks.
- Field operations and maintenance of pipelines, facilities and networks.
- Gas measurement and reconciliation.

These Technical Specification address the following:

- Compliance with applicable codes and standards.
- Approved, best practice inspection techniques.
- Preventative and corrective maintenance activities.
- Methods to determine frequency of activities e.g. fixed interval, risk based.

- Anomaly assessment methods.
- Repair methods.

These Specifications interface with Service Delivery (SD) to inform for asset specific Field Manuals, thus ensuring that best practices and consistency in the management of all Jemena Assets.

Field manuals provide the specific activities (type, frequency and procedures) which will be carried out for the asset via Work Codes.

Routine, prescriptive works as defined in the Field Manuals are automatically inputted into the Work Management System, unless there is a strategic change which would cause a change to the Specifications.

5.2.4.1 Technical Change Management

Review and updates to Technical Specifications will be carried out on a periodic basis. The suitability of any changes will be demonstrated by an assessment to ensure the change is in compliance with legislation and Jemena's objectives and all changes will be carried out in accordance with Jemena Change Management Manual. All changes will need to be approved.

Changes in the Technical Specifications will be reflected in subsequent updates to the relevant Work Codes, which are referenced in the Service Delivery field manual. Updates to Work Codes will be carried out by Asset Strategy and approved, for execution by Service Delivery.

5.2.5 WORKS MANAGEMENT SYSTEM

The delivery of the tasks/activities needed to operate and maintain Jemena assets is performed by the works management system (Service Delivery). These tasks/activities are governed by the design basis manuals and operational/maintenance specifications established by asset management, as previously described.

Routine, prescriptive works as defined in the Field Manuals (i.e. Work Codes as described above) would be automatically inputed into the WMS, unless there was a strategic change which would cause a change to the AM Specification and hence a change to the SD field Manuals.

5.3 COMPLIANCE ASSURANCE MATRIX MAPPING

The Compliance Assurance Matrix is designed to demonstrate to the Regulator and the external auditor (nominated by the regulator) that safety management system requirements stated in the Acts/Regulations and standards are effectively mapped against current processes and procedures. The matrix maps relevant artefacts to AS 2885 and AS 4645 as well as applicable additional requirements placed by technical regulators.

The compliance assurance matrix will act as the "sole source of truth" during external audits. The currency of these supporting processes/procedures will be maintained by the functional areas that own them. All procedures set out or referred to in the Compliance Assurance Matrix are in place and have been tested and proved.

5 — SAFETY MANAGEMENT SYSTEM

Refer to Appendix C - Compliance Assurance Matrix

6. EMERGENCY MANAGEMENT SYSTEM



The Emergency Management Plan (EMP) and its annexes are intended to support the actions of the Emergency Management Team (EMT) and Incident Management Team (IMT) and includes guidance on:

- effective decision-making for significant incident and emergency events.
- effective identification, assessment and escalation of events.
- effective recording of EMT/IMT actions and decisions.
- supports the post-event review of EMT/IMT management to support recommendations for future improvement.
- provision of training.

The "JAA NSO FW 0002 Crisis Emergence Management Framework can be accessed via the following link: http://ecms/otcs/cs.exe/fetch/2000/246816060/301878299/302493064/JAA_NSO_FW_0002_Crisis_and_Emergency_Management_Framework.pdf?nodeid=306659878&vernum=-2

The "JAA NSO PL 0003 Jemena Emergency Management Plan" can be accessed via the following link: <u>http://ecms/otcs/cs.exe/app/nodes/305832432</u>

The JAA NSO PR 0001 Alerts & Notification procedure can be accessed via the following link: <u>http://ecms/otcs/cs.exe/app/nodes/303448071</u>. This procedure is used to alert relevant stakeholders, including technical regulators of any notifiable incidents

7 — GOVERNANCE (MANAGEMENT REVIEW AND ASSURANCE)

7. GOVERNANCE (MANAGEMENT REVIEW AND ASSURANCE)



The Jemena governance process described below provides the management review and assurance of gas assets.

The HSE Council provides overall HSE leadership and assists Jemena to fulfil its overall responsibilities in relation to HSE matters as they affect workers (employees and contractors), customers and the community. Membership of the Council includes the Managing Director as the Chair, all Executive General Managers and the General Manager of HSEQ.

The HSE Council provides overall HSE leadership and assists Jemena to fulfil its overall responsibilities in relation to HSE matters as they affect workers (employees and contractors), customers and the community. Membership of the Council includes the Managing Director as the Chair, all Executive General Managers and the General Manager of HSEQ.

The HSE Council also monitors and reports on the effectiveness of strategies and practices to manage risks. The SGSPAA HSE & APS Performance Report is used to summarise any "Asset Public Safety Emerging Issues" with the information derived from the Gas Safety Management Review Committee (GSMRC).

The GSMRC oversees the following areas as far as they relate to asset and public safety as detailed in the GSMRC charter (refer to compliance matrix for the charter). Typically the review inputs include:

- Technical specifications and allied artefacts.
- Acts, Regulations, Codes, Standards and other applicable requirements.
- Audit and incident investigations.
- Performance, integrity and condition monitoring.
- Good industry practice, research and innovation.

The GSMRC reports to the HSE Council, on a quarterly basis, the current status of the asset and public safety program and management system including:

- Performance against key performance indicators.
- Trend analysis of significant events.
- Major incident logs and major incident review completed.

The GSMRC is supported by the AS2885 Pipeline Code Committee and the AS4645 Code Committee.
GOVERNANCE (MANAGEMENT REVIEW AND ASSURANCE) — 7

In addition to the above committees and management reviews, Jemena utilises its risk-based asset management system processes such as APAIR and control assessments that relate to gas safety. The control assessments include periodical evaluations and other monitoring and measurements through reported data on asset condition and performance.

Jemena also utilises OMNIA (Jemena Governance, Risk Management & Compliance System) to support the assurance processes by continuous monitoring of its commitment to comply with laws, regulations and other subscribed requirements. Outputs from the management review processes may trigger a review of the safety case. The management recommends a periodic review of the safety case once every 2 years. In some jurisdiction, the safety case review / resubmission is required once every 5 years.

In addition to the above assurances processes, Jemena also uses an independent external auditor to undertake regulatory audits on behalf of the auditor as required by the respective technical legislations. The current auditor for JGN assets is Ken Cameron, from Ken Cameron and Associates.

The organization's roles, responsibilities, accountabilities and authorities in managing the gas assets are addressed in Table 7.1, Jemena's HR system "Success Factors" and <u>GAS-999-PA-DM-004 GAS AS 2885</u> Document Approvals Structure.

Figure 7-1 depicts the organisation structure down to a Level 3 Manager. For quick references please visit <u>One</u> <u>Group Organisation Structure</u>





7 — GOVERNANCE (MANAGEMENT REVIEW AND ASSURANCE)

Table 7-1 below briefly describes accountabilities and responsibilities.

Table 7-1: Key Positions – Accountabilities / Responsibilities

No	Key Position	Accountabilities/ Responsibilities
1	Managing Director (level 1)	Person Responsible for Operation of the Facility (VIC) and his accountabilities Approve the SGSPAA Health, Safety, Environment & Quality Policy
	(David Oliespie))	Approve the Jemena Asset Management Policy
		Approve budgets and resource plans
		Approve Service Provider contracts (as required by) State Grid Singapore Power (Australia) Assets Pty Ltd (SGSPAA) Delegated Financial Authority (DFA) Policy)
		Delegate responsibilities for management of the assets
		Approve the EGP(232) and Vic Hub (247) Safety Case
		567 Collins Street, Melbourne VIC 3000
2	GM Asset &	Person-In-Charge (NSW for PL1,2,3,7,8,29); Chief Technical Officer (ACT)
	Operations (Gas), Jemena Networks (level 3) (Mark Dragar)	Approve the Safety Case for all Jemena owned or managed Gas Distribution Assets including the NSW licensed Pipelines that support the distribution assets.
		Represents the asset owner and is responsible for all asset and investment related issues including engineering strategy and planning, asset delivery, network development, commercial services and business services. This position is also the Person In-Charge (NSW), Chief Technical Officer (ACT) and the Licensee (NSW). The position is also responsible for the approval of business cases in accordance with the SPI (Australia) Assets, Delegations of Financial Authority (DFA). Business cases requiring approval in excess of this position and the appropriate authority levels are also detailed in the DFA
		Approve the Safety Cases for JGN NSW Distribution Assets, Pipelines Licenses 1,2,3,7,8,29 and Evoenergy NSW & ACT (co-signed).
		99 Walker St, North Sydney, NSW 2060
3	GM Asset Management, Gas	Person in Charge (NSW for PL33), Executive Safety Manager (QLD) and Registered Holder (NT)
	Markets (level 3)	Approve the Jemena Safety Case for all Jemena Gas Markets managed assets (Licensed Pipelines) including Colongra but excluding those within Victoria.
	(Sean Ward)	Represents the asset owner and is responsible for all asset and investment related issues including engineering strategy and planning, asset delivery, network development, commercial services and business services. This position is also the Licensee. The position is also responsible for the approval of business cases in accordance with the SPI (Australia) Assets, Delegations of Financial Authority (DFA). Business cases requiring approval in excess of this position and the appropriate authority levels are also detailed in the DFA
		567 Collins Street, Melbourne VIC 3000

GOVERNANCE (MANAGEMENT REVIEW AND ASSURANCE) — 7

No	Key Position	Accountabilities/ Responsibilities
4	Engineering &	Prepare Asset Management Plans and Asset Strategies
	Network Control Manager	Prepare and manage the Works Program to ensure the long term integrity of the asset.
	(Gregg Hector) and Planning & Optimination	Responsible for overall operational control of the network and leading Jemena's emergency response approach, including policies, documentation and user training. This role is also responsible for management of call answering, work scheduling and dispatch, incident investigation and overseeing the operations of the emergency management system & emergency incident simulations
	Manager	Monitor Works Delivery performance
	(Rochelle Redford)	Monitor Asset Performance to ensure it meets regulatory, code and business requirements
		Coordinate and assist operations management in the implementation of the requirements of the Safety Management System. Undertake the role of Principal Engineer for the pipelines design and operations engineering sectors;
5	Asset Investment	Prepare Asset Management Plans and Asset Strategies
	Manager	Prepare and manage the Works Program to ensure the long term integrity of the asset.
	(Lynley Hickey) and Engineering Integrity Manager	Responsible for overall operational control of the network and leading Jemena's emergency response approach, including policies, documentation and user training. This role is also responsible for management of call answering, work scheduling and dispatch, incident investigation and overseeing the operations of the emergency management system & emergency incident simulations
	(Lorraine van der Vvver)	Monitor Works Delivery performance
	.,	Monitor Asset Performance to ensure it meets regulatory, code and business requirements
		Coordinate and assist operations management in the implementation of the requirements of the Safety Management System. Undertake the role of Principal Engineer for the pipelines design and operations engineering sectors;
6	Gas Networks Future Network	Person responsible for the preparation, revision and submission of the Safety Case for JGN, Evoenergy (Gas Networks) and Colongra (Gas Markets)
	Manager (Gas Networks)	Responsible for the monitoring and auditing programme for the Safety Case compliance
	(Phil Colvin)	Develop and implement the auditing program for Safety Case compliance
	and Engineering	Liaise with safety regulators about matters relating to the Safety Case and the Compliance Management System
	Integrity Manager (Gas Markets)	Liaise with relevant positions within Jemena to ensure operational input into the Management Systems and specifications including this Safety Case.
	(Lorraine van der Vyver)	Communicate and manage compliance with regulatory, industry and code obligations and requirements.
7	GM HS & GM Environment Manager (Level3)	Responsible for the provision of Health, Safety, Environment & Quality strategy, policies and programs throughout Jemena

Appendix A Asset Description

Note: Inclusions and exclusions during external regulatory audits are as follows.

ASSET DESCRIPTION JEMENA NSW GAS ASSETS

INTERNAL

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1 OVERVIEW OF ASSETS

1.1 INTRODUCTION

This document will describe all the assets associated with the Jemena NSW Gas Distribution Network, Jemena Colongra Pipeline and the Western Sydney Hydrogen Hub (**WSHH**) packaged facility.

1.1.1 JEMENA NSW GAS DISTRIBUTION NETWORK

The Jemena NSW Gas Distribution Network includes over 26,000km of pipelines and mains of various sizes and Maximum Allowable Operating Pressures (**MAOP**), ranging from 6,895kPa to 2kPa. The pipes are divided into their MAOP as summarised below and include associated systems and services, such as cathodic protection equipment and valves.

• Trunk Pipelines (MAOP of 6,895 kPa), including :

- License 1 Wilton to Horsley Park Natural Gas Pipeline;
- License 2 Wilton to Wollongong Natural Gas Pipeline;
- License 3 Horsley Park to Plumpton Natural Gas Pipeline;
- License 7 Plumpton to Killingworth Natural Gas Pipeline; and
- License 8 Killingworth to Kooragang Island Natural Gas Pipeline.

• Primary Mains (MAOP of 3,500 kPa), including :

- Sydney Primary Mains;
- Sydney Primary Loop;
- Penrith Primary Mains; and
- Wollongong Primary Mains.
- Secondary Mains (MAOP of 1,050kPa); and

• Medium and low pressure mains (MAOP of 400kPa, 300kPa, 210kPa, 100kPa, 30kPa, 7kPa, 2kPa).

The Jemena NSW network distributes natural gas from the transmission pipeline receipt points to gas customers via a series of pipelines. Figure 3 illustrates how the pressure steps down from 14,895 kPa to a minimum of 2 kPa via a series of pressure regulating stations and regulator sets.

The customers then receive gas via a meter at the appropriate pressure. Residential and small commercial customers are generally connected to the medium pressure mains, whilst larger commercial and industrial customers are connected at secondary pressures.

1.1.2 JEMENA COLONGRA PIPELINE

The Jemena Colongra Pipeline has the pipeline Licence Number 33 which commences at the outlet of the Munmorah Off Take Metering Station (**MOMS**) and runs approximately 13km to the Colongra Power

Station. The MOMS is located off the Jemena NSW Licence 7 pipeline, described above and shown in Figure 2. There are six sections that make up the Colongra Pipeline :

- The Munmorah Compressor Station (MCS);
- The Munmorah Gas Pipeline (MGP) Feeder (MAOP 13,000kPa);
- The MGP Interconnect (MAOP 13,000kPa);
- The Munmorah Gas Pipeline (MGP) (MAOP 13,000kPa);
- The Munmorah Delivery Station (**MDS**);
- The Munmorah Delivery Pipeline (**MDP**) (MAOP 3,600kPa).

1.1.3 WESTERN SYDNEY HYDROGEN HUB PACKAGED FACILITY

The Western Sydney Hydrogen Hub (**WSHH**) packaged facility is a Power to Gas (**P2G**) project situated within the JGN Horsley Park compound. The project transforms electrical energy from the power grid into a combustible gas; hydrogen, which will either be injected into the Sydney secondary gas network (MAOP 1,050kPa) at a small percentage, used to generate electricity using a gas fuelled generator package and/or fuel cell, or used by other consumers such as vehicle refuelling in the future. The Western Sydney Hydrogen Hub packaged facility includes the :

- Electrolyser (also water treatment system, stack, purification & cooling systems);
- Hydrogen buffer store (buried carbon steel pipeline);
- Hydrogen gas control panel and secondary mains injection panel;
- Hydrogen microturbine and fuel cell;
- High Voltage substation (including transformer) and grid connection; and
- Control and instrumentation system.



Figure 1 : Overview of the Jemena NSW Gas Distribution Network.



Figure 2 : Overview of the Jemena NSW Licenced Pipeline Sections.



Figure 3 : Jemena NSW Pressure Levels Schematic including WSGG & Malabar

2 PIPELINE SYSTEM SPECIFICATIONS

2.1 TRUNK PIPELINES

2.1.1 DESCRIPTION

The trunk pipelines consist of approximately 284km of high strength steel with a MAOP of 6,895kPa (Licence 1,2,3,7,8) and MAOP of 13,000kPa (Licence 33), and is externally protected against corrosion by an anti-corrosion pipe coating and has an internal lining for flow efficiency. Additional protection is also achieved via a Cathodic Protection (**CP**) system. A breakdown of all the licenced trunk pipelines are found below in Table 1.

Mains Section	Construction / Licence Date	Diameter (mm)	Length (km)
Licence 1 – Wilton to Horsley Park			
(Licence includes the Wilton TRS Facility and associated ALBV's along the pipeline and contained within a 24m wide easement)	1974	DN850	52.5
Licence 2 – Wilton to Covett Cr MLV			
(Licence includes the associated ALBV along the pipeline and contained within a 24m wide easement)	1975	DN500	32.6
Licence 3 – Horsley Park to Plumpton			
(Licence includes the associated ALBV along the pipeline and contained within a 24m wide easement)	1975	DN500	9.4
Licence 7 – Plumpton to Killingworth Offtake			
(Licence includes the associated ALBV's along the pipeline and contained within a 24m wide easement)	1978	DN500	143.3
Licence 8 – Killingworth Offtake to Kooragang Island		DN250 / 250	
(Licence includes the associated ALBV's along the pipeline and contained within a 24m wide easement)	1979	/ 500	32.8
Licence 33 – Munmorah Off-take to Colongra Power Station		DN250 / 400	
(Licence includes the associated MLV's along the pipeline and contained within various 20m, 30m, 60m wide easements)	2007	/ 1050	13.0
Total Length			283.6 km

Table 1 : Trunk Pipelines Detail

2.1.2 SAFETY PARAMETERS

The pipeline condition of the Trunk Pipelines are assessed and confirmed based on the :

- Licence conditions;
- Jemena Safety Management Manual;
- Australian AS2885 standards; and
- Annual Asset Performance and Integrity Review (APAIR) Process.
- Colongra Pipeline Integrity Management Plan (PIMP)

Pipeline integrity provides an integrated and structured pipeline operation and maintenance management system and outlines key processes and assessment methodologies to maintain pipe integrity. The integrity of the trunk pipeline is based on pipeline conditions derived from data by inspection and testing which includes :

- Inline Inspection (ILI), also referred to as 'Pigging', to assess metal loss or mechanical damage;
- CP Monitoring, providing additional pipe protection against corrosion at locations of damaged pipe coating;
- Direct Current Voltage Gradient (DCVG) measurement, providing an indication of coating defects which may lead to potential corrosion and carried out on unpiggable pipelines every five years and piggable pipelines every ten years;
- Validation Digs, provide direct measured pipe data at selected locations following an ILI; and
- Safety Management Studies (SMS), which enables pipeline safety and risk assessments to identify threats, review controls and implement additional protection measures where existing controls are inadequate. The SMS also considers all relevant data obtained from the inspection and testing activities to determine the pipeline integrity for purposes of confirming or validating the pipeline MAOP.

In the event of a pipeline failure or required maintenance activity where gas flow must be stopped, the trunk pipelines have various Main Line Valves (**MLV**) and Automatic Line Break Valves (**ALBV**) located along on the trunk main to either mitigate risk (lessen the consequence) and provide safe isolation to the public and staff.

2.2 PRIMARY MAINS SYSTEM

2.2.1 DESCRIPTION

The Primary Mains System (MAOP 3,500kPa) in the Jemena NSW Distribution Network is supplied natural gas via the upstream Trunk Pipelines as above, through various Trunk Regulating Stations (**TRS**).

The primary mains consist of approximately 147km of high strength steel pipe and are externally protected against corrosion by an anti-corrosion pipe coating and internal lining for flow efficiency. Additional protection is also achieved via a CP system. The Primary Mains were predominantly constructed in the mid-1970s and mid-2000s with the new Emu Plains Primary Main section constructed in 2012 and summarised below in Table 2.

Mains Section	Construction Date	Diameter (mm)	Length (km)
Sydney Primary Main ¹	1969 - 1987	DN150 / 250 / 500 / 550	75.1
Sydney Primary Loop ²	1987 & 2007	DN500 / 550	42.6
Penrith Primary Main ³	2003 & 2012	DN200	22.1
Wollongong Primary Main	1982	DN150 / 250	7.3
Total Length			147.1 km

Table 2 : Primary Mains Detail

(1) The Sydney Primary Main consists of various diameter pipe, built and extended during the period over the years.

(2) The West Hoxton to Casula section was built in 1987 (14km) and the Casula to Tempe section of the loop completed in 2007.

(3) The Eastern Creek to Penrith section was built in 2003 (19km), with a further 3km built in 2013 from Penrith to Emu Plains.

