APPENDIX E QRA KAPUNI GAS TREATMENT PLANT - WORLEY

TODD ENERGY LTD

Kapuni Gas Treatment Plant
Quantitative Risk Assessment Report

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EXECUTIVE SUMMARY

Introduction

Worley New Zealand Limited (Worley) has been commissioned by Todd Energy (Todd) to perform a Quantitative Risk Assessment (QRA) for the Kapuni Gas Treatment Plant (KGTP).

Objectives

The main objective of this study is to develop risk contours to assess land use compatibility in accordance with the NSW Hazardous Industry Planning Advisory Paper No. 4 (HIPAP 4) "Risk Criteria for Land Use Planning".

Methods

The study uses an internationally accepted QRA approach that involves identification of hazards, assessment of the frequency of potential events, assessment of the consequences of potential events, risk computation and comparison of risk results with Todd's risk acceptance criteria and NSW HIPAP 4 individual fatality risk criteria. The risk computation is carried out using DNV risk modelling software package Safeti version 8.22.

The assessment considers risks from KGTP for the following cases:

- Base Case – all facilities currently in operation;
- Sensitivity Case 1 – all facilities currently in operation with reduced ESDV success rate of 98% instead of 100%; and
- Sensitivity Case 2 – all facilities currently in operations including standby and mothballed facilities which might be brought back to operation in the future.

This QRA specifically evaluates onsite process/ flammable and toxic risks, but excludes risks from neighbouring facilities, non-flammable risks due to natural environmental hazards and occupational hazards.

Results

Risk contours for the Base Case are presented in Figure 1.

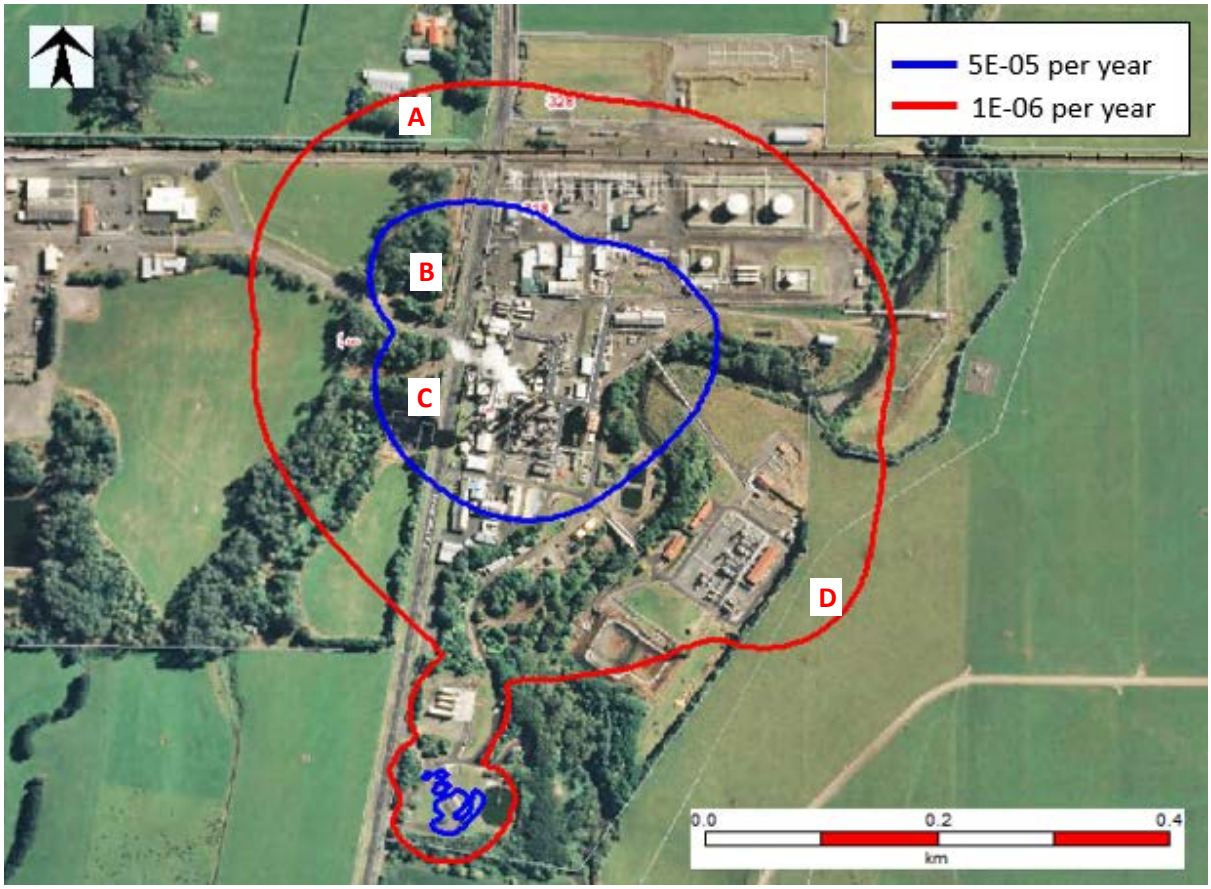

Figure 1: Base Case LSIR Contours at KGTP

The following conclusions have been made for the Base Case assessment:

- The 5E-05 per year contour extends into the KPS site to the north but remains within the Todd Energy site boundary;
- The 5E-05 per year contour extends across Palmer Road and into the bushes at the west boundary of the Ballance site;
- The 1E-06 per year contour extends onto the property of the neighbour to the northwest (approximately 180m NW of KGTP northern boundary) but does not extend as far as the dwelling and farm buildings;
- The main risk contributors to the shed area (location A) are ammonia toxic events from 71 mm leaks from the Liquid Receivers (KGT80_AMM_04_L_71mm) and Ammonia Condensers (KGT80_AMM_03_L_71mm) within the CO2 Recovery Unit (at approximately 15°C and 15 barg); and
- The main risk contributors to the Ballance site bushes (locations B and C) are ammonia toxic events from 22 mm leaks from the Liquid Receivers (KGT80_AMM_04_L_22mm) and Ammonia Condensers (KGT80_AMM_03_L_22mm) within the CO2 Recovery Unit (at approximately 15°C and 15 barg).
- The main risk contributors to the rural land area to the east of the plant (location D) are Product Gas jet fire events from 85 mm leaks from the Gas Storage Compressor (D4-0401) to Coalescer (KGT13_PGS_16_V_85mm), and the Gas Storage Compressor (KGT13_PGS_15_V_85mm) within the Product Gas Lines and Compressors unit (at approximately 15°C and 40 barg).

Risk contours for the Sensitivity Case 1 are presented in Figure 2.

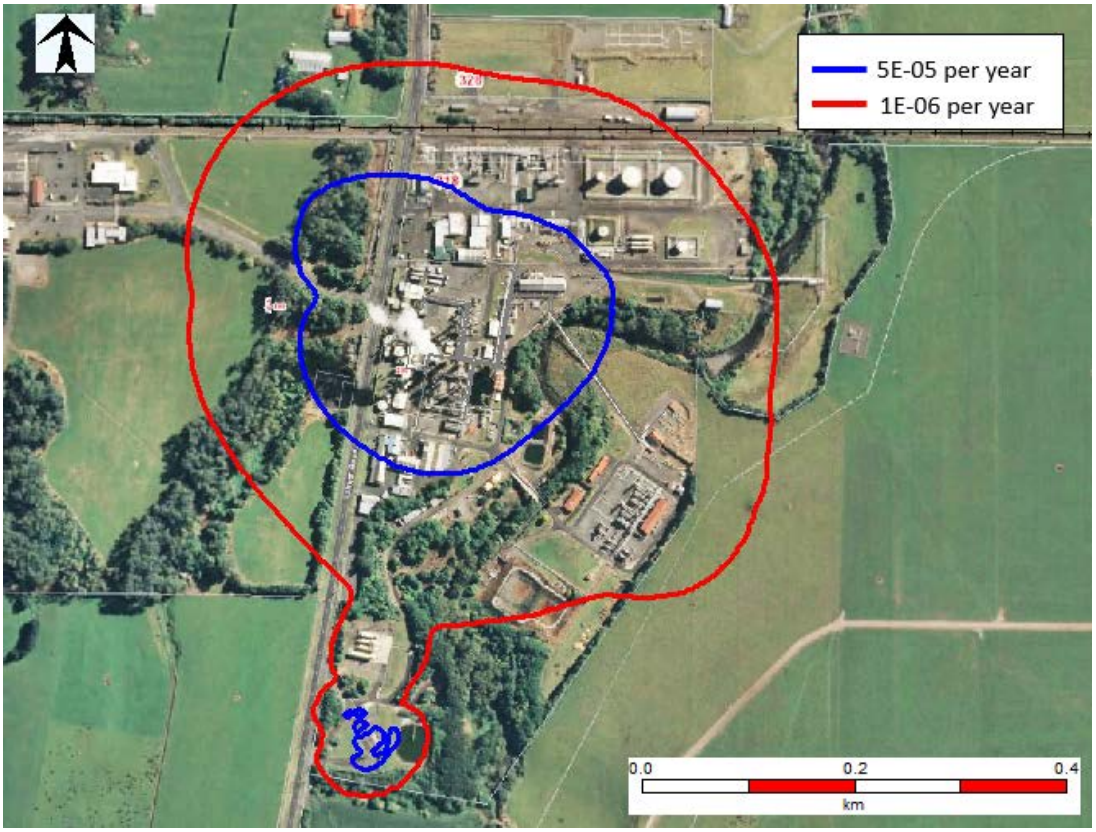

Figure 2: Sensitivity Case 1 LSIR Contours at KGTP

The 5E-05 per year and 1E-06 per year risk contours for Sensitivity Case 1 are similar to the Base Case risk contours. The assessment conclusions made against HIPAP 4 for Base Case are applicable to Sensitivity Case 1 as well. This is mainly due to:

- The ESDV failure probability change is only 2%, therefore the frequencies of hazardous events (fire explosion or toxic) associated with increased consequence distances (if any, from the additional inventory due to isolation failure cases) are not expected to be apparent in the risk contours; and
- In most modelling cases, especially gas releases, it is expected that the consequence effects would have reached the steady state condition before the inventory depletes. Hence the additional inventory may lead to a prolonged fire event, but not increase the magnitude of the consequence.

Risk contours for the Sensitivity Case 2 are presented in Figure 3.

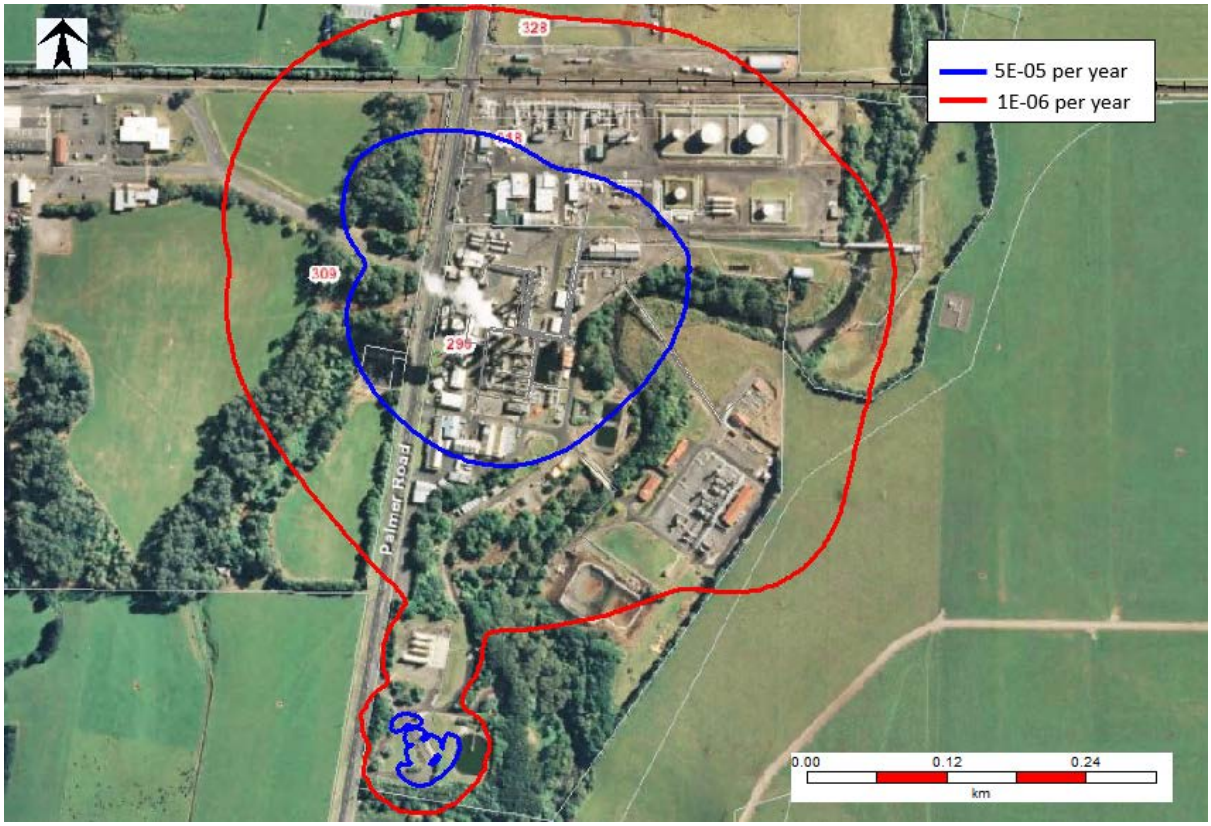

Figure 3: Sensitivity Case 2 LSIR Contours at KGTP

The risk contours of 5E-05 per year and 1E-06 per year for Sensitivity Case 2 are slightly larger, when compared to Base Case. This is particularly apparent at the LPG/NGL loading area at the southern edge of the KGTP site, which is due to the increased in loading frequencies for both the NGL and LPG loading scenarios. The increase in 5E-05 per year and 1E-06 per year contours do not change the assessment conclusions made against HIPAP 4 criteria. The assessment conclusions made against HIPAP 4 for Base Case are applicable to Sensitivity Case 2 as well.

Although there is additional equipment and inventories considered in Sensitivity Case 2, the increase in risk levels are not significant. This is most likely due to:

- The additional nodes/sections considered in Sensitivity Case 2 only formed a small part of the overall KGTP hazardous nodes/sections. There is approximately 18 % increase in total release frequency for Sensitivity Case 2 as compared to the Base Case, with 50% of the increase being from the “1-3 mm” leak category; and
- In most modelling cases, especially gas releases, it is expected that the consequence effects would have reached the steady state condition before the inventory depletes. Hence the additional inventory due to the higher throughput in Sensitivity Case 2 may lead to a prolonged fire event, but not increase the magnitude of the consequence.

1 ABBREVIATIONS

API	American Petroleum Institute
BLEVE	Boiling Liquid Expanding Vapour Explosion
CO_2	Carbon Dioxide
DNV	Det Norske Veritas
DTL	Dangerous Toxic Load
ESDV	Emergency Shutdown Valve
FBR	Full Bore Rupture
FGL	First Gas Limited
GCPS	Global Congress on Process Safety
HCRD	Hydrocarbon Release Database
HIPAP4	NSW Hazardous Industry Planning Advisory Paper No. 4
HMB	Heat and Material Balance
IOGP	International Association of Oil and Gas Producers
IRPA	Individual Risk Per Annum
KGTP	Kapuni Gas Treatment Plant
KPS	Kapuni Production Station
LFL	Lower Flammable Limit
LPG	Liquefied Petroleum Gas
LSIR	Location Specific Individual Risk
MEM	Multi-Energy Method
NGL	Natural Gasoline
NH_3	Ammonia
NIWA	National Institute of Water and Atmospheric Research Ltd
NZ	New Zealand
P&ID	Piping & Instrumentation Diagram
PFD	Probability of Failure on Demand
PHAST	Process Hazard Analysis Software Tool
SDV	Shutdown Valve
SLOT	Specified Level of Toxicity
SLOD	Significant Likelihood of Death
QRA	Quantitative Risk Assessment
RADD	Risk Assessment Database Directory
STDC	South Taranaki District Council
Todd	Todd Energy

VCE	Vapour Cloud Explosion
Worley	Worley New Zealand Limited

2 INTRODUCTION

2.1 Background

A Quantitative Risk Assessment (QRA) was completed by Worley New Zealand Limited (Worley) for Kapuni Gas Treatment Plant (KGTP) in 2020 as requested by Todd Energy (Todd).

An Assumptions Register has been prepared and agreed with Todd [Ref. 1] prior to commencing the QRA to ensure all modelling inputs used represent the current processes and operating conditions of KGTP and assumptions made are reasonable.

This report presents the QRA methodology, modelling inputs, assumptions and risk results.

2.2 Objectives

The main objective of the study is to develop risk contours to assess land use compatibility in accordance with the NSW Hazardous Industry Planning Advisory Paper No. 4 (HIPAP 4) "Risk Criteria for Land Use Planning" [Ref. 8].

2.3 Scope

Facilities considered in the QRA include:

- CO_2 Removal Unit (Benfield);
- Dehydration and Dew Point Control Unit;
- Propane Refrigeration System;
- Liquefied Petroleum Gas (LPG) Production Unit;
- Storage tanks for LPG & Loadout Facility;
- Storage tank for Natural Gasoline (NGL) & Loadout Facility;
- Product Lines and Compressors;
- Cogeneration Area;
- Utilities;
- CO_2 Recovery Unit; and
- CO_2 Storage tanks & Loadout Facility.

2.4 Exclusions

The following facilities and scope of work are excluded from the QRA:

- Utilities such as instrument air and utility water as they do not contain any hydrocarbon inventory;
- The flare and blowdown;
- The impact from Ballance Agri-Nutrients and Kapuni Production Station (KPS) to KGTP. The cumulative risk considering both KGTP and KPS is discussed briefly in Section 9;
- Risk other than hydrocarbon/ process (e.g. transportation/ seismic/ volcanic risks);
- Societal Risk (F-N Curve); and
- Occupied building risk assessment.

2.5 QRA Study Cases

The QRA study includes base case and sensitivity cases assessment to study the impact of certain assumptions and/or plant operating capacity on the risk results. The QRA Base Case includes the assessment of current KGTP operation with a set of agreed modelling assumptions detailed in Section 4.2.

The two sensitivity cases considered in the KGTP QRA are:

- Sensitivity Case 1: 98% ESDV Success Probability; and
- Sensitivity Case 2: Future Operations.

The details of Base Case, Sensitive Case 1 and Sensitivity Case 2 are summarised in Table 2-1.

