DAMPIER TO BUNBURY NATURAL GAS PIPELINE

Submission to the Gas Supply and Emergency Management Committee

May 2009

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5.3.1 PIPELINE DESCRIPTION

DBP is the owner and operator of the Dampier to Bunbury Natural Gas Pipeline system (DBNGP) which extends almost 1600 kilometres from the Dampier landfall of the offshore Carnarvon Basin gas fields to Bunbury in the south west of the State. DBP has three corporate owners – Diversified Utilities Energy Trust (DUET - 60%); Babcock and Brown Infrastructure (BBI – 20%); and Alcoa of Australia (20%).

DBP and its owners are conscious of the State's heavy reliance on the domestic gas supply chain, and in particular the DBNGP which serves as the backbone of the onshore delivery system. The consequences of a failure of any link in the supply chain are potentially severe – whether in terms of economic or social impact.

DBP is keen to ensure that all key stakeholders are fully informed in respect of the operation of the DBNGP and in particular:

- the historically high reliability of the DBNGP;
- the measures that are in place to deal with identified delivery disruption risks; and
- DBP's preparedness and ability to expand the capacity of the pipeline and to offer alternative services.

The DBNGP was commissioned in 1984 and has undergone seven expansion programs since first commissioning. The original pipeline is 660 mm in diameter and is currently rated to a pressure of 8.48 MPa. Approximately 50% of the pipeline has now been duplicated (looped) with pipe of the same diameter, but rated to 10.2 MPa.

At the completion of the various stages of expansion, the pipeline has or will have the following firm full haul capacities.

- Stage 5A completed in 2008 - 750 TJ/day
- Stage 5B forecast to be completed in early 2010 - 885 TJ/day

The Pipeline

The current pipe and coating details are as follows:

DESCRIPTION	MAOP MPa	DIA mm	W T Mm	MATERIAL	LENGTH Kms	PIG	COATING MATERIAL	D/F
MAINLINE								
DF – CS2	8.48	660	8.74	API 5L X65 DSAW	272.1	✓	MobiloxD1003	0.72
CS2 – MLV92	8.48	660	8.74	API 5L X65 DSAW	750.5	✓	MobiloxD1003	0.72
MLV92 - MLV116	8.48	660	8.74	API 5L X65 DSAW	288.5	✓	MobiloxD1003	0.72
MLV116 - KJN	8.48	660	12.70	API 5L X65 DSAW	87.4	✓	MobiloxD1003	0.50
Stage 4: Loops	10.2	660	8.72	API 5L X70 ERW	216.7	-	Trilaminate	0.80
Stage 5A: Loops	10.2	660	8.72	API 5L X70 ERW	570.7	✓	Trilaminate	0.80
WLPG Loop	8.48	660	14.27	API 5L X 65DSAW	6.4	✓	MobiloxD1003	0.72
KJN – MLV141	6.90	500	7.92	API 5L X65 DSAW	10.8	✓	MobiloxD1003	0.50
MLV141 - FWW	6.90	500	5.56	API 5L X65 DSAW	73.5	✓	MobiloxD1003	0.72
FWW – MLV154/55	6.90	250	4.80	API 5L X52 ERW	23.9	✓	MobiloxD1003	0.72
MLV155 - MLV157	6.90	200	4.80	API 5L X52 ERW	25.5	-	MobiloxD1003	0.72
SW Loop	8.28	450	6.35	API 5L X60 ERW	24.4	✓	Napguard	0.72
TOTAL MAINLINE					**2350.543**			

MAOP	Maximum Allowable Operating Pressure	CS	Compressor Station
DIA	Diameter	MLV	Main Line Valve
WT	Wall Thickness	KJN	Kwinana Junction
D/F	Design Factor	WLPG	Wesfarmers LPG
DF	Dampier Facilities		

The following additional pipe – or looping - has been installed since 2005 as part of the Stage 4 and Stage 5A expansions, or is planned for Stage 5B. At the completion of Stage 5B, more than 80% of the DBNGP will have been duplicated (or 88% as far as Perth).

	Stage 4 (km)	Stage 5A (km)	**Stage 5B** (km)	Cumulative Total (km)	Remaining Loop to next station (km)
Northern Loop					
Loop 0	0	0	115.084	115.084	0.000
Loop 1	11.994	74.015	32.900	118.909	15.476
Loop 2	32.237	57.793	31.901	121.931	14.611
Loop 3	24.996	60.296	34.559	119.851	17.156
Loop 4	24.997	61.823	33.635	120.455	16.985
Loop 5	21.860	63.690	33.980	119.530	20.020
Loop 6	10.996	70.354	35.820	117.170	23.990
Loop 7	5.689	60.431	44.008	110.128	36.872
Loop 8	46.140	55.280	21.780	123.200	19.060
Loop 9	15.150	51.980	23.375	90.505	50.925
Sub-Total	***194.059***	***555.662***	***407.042***	***1156.763***	***215.095***
Southern Loop					
Loop 10	22.650	15.040	33	70.960	12.740
Total Northern & Southern Loop					
Total	**216.709**	**570.702**	**440.312**	**1227.723**	**227.835**

Note: Loop 1 is downstream of Compressor Station 1; Loop 2 is downstream of Compressor Station 2, etc…

Pipeline Corridor

Ownership of land on the pipeline corridor falls into several categories as follows:

- Freehold Land - encompasses facilities located above ground and fenced off for security and safety reasons.

- State Corridor Rights - land owned by the landholder but where State Corridor Rights have been taken by the State to enable DBP to operate and maintain the pipeline.