2.2.2 SAFETY PARAMETERS

The Primary Mains System operation complies with AS2885 to ensure "continued pipeline integrity during the life of the pipeline" to prevent risk to community safety, property and environmental damage and loss of gas supply. The integrity of the primary mains are based on pipeline conditions derived from data by inspection and testing which includes :

- Inline Inspection (ILI), also referred to as 'Pigging', to assess metal loss or mechanical damage;
- CP Monitoring, providing additional pipe protection against corrosion at locations of damaged pipe coating;
- Direct Current Voltage Gradient (**DCVG**) measurement, providing an indication of coating defects which may lead to potential corrosion and carried out on unpiggable pipelines every five years and piggable pipelines every ten years;
- Validation Digs, provide direct measured pipe data at selected locations following an ILI; and
- Safety Management Studies (**SMS**), which enables pipeline safety and risk assessments to identify threats, review controls and implement additional protection measures where existing controls are inadequate. The SMS also considers all relevant data obtained from the inspection and testing activities to determine the pipeline integrity for purposes of confirming or validating the pipeline MAOP.

In the event of a pipeline failure or required maintenance activity where gas flow must be stopped, the primary mains have various Main Line Valves (**MLV**) and Automatic Line Break Valves (**ALBV**) located along on the primary mains to either mitigate risk (lessen the consequence) and provide safe isolation to the public and staff.

2.3 SECONDARY MAINS SYSTEM

2.3.1 DESCRIPTION

The Secondary Mains System (MAOP 1,050kPa) in the Jemena NSW Distribution Network is supplied natural gas via the upstream Primary Mains System and the APA transmission pipeline for the regional Jemena country networks through various gas regulating facilities.

The Secondary Mains System consists of approximately 1450km of steel pipe, which is externally coated with High-Density Polyethylene (**HDPE**) or Tri-laminate product to protect it from corrosion and internally lined to reduce frictional loses and provide some internal corrosion protection. There is also approximately 10km of 250mm HDPE secondary pipe inserted into a 350mm steel main, constructed in 2011. This section of secondary pipe has 9 MLV's and is protected by the 350mm steel conduit.

The addition of the WSGG packaged facility also injects small percentages of hydrogen gas into a standalone secondary mains system at Horsley Park, in order to control the proximity of the project.

2.3.2 SAFETY PARAMETERS

The Secondary Mains are operated and maintained with the Safety Management Manual and the requirements of AS4645. The integrity of the secondary mains is assessed through integrity and performance assessments which use indirect monitoring and performance methods including :

- Providing Cathodic Protection (CP) to the network and maintaining it;
- CP and Leakage surveys;
- Publicly reported leaks;
- Field Reports and feedback;
- Pipeline Patrol / Surveillance; and
- Conducting Formal Safety Assessments (FSA).

It should be noted that Secondary mains are not piggable.

In the event of a secondary mains failure or required maintenance activity where gas flow must be stopped, the system has many high risk and isolation valves of varying sizes to either mitigate risk (lessen the consequence) and provide safe isolation to the public and staff.

2.4 MEDIUM & LOW PRESSURE MAINS SYSTEM

2.4.1 DESCRIPTION

The Medium & Low Pressure Mains and services supply natural gas to domestic, commercial and industrial users through approximately 25,000km of largely plastic pipe, with approximately 10% being cast iron and steel. The network comprises of mains, services, valves, boundary regulators and exposed mains. The medium pressure networks have a MAOP of 210kPa, 300kPa and 400kPa, with a small number of networks operating a MAOP of 30kPa and 100kPa. The low pressure networks have a MAOP of 2kPa and 7kPa.

The mains and services are predominantly plastic (polyethylene and nylon) with a small number of galvanised mains. Valves are devices used to stop the flow of natural gas. This includes both standard isolation valves and high risk sector valves.

Boundary regulators are used to reduce the medium pressure at the property boundary to low pressure. The low pressure end user service then supplies high density housing such as units and townhouses.

Exposed mains are the mains that are not directly buried in the ground. Typically exposed mains are located in or under bridges, culverts and across storm water channels, etc.

2.4.2 SAFETY PARAMETERS

The medium pressure network is complex and continuously expanding into new estate growth areas. The integrity and condition of the mains are assessed in accordance with Australian Standard AS4645 through numerous integrity and performance assessments including :

- Network leakage tests;
- Leakage survey;
- Network incident assessments via Incident Cause Analysis Method (ICAM);
- Formal Safety Assessments (**FSA**);
- Field failure reports; and
- Poor supply report reviews.

Leakage surveys are a maintenance strategy employed by distribution businesses to locate leaks in gas distribution networks. The frequency with which these surveys are undertaken are based upon risk and past performance, with all sections being surveyed at least once every five years (the minimum requirements of AS4645). More frequent surveys are undertaken in high risk areas and where previous surveys indicated and excessive level of leaks. All gas leaks located are assessed and actioned.

Network incidents are another indicator of network integrity and performance. An incident can be caused by a component failure. Failed components (pipe and fittings) are sent to a laboratory for analysis. Network reliability is monitored closely and remains focused on improving asset integrity and management practises to reduce installation related field failures on the plastic distribution system.

3 FACILITY COMPONENTS

3.1 CUSTODY TRANSFER STATIONS

3.1.1 JEMENA NSW GAS DISTRIBUTION NETWORK

The Jemena NSW Gas Distribution Network is currently supplied natural gas via seven (7) Custody Transfer Stations (**CTS**), those being :

- Wilton APA CTS owned by APA Group, measures the gas received from the Moomba to Sydney Pipeline, also owned by APA Group, entering the Jemena NSW Gas Distribution Network, particularly the Jemena NSW Licence 1 Pipeline.
- Wilton EGP CTS owned by Jemena, measures the gas received from the Eastern Gas Pipeline (EGP), also owned by Jemena, entering the Jemena NSW Gas Distribution Network, particularly the Jemena NSW Licence 1 Pipeline.
- Horsley Park EGP CTS owned by Jemena, measures the gas received from the Eastern Gas Pipeline (EGP), also owned by Jemena, entering the Jemena NSW Gas Distribution Network, particularly the Jemena NSW Licence 3 Pipeline.
- Port Kembla EGP CTS owned by Jemena, measures the gas received from the Eastern Gas Pipeline (EGP), also owned by Jemena, entering the Jemena NSW Gas Distribution Network, particularly the Wollongong Primary Main.
- Hexham AGL CTS owned by AGL, measures the gas received from the Newcastle Gas Storage Facility (NGSF), also owned by AGL, entering the Jemena NSW Gas Distribution Network, particularly the Jemena NSW Licence 8 Pipeline.
- Malabar CTS owned by Jemena, measures the biomethane gas received from the Sydney Water Resource Recover facility at Malabar, owned by Sydney Water, entering the Jemena NSW Gas Distribution Network, particularly the Banksmeadow Secondary system.
- Lenaghan CTS owned by APA Group, measures the gas received from the Kurri Kurri Lateral Pipeline and associated storage pipeline, also owned by APA Group, entering the Jemena NSW Gas Distribution Network, particularly the Jemena NSW Licence 8 Pipeline.

All these stations are equipped with metering facilities to accurately measure gas transfer and gas quality through the CTS. These meters are used for billing purposes and are calibrated in accordance with appropriate measurement standards. These CTS's are not included in the Jemena NSW Gas Distribution Network but play an integral part in securing the natural gas supply.

3.1.2 JEMENA COLONGRA PIPELINE

The Jemena Colongra Pipeline (Licence 33) is supplied from the Munmorah Offtake Metering Station (MOMS) owned by Jemena, which is a custody transfer metering and gas quality measurement facility off the Jemena NSW Licence 7 pipeline. The MOMS is not included as part of the Jemena Colongra Pipeline.

3.1.3 KURRI KURRI OFFTAKE METER STATION

The Kurri Kurri Lateral Pipeline is supplied via the Kurri Kurri Offtake Meter Station (KKOMS), which is a custody transfer metering and flow control facility co- located with the Lenaghan CTS (see 3.1.1), which together allow for bi-directional flow into, and out of the Jemena NSW Licence 8 pipeline.

3.2 REGULATING STATIONS

3.2.1 JEMENA NSW GAS DISTRIBUTION NETWORK FACILITIES

This section includes the Trunk and Primary Regulating Stations and Packaged Off-Take Stations that are included in the Jemena NSW Gas Distribution Networks and summarised in further detail in Table 3.

Trunk Regulating Stations (**TRS**) are gas pressure reduction and filtration facilities that are supplied at trunk pressure and deliver gas at the appropriate pressure to the downstream network.

Packaged Off-Take Stations (**POTS**) are generally smaller capacity installations combining or 'packaging' the functions of measurement, filtration and pressure reduction. They are supplied at trunk pressure and deliver gas at the appropriate pressure to the downstream network.

Primary Regulating Stations (**PRS**) are gas pressure reduction and filtration facilities located at each off-take on the primary mains. They reduce the pressure from 3,500kPa to 1,050kPa to supply the secondary network or lower metering pressures to a specified customer.

Bulk Metering Stations (**BMS**) are metering stations used to deliver gas to a single user who is generally a large industrial customer. There are three (3) BMS' located within the Jemena NSW Distribution Network:

- Botany STA Buses BMS
- Incitec BMS.
- Kurri Kurri Offtake Meter Station

The facility components within these stations include above and below ground pipework, isolation valves, insulating joints, control valves / regulators, filters, SCADA and other related components to promote the safe delivery of gas to the network.

As described in Section 3.4, various stations also have heating located on site, used to preheat the gas to ensure that the temperature reduction (Joule Thompson Effect) caused by large pressure drop through regulators does not adversely affect the facility and downstream gas networks.

TRS Loc	ations	POTS L	ocations	PRS Locations	
Albion Park	Kooragang	Appin	Minmi	Auburn	Willoughby
Bathurst	Lithgow	Appin (Inghams)	Morisset	Banksmeadow	Wollongong
Bingara Gorge	Marulan	Appin (Tower	Murrami	Emu Plains	
Blayney	Moss Vale	Bargo	Narranderra	Flemington	
Bowral	Mount Keira	Boorowa	Narromine	Haberfield	
Campbelltown	Oberon	Coolamon	Parkes	Horsley Park	
Cootamundra	Orange	Dubbo West	Rockdale	Lane Cove	
Cowra	Plumpton	Forbes	Wallerawang	Mascot	
Dubbo	Sally's Corner	Ganmain	Warnervale	Moorebank	
Eastern Creek	West Hoxton	Junee	West Wyalong	North Ryde	
Gosford	Wilton	Leeton	Wyee	Penrith	
Goulburn	Windsor	Maroota	Yass	Riverwood	
Griffith	Wyong	Milthorpe		Tempe	

Table 3 : List of Jemena NSW Gas Distribution Network Facilities

Hexham	Young		
Horsley Park			

3.2.2 JEMENA COLONGRA PIPELINE FACILITIES

The Munmorah Delivery Station (**MDS**) is a gas regulating station which receives gas from the Munmorah Gas Pipeline (**MGP**) and regulates the gas pressure into the Munmorah Delivery Pipeline (**MDP**), in turn, supplying the Colongra Power Station.

The facility components within the MDS include above and below ground pipework, isolation valves, insulating joints, regulators, filters, SCADA and other related components to promote the safe delivery of gas to the Colongra Power Station. A Water Bath Heater is also located on site, used to preheat the gas to ensure that the temperature reduction (Joule Thompson Effect) caused by large pressure drop through regulators does not adversely affect the facility and downstream assets.

3.3 COMPRESSOR STATION

The Munmorah Compressor Station (**MCS**) is a gas compression facility located on the Jemena Colongra Pipeline (Licence 33). Its purpose is to compress gas from the Jemena Licence 7 pipeline (MAOP 6,895kPa) into the Jemena Colongra Pipeline (MAOP 13,000kPa).

The minimum inlet design pressure and temperature of the MCS is 2,500kPa and -10oC respectively. The maximum outlet (discharge) design pressure and temperature of the MCS is 13,000kPa and 45oC respectively. These few design parameters ensure the safe operational limit of the MCS.

3.4 WESTERN SYDNEY HYDROGEN HUB PACKAGE

The Western Sydney Hydrogen Hub (**WSHH**) packaged facility is situated within the JGN Horsley Park compound. Its purpose is to transform electrical energy from the power grid into hydrogen gas, which is then injected at small percentages in the secondary system at Horsley Park.

The primary plant is the Electrolyser which generates hydrogen gas on-demand from mains feed of electricity and water. The electrolyser is a self-contained unit with a package control system and can be shutdown remotely from the Jemena NSW Control room. It has a maximum outlet pressure of 3,200kPa. All the hydrogen that is produced flows into the buffer store pipeline.

The buffer store pipeline is buried within the JGN Horsley Park compound and manages the incoming flow of hydrogen gas from the electrolyser for temporary onsite storage and distribution into the secondary network in a controlled manner. The MAOP of the buffer store pipeline is 3,800kPa.

3.5 HEATING REQUIREMENTS

Due to the nature of the gas supply chain from the APA Pipeline (MAOP 6,200kPa) and EGP pipeline (MAOP 14,900kPa) into the Jemena NSW Gas Distribution Network, large pressure drops across the gas regulating stations can occur, known as the Joule Thompson Effect. To mitigate this effect, the gas is preheated via either Water Bath Heaters or Electrical Insulted Heaters (**EIH**) to protect the downstream equipment / pipelines / networks.

3.5.1 JEMENA NSW GAS DISTRIBUTION NETWORK

The Jemena NSW gas distribution network consists of 15 Water Bath Heaters (**WBH**) and 2 Electrical Insulated Heaters (**EIH**), located at various facilities across the network, where large pressure cuts exist and require gas heating as summarised below in Table 4.

Facility Location	Commissioning Date	Heating Type	Heat Power (Rated)
Albion Park TRS	2011	WBH	555 kW
Bathurst TRS	2007	WBH	320 kW
Blayney TRS	2005	WBH	40 kW
Cootamundra TRS	2008	WBH	88 kW
Cowra TRS	2005	WBH	30 kW
Dubbo TRS	2010	WBH	278 kW
Dubbo West POTS	2010	WBH	32 kW
Forbes POTS	2010	WBH	82 kW
Junee POTS	2008	WBH	40 kW
Lithgow TRS	2007	WBH	40 kW
Milthorpe POTS	2008	EIH	N/A
Narromine POTS	2010	WBH	24 kW
Oberon TRS	2007	WBH	160 kW
Orange TRS	2006	WBH	200 kW
Parkes POTS	2010	WBH	82 kW
Young TRS	2008	WBH	114 kW
Wallerawang	2008	EIH	N/A

Table 4 : Location of WBH & EIH

3.5.2 JEMENA COLONGRA PIPELINE

As described in Section 1.1.2, there are six sections that make up the Colongra Pipeline. The Munmorah Delivery Station (**MDS**) section consists of a 6MW Water Bath Heater (**WBH**) commissioned in 2009, Australia's largest. The WBH is required to regulate the gas supply down to 2,900kPa from the Munmorah Gas Pipeline (**MGP**) feeder operating up to 13,000kPa, hence the large pressure cut.

3.6 SECONDARY REGULATOR SETS (SRS)

Secondary Regulator Sets (**SRS**) are used to describe the Regulator Sets that supply the medium pressure networks. The SRSs reduce the pressure from the secondary network to supply the medium pressure networks. Most SRSs are located in public land and are installed in underground boxes, with a small number installed above ground. There are currently approximately 520 SRSs in service in Jemena Gas Distribution Network.

The Secondary Regulator Sets are operated and maintained in accordance with the Safety Management Manual and Australian Standard AS4645.

The integrity and condition of the SRSs are assessed through numerous activities including :

- Network incident assessments via Incident Cause Analysis Method (ICAM);
- Formal Safety Assessments (FSA);
- Field failure reports; and
- Poor supply report reviews.

3.7 DISTRICT REGULATOR SETS (DRS)

District Regulator Sets (**SRS**) are used to describe the Regulator Sets that supply the low pressure networks. The DRSs reduce the pressure from the medium pressure network to supply the low pressure networks. Most DRSs are located in public land and are installed in underground boxes. There are currently approximately 50 DRSs in service in Jemena Gas Distribution Network.

The District Regulator Sets are operated and maintained in accordance with the Safety Management Manual and Australian Standard AS4645.

The integrity and condition of the SRSs are assessed through numerous activities including :

- Network incident assessments via Incident Cause Analysis Method (ICAM);
- Formal Safety Assessments (FSA);
- Field failure reports; and
- Poor supply report reviews.

4 OPERATING PARAMETERS

4.1 NETWORK PRESSURE

The different network systems within the Jemena Gas Distribution Networks operate at various pressures, throughout the day and year based on the network gas demand at any given time. Jemena Colongra also has these cyclic effects on the pipeline as the pipeline fills and discharges depending on the operational requirements for the day. Hence, the network operates within these given operating pressure envelopes as shown in Table 5 below.

Notwork	Jemena NSW Distribution							Jemena Colongra
System	Trunk	Primary	Secondary	Medium Pressure Systems	Low Pr	essure Sy	rstem	Pipeline
Maximum Allowable Operating Pressure (kPa)	6,895	3,500	1,050	400, 300, 210, 100	30	7	2	13,000
Minimum Operating System Pressure (kPa)	1,750	1,750	525	70	10	3.5	1.5	3,400
Minimum Emergency System Pressure (kPa)	1,500	1,500	400	40	5	2.8	1.4	2,500
Standard Metering Pressure (kPa)	Floating*	Floating*, 100kPa	100	35, 5, 2.75	5, 2.75, 1.38	2.75, 1.38	1.38	Floating*

Table 5 : Jemena NSW Distribution and Jemena Colongra Operating Pressures

*Note : Floating pressure effectively means the customer receives the network / pipeline pressure.

4.2 RECEIPT POINT PRESSURES

Gas from third party pipelines is delivered into the Jemena Gas Distribution Network through various receipt points. The relevant receipt point parameters as per Schedule 8 of the latest JGN Access Arrangement are listed below in Table 6 and Table 7.

Upstream Facility (Allows receipt of Gas from this asset, which does not form part of the Network).	Location of Receipt Point	Max. Receipt Pressure at Receipt Point (kPa)	Min. Receipt Pressure at Receipt Point (kPa)	Areas of Network downstream of Receipt Point
MSPS – Moomba to Young	West Wyalong	6,895	1,750	West Wyalong
	Cowra	10,200	1,750	Cowra
	Blayney	10,200	1,750	Blayney
	Orange	10,200	1,750	Orange
	Millthorpe	10,200	1,750	Millthorpe
MSPS – Young to Litingow	Bathurst	10,200	1,750	Bathurst, Kelso, Raglan
	Oberon	10,200	1,750	Oberon
	Lithgow	10,200	1,750	Lithgow
	Wallerawang	10,200	1,750	Wallerawang
	Junee	6,895	1,750	Junee
	Coolamon	6,895	1,750	Coolamon
	Ganmain	6,895	1,750	Ganmain
MSPS – Burnt Creek to	Narrandera	6,895	1,750	Narrandera
Griffith	Rockdale	6,895	1,750	Rockdale
	Leeton	6,895	1,750	Leeton, Yanco
	Murrami	6,895	1,750	Murrami
	Yoogali (Griffith)	6,895	1,750	Griffith
	Boorowa	6,200	1,750	Boorowa
	Yass	6,200	1,750	Yass
	Goulburn	6,200	1,750	Goulburn
MSDS Voung to Militan	Marulan	6,200	1,750	Marulan
	Sally's Corner	6,200	1,750	Exeter, Bundanoon
	Moss Vale	6,200	1,750	Moss Vale, Berrima
	Bowral	6,200	1,750	Bowral, Mittagong
	Bargo	6,200	1,750	Bargo, Picton, Tahmoor

Table 6 : Country Network Receipt Point Pressures

Upstream Facility (Allows receipt of Gas from this asset, which does not form part of the Network).	Location of Receipt Point	Max. Receipt Pressure at Receipt Point (kPa)	Min. Receipt Pressure at Receipt Point (kPa)	Areas of Network downstream of Receipt Point
MSPS – Young to Wagga	Young	10,200	1,750	Young
	Cootamundra	10,200	1,750	Cootamundra
	Dubbo	10,200	1,750	Dubbo, Wellington
	Dubbo West	10,200	1,750	Dubbo West
Central West Pipeline – Marsden to Dubbo	Forbes	10,200	1,750	Forbes
	Parkes	10,200	1,750	Parkes
	Narromine	10,200	1,750	Narromine

Table 7 : JGN NSW Northern Trunk and Southern Trunk Receipt Point Pressures

Upstream Facility (Allows receipt of Gas from this asset, which does not form part of the Network).	Location of Receipt Point	Max. Receipt Pressure at Receipt Point (kPa)	Min. Receipt Pressure at Receipt Point (kPa)	Areas of Network downstream of Receipt Point	
Wilton – Newcastle Network Section					
Eastern Gas Pipeline (EGP)	Horsley Park CTS	5,000^^	3,600+	Sydney	
Eastern Gas Pipeline (EGP)	Wilton CTS (EGP)	5,000^^	3,600+	Blue Mountains	
Moomba Sydney Pipeline (MSP)	Wilton CTS (MSP)	5,000^^	3,800+	Newcastle	
Newcastle Gas Storage Facility (NGSF)	Hexham CTS	5,000**	2,200+	Lower Hunter	
Newcastle Gas Storage Facility (NGSF)	Tomago CTS	1,050	525+		
Kurri Kurri Lateral Pipeline	Lenaghan CTS	5,000**	2,200+		
Wilton – Wollongong Network Section					
Eastern Gas Pipeline (EGP)	Port Kembla CTS	3,500	2,600+	Wollongong	
Eastern Gas Pipeline (EGP)	Albion Park CTS	1,050	525+	Shellharbour Kiama	
Moomba Sydney Pipeline (MSP)	Wilton CTS (MSP)	5,000^^	3,800+		

If marked "+" then the Minimum Receipt Pressure may be subject to future increases.