Table 2-1: KGTP QRA Base Case, Sensitivity Case 1, Sensitivity Case 2 Comparison

QRA Case	Details	Potential Impact
Base Case	• Current plant operation with 2 Benfield nominal throughput (12 Sm^3/s), includes all Operating units summarised in Table 3-2 • Assumed ESDV system has 100% isolation success probability	-
Sensitivity Case 1 (98% ESDV Success Probability)	• Current plant operation with 2 Benfield nominal throughput (12 Sm^3/s), includes all Operating units summarised in Table 3-2 • Assumed ESDV system has 98% success probability	• Increased release inventories during ESDV failure, i.e. 2% of the time. The volume for each isolatable section is added with the next biggest connecting isolation inventory
Sensitivity Case 2 (Future Operation)	• Maximum throughput operation (29 Sm^3/s) for future operation after the Kapuni development project, includes all Operating, Mothballed and Standby units summarised in Table 3-2 • Assumed ESDV system has 100% isolation success probability (noting that the 100% and 98% scenarios give very similar results)	• Additional equipment considered in the QRA model • Increased in inventory for each isolatable section due to increase in throughput • Increased in total leak frequency

3 FACILITY AND PROCESS OVERVIEW

3.1 Facility Overview

Kapuni is an onshore gas and condensate field located in South Taranaki, approximately 50 km south of New Plymouth and 14 km northwest of Hawera. Throughout the Kapuni gas field, there are feeder well-sites which deliver raw Kapuni gas to Kapuni Production Station (KPS) and KGTP. The well sites, KPS and KGTP are owned and operated by Todd. Todd recover hydrocarbon condensate from the raw gas at KPS. The remaining raw gas is delivered via pipeline from KPS to KGTP.

KGTP is located directly to the south of KPS, with a fence separating the two facilities. Ballance Agri-Nutrients plant is located to the west of the KGTP. The locations of these sites land area are shown in Figure 3-1:

Figure 3-1: Map Showing Locations of KPS, KGTP and Ballance Sites

Raw Kapuni gas has a very low heating value due to it containing about 40-46 mol% Carbon Dioxide (CO_2). Consequently, this gas needs to be treated at KGTP so that the natural gas meets the New Zealand (NZ) specification for reticulated natural gas and can, therefore, go into the NZ open access gas transmission network owned by First Gas Limited (FGL).

Overview site plans of KGTP are shown in Figure 3-2 to Figure 3-4, and Table 3-1 shows the description of each area.

Table 3-1: KGTP Area Description

Area	Description
1	CO_2 Removal
2	Dehydration and Dewpoint Control
3	Refrigeration
4	LPG Production
5	Product Lines and Compressors (West)
6	Product Lines and Compressors (East)

Area	Description
7	LPG Storage
8	LPG Loadout
9	Product Gas Storage Compressors (East)
10	Flare (East)
11	Flare (West)
12	Steam Boilers
13	CO_2 Recovery
14	Alkali Storage
15	LTS Road Bridge
16	LTS Pipe Bridge
17	Methanol Storage

Figure 3-2: Kapuni Gas Treatment Plant Plot Plan (Main Process Area)

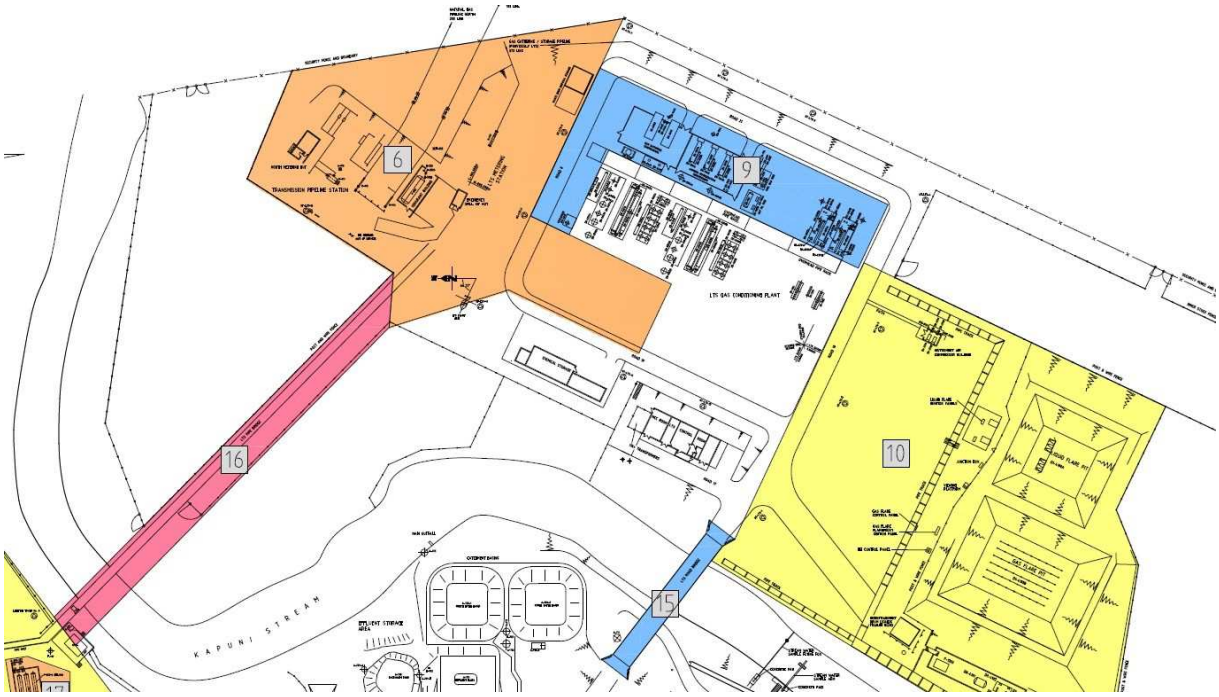

Figure 3-3: Kapuni Gas Treatment Plant Plot Plan (Product Gas Compression Unit and Flare Pits)

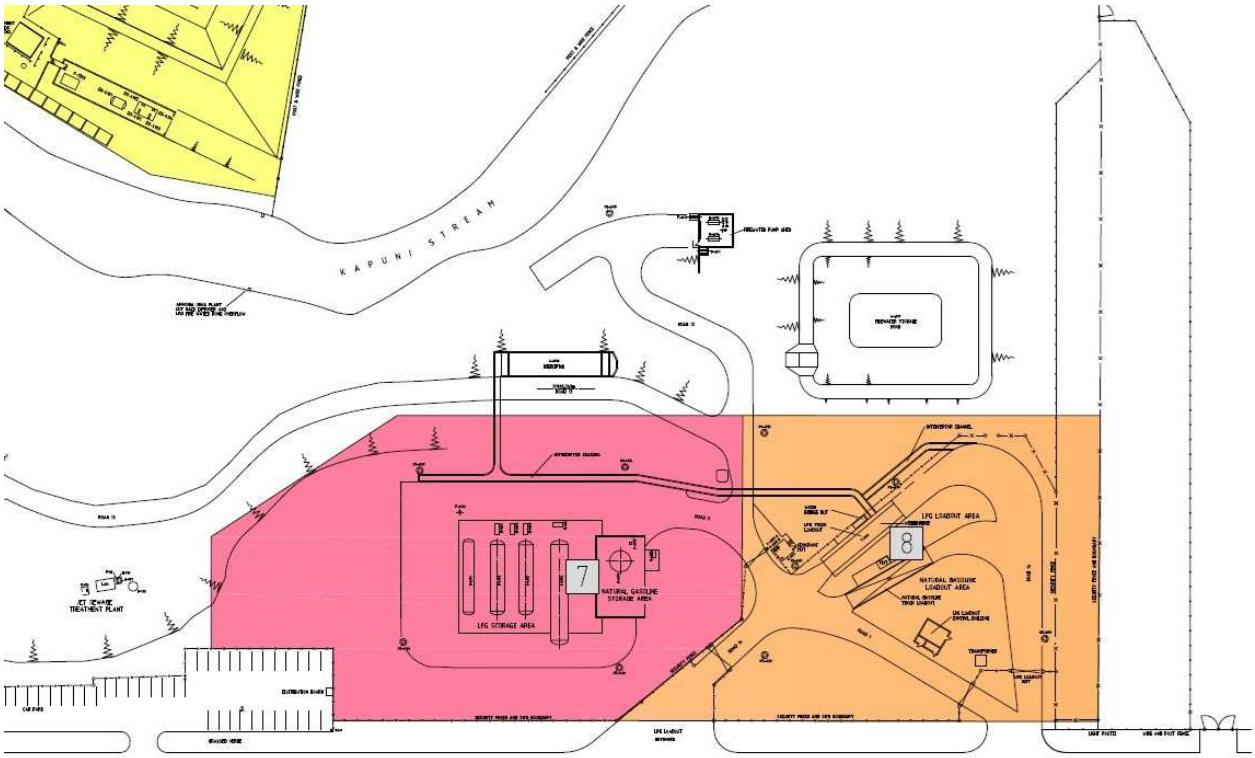

Figure 3-4: Kapuni Gas Treatment Plant Plot Plan (LPG Storage and Loadout Area)

3.2 Process Overview

The generalised gas treatment process in KGTP involves the following steps:

a) Removal of the bulk of the CO_2 via a recirculating Benfield hot potassium carbonate process so that the gas meets the acceptable specifications for energy content.

b) Removal of water by contact with methanol and then chilling using propane refrigerant to meet the water content and hydrocarbon dewpoint specifications.

c) Removal of a large proportion of the heavier hydrocarbon components in the above chilling stage, followed by separation to produce Liquefied Petroleum Gas (LPG) and Natural Gasoline (NGL) for export/sale.

d) Compression and metering of treated spec gas to transfer into the transmission network. Note that the Product Gas Compressor system is a First Gas asset but can be controlled from KGTP.

e) CO_2 collected from Benfield Process is processed into liquid CO_2, using an ammonia refrigeration system and transferred to storage tanks for export/sale.

The KGTP process overview is shown in Figure 3-5.

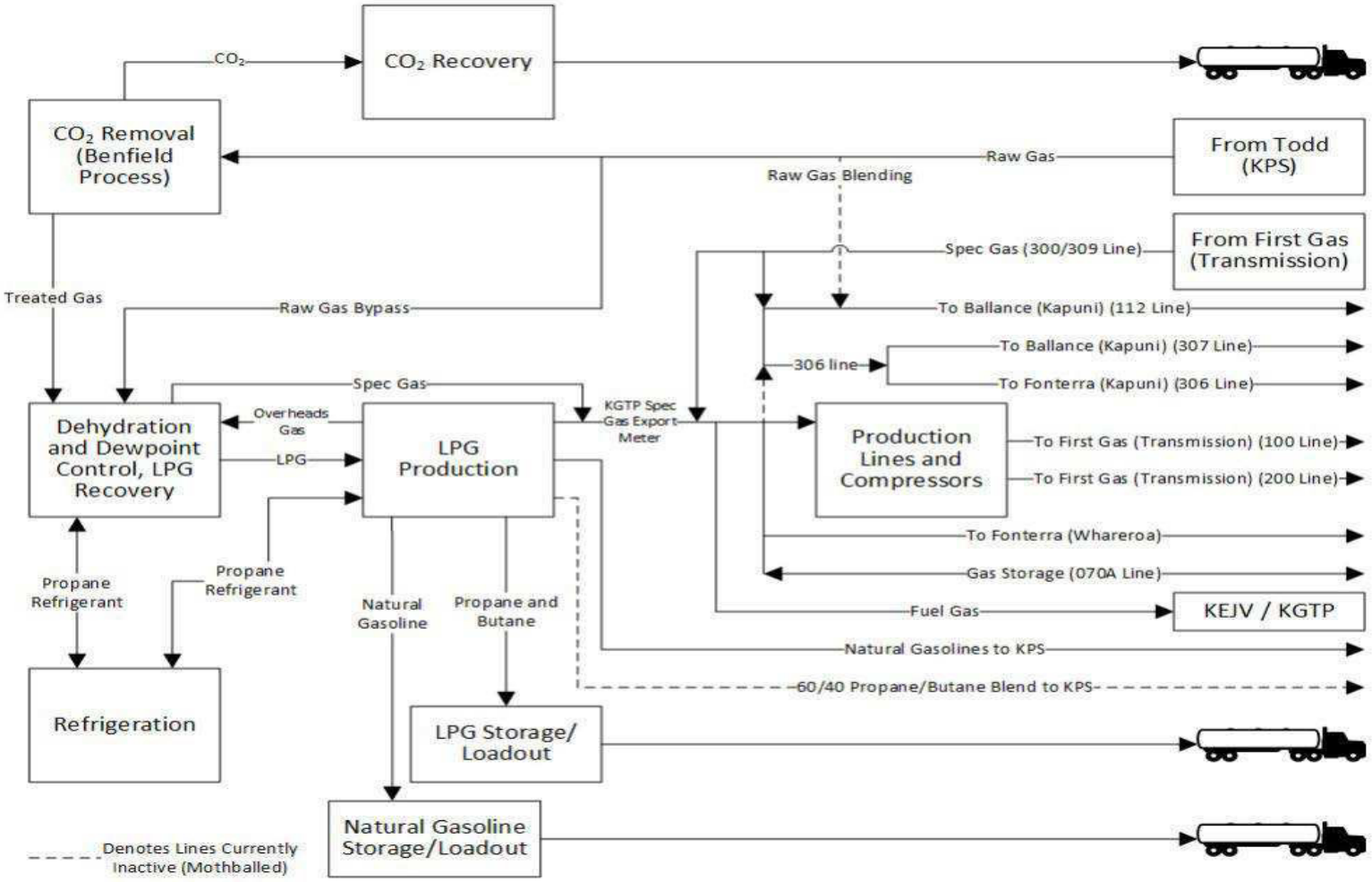

Figure 3-5: Kapuni Gas Treatment Plant Process Overview

3.3 Plant and/or Equipment Operational Status

Not all plant and equipment in the KGTP site are currently in operation. The four plant and equipment status categories defined by Todd are as follow:

- Operating: All plant and / or equipment that are currently in operation to achieve an outcome for the business.
- Standby: All plant and / or equipment that are ready to start when the operating plant and / or equipment unit stops.
- Mothballed: All plant and / or equipment that are unlikely to be used for achieving any business outcome in the near future. They are positively isolated from all upstream and downstream process systems. Blinds, spades or spacers are installed at all the points of disconnection from live process systems. All systems are electrically isolated and earthed. The plant and / or equipment is preserved to maintain it in a satisfactory condition.
- Abandoned: All plant and / or equipment that are unlikely to be used for achieving any business outcome in the foreseeable future. They are positively isolated and physically disconnected from all upstream and downstream process systems with a visible air gap present to prove positive isolation but maintain physical position on site. Blinds are installed at all the points of disconnection from live process systems. All systems are electrically isolated / disconnected as appropriate. Plant or equipment is not maintained or preserved.

The operational status of process plants / units in KGTP are summarised in Table 3-2.

Table 3-2 : KGTP Plants/Units Operational Status

Plant/Unit		Operational Status	Considered in QRA?
CO_2 Removal Unit (Benfield)	Train 1, 2	Operating	Yes
	Train 3	Mothballed Note1	Yes (Sensitivity case 2) Note 1
Dehydration and Dew Point Control Unit	No. 2 Chilling System	Operating	Yes
	No. 1 Chilling System	Standby Note2	Yes (Sensitivity case 2) Note 2
Propane Refrigeration System		Operating	Yes
LPG Production Unit	Train 1	Standby Note2	Yes (Sensitivity case 2) Note 2
	Train 2	Operating	Yes
LPG Storage & Loadout Facility		Operating	Yes
• 60/40 Condensing Tank		Mothballed Note 6	Yes (Sensitivity case 2) Note 6
Natural Gasoline Storage & Loadout Facility		Operating	Yes
Product Lines and Compressors		Operating	Yes
• Stab Gas Compressor • CNG Compressor • No.4 Product Gas Compressor		Abandoned Note 3	No
Gas Gathering Facility		Operating	Yes
Cogeneration Area		Operating	Yes
CO_2 Recovery Unit		Operating	Yes
Utilities		Operating	Yes

Plant/Unit	Operational Status	Considered in QRA?
• Boilers (B-901-1/2/3) • De-aerator (E-901-1)	Mothballed Note 4	Yes (Sensitivity case 2) Note 4
• Demin Plants 1&2	Abandoned Note 3	No
LTS Conditioning Unit	Abandoned Note 5	No Note5

Notes:

1. Benfield train 3 is mothballed and considered in QRA as Sensitivity case 2.
2. One out of two trains of the Dehydration and Dew Point Control Unit and the LPG Production Unit are currently on standby and considered in QRA as Sensitivity case 2.
3. Equipment is abandoned and will never be recommissioned, therefore not considered in QRA.
4. Boilers and de-aerator are mothballed, and the fuel gas lines are blinded off. One boiler is not in the condition that could be easily restarted but two can be brought back online fairly easy. Therefore, only two boilers are considered in QRA as Sensitivity case 2.
5. The LTS gas conditioning unit is in an abandoned condition which would require significant remedial work prior to recommissioning, therefore not considered in the study. However, a few live product gas lines and Gas Storage Compressors (D4-0401/0402) in this area, are considered in QRA.
6. 60/40 LPG line is mothballed and is considered in QRA as Sensitivity Case 2.

The QRA study considers current KGTP operation as Base Case. Risk levels considering equipment to be use for future production are considered in the Sensitivity Case 2 assessment.

4 STUDY METHODOLOGY AND ASSUMPTIONS

The methodology followed for completing the QRA is aligned with good industry practice and the Todd Energy Fire and Explosion Analysis and Quantitative Risk Assessment Methodology Guideline [Ref. 2]. The generic process, specified in the Worley's Onshore QRA Method Statement [Ref. 3], is illustrated in Figure 4-1 with the minor modification in that this study does not include the provision of risk mitigation measure recommendations.