The control of the pipeline corridor is the responsibility of the DBNGP Land Access Minister. The corridor is administered by the Department for Planning and Infrastructure (DPI) on behalf of the DBNGP Land Access Minister. The Access Right allows DBP to access 20 m of the 100 m wide corridor from Dampier to Bullsbrook and the entire width of the corridor south of Bullsbrook to operate and maintain its assets. The DBNGP pays an annual fee to the DBNGP Land Access Minister for the rights.

Laterals

- **Dampier to CS 10 Section Laterals**

Lateral		Length	Nominal diameter		MAOP	
		(km)	(mm)	(inches)	(MPa)	(psi)
Hamersley Iron		0.510	200	8	8.48	1,230
GGT Interconnect		1.48	300	8	10.2	1,478
Carnarvon	MLV55-MCP	163.669	150	6	8.48	1,230
	MCP-FCP	7.433	150	6	2.0	290
Mungarra		2.511	150	6	8.48	1,230
Pinjar		14,231	350	14	8.48	1,230
Russell Road		7.273	300	12	8.48	1,230

- **Kwinana West Lateral Section Laterals**

Lateral	Length	Nominal diameter		MAOP	
	(km)	(mm)	(inches	(MPa)	(psi)
Rockingham					
KLV1 to Mason Rd	3.220	300	12	6.89	1000
Mason Rd to Rockingham	2.583	150	6	6.89	1000
BP/Mission Energy	0.862	200	8	6.89	1000
CSBP	1.552	250	10	6.89	1000
Tiwest	0.580	150	6	6.89	1000
Kwinana West					
UV496-KLV2	2.063	500	20	6.89	1000
KLV2 – KLV6	2.767	350	14	6.89	1000
KLV3 – Alcoa Kwinana Meter Station					

- **Pipeline South Section Laterals**

Lateral	Length	Nominal diameter		MAOP	
	(km)	(mm)	(inches	(MPa)	(psi)
Alcoa Pinjarra	5.380	300	12	6.89	1,000
Alcoa Wagerup	9.535	350	14	6.89	1,000
Worsley Alumina LP	32.935	250	10	6.89	1,000
Worsley Alumina HP	33.59	450	18	8.28	1,200
Kemerton	5.0	323.9	12	6.90	1,000

Compression

The DBNGP currently has ten mainline compressor stations spaced at intervals of approximately 140 km.

Station	Distance from Dampier (km)	Turbine	Nominal Power (MW)	Compressor Type	Year Commissioned
CS1	137	Solar Mars *T15000*	10	Solar Mars C505U	1991
		Solar Mars T15000	*10*	*Solar C405*	*2006*
CS2	272	GE LM500	4	Norwalk V-422	1985
		Solar Mars T15000	10	Solar Mars C652U	2000
		Solar Mars T15000	10	*Solar C405*	*2006*
CS3	409	Solar Mars T15000	10	Solar Mars C505U	1991
		GE LM500	4	Norwalk V-422	1985
		Solar Mars T15000	10	*Solar C405*	*2006*
CS4	546	GE LM500	4	Norwalk V-422	1985
		Solar Mars T15000	10	Solar Mars C652U	2000
		Solar Mars T15000	10	*Solar C405*	*2006*
CS5	684	Solar Mars *T15000*	10	Solar Mars C505U	1991
		Solar Mars *T15000*	10	Solar Mars C505U	1991
CS6	824	GE LM500	4	Norwalk V-422	1985
		Nuovo Pignone PGT10	10	Nuovo Pignone PLC603	1997
		Solar Mars T15000	*10*	*Solar C405*	*2006*
CS7	966	GE LM500	4	Norwalk V0422	1985
		Solar Mars T15000	10	Solar Mars C652U	2000
		Solar Mars T15000	*10*	*Solar C405*	*2006*
CS8	1,114	Solar Mars *T15000*	10	Solar Mars C505U	1991
		Solar Mars *T15000*	10	Solar Mars C505U	1991
CS9	1,256	Nuovo Pignone PGT10	10	Nuovo Pignone PLC603	1997
		Solar Mars T15000	*10*	*Solar C405*	*2006*
CS10	1.402	Solar Centaur T4000	2.5	Solar C304	2000
		Solar Centaur T4000	2.5	Solar C304	2000
		Solar Taurus T70	*7.5*	*Solar C402*	*2006*
		Solar Taurus T70	*7.5*	*Solar C402*	*Planned 2009*

There are three types of compressor units in operation, with units at all stations having the capability for series operation. At CS10, the two upstream Solar Centaur units are configured for parallel operation, and these units can operate in series with the larger Solar Taurus unit (and the planned, second Solar Taurus unit planned for the Stage 5B enhancement project).

5.3.2 DESIGN & OPERATING PHILOSOPHY

Pipeline Licence

The DBNGP operates under a Pipeline Licence issue and administered by the State Department of Mines & Petroleum. A requirement of the Pipeline Licence is that there is a comprehensive Safety Case regime covering all activities on the pipeline, including new construction. The Safety case regime is subject to detailed review and approval by the Resources Safety Division of the Department. It is a requirement of the Safety Case that risks related to all pipeline activities are reduced to a level “As low as Reasonably practicable” (ALARP).

Pipeline Design

The design standard governing the design of the DBNGP is AS2885. “Firm” capacity services on the pipeline are designed to be delivered at a probability level of greater than 98%. Any curtailment of a shipper’s capacity entitlement counts against this service delivery measurement. Capacity can be affected by a number of factors including: plant outages (planned or otherwise); ambient temperatures; gas quality.

Pipeline Control

DBP maintains a Transportation Services Control Centre within its offices on The Esplanade, which is the focal point of pipeline operation. Remote operation and control of the pipeline takes place from this Control Centre via the System Control and Data Acquisition system (SCADA) using a dedicated microwave communication system for transfer of data and controls between field equipment and Perth.