If marked "^^" then the 5,000kpa Maximum ROP will be in effect until Feb 2030 following the increase in pressure from 4,500 to 5,000kpa.

4.3 FLOW

4.3.1 JEMENA GAS DISTRIBUTION NETWORK

The Jemena Gas Distribution Network is supplied natural gas via 31 Gas Regulating Stations (TRS, POTS) off the APA Moomba – Sydney Pipeline to service the Country areas and in turn, 5 Custody Transfer Stations (**CTS**) at Wilton (2), Horsley Park (1), AGL Hexham (1), Port Kembla (1), Malabar (1), and Lenaghan (Kurri Kurri, 1) supply the Sydney Metropolitan region (Sydney to Newcastle and Wollongong), as mentioned in Section 3.1.

The typical maximum winter peak gas demand for the Sydney Metro Region and Country Region is approximately 325 TJ/day and 40 TJ/day respectively, which is delivered to the networks via either of the CTS's, TRS's or POTS mentioned above, depending on the gas market demand, its drivers or its constraints.

There are also generally three seasonal gas loads on the system, those being, Summer, Winter and the Shoulder Period. For a sense of magnitude, the Total Winter load in the Jemena Distribution Network, is generally 60% more than that of the Total Summer load. A normal winter's gas day also has a morning peak, evening peak and off-peak period.

4.3.2 JEMENA COLONGRA PIPELINE

The Jemena Colongra Pipeline takes a maximum gas rate of 1.8TJ/hr from the Jemena Licence 7 Trunk pipeline and stores approximately 43TJ's of gas. The pipeline can then provide up to 5 hours of continuous operation to the 667 MWe Colongra Power Station.

The pipeline is effectively a gas storage "bottle" that cycles throughout the day and year, depending on the operational requirements of the Colongra Power Station.

4.3.3 KURRI KURRI OFFTAKE METER STATION

The Kurri Kurri Offtake Meter Station supplies a maximum of 2.2TJ/hr from the Jemena Licence 8 Trunk pipeline to the APA Groups Kurri Kurri Lateral pipeline and associated storage pipeline. These pipelines operate in a similar manner to the Colongra pipeline to supply gas to the Kurri Kurri Power Station and have sufficient storage capacity to also re-supply gas back to the JGN Trunk via the Lenaghan CTS if required.

4.4 GAS COMPOSITION / QUALITY

Gas composition must comply with Australian Standard AS4564 (Specification for General Purpose Natural Gas), and the key requirements are listed below :

- Wobbe Index 46.0 52.0 MJ/Sm3
- Higher Heating Value Maximum 42.2 MJ/Sm3
- Oxygen
- Hydrogen Sulphide Maximum 5.7 mg/Sm3
- Total Sulphur Maximum 50 mg/Sm3
- Water Content Maximum Dewpoint 0oC at MAOP (Max 112.0 mg/Sm3)

Maximum 0.2 mol%

- Hydrocarbon Dewpoint Maximum 2.0oC at 3500 kPag
- Total Inert Gases Maximum 7.0 mol%
- Oil Maximum 20 mL/TJ

The instruments used to measure the key requirements are :

- Gas Chromatographs (GCs) are instruments which analyse the components of gas. From the components, they calculate the specific gravity and heating value of the gas. This is important for billing in general and in particular, when there are different sources of gas supplied into a gas network. The Jemena NSW gas distribution networks receive gas from a number of sources. As a result, Jemena installs GCs in strategic locations to accurately measure the resulting mixture of gases. Currently, these strategic locations are at West Hoxton, Horsley Park, Plumpton, Wyong and Hexham.
- Hydrocarbon and Water Dewpoint analysers are used to see if gas is out of specification. It is
 possible that water and liquid hydrocarbons could drop out of the gas as the gas pressure is
 regulated and reduced. This material could block regulators and pipes and stop supply of gas
 to townships and end users. Hydrocarbon and Dewpoint temperature analysers are installed
 in meter stations to monitor the gas quality and provide alerts when the gas is out of
 specifications.

4.5 SCADA SYSTEM

The Jemena gas network Supervisory Control and Data Acquisition (**SCADA**) and Real Time System (**RTS**) assets are infrastructure put in place to enable the safe and efficient delivery of gas to Jemena's gas customers, and timely business and operational management decisions to be made.

SCADA and RTS assets are critical infrastructure to core business functions, such as gas billing, gas dispatch / distribution and demand management. Sites are designed to be unmanned and any loss of communication with SCADA does not impact the safe operation and control of the site.

The Jemena SCADA and RTS assets comprise of :

- Custom designed software that runs on the Jemena Gas Network's GENe SCADA system and OSI Pi Data Historian system;
- A number of Remote Telemetry Units (**RTU**) and Remote Units (**RU**) connected to field control and instrumentation facilities (flow, pressure, and temperature monitoring and control equipment installations) located at strategic locations (Gas Regulating Facilities) throughout the Jemena gas networks; and
- A SCADA telecommunications network that ensures that information acquired from the strategic locations throughout the Jemena gas networks (via the RTUs and associated flow, pressure, temperature monitoring devices, etc) and back to the central SCADA system.

APPENDIX B

Appendix B Safety Management Manual

Note: Inclusions of document

Jemena Asset Management Pty Ltd

Safety Management Manual

Gas Assets

Protected



2 August 2021

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Owning Functional Area

Business Function Owner:	Asset Management
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1. INTRODUCTION

1.1 PURPOSE

The purpose of this Safety Management Manual (Gas Assets) is to describe the Safety Management System and supporting processes that Jemena has in place to provide for the safe and reliable operation of gas assets (transmission and distribution) in accordance with Jemena's operational, societal and environmental objectives as well as legislation, industry standards and specific pipeline licence conditions.

1.2 SCOPE

The scope of the safety management system applies to the following Asset Classes:

AS2885 Pipelines: includes primary mains network and transmission pipelines including pipeline assemblies for assets operating above 1050kPa.

AS4645 Networks: includes distribution line pipe networks and associated pressure regulating devices operating at and below 1050kPa.

Facilities: includes gas facilities operating above 1050kPa. These asset are grouped into sub-classes as:

- Compressor/engine packages
- · Pressure Equipment (Pressure equipment includes all piping, pressure vessels and regulator skids)
- Processing facilities

1.3 GAS SAFETY RISKS

For the purpose of identifying, assessing and controlling gas safety risks, the following risk categories are considered significant on the basis of Jemena's risk framework and underpinned by this safety case:

- Uncontrolled release of gas
- Overpressure of downstream gas supply
- · Delivery of 'out of spec' gas quality
- Loss of Supply
- Gas Processing operational risks cryogenic liquids, amine, hot oils etc.

1.4 APPLICABLE ASSETS

This manual applies for the following Jemena owned or managed gas assets:

- Evoenergy ACT Distribution Network (ACT)
- Jemena NSW Gas Distribution Network (NSW)
- Evoenergy PL 29 Pipeline (NSW)

1

1 — INTRODUCTION

- Jemena Gas Pipelines PL 1,2,3,7,8 (NSW)
- Evoenergy NSW Distribution Network and PL 29
- Evoenergy ACT Distribution Network
- Jemena Colongra Pipeline PL 33 (NSW)
- Eastern Gas Pipeline PL 26 (NSW) and PL 232 (VIC) and VicHub Pipeline PL 247 (VIC)
- Darling Downs Pipeline PL 90, PL133, PL134 (QLD)
- Queensland Gas Pipeline PL 30 (QLD)
- Northern Gas Pipeline PL 34 (NT) and PL 2015 (QLD)
- Atlas Lateral Pipeline PL 2040 (QLD) and Atlas Facility PL 29 (QLD)
- Roma North Pipeline PL 2028 (QLD)
- Western Sydney Hydrogen Hub Facility (NSW)
 Malabar Biomathane Plant

LEGISLATIVE COMPLIANCE —

2. LEGISLATIVE COMPLIANCE

2.1 APPLICABLE LEGISLATION

Jemena gas assets are created, operated and maintained in accordance with the following Legislation and industry standards:

Legislation:

- Gas Industry Act 2001 (Victoria)
- Pipelines Act 2005 (Victoria)
- Pipelines Regulations 2017 (Victoria)
- Gas Safety Act 1997 (Victoria)
- Gas Safety (Safety Case) Regulations 2018 (Victoria)
- Pipelines Act 1967 No 90 (NSW)
- Pipelines Regulation 2023 (NSW)
- Gas Supply Act 1996 (NSW)
- Gas Supply (Safety and Network Management) Regulation 2022 (NSW)
- Petroleum and Gas (Production and Safety) Act 2004 (Queensland)
- Petroleum and Gas (Production and Safety) Regulation 2018 (Queensland)
- Energy Pipelines Act 1981 (NT)
- Energy Pipelines Regulations 2001 (NT)
- Utilities Act 2000 (ACT)
- Utilities (Technical Regulation) Act 2014 (ACT)
- Utilites (Technical Regulation) (Gas Safety and Network Operation Code) Approval 2021

Primary Standards:

- AS/NZS 2885 suite of standards
- AS/NZS AS4645 suite of standards
- AS 4564 Gas Quality

2.2 COMPLIANCE ASSURANCE MATRIX

The Compliance Assurance Matrix is designed to demonstrate to the Regulator that Jemena's processes and procedures are in compliance with applicable requirements stated in the Acts/Regulations and standards. The

2 — LEGISLATIVE COMPLIANCE

Compliance Matrix forms an integral part of each asset Safety Case (Safety and Operating Plan) providing a roadmap between a requirement and the substantive document that addresses the requirement.

The matrix document will be utilised as "sole source of truth" for all regulatory external audits. It will point to various supporting processes/procedures. The currency of these supporting processes/procedures will be maintained by the functional areas that own them.

3. SAFETY MANAGEMENT SYSTEM

3.1 GENERAL

Jemena management is committed to ensuring that all operations meet or exceed its corporate standards and the requirements of relevant state and federal legislation, as well as meeting customer and community expectations for the management of health, safety, environment and quality performance. This includes ensuring that assets are managed safely whilst ensuring the reliable supply of gas for the duration of the asset life cycle. The Jemena Health and Safety Policy outlines management commitments, requirements and goals for Safety performance, including the following:

- Providing a safe and healthy workplace where the risk of injury and illness is minimised;
- Having systems and processes that enhance the way our people work, thus maximising reliable performance;
- Complying with applicable statutory obligations, standards, codes of practice and other regulatory requirement relevant to our assets and our operations;
- Designing, operating and maintaining our assets in a way that protects or enhances community safety; and continuity of supply

This manual describes how Jemena achieves these safety performance goals.

3.2 ASSET MANAGEMENT SYSTEM OVERVIEW

Jemena has a certified Asset Management System (AMS) within which Safety Management is a key element. The Asset Management System provides the principle framework for the organization to direct, coordinate and control asset management activities and provides assurance that Jemena's operational, societal and environmental objectives are achieved on a consistent basis. It brings together the external influences, asset management drivers, business values and selected strategies to deliver sustained performance for the benefit of all stakeholders.

Jemena's strategic approach to asset management is explained in detail in Asset Management System Manual JEM-AM-MA-0001.

The Overall Asset Management System document hierarchy is summarised in Figure 3-1 below.

3 — SAFETY MANAGEMENT SYSTEM



Figure 3-1 Jemena Asset Management System Document Hierarchy

SAFETY MANAGEMENT SYSTEM — 3

3.3 SAFETY MANAGEMENT PROCESS

The overall Safety Management process is defined in the context of the level 2 processes, shown in Figure 3-2 below.



Figure 3-2 Jemena Asset Management Level 2 Processes
3 — SAFETY MANAGEMENT SYSTEM

3.3.1 ASSET BUSINESS STRATEGY DEVELOPMENT

3.3.1.1 Asset Business Strategy

The Asset Business Strategy (ABS) translates Jemena's organisational objectives including safety into individual Asset objectives, e.g. profitability, cash flows, desired performance, current and expected performance, etc. It is also, used to confirm with stakeholders whether the Asset is meeting their expectations.

3.3.2 ASSET PLANNING AND PRIORITISATION

Asset specific activities are prioritised and planned based on the results of asset condition and performance assessments and risk assessments to ensure the safe operation of the assets. The planning and prioritisation cascades down from Asset Class Strategies (ACS) to Asset Investment Plans (AIP) then onto Capital and Operational Work Plans (COWP) and finally to the Delivery Plans as described in the following sections. This includes the development of engineering assessments, business plans, minor business plans, etc. as required for the size of the work.

Once works are approved, the work is passed to Jemena Network Services (JNS), via a confirmed Scope of Work, within the Works Management System.

3.3.2.1 Asset Class Strategy

The ACS explains the approach and principal methods by which each asset class contributes to delivering Asset Management objectives as stated in relevant ABSs, considering the age, criticality and condition profile of the class. It may also include scenario analysis for various strategies (e.g. replacement vs. refurbishment, non-asset solutions, etc), and demonstrates how the Asset Management activities for the asset class are to be prioritised or optimised to achieve Asset Management objectives (as defined in ABS).

3.3.2.2 Asset Investment Plan

Each AIP is a response to one or more ACS, and it defines an optimum set of Asset Management activities (OpEx & CapEx with budgetary financial information) to achieve Asset Management objectives set for the Asset as defined in the relevant ACSs. The AIP sets out proposed costs and activities for the next 7 years as a feed to corporate planning and forecasting.

The content of the AIP in our new format has been substantially reduced to provide the list of proposed projects in the programs of work and explanatory notes on the prioritisation of competing programs of work and any mitigation actions required to maintain targeted risk levels.

3.3.2.3 Capital & Operational Work Plan

The COWP contains details on optimised capital and operational expenditures for next two years, linking each expenditure item to one or more Asset objective(s). It sets out the detailed programs of work, resource requirements and costs that feed the Jemena business planning and budgeting process.

3.3.2.4 Delivery Plan

The delivery plan describes how JNS will deliver to requirements of COWP including management of supply contracts, resource planning, etc. It provides assurance to Senior Management and the Board that our proposed business plan and budget can be delivered.

SAFETY MANAGEMENT SYSTEM — 3

3.3.3 ASSET PERFORMANCE AND INTEGRITY MANAGEMENT

All field work is completed by JNS under the Works Management System, as directed by Asset Planning and Prioritisation process and/or Technical Specifications. As a result of these activities, Asset Records are prepared as specified by the Work Codes or as defined by a prepared Scope of Work.

These Asset Records are utilised to carry out a series of assessment to confirm the asset condition and performance (Asset Performance and Integrity Management). These assessments are described in the following sections.

As a result of these assessments, anomalies (technical risk items that may require corrective action to ensure continued safe operation) are identified and are risk-assessed to determine criticality. These are recorded and tracked in the Risk Registers.

Risk assessments are also performed on a continuous basis as asset information is updated. The risk assessments include Safety Management Studies, Formal Safety Assessments and Hazard and Operability Studies (HAZOPS). These are described in Section 4.

3.3.3.1 Asset Condition Assessment Report

Asset condition / integrity assessments evaluate how the condition of the assets has changed over time in comparison to set targets. For example, the level of corrosion observed during inspections. The condition of the asset includes not only the physical condition but also the age and criticality of the asset.

The condition / integrity assessment reports help to inform the expected life expectancy of the asset, when preventative actions are required and if there is a need to be make changes to the frequency of inspections.

3.3.3.2 Asset Performance Assessment Report

The performance report compares the performance of the Asset Classes against set targets and identifies trends in performance. Examples of the inputs to these assessments include:

- engineering investigations and incident report findings;
- plant availability;
- failure rates or frequencies;
- Asset Performance
- reliability;
- asset-specific costs;
- mean time between failure;
- plant defects and cause codes;
- corrective maintenance rates;
- Major Incidents

3.3.3.3 Asset Control Assessment Report

Controls are processes or actions designed to eliminate, control or mitigate key business risks.

3 — SAFETY MANAGEMENT SYSTEM

The asset control assessment report evaluates the annual compliance to these controls and effectiveness of the control. This is achieved by reviewing:

- Jemena's Compliance and Risk System (JCARS);
- Planned Maintenance PM compliance;
- internal and external audits
- work in backlog; and
- rework.

3.3.3.4 Risk Register

Asset Class risk registers are used to record and track all "Above appetite risks".¹ These risks are under active management.

The risk register and identified risks are used to underpin the ACS to ensure the safe operation of the gas assets.

3.3.4 TECHNICAL SPECIFICATIONS

Technical Specifications are the suite of documentation defining the minimum technical requirements for the creation and management of gas assets to meet Jemena safety and performance objectives and legislative requirements. These specifications underpin the safety management process and are adopted in all design, construction, operational, inspection, maintenance, assessment and repair activities carried out by Jemena.

Specifications are prepared by Asset Management to address the following:

- Design and construction of pipelines, facilities and networks;
- Operational monitoring, control and response of pipelines and networks;
- Field operations and maintenance of pipelines, facilities and networks;
- Gas measurement and reconciliation.

These Technical Specification address the following:

- · Compliance with applicable codes and standards;
- Approved, "industry best practice" inspection techniques;
- · Preventative and corrective maintenance activities;
- Methods to determine frequency of activities e.g. fixed interval, risk based;
- Anomaly assessment methods;
- Repair methods.

These Specifications dictate the content for the asset specific Field Manuals, which are maintained by JNS.

JAA MA 0050 Group Risk Management Manual , refer to ALARP 'Carrot' diagram

SAFETY MANAGEMENT SYSTEM — 3

Field Manuals provide the specific activities (type, frequency and procedures) which will be carried out for the asset via Work Codes.

Works defined in the Field Manuals are inputted into the Work Management System.

3.3.4.1 Technical Change Management

Review and updates to Technical Specifications will be carried out. The suitability of any changes will be demonstrated by an assessment to ensure the change is in compliance with legislation and Jemena's objectives and all changes will be carried out in accordance with GAS-980-OM-CM-001 Change Management Manual.

3.3.5 WORKS MANAGEMENT SYSTEM

The delivery of the tasks/activities needed to operate and maintain Jemena assets is performed by the JNS Works Management System. These tasks/activities are governed by the Specifications.

3.4 SUPPORTING ELEMENTS

The key elements which support the Safety Management System process and ensures the safe operation of the gas assets are:

- Risk Management;
- Asset Integrity Assurance;
- Incident Investigation and reporting;
- Emergency Management System;
- Competency and Training;
- Management Review and System Audits;
- Asset Information Management.

These elements are described in the following sections.

4 — RISK MANAGEMENT

4. RISK MANAGEMENT

4.1 RISK MANAGEMENT PRINCIPLES

Risk Management provides the basis of Jemena's Asset Management System. Jemena's approach to risk management is described in the JEM AM GU 0007 Jemena Asset Risk Management Guideline.

Safety and performance management is ensured through the following application of risk management:

- Training of staff in Company Health Safety & Environment (HSE) systems, operations safe work systems and associated processes;
- Pre-job planning, including task step identification and job hazard analysis, involving personnel undertaking the tasks;
- Use of safe work systems including Permit to Work Procedure to ensure that no work is undertaken on the pipeline or associated facilities without appropriate control;
- · Regular workplace inspections to identify and control hazards;
- Timely reporting and investigation of hazards, near misses and incidents and the assignment of appropriate corrective and preventative action;
- Development and use of Risk Registers to identity and track risks;
- Use of pipeline and facility integrity risk review information and recommendations;
- Undertaking asset risk assessments for all new projects and where there is a change or modification to existing plant, equipment or processes, or as required by legislation. The type of hazard/risk identification and assessment process applied is dependent on the nature of the activity being assessed.

4.2 ASSET RISK ASSESSMENTS

Jemena undertakes risk assessments for all new projects and periodic risk assessment for all existing assets as required by JAA MA 0050 Group Risk Management Manual and the applicable codes and standards.

The following sections describe the risk assessments undertaken by Jemena to ensure the safe operation of the gas assets, which includes the method of assessment based on the gas asset class.