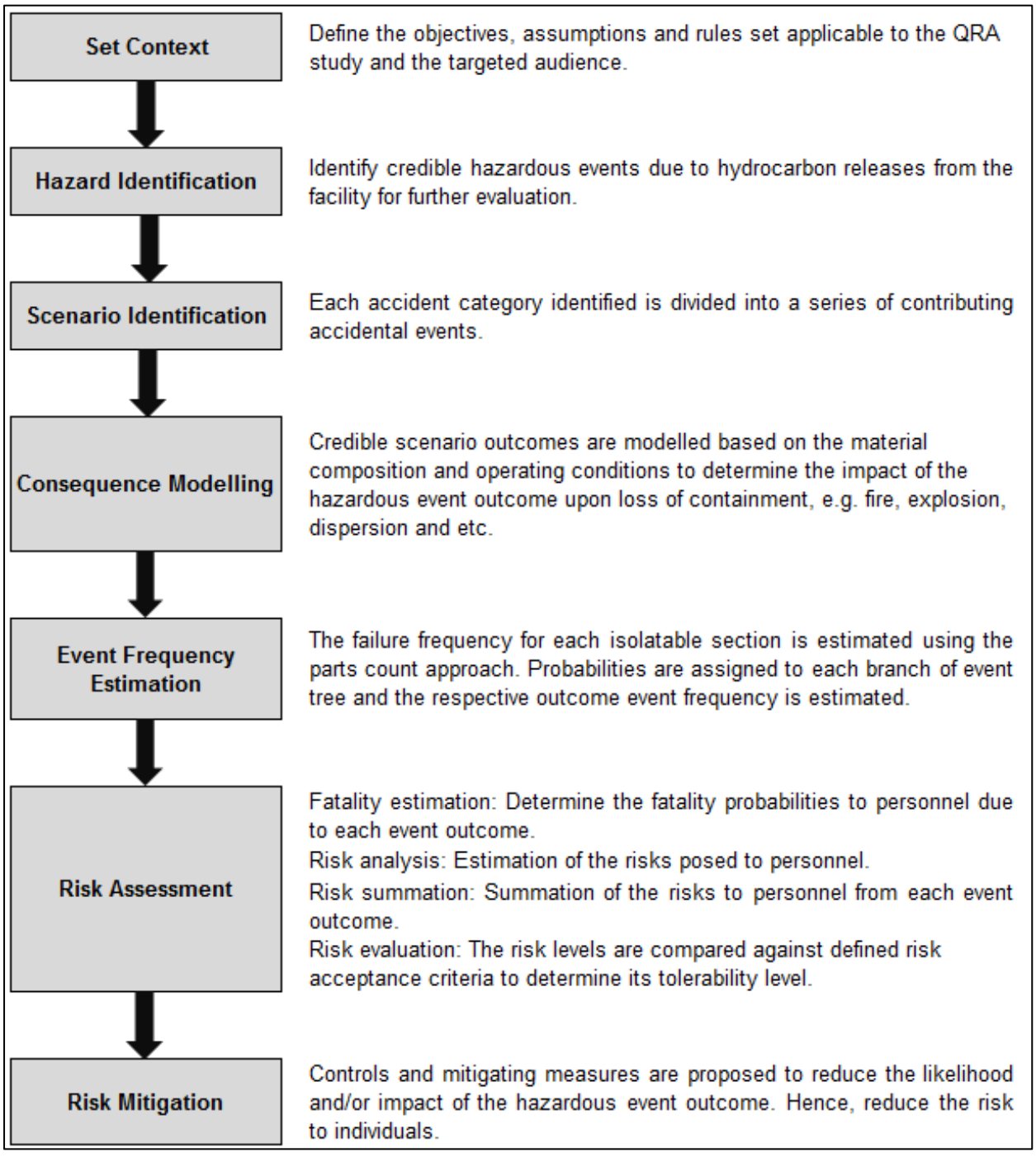

Figure 4-1: QRA Methodology

4.1 Assessment Tool

DNV Safeti Software version 8.22 [Ref. 6] is used to build the QRA model. Safeti is an integrated consequence and risk modelling package developed by DNV Software aimed at the onshore petrochemical and chemical process industry for assessing process plant risks via comprehensive QRA. It is designed to perform all the analytical, data processing and results presentation elements of a QRA within a structured framework.

4.2 QRA Assumptions

An Assumptions Register [Ref. 1] was generated which outlines the basis of all assumptions and the input bases inherent in the QRA study. Key assumptions are shown in the following subsections for reference.

4.2.1 Atmospheric Conditions

Meteorological conditions impact the outcomes of release modelling, including downwind flammable and toxic vapour cloud dispersion distance (influenced by atmospheric stability and wind speed), rate of pool vaporisation (ambient temperature), and atmospheric attenuation of radiant heat (temperature and relative humidity).

The following conditions are used as basis in the QRA modelling.

Wind Speed and Direction

Wind speed and direction data are taken from NIWA's CliFlo database [Ref. 19] for the Hawera Automatic Weather Station to represent the atmospheric conditions at KGTP. Data for 5-year period from January 2008 to December 2012 are taken, with wind speed and direction measurements taken every hour. The wind rose is shown in Figure 4-2.

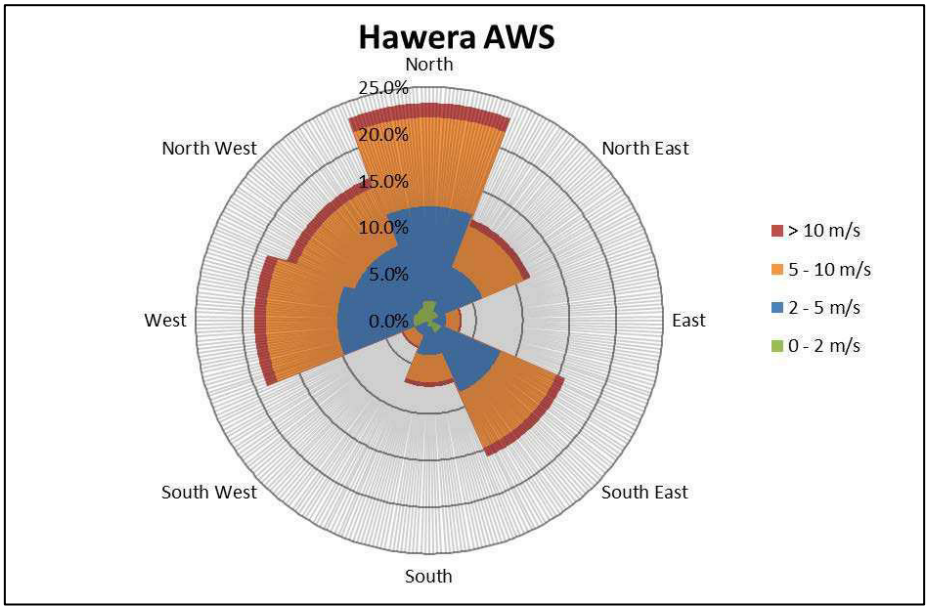

Figure 4-2: Hawera AWS Windrose

The following combinations of wind speed and atmospheric stability is used in the QRA model to represent the typical wind speed conditions around the plant area:

- 2/F – wind speed of 2 m/s with Pasquill Stability class F – stable, night with moderate clouds and light/moderate wind
- 5/D – wind speed of 5 m/s with Pasquill Stability class D – neutral, little sun and high wind or overcast/windy night

- 10/D – wind speed of 10 m/s with Pasquill Stability class D – neutral, little sun and high wind or overcast/windy night

For the modelling, wind speed reference height (the height at which the wind impacts a release) is set at 1 m (i.e. so as to match the release height). The Power Law wind profile is applied, where the wind speed varies with height according to power-law profile.

By consideration of the Pasquill Stability class relationship with day and night and wind speeds, the wind data for use in the QRA model is calculated as shown in Table 4-1.

Table 4-1: Hawera AWS Wind Data

Wind Speed / Pasquill Stability	North	North East	East	South East	South	South West	West	North West	Total
0 - 2 m/s / F	2.1%	1.1%	0.3%	1.4%	0.6%	0.3%	1.7%	1.5%	9.0%
2 - 5 m/s / D	10.1%	5.1%	1.5%	6.9%	3.1%	1.4%	8.2%	7.2%	43.5%
5 - 10 m/s / D	11.1%	5.6%	1.7%	7.5%	3.4%	1.5%	8.9%	7.9%	47.5%
Total	**23.3%**	**11.8%**	**3.5%**	**15.9%**	**7.1%**	**3.2%**	**18.7%**	**16.5%**	**100.0%**

Ambient Temperature and Relative Humidity

The following ambient temperature and relative humidity are used in the QRA:

- Ambient temperature: 14°C
- Relative humidity: 83%

Solar Radiation

The allowance for solar radiation has been excluded from the calculations.

Topography

Safeti cannot take into account the effects of the local undulating topography for the gas dispersion. The surface roughness of 0.1 m is applied to represent an area of “low crops, occasional large obstacles”.

4.2.2 General Leak Frequency

The leak frequencies for process equipment in general are taken from the International Association of Oil and Gas Producers (IOGP) Risk Assessment Data Directory (RADD) Process Release Frequency [Ref. 12]. Where IOGP data does not cover such as storage vessels, TNO Purple book failure data [Ref. 10] was used. The details are provided in the Assumptions Register [Ref. 1].

4.2.3 Release Hole Sizes

For every component failure, there is a range of credible hole sizes ranging from pinhole leak to full bore rupture. In general, the representative hole sizes used in the QRA is as shown in Table 4-2.

Selected representative holes sizes were chosen using the geometric mean of the smallest and largest hole size in each group. For example, the representative hole size for the range 10 – 50 mm is calculated as (10 x 50)0.5 = 22 mm. The use of geometric mean is also aligned with the recommendation in the latest OGP Process Release Frequency [Ref. 12].

Table 4-2: Hole Size Distribution

OGP Hole Size Group (mm)	Representative Hole Size (mm)
1 - 3	2
3 - 10	6
10 - 50	22
50 - 150	85
> 150	Range geometric mean

22 mm is used as the maximum hole size for small bore fittings. The maximum hole size for a flange is also limited to 22 mm as a release from a flange is normally limited to a segment of a gasket between bolts [Ref. 2].

It is noted for equipment referencing TNO Purple Book [Ref. 10] failure data, actual hole sizes following the failure data is used as there are no sufficient leak size distribution data in Purple Book to calculate the geometric mean.

4.2.4 Leak Frequency Modification Factor

Several leak frequency modification factors are applied to the release frequency database as per the Assumption Register [Ref. 1] and Todd Energy's Methodology Guideline [Ref. 2].

Table 4-3: Leak Frequency Modification Factor

Type of Release		Reduction in frequencies
Piping Release Frequency	Process Piping	-
	Inter-unit Piping	90%
Rupture Release Frequency	Full bore rupture	52%

For KGTP, process (on skid) piping are considered for pipework which connect equipment within the unit boundary while inter-unit piping is considered for piping which connects different units within the KGTP site.

4.2.5 Isolation Success Probability

The Emergency Shutdown (ESD) systems are intended to shut down and isolate the process inventories to reduce damage or risk of escalation. When activated, emergency shutdown valves (ESDVs) divide the process system into a number of isolatable sections, with each potential leak source associated with a particular isolatable inventory.

In this KGTP QRA, 100% ESDV success probability is assumed for the Base Case inventory consideration.

4.2.6 Ignition Probabilities

For KGTP QRA, the Energy Institute (EI) ignition probability model referenced in OGP Ignition Probabilities [Ref. 14] is used for the estimation of overall ignition probability of loss of containment scenarios.

For this QRA, the following ignition scenarios are used [Ref. 14]:

- Scenario 8 – Large Plant Gas LPG (Gas of LPG release from large onshore plant) – Releases of flammable gases, vapour or liquids significantly above their normal (NAP) boiling point from large onshore outdoor plants (plant area above 1200 m², site area above 35,000 m²).

- Scenario 9 – Large Plant Liquid (Liquid release from large onshore plant) – Releases of flammable liquids that do not have any significant flash fraction (10% or less) if released from large onshore outdoor plants (plant area above 1200 m^2, site area above 35,000 m^2) and which are not bunded or otherwise contained.
- Scenario 13 – Tank Liquid 100 m x 100 m Bund (Liquid release from onshore tank farm where spill is limited by small or medium sized bund) – Releases of flammable liquids that do not have any significant flash fraction (10% or less) if released from onshore outdoor storage area 'tank farm' (e.g. spill in a large tank bund containing four or fewer tanks, or any other bund less than 25,000 m^2 area).

The graphs of ignition probabilities as a function of mass release rate are shown in Figure 4-3.

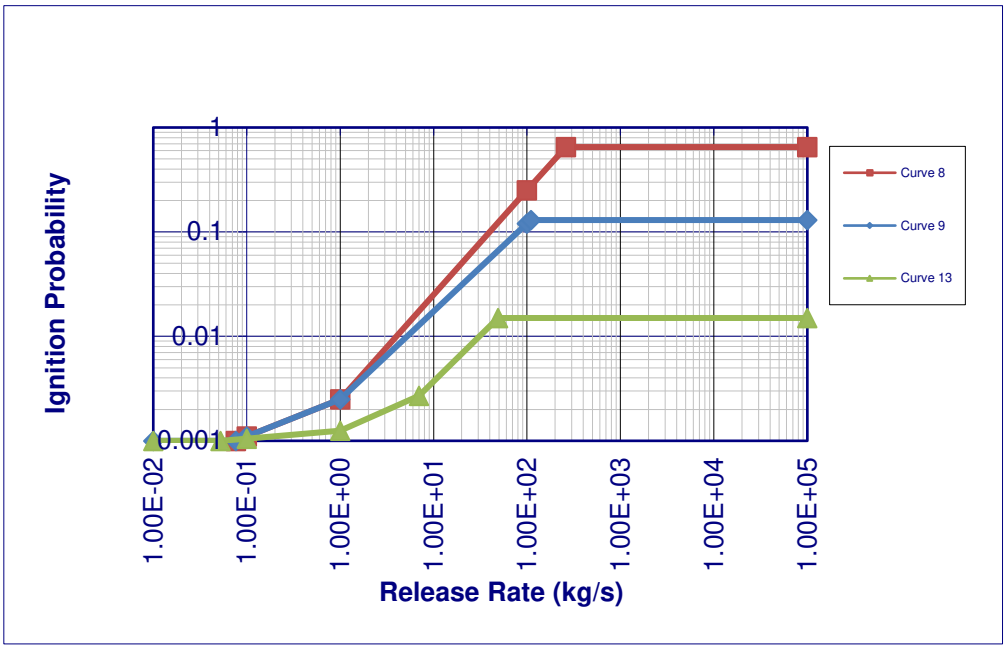

Figure 4-3 Ignition Probability

Early and Delayed Ignition Probabilities

The graph presented in Figure 4-3 represents the total ignition probability. An overall distribution for early to delayed ignition ratio of 30:70 to 50:50 split is considered reasonable. The timing of ignition is used as a means to predict the nature of the ignited event. Early ignition is taken to indicate a jet fire or pool fire depending on the material released. Delayed ignition is taken to indicate that the ignition would initially result in a flash fire or explosion.

For this study, a 30:70 split for early to delayed ignition probability is used. Given the maturity of the hazardous area and ignition control measures in place on KGTP site, it can be assumed that 70% of releases will not find an ignition source in the immediate area of the release and therefore will have a delayed ignition.

Explosion Probabilities

For this QRA, the generic explosion probabilities shown in Table 4-4 is used [Ref. 15].

Table 4-4: Explosion Probabilities

Release Rate Category	Release Rate (kg/s)	Explosion Probability given ignition
Minor	<1 (0.5 nominal)	0.04
Major	1-50	0.12
Massive	>50 (100 nominal)	0.3

4.2.7 Congested Areas

Flammable vapour cloud accumulation at congested area(s) is a prerequisite to initiate a Vapour Cloud Explosion (VCE).

KGTP is generally open with good ventilation expected throughout the year. However, some areas around the process plants can be quite congested due to the size and arrangement of process equipment/ vessels/ piping. These areas are identified as congested areas and shown in Figure 4-4.

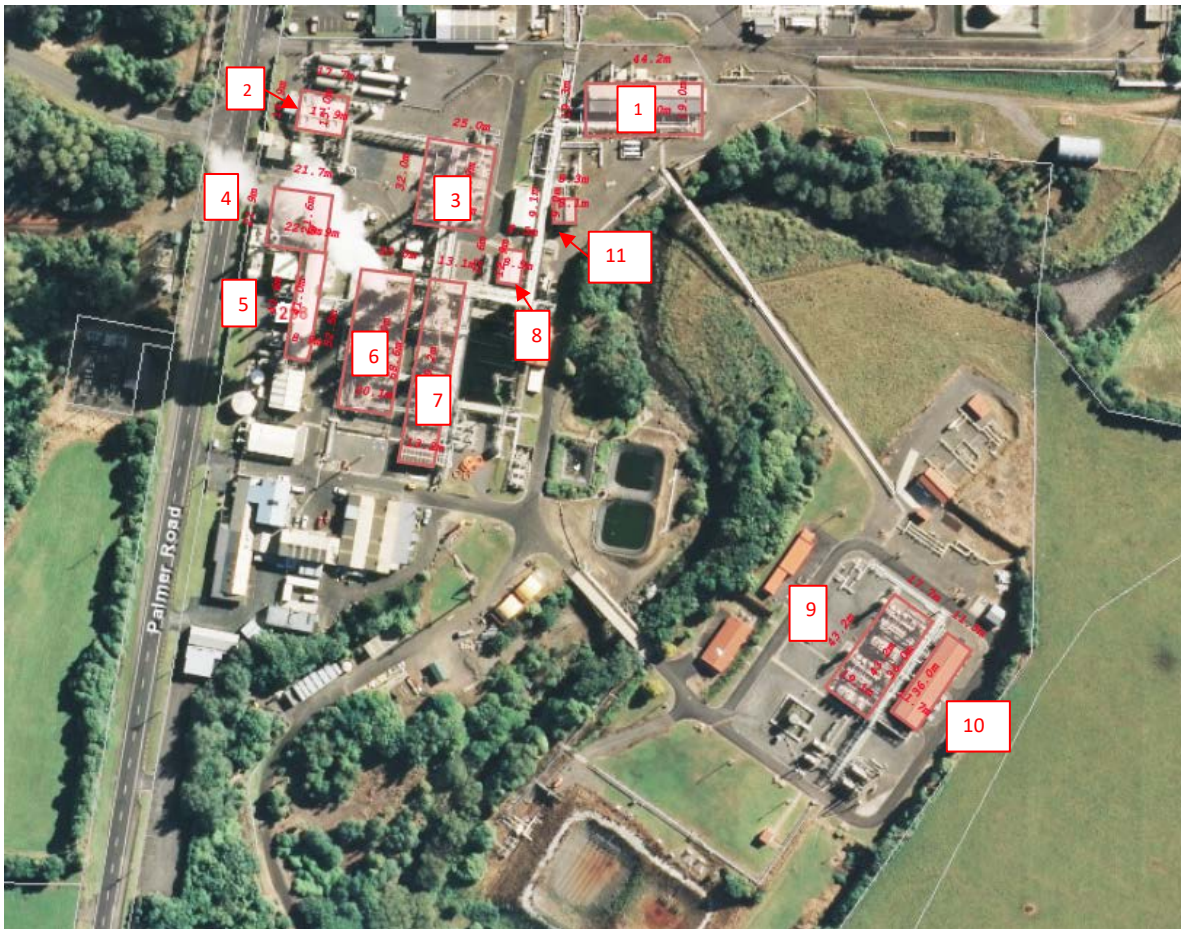

Figure 4-4: KGTP Congested Area

The estimated volume of each congested area is given in Table 4-5.