All significant equipment can be operated remotely from the control room and is monitored 24 hours per day, 365 days per year using a 12-hour roster work pattern. The controllers are able to close valves along the pipeline to isolate a ruptured section of pipe or damaged compressor station.

Pipe Coating

Primary corrosion protection is provided by a Fusion Bonded Epoxy (FBE) coating for the original pipeline and a Trilaminate coating for the loops. The condition of the coating is closely monitored on an ongoing basis through surveys and chemical evaluation of selected sections of the pipeline to assess how coating is performing with time. The whole DBNGP coating system is surveyed, analysed and assessed once every 5 years and intelligent pigging is conducted on critical areas of the DBNGP once every 10 years.

Cathodic Protection

The protection provided by the coating is supported by an impressed current cathodic protection system which consists of some 72 transformer rectifier units and ground beds located along the pipeline, each of which has a capacity of 10 amps. The total current demand for the mainline protection is 18.350 amps (out of a total design capacity of 720 Amps) which represent a protection current density of 4.7 microamperes per square metre of exposed pipe. In comparison with industry standards, the required protection current level is low for a pipeline that has now been service for almost 25 years and is evidence of the excellent condition in which the DBNGP has been maintained.

Compressor Stations

All compressor stations have been designed to be operated remotely, but have accommodation facilities, power generation, airstrips and water treatment facilities to allow for manned operation as required. The Stations are designed to be completely bypassed without interrupting the main flow of gas. Each station has a stockpile of emergency pipes and fittings to allow for maximum readiness to respond to emergency situations so that continuity of supply can be maintained.

Aftercoolers were installed on the DBNGP as part of its integrity management program to mitigate against the possibility of stress corrosion cracking. They are designed to enable the gas exiting the compressors to be maintained at a target of 45ºC annual average discharge temperature. Operating procedures are in place to ensure the target is achieved without compromising the capacity requirements of the pipeline.

Stress Corrosion Cracking

Some buried pipelines can experience Stress Corrosion Cracking (SCC), which involves the slow growth of cracks until wall penetration causing a leak or rupture occurs. The mechanisms governing SCC are complex and a function of a number of variables which influence design and determine the remedial measures available to a pipeline operator for the effective control of SCC,

For existing pipelines such as the DBNGP, the lowering of gas temperatures at compressor station discharges and limiting the frequency of pressure fluctuations are the two most common approaches employed. In over 30 years of service around the world, no SCC failures have been recorded on any pipeline coated with fusion bonded epoxy.

Considerable research has been undertaken on samples of DBNGP pipeline materials, and led to the inclusion of aftercoolers as a design standard for all compressor stations and to retrofitting of aftercoolers at all compressor stations and at Dampier Facilities.

Pipeline Corridor

The corridor rights provide for the ongoing operation and maintenance of pipelines in accordance with relevant legislation, licensing and Australian Standards. In general, the DBNGP is buried at depths ranging from 750 mm in pastoral areas to over 2000 mm in built up areas. It is subjected to land settlement and other effects on the right of way where they cross rivers, roads, highways, agricultural farmlands, and pastoral grazing areas, controlled parks and reserves. The wall thickness of the pipeline varies (by use of design factors recommended in AS2885) to accommodate the type of land traversed.

5.3.3 RELIABILITY PERFORMANCE

Pipeline Breaches

In its 25 years of operation the DBNGP has never experienced a full bore pipeline rupture - or a breach of any sort which has required a curtailment of pipeline capacity. On occasions it has been necessary to curtail capacity to meet the requirements of major expansion activities. Such curtailments are provided for in Shipper contracts and have been planned well in advance and the impacts signalled to affected shippers.

Compressor Availability

It is useful to understand the historic reliability/availability of the major compressor units and compressor stations on the DBNGP. The figures are summarised as follows:

	2004	**2005**	**2006**	**2007**
Unit Availability	95.24	99.1	83.58	92.02
Unit Reliability	98.04	99.1	98.14	97.87
Station Availability	98.82	99.6	99.13	99.23
Station Reliability	99.99	99.6	99.89	99.88

Note: Figures for the smaller 5 MW units are not included as they are only required for emergencies.

The figures show the high unit and station availability and reliability achieved on the DBNGP. It is important to note that the Unit Availability and Reliability levels were impacted by outages required for the Stage 4 and Stage 5A expansion work. Despite these expansion related disruptions all contracted services have been met.

5.3.4 SUPPLY DISRUPTION RISKS

The following section describes the types of incidents where gas supply might be partially or wholly interrupted. It also addresses the expected time for restoration of supply in each case.

A rupture (as opposed to a puncture) is defined as a full diameter breach (or venting) from the pipe. A rupture would require the isolation of the length of pipe involved - and the cessation of flow in that length - in order to carry out repair work. If the rupture took place where the pipeline has been duplicated, flows could be maintained in the duplicated section and overall capacity loss would be limited to between 22% and 27% depending on the affected loop. Any curtailments would depend on the level of demand at the time. If the rupture took place in a single section of the pipeline, supplies could be interrupted for up to 2-3 days.

A rupture could result from:

Third Party Interference - most likely to arise from inadvertent use of heavy earthmoving or boring equipment within the pipeline corridor. Surveillance and other operational measures to help prevent Third Party damage to the DBNGP are set out elsewhere in the report. The likelihood of third party damage is highest in built-up areas and to reduce this risk, the pipe wall thickness has been substantially increased in these areas from Muchea to Baldivis. This section also has deeper cover - with marker tapes and more visible sign-posting - to mitigate against third party damage. Patrols of this area to identify construction activity near the pipeline are conducted twice weekly, with direct contact being made with constructors to ensure that they are aware of the presence of the DBNGP.