These risk assessments are undertaken to:

- Ensure, and provide assurance that the asset is operated safely;
- · Identify and assess threats to the assets that have the potential to impact on integrity;
- Identify procedural and design measures necessary to eliminate or reduce significant risks to a level regarded as either acceptable or as low as reasonably practicable (ALARP); and
- Demonstrate that the entire gas asset meets or exceeds code requirements and the level of risk is acceptable or ALARP.

The following risk assessments are performed:

4.2.1 SAFETY MANAGEMENT STUDIES

Safety management studies (SMS) identifies threats to AS 2885 pipeline systems and applies controls to them, and (if necessary) undertakes assessment and treatment of any risks to ensure that residual risk is reduced to ALARP..

Safety management studies are carried out in accordance with AS 2885.6.

Safety management studies are conducted as per AS 2885.6 requirements, which include:

- During design and construction process(as per Section 5.4 of AS 2885.6 2018);
- Periodic operational review, at intervals not exceeding five years;
- Land use change;
- Encroachment SMS;
- Change of operating conditions SMS
- Failure event SMS

4.2.2 FORMAL SAFETY ASSESSMENTS

Formal safety assessments (FSA) are used to identify specific threats and hazards associated with gas networks and metering systems and the mitigation of threats and hazards operating at or less than 1050kPa. As for SMS, FSA identify threats to the gas network and applies controls as required to ensure that the residual risk is reduced to an acceptable level.

FSA are carried out in accordance with AS/NZS 4645.1.

4.2.3 HAZARD AND OPERABILITY STUDIES

Hazard and Operability Studies (HAZOPS) are a process aimed at the systematic review to identify and assess hazards inherent in the design, operation and maintenance of the facilities. HAZOPS are carried out for all Jemena gas facilities in accordance AS IEC 61882.

4.2.4 GAS PROCESSING SAFETY

Jemena has a comprehensive review of process safety, which mirrors the SMS process. The details of which is reflected in the JAA MA 0050 Group Risk Management Manual.

Jemena has conducted HAZOP and Safety Integrity Level (SIL) studies for its gas processing facilities to ensure that process hazards are identified and their control mechanisms are reliable and functional. These studies have identified key process and instrumentation risks and testing and maintenance requirements. These risks will form the starting point for process hazard management which uses risk assessment and procedural control effectiveness principles. The process hazard management system analyses the following aspects of facility operation, as a minimum:

- Incident identification
- Review of maintenance
- Alarm Management

4 — RISK MANAGEMENT

• Technical review of Change Management System requests

4.2.5 ENCROACHMENT MANAGEMENT

Jemena employs an encroachment management system to monitor and assess the impact of developments occurring within the vicinity of gas assets. The encroachment management system uses the AS 2885.6 Safety Management Study process to assess the impact of any development and advise the proponent of the impact identified as a result of the change in land use and to define appropriate mitigation measures to be implemented.

5. ASSET INTEGRITY ASSURANCE

5.1 GENERAL

Asset safety and performance can be impacted in many ways along the lifecycle of the asset. These include a range of issues from poor design and construction to inadequate maintenance or operational procedures through to third party activities. The case for safety of the assets must therefore consider these various aspects that affect asset integrity and subsequently asset safety.

Jemena ensures gas asset system integrity by performing design, construction, commissioning, inspection, operations and maintenance activities in accordance with Jemena Specifications, practices, procedures and applicable codes and standards, as described in the following sections.

5.2 ASSET CREATION

Asset Creation involves all the Design, Construction, Procurement, Commissioning and Handover activities needed to turn a business requirement into a functional and safe asset.

Jemena Specifications covering design, construction and commissioning ensure asset integrity is enhanced during Asset Creation through reference to:

- Applicable codes and standards;
- Best industry practices;
- Jemena experience;
- Risk management principles.

5.3 INSPECTION AND MAINTENANCE

Ongoing asset integrity is monitored through inspection and enhanced through maintenance activities documented in the Field Operations and Maintenance Specification (FOMS). This includes the following key elements:

- Inspections to identify and collect relevant integrity data;
- Asset condition assessments to identify anomalies;
- Gas Asset anomalies assessment;
- Planned maintenance to maintain integrity;
- Corrective maintenance to return equipment to a safe condition.

As with other Specifications, the FOMS is updated as part of the 'plan, do, check, act cycle inherent in the AMS.

5.4 OPERATIONS

All Jemena gas assets are operating in accordance with operating manuals which define the actions to be taken in the event of normal, abnormal, and emergency operating conditions to ensure the safe operation of the assets.

5 — ASSET INTEGRITY ASSURANCE

These operating manuals and procedures for each gas asset are developed and established on the basis of the Operational Monitoring, Control and Response Specifications (OMCR).

The OMCRs provide the operational monitoring, control and fault and emergency response requirements for all Jemena gas assets in accordance with relevant legislation and Jemena's operational, societal and environmental objectives.

5.5 MANAGEMENT OF CHANGE

All gas asset modifications are required to follow the requirements of GAS-980-OM-CM-001 Change Management Manual. The change management process includes the following activities.

In circumstances when a modification is necessary, the GAS-980-OM-CM-001 Change Management Manual is followed. In this instance, the suitability of the modification shall be demonstrated through a documented assessment which will ensure all relevant inputs and implications on existing facilities are considered

All modifications work is carried out in accordance with Jemena Safe Work practices, as defined in Section 5.6.

Reference to Change Management procedures is provided in the Compliance Assurance Matrix.

5.6 SAFE WORK SYSTEMS

Jemena operates safe work systems to ensure high levels of health and safety and ensuring the environment is maintained when work is carried out on gas assets. The activities and processes that Jemena employ to ensure all field work is carried out safely is described below.

Risk assessment for field operations are carried out in advance of the operations to identify threats to the assets and confirm adequate controls have been included in the work procedures to mitigate any residual risk to acceptable levels. The most typical risk assessments include the following:

- Construction Work Safety Management Studies/Risk Assessments in accordance with AS2885.1;
- In-service welding risk assessments in accordance with AS 2885.2 and WTIA Technical Note 20;
- Hot tapping risk assessment.

Hazard Identification and Risk Assessments (HIDRA) are performed prior to operations to address threats to personnel and confirm adequate controls are established within the work procedures to reduce any residual risk to acceptable levels.

Jemena operates a Permit to Work (PTW) system for work carried out on all Jemena gas assets. The PTW System is an additional procedural control employed for site works involving high levels of risk when working with any pipeline or its facilities to ensure high levels of health, safety and the environment are maintained. Types of Permit to Work include:

- Cold Work Permit;
- Hot Work Permit;
- Excavation Permit;
- Confined Space Entry Permit
- Critical Work Permit

ASSET INTEGRITY ASSURANCE — 5

References to the Safe Work Systems is referenced in the Compliance Assurance Matrix.

6 — INCIDENT INVESTIGATION AND REPORTING

6. INCIDENT INVESTIGATION AND REPORTING

Within the Asset Management System, Jemena utilises an Incident Management System for logging incidents. The management of the incident investigation is completed through JAA HSE PR 003 Investigating Incidents Procedure where appropriate persons are tasked with investigation of the incident.

Jemena has established procedures for identifying, notifying, recording, investigating and reporting accidents or incidents resulting from the operation and maintenance of the assets. This includes any event associated with the pipeline or facility that either causes or has the potential to cause:

- Injury or death to pipeline personnel or the public
- Significant damage to the environment
- · Significant impact on the pipeline's operation or integrity

These procedures provide for feedback to ensure appropriate preventative actions are implemented in the Safety Management process.

Reference to Jemena Incident Investigation and Reporting procedures is provided in the Compliance Assurance Matrix.

EMERGENCY MANAGEMENT SYSTEM — 7

7. EMERGENCY MANAGEMENT SYSTEM

Jemena maintains an Emergency Management Plan (EMP) which provides a common emergency management structure surrounding an event which is impacting on the business and has been classified as being an emergency.

This EMP and its annexes, are prepared to support the actions of an established Emergency Management Team (EMT) and Area Management Team (AMT), and include the following elements:

- Effective decision-making for significant incident and emergency events;
- Effective identification, assessment and escalation of events;
- Effective recording of EMT/ AMT actions and decisions:
- Supports the post-event review of EMT/AMT management to support recommendations for future improvement; and
- Provision of training.

This EMP provides guidance on EMT processes and the roles and responsibilities of team members during an event and describes the structure of the EMT and AMT. This includes the process of escalation, activation and mobilisation to provide a state of readiness for effective deployment and response.

The EMP and other supporting documentation is referenced in the Compliance Assurance Matrix.

8 — COMPETENCY AND TRAINING

8. COMPETENCY AND TRAINING

Jemena has systems in place to ensure that it's management, supervisors, employees and contractors are recruited appropriately, have the necessary skills and knowledge and are competent to operate and maintain the facilities in compliance with Jemena safety objectives.

Competency procedures address the following to ensure the safe operation of the gas assets:

- Appropriate employee selection;
- Engineering and Asset Management staff competency;
- Field staff technical and HSE competency;
- · Contractor management;
- Employee performance review and development.

Reference to Competency and Training Procedures is provided in the Compliance Assurance Matrix.

9. SYSTEM AUDITS

Management review and auditing activities are part of Jemena's continual improvement process as outlined in the Asset Management System. These activities incorporate the principles of 3 lines of defence. Along with asset assessments, AMS monitoring, compliance management and incident investigations, these audits assure that the AMS is providing the necessary outcomes to meet Jemena's objectives.

Reference to system audit activities and procedures is provided in the Compliance Assurance Matrix.

The audits related to the gas safety management systems are described below.

9.1 EXTERNAL AUDITS

Jemena complies with external audit regimes as relevant, to monitor and evaluate the level of compliance. This may include:

- Auditing of the Safety and Operating Plans (SAOPs), Pipeline Management Plans (PMP), Safety Cases, Safety Management Plans, Safety Management Schemes and Environmental Management Plans associated with the gas assets;
- Auditing the accuracy of compliance obligation;
- Acting upon deficiencies identified in the audit in a timely manner;
- The inclusion of audit results in management reviews;
- Non-conformance, Corrective and Preventative Action Plans.

9.2 INTERNAL AUDITS

Jemena carries out internal audits to monitor and evaluate compliance to technical safety requirements. This includes:

- Auditing of the Safety Management Plans, SAOPs, Safety Management Schemes and Environmental Management Plans associated with the various assets under management;
- Scheduling of audits in order of the importance of the activities and associated risk and the results of
 previous audits taking into account scheduled external regulatory audits;
- Acting upon deficiencies identified in the audit in a timely manner;
- The inclusion of audit results in management reviews;

9.3 AUDIT FOLLOW UP AND CONTINUOUS IMPROVEMENT

JCARS action progress is tracked through the dashboard and followed up by respective General Managers and also highlighted in the monthly key performance indicator (KPI) reports. The Risk & Assurance function reviews the outcomes of these actions following the closure of each action item.

10 — SAFETY PERFORMANCE MANAGEMENT AND GOVERNANCE

10. SAFETY PERFORMANCE MANAGEMENT AND GOVERNANCE

Safety performance is managed and governed through the preparation of asset safety performance reports, the results of which are reported through a number of established safety committees. This safety performance management and government process is described below.

The Safety Council provides overall HSE leadership and assists Jemena to fulfil its overall responsibilities in relation to HSE matters as they affect workers (employees and contractors), customers and the community. Membership of the Council includes the Managing Director as the Chair, all Executive General Managers and the General Manager Safety and People.

The HSE Council has established an Asset and Public Safety Committee (APSC), which monitors and reports on the effectiveness of strategies and practices to manage asset and public safety risks. The APSC includes all Asset Management and Delivery General Managers as well as representatives from HSE and the Corporate Risk Management team. On behalf of the APSC, the APSC chair reports to the HSE Council on the APSC's activities and on the safety performance of Jemena gas (and electricity) assets.

The APSC oversees a number of operational and review committees which have specific objectives, including the Gas Safety and Management Review Committee (GSMRC). Through the GSMRC, the APSC reviews and monitors the operation of gas safety management processes and systems to ensure they deliver to the Jemena objectives.

The GSMRC oversee the following asset and public safety elements as detailed in the committee charter:

- Technical policies, procedures and work instructions;
- Regulations, codes, standards and contractual compliance;
- Audit and incident investigations;
- Performance, integrity and condition monitoring;
- Good industry practice, research and innovation.

The GSMRC reports to the APSC, on a quarterly basis, the current status of the asset and public safety program and management system including:

- Performance against KPIs;
- · Trend analysis of significant events;
- Major incident logs and major incident review completed;
- · Formal Safety Assessments and Safety Management Studies;
- · Legislative and regulatory compliance;
- · Status of relevant management system audit or corrective actions;
- Changes to the status of risks and controls.

The GSMRC is supported by Jemena's AS 2885 Pipeline Code Committee and the AS 4656 Code Committee.

SAFETY PERFORMANCE MANAGEMENT AND GOVERNANCE — 10

These are operational level committees with the purpose of developing operational excellence across all gas infrastructure assets governed by the AS 2885 suite of standards for gas pipelines and facilities and AS 4645 suite of standards for gas networks.

Performance reports are prepared at the operational level for the gas assets, which relate performance to a number of KPIs, including:

- Reportable incidents;
- · Gas releases;
- Response time;
- Encroachments;
- Cathodic Protection performance;
- Third party hits;
- Pipeline defects;
- · Pipeline patrols;
- Maintenance completion.

11 — ASSET INFORMA

11. ASSET INFORMATION MANAGEMENT

Information management, which supports asset management process including decision making, reporting and activities, is fundamental to the assured safe performance of the assets.

Jemena has established record management plans for the identification, preparation, collection, storage, transfer and disposal of information pertinent to the safe operation of the assets. This information includes the following:

- Engineering records including pipeline design, construction records, change requests, engineering assessments, operating condition data, welding qualifications, communication systems data, drawings, risk assessments, HAZOPs, easement information, location class review, Remaining Life Review, maps, coating inspections, pipeline inspections (both internal and external), cathodic protection, hydrotest and commissioning reports;
- Operations and maintenance records including inspection and test records, surveillance records, quality and integrity data from forms;
- Audit records of field operations, work practices, competency details, health, safety and environment performance data;
- Operational reports as required by the company and by regulators;
- Incident reports and corrective action reports;
- · Work management system data including work orders and completion reports;
- Health and safety including meeting minutes, safety grams, safe work method statements (SWMS), audits and environmental issues.

Jemena utilises a Geographic Information System (GIS) to manage pipeline information, landowner management, crossing notifications, field data capture, pipeline inspections and other asset information. The GIS allows users to view, query, analyse and map information related to the asset and surrounding land, and provides access to the following types of data:

- As-built pipeline data;
- Pipe & weld traceability recorded during construction;
- Above ground & below ground features near pipeline;
- Right of Way information / environmental / land management data / Inspection records;
- Safety Management (AS 2885) information including. Location Class;
- Aerial photography.

The overall principles of Asset Information management is addressed in the AMS Manual. Reference to the asset information Management procedures are provided in the Compliance Assurance Matrix.

Appendix C Compliance Assurance Matrix

Note: Inclusions of compliance matrix pdf

No	Standard	Requirement Title and Detail	How do we address the requirement – additional information	Supporting artefacts /procedures / processes
1	AS2885.3 Cl.2.3.2.1	 Management - Policy and commitment Policy and commitment The PMS shall detail the licensee's approach to the various aspects of managing a pipeline system as required by this Standard. The PMS shall include statements demonstrating the licensee's commitment to the following key aspects: (a) Integrity management. (b) Process safety management. (c) Environmental management. (d) Occupational health and safety management. 	Jemena is committed to being the customer's choice for world leading, reliable and sustainable energy solutions. Jemena has in place a comprehensive set of policies approved by its board to be implemented by management including Asset Management Policy and HSE Policies.	JAA LEG PO 0001 Group_Compliance_Policy JEM PO 0001 Jemena Asset Management Policy SGSPAA Health, Safety, Environment & Quality Policy JAA HSE PO 0001.pdf (sharepoint.com) Gas Process Safety Terms of Reference GSMRC Terms of Reference
2	AS2885.3 Cl.2.3.2.2 & Cl.2.3.2.3	 (e) Legan and regulatory requirements. Management - Structure The Licensee shall have a defined organization structure for the management of the pipeline system. Management - Responsibilities, Accountabilities and Authorities The responsibilities, accountabilities and authority levels of defined roles with respect to the various aspects of the management of the pipeline system shall be detailed in the PMS. In particular, roles shall be identified and documented with the responsibility and authority to: (a) initiate action to prevent, and if required correct, a loss of integrity, damage to the environment, impact to public, interruption to supply, or an occupational health and safety issue; (b) identify and report on any existing or potential deficiencies within the PMS; (c) initiate, recommend and approve corrective and preventative actions relating to identified existing or potential deficiencies within the PMS; (d) evaluate and verify the effectiveness of any corrective or preventative action implemented; and (e) satisfy the mandatory approval requirements of this Standard.	The asset management structure is broadly described in section 9 of the AMS manual. Further details in element 7 of the safety case and safety management manual. In addition to this, as required by the standard, Jemena has established AS 2885 Document Approvals Structure to meet necessary compliance (refer Document Approvals Matrix)	Note : Asset Management System Manual provides an approach to the activities undertaken by AM to manage the lifecycle of its assets, to ensure optimum outcomes.Asset Management System Manual Group intranet - Home (sharepoint.com) Organisation ChartGAS-999-PA-DM-004 GAS AS 2885 Document Approvals Structure
3	AS2885.3 Cl.2.3.2.4	Management - Training and competency The PMS shall identify the requirements and processes for establishing, maintaining and providing for the training needs of all roles performing functions covered by the PMS. This should include consideration of the operational environment, the identification of any gaps in competency and the necessary training to enable personnel to fulfil their duties	Jemena has comprehensive Learning and Development Processes in place to meet ongoing training and competency needs . These are met through several processes. The details of which can be demonstrated by a member of the Jemena Learning and Development team. In addition, People leaders have responsibility to ongoing management of competency and support. Sever tools are available to support the training and competency requirements. Learning includes Success Factors, Competency Framework. Passport (Contractors).	Asset Management System Manual – Section 9Jemena Learning & Development WebsiteGas Competency and Training FrameworkAM Competency FrameworkG-HR-PR-50389Plan Implement and MonitorCompliance Training

No	Standard	Requirement Title and Detail	How do we address the requirement – additional information	Supporting artefacts /procedures / processes
1	AS2885.3 Cl.2.3.2.1	 Management - Policy and commitment Policy and commitment The PMS shall detail the licensee's approach to the various aspects of managing a pipeline system as required by this Standard. The PMS shall include statements demonstrating the licensee's commitment to the following key aspects: (a) Integrity management. (b) Process safety management. (c) Environmental management. (d) Occupational health and safety management. (e) Legal and regulatory requirements. 	Jemena is committed to being the customer's choice for world leading, reliable and sustainable energy solutions. Jemena has in place a comprehensive set of policies approved by its board to be implemented by management including Asset Management Policy and HSE Policies.	JAA LEG PO 0001 Group_Compliance_Policy JEM PO 0001 Jemena Asset Management Policy SGSPAA Health, Safety, Environment & Quality Policy JAA HSE PO 0001.pdf (sharepoint.com) Gas Process Safety Terms of Reference GSMRC Terms of Reference
2	AS2885.3 Cl.2.3.2.2 & Cl.2.3.2.3	 Management - Structure The Licensee shall have a defined organization structure for the management of the pipeline system. Management - Responsibilities, Accountabilities and Authorities The responsibilities, accountabilities and authority levels of defined roles with respect to the various aspects of the management of the pipeline system shall be detailed in the PMS. In particular, roles shall be identified and documented with the responsibility and authority to: (a) initiate action to prevent, and if required correct, a loss of integrity, damage to the environment, impact to public, interruption to supply, or an occupational health and safety issue; (b) identify and report on any existing or potential deficiencies within the PMS; (c) initiate, recommend and approve corrective and preventative actions relating to identified existing or potential deficiencies within the PMS; (d) evaluate and verify the effectiveness of any corrective or preventative actions relating to implemented; and (e) satisfy the mandatory approval requirements of this Standard. 	The asset management structure is broadly described in section 9 of the AMS manual. Further details in element 7 of the safety case and safety management manual. In addition to this, as required by the standard, Jemena has established AS 2885 Document Approvals Structure to meet necessary compliance (refer Document Approvals Matrix)	Note : Asset Management System Manual provides an approach to the activities undertaken by AM to manage the lifecycle of its assets, to ensure optimum outcomes. Asset Management System Manual – Section 9 Group intranet - Home (sharepoint.com) Organisation Chart GAS-999-PA-DM-004 GAS AS 2885 Document Approvals Structure
3	AS2885.3 Cl.2.3.2.4	Management - Training and competency The PMS shall identify the requirements and processes for establishing, maintaining and providing for the training needs of all roles performing functions covered by the PMS. This should include consideration of the operational environment, the identification of any gaps in competency and the necessary training to enable personnel to fulfil their duties	Jemena has comprehensive Learning and Development Processes in place to meet ongoing training and competency needs . These are met through several processes. The details of which can be demonstrated by a member of the Jemena Learning and Development team. In addition, People leaders have responsibility to ongoing management of competency and support. Sever tools are available to support the training and competency requirements. Learning includes Success Factors, Competency Framework. Passport (Contractors).	Asset Management System Manual – Section 9Jemena Learning & Development WebsiteGas Competency and Training FrameworkAM Competency FrameworkG-HR-PR-50389Plan Implement and MonitorCompliance Training