The VCE impacts are estimated using "Multi Energy Model" in Phast/Safeti, where the explosion overpressure is modelled based on blast strength of each congested area. The blast strength class assumed for each congested area is summarised in Table 4-5. Details and basis of the "Multi Energy Model" congested area parameters are provided in Assumptions Register [Ref. 1].

Table 4-5: Volume and Blast Strength Index of the Congested Areas

No.	Description	Volume (m^3)	Blast Strength Class
Congested Area 1	Gas Compression Area Compressor Shed	5,852	5
Congested Area 2	CO_2 Recovery Area Compressor Shed	1,350	5
Congested Area 3	LPG Production Process Area	2,400	5
Congested Area 4	Cogeneration Process Area	2,904	5

No.	Description	Volume (m^3)	Blast Strength Class
Congested Area 5	Boiler House	3,321	5
Congested Area 6	Gas Treatment Process Area 1	3,180	5
Congested Area 7	Gas Treatment Process Area 2	2,691	5
Congested Area 8	OVHD Compressor Shed	585	5
Congested Area 9	LTS Conditioning Process Area	2,451	3
Congested Area 10	LTS Gas Conditioning Compressor House	2,592	5
Congested Area 11	Stab Gas Compressor Shed	432	5

It is noted that VCE is performed with a "black box" calculations in the Safeti model. Safeti estimates explosion risk based on percentage fill of the identified congested areas, taking into account of the flammable gas cloud dispersion from all release scenarios within KGTP. The software however does not report the eventual percentage filled in each identified congested area used for the explosion fatality risk modelling.

4.2.8 Fatality Criteria

Heat Radiation

The method of calculating the probability of fatality for an individual, given known exposure duration and thermal heat radiation levels, is undertaken by using a Probit function. The Probit function is a general formula which takes the same form, but with various constants used. The Probit used for lethality calculations is taken from the TNO Green Book [Ref. 11]. The Probit function is defined as follows:

$$\text{Probit} = -36.38 + 2.56 \ln (t \times q^{4/3})$$

Where:

t = exposure duration in seconds

q = thermal radiation level in W/m^2

Safeti calculates the Probit values during the analysis.

An exposure duration of 20 seconds is used as a base case, although it is noted that personnel are likely to find some form of shielding protection within this time frame.

Flash Fire

If personnel are within the 100% lower flammable limit (LFL) of the gas plume, 100% fatality is assumed. LFL is the lower end of the concentration range over which the flammable mixture of a gas/ vapour in air can be ignited at a given temperature/ pressure.

A flash fire occurs when a dispersed cloud of flammable gas or vapour and air mixture is ignited within its flammable regions, causing a wall of flame to spread throughout the flammable region and back to the release point. The flame propagates through the cloud in a manner such that negligible or no damaging overpressure is generated. This flash is almost instantaneous as the flame propagates at high speed through the cloud and back to the source.

An assumption of 100% fatality rate within the footprint of the cloud is conservative and does not allow for potential risk reducing considerations such as;

- uneven mixing of gas and air in the cloud resulting in uneven propagation of the flame;
- topography;
- sparsely populated rural land use adjoining the site;

- availability of shelter;
- opportunity for escape; and
- clothing worn by persons exposed to the flash fire.

Thermal radiation outside of the flash fire falls off rapidly and is not sustained due to the instantaneous nature of the event. The potential for fatality outside the flash fire footprint is not considered credible.

Explosion Overpressure

The "Multi-Energy Explosion" model is used to model the congested area Vapour Cloud Explosion (VCE). The assessment criteria for explosion overpressure effects are based on the explosion effects taken from the HIPAP4 [Ref. 8] as given in Table 4-6.

Table 4-6: Effects of Explosion Overpressure

Explosion Overpressure (kPa)	Effects
3.5	No fatality and very low probability of injury
7	Probability of injury is 10%. No fatality
21	20% chance of fatality to a person in a building
35	50% chance of fatality for a person in a building and **15% chance of fatality for a person in the open**
70	Threshold of lung damage **100% chance of fatality for a person in a building or in the open**

Note: The two overpressure levels in bold are considered in the QRA as the fatality probabilities for personnel in the open.

BLEVE

Boiling Liquid Expanding Vapour Explosion (BLEVE) is an escalation scenario that occurs as a result of prolonged flame impingement on above ground pressurised vessels containing materials such as liquefied petroleum gas (LPG) or lighter end hydrocarbon. BLEVE would result in an explosion overpressure together with a fireball and missile generation over some distance. As the fireball tends to drift upward and to avoid double counting, only the explosion overpressure effects are considered in the QRA. The fatality criteria for BLEVE explosion are referenced from Table 4-6 above.

For KGTP study, BLEVE is considered credible if a pressurised vessel contains at least 4 m3 of volatile hydrocarbon (liquid butane or lighter). The BLEVE scenarios considered in the KGTP QRA study are shown in Table 4-7. These vessels are above ground vessels and no credit is taken for the available firefighting provisions (e.g. deluge).

Table 4-7: Vessels Considered for BLEVE in KGTP

Equipment Tag no.	Description	V/H Note 2	Material[Note1]	Equip. Volume (m^3)	Liquid Inventory (m^3)
D-420-2	De-Ethaniser	V	K402	33.5	16.75
D-420-1	Stabiliser	V	K402	10.3	5.15
D-430-2	De-Propaniser	V	K404	20.9	10.45
D-430-1	De-Propaniser	V	K404	14.3	7.15
F-4003	Propane Storage Vessel	H	Propane	113	51.32 Note 3
F-4004	Propane Storage Vessel	H	Propane	230	106.59 Note 3

Equipment Tag no.	Description	V/H Note 2	Material[Note1]	Equip. Volume (m^3)	Liquid Inventory (m^3)
F-4001	Butane Storage Vessel	H	Butane	66	51.29 Note 4
F-4002	Butane Storage Vessel	H	Butane	113	44.45 Note 4
F-315	Propane Refrigerant Surge Drum	H	Propane	9.2	4.6
D-315-2	Propane Refrigerant Economiser	H	Propane	17.6	5.3

Notes:

1. Material composition is provided in Assumptions Register [Ref. 1].
2. V - denotes vertical vessel, H - denotes horizontal vessel.
3. Mass inventory values (26 tonnes, 54 tonnes) were converted to volume respectively using Propane density of 506.6 kg/m^3 at 2 barg, 15°C [Ref. 6].
4. Mass inventory values (30 tonnes, 26 tonnes) were converted to volume respectively using Butane density is 585.0 kg/m^3 at 2 barg, 15°C [Ref. 6].

Toxic Effects

Fatality probabilities when exposed to toxic gas as a function of concentration and exposure duration can be calculated by using a probit function in the form given below:

Probit = a + b ln ($C^n \cdot t$)

where:

t = exposure durations in minutes

C= concentration in ppm

a, b and n = material specific probit constants

The toxic materials handled onsite include:

- Ammonia;
- Methanol;
- Ethyl Mercaptan (odorant);
- t-Butyl Mercaptan (odorant); and
- Carbon Dioxide.

UK HSE [Ref. 20] gives the following toxic load values for toxic materials as shown in Table 4-8.

Table 4-8 : UK HSE Dangerous Toxic Load (DTL) for Specified Level of Toxicity (SLOT) and Significant Likelihood of Death (SLOD) Values

Material	n	SLOT DTL ($ppm^n \cdot min$)	SLOD DTL ($ppm^n \cdot min$)
Ammonia	2	3.78×10^8	1.03×10^9
Methanol	1	8.02×10^5	2.67×10^6
Ethyl mercaptan	1	1.66×10^5	6.62×10^5
t-Butyl mercaptan	1	9.9×10^5	3.96×10^6
Carbon Dioxide	8	1.5×10^{40}	1.5×10^{41}

By solving the simultaneous equation, the other constants a and b can be calculated. The probit constants for toxic materials onsite are shown in Table 4-9.

Table 4-9 : Probit Constants

Material	a	b	n
Ammonia	-43.24	2.32	2
Methanol	-23.67	1.94	1
Ethyl mercaptan	-17.58	1.68	1
t-Butyl mercaptan	-20.53	1.68	1
Carbon Dioxide	-90.94	1.01	8

4.3 Vapour Cloud Explosion and UK HSE Research Report RR1113 Findings

The UK Buncefield Oil Depot explosion and fire in December 2005 is of particular interest for sites with vapour cloud explosion (VCEs) potential. UK HSE Research Report RR1113 (Review of Vapour Cloud Explosion Incidents) [Ref.22] describes post-Buncefield work undertaken by the UK HSE (along with US safety regulators) to consolidate previous research and analysis on vapour cloud development and explosions into a single review of historical incidents.

The review focusses on source terms, cloud development and explosion mechanics for both permanent fuel gases C2-C4 (e.g. LPG) and volatile liquids C4-C6 (e.g. gasoline). The report notes that, once a stable current of cold heavy vapour forms, the subsequent development of LPG and gasoline clouds are similar [Ref.22]. Those operating sites handling LPG should therefore be interested in records of vapour cloud development and VCEs at gasoline sites and vice versa.

There is one gasoline tank (F-4033) at the KGTP site. However, the tank has a volume of 65 m3 and filling rate of approximately 2 m3/hr, which is much lower than the 100 m3/hr “in-scope tank” criteria for Buncefield type overflow scenarios consideration [Ref. 24]. The Buncefield type overflow scenario assessment is therefore not addressed in this report.

The KGTP site handles and stores LPG, and it is acknowledged that the LPG spray releases could potentially form large vapour clouds under nil/ very low wind conditions (< 1.3m/s).

RR1113 notes that under nil / very low wind speed conditions (<1.3 m/s) vapour dispersion will be gravity-driven, and the vapour cloud will continue to grow for as long as the release continues (spreading out in all directions and/or following any downward slopes around the release source).

These large vapour clouds are almost certain to ignite, and the probability of a severe explosion event (open area VCE) is high, especially for gasoline. However, for LPG incidents, it is suggested that the clouds formed can be very rich or even over the upper flammability limit (UFL) and as such the risk of an open area VCE is most likely less than 50%. RR1113 concluded that additional experimental and modelling work is required determine what kind of LPG spray releases in nil/very low wind conditions could results in clouds within the flammable range.

The report also concludes that although the transition to a severe explosion seems to involve some degree of congestion or confinement as an initiator, the overpressure effects are not limited to areas of congestion or confinement. The report suggests that overpressures in this scenario could be in excess of 2000 mbar, with 100% fatalities throughout the extent of the large flammable cloud at time of ignition.

However, at this point in time, the explosion propagation mechanism through open/uncongested areas is subjected to considerable academic debate, and there are no commonly available methods to reproduce these specific conditions and subsequent high levels of overpressure with current industry standard explosion models (e.g. Multi Energy Method). Furthermore, the UK HSE Vapour Cloud Assessment (VCA) method provided in RR908 / FABIG 12 [Ref.26, 27] addresses gasoline overfill, but does not address LPG releases. As such, the LPG vapour cloud formation under nil/ very low wind conditions have not been quantified in this QRA.

The findings of RR1113 are highlighted in this assessment to reinforce the maintenance of plant integrity as critical risk reduction measures and suggest that the value of mitigation measures such as vapour detection should be reviewed. Site emergency response planning should take into consideration the LPG vertical spray release scenarios under nil / very low wind conditions.

5 HAZARD IDENTIFICATION

5.1 Hazardous Materials

The material compositions used in the QRA modelling are based on information and confirmation provided by Todd [Ref. 4, 5, 16].

Any stream that will generate different consequences is represented by different sections. For node sections with similar operating conditions or fluid composition that will generate similar consequence results, the stream which results in worst case result is selected as representative to rationalise the number of scenarios performed. This is also to avoid the method of averaging out the inputs of different feed gas streams as it may create a stream with 'brand new' operating conditions, material compositions and flowrates which does not represent the actual release conditions.

The effect of CO in hydrocarbon mixtures on fire hazards is considered to avoid over/under conservatism in the QRA. Research [Ref. 18] has found that CO_2/methane mixture were ignitable up to a CO_2 concentration of 60%. Following the research findings, hydrocarbon mixtures with CO_2 concentration of up to 60 vol% are assumed to remain flammable and modelled in the QRA to account for the fire and explosion hazards. CO_2 toxic effects on personnel fatalities are considered in the QRA study as discussed in Section 4.2.7. It is noted that the CO_2 toxic fatality effects are only considered for scenarios with equipment containing pure CO_2.

As far as is reasonable, the compositions in each stream are simplified (i.e. isomers are summed together). The important characteristic of molecular weight is kept close to the actual value to ensure the release rate is representative.

In addition to the material composition provided in process condition summary [Ref. 4], the following materials and the associated compositions are used in the QRA as well:

- Product gas (89 mol% Methane and 11 mol% Ethane);
- LPG (60 mol% Propane and 40 mol% Butane); and
- Natural Gasoline (50 mol% Pentane and 50 mol% Hexane).

Detailed stream compositions used for each isolatable sections/node were provided in Assumptions Register [Ref. 1].

Diesel and lube oil have high flash points and considered as combustible liquids, thus not further modelled in the QRA study. The flash point of a liquid is the lowest temperature at which a liquid will form a vapour in the air near its surface. For substances with high flash point, presence of major heat sources such as pre-existing fire [Ref. 7] are required to heat the substances above its flash point before it can be ignited in air.

5.2 Isolatable Sections

An ESD system can limit the outflow once a loss of containment occurs. When activated, ESDVs divide the process system into a number of isolatable sections, with each potential leak source associated with a particular isolatable inventory. These sections were split further where necessary and the entire contained inventory was considered as available for release.

Node sections highlighted in the Piping & Instrumentation Diagrams (P&IDs) are presented in Appendix 1. Details of the node sections for Base Case and Sensitivity Case 2 are presented in Table 5-1. Inventory calculation for Sensitivity Case 1 are detailed in Section 8.1.1.

5.3 Release Scenarios

Release rates were calculated based on the release hole sizes and fluid pressure/ tank head pressure. The height of release from all scenarios is assumed to be at 1 m above ground, although some equipment may be located at the elevation higher than the ground level. It is assumed that 70% of the releases are horizontal and 30% of the releases are vertical.

The release scenarios and the respective operating conditions used in the QRA study are presented in Table 5-1.

Table 5-1: Release Scenarios and Operating Conditions

Node	Description / Boundaries	Stream No. (Note 1)	T (° C)	P (barg)	Max Pipe / Hose Diameter (mm) (Note 2)	Pipe / Hose Length (m) (Note 3)	Volume of Isolatable Section (m³)
Raw Gas and Maui Gas Lines							
KGT01_RGS_01_V	Raw Gas header from KPS/KGTP Site Boundary via Inlet Separator (M-507) and Clanton Separator (M-105) to Absorber Towers (D-101-1/2) inlet valves (PV101-1/2), Cogen Plant Header (XSV-603), LTS Plant Gas Header and bypass to Separator (D-201-4) top line	K101	15	40	500	259	233.0
KGT01_RCS_01_L	Raw Condensate from Cyclone Bank (M-507) bottom to LPG Surge Vapouriser (F-201) inlet (liquid inventory taken up to XSV-516)	K919	15	40	100	218	4.1
KGT01_MAU_01_V	Maui Gas from 300 line & 309 line (XSV-594) adjoining with Product Gas Compressors Inlet header and sending Maui Gas export to AUP/ Ballance & Lactose Plant -306 line (up to XSV-9622)	K502	15	45	500	111	233.0
KGT01_MAU_02_V	Maui Gas export via Dry Gas In-line Filter (M-512) to A/U Plant- 112 line (up to HV-300)	K502	15	45	100	63	233.0
CO_2 Removal							
KGT02_TGS_01_V	Treated gas from top of CO_2 Absorber Tower (D-101-1) via Gas Cooler (E-105-1) and Gas Separator (M-101-1) to FV-102-1 (Benfield Train 1)	K102	42	40	300	15	36.2
KGT03_TGS_04_V	Treated gas from top of CO_2 Absorber Tower (D-101-2) via Gas Cooler (E-105-2) and Gas Separator (M-101-2) to FV-102-2 (Benfield Train 2)	K102	42	40	250	15	36.0
Dehydration and Dewpoint Control							
KGT01_TGS_07_V	Treated gas from CO_2 Removal Unit via Decanted Water Stripper (D-201-3) and Wash Water Stripper (D-201-4) to Chilling System	K203	42	40	300	48	233.0
KGT01_TGS_10_V	Treated gas from Strippers via Gas/Gas Heat Exchangers (E-313-1/2) and Gas Chiller (E-313-3) to Low Temperature Separator (M-313) inlet	K203	42	40	300	48	233.0
KGT01_TGS_12_V	Treated gas from Strippers via Gas/Liquid Heat Exchanger (E-303-4) adjoining with Gas Chiller (E-313-3) inlet line	K203	42	40	200	49	233.0
KGT01_PGS_02_V	Product gas from Low Temperature Separator (M-313) and Two-Phase Separator (M-314) via Gas/Gas Heat Exchangers (E-313-1/2) to Product Gas header (PV-337)	K205	12	40	200	15	233.0
KGT04_PGS_07_V	Product gas from top of High Temperature Separator (M-307) to Product Gas header (PV-380)	K205	12	40	80	15	2.4
KGT01_MPG_01_L	Mixed LPG from bottom of Low Temperature Separator (M-313) and Two-Phase Separator (M-314) to FV-357 on outlet line	K204	12	40	80	15	56.3
KGT04_MPG_03_L	Mixed LPG from FV-357 on outlet line of Two-Phase Separator (M-313) via Gas Liquid Heat Exchanger (E-303-4) to High Temperature Separator (M-307) inlet	K204	12	40	100	35	4.0
KGT04_MPG_04_L	Mixed LPG from bottom of High Temperature Separator (M-307) to HT Separator Condensate Pumps (G-301-1/2) suction. (G-301-2 is on stand-by)	K204	12	40	150	15	4.0
KGT04_MPG_05_L	Mixed LPG from HT Separator Condensate Pump (G-301-1) Discharge to Wash Water Coalescer (M-302) inlet	K204	12	40	100	15	4.0
KGT04_MPG_06_L	Mixed LPG from Wash Water Coalescer (M-302) to LPG Production Unit (XSV-332)	K204	12	40	100	15	4.0
Product Gas Lines and Compressors							
KGT01_PGS_01_V	Product Gas header from Dehydration and Dew Point Unit to Product Gas Compressors Inlet header, domestic supply and sending Product Gas export to KPS and Whareroa (up to KPS/KGTP Site Boundary)	K501	15	40	400	229	233.0
KGT01_PGS_13_V	Product Gas from Product Gas header to blanket Hydrocarbon Separator (M-111) top section	K501	15	40	100	15	233.0
KGT01_PGS_14_V	Product Gas from Product Gas Header (FV-0106) via LTS pipe bridge to XSV-0109 near Gas Storage Compressors in LTS unit	K505	15	40	200	274	233.0
KGT13_PGS_15_V	Product Gas from XSV-0109 to Gas Storage Compressors (D4-0401/0402) Inlet (D4-0402 is on standby.)	K901	15	40	500	56	23.5
KGT13_PGS_16_V	Product Gas from Gas Storage Compressor (D4-0401) Discharge via Gas Storage Compressor Cooler (D2-0402) to Coalescer (D11-0417) inlet	K901	15	40	150	51	23.5
KGT13_PGS_17_V	Product Gas export from Coalescer (D11-0417) to Gas Storage/ 070 Pipeline (XSV-0112)	K901	15	40	500	51	23.5
KGT01_MGS_01_V	Mixed Gas from Process Gas header and Maui Gas line to suction of Product Gas Compressor (C-903-2/3/5) (C-903-3 is on standby.)	K501	15	40	400	91	233.0
KGT01_MGS_03_V	Mixed Gas from Product Gas Compressor (C-903-2) Discharge	K506	40	70	200	15	233.0
KGT01_MGS_07_V	Mixed Gas from Product Gas Compressor (C-903-5) Discharge	K506	40	70	200	15	233.0
KGT11_MGS_05_V	Mixed Gas discharge header to the flange to the flange with Transmission export line	K506	40	70	350	91	41.3
KGT11_MGS_08_V	Mixed Gas domestic supply to Stores/ Workshop/ Admin. Building	K506	40	70	50	251	41.3
KGT11_MGS_09_V	Mixed Gas export from Product Gas Compressor Discharge header via Oil Coalescer (M-919) to 100/200 Pipelines in Transmission metering area and side uses as purge gas for Odorant Injection Tank (F-553) and instrument gas for XSV-0107	K506	40	70	350	278	41.3