The specification of pipes used on the DBNGP ensures:

- High fracture toughness pipes are utilised
- A single tooth force on pipes in broad rural areas will require 38 tonnes to puncture
- A single tooth force on pipes used in metropolitan areas will require 50 tonnes to puncture
- The pipes will dent extensively before puncture

These pipeline material properties coupled with the shift to leaner gas mixtures since the regulatory requirement to inject minimum quantities of LPG was removed in July 2005, has resulted in a reduced risk of rupture propagation. In most cases a puncture of the pipeline will result in just a leak and only in rare occasions would a leak propagate to a full bore rupture.

The Dampier Bunbury Pipeline Act (Section 41) provides a mechanism for the management and approval of works by others in the corridor.

In view of the fact that the DBNGP is already duplicated to 53% of its length and will be 88% duplicated to Perth at the completion of the Stage 5B Expansion in early 2010, the likelihood of a rupture causing significant curtailment of deliveries will be substantially reduced.

Replacement of a ruptured section involving 3 to 4 lengths of pipe could be achieved within 24 – 72 hours.

External Corrosion - Buried pipelines such as the DBNGP are protected from corrosion by coatings and by a sophisticated cathodic protection system. Corrosion can occur when cathodic protection does not work effectively and it is now a standard procedure for pipelines around the world to use regular intelligent pigging programs (every 10 years for the DBNGP) to identify whether any metal loss has taken place and to plan for any remedial action which might be warranted.

In addition, DBP has a routine program of excavations at locations along the DBNGP to check for evidence of coating failure. From a review of recent excavation works, DBP is confident that its coating and CP mitigation systems in place are assuring the long term protection of the DBNGP from external corrosion.

To the extent that external corrosion were to be detected on the DBNGP, repair procedures are well documented and would require lowering of pipeline pressures in order to fit repair sleeves, followed by the gradual increasing of pressures to assist in the transfer of loads from the pipe to the sleeves. A repair of 3 to 4 pipeline lengths on the DBNGP would be completed within 24 to 72 hours.

Stress Corrosion Cracking – Whilst the risk associated with SCC is discussed in a separate section of the report, the DBP employs an routine monitoring program where all exposed sections of the DBNGP is evaluated for SCC. It has a program ‘Looking for SCC’ in areas most prone to its formation and in the last 25 years of searching – DBP has not found any SCC on the DBNGP.

Natural Causes – Landslides & Earthquakes - The process of surveying the original DBNGP pipeline route identified areas of potential landslide and earthquake activity and took account of river crossings, heritage sites and other features that could have long term impact on the integrity and serviceability of the DBNGP. A subsequent risk assessment process conducted in 2004 prior to the Stage 4 Expansion confirmed that the DBNGP is located in areas that are stable and not subject to landslides and that risk from these causes was reduced to a level “as low as reasonably practicable” (ALARP).

Any impacts of landslide or earthquake damage would be expected to be confined to short sections of pipe. The response would involve reducing pressure to facilitate safe investigations. Actual repairs might require a severely damaged section to be replaced, requiring an interruption of 24 to 72 hours, depending on the extent of damage.

Natural Causes - Severe washouts - The DBNGP crosses many rivers and creeks ranging in size and impact in terms of flows. The design basis adopted for the river crossings on the original pipeline was to meet 1 in 100 year events.

In 2004 a section of the pipeline was exposed by a major flood at the Fortescue River Crossing but resulted in no permanent damage to the pipeline. Temporary protective measures were put in place until a permanent repair could be effected. The permanent repair required two ‘tie ins’ to the existing DBNGP, a process that took less than 24 hours to implement.

Each of the major DBNGP river crossings has been subject to an extremely exhaustive investigation, risk assessment and design process – which have been replicated during the design of the pipeline loops.

It is conceivable that a flood well in excess of the 1 in 100 year event, could result in a rupture of the DBNGP and that access difficulties could delay repairs for an indefinite period of time. In such an event the damaged section would need to be isolated and flows interrupted. The process of duplicating the pipeline as a result of the looping process provides protection against a total curtailment of gas deliveries.

Vulnerability Assessment - The Commonwealth Department of Resources Energy and Tourism (DRET) produced an Onshore Oil and Gas Risk Context Statement which lists forms of malicious acts, including terrorism that should be considered when undertaking Security Risk Assessments. DBP has conducted a security risk assessment for the DBNGP part of the SCADA security vulnerability review. This assessment examined intentional security incidents directed at the DBNGP in its entirety.

The security vulnerability assessment aims to identify discrete points of potential failure by damage and the extent of the resultant curtailment of supply interruption. Recommendations from this review are being actioned by DBP to minimise exposure to the various scenarios to ALARP. It is envisaged that whilst the main line flow would not be interrupted, flows from individual compressor stations could be cut off for 1 to 2 months, with some level of curtailment for 8 to 12 months.

Given that individual compressor stations are able to be isolated from the main pipeline and upstream and downstream compressors can be used to compensate for a station outage, the impact on total pipeline capacity can be significantly mitigated.