No	Standard	Requirement Title and Detail	How do we address the requirement – additional information
4	AS2885.3 Cl.2.3.2.5	 Management – Resourcing The PMS shall identify the process for determining and managing the resourcing, equipment and material requirements for the pipeline systems' operation and maintenance. NOTE Where the pipeline system is in continuous operation, sufficient personnel should be available to undertake planned and unplanned operations and maintenance, allowing for absences due to leave and training. 	Resourcing is undertaken via specific processes within the AMS. The purpose of the plan is to assess and formulate the delivery strategy. It analyses of the ability of the business to deliver the program of work and including the delivery approach. This Delivery Plan provides the framework to deliver the projects specified in the Asset Investment Plan (AIP) and an assessment of the deliverability of the Capital Programme of Works including the delivery approach.
5	AS2885.3 Cl.2.3.2.6	 Management - Change management The PMS shall identify a process, in accordance with AS 2885.0, for managing, reviewing and approving changes. In the operational phase, change management is required if the engineering design is being upgraded or modified, or if there is any operational, technical or procedural change to the measures in place which — (a) protect the pipeline system; (b) promote public awareness of the pipeline system; (c) operate and maintain the pipeline system safely; (d) provide for the response to emergencies; (e) prevent and minimize loss of containment; (f) prevent loss of supply (f) carry out monitoring and inspections in accordance with the requirements of Sections 5 to 8; (g) ensure that the plans and procedures continue to conform to the engineering design; and (h) ensure that operation and maintenance personnel are aware of the change and are adequately trained. 	The purpose of Change Management is to ensure that no new hazards are unknowingly introduced and that the risks of hazards to employees, the public or the environment are reduced to As Low as Reasonably Practicable (ALARP). The AMS documents Jemena's change management procedures to address changes to asset (i.e. design, process, projects etc). Examples include Engineering Change Management, Field Technical Change and Acts & Regulations Change. A SharePoint site has been developed to implement the process by which engineering changes (ECR) to physical assets are controlled from initiation to completion as well as work flowing Technical queries (TQ) including field technical queries
6	AS2885.3 Cl.2.3.2.7	Management – Review of the PMS The PMS shall identify procedures for a regular review of its effectiveness and appropriateness. The pipeline management system shall be reviewed and, if necessary, updated, at least every 2 years or in the event of any change to the pipeline management system elements (as detailed in Clause 2.2 and 2.3). NOTE: For example, updating of the pipeline management system may be necessary when there are changes to legislative requirements, Licensee, or organization structure.	Gas Safety Management Review Committee . The purpose of this committee is to monitor and report on the effectiveness of strategies and practices to manage risks associated with the safe operation of all gas network and pipeline assets in accordance with the charter. The meetings are held quarterly and are supported by an operating charter and minutes with retained within the process. Follow-up of decisions and actions are supported by several process within Jemena.

Supporting artefacts /procedures / processes
Asset Management System Manual – Section 6.4
Asset Investment Plan
Asset Management System (AMS) Intranet Site
Asset Management System Manual – Section 10.4
GAS-980-OM-CM-001 Change Management Manual
Change Management System - Landing page
(sharepoint.com)
JEM RCM PR 0001 Managing Compliance Tasks in
JCARS Procedure
JEM PR 0047 Acts & Regulation Change Procedure

Asset Management System Manual – Section 10.7

GSMRC ECMS Link

GSMRC Terms of Reference

No	Standard	Requirement Title and Detail	How do we address the requirement – additional information	Supporting artefacts /procedures / processes
7	AS2885.3 Cl.2.3.3.2	 Planning - Planning for normal operation The PMS shall identify the process for: (a) Preparation for operation of new or recommissioned pipeline systems, in accordance with Section 3. (b) Identification of occupational health and safety, and environment hazards and mitigation of risks as described in Section 4 prior to the commencement of any activity. (c) Identification of threats and mitigation of risks to the pipeline system integrity in accordance with Sections 6, 7 and 8. Pipeline operating procedures shall be in place for all operational activities that may impact the reliability of the pipeline system and the safety of personnel and the public. 	Jemena Asset Strategy Gas with its asset classes define planning requirements from Design Basis Manuals, Operational and Maintenance Specifications, Risk Management Guidelines etc. These culminate in workplans which are managed in SAP.	Asset Management System Manual – Section 5 JEM AM GU 0007 Asset Risk Management Guideline GAS-999-OM-HSE-002 Safe Work System Manual GAS-999-PR-RM-002 Procedure for 5 Yearly Operational Safety Management Studies JEM AM GU 0007 Asset Risk Management Guideline Asset Management System Intranet
8	AS2885.3 Cl.2.3.3.3	 Planning - Planning and preparation for abnormal operations The PMS shall identify a process for operation of the pipeline system in circumstances that are different from those initially considered during the design or during significant disruption to normal operations. These circumstances may include the following: (a) Operating under backup power supplies. (b) Operating without key assets such as compressors or pumps. (c) Operating at no flow, low flow, pressure or line pack levels. NOTE For no flow conditions, the process should identify when pipeline becomes suspended rather than in abnormal operations, see Clause 10.8. (d) Operating under communication outages. (e) Operating under alternative conditions to maintain safety of a damaged pipeline system. The process should consider and document the period for which abnormal operations can be sustained without additional controls in place. 	 Jemena Asset Strategy Gas with its asset classes define planning requirements from Design Basis Manuals, Operational and Maintenance Specifications. This Operational Monitoring, Control & Response (OMCR) Specification is a part of the Jemena Asset Management System. This specification outlines the operational monitoring, control and response requirements for the Gas Distribution Assets managed and operated by Jemena. This document ensures consistency across all Jemena gas distribution assets for operational monitoring, control and response activities and ensure accordance with relevant legislation and Jemena's operational, societal and environmental objectives. It defines the following key operational aspects: Maximum operational control limits for the gas distribution systems including receipt and delivery facilities. Key monitoring requirements Operational envelopes and limits for normal and abnormal operational conditions Functionality associated with normal and abnormal configurations and configurations. 	Asset Management System Manual – Section 5 GAS-960-SP-NC-002 Gas Distribution Operations, Monitoring, Control & Response Specification GAS-799-SP-NC-502 Colongra Operations Monitoring Control and Response (OMCR) Specification
9	AS2885.3 Cl2.3.3.4	Planning – Isolation Plan The PMS shall identify an isolation plan in accordance with AS/NZS 2885.1. The plan shall cover the pipeline system. The isolation plan shall be reviewed for currency at intervals not exceeding 5 years to ensure it remains valid throughout the operational life of the pipeline system.	The requirement is addressed by asset specific Pipeline Isolation Plans with review frequency in line with AS2885.	Colongra Lateral Pipeline GAS-799-PA-PL-003 GAS-1090-PA-PL-001 – Licence 1 Pipeline (Central Trunk) Isolation Plan GAS-1190-PA-PL-001 – Licence 2 Pipeline (Southern Trunk) Isolation Plan GAS-1295-PA-PL-001- Licence 3, 7, 8 Pipeline (Northern Trunk) Isolation Plan GAS-1400-PA-PL-001 – Sydney Primary System (SPM & SPL) Isolation Plan GAS-1410-PA-PL-001 – Western Sydney Primary Isolation Plan GAS-1415-PA-PL-001 – Wollongong Primary Isolation Plan

No	Standard	Requirement Title and Detail	How do we address the requirement – additional information
10	AS2885.3 Cl.2.3.3.5	Planning - Emergency planning and preparation The PMS shall identify a process for managing emergency events resulting from the pipeline system's operation and maintenance and from external events that may affect the safe and reliable operation of the pipeline system, in accordance with Section 11.	Jemena Asset Strategy Gas with its asset classes define planning requirements from Design Basis Manuals, Operational and Maintenance Specifications and Operations Monitoring & Control Specification. Also refer to implementation (Section 11) requirements within this matrix.
11	AS2885.3 Cl 2.3.3.6	Planning – Records Management The PMS shall identify a process for managing records resulting from the pipeline system's operation and maintenance in accordance with Section 12.	Jemena applies various tools and systems towards management of asset records. These include ECMS, SharePoint, SAP, ASPiRE, Omnia, Learning and Development and the Gas Pipelines, Facilities, Networks and Measurement Records Management Plan. An intranet site has been created for easy retrieval of critical records.
12	AS2885.3 Cl 2.3.4	 Measurement and evaluation 2.3.4.1 General The PMS shall identify the process for measurement and evaluation of the performance of the pipeline system. 2.3.4.2 Performance evaluation The PMS shall identify a process to monitor trends in the operation and performance of the pipeline system. The process shall also describe the actions taken when monitored trends exceed defined limits. NOTE System controls, particularly those defined as critical controls, should have defined performance standards. Performance against those standards should be monitored. 	Jemena's approach to defining, acquiring and evaluating data is outlined section 5 of the AMS. Key Performance metrics and data requirements are defined in the ACS. Monitoring requirements is defined within performance and integrity process The requirement is addressed by several Jemena Artefacts and as relevant/applicable to the specific 2885 asset. Jemena Asset Strategy Gas with its asset classes define planning requirements from Design Basis Manuals, Operational and Maintenance Specifications. Asset Information corresponding to pipeline's operation and performance is retained in relevant asset records.
13	AS2885.3 Cl.2.3.4.3	 Measurement and evaluation – Accident or incident investigation and reporting The PMS shall describe the processes for identifying, investigating, recording and reporting, accidents or incidents that either cause or have the potential to cause — (a) injury or death to operating and maintenance personnel or the public; (b) significant or material damage to the environment; or (c) significant impact on the pipeline system's operation or integrity. 	Jemena addresses this requirement through its asset management system, incident and emergency management processes. This is addressed vis several tools and systems including ASPiRE, ICAMS, Crisis and Emergency procedures / systems.

Note: Assets Operating above 1050kPa, refer to AS 2885 requirements. Assets Operating below 1050kPa, refer AS 4645 requirements.

Supporting artefacts /procedures / processes Asset Management System Manual – Section 5 Asset Management System Intranet GAS-999-PR-IN-001 AS2885 Pipeline Anomaly Assessment Procedure GAS-960-SP-ME-019 Gas Distribution AS2885 Field Operations and Maintenance Specification (FOMS) Group Business Resilience - Home (sharepoint.com) JAA NSO FW 0002 Crisis and Emergency Management Framework JAA NSO PL 0003 Jemena Emergency Management Plan JAA NSO PR 0001 Alerts & Notification Procedure Asset Management System Manual – Section 8 GAS-999-PA-DM-001 Gas Pipelines, Facilities And Metering Records Management Plan.pdf Enterprise Content Management - JAA CAP GU 0003.pdf - All Documents - Grouped (sharepoint.com) JGN/evoenergy Critical Records (sharepoint.com) Asset Management System Manual – Section 5 and 10.5 Asset Class Strategies GAS-999-GL-RM-001 GSMRC Operating Charter **GSMRC** Intranet Link **Operational Reports** Asset Specific Annual Performance and Integrity Report (APAIR) Process. Asset Management System Manual – Section 10.7 JEM HSE PR 0032 Management of Health & Safety Risk & Legal Obligations Registers JEM PR 0110 W I1 0HSE External Incident Notification Aspire Incident Investigation & Reporting System JAA NSO PR 0001 Alerts & Notification Procedure

Νο	Standard	Requirement Title and Detail	How do we address the requirement – additional information
		NOTE Accident and incident investigations should identify relevant root causes and corrective actions to address these root causes.	
14	AS2885.3 CI.2.3.4.4	Measurement and evaluation - System audits The PMS shall identify a process for establishing audits to confirm conformance with the requirements for the PMS and validate the effectiveness of the controls, plans and processes it references. The outcomes of audits shall be documented and approved. NOTE AS/NZS ISO 9001 and ISO 19011 provide auditing guidance.	Jemena Asset Risk and Assurance has a process in place for internal and external audits for all Jemena managed gas assets. These audits have a primary intent to satisfy internal and external audits requirements as part of the pipeline management system. AMS system audits, Asset Risk and Assurance audits augmented by external regulatory audits and several audit actions tools including OMNIA provides a review for effectiveness of the system. A copy of the audit plan and an extract of the most recent periodical SAOP audit is included (on request) in Appendix D of the SAOP.
15	AS2885.3 CI 2.3.4.5	 Measurement and evaluation - Corrective and preventive action 2.2.5.5 Corrective and preventive action The PMS shall identify the process for determining, approving and implementing corrective and preventative actions. NOTE Corrective actions are taken to deal with an existing issue, while preventive actions address potential issues. The basis and expected effectiveness for any action shall be approved. 	Jemena AMS and Gas Safety Management Manual(GSMM) Jemena Compliance and Risk System (OMNIA) is the primarily system of corrective and preventive actions. The process is supported by additional artefacts such as procedures and other monitoring tools within OMNIA to enable better management oversight. In addition there are other systems and processes within Jemena that support the corrective and preventive actions. e.g. ASPiRE.
16	AS2885.3 Cl 2.3.5	Consultation, Communication and Reporting The PMS shall identify the process for consultation with, and communication and reporting to, identified stakeholders	Jemena and Evoenergy engage several methods to communicate consult and report including statutory reporting. The process is robust and uses latest IT tools, mobile solutions and Intranet sites. Other means include team meetings, dashboards, townhalls etc, including management review process. external reporting normally is coordinated through the relevant approval processes and document approvals structure. Landholder liaison and council liaison are managed on a periodical basis.

Supporting artefacts /procedures / processes

JEM HSE PR 0151 Jemena Incident Investigation Procedure

Asset Management System Manual – Section 10.8

<u>Asset Risk and Assurance Internal Audit Plan</u> (Electricity, Gas and Water)

JEM-AM-PL-0006 Generic RAA Internal Audit Plan

Asset Management System Manual – Sections 6 and 10.9

Asset Risk and Assurance Internal Audit Plan (Electricity, Gas and Water)

Aspire Incident Investigation & Reporting System

OMNIA Action Plans

JAA HSE PR 0003 Jemena Investigating Incidents Procedure

<u>Asset Management System Manual</u> – Section 10.10 Jemena Business Applications (OMNIA, Aspire)

Group Business Resilience - Home (sharepoint.com)

Regulatory Reporting and General Notifications Annual Reports (NSW Technical Regulator) Annual Reports (ACT – UTR & ICRC)

Landowner - stakeholder engagements

JEM FPF PL0012 Landholder & Stakeholder Engagement

No	Standard	Requirement Title and Detail	How do we address the requirement – additional information
17	AS2885.3 CI 3.2	 Preparation for operation and environment management (AS2885.3 Section 3) 3.2 Preparation requirements A process shall be established to coordinate the engagement of stakeholders and the preparation of the pipeline system for precommissioning, commissioning, handover and ongoing operation. Preparations for operation shall only be deemed complete when the plans and procedures set out in this Section have been implemented. A detailed handover process shall be undertaken including the involvement of key operating personnel 	Jemena Project Management Methodology includes the construction and commissioning processes. Project Gating ensure necessary administrative and technical controls are obtained, implemented and made available before an asset is transitioned into normal operation/maintenance – including as-built records.
18	AS2885.3 Cl 3.3	Preparation for operation and environmental management (AS2885.3 Section 3) 3.3 Preparation for periodic reviews of management documentation. Document Max Interval PMS 5 years Isolation plan 5 years Fit for purpose assessment 10 years PIMP 5 years Fracture resistance assessment 5 years ERP 2 years SMS periodic operational review 5 years LOCATION CLASS (WITH SMS) 5 years APPROVALS structure 1 year	AS2885 key documents and documentation intervals are in line with the requirements of Cl3.3. The PMS is represented by this Safety Case whilst the PIMP is governed by the Asset Management System as detailed in the Compliance Assurance Matrix "AS2885.3:2022 – Matrix of PIMP Requirements and Jemena's application through AMS documents for JGN and Evoenergy AS2885 assets "
19	AS2885.3 Cl3.4	 Preparation for operation and environmental management (AS2885.3 Section 3) 3.4 Environmental management The PMS shall identify and assess where the operation of the pipeline system has the potential to cause harm to the environment. Mitigation activities to avoid, minimize, or mitigate the risk including any residual requirements from design and construction shall be detailed in the PMS 	The requirement is addressed by the Group Operational Environmental Management Plan and asset specific OEMP annexes
20	AS2885.3 Section 4	Site Safety Management (AS2885.3 Section 4)	Jemena HSEQ Management Systems largely provides the basis for personnel working under safe systems of work. Mandatory HSEQ requirements to mitigate the risks associated with the critical hazards common across its operations, in line with WHS Regulations and Industry Codes of Practice are provided as part of a HSEQ suite of documents – Refer to HSEQ intranet. Several work instructions e.g. SWMS, etc provide a trigger for field operatives to perform a routine review of site HSE risks before any work activity is performed. The Network Accreditation and Compliance group is responsible for validating and issuing field inductions, passports and authorities as required for employees and contractors.

Supporting artefacts /procedures / processes
<u>Project Delivery Centre Intranet</u> / PMM Gating Portal – Jemena 7 Step Gating online management portal Asset Management Manual – Section 5 <u>Asset Management System (AMS) Intranet Site</u>
Refer to individual documents

GAS-999-PA-EV-002 Group GAS Operational Environmental Management Plan (OEMP)

JGN PL 0065 ActewAGL OEMP

Asset Management System Manual – Section 5

HSEQ Management Website

Pages - Network Accreditation and Compliance (sharepoint.com)

Environment Management (sharepoint.com)

No	Standard	Requirement Title and Detail	How do we address the requirement – additional information
21	AS2885.3 Section 5	Pipeline System Integrity Management (AS2885.3 Section 5)	Pipeline Integrity Management The requirements for a PIMP are covered through the application of Jemena's AMS. The integrity management approach and actions are defined in the Asset Class Strategies (ACS),
		Please refer to Section 5 of the AS2885.3 Standard.	operationalised through the OMCRS & FOMS, and assessed annually through the APAIR. Management review and assurance over the integrity management approach is provided through the GSMRC and APSC. In addition the 5 yearly SMS a detailed strategic review of the adequacy of the integrity management approach and actions.
			Refer to the AS2885.3:2022 – Matrix of PIMP Requirements and Jemena's application through AMS documents for JGN and Evoeenrgy AS2885 assets.