Node	Description / Boundaries	Stream No. (Note 1)	T (° C)	P (barg)	Max Pipe / Hose Diameter (mm) (Note 2)	Pipe / Hose Length (m) (Note 3)	Volume of Isolatable Section (m³)
Pigging							
KGT01_PIG_01_V	Pig Receiver - 300 and 309 Pipeline (M-918)	K502	15	45	500	-	233.0
KGT13_PIG_02_V	LTS Pig Launcher (M-917)	K901	15	40	500	-	23.5
KGT11_PIG_03_V	Kapuni North Pig Launcher - 200 Pipeline (M-915)	K506	40	70	200	-	41.3
KGT11_PIG_04_V	Kapuni South Pig Launcher - 100 Pipeline (M-916)	K506	40	70	200	-	41.3
Utilities and Cogen Unit							
KGT01_MPG_21_V	Mixed LPG from top of LPG Surge Vaporiser (F-201) via Rich Fuel Gas Separator (M-201-2) to HRSG burners (B-604-A-1/2/3, B-604-B1/2/3) in Cogen. Unit	K919	88	3.9	100	78	233.0
KGT01_MPG_22_L	Mixed LPG at bottom of LPG Surge Vaporiser (F-201)	K919(L)	88	3.9	50	15	56.3
KGT01_MPG_23_L	Mixed LPG from bottom of Hydrocarbon Separator (M-111) to LPG Surge Vapouriser (F-201) inlet	K919	15	40	50	50	56.3
KGT01_FGA_01_V	Product Gas from Product Gas header via Fuel Gas Heater (E-602) and Fuel Gas KO Pot (M-601) to Fuel Gas Superheater (E-603)	K503	15	40	150	38	233.0
KGT01_FGA_02_V	Fuel Gas from Fuel Gas Superheater (E-603) via Fuel Gas Filters (M-628-A/B) to HRSG A/B Burners (B-604-A-1/2/3, B-604-B1/2/3) (M-628-B is on standby.)	K503	15	40	150	138	233.0
KGT01_PGS_19_V	Product gas from Product Gas header to Ammonia/ CO_2 Compressor Engines (CE-821/822) in CO2 Recovery Unit	K501	15	40	50	154	233.0
KGT01_PGS_21_V	Product gas from Product Gas header to Gas Flare System Burners (D1-4100B)	K501	15	40	100	274	233.0
LPG Production Facility - Stabiliser, De-Ethaniser							
KGT01_MPG_07_L	Mixed LPG from Dehydration unit (XSV-332) via De-Ethaniser Feed Preheater (E-420-3) to De-Ethaniser (D-420-2) inlet (LPG Production Train 2)	K401	12	30	100	194	56.3
KGT01_DET_01_V	De-Ethaniser (D-420-2) Top Vapour via De-Ethaniser OVHD Condenser (E-420-2) and De-Ethaniser Reflux Drum (F-420-2) to XSV-411-2 on inlet line to OVHD Compressor Suction Scrubber (M-422) (LPG Production Train 2)	K408	20	30	100	15	233.0
KGT01_PGS_04_V	Product gas from De-Ethaniser(D-420-2) via top of Suction Scrubber (M-422) to OVHD Compressor (C-421-1/2) inlet (LPG Production Train 2) (C-421-2 is on standby.)	K408	20	30	80	110	233.0
KGT01_PGS_05_V	Product gas from De-Ethaniser OVHD Compressor (C-421-1) discharge via De-Ethaniser OVHD Compressor Cooler (E-421-1) to Product gas header and to adjoining Treated Gas line from Strippers (LPG Production Train 2)	K408	20	30	200	143	233.0
KGT01_DEX_01_L	Reflux from De-Ethaniser Reflux Drum (F-420-2) via De-Ethaniser Reflux Pumps (G-420-1/2) to De-Euthaniser (D-420-2) top side (LPG Production Train 2) (G-420-2 is on standby.)	K402	100	30	80	15	56.3
KGT01_DEB_01_L	De-Ethaniser (D-420-2) Bottom Liquid to/from De-Ethaniser Reboiler (E-422-2) and to De-Propaniser Feed Surge Drum (F-420-3) inlet (LPG Production Train 2)	K402	100	30	150	15	56.3
KGT01_MPG_09_L	Mixed LPG from Bottom of De-Propaniser Feed Surge Drum (F-420-3) to De-Propaniser (D-430-1/2) inlet	K402	100	30	150	22	56.3
KGT01_MPG_10_V	Mixed LPG from Top of De-Propaniser Feed Surge Drum (F-420-3) to De-Propaniser (D-430-2) inlet	K402	100	30	100	15	233.0
LPG Production Facility - De-Propaniser							
KGT01_DPT_11_V	De-Propaniser (D-430-2) Top Vapour via De-Propaniser Condenser (E-430-2) to De-Propaniser Reflux Drum (F-430-2) (LPG Production Train 2)	K403	20	14	150	15	233.0
KGT01_DPX_11_L	Reflux from De-Propaniser Reflux Drum (F-430-2) via De-Propaniser Reflux Pumps (G-430-3/4) to De-Propaniser (D-430-2) (LPG Production Train 2) (G-430-4 is on stand-by.)	K403	20	14	100	15	56.3
KGT01_PC3_02_L	Product propane from De-Propaniser Reflux Pump (G-430-3) via Propane Product Cooler (E-4001-2) to XSV-417-2 on the export line to Storage (LPG Production Train 2)	K403	20	14	50	15	56.3
KGT01_DPB_11_L	De-Propaniser (D-430-2) Bottom Liquid to/from De-Propaniser Reboiler (E-432-2) and to De-Butaniser (D-440-1/2) (LPG Production Train 2)	K404	105	14	150	56	56.3
LPG Production Facility - De-C4							
KGT01_DBT_11_V	De-Butaniser (D-440-2) Top Vapour via De-Butaniser Condenser (E-440-2) to De-Butaniser Reflux Drum (F-440-2) and to Surge Vaporiser (F-201) (LPG Production Train 2)	K405	20	7	150	168	233.0
KGT01_DBX_11_L	Reflux from De-Propaniser Reflux Drum (F-440-2) via De-Butaniser Reflux Pumps (G-440-3/4) to De-Butaniser (D-440-2) (LPG Production Train 2) (G-440-4 is on standby.)	K405	20	7	80	15	56.3
KGT01_NGL_01_L	Natural Gasoline from bottom of De-Butaniser (D-440-2) and De-Butaniser Reboilers (E-442-1/2) to De-Ethaniser FEED Pre-Heater (E-420-3) inlet (LPG Production Train 2) (E-442-1 is on standby.)	K406	115	7	150	42	56.3
KGT01_NGL_02_L	Natural Gasoline from De-Ethaniser Feed Pre-Heater (E-420-3) via Gasoline Cooler (E-460) to the export lines KPS and Storage (XSV-416 and XSV-481-1)	K407	20	7	150	23	56.3

Node	Description / Boundaries	Stream No. (Note 1)	T (° C)	P (barg)	Max Pipe / Hose Diameter (mm) (Note 2)	Pipe / Hose Length (m) (Note 3)	Volume of Isolatable Section (m³)
LPG Production Facility - Product Export and Loadout							
KGT32_NGL_05_L	Natural Gasoline from XSV-416 in LPG Production Unit to KPS (up to KPS/KGTP Site Boundary)	K507	20	7	50	210	0.4
KGT33_NGL_06_L	Natural Gasoline from LPG Production Unit (XSV-481-1) to XSV-4073 on the inlet to NGL Storage Tank (F-4033)	K703	15	7	100	578	4.7
KGT34_NGL_07_L	Natural Gasoline Storage Tank (F-4033)	K706	15	ATM	-	-	65.0
KGT35_NGL_09_L	Natural Gasoline export from Natural Gasoline Storage Tank (F-4033) via Natural Gasoline Load Out Pump (G-4033) to XSV-4068 on the NGL export line	K803	15	2.95	100	15	0.1
KGT36_NGL_10_L	Natural Gasoline from XSV-4068 to NGL Tanker Loading Hose (T-4003) inlet	K803	15	2.95	100	15	0.1
KGT36_NGL_11_L	Natural Gasoline Loadout Hose (T-4003)	K803	15	2.95	100	-	0.1
KGT36_NGL_12_L Note 4	Natural Gasoline Road Tanker	K803	15	2.95	100	-	20 tonnes
KGT37_PC3_05_L	Product Propane export from LPG Production Unit (XSV 417-2) to SDV-4004 on the inlet lines to Propane Storage Vessels (F-4003, F-4004)	K701	15	14	80	-	2.5
KGT39_PC3_07_V	Vapour Section of Propane Storage Vessel (F-4003)	K704	15	7	-	-	61.7
KGT39_PC3_08_L	Liquid Section of Propane Storage Vessel (F-4003)	K704	15	7	-	-	51.3
KGT40_PC3_09_V	Vapour Section of Propane Storage Vessel (F-4004)	K704	15	7	-	-	123.4
KGT40_PC3_10_L	Liquid Section of Propane Storage Vessel (F-4004)	K704	15	7	-	-	106.6
KGT41_PC4_04_L	Product Butane export from LPG Production Unit (XSV-419-2) to SDV-4005 on the inlet lines to Butane Storage Vessels (F-4001, F-4002)	K702	15	7	80	562	2.6
KGT43_PC4_06_V	Vapour Section of Butane Storage Vessel (F-4001)	K705	15	2	-	-	14.7
KGT43_PC4_07_L	Liquid Section of Butane Storage Vessel (F-4001)	K705	15	2	-	-	51.3
KGT44_PC4_08_V	Vapour Section of Butane Storage Vessel (F-4002)	K705	15	2	-	-	68.6
KGT44_PC4_09_L	Liquid Section of Butane Storage Vessel (F-4002)	K705	15	2	-	-	44.5
KGT45_PC3_12_L	Product Propane export from Propane Storage Vessels (F-4003, F-4004) via Propane Loadout Pumps (G-4002/4024) to SDV-4017 on the LPG export line (G-4002 is on standby.)	K801	15	10	200	15	0.5
KGT46_PC4_11_L	Product Butane export from Butane Storage Vessels (F-4001, F-4002) via Butane Loadout Pump (G-4001) to SDV-4016 on the LPG export line	K802	15	5	200	15	0.5
KGT47_LPG_01_L	Product LPG export from SDV-4016/4017 to LPG Loadout Arm (T-4002)	K806	15	7.5	100	15	0.1
KGT47_LPG_02_L	LPG Loadout Arm (T-4002)	K806	15	7.5	80	-	0.1
KGT47_LPG_03_L Note 4	LPG Road Tanker	K806	15	7.5	80	-	20 tonnes
KGT47_LPG_05_L	LPG Loadout Smart Hose to Isotainers	K806	15	7.5	50	-	0.1
KGT47_LPG_06_L Note 4	New LPG Road Tanker (Isotainer)	K806	15	7.5	50	-	12 tonnes
Propane Refrigeration System							
KGT70_REF_01_V	Vapour section of Propane Refrigerant Surge Drum (F-315)	K302	-34	1	100	15	36.4
KGT70_REF_02_L	Propane refrigerant from bottom of Propane Refrigerant Surge Drum (F-315) to Propane Refrigerant Economiser (D-315-2) inlet	K301	15	4	100	15	25.2
KGT70_REF_03_V	Propane refrigerant from Propane Refrigerant Economiser (D-315-2) to Compressors (C-330-1/ C-330-2) inter-stage suction	K301	15	4	150	22	36.4
KGT70_REF_04_L	Propane refrigerant from bottom of Propane Refrigerant Economiser (D-315-2) to each user (E-313-3, E-420-2) (E-303-3 is on standby.)	K301	15	4	200	174	25.2
KGT70_REF_05_L	Propane refrigerant in Gas Chiller (E-313-3)	K302	-34	1	150	15	25.2
KGT70_REF_07_L	Propane refrigerant in De-Ethaniser Reflux Drum (E-420-2)	K302	-34	1	150	15	25.2
KGT70_REF_11_V	Propane refrigerant from each user via Propane Compressor Suction Scrubber (M-333) to Compressors (C-330-1/ 2) suction	K302	-34	1	300	154	36.4
KGT70_REF_14_V	Propane refrigerant from Compressors (C-330-1/2) discharge via Oil Separator (M-330-1/2) to Propane Refrigerant Condensers (E-317-1A/B, E-317-2) inlet	K301	15	4	250	65	36.4
KGT70_REF_15_L	Propane refrigerant from Propane Refrigerant Condensers (E-371-1A/B, E-317-2) to Propane Refrigerant Surge Drum (F-315) inlet	K301	15	4	200	28	25.2
Mercaptans and Methanol							
KGT50_EMC_01_L	Ethyl Mercaptan from Transportable Odorant Drums (F-4007-A/ B) via Odorant Injection Pump (G-4011) to LPG Loadout Arm (T-4002) inlet (F-4007-B is on standby.)	K804	15	10	15	15	0.2
KGT50_EMC_02_L	Ethyl Mercaptan Transportable Odorant Drums (F-4007-A/ B)	K805	15	1	-	-	0.2
KGT51_BMC_05_L	t-Butyl Mercaptan Portable Odorant Tank (F-521) to domestic gas supply header	K603	15	8	-	-	0.1
KGT52_BMC_01_L	t-Butyl Mercaptan Odorant Injection Tank (F-553)	K603	15	1	-	-	19.0