Pipeline Leaks or Minor Damage – In these events the pipe may require either a reduction in pressure or complete venting of the affected section in order to effect the repair. To date any leaks detected on the DBNGP have related to:

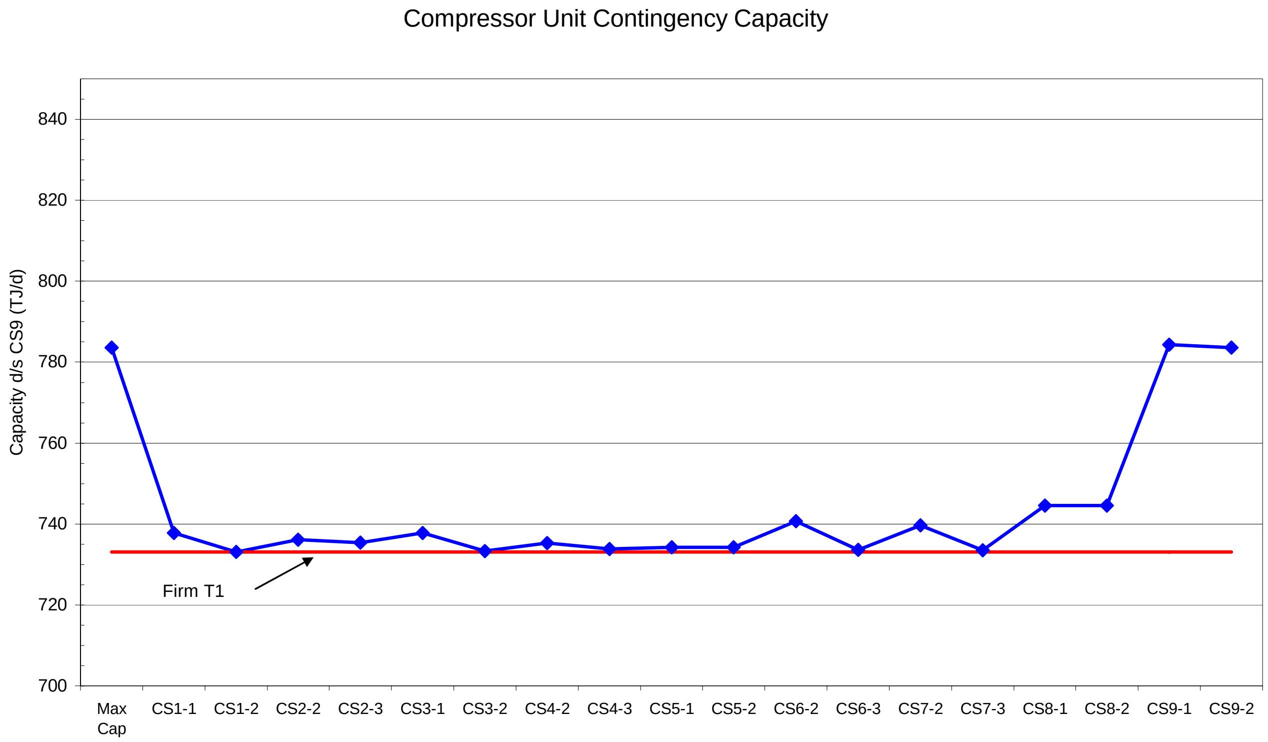
- Screwed fittings associated with buried main line valves that have worked loose during operation
- Flange joints that have leaked in service
- Leaks from monolithic joints

In all cases, the leaks were repaired either by taking the particular equipment off line or using the hot tapping and stoppling equipment where outages were not possible. No corrosion related leak has been recorded on the DBNGP. Repairs could cause a temporary reduction of capacity of up to 100 to 120TJ/d.

Catastrophic failure of a Compressor Unit - Currently nine of the ten compressor stations have at least two 10MW and in some case three compressors units installed. Each compressor is separately housed and operates independently, while being controlled from the Station Control System. The type of incident which would render a whole pipeline compressor station inoperable – such as a major accident or explosion - is unknown in the history of the Australian gas industry.

Even if all the compressor units at a compressor station are inoperable, gas will continue to flow, because at each station there is a buried station bypass pipeline which enables the whole station to be bypassed. The extent of any capacity reduction in such an event would depend on the location of the compressor station.

Concurrent unavailability of both units at the same compressor station is very rare. The following table summarises the impact of single compressor unit unavailability on firm pipeline capacity services, following the completion of Stage 5A. Historically failures of compressors have taken no more than 7 days to rectify, with recent experience on the Solar Turbines machines taking as little as 3 days to replace. In the meantime pipeline capacity can be maintained from the remaining unit(s) within the station



As part of Stage 5A and Stage 5B expansion projects, power generation capability has been upgraded at all compressor stations to improve system reliability.

Whilst the concurrent catastrophic failure of two units is a rare event, the duplication of compressor units within each station enables the relocation of a unit from one station to another in order to avoid any long term supply curtailment.

On previous occasions when pipeline throughput has approached the upper limit of available capacity, DBP has arranged to hold a permanent spare Mars machine in WA to service the rotation of plant for overhauls and as back up to any machine that may fail prematurely.

A breakdown/failure of a single compressor unit - There are a number of breakdowns of single compressor units on the DBNGP each year. However as shown in the above chart, a single unit failure only impacts on shippers with non-firm – as opposed to firm service contracts..

It is noteworthy that, in the February 2004 incident where Western Power issued orders to cut electricity consumption all pipeline users (including Western Power) continued to receive their full contractual entitlements.

5.3.5 PREVENTION STRATEGIES

Pipeline Maintenance

DBNGP maintenance consists of the following key functional areas::

- Compressor stations
- Pipeline
- Meter Stations
- Field Technical Services (including the Outage Crew)
- Planning
- Field Services
- Project Interface

Crews are allocated to Pipeline, Compressor Stations, Outage, and Meter Station functional areas, and work a roster cycle of 11 days on and 9 days off. The planning of maintenance programmes for all maintainable assets is carried out using the Computerized Maintenance Management System, Maximo. A detailed maintenance plan exists, that identifies all locations or major items of equipment.