Supporting artefacts /procedures / processes
Asset Management System Manual – Section 10.6
GAS-960-DG-PL-001 Pipeline Design Guide
GAS-999-DG-FA-001 HO Facilities Design Guide
GAS-799-PA-IN-004 Colongra Lateral Pipeline (CLP) Pipeline Integrity Management Plan
 Asset specific plans / procedures for: Pipeline Isolation Fracture Control DSN-00171-01 PL8, DSN00170-01 PL7, DSN-00167-01 PL1, DSN001168-01 PL2, DSN-00169-01 PL3, DSN00174-01 PPM.
Pipeline Repair

	Standard	Requirement Title and Detail	Jemena Processes/procedures/artefacts addressing the requirements	Pro
22	AS2885,3 Section 8	Station Operation and Maintenance (Section 8) Please Refer Section 8 of the AS2885.3 Standard	Jemena delivers safe and reliable station Operations and Maintenance through the development of O&M specifications and manuals as outlined in the AMS. The artefacts include field operation and maintenance specifications, Operational Monitoring, Control and response Specifications, field operation manuals.	Ass GA GA Op GA GA
23	AS2885.3 Section 11	Emergency response preparedness (Section 11) Please Refer Section 11 of the AS2885.3 Standard	The purpose of emergency management is to manage an adverse event or series of events, which has the potential to impact on employee, public safety or loss of supply. Emergency procedures have been established and implemented to minimise any consequences resulting from incidents. Jemena Emergency Management Plan defines emergency processes and the roles and responsibilities of team members during an event. This includes the process of escalation, activation and mobilisation to provide a state of readiness for effective deployment and response. The Crisis & Emergency Management Training & Exercise framework provides a standardised approach to crisis and emergency management training and exercising (simulations) and supports crisis and emergency preparedness.	Ass Gro JAA JAA
24	AS2885.3 Section 12	Implementation - Records management (Section 12) Please Refer Section 12 of the 2885.3 Standard	Jemena applies various tools and systems towards management of asset records. These include ECMS, SAP, ASPiRE, Drawbridge. Critical records are retrievable from the JGN/Evoenergy Critical Records SharePoint site.	Ass GA Ent OOC JGN Asp Jen
25	AS4645.1:2018 Section 2.4.2 Elements of SAOP	 The <u>framework</u> of the SAOP shall <u>include or reference</u>, but not be limited to, the following: (a) Administrative requirements: (i) Scope and objectives of the SAOP. (ii) Review period for the SAOP. (iii) The process for auditing in accordance with Clause 10.3. 	 AMS and GSMM defines how Jemena addresses the management of safety requirements of its gas assets Framework of the SAOP (a) Administrative requirements (i) Safety case purpose and objectives of the plan is set out in this safety case. (ii) Refer to section 7 of the SAOP. (iii) Jemena Asset Risk and Assurance has a process in place for internal audit for Jemena Assets. These audits have a primary 	Fra ii

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set Management System Manual – Section 7.2

<u>S 960 DG PL 001 Pipeline Design Guide</u>

S=960-SP-ME-037 Gas Markets AS2885 Field erations & Maintenance

S-999-DG-FA-001 HO Facilities Design Guide

AS-960-SP-ME-019 Gas Distribution AS2885 Field erations and Maintenance Specification (FOMS)

set Management System Manual – Section 7.4

oup Business Resilience - Home (sharepoint.com)

NSO PL 0003 Jemena Emergency Management Plan

NSO PR 0001 Alerts & Notification Procedure

set Management System Manual – Section 8

S-999-PA-DM-001 Gas Pipelines, Facilities And etering Records Management Plan.pdf

erprise Content Management - JAA CAP GU 03.pdf - All Documents - Grouped (sharepoint.com)

N/evoenergy Critical Records (sharepoint.com)

pire Incident Investigation & Reporting System

<u>nena Intranet</u>

nia

mework of the SAOP

- a) Administrative requirements
- Refer to section 1 of this document "Safety Case Purpose & Objectives"
- i. Refer to section 7 of SAOP.
- i. <u>Asset Risk and Assurance Internal Audit Plan</u> (Electricity, Gas and Water)

	Standard	Requirement Title and Detail	Jemena Processes/procedures/artefacts addressing the requirements	Pro
		(b) Description (by listing) of primary legislation, codes and standards of design and construction, maintenance and operation of the gas distribution network.	 intent to satisfy Jemena internal audits requirements as part of the pipeline management system. (b) Primary legislation, codes and standards of design and construction, maintenance and operation of the gas distribution network are specified within this safety case. 	
26	AS4645.1:2018 Section 2.4.2 Elements of SAOP	Description of gas network (c) Description of the gas distribution network physical scale and dimensions, including (i) Geographical location and spread. (ii) Materials used for mains. (iii) Length and diameter of mains. (iv) Materials used for services. (v) Number of services. (vi) Operating pressures. (vii) Number and technical outline of city gates affecting the safety of the system and gas supply. (viii) Number and technical outline of network pressure control systems. (c) The operating parameters of the gas distribution network in sufficient detail to allow assessment of the risks from loss of supply and over-pressure of supply	Jemena prepares a description of each gas asset (according to jurisdiction in which the asset operates) and is included in appendix A of the safety case A description of JGN's gas assets including geographical location, pipeline system specifications, facility components and operating pressures is provided in Appendix A of this safety case. Up to date maps of the gas network are maintained in Jemena GIS system and can be accessible via the Before You Dig Australia process for anyone working in the vicinity of JGN's gas assets. The BYDA process is defined in procedure "GAS-1999-SP-ME-001" and the BYDA website. Records are maintained in accordance JGN/Evoenergy critical Records Share Point site and GAS-999-PA-DM-001 Gas Pipelines, Facilities and Metering Records Management Plan.	Refe NSV 001 <u>GAS</u> <u>Mai</u> <u>Net</u> GAS
27	AS4645.1:2018 Section 2.4.2 Elements of SAOP	 (e) Accountabilities and resources: (i) A description of the organization structure and responsibilities of key positions including the positions with approval authorities as required by this Standard. (ii) Description of the responsibilities for participants in the gas supply chain with respect to consumer education and public awareness programs, including information on how to report gas leaks or other gas related occurrences on the gas distribution network, such as broken main or service, leaks in public areas. (iii) Description of the resources to safely operate and maintain the system throughout its lifecycle. These resource details may include— (A) numbers, competence (in accordance with Clause 2.5) and span of control over the necessary workforce; (B) description of other necessary resources; (C) means to ensure that resources are monitored and maintained; and (D) system support availability and backup provisions. (iv) Description of the means utilized to ensure that all persons involved in critical activities within design, construction, operation, monitoring and 	The asset management structure is broadly described in section 9 of the AMS manual. Further details in element 7 of the safety case and safety management manual. Information for reporting gas leaks etc is available on the Jemena's website.	<u>Jem</u>

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(b) Primary legislation and standards are detailed in the Executive Statement to this safety case and section 2 of Jemena's Safety Management Manual as detailed in this safety case.

fer to Appendix A for description of gas network.

W ACT Mapping Operations Manual GEO-GAS-PR-

<u>S-1999-SP-ME-001 AS4645 Field Operations and</u> <u>intenance Specification (FOMS) - JGN Distribution</u> twork <1050KPA

fore You Dig Australia Website

S-999-PA-DM-001 Gas Pipelines, Facilities and stering Records Management Plan

set Management System Manual – Section 9

nena Organisation Chart

	Standard	Requirement Title and Detail	Jemena Processes/procedures/artefacts addressing the requirements	Pro
		maintenance of the gas distribution network are competent to carry out their duties.		
28	AS4645.1:2018 Section 2.4.2 Elements of SAOP	 (f) Outcomes of FSA, including: (i) The threat identification, consequence and likelihood assessment and level of risk from each threat. (ii) The controls identified via FSA to ensure that all risks are eliminated or reduced to an acceptable level during the lifecycle of the gas distribution network. (iii) FSA outcomes and the controls in the SAOP framework shall be linked through utilizing a risk register or other appropriate means. 	Risk Register (asset specific)Risk AssessmentThe Asset Risk Management Guideline details the safety management processes implemented within Jemena to manage the asset in a safe manner including providing a line of sight from corporate level risk to asset based risks. The purpose of this document is to provide guidance on the application of appropriate asset risk management processes to ensure the safety, reliability and affordability of Jemena managed assets throughout their lifecycle.Formal Safety Assessment (asset specific) 	<u>JEM</u> <u>GAS</u> <u>Proo</u> Wes
29	AS4645.1:2018 Section 2.4.2 Elements of SAOP	 (g) Functional requirements, specifications, plans, procedures, designs, including: Functional requirements in accordance with Clause 3.3. II. The methods for control, identification and traceability for materials and equipment in accordance with Clause 4.5. 	 The AMS with relevant ACS, design basis manuals, FOMS and OMCR provides the framework to address this requirement Jemena has developed and implemented technical specifications to manage the design, construction, and operations and maintenance of network assets. These are summarised as follows: Refer to following information. II. Approved Materials and Equipment Lists have been developed to ensure that only appropriate equipment is used in the network. Traceability is via SAP and relevant material supply build standard. The process includes engineering approval for any new equipment. 	i. ii.

Note: Assets Operating above 1050kPa, refer to AS 2885 requirements. Assets Operating below 1050kPa, refer AS 4645 requirements.

1 AM GU 0007 Asset Risk Management Guideline

S-999-PR-RM-001 Formal Safety Assessment (FSA) ocedure

estern Sydney Green Gas Hydrogen Hub FSA

labar Biomethane Plant FSA

- Functional Requirements have been incorporated in the following procedures.
- i. Approved Materials & Equipment
 - Approved Materials List (≤1050kPa)
 - Approved Equipment List (≤1050kPa)
 - Approved material list of low and medium pressure systems (≤500kPa)
 - Distribution System Approved
 Equipment List For networks with an
 MAOP less than 500kPa

Standard	Requirement Title and Detail	Jemena Processes/procedures/artefacts addressing the requirements	Procedure
	 III. Effective processes for the control of construction and commissioning activities to ensure that they are implemented in accordance with the specifications. IV. Operational and maintenance plans, processes and/or procedures, including— a. requirements for third party liaison; 	 III. Appropriate construction and commissioning processes have been developed to ensure that the gas distribution network and network elements are installed in a safe controlled manner. The Project Management Methodology is used for large projects whilst routine construction are based on the Construction Field Manual. IV. Operational & Maintenance Plans, processes, procedures a. Third Party Liaison processes have been implemented to manage engagement activities. 	 Site specific Bill of Material (BOM) for district regulator sets and I&C meter sets Approved materials list for corrosion mitigation Construction & Commissioning GAS-999-OM-GD-002 Construction Field Manual Project Delivery Centre Intranet PMM Gating Portal
	b. maintenance;c. work practices;d. permit to work;	 b. Maintenance is based on SAP work orders being developed from the asset class strategies. Maintenance activities are defined in the Operations Field Manual. c. Work Practices review and audit ongoing works installations d. Permit to Work process has been established for transmission assets whilst AS 4645 activities are based on risk control detailed in the Operations Field Manual and field risk management process. 	 iv. Operational & Maintenance Plans, processes, procedures a) Third Party Liaison Property Portfolio Landholder & Stakeholder Engagement Strategy Stakeholder Engagement Plan ACT (Gas) b) Refer to Appendix D for schedule
	 e. leakage management, including the classification of leaks; f. condition monitoring; and g. capacity management. 	 e. Leakage Management is a key control to the safe operation of the asset as provides an input into the condition monitoring process of the asset. For more information refer to item 30.5 – PICARRO. f. Annual Condition Assessments are undertaken for all Jemena managed gas assets. It uses a combination of integrity data and operational reports to determine the condition of the asset. Monitoring is performed via 	 e) <u>GAS-1999-SP-ME-001 AS4645 Field Operations</u> and Maintenance Specification (FOMS) - JGN Distribution Network <1050KPA f) Annual condition assessments are undertake via the yearly APAIR process
	h. Competency of personnel	 condition of the asset. Monitoring is performed via monthly operational reports. Gapacity Management involves the ongoing pro-active monitoring of network pressures across networks to ensure that gas pressures are capable of meeting forecast demand including load modelling. h. Competency of Personnel. Jemena has comprehensive Learning and Development Processes in place to meet 	g) <u>GDN 1999 SP DN 001 Capacity Design</u> Specification Manual

Note: Assets Operating above 1050kPa, refer to AS 2885 requirements. Assets Operating below 1050kPa, refer AS 4645 requirements.

ongoing training and competency needs. The	an ave met
(v) Description of the quality specification for the gas to be delivered including the safe range and/or limits of relevant gas characteristics.through several processes including Success Competency Framework. Passport (Contractor)	Factors,)rs)
(vi) Description of the odorant and detection levels of odorant. (v) Gas quality specification is detailed later in this m	iatrix.
(vii) The emergency plan for implementation in the event of emergencies in accordance with section 9. (vi) As above.	
(viii) The process for establishment and maintenance of a system of emergency load management to mitigate the consequences of a gas supply failure. (vii) Refer to emergencies section detailed later in this	s matrix.
(ix) The process for investigation of failures and the subsequent analysis for their implications on the management of risk. (viii) Emergency load management is the process of co- asset owners customers during times of short sup process is tested periodically and implemented w required.	ontacting the oply. This /hen
(ix) The purpose of investigating failures is to ensur- incidents of failures of piping and components in distribution system are investigated, and docum appropriate manner, and any trends analysed.	e that all າ the ented in an
 (xi) For each system or process identified by FSA as critical control the risk, the network operator shall utilise a process of monitoring and review of system performance to ensure that the system continues to operate as designed. (x) Jemena applies various tools and systems toward management of asset records. These include, EC SharePoint, SAP, ASPiRE, OMNIA, Leaning and Detect. 	ls IMS, evelopment,
 (xii) Description of change management processes. These processes shall address— the technical basis for any proposed change impact of change on safety and health of personnel, plant and environment; modifications to operating or maintenance procedures; necessary time period for the change; and authorization requirements for the proposed change, if applicable 	itor network perational indition These uirements of 1. procedures to pjects etc). al Change for
A to E.	
	xii
30 Additional Requirements AS4645 Additional Requirements	

Note: Assets Operating above 1050kPa, refer to AS 2885 requirements. Assets Operating below 1050kPa, refer AS 4645 requirements.

- h) <u>Pages Network Accreditation and Compliance</u> (sharepoint.com)
 - AM Competency Development
 - JEM PR 0101 Technical Training

- (ix) <u>GAS-1999-SP-ME-001 AS4645 Field</u> Operations and Maintenance Specification (FOMS) - JGN Distribution Network <1050KPA
 - (x) <u>GAS-999-PA-DM-001 Gas Pipelines,</u> <u>Facilities And Metering Records</u> <u>Management Plan.pdf</u>
 - <u>Enterprise Content Management JAA</u> <u>CAP GU 0003.pdf - All Documents -</u> <u>Grouped (sharepoint.com)</u>
 - <u>JGN/evoenergy Critical Records</u> (sharepoint.com)
 - (xi) <u>GAS-999-GL-RM-001 GSMRC Operating</u> <u>Charter</u>
 - (xii) JEM PR 0026 Field Technical Change & Implementation Process

Field	Technical	Change	Intranet 3	Site

	Standard	Requirement Title and Detail	Jemena Processes/procedures/artefacts addressing the requirements	Ρ
		 The following requirements (may already have been included elsewhere in this matrix) are provided to simplify understanding that the requirements have been addressed by specific procedures. 1. Purging 2. Isolated Mains 	 Purging procedures are developed to ensure that any purging operation carried out during commissioning/degassing of a distribution system meets the requirements of AS4645. The process is detailed in the following procedure. Isolated mains are assets which are not utilised for gas transportation and are still owned by the asset owner and remain in the Asset Register. Isolated mains are valuable assets because of their potential for reuse at some time in the future and shall be preserved for that purpose. 	G № JE
		 Means of Conformance High Risk Area Identification 	Means of conformance is managed via risk management processes. A high risk area is an area that requires a higher level of safety management. High risk areas are locations where there is a higher density of public usage over what is considered normal usage. High risk areas require an isolation plan to enable safely stopping gas escape during any incident or emergency. These high risk areas are leakage surveyed on a yearly basis.	
		5. Leakage Management via PICARRO	 PICARRO - A new methodology for leakage management was implemented for JGN during 2024. The new technology is known as PICARRO which is capable of identifying and analysing methane and traces gases in real-time vehicle mounted surveys. It is far more sensitive and better able to estimategas emissions directly by rapidly identifying, quantifying and pinpointing the leak location via GPS. In support of JGN's emissions reduction strategy to reduce CO2 emissions, PICARRO is a proactive method of identifying leaks rather than relying on pubic reported leaks and leakage surveys where 20% of the network was surveyed annually. PICARRO enables the entire JGN network (consisting in excess of 26,000kms) to be leakage surveyed annually. 	
31	Schedule 1 - Safety and operating plans of Gas Supply (Safety and Network Management) Regulation 2022	 Gas Supply (Safety and Network Management) Regulation 2022 General provisions of safety and operating plan The following general matters must be included in a safety and operating plan a) the objectives of the plan, b) a description of the management structure of the network operator, c) a schedule identifying each person designated by the network operator as being responsible for the development, approval and implementation of the plan, d) identification of the distribution districts to which the plan applies and of the procedures set out or referred to in the plan that apply only in relation to a particular distribution district, e) a description of the gas network, and its operation and maintenance, within each distribution district, f) a statement that all procedures set out or referred to in the plan are in place and have been tested and proved. 	 AMS and GSMM defines how Jemena addresses the management of safety requirements of its gas assets General Provisions a) Safety case purpose and objectives of the plan is set out in this safety case. b) Refer to the Intranet / Approvals Structure and Jemena Organisation Framework- JEM HR GU 0001, Position Descriptions, etc. c) Refer to Section 7, Governance (Management Review & Assurance) d) Refer to Appendix A e) Refer to Appendix A f) All procedures referred to in this safety case have been tested and proved. 	G

Note: Assets Operating above 1050kPa, refer to AS 2885 requirements. Assets Operating below 1050kPa, refer AS 4645 requirements.

AS-1999-SP-ME-001 AS4645 Field Operations and Aaintenance Specification (FOMS) - JGN Distribution Aletwork <1050KPA

EM AM GU 0007 Asset Risk Management Guideline

ieneral Provisions

- a) Refer to Section 1 Safety Case Purpose & Objectives
- b) JEM HR GU 0001 Jemena Organisation Framework
- c) Refer to Section 7, Governance (Management Review & Assurance)
- d) Refer to Appendix A
- e) Refer to Appendix A and Field Operations Maintenance Specifications
- f) Refer to Section 5.3

	Standard	Requirement Title and Detail	Jemena Processes/procedures/artefacts addressing the requirements	Pro
			(c) Primary legislation, codes and standards of design and construction, maintenance and operation of the gas distribution network are specified within this safety case.	
32	Schedule 1 - Safety and operating plans of Gas Supply (Safety and Network Management) Regulation 2022	 Gas Supply (Safety and Network Management) Regulation 2022 – 2. Description of gas network A description of the gas network, and its operation and maintenance, within each distribution district of the network operator must include the following— a) the range of supply pressures applied within each distribution district, b) a description of the gas works within each distribution district, c) references to maps showing the location of the gas works and the procedures for accessing the maps, d) the following in relation to engineering records maintained by the network operator— (i) a description of the records, (ii) the location of the records, (iii) the procedures for maintaining, filing and accessing the records 	 Jemena prepares a description of each gas asset (according to jurisdiction in which the asset operates) and is included in appendix A of the safety case A description of JGN's gas assets including geographical location, pipeline system specifications, facility components and operating pressures is provided in Appendix A of this safety case. Up to date maps of the gas network are maintained in Jemena's GIS system and can be accessible via the Before You Dig Australia process for anyone working in the vicinity of JGN's gas assets. The BYDA process is defined in procedure "GAS-1999-SP-ME-001" and the BYDA website. Records are maintained in accordance JGN/Evoenergy critical Records Share Point site and GAS-999-PA-DM-001 Gas Pipelines, Facilities and Metering Records Management Plan. 	Refe NSW 001 <u>GAS</u> <u>Main</u> <u>Netw</u> GAS Met
33	Schedule 1 - Safety and operating plans of Gas Supply (Safety and Network Management) Regulation 2022	Gas Supply (Safety and Network Management) Regulation 2022 3 Analysis of hazardous events (1) An analysis of hazardous events must be prepared in relation to each distribution district of the network operator unless subclause (2) applies. (2) A common analysis of hazardous events may be prepared in relation to those distribution districts of the network operator that possess the same characteristics from which the risk of hazardous events may be identified. (3) If a new gas network is to be constructed or an existing gas network extended, an analysis of hazardous events must be prepared in relation to the construction or extension before its construction is commenced. (4) An analysis of hazardous events must, consistent with the size and complexity of each distribution district or proposed distribution district, concerned: (a) identify the range of supply pressures applied within each distribution district, as the case may be), and (b) systematically identify hazardous events, and (c) identify the potential causes of those events, and (d) identify the possible consequences of those events, and (e) specify operational, maintenance and organisational measures intended to protect operating personnel, plant, equipment, 	Jemena risk management process, AMS, risk management guideline, GSMM, The FSA is a systematic review to identify and assess hazards inherent in the lifecycle of a gas distribution network. The FSA documents the controls that are in place to manage these hazards and demonstrates the safe systems of work for the management of all hazards and risks in its business and to the public and environment. It is conducted over a 5 year cycle or as required depending on activities at the time. Outcomes may result in works procedures, maintenance regimes and methodologies. Risk Assessment The Asset Risk Management Guideline details the safety management processes implemented within Jemena to manage the asset in a safe manner including providing a line of sight from corporate level risk to asset based risks. The purpose of this document is to provide guidance on the application of appropriate asset risk management processes to ensure the safety, reliability and affordability of Jemena managed assets throughout their lifecycle.	GAS Proc Also

Note: Assets Operating above 1050kPa, refer to AS 2885 requirements. Assets Operating below 1050kPa, refer AS 4645 requirements.

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 (a) Primary legislation and standards are detailed in the Executive Statement to this safety case and section 2 of Jemena's Safety Management Manual as detailed in this safety case.

er to Appendix A for description of gas network.

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S-1999-SP-ME-001 AS4645 Field Operations and intenance Specification (FOMS) - JGN Distribution work <1050KPA

ore You Dig Australia Website

S-999-PA-DM-001 Gas Pipelines, Facilities and tering Records Management Plan

S-999-PR-RM-001 Formal Safety Assessment (FSA) ocedure

o include technical management guideline??