Node	Description / Boundaries	Stream No. (Note 1)	T (° C)	P (barg)	Max Pipe / Hose Diameter (mm) (Note 2)	Pipe / Hose Length (m) (Note 3)	Volume of Isolatable Section (m^3)
KGT52_BMC_02_L	t-Butyl Mercaptan from Odorant from Odorant Injection Tank (F-553) via Odorant Injection Pumps (G-552-A/B) to Transmission export lines (100/200 lines) (G-552-B is on standby.)	K602	15	80	15	15	19.0
KGT52_BMC_03_L	t-Butyl Mercaptan Filling Hose	K603	15	1	50	-	19.0
KGT53_BMC_04_L Note 4	t-Butyl Mercaptan Road Tanker	K603	15	1	50	-	16 tonnes
KGT55_MOH_01_L	Methanol Storage Tanks (F-502-1/2/4/6)	K918	15	ATM Liquid head (2.7m)	-	-	8.7
KGT55_MOH_02_L	Methanol from Methanol Storage Tanks (F-502-1/2/4/6) via Metering Pumps (G-309-1/2, G-319-1/2) to users (G-309-2, G-319-2 are on standby.)	K917	15	50	25	343	8.7
KGT55_MOH_03_L	Methanol Filling Hose	K918	15	0	40	-	8.7
KGT56_MOH_04_L Note 4	Methanol Road Tanker	K918	15	0	40	-	4 tonnes
CO_2 Recovery - Ammonia							
KGT80_AMM_01_V	Ammonia gas from Ammonia Compressor (C-888) discharge to Ammonia Condenser (E-895) through Oil Separator (M-892) (Train A)	K908	15	15	150	15	3.3
KGT80_AMM_11_V	Ammonia gas from Ammonia Compressor (C-821) discharge to Ammonia Receiver (F-823) through Oil Separator (M-825) and Ammonia Condenser (E-825) (Train B)	K908	15	15	150	15	3.3
KGT80_AMM_02_V	Ammonia gas section of Liquid Receivers (F-803/F-823)	K908	15	15	32	15	3.3
KGT80_AMM_03_L	Ammonia liquid from Ammonia Condensers (E-895/825) to Liquid Receiver (F-803/F-823)	K908	15	15	100	15	4.9
KGT80_AMM_04_L	Ammonia liquid from Liquid Receivers via Liquid Sub-Coolers (E-826/896) and CO_2 Condenser (E-804) to Oil Receiver (M-828)	K908	15	15	100	21	4.9
KGT80_AMM_07_L	Ammonia liquid from SV-825 and SV-896C via Oil Receiver (M-828) (coil) to CO_2 Chiller (E-803)	K908	15	15	25	38	4.9
KGT80_AMM_08_V	Ammonia gas return from CO_2Condenser (E-804) and Oil Receiver (M-828) to Ammonia Compressors (C-888/821) suction	K909	-30	0	250	15	3.3
KGT80_AMM_09_V	Ammonia gas return from CO_2 Chiller (E-803) and liquid ammonia vaporising via Liquid Sub-Coolers (E-826/896) to Ammonia Compressors (C-888/821) suction	K909	-30	0	80	48	3.3
CO_2 Recovery - CO_2							
KGT90_CO2_01_V	CO_2 gas from CO_2 Compressor (C-802) Discharge via Pulsation Vessel (F-806), Intercooler (E-807) and Interstage Separator (M-830) to After Cooler (E-802) inlet (Train A)	K910	-26.6	15	100	15	45.6
KGT90_CO2_02_V	CO_2 gas from CO_2 Compressor (C-822) Discharge via Pulsation Vessel (F-826), Intercooler (E-827) and Interstage Separator (M-829) to After Cooler (E-802) (Train B)	K910	-26.6	15	100	15	45.6
KGT90_CO2_03_V	CO_2 gas from CO_2 After Cooler (E-802) via Aftercooler Separator (M-881) and via CO_2 Chiller (E-803) to Chiller Separator (M-882)	K910	-26.6	15	100	31	45.6
KGT90_CO2_07_V	CO_2 gas from Chiller Separator (M-882) outlet via CO_2 Purifiers(M-807-1/2), CO_2 Driers (B-801-1/2) and CO_2 Particulate Filters (M-879-1/2) to CO_2 Condenser (E-804) inlet adjoin with CO_2 gas lines from Storage Tanks (F-801-1/2/3) (M-807-2, B-801-2 and M-879-2 are on standby.)	K910	-26.6	15	80	89	45.6
KGT90_CO2_08_L	CO_2 liquid from CO_2 Condenser (E-804) via CO_2 Liquid Receiver (F-802) and CO_2Condenser Pump (G-883) to Liquid CO_2 Storage Tanks (F-801-1/2/3) inlet	K910	-26.6	15	100	71	223.0
KGT90_CO2_16_V	CO_2 gas from Aftercooler Separator (M-881) and Raw Gas Boosters (C-885/823) discharge via Catalyst Carbon Vessels (D-821/ D-801) to CO_2 Compressors (C-802/822) suction	K907	15	1	300	180	45.6
KGT90_CO2_18_V	CO_2 gas from Storage Tanks (F-801-1/2/3) to users (Compressor shelters, LPG Storage tanks and LPG Loading facility)	K920	15	0.094	50	796	45.6
KGT90_CO2_19_V	CO_2 gas for Regeneration Cycle via Regeneration Heaters (B-802/ B-803), CO_2 Purifier (M-807-2), CO_2 Drier (B-801-1)	K922	15	0.1	80	15	45.6
KGT90_CO2_09_L	Liquid CO_2 Storage Tank (F-801-1)	K910	-26.6	15	-	-	223.0
KGT90_CO2_10_L	Liquid CO_2 Storage Tank (F-801-2)	K910	-26.6	15	-	-	223.0
KGT90_CO2_11_L	Liquid CO_2 Storage Tank (F-801-3)	K910	-26.6	15	-	-	223.0
KGT90_CO2_12_L	Air Liquide CO_2 Storage Tank (F-811)	K910	-26.6	15	-	-	223.0
KGT90_CO2_24_L	Liquid CO_2 from Storage Tanks (F-801-1/2/3) via CO_2 loadout pumps (G-821, G-801-1/2) to BOC CO_2 Road Tanker Loadout Connections	K906	-26.6	15	100	71	223.0
KGT90_CO2_25_L	Liquid CO_2 from Air Liquid CO_2 Storage Tank (F-811) via G-812 to Air Liquid Road Tanker Loadout Connection	K906	-26.6	15	50	15	223.0
KGT90_CO2_26_V	CO_2 gas to Storage Tanks (F-801-1/2/3) from BOC CO_2 Road Tanker Revert Connections	K906	-26.6	15	50	23	45.6
KGT90_CO2_27_V	CO_2 gas to from Air Liquid CO_2 Storage Tank (F-811) from Air Liquid Road Tanker Revert Connection	K906	-26.6	15	25	15	45.6

Node	Description / Boundaries	Stream No. (Note 1)	T (° C)	P (barg)	Max Pipe / Hose Diameter (mm) (Note 2)	Pipe / Hose Length (m) (Note 3)	Volume of Isolatable Section (m³)
KGT90_CO2_28_L	Vector CO_2 Loadout connection	K906	-26.6	15	50	-	223.0
KGT90_CO2_29_V	BOC CO_2 Road Tanker Revert connections	K906	-26.6	15	25	-	45.6
KGT90_CO2_30_L	BOC CO_2 Road Tanker Loadout Connection	K906	-26.6	15	80	-	223.0
KGT90_CO2_31_V	Air Liquide Road Tanker Revert connection	K906	-26.6	15	25	-	45.6
KGT90_CO2_32_L	Air Liquide Road Tanker Loading connection	K906	-26.6	15	50	-	223.0
KGT90_CO2_33_L Note 4	Vector CO_2 Road Tanker	K906	-26.6	15	50	-	18 tonnes
KGT90_CO2_34_L Note 4	BOC CO_2 Road Tanker	K906	-26.6	15	80	-	18 tonnes
KGT90_CO2_35_L Note 4	Air Liquide Road Tanker	K906	-26.6	15	50	-	18 tonnes

Notes:

1. Stream compositions are provided in Assumptions Register [Ref. 1].
2. The maximum pipe/hose diameters of each node are determined using the P&IDs.
3. The piping lengths are measured from the KGTP layout drawings using scale [Ref. 17]. A safety factor 1.25 has been applied to all lengths measured from the map to account for bends and elevations which could not be determined from the 2D map. See Appendix 3 for the main estimated piping lengths.
4. Road tankers BLEVE have been excluded in the assessment since several control measures are provided for road tankers in KGTP site as listed below. This is in line with the following TNO Purple Book [Ref. 10] recommendation where it stated “In general, the external impact LOCs for road tanker accidents do not have to be considered in an establishment if measures have been taken to reduce road accidents, like speed limits.” The KGTP site specific measures are:
   - Only one LPG/ NGL loadout occurs at a time. Other vehicles are precluded from entering the area via the site access system.
   - Site speed limit
   - Deluge cage over LPG loadout area

6 FREQUENCY ANALYSIS

6.1 Release Frequency Assessment

Following the nodes sectionalisation, parts (equipment) count on each release scenario is conducted based on Piping & Instrumentation Diagrams (P&IDs) to estimate the release frequency. The summary of estimated release frequencies for each KGTP unit for the Base Case are presented in Table 6-1. The detail breakdown of release frequencies for each node sections are provided in Appendix 4.

Table 6-1: Release Frequencies Summary for KGTP Units

Node Section	Base Case Release Frequencies (per year) Note 1						
	1 - 3 mm	3 - 10 mm	10 - 50 mm	50 - 150 mm	> 150 mm	Total	% Contrib.
Raw Gas and Maui Gas Lines	1.50E-02	6.58E-03	3.50E-03	6.07E-04	1.03E-04	2.58E-02	2.9%
CO_2 Removal	6.12E-03	2.82E-03	1.56E-03	3.83E-04	3.57E-05	1.09E-02	1.2%
Dehydration and Dewpoint Control	2.56E-02	1.10E-02	5.66E-03	1.06E-03	2.54E-04	4.36E-02	4.9%
Product Gas Lines and Compressors	6.28E-02	2.75E-02	1.39E-02	2.96E-03	4.61E-04	1.08E-01	12.0%
Pigging	3.58E-06	1.85E-06	1.03E-06	2.55E-07	1.16E-07	6.83E-06	<0.01%
Utilities and Cogen Unit	4.82E-02	1.97E-02	8.94E-03	1.86E-03	7.00E-05	7.88E-02	8.8%
LPG Production Facility - Stabiliser, De-C2	2.89E-02	1.23E-02	5.99E-03	1.67E-03	3.58E-05	4.89E-02	5.5%
LPG Production Facility - De-C3	1.47E-02	5.92E-03	2.82E-03	6.34E-04	1.90E-05	2.41E-02	2.7%
LPG Production Facility - De-C4	2.09E-02	8.35E-03	3.88E-03	8.22E-04	1.62E-05	3.40E-02	3.8%
LPG Production Facility - Product Export and Loadout	2.33E-02	6.71E-02	3.40E-03	6.87E-04	5.94E-03	1.00E-01	11.2%
Propane Refrigeration System	3.78E-02	1.63E-02	7.60E-03	1.60E-03	3.15E-04	6.36E-02	7.1%
Mercaptans and Methanol	1.95E-02	1.65E-02	3.85E-03	2.05E-03	8.51E-04	4.28E-02	4.8%
CO_2 Recovery - Ammonia	7.07E-02	2.81E-02	1.14E-02	2.90E-03	2.50E-04	1.13E-01	12.6%
CO_2 Recovery - CO_2	7.98E-02	9.66E-02	1.54E-02	4.18E-03	6.80E-03	2.03E-01	22.6%
Total	**4.53E-01**	**3.19E-01**	**8.79E-02**	**2.14E-02**	**1.51E-02**	**8.97E-01**	**100.0%**
% Contribution	**50.5%**	**35.6%**	**9.8%**	**2.4%**	**1.7%**	**100.0%**	**-**

Notes:

1. Release frequencies estimated have considered the operating factor of equipment.

The total release frequencies for the Base Case scenarios within KGTP are approximately 0.9 per annum, or equivalent one leak every 1.1 years. Approximately 51% of the leak frequencies are contributed from the "1 – 3 mm" hole sizes range.

6.2 Ignition and Explosion Probabilities

The split between immediate ignition, delayed ignition and explosion probabilities for the node sections are presented in Appendix 5.

7 RISK ANALYSIS

This section presents QRA risk results, presented in the form of Location Specific Individual Risk (LSIR) contours. Major risk contributors at selected points on the KGTP are discussed as well.

7.1 Location Specific Individual Risk (LSIR)

7.1.1 Criteria

LSIR is defined as the risk of fatality at a point in space to a hypothetical individual at a location for 365 days per year, 24 hours a day, unprotected and unable to escape.

As there are no standard risk criteria which have been developed for the New Zealand context, the individual risk has been assessed against the suggested risk criteria in the NSW HIPAP No. 4 "Risk Criteria for Land Use Planning" [Ref. 8], as shown in Table 7-1.

Table 7-1: Individual Fatality Risk Criteria

Land Use	Risk Criteria Adopted (per annum)	Interpretation for QRA
Hospitals, schools, childcare facilities, old age housing	0.5E-06 (or 5E-07) (1 in 2 million)	5E-07 risk contour should not extend to these areas
Residential, hotels, motels, tourist resorts	**1E-06** **(1 in 1 million)**	**1E-06 risk contour should not extend to these areas**
Commercial developments including retail centres, offices and entertainment centres	5E-06 (1 in 200,000)	5E-06 risk contour should not extend to these areas
Sporting complexes and active open space	10E-06 (or 1E-05) (1 in 100,000)	1E-05 risk contour should not extend to these areas
Industrial	**50E-06 (or 5E-05)** **(1 in 20,000)**	**5E-05 risk contour should, as a target, be contained within the boundaries of the industrial site where applicable**

KGTP is situated in an area classified as "Rural Industrial" under the Operative South Taranaki District Plan [Ref. 23]. The KPS plant is located immediately adjacent to the north while the Ballance plant is located north-west of the KGTP site, as presented in Figure 3-1. It should be noted that the KGTP, KPS and Ballance sites have been classified as a single 'Rural Industrial Zone' on the STDC Operative District Plan.

There are no sporting complexes, hospitals or commercial developments in the area surrounding KGTP. The closest identified offsite parties are a dwelling and a farm shed (approximately 220 metres and 180 metres, respectively from the northwest boundary of KGTP), in addition to the KPS and Ballance plants. Therefore, only the "Industrial" (i.e. the 5E-05/ year risk) and "Residential" (the 1E-06 /year risk) are considered in the QRA study.

7.1.2 Base Case Risk Contours

Figure 7-1 presents the Base Case overall LSIR contours at KGTP. The LSIR for fire and explosion events as well as toxic events are presented in Figure 7-2 and Figure 7-3, respectively.