The majority of maintenance activities relate to asset integrity and asset security, including:

- **Comprehensive inspection and monitoring**
    - Pipeline Surveillance (aerial and ground patrol)
    - Pipeline visibility and line of sight
    - Geotechnical Surveys
    - Pipeline Inspections (coating and metal loss evaluation)
    - Pipeline Coating Surveys
    - Pipeline Potential and Current Surveys
    - Pipeline Internal Inspection
    - Vegetation surveys
    - Environmental Audit
    - Pipeline Corridor / Landholder Liaison

- **Preventative Maintenance**
    - Maintenance programs in accordance with the approved Asset Management Plan
    - Management of Cathodic Protection and Stress Corrosion Cracking (SCC)
    - Flow induced Vibration and Noise surveys and assessment
    - Thermography Assessments

Spare pipes and other equipment are strategically located along the pipeline to enable rapid response in the event of any incident or emergencies. All northern compressor stations are accessible by air as well as by road.

Pigging

The DBNGP has undergone an intelligent pigging program using the British Gas' developed intelligent pigging tool. This confirmed that not only was the DBNGP fit for purpose for the current design basis – it was capable of operating at a higher pressure. The DBNGP will be inspected by intelligent pigging once every 10 years with the next program scheduled for 2010/11 financial year.

Third Party Damage

As previously indicated earlier, one of the major risks to any gas transmission pipeline is third party damage. The DBNGP has a number of measures aimed at minimising this risk. These include:

- Making the DBNGP visible with signpost warnings at sufficient intervals to ensure a line of sight between any two signs.
- Close relationships with all key landowners to ensure that:
    1. businesses incorporate DBNGP into their Safety Management Systems;
    2. contractors used by landowners are subjected to appropriate Job Hazard Analysis (JHA) and safety induction procedures; and
    3. land owners have a structured Safety Management System - identifying the DBNGP as a major hazard in proximity to their operations.
- Pipeline Surveillance. The surveillance of the pipeline includes patrols both by road and aircraft (fixed winged and helicopters).
- DBNGP membership of the WA 'Dial before you dig' program.
- Annual land-holder, council and utility safety awareness program.

DBP has procedures and policies in place to ensure prompt response to incidents. These include:

- Rostering field maintenance officers on an 11/9 roster work pattern to provide permanent manning of the pipeline 365 days per year.
- Manning of critical compressor stations when linepack drops below predetermined level.
- Continuous manning of the control centre to monitor the operation of the pipeline 24 hours a day.

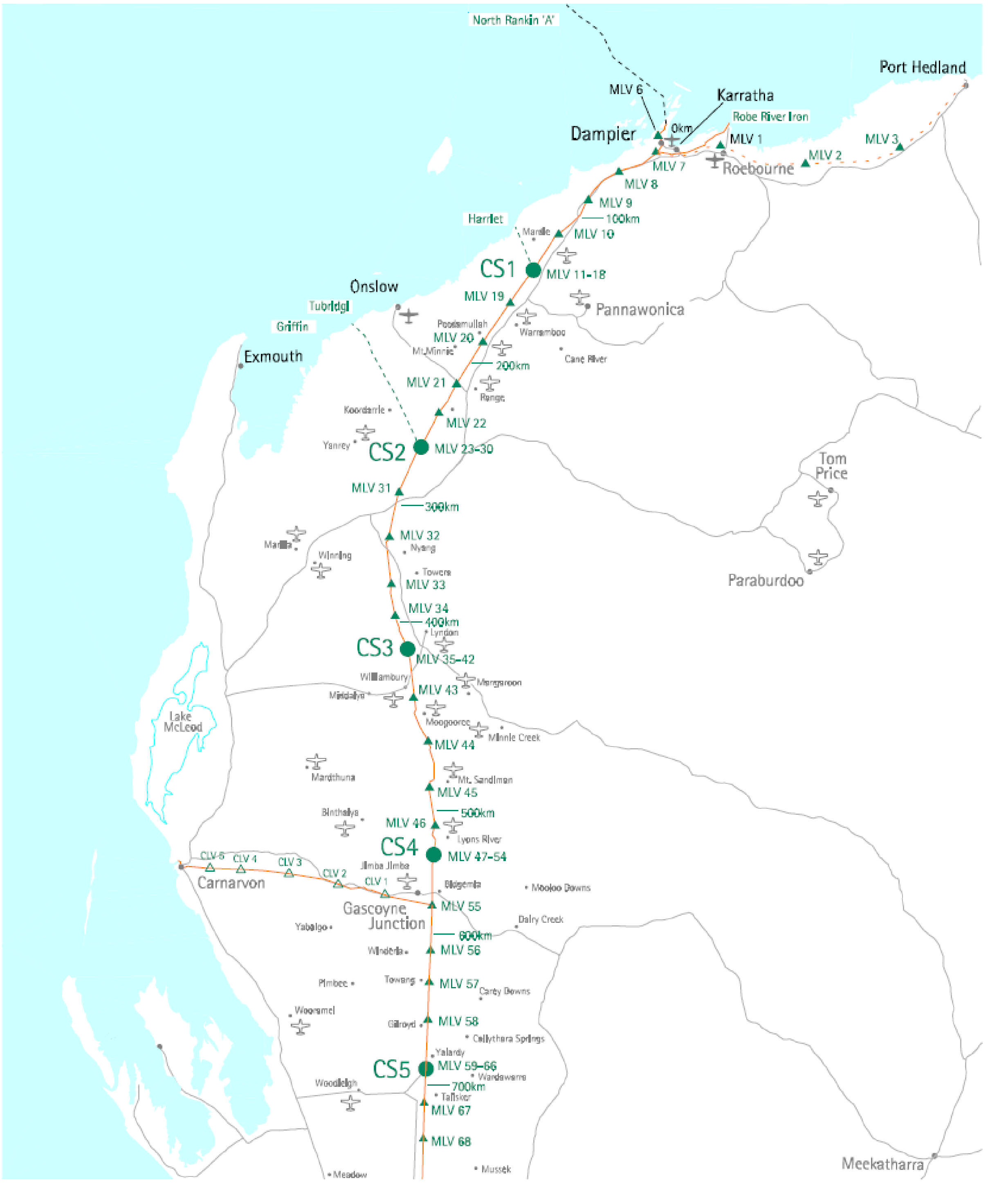
- Carrying crucial spares (including the strategic location of spare pipe lengths along the pipeline) and maintaining arrangements with suppliers to ensure replacement equipment can be sourced within the shortest practical time.