1 AM GU 0007 Asset Risk Management Guideline

	Standard	Requirement Title and Detail	Jemena Processes/procedures/artefacts addressing the requirements	Pro
		 the community and the environment. (5) The operational and maintenance measures must include a maintenance schedule indicating, among other things, the type and frequency of inspections, coating surveys and checks on cathodic protection devices (if such coatings or devices are used). (6) In the case of new gas networks or extensions to existing networks, an analysis of hazardous events should also take into account hazardous events that may occur during construction. 	 5) SAP specifies the maintenance regime for all assets. GAS-960-SP-ME-019 AS2885 Field Operations and Maintenance Specification GAS 1999 SP ME 001 AS 4645 Field Operations and Maintenance Specification GAS-960-SP-NC-001 Gas Pipelines - Operational Monitoring, Control and Response Specification GAS-960-SP-NC-002 Gas Networks - Operational Monitoring, Control and Response Specification 	
34	Schedule 1 - Safety and operating plans of Gas Supply (Safety and Network Management) Regulation 2022	 (7) A safety and operating plan must include a description of the methodology to be used to conduct an analysis of hazardous events. Gas Supply (Safety and Network Management) Regulation 2022 4. Emergencies ((1) A safety and operating plan must identify the emergency procedures to be implemented by the network operator to ensure an effective response to emergencies. (2) The types of emergencies in respect of which procedures must be implemented include (as a minimum): 	The purpose of emergency management is to manage an adverse event or series of events, which has the potential to impact on employee, public safety or loss of supply. Emergency procedures have been established and implemented to minimise any consequences resulting from incidents. The Emergency Management Plan provides guidance on emergency	Jem Intra JEM JEM
		 (a) fires, explosions, leaks and impacts (with particular reference to those caused by the activities of other parties), and (b) natural disasters, and (c) civil disturbances. A safety and operating plan must identify the procedures implemented by the network operator that ensure: (a) all emergency procedures have been tested and proved, and (b) all emergency procedures are reviewed and tested on a regular basis 	processes and the roles and responsibilities of team members during an event. This includes the process of escalation, activation and mobilisation to provide a state of readiness for effective deployment and response. The Crisis & Emergency Management Training & Exercise framework provides a standardised approach to crisis and emergency management training and exercising (simulations) and supports crisis and emergency preparedness.	<u>Trai</u>
35	Schedule 1 - Safety and operating plans of Gas Supply (Safety and Network Management) Regulation 2022	Gas Supply (Safety and Network Management) Regulation 2022 5. Gas quality The gas quality standards to be applied must include standards relating to the following: (a) heating value, (b) relative density, (c) composition and purity.	Jemena Sydney and Melbourne Control Centres monitor on a continuous basis, the quality of the gas entering the gas network. The analysis is performed by the gas chromatographs installed at each receipt point, and values are fed into the SCADA system.	Ope
36	Schedule 1 - Safety and operating plans of Gas Supply (Safety and Network Management) Regulation 2022	Gas Supply (Safety and Network Management) Regulation 2022 6. Procedures for ensuring gas is malodorous A safety and operating plan must— (a) identify the procedures to be implemented by the network operator to ensure that gas conveyed or supplied has a distinctive and unpleasant odour, and (b) specify the odoriferous substances to be used, and (c) specify the odour intensities		
37	Schedule 1 - Safety and operating plans of Gas Supply (Safety and Network Management) Regulation 2022	Gas Supply (Safety and Network Management) Regulation 2022 7. Procedures for testing gas (1) A safety and operating plan must identify the procedures to be implemented by the network operator to ensure that gas conveyed or supplied: a) meets the relevant gas quality and pressure standards, and b) complies with the relevant gas specification.	Gas Quality Before any shipper can require a transportation service, Jemena will require the prospective user to demonstrate that it has arrangements in place to ensure gas presented at a receipt point for transportation will conform to the gas quality specifications. Gas quality is monitored and measured via the SCADA system. Reporting of out of specification	<u>GAS</u> <u>Mair</u> <u>Net</u> v

Note: Assets Operating above 1050kPa, refer to AS 2885 requirements. Assets Operating below 1050kPa, refer AS 4645 requirements.

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nena Crisis Emergency Management & Security ranet site

1 PL 0013 Jemena Emergency Management Plan

<u>A PL 0014 Crisis and Emergency Management</u> ining and Exercise Framework

erational Monitoring, Control & Response

<u>S-1999-SP-ME-001 AS4645 Field Operations and</u> intenance Specification (FOMS) - JGN Distribution twork <1050KPA</u>

	Standard	Requirement Title and Detail	Jemena Processes/procedures/artefacts addressing the requirements	Pro
		 (2) A safety and operating plan must specify: a) the equipment to be provided and maintained by or on behalf of the network operator for the testing of gas (including the order of accuracy of results the equipment delivers), and b) the place or places at which the equipment is to be kept, and c) how often calibration tests are to be conducted on the equipment to ensure its accuracy, and d) how often gas testing is to be carried out. 	gas is provided to the appropriate regulator and based on the Emergency Management Response Plan. Continuous monitoring of gas quality is carried out by gas chromatographs (GC). These GCs are auto calibrated daily and manually calibrated monthly. Calibration results and equipment are maintained at the Meter Centre. Witness tests are performed at the Custody Transfer stations on a regular basis as per SAP.	
			Odorant Monitoring and measuring the performance of the odorant dosing specification is done through alarms, Logs and gas sampling including monitoring from data acquisition via SCADA at Longford, Port Kembla , Rosalind Park, NGSF and Young. Monthly sampling are undertaken at extremities to validate the presence of odorant for JGN and yearly sampling for Evoenergy. Refer to procedures for more information on odorant management including responsibility matrix.	
38	Schedule 1 - Safety and operating plans of Gas Supply (Safety and Network Management) Regulation 2022	Gas Supply (Safety and Network Management) Regulation 2022 8. Procedures for connection of gas supply to a gas installation A safety and operating plan must identify the procedures to be implemented by the network operator to ensure that gas installations are safe for the connection or reconnection of the supply of gas	The Jemena Network Operator Rules have been established to ensure the safe installation, operation and repair of the consumer service for assets in NSW. The prime objective of the Network Operator Rules is to provide for the safe connection of natural gas to a property from Jemena's natural gas reticulation network in NSW. The steps undertaken to ensure that those persons are adhering to the relevant standards, codes, specifications and the requirements of the Jemena Network Operator Rules include the following: a. Work to be done only by certified and licensed Gas Fitters. This is verified by an on line check via the NSW Government Licensing Service that the Gas Fitter is licensed to do the work prior to the issue of any meters. b. Certificate of compliance provided on completion of work. c. Leak test certificate provided on completion of work. d. Ensuring that relevant certificate of compliance and leak test certificates are received by Jemena.	Jen
39	Schedule 1 - Safety and operating plans of Gas Supply (Safety and Network Management) Regulation 2022	Gas Supply (Safety and Network Management) Regulation 2022 9. Plan must incorporate any relevant management system standards A safety and operating plan must incorporate any management system standards that are relevant to the management of a gas network (for example, standards relating to document control, record management, and procedures for conducting audits and management reviews).	Jemena has an Asset Management System in place (in alignment with ISO 55001).	Jer <u>As</u>
40	Schedule 1 - Safety and operating plans of Gas Supply (Safety and Network Management) Regulation 2022	Gas Supply (Safety and Network Management) Regulation 2022 10. Codes and standards If a network operator has departed from any standards that it was required to take into account under clause 6 (2) of this Regulation when designing, constructing, operating or extending its gas network, or any part of its gas network, the safety and operating plan must contain an explanation of: a) the extent of the departure, and	Not Applicable for EVO or JGN Assets in this instance. Where required, the process will follow AS 4645 and AS 2885. Requirements and sufficient basis for such deviations/departure will be maintained with appropriate consultation with the relevant jurisdictional Technical Regulatory organisation.	

Note: Assets Operating above 1050kPa, refer to AS 2885 requirements. Assets Operating below 1050kPa, refer AS 4645 requirements.

mena Network Operator Rules

mena certification to ISO 55001 system sset Management System Manual

	Standard	Requirement Title and Detail	Jemena Processes/procedures/artefacts addressing the requirements	Pro
		 b) the arrangements in place to ensure that an equivalent or safer outcome has been achieved despite that departure. 		
41	Schedule 1 - Safety and operating plans of Gas Supply (Safety and Network Management) Regulation 2022	Gas Supply (Safety and Network Management) Regulation 2022 11 Meters, regulators and other basic metering equipment A safety and operating plan must require devices or equipment used in the gas network, including basic metering equipment— (a) to be suitable for the design working pressure of the part or parts of the network in which it is used, and (b) if installed, to be installed to not interfere with metering accuracy	Jemena has developed a series of design basis manuals covering the design of gas distribution networks . It has implemented a proactive process to monitor network pressures across networks and sub-networks to ensure gas pressures in each are capable of meeting current and future forecasts in demand. Accordingly metering equipment have been designed and selected based on recommended pressures in accordance with a minimum inlet guaranteed network pressure. The process is defined in the referenced procedures. The requirement for pressure regulators operating with an outlet pressure exceeding 35kPa is also defined in the operational manual.	GAS Bas GDN Mar GDN Mar GAS Des GDN Mec GAS Mai Net
42	Schedule 1 - Safety and operating plans of Gas Supply (Safety and Network Management) Regulation 2022	 Gas Supply (Safety and Network Management) Regulation 2022 12 Network operator rules (NSW) (1) A safety and operating plan must set out rules about the way in which work to which this Regulation, section 10 applies must be carried out (the network operator rules). (2) The network operator rules must be no less stringent than a code of practice or standard that is applied to the work by the regulations under the Act. (3) A safety and operating plan must identify— (a) procedures that provide for the authorisation of persons to carry out the work, and (b) steps to be taken to ensure those persons comply with the network operator rules in carrying out the work 	 The Jemena Network Operator Rules have been established to ensure the safe installation, operation and repair of the consumer service for assets in NSW. The prime objective of the Network Operator Rules is to provide for the safe connection of natural gas to a property from Jemena's natural gas reticulation network in NSW. The steps undertaken to ensure that those persons are adhering to the relevant standards, codes, specifications and the requirements of the Jemena Network Operator Rules include the following: e. Work to be done only by certified and licensed Gas Fitters. This is verified by an on line check via the NSW Government Licensing Service that the Gas Fitter is licensed to do the work prior to the issue of any meters. f. Certificate of compliance provided on completion of work. g. Leak test certificate provided on completion of work. h. Ensuring that relevant certificate of compliance and leak test certificates are received by Jemena 	Jem
43	Schedule 1 - Safety and operating plans of Gas Supply (Safety and Network Management) Regulation 2022	Gas Supply (Safety and Network Management) Regulation 2022 13 Identification of ownership of pipes A safety and operating plan must identify procedures to be implemented by the network operator to ensure that the network operator can identify its pipes if necessary, for example, during an emergency.	Pipes are identified within Jemena's GIS System.	Geo
44	Schedule 1 - Safety and operating plans of <i>Gas Supply (Safety</i>	8. Network operator to nominate person-in-charge	Processes have been established to assure that a Person-In-Charge is notified to the NSW Technical Regulator including changes in personnel.	Nor

Note: Assets Operating above 1050kPa, refer to AS 2885 requirements. Assets Operating below 1050kPa, refer AS 4645 requirements.

S-1799-DG-EQ-001 Metering Equipment Design sis Manual

N 1999 SP DN 001 Capacity Design Specification nual

N 1999 DG DN 001 JGN - Secondary Systems Design nual

S-1999-GD-DN-003 Network Pressure Control sign Basis Manual Part 1 - District Regulator Sets

N 1999 DG DN 002 JGN - ActewAGL - Low And dium Pressure System Design Manual

S-1999-SP-ME-001 AS4645 Field Operations and intenance Specification (FOMS) - JGN Distribution twork <1050KPA

nena Network Operator Rules

<u>oPlus Portal (jemena.com.au)</u>

mination of Person In Charge
Standard	Requirement Title and Detail	Jemena Processes/procedures/artefacts addressing the requirements	Pro
and Network Management) Regulation 2022	(1) A network operator must, within 7 days after the date of the grant of an authorisation or licence to operate a gas network, nominate a contact person (the <i>person-in-charge</i>) for the gas network by written notice to the Secretary.	Details of the Person-In-charge are specified in Section 7 Governance (Management Review & Assurance) of the SAOP/PMP.	



AS2885.3 Reference	Detail Reference	Requirement	Jemena Document	Comment	Records / Assessment
Section 6: Pipeline Structural Integrity	Section 6.2 – Structural Integrity Management	To maintain the structural integrity of the pipeline, all threats that may impact the pipe wall shall be identified. This includes assessment of high consequence areas, availability of pipeline pressure records and fracture resistance assessments.	GAS-960-SP-NC-002 Gas Distribution Operations, Monitoring, Control and Response	The OMCR document outlines the requirements for the Gas distribution assets managed and operated by Jemena. a) Gas Quality b) Operating pressures, temperatures and flowrates (pipeline parameters – overpressure protection)	Logged data in Control Centre Jemena pipelines are monitored in real time by the SCADA / alarms

Note: Assets Operating above 1050kPa, refer to AS 2885 requirements. Assets Operating below 1050kPa, refer AS 4645 requirements

AS2885.3 Reference	Detail Reference	Requirement	Jemena Document	Comment	Records / Assessment
		Pipeline operation and control shall be continually monitored while the pipeline is in operation to ensure that pipeline structural integrity is maintained.	GAS-960-SP-ME-019 AS2885 Field Operations and Maintenance Specifications GAS-4999-SP-ME-001Evo Energy – AS2885 Field Operations and Maintenance Specification	The Field Operations and Maintenance (FOM) document outlines the requirement for field operation and maintenance of AS2885 assets. Section 4: Pipeline operation and pressure settings.	
	Section 6.4 Integrity threat mitigation & monitoring	Credible threats shall have multiple independent controls applied to mitigate the threats. All controls shall have their process of implementation and monitoring documented and the effectiveness criteria detailed. The effectiveness of all controls shall be defined, measured, and documented.	GAS-960-SP-ME-019 AS2885 Field Operations and Maintenance Specifications GAS-4999-SP-ME-001Evo Energy – AS2885 Field Operations and Maintenance Specification	Section 5.2 Cathodic Protection details regarding the CP inspection and frequencies	CP survey results and bond checks maintained in ECMS Cathodic Protection Control Effectiveness Report is prepared annually for each asset for JGN. GAS-999-RP-IN-003 - Annual JGN Pipelines APAIR provides annual pipeline condition based on the status of pipeline CP, coating, ILI, direct
			GAS-999-PA-PL-002 Asset Class Strategy – JGN Pipelines GAS-4999-PA-IN-008 Evo Energy – Asset Class Strategy Pipeline 2020 – 2026	Discusses about Jemena strategy for corrosion mitigation for piggable and non-piggable pipelines	GAS-4999-RP-IN-003 - Annual Evo Energy Pipeline Asset Performance and Integrity Report – based on the status of pipeline CP, coating, ILI, direct inspection & exposed mains.
	Section 6.3 Pipe Wall Integrity	Threats to the PIPELINE SYSTEM that might impact the pipe wall shall be identified. Where the most current SMS identifies threats (a) to (e) as credible, the PIMP (AMS system) shall reference the mitigations. The Licensee shall implement process and procedures to monitor and assess pipe wall integrity to maintain the required wall thickness Wall thickness and structural integrity is maintained to prevent leakage at the MAOP	GAS-960-SP-ME-019 AS2885 Field Operations and Maintenance Specifications GAS-4999-SP-ME-001 Evo Energy – AS2885 Field Operations and Maintenance Specification	 Section 6.1 – Planned Maintenance details about Jemena's inspections to manage pipe wall integrity and their frequencies In-Line Inspections Direct Inspections (based on DCVG and ILI) 	 GAS-999-RP-IN-003 JGN Pipelines APAIR provides annual pipeline condition based on the status of pipeline CP, coating, ILI, direct inspection & exposed mains GAS-4999-RP-IN-003 Evo Energy Pipeline Asset Performance and Integrity Report – July 2020 – June 2021 Appendix B – Direct Inspection Field Report (prepared for each integrity dig) ILI Reports from vendors after each ILI campaign.
			GAS-999-PA-PL-002 Asset Class Strategy – JGN Pipelines GAS-4999-PA-IN-008 Evo Energy – Asset Class Strategy Pipeline 2020 – 2026	Sections 4.1 and 4.2 provides condition of the pipeline wall integrity for piggable and non- piggable pipelines	

AS2885.3 Reference	Detail Reference	Requirement	Jemena Document	Comment	Records / Assessment
	Section 6.5 Integrity Assessment Techniques	Periodic inspections of the pipe wall shall be carried out to determine whether preventative maintenance controls have been effective. The frequency of inspection shall be determined and detailed. Periodic inspections shall be carried	GAS-960-SP-ME-019 AS2885 Field Operations and Maintenance Specifications GAS-4999-SP-ME-001 Evo Energy – AS2885 Field Operations and Maintenance Specification	As above. Section 6.1 and Section 6.2 of FOMS provide Jemena's planned and corrective maintenance requirements.	GAS-999-RP-IN-003 JGN Pipelines APAIR provides annual pipeline condition based on the status of pipeline CP, coating, ILI, direct inspection & exposed mains (Section 3 and Section 5)
		out to identify actual or potential factors that could affect the integrity of the pipeline. These include in-line inspections, pressure testing, direct and indirect assessments and leak detection.	GAS-999-PA-PL-002 Asset Class Strategy – JGN Pipelines GAS-4999-PA-IN-008 Evo Energy – Asset Class Strategy Pipeline 2020 – 2026	Sections 4.1 and 4.2 provides condition of the pipeline wall integrity for piggable and non-piggable pipelines	
Section 7: Pipeline Corridor Management	Section 7.2 External Interference Management	 Pipeline Corridor management includes managing external interference, external load, vegetation, other first and third party activities which have the Safety Management Study to be carried out in accordance with the requirements of AS2885.1 (will be updated to AS2885.6 in new edition) The Licensee shall establish and implement procedures to monitor the effectiveness of the threat mitigation controls and to identify any new pipeline corridor threats and document any such threats. Procedural controls, by definition, apply to pipeline corridor threats. In this clause, these controls and the associated management systems may also apply to other threats covered under pipeline corridor management The Licensee shall establish a liaison program to communicate to the community and stakeholders the presence of the pipeline and the importance of the integrity of the pipeline for the safety of the public and environment 	GAS-960-SP-ME-019 AS2885 Field Operations and Maintenance Specifications GAS-4999-SP-ME-001 Evo Energy – AS2885 Field Operations and Maintenance Specification GAS-999-PR-LM-001 AS2885 Gas Transmission Pipelines: Landholder Contact Procedure.	 FOM – Section 5.3 to 5.6 provides the type of inspections that are performed on JGN & Evoenergy assets to manage its pipeline corridor. a) Pipeline Patrols b) Exposed Mains Inspection c) Landholder – Engagement/Contact Gas and BYDA Awareness FOM – Section 6.3 details the requirements to carry out these inspections. a) Encroach Management b) BYDA c) Monitoring of Works near pipelines d) Isolation Venting and Purging This procedure specifies how Jemena AS2885 gas transmission assets communications with stakeholders are maintained and recorded.	5 yearly and regular Safety Management Study reports and workshops conducted on a periodic basis. Jemena has an Encroachment Management System (EMS) where each non-standard encroachment is logged, reviewed and assessed. Standard encroachments are managed through GAS-960-GL-PL- 001 Guidelines to Designing, Constructing and Operating around Existing AS2885 Natural Gas Pipelines. GAS-999-RP-IN-003 JGN Pipelines APAIR – Section 3 provides summary of SMS reviews, patrols, encroachments and BYDA. Section 5 details regarding encroachment and easement management.