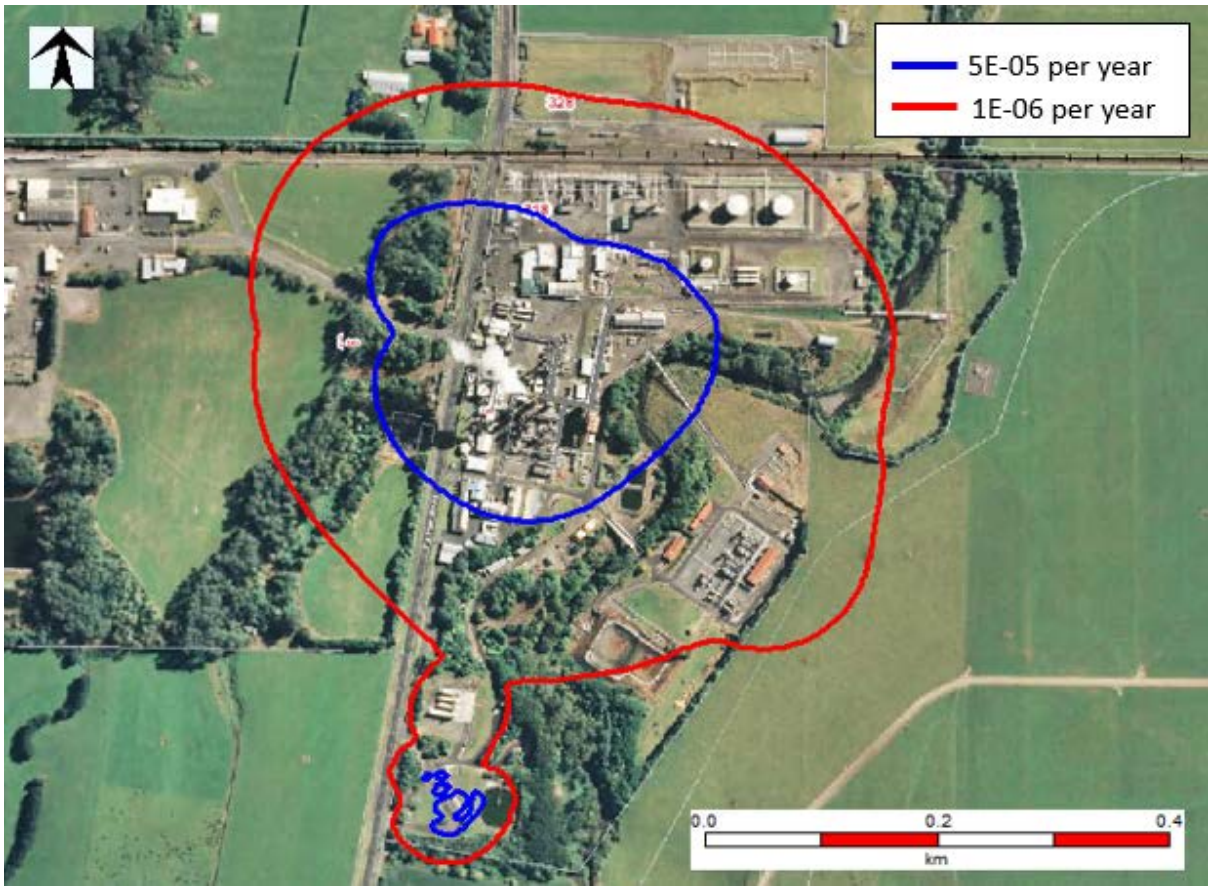

Figure 7-1: Base Case LSIR Contours at KGTP – All Events

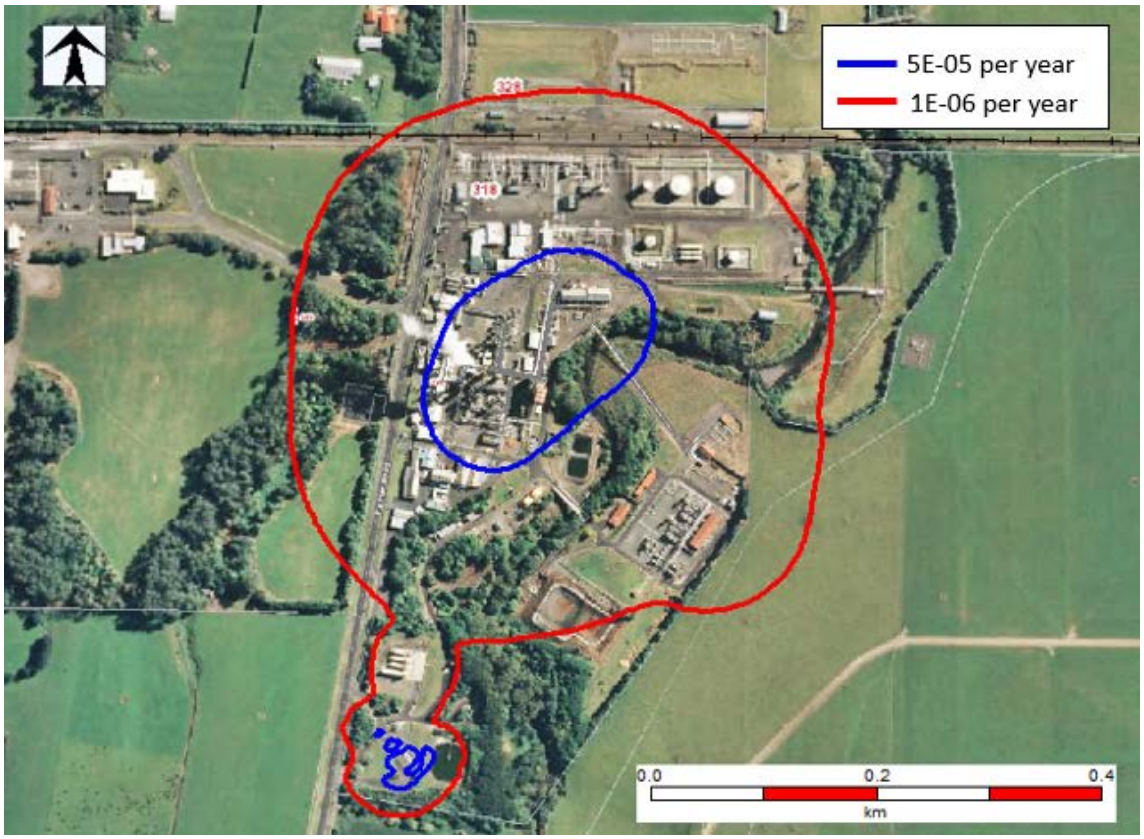

Figure 7-2: Base Case LSIR Contours at KGTP – Fire and Explosion Events

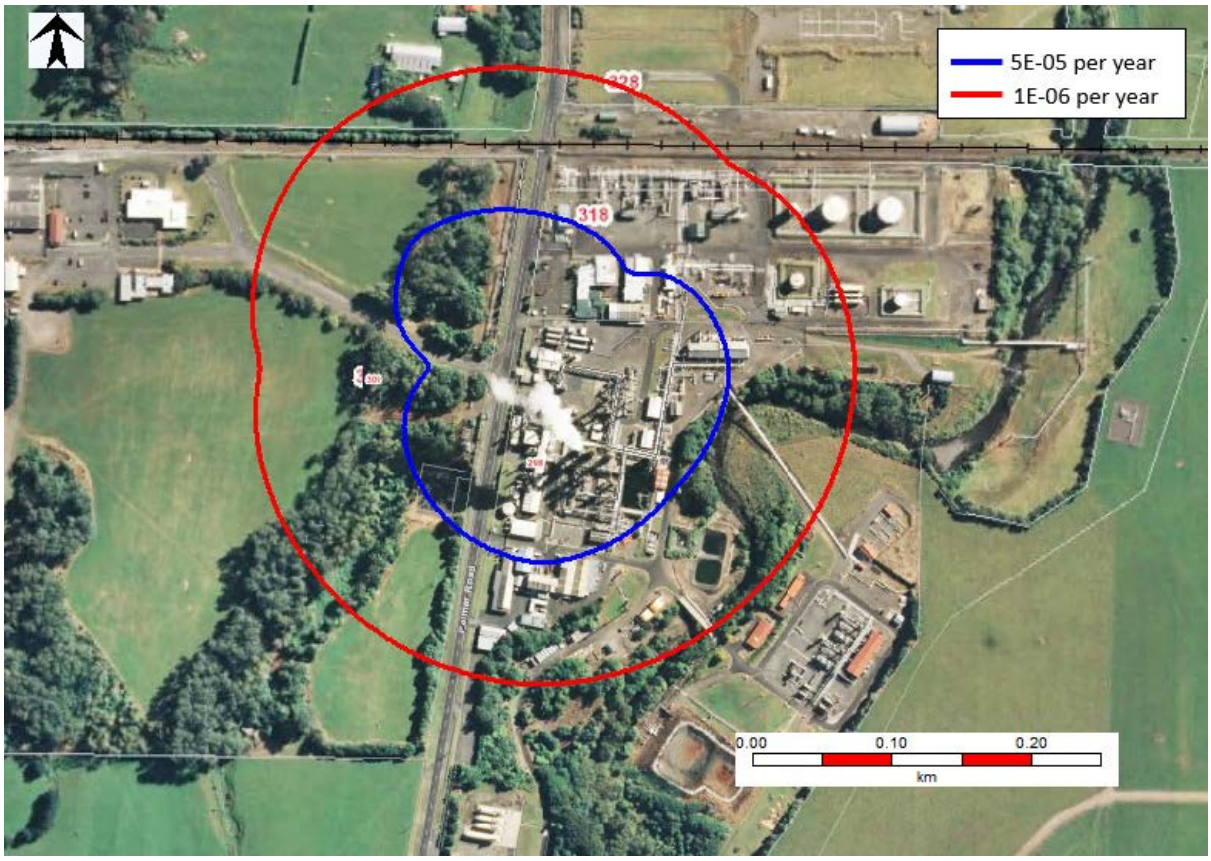

Figure 7-3: Base Case LSIR Contours at KGTP – Toxic Events

Overall risk levels are plotted between 5E-05 and 1E-06 per year, to allow for comparison against the NSW HIPAP 4 [Ref. 8] risk criteria documented in Table 7-2.

Table 7-2: Comparison with Fatality Risk Criteria (Base Case Overall LSIR)

Overall LSIR	Risk Contour	Risk Criteria	Result Observation
5E-05 / year	Blue	*Industrial* 5E-05 / year risk contour should, as a target, be contained within the boundaries of the industrial site where applicable.	1. 5E-05 per year contour extends into the KPS site to the north but remains within the Todd Energy site boundary. 2. The 5E-05 per year contour extends across Palmer Road and into the bushes at the west boundary of the Ballance site. 3. The 5E-05 per year contour offsite impact is mainly attributed to toxic events.
1E-06 / year	Red	*Residential* 1E-06 / year risk contour should not extend to residential, hotels, motels, tourist resorts	The 1E-06 per year contour extends onto the property of the closest neighbour north west of KGTP site but does not extend as far as the dwelling and farm buildings.

The major risk contributors are identified and analysed in Section 7.2.

7.2 Major Risk Contributors

The major risk contributors are extracted from the risk model at selected risk points (indicated as the red dots) of interest, as shown in Figure 7-4.

Figure 7-4: Major Risk Contributors Points

7.2.1 Base Case Risk Contributor Analysis

The major risk contributing scenarios towards the risk points of interests for base case are presented in Table 7-3.

Table 7-3: Major Risk Contributors to Selected Locations for Base Case Assessment

Risk Points	Release Source	Description	LSIR (per year)	Percentage of Risk Contribution (%)
A - Shed Area	KGT80_AMM_04_L_71mm	Ammonia liquid from Liquid Receivers via Liquid Sub-Coolers (E-826/896) and CO_2 Condenser (E-804) to Oil Receiver (M-828)	5.21E-07	43.1%
	KGT80_AMM_03_L_71mm	Ammonia liquid from Ammonia Condensers (E-895/825) to Liquid Receiver (F-803/F-823)	4.21E-07	34.8%
B - Ballance Site 1	KGT80_AMM_04_L_22mm	Ammonia liquid from Liquid Receivers via Liquid Sub-Coolers (E-826/896) and CO_2 Condenser (E-804) to Oil Receiver (M-828)	2.97E-05	34.5%
	KGT80_AMM_03_L_22mm	Ammonia liquid from Ammonia Condensers (E-895/825) to Liquid Receiver (F-803/F-823)	2.22E-05	25.8%

Risk Points	Release Source	Description	LSIR (per year)	Percentage of Risk Contribution (%)
C -Ballance Site 2	KGT80_AMM_04_L_ 22mm	Ammonia liquid from Liquid Receivers via Liquid Sub-Coolers (E-826/896) and CO_2 Condenser (E-804) to Oil Receiver (M-828)	3.75E-05	35.5%
	KGT80_AMM_03_L_ 22mm	Ammonia liquid from Ammonia Condensers (E-895/825) to Liquid Receiver (F-803/F-823)	2.47E-05	23.3%
D - KGTP Site East	KGT13_PGS_16_V_ 85mm	Product Gas from Gas Storage Compressor (D4-0401) Discharge via Gas Storage Compressor Cooler (D2-0402) to Coalescer (D11-0417) Inlet	6.65E-07	33.5%
	KGT13_PGS_15_V_ 85mm	Product Gas to Gas Storage Compressors (D4-0401/0402) Inlet	3.87E-07	19.5%
E – LPG Area	KGT01_TGS_10_V_ 212mm	Treated gas from Strippers via Gas/Gas Heat Exchangers (E-313-1/2) and Gas Chiller (E-313-3) to Low Temperature Separator (M-313) inlet	2.64E-07	23.5%
	KGT01_PGS_01_V_ 245mm	Product Gas header from Dehydration and Dew Point Unit to Product Gas Compressors Inlet header, domestic supply and sending Product Gas export to KPS and Whareroa (up to KPS/KGTP Site Boundary)	1.23E-07	11.0%

Based on the major risk contributors above, it can be shown that the shed area and Ballance site risk ranking points are mainly impacted by the ammonia release scenarios, in line with the LSIR toxic risk contours shown in Figure 7-3. The KGTP site east risk point is mainly impacted by the Gas Storage Compressor inlet and discharge line.

7.3 LPG Risk Analysis

The LPG storage and loadout facilities contribution to the overall plant risk for the base case are assessed in this section [Ref. 28]. The 1E-06 per year LSIR contour generated from only the LPG storage and loadout area is shown in Figure 7-5.

Figure 7-5: 1E-06 per year Risk Contour Contributed by the LPG Storage & Loadout Area Scenarios only

The major risk contributors to the LPG area (point E) have been identified at Section 7.2 above. The LPG storage and loadout equipment does not feature in the lists as they do not contribute significantly to the overall risk. This is largely due to the low failure frequencies from the LPG equipment and the relatively small inventories compared to the main process area. Each LPG vessel only contributes to about 1% of the risk at point E.

The main vessels, pipework and equipment from the LPG storage and loadout area that contribute to this risk contour are summarized in Table 7-4.

Table 7-4: LPG Storage and Loadout Area Associated Scenarios

Description / Boundaries	Volume of Isolatable Section (m^3)
Natural Gasoline Storage Tank (F-4033)	65.0
Natural Gasoline Loadout Facilities (including Load Out Pump (G-4033), Loadout Hose (T-4003))	0.1
Natural Gasoline Road Tanker	20 tonnes
Vapour Section of Propane Storage Vessel (F-4003)	61.7
Liquid Section of Propane Storage Vessel (F-4003)	51.3
Vapour Section of Propane Storage Vessel (F-4004)	123.4
Liquid Section of Propane Storage Vessel (F-4004)	106.6
Vapour Section of Butane Storage Vessel (F-4001)	14.7
Liquid Section of Butane Storage Vessel (F-4001)	51.3
Vapour Section of Butane Storage Vessel (F-4002)	68.6
Liquid Section of Butane Storage Vessel (F-4002)	44.5
Propane and Butane Loadout Pumps (G-4002/4024, G-4001)	0.5

Description / Boundaries	Volume of Isolatable Section (m^3)
LPG Loadout Arm (T-4002)	0.1
LPG Road Tanker	20 tonnes
LPG Loadout (Smart Hose to Isotainers)	0.1
New LPG Road Tanker (Isotainer)	12 tonnes
Ethyl Mercaptan Odorant Injection Pump (G-4011)	0.2
Ethyl Mercaptan Transportable Odorant Drums (F-4007-A/ B)	0.2

The loadout frequencies assumed for the loadout equipment at the LPG area are summarised in Table 7-5.

Table 7-5: Loadout Frequencies

Description		Loading/Unloading	Load out Frequency (loadings/year)	Filling Time (hours/loading)
NGL	Tankers	Hose	715 (20 T/Load)	2 hours
LPG	Tankers	Arm	1452 (20 T/Load)	2 hours
	Isotainers	Hose	13 (12 T/Load)	1.2 hours
Ethyl Mercaptan	Transportable Odorant Drums (F-4007-A/B) contain Ethyl Mercaptan for odorising the LPG. 2 x 200L drums are swapped out approximately 12 times per year.			

8 SENSITIVITY CASES

The two sensitivities cases considered in the KGTP QRA study, as detailed in Section 2.5 are:

- Sensitivity Case 1: 98% ESDV Success Probability; and
- Sensitivity Case 2: Future Operation.

This section presents results of the QRA sensitivity cases.

8.1 Case 1. ESDV Success Probability of 98%

The ESD systems are intended shutdown and isolate the process inventories to reduce damage or risk of escalation. In the event an ESDV failed to close, the expected outcome is additional flow or inventory from the process system adding to the release.

In the QRA Base Case assessment, the probability of successful detection and isolation is assumed to be 100%. However, it is acknowledged that there is potential for detection and isolation to fail. The Probability of Failure on Demand (PFD) of the ESDV can be referenced from industry sources as follow:

- 0.001 – 0.01 per demand depending on the types of the ESD system (TNO Purple Book [Ref. 10]); and
- In the order of magnitude of 10^{-2} per demand (CMPT Quantitative Risk Assessment for offshore installation [Ref. 21]).

For the purpose of the Sensitive Case 1 assessment, ESDV success probability is assumed to be 98%, and the corresponding ESDV failure probability is 2%.

8.1.1 Isolatable Inventories for ESDV Failure Consideration

In Sensitivity Case 1, the inventory from the next connecting isolatable section (or the largest inventory if connecting with multiple isolatable sections) are added to the inventory from each isolatable section for the ESDV failure. The connecting isolatable sections have been identified from the P&IDs and are given in Table 8-1.

Table 8-1: Identification of the Connecting Isolatable Sections and Inventories

Isolatable Section	Description	Volume of Isolatable Section (m³)		Connecting Isolatable Section	Volume of Connecting Isolatable Section Note 1 (m³)		Total Volume (m³)	
		Vapour	Liquid		Vapour	Liquid	Vapour	Liquid
KGT01	Raw gas and Maui gas lines, Dehydration and dewpoint unit, LPG production unit, Product gas lines, Utilities	233.0	56.3	KGT11 – Vapour; KGT04 - Liquid	41.3	4.0	274.2	60.3
KGT02	CO_2 removal (Train 1)	36.2	-	KGT01	233.0	-	269.2	-
KGT03	CO_2 removal (Train 2)	36.0	-	KGT01	233.0	-	269.0	-
KGT04	Mixed LPG - High Temperature Separator (M-307) and Wash Water Coalescer (M-302)	2.4	4.0	KGT01	233.0	56.3	235.4	60.3
KGT11	Mixed gas export from Product Gas Compressors (C-903-2/3/5) discharge	41.3	-	KGT01	233.0	-	274.2	-

Isolatable Section	Description	Volume of Isolatable Section (m^3)		Connecting Isolatable Section	Volume of Connecting Isolatable Section Note 1 (m^3)		Total Volume (m^3)	
		Vapour	Liquid		Vapour	Liquid	Vapour	Liquid
	header to 100/200 Pipelines							
KGT13	Product gas export from Gas Storage Compressors (D4-0401/0402) to Gas Storage/070 Pipeline	23.5	-	KGT01	233.0	-	256.5	-
KGT32	NGL export from LPG production unit to KGTP/KPS boundary	-	0.4	KGT01	-	56.3	-	56.8
KGT33	NGL export from LPG production unit to Storage	-	4.7	KGT34	-	65.0	-	69.7
KGT34	NGL Storage Tank (F-4033)	-	65.0	KGT33	-	4.7	-	69.7
KGT35	NGL Loadout Pump (G-4033)	-	0.1	KGT34	-	65.0	-	65.1
KGT36	NGL Loadout System	-	0.1	KGT35		0.1	-	0.2
KGT37	Propane export from LPG production unit to Storage	-	2.5	KGT01	-	56.3	-	58.9
KGT39	Propane Storage Vessel (F-4003)	61.7	51.3	KGT37	-	2.5	61.7	53.9
KGT40	Propane Storage Vessel (F-4004)	123.4	106.6	KGT37	-	2.5	123.4	109.1
KGT41	Butane export from LPG production unit to Storage	-	2.6	KGT01	-	56.3	-	58.9
KGT43	Butane Storage Vessel (F-4001)	14.7	51.3	KGT41	-	2.6	14.7	53.8
KGT44	Butane Storage Vessel (F-4002)	68.6	44.5	KGT41	-	2.6	68.6	47.0
KGT45	Product Propane Loadout System	-	0.5	KGT40	-	106.6	-	107.1
KGT46	Product Butane Loadout System	-	0.5	KGT43	-	51.3	-	51.8
KGT47	Product LPG Loadout System	-	0.1	KGT45	-	0.5	-	0.6
KGT50	Odorant (Ethyl mercaptan) Injection System for LPG loadout	-	0.2	-	-	-	-	0.2
KGT51	Odorant (t-Butyl mercaptan) Injection System for Domestic	-	0.1	-	-	-	-	0.1

Isolatable Section	Description	Volume of Isolatable Section (m^3)		Connecting Isolatable Section	Volume of Connecting Isolatable Section Note 1 (m^3)		Total Volume (m^3)	
		Vapour	Liquid		Vapour	Liquid	Vapour	Liquid
KGT52	Odorant (t-Butyl mercaptan) Injection System for Gas Export Line	-	19.0	-	-	-	-	19.0
KGT55	Methanol Injection System	-	6.5	-	-	-	-	6.5
KGT70	Propane Refrigeration System	36.4	25.2	-	-	-	36.4	25.2
KGT80	CO2 Removal Unit – Ammonia System	3.3	4.9	-	-	-	3.3	4.9
KGT90	CO2 Removal Unit – Ammonia System	45.6	223.0	-	-	-	45.6	223.0

Notes:

1. For modelling purposes, only the inventory within the same phase are added, e.g. KGT02 contains vapour phase only, and is connected to KGT01 which contains both vapour and liquid phase, only the vapour inventory from KGT01 is added to KGT02.

8.1.2 Sensitivity Case 1 Release Frequencies

There are no changes in estimated release frequencies for the node sections in Sensitivity Case 1. Release frequencies assessment presented in Section 6.1 is applicable to Sensitivity Case 1.

8.1.3 Sensitivity Case 1 Risk Contours

Figure 8-1 presents the LSIR contour for KGTP Sensitivity Case 1.

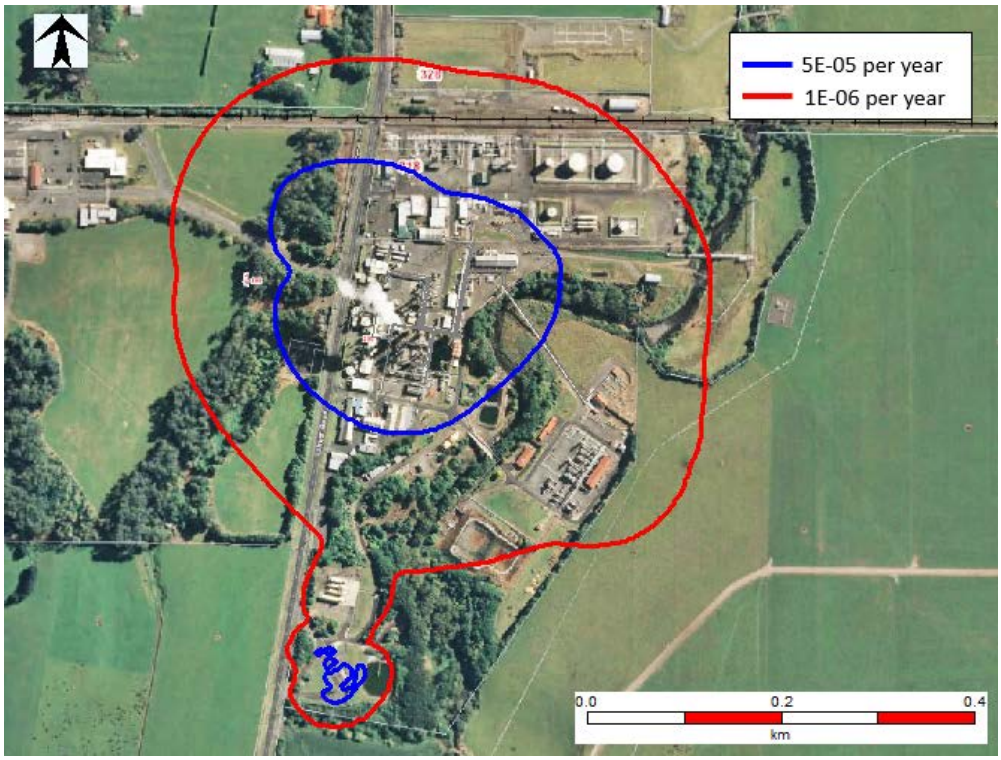

Figure 8-1: Sensitivity Case 1 LSIR Contours at KGTP

The 5E-05 per year and 1E-06 per year risk contours for Sensitivity Case 1 are shown to be similar to the Base Case risk contours (Figure 7-1). It can be concluded that the outcome of assessment against HIPAP 4 for Sensitivity Case 1 is same as that captured in the Base Case. Conclusions made in Table 7-2 are applicable for Sensitivity Case 1 as well.