- Carrying emergency repair equipment that includes 'hot tap' and 'stopple' fittings which enable a pipeline to be repaired while maintaining throughput.

- Regular full scale practice of emergency response plans.

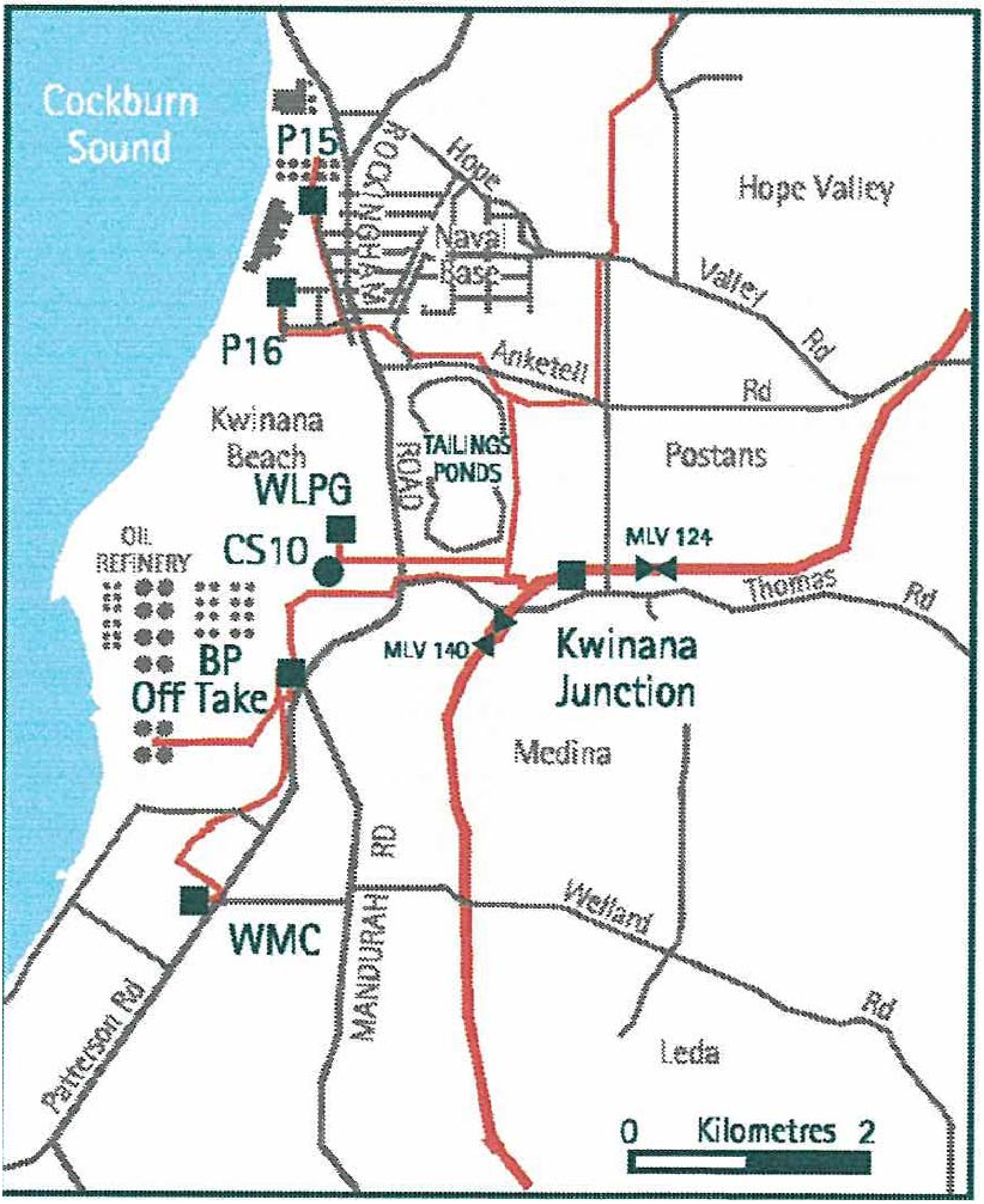
These arrangements have been developed in accordance with the requirements of the relevant Australian Standard – AS 2885.