AS2885.3 Reference	Detail Reference	Requirement	Jemena Document	Comment	Records / Assessment
	Section 7.3 Procedural Controls Section 7.4 Corridor Surveillance	Procedural controls, by definition, apply to pipeline corridor threats threats. In this clause, these controls and the associated management systems may also apply to other threats covered under pipeline corridor management The Licensee shall establish a liaison program to communicate to the community and stakeholders the presence of the pipeline and the importance of the integrity of the pipeline for the safety of the public and environment Surveillance of the entire pipeline	JEM FPF PL0012 Landholder & Stakeholder Engagement GAS-999-PA-LM-002 Lands (Gas) Asset Class Strategy GAS-499-PA-LM-001 WSGG Land Engagement Strategy GAS-1499-PA-LM-001 – NSW Stakeholder Engagement (Gas) Plan GAS-1499-PA-LM-002 - JGN Landholder Engagement Plan	These documents provide plans to Jemena Lands Team to deliver strategic, targeted and meaningful stakeholder and user liaison; and communication.	 MIPELA X-Info (Land Holder Record Management System). MIPELA is a repository for all landholder details, property restrictions, access requirements, and communication records. As mentioned in Section 7.2 Jemena uses SAP as its Computerised Maintenance Management System. It serves as its asset register, maintenance planning / scheduling tool and material management tool. All current data accessible through SAP Pipeline ROW Reports prepared by patrolmen after each patrol activity (started from Jan 2020) stored in ECMS Safety Management Study reports GAS-999-RP-IN-003 JGN Pipelines APAIR – Section 3 provides summary of SMS reviews, patrols, encroachments and BYDA. Section 5 details regarding encroachment and easement management.
	Section 7.5 Controlling Activities near the Pipeline	corridor shall be undertaken at least annually.	GAS-960-SP-ME-019 AS2885 Field Operations and Maintenance Specifications	FOM – Section 5.3 to 5.6 provides the type of inspections that are performed on JGN assets to manage pipeline corridor threats.	
		 Work procedures shall be identified in the PMS documenting the requirements for the control of third party activities. Pipeline patrols shall be undertaken at a frequency that will enable the Licensee to be assured the pipeline corridor threats are identified and managed. Surveillance of the entire pipeline corridor shall be undertaken at least annually. 		 a) Pipeline Patrols b) Exposed Mains Inspection c) Landholder – Engagement/Contact Gas and BYDA Awareness FOM – Section 6.3 details the requirements to carry out these inspections. a) Encroach Management b) BYDA c) Monitoring of Works near pipelines d) Isolation Venting and Purging It provides general guidelines to assist 3 rd parties with their design/construction proposal prior to	
		Work procedures shall be identified in the PMS, documenting the requirements for the control of third			Management System (EMS) where all non-standard encroachments are logged, reviewed and assessed.
		system.	GAS-960-GL-PL-001 Guideline to Designing, Constructing and Operating around existing AS2885		Type B encroachments are recorded in Encroachment Reports for each asset in ECMS Safety Management Study reports (encroachment / Land use Change) GAS-999-RP-IN-003 JGN Pipelines APAIR – Section 3 provides summary of SMS reviews, patrols, encroachments and BYDA. Section 5 details regarding encroachment and easement management.
		Pipelines. Ensuring appropriate separation distances are maintained, no materials / vegetation are placed on top or near pipeline without approval. Similarly, any land use change require Licensee review and SMS, if required. Also assessing vehicle load limits or any access restriction to easements etc.	Natural Gas Pipelines GAS-960-SP-ME-019 AS2885 Field Operations and Maintenance Specifications	 approval FOM – Section 6.3 details the requirements to carry out these inspections. a) Encroach Management b) BYDA c) Monitoring of Works near pipelines d) Isolation Venting and Purging 	

AS2885.3 Reference	Detail Reference	Requirement	Jemena Document	Comment	Records / Assessment
Section 8 Station Operations and Maintenance	All sections	 This section requires the development of operational plans and maintenance practices to enable continuous safer and reliable operation of the STATION facilities and equipment. Maintenance of stations ensure that a) All devices and systems required to ensure the station operates within these limits are operable; and b) The structural and pressure integrity of stations is not compromised over time c) All equipment are fit for purpose 	GAS-999-RP-IN-004 Facilities APAIR Gas Markets. Individual stations have station specific work procedures All critical valves have maintenance codes and frequencies with records which are captured in the SAP system	Facilities APAIR provides a summary of any significant or higher risks on facilities. Facilities APAIR is updated annually.	 5 yearly Safety Management Study report for each JGN pipeline (includes facilities structural integrity) Jemena uses SAP as its Computerised Maintenance Management System. It serves as its asset register, maintenance planning / scheduling tool and material management tool. All current data accessible through SAP Facilities inspection reports prepared by technicians after each inspection activity (stored in ECMS) Facilities APAIR (annually assess condition of facilities)
Section 9: Anomaly Assessment and Defect Repair	Section 9.2 Initial Assessment & Response	 This Section of the standard details the minimum requirements for the management of pipe wall anomalies and includes an assessment process to determine whether they are defects and, if applicable, repair strategies and techniques. AS2885 Four-element approach i) Pre-assessment ii) Indirect inspection iii) Direct examination iv) Post-assessment 	GAS-999-PA-PL-002 Asset Class Strategy – JGN Pipelines GAS-4999-PA-IN-008 Evo Energy – Asset Class Strategy Pipeline 2020 – 2026 GAS-999-PR-IN-001 AS2885 Pipeline Anomaly Assessment	The ACS, discusses about Jemena strategy for managing piggable and non-piggable pipelines using the AS2885 four element approach This procedure describes information required and steps taken to assess an anomaly found on an AS2885 Jemena pipeline to the requirements of AS288.3-2012.	GAS-999-RP-IN-003 JGN Pipelines APAIR provides annual pipeline condition based on the status of pipeline CP, coating, ILI, direct inspection & exposed mains (Section 3 and Section 5) In APAIR, based on the available records, risk ratings are evaluated and summarised in asset risk status and recommendations are made to undertake any further assessment or initiate a project to reduce the risk.

AS2885.3 Reference	Detail Reference	Requirement	Jemena Document	Comment	Records / Assessment
Section 9.3 Anomaly Assessment Section 9.3 Anomaly Assessment Is a The anomaly Section 9.4 Defect Repairs Section 9.5 Repair & Miligation Methods Provide Methods Provide Pr	 9.3 The objective of anomaly assessment is to determine whether a pipeline has the structural integrity to withstand all forces to which it may be subjected during operations (within prescribed safety margins) and determine whether the anomaly is a defect. The anomaly assessment is analysed and reviewed as required. It consists of activities including the following: Pipe wall assessments. Fitness for Service assessments. Assessment of ILI results 	GAS-999-PR-IN-001 AS2885 Pipeline Anomaly Assessment	This procedure describes information required and steps taken to assess an anomaly found on an AS2885 Jemena pipeline to the requirements of AS288.3-2012 Section 3: Anomaly Characterisation Section 4: Screening of anomalies (Table 4.1 – provides a guide to repair). Sections 4.1 and 4.2 provides condition of the pipeline wall integrity for piggable and non-piggable pipelines	 Pipeline Opening Report, known as Appendix B – Direct Inspection Field Report (prepared for each integrity dig) – provides summary of anomaly, and method of repair based on Jemena's assessment GAS-999-RP-IN-003 JGN Pipelines APAIR provides annual pipeline condition based on the status of pipeline CP, coating, ILI, direct inspection & exposed mains (Section 5) Fitness for Service Review (Lic 29) GAS-999-RP-IN-003 JGN Pipelines APAIR provides annual pipeline status for ILI results (where applicable) (Section 5) In APAIR, based on the available records, risk ratings are evaluated and summarised in asset risk status and recommendations are made to undertake validation digs based on ILI results. 	
	Section 9.4 Defect Repairs Section 9.5 Repair & Mitigation Methods	The objective of repair is to ensure that the repaired pipe is fit for purpose over the remaining pipeline life. The nature of external interference involves the removal of, or penetration of, the protective ground cover and the potential contact with the pipe.	GAS-960-GL-PL-002 AS2885 Pipeline Repair Guideline GAS-960-SP-ME-019 AS2885 Field Operations and Maintenance Specifications GAS-4999-SP-ME-001 Evo Energy – AS2885 Field Operations and Maintenance Specification	This document provide guidelines on selecting and applying pipeline repair methods for various pipeline defects that may be found on Jemena AS2885 pipelines	

AS2885.3 Reference	Detail Reference	Requirement	Jemena Document	Comment	Records / Assessment
	Section 9.6 Pipeline Coating Repair	The objective of making a repair is to ensure that the structural integrity of the repaired pipe will withstand all the identifiable forces to which it may be subjected during operations, including the MAOP, cyclic pressure fluctuations and other stresses and strains as defined in AS/NZS 2885.1. The Licensee shall establish procedures to repair defects. The Licensee shall document these procedures. The objective of repair is to ensure that the repaired pipe is fit for purpose over the remaining pipeline life.	GAS-960-GL-PL-002 AS2885 Pipeline Repair Guideline	This document provide guidelines on selecting and applying pipeline repair methods for various pipeline defects that may be found on Jemena AS2885 pipelines	Case by Case basis, project specific repair plan would be prepared detailing the requirements of pressure reduction etc. When an MOP restriction needs to lifted after extended period, a project specific SMS will be undertaken as per AS2885.3 requirements.
		Pipelines are designed to operate safely and reliably. Any proposed or enforced changes to the design of an existing pipeline shall be fully evaluated to confirm continued safe and reliable operation. This Section of the standard details the minimum requirements to enable the impact of any change to be understood, to avoid the implementation of the change having an undesired or unintended impact elsewhere within the pipeline system.	GAS-960-SP-ME-019 AS2885 Field Operations and Maintenance Specifications GAS-980-OM-CM-001 Change Management Manual	 The FOM document outlines the requirement for field operation and maintenance of AS2885 assets. c) Section 4: Pipeline operation and pressure settings. This document describes the process by which engineering changes to physical assets are controlled from initiation to completion as well as work flowing technical queries (including field technical queries) 	Pipeline specific 5 yearly Safety Management Study Reports and database GAS-999-RP-IN-003 JGN Pipelines APAIR – Location class review and any operational changes are reported in APAIR
Section 10 Changes to Approved Operating Conditions	Section 10.3 Design Change Section 10.4 Design Change AssessmentChanges to the operating condition include any design condition change suspension of operation, decommissioning and abandonme a) Design condition changes b) MAOP verification or upgradea) Design condition changes b) MAOP verification or upgradeb) MAOP verification or upgrade b) MAOP verifications d) Review of pressure control over pressure protection e) Review of location class f) Operation of suspended pipeline g) MAOP adjustment Where the MAOP of the pipeline i be upgraded beyond the originally designed and established h) MAOP, the process definer AS/NZS 2885.1 shall be followed.	 Changes to the operating conditions include any design condition changes, suspension of operation, decommissioning and abandonment. a) Design condition changes b) MAOP verification or upgrade by pressure testing 	GAS-999-PA-PL-002 Asset Class Strategy – JGN Pipelines GAS-4999-PA-IN-008 Evo Energy – Asset Class Strategy Pipeline 2020 – 2026	Fitness for Service Review included a review of operating conditions as per AS 2885.3 requirements.	
		 c) Pipeline Modifications d) Review of pressure control and over pressure protection e) Review of location class f) Operation of suspended pipeline g) MAOP adjustment Where the MAOP of the pipeline is to be upgraded beyond the originally designed and established h) MAOP, the process defined in AS/NZS 2885.1 shall be followed. 	GAS-999-PA-PL-002 Asset Class Strategy – JGN Pipelines	The ACS, discusses about Jemena strategy for managing piggable and non-piggable pipelines using the AS2885 four element approach and meets the requirements for a Fitness for Service Assessment in AS 2885.3.	

AS2885.3 Reference	Detail Reference	Requirement	Jemena Document	Comment	Records / Assessment
	Section 10.6 Restricted Operating Pressure	An ROP shall be applied where an adjustment to pipeline system operating pressure below the MAOP needs to be implemented as a safety critical control to manage a change to the pressure-related threats or to the pressure-containment condition of the pipeline. The ROP shall remain in place until such time as a permanent control is implemented, the threat no longer exists, or the integrity of the line is re-established.	GAS-999-PR-IN-001 AS2885 Pipeline Anomaly Assessment (it was MOP reduction in AS2885.3 - 2012) GAS-999-PA-PL-002 Asset Class Strategy – JGN Pipelines	The ACS, discusses about Jemena strategy for managing piggable and non-piggable pipelines. Where the assessment confirms that remediation is required, an approved remediation plan is developed to reinstate the pipeline to its design and MAOP	GAS-4005-RP-IN-003 – Evoenergy PL29 Remaining Life Review Fitness for Service Document for each JGN pipeline (Currently not available)
	Section 10.7 Increasing a Reduced MAOP	Where an MAOP has been previously reduced for operational or integrity reasons, under a previous edition of this Standard, it is acceptable for the MAOP to be increased after the reason(s) for the reduction have been rectified.	GAS-4999-PA-IN-008 Evo Energy – Asset Class Strategy Pipeline 2020 – 2026 GAS-999-PA-PL-002 Asset Class Strategy – JGN Pipelines	The ACS, discusses about Jemena strategy for managing piggable and non-piggable pipelines using the AS2885 four element approach	 5 yearly Safety Management Study report for each JGN pipeline Fitness for Service Document for each JGN pipeline (Currently not available) In APAIR, based on the available records, risk ratings are evaluated and summarised in asset risk status and recommendations are made to undertake any further assessment or initiate a project on a case by case basis to reduce the risk.
	Section 10.8 Pipeline Suspension	The operation of a pipeline shall be considered suspended when the pipeline is taken out of service and the pipeline is no longer available for normal operation, see	Noted.		GAS-4005-RP-IN-003 – Evoenergy PL29 Remaining Life Review Fitness for Service Document for each JGN pipeline (Currently not available)

AS2885.3 Reference	Detail Reference	Requirement	Jemena Document	Comment
	Section 10.9 Pipeline Failure	Where a pipeline failure event occurs, an investigation (see Clause 2.3.4.3) shall be completed in conjunction with a failure event review sms to identify the root cause(s) of the failure event. Actions to address the root causes and prevent reoccurrence shall be identified and implemented in accordance with the outcomes identified in the SMS. A review and update of the relevant aspects of the PMS shall also be completed When a pipeline failure occurs a full and detailed root cause analysis shall be completed in conjunction with a safety management study and system review, and a mitigation strategy revised or developed to the pipeline being returned to full operation	ICAM – Incident Cause Analysis Method JAA HSE PR 0003 Investigating Incidents Procedure	Developed in response to a maincident or failure
	Section 10.10 Pipeline Abandonment	 A change in operating condition SMS shall be conducted to inform the requirements for the decommissioning and abandonment of a pipeline. When a pipeline is to be abandoned an abandonment plan, including an SMS and environment rehabilitation plan shall be compiled. Maintenance of stations ensure that d) All devices and systems required to ensure the station operates within these limits are operable; and e) The structural and pressure integrity of stations is not compromised over time 	Pipeline Abandonment Plan (case by case basis) GAS-960-SP-ME-019 AS2885 Field Operations and Maintenance Specifications	As per the requirements of AS The FOM document outlines th requirement for field operation maintenance of AS2885 asset Section 7: High Pressure Fac

	Records / Assessment
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2885 ne and s. lities	Prepared on a case by case basis if abandonment is required.

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APPENDIX D

Appendix D Specific Jurisdiction Requirements

Note: Inclusions and exclusions as necessary

Appendix D contains information relating to the WSHH Formal Safety Assessment.

A Formal Safety Assessment (FSA) workshop as required by AS 4645 was undertaken on 26th August 2020 in Jemena's North Sydney office, to assess the risk of injecting hydrogen into the existing natural gas network as a part of the Western Sydney Hydrogen Hub Project (WSGG).

The aim of the FSA was to identify the incremental risks associated with the injection of hydrogen and provide assurance to stakeholders that these risks are manageable and can be mitigated accordingly without adversely impacting on the safety of the asset, public, employees or the environment.

The methodology used during the FSA was favourably acknowledged by the workshop participants including representatives from Jemena and the following external stakeholders.

- NSW Department of Planning Environment.
- NSW Department of Customer Service.
- The Australian Gas Infrastructure Group (AGIG).
- GPA Engineering

Following is the summary of the outcome of the Formal Safety Assessment (FSA) undertaken, to identify, assess and control the risks that may arise from the blending of hydrogen into the gas distribution network fed by the Horsley Park Primary Regulating Station (PRS). For more information on the outcome of the FSA including associated actions, please refer to the actual Western Sydney Hydrogen Hub Trial Project FSA Report FSA P2G-2099-RP-RM-005.

1 BACKGROUND

Jemena Gas Networks is the asset owner of the Horsley Park High Pressure Gas Facility, comprising of a number of pressure let down and pipeline pigging facilities, including the Eastern Gas Pipeline (EGP) pipeline, Jemena Gas Network (JGN) Trunk, Sydney Primary Loop and local secondary network, located on Chandos Road in Horsley Park, NSW.

Jemena has proposed construction of a demonstration hydrogen production plant within and adjacent to their existing high pressure gas facilities at Horsley Park in New South Wales. The project, called the Western Sydney Hydrogen Hub Trial (WSHHT), will initially produce 100 Nm³/h of hydrogen gas with a 500 kW Hydrogenic PEM electrolyser using electricity from an on-site solar array or the local power grid. It is proposed to blend up to 2 percent of hydrogen gas by volume by directly injecting hydrogen into the outlet natural gas stream of the PRS, at such hydrogen concentrations the blended gas stream will not exceed the gas combustion characteristic limits specified in AS 4564.

The *Gas Supply (Safety and Network Management) Regulation 2022* does not permit injection of gases not conforming with AS4564 into the network. Given that pure hydrogen does not conform to requirements of AS4564, Jemena will be seeking the following exemptions:

- Seek an exemption under Part 4, Cl 31 from conveying compliant natural gas from within the WSGG hydrogen pipeline.
- Invoke Part 4 Cl 24.2 (b) to seek permission to convey non-compliant natural gas at the point of injection on the basis that the blended hydrogen/natural gas stream conveyed to the end user will be compliant with AS4564.

Jemena conducted this Formal Safety Assessment in accordance with AS4645.1 to assess the risks that may arise from direct injection of hydrogen at Horsley Park to the continue safe operations of the gas distribution system, gas distribution employees and contractors, members of the public and gas consumers. The assessment included a review of the adequacy of Jemena's asset and safety management systems and key risk controls and identified required changes to be documented in JGN's SAOP including changes to the description of the asset and risk registers.

2 RISKS AND RISKS MITIGATION

There were no "high" or "intermediate" risks reported during the risk assessment validation workshop for carrying hydrogen containing natural gas. Majority of the risks are rated as "low" or negligible" indicating no significant increase in risk as result of the gas quality change.

3 FSA VALIDATION WORKSHOP PARTICIPANTS

The validation workshop was carried out on 26 August 2020 at Jemena North Sydney office with many participants joining in remotely via teams. The workshop team was consisted of participants with wider range of expertise related to the gas distribution network representing operational and managerial roles. As the WSGGT will have a direct impact on the composition of gas downstream of the facility, this FSA also included both technical and consumer regulatory representatives, and an external gas combustion specialist. This multi-disciplinary team-based approach was used to increase the understanding about the nature of hazards and risks within the workplace and especially to consumers and the general public. The team assembled for the FSA validation workshop is listed below.

The methodology used during the FSA was favourably acknowledged by the workshop participants including representatives from Jemena and the following external stakeholders.

- NSW Department of Planning Industry and Investment.
- NSW Department of Customer Service.
- The Australian Gas Infrastructure Group (AGIG).
- GPA Engineering

4 SUMMARY OF IDENTIFIED THREATS

A total of 24 threats were identified across the category of People and Supply associated with conveying of hydrogen blended natural gas in the downstream distribution network to the boundary limit of end user appliances. Where a threat was deemed credible, existing controls implemented were identified to mitigate or manage the risks during asset life cycle. Further if identified risk is different from natural gas, the risk of the threat was assessed for downstream assets in the distribution network. A breakdown summary of these threats is shown below.

APPENDIX D

Threat Category	Threats Identified (People & Supply Category)	Threats Deemed Credible
Gas Composition (quality)	3	2
Material/Component Defects	9	4 (Out of 4, 3 to be re- assessed)
Operational Non-Conformance	7	2
Overpressure	1	0
Maintenance	3	0
Corrosion/Third party Damage	1	0
Total	24	8

The summary table shows a reduction in the number of threats identified against credible threats that are assesses as specific to 2 molar percent of hydrogen blended in natural gas conveyed un the gas distribution network.

5 CONCLUSION

Based on the findings from the Formal Safety assessment there are no "high" or "intermediate" risks assessed for transporting 2 percent of hydrogen blended natural gas in the distribution network. Completion of the actions recommended by this FSA will assure that the transport of hydrogen blended natural gas is not expected to introduce unacceptable risk to the operation of the Jemena gas distribution network. Recommended actions include developing of sampling program and sampling tests to be performed after commissioning to confirm the homogeneous blend and no stratification of gas occurring due to low flow. Also, Jemena to consult manufacturers of fittings on suitability of sleeves, diaphragms etc with Town Gas.

This Formal Safety Assessment will be reviewed upon completion of the actions to ensure the validity of the findings. When the actions are completed, risks which could not be assessed during the workshop or required more information will be reviewed to determine the appropriate risk rank considering the implementation of additional controls.

The assets and equipment located within the development footprint is reflected in the general layout per below image.

APPENDIX D