Dampier to CS 10 Indicative Pipeline Map

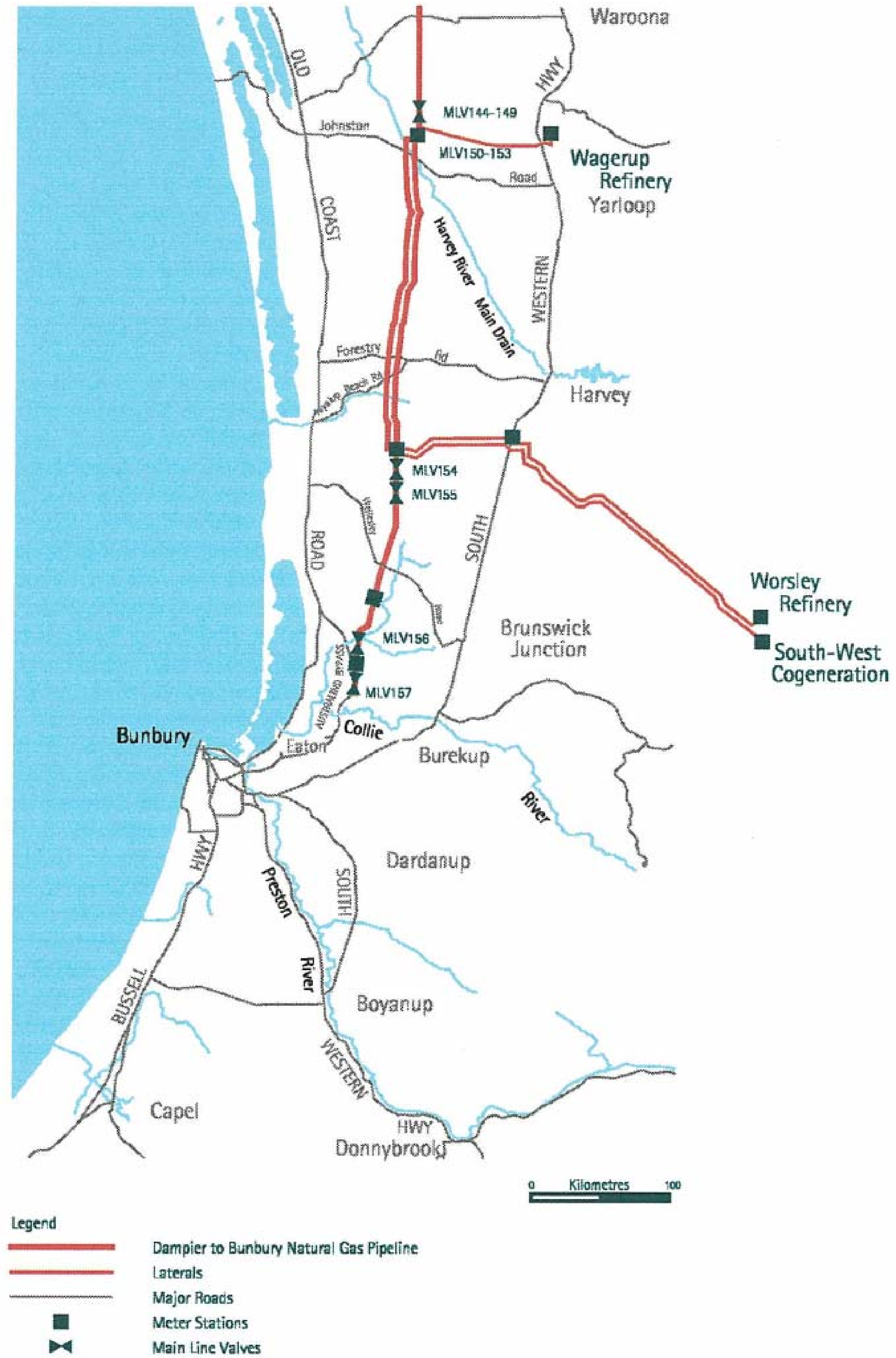



MLV 69
MLV 70
800km
CS6
MLV 71–78
New Forest
Cue
MLV 79
Kalbarri
Yangi
MLV 80
900km
MLV 81
Mt Magnet
MLV 82
CS7
Mullewa
MLV 83–90
Geraldton
MLV 91
1000km
MLV 92
Dongara
Mingenew
Morawa
Perenjori
MLV 93
Three Springs
MLV 94
Eneabba
1100km
MLV 95–102
CS8
Coorow
MLV 103
Dalwallinu
Jurien
MLV 104
MLV 105
Moora
1200km
Dandaragan
Koorda
MLV 106
New Norcia
Wongan Hills
CS9
MLV 107–114
Dowerin
MLV 115
Goomalling
Wyalkatchem
Gingin
1300km
MLV 116
Toodyay
Northam
Cunderin
MLV 117
Kellerberrin
Wanneroo
MLV 118
MLV 119
Perth
York
MLV 120
MLV 121
Quairading
MLV 122
Beverley
CS10
MLV 123
1400km
Kwinana
MLV 124–140
MLV 141
MLV 142
Mandurah
Pinjarra
Alcoa
Dwellingup
Boddington
Waroona
Williams
Wagerup
Narrogin
1500km
MLV 154,155
Harvey
Worsley
WLV 12–17
MLV 156,157
Wagin
Darkan
Bunbury
Collie
Capel
Donnybrook
Busselton
Katanning

Kwinana West Lateral Section



Pipeline South Section



Waroona
OLD
HWY
MLV144-149
Johnston
MLV150-153
Road
Wagerup
Refinery
Yarloop
COAST
Harvey River
Main Drain
WESTERN
Forestry
Rd
Harvey
MLV154
MLV155
ROAD
SOUTH
Worsley
Refinery
Brunswick
Junction
MLV156
South-West
Cogeneration
MLV157
Bunbury
Collie
Eaton
Burekup
River
HWY
Preston
SOUTH
Dardanup
River
BUSSELL
Boyanup
WESTERN
Capel
HWY
Donnybrook
0
Kilometres
100
Legend
Dampier to Bunbury Natural Gas Pipeline
Laterals
Major Roads
Meter Stations
Main Line Valves