The insignificant differences in risk contours for Sensitivity Case 1 when compared to Base Case is most likely due to:

- In most modelling cases, especially gas releases, it is expected that the consequence effects would have reached the steady state condition before the inventory depletes. Hence the additional inventory may lead to a prolonged fire event, but not increase the magnitude of the consequence; and
- The ESDV failure probability change is only 2%, therefore the frequencies of hazardous events (fire explosion or toxic) associated with increased consequences (if any) are not expected to be apparent in the risk contours.

8.2 Case 2. Future Operating Case

KGTP future operation at maximum throughput operation (29 Sm3/s) is considered in the QRA as Sensitivity Case 2.

8.2.1 Sensitivity Case 2 Release Scenarios

The additional release scenarios considered for the Sensitivity Case 2 assessment and the corresponding operating conditions are presented in Table 8-2. The volume of some isolatable sections for existing (Base Case) scenarios are increased due to maximum throughput consideration in Sensitivity Case 2.

Table 8-2: Release Scenarios and Operating Conditions (Sensitivity 2)

Node	Description / Boundaries	Stream No.	T (degC)	P (barg)	Max Pipe / Hose Diameter (mm)	Pipe / Hose Length (m)	Volume of Isolatable Section (m³)
CO_2 Removal							
KGT05_RGS_07_V	Raw gas from Raw Gas header from HV-105-3 via Gas/Gas Heat Exchanger (E-101-3/2) to CO_2 absorber tower (D-101-3) inlet (Benfield Train 3)	K101	15	40	300	15	33.0
KGT05_TGS_16_V	Treated gas from top of CO_2 absorber tower (D-101-3) via Gas/Gas Heat Exchanger (E-101-3/2) and Gas Separator (M-101-3) adjoining with the inlet line to Strippers (D-201-3/4) in Dehydration and Dewpoint Control Unit (Benfield Train 3)	K102	42	40	300	15	33.0
Dehydration and Dewpoint Control							
KGT01_TGS_11_V	Treated gas from Strippers via Gas/Gas Heat Exchangers (E-303-1/2) and Gas Chiller (E-303-3) to 3 Phase Low Temperature Separator (M-306) inlet (No.1 Chilling System)	K203	42	40	200	43	271.6
KGT01_PGS_03_V	Product gas from top of 3 Phase Low Temperature Separator (M-306) via Gas/Gas Heat Exchanger (E-303-1/2) to PV-338 adjoining with Product Gas header (No.1 Chilling System)	K205	12	40	150	15	271.6
KGT01_MPG_02_L	Mixed LPG from bottom of 3 Phase Low Temperature Separator (M-306) to FV-381 on the line adjoining with inlet of Gas/Liquid Heat Exchanger (E-303-4) (No.1 Chilling System)	K204	12	40	100	15	56.3
Utilities and Cogen Unit							
KGT01_PGS_22_V	Product gas to Boilers (B-901-1/2)	K501	15	40	150	50	271.6
LPG Production Facility - Stabiliser, De-Ethaniser							
KGT01_MPG_13_L	Mixed LPG from XSV-332 on outlet line of Wash Water Coalescer (M-302) in Dehydration unit to Stabiliser (D-420-1) inlet (LPG Production Train 1)	K401	12	30	150	144	56.3
KGT01_STT_01_V	Stabiliser (D-420-1) Top Vapour via Stabiliser OVHD Scrubber (M-420) to XSV-420 on inlet line to Suction Scrubber (M-421) (LPG Production Train 1)	K408	20	30	80	15	271.6
KGT01_PGS_10_V	Product gas from top of Stabiliser OVHD Scrubber (M-421) to Stabiliser OVHD Compressor (C-420-1/2) suction (LPG Production Train 1) (C-420-1 is on standby)	K408	20	30	100	90	271.6
KGT01_PGS_11_V	Product gas from Stabiliser OVHD Compressor (C-420-2) discharge via Stabiliser OVHD Compressor Cooler (E-420-5) to Product gas header (LPG Production Train 1)	K408	20	30	100	15	271.6
KGT01_STB_01_L	Stabiliser (D-420-1) Bottom Liquid to/from Stabiliser Reboiler (E-422-1) and to De-Propaniser Feed Surge Drum (F-420-3) inlet (LPG Production Train 1)	K402	100	30	150	15	56.3
LPG Production Facility - De-Propaniser							
KGT01_DPT_01_V	De-Propaniser (D-430-1) Top Vapour via De-Propaniser Condenser (E-430-1) to De-Propaniser Reflux Drum (F-430-1) (LPG Production Train 1)	K403	20	14	150	15	271.6
KGT01_DPX_01_L	Reflux from De-Propaniser Reflux Drum (F-430-1) via De-Propaniser Reflux Pumps (G-430-1/2) to De-Propaniser (D-430-1) (LPG Production Train 1) (G-430-2 is on stand-by.)	K403	20	14	100	15	56.3
KGT01_PC3_01_L	Product propane from De-Propaniser Reflux Pump (G-430-1) via Propane Product Cooler (E-4001-1) adjoining with export line to storages (LPG Production Train 1)	K403	20	14	50	22	56.3
KGT01_DPB_01_L	De-Propaniser (D-430-1) Bottom Liquid to/from De-Propaniser Reboiler (E-432-1) and to De-Butaniser (D-440-1/2) (LPG Production Train 1)	K404	105	14	150	44	56.3
LPG Production Facility - De-C4							
KGT01_DBT_01_V	De-Butaniser (D-440-1) Top Vapour via De-Butaniser Condenser (E-440-1) to De-Butaniser Reflux Drum (F-440-1) (LPG Production Train 1)	K405	20	7	100	15	271.6
KGT01_DBX_01_L	Reflux from De-Butaniser Reflux Drum (F-440-1) via De-Butaniser Reflux Pumps (G-440-1/2) to De-Butaniser (D-440-1) (LPG Production Train 1) (G-440-2 is on standby)	K405	20	7	80	15	56.3
KGT01_DBB_01_L	De-Butaniser (D-440-1) Bottom Liquid to /from De-Butaniser Reboiler (E-442-1) (LPG Production Train 1)	K406	115	7	150	15	56.3
KGT01_PC4_12_L	Product Butane from HV-450-1/2 on Debutaniser Reflux Pumps Discharge via Butane Cooler (E-450) adjoining with Product Propane at 60/40 Condensing Tank (M-430) inlet	K405	20	7	80	41	56.3
KGT01_PC3_13_L	Product Propane from Propane Product Coolers (E-4001-1/2) adjoining with Product Butane at 60/40 Condensing Tank (M-430) inlet	K403	20	14	50	15	56.3
KGT01_LPG_04_L	LPG product 60/40 via 60/40 Condensing Tank (M-430) to XSV-434 on KPS export line	K808	20	10.5	50	232	56.3
Propane Refrigeration System							
KGT70_REF_06_L	Propane refrigerant Gas Chiller (E-303-3)	K302	-34	1	150	64	25.2
CO_2 Recovery - CO_2							
KGT90_CO2_23_V	CO_2 gas from CO_2 Primary Separator (M-801-3)	K907	15	1	300	15	48.5

The modified isolatable section volume used in the Sensitivity Case 2 modelling are summarised in Table 8-3.

Table 8-3: Modified Volume of Isolatable Sections

Isolatable Section	Description	Volume of Isolatable Section (m³) Base Case		Volume of Isolatable Section (m³) Sensitivity Case 2	
		Vapour	Liquid	Vapour	Liquid
KGT01	Raw gas and Maui gas lines, Dehydration and dewpoint unit, LPG production unit, Product gas lines, Utilities	233.0	56.3	271.6	84.8
KGT05	CO_2 removal (Train 3)	0 Note 1	0 Note 1	33.0	0
KGT70	Propane Refrigeration System	36.4	25.2	36.4	28.4
KGT90	CO_2 Removal Unit – Ammonia System	45.6	223.0	48.5	223.0

Note 1: Only considered for Sensitivity Case 2 (for future operation).

8.2.2 Sensitivity Case 2 Leak Frequencies

The estimated release frequencies summary of each KGTP unit considered in Sensitivity Case 2 are presented in Table 8-4. The detail breakdown of release frequencies for each node sections are provided in Appendix 4.

Table 8-4: Release Frequencies Summary for KGTP Units (Sensitivity 2)

Node Section	Sensitivity 2 Release Frequencies (per year) Note 1						
	1 - 3 mm (2 mm)	3 - 10 mm (6 mm)	10 - 50 mm (22 mm)	50 - 150 mm (85 mm)	> 150 mm (Rupture)	Total	% Contribution
Raw Gas and Maui Gas Lines	1.50E-02	6.58E-03	3.50E-03	6.07E-04	1.03E-04	2.58E-02	2.4%
CO_2 Removal	1.28E-02	5.82E-03	3.20E-03	6.10E-04	1.17E-04	2.25E-02	2.1%
Dehydration and Dewpoint Control	3.30E-02	1.45E-02	7.54E-03	1.71E-03	2.69E-04	5.70E-02	5.4%
Product Gas Lines and Compressors	6.28E-02	2.75E-02	1.39E-02	2.96E-03	4.61E-04	1.08E-01	10.2%
Pigging	3.58E-06	1.85E-06	1.03E-06	2.55E-07	1.16E-07	6.83E-06	<0.1%
Utilities and Cogen Unit	5.30E-02	2.18E-02	9.99E-03	2.03E-03	9.45E-05	8.70E-02	8.2%
LPG Production Facility - Stabiliser, De-C2	4.99E-02	2.16E-02	1.06E-02	2.81E-03	5.84E-05	8.49E-02	8.0%
LPG Production Facility - De-C3	3.13E-02	1.26E-02	6.06E-03	1.23E-03	3.30E-05	5.13E-02	4.8%
LPG Production Facility - De-C4	3.96E-02	1.59E-02	7.52E-03	1.63E-03	2.86E-05	6.47E-02	6.1%
LPG Production Facility - Product Export and Loadout	2.33E-02	9.14E-02	3.40E-03	6.87E-04	8.37E-03	1.27E-01	12.0%

Node Section	Sensitivity 2 Release Frequencies (per year) Note 1						
	1 - 3 mm (2 mm)	3 - 10 mm (6 mm)	10 - 50 mm (22 mm)	50 - 150 mm (85 mm)	> 150 mm (Rupture)	Total	% Contribution
Propane Refrigeration System	3.99E-02	1.73E-02	8.06E-03	1.73E-03	3.22E-04	6.73E-02	6.3%
Mercaptans and Methanol	1.95E-02	2.01E-02	3.85E-03	2.05E-03	1.21E-03	4.68E-02	4.4%
CO_2 Recovery - Ammonia	7.07E-02	2.81E-02	1.14E-02	2.90E-03	2.50E-04	1.13E-01	10.7%
CO_2 Recovery - CO_2	8.06E-02	9.70E-02	1.56E-02	4.22E-03	6.81E-03	2.04E-01	19.3%
Total	**5.31E-01**	**3.80E-01**	**1.05E-01**	**2.52E-02**	**1.81E-02**	**1.06E+00**	**100.0%**
% Contribution	**50.2%**	**35.9%**	**9.9%**	**2.4%**	**1.7%**	**100.0%**	**-**

Notes:

1. Release frequencies estimated has considered the operating factor of equipment.

The Sensitivity Case 2 scenarios have higher total release frequencies of 1.1 per annum, equivalent to one leak every 0.9 year. There is approximately 6% increase in total release frequencies for Sensitivity Case 2. This can be attributed to Sensitivity Case 2 considered additional equipment in operation. Similarly, to the Base Case, 50% of the leak frequencies are contributed from the "1 – 3 mm" hole sizes range.

8.2.3 Sensitivity Case 2 Risk Contours

Figure 8-2 presents the LSIR contour for Sensitivity Case 2.

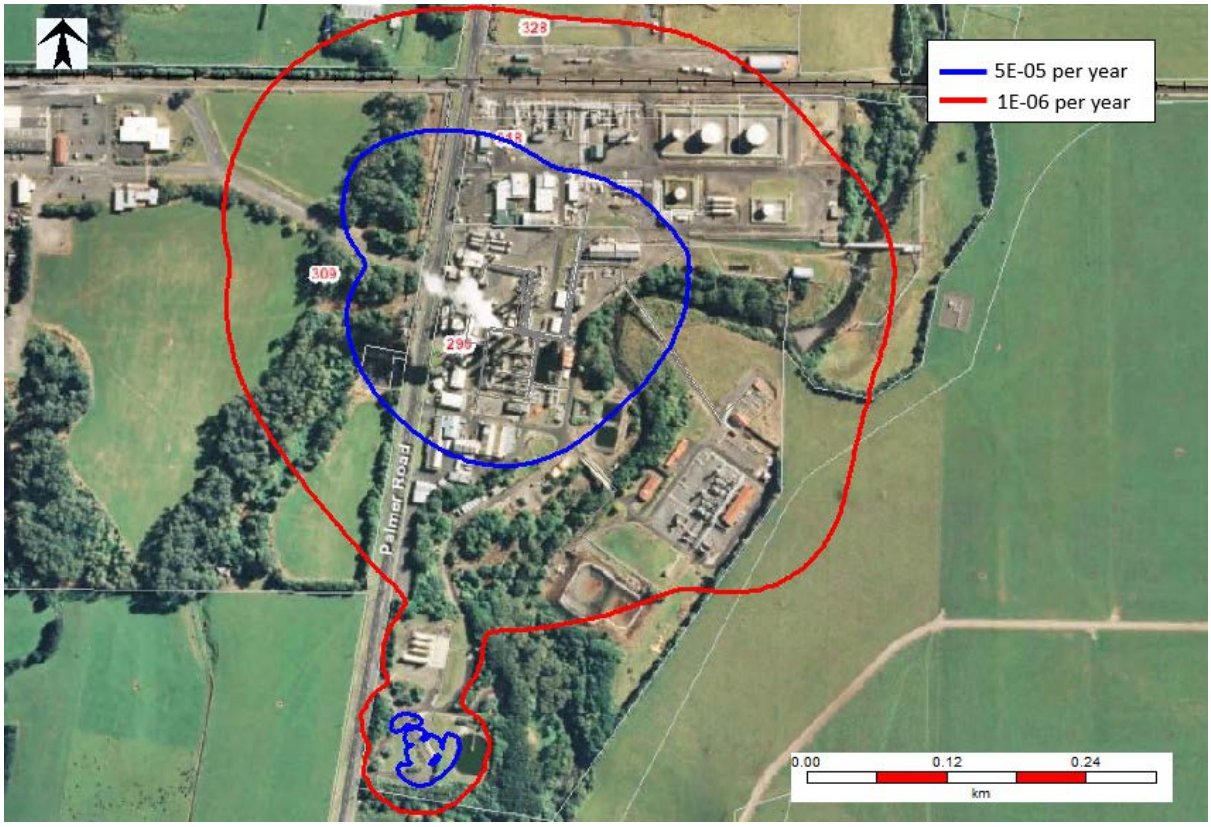

Figure 8-2: Sensitivity Case 2 LSIR Contours at KGTP

When compared to the Base Case, it can be seen that the Sensitivity Case 2 risk contours of 5E-05 per year and 1E-06 per year are slightly larger. This is particularly apparent at the LPG/NGL loading area, which is due to an increased in loading frequencies for both the NGL and LPG scenarios. The slight increase in 5E-05 per year and 1E-06 per year contours however does not change the assessment conclusions made against HIPAP 4 criteria. Conclusions made in Table 7-2 are applicable to Sensitivity Case 2 as well. Although there are additional equipment and inventories considered in Sensitivity Case 2, the increase in risk levels are not significant. This is most likely due to:

- The additional nodes/sections considered in Sensitivity Case 2 only formed a small part of the overall KGTP hazardous nodes/sections. There is approximately 18% increase in total release frequency for Sensitivity Case 2 as compared to the Base Case, with 50% of the increase is from the “1-3 mm” leak category; and
- In most modelling cases, especially gas releases, it is expected that the consequence effects would have reached the steady state condition before the inventory depletes. Hence the additional inventory may lead to a prolonged fire event, but not increase the magnitude of the consequence.

8.2.4 Sensitivity Case 2 Risk Contributor Analysis

The major risk contributing scenarios towards the risk points of interests for Sensitivity Case 2 (which has the worst case risk results) are presented in Table 8-5.

Table 8-5: Major Risk Contributors to Selected Locations for Sensitivity Case 2 Assessment

Risk Points	Release Source	Description	LSIR (per year)	Percentage of Risk Contribution
A - Shed	KGT80_AMM_04_L_71mm	Ammonia liquid from Liquid Receivers via Liquid Sub-Coolers (E-826/896) and CO_2 Condenser (E-804) to Oil Receiver (M-828)	5.22E-07	41.6%
	KGT80_AMM_03_L_71mm	Ammonia liquid from Ammonia Condensers (E-895/825) to Liquid Receiver (F-803/F-823)	4.22E-07	33.6%
B - Ballance Site 1	KGT80_AMM_04_L_22mm	Ammonia liquid from Liquid Receivers via Liquid Sub-Coolers (E-826/896) and CO_2 Condenser (E-804) to Oil Receiver (M-828)	2.97E-05	34.1%
	KGT80_AMM_03_L_22mm	Ammonia liquid from Ammonia Condensers (E-895/825) to Liquid Receiver (F-803/F-823)	2.22E-05	25.5%
C - Ballance Site 2	KGT80_AMM_04_L_22mm	Ammonia liquid from Liquid Receivers via Liquid Sub-Coolers (E-826/896) and CO_2 Condenser (E-804) to Oil Receiver (M-828)	3.75E-05	34.7%
	KGT80_AMM_03_L_22mm	Ammonia liquid from Ammonia Condensers (E-895/825) to Liquid Receiver (F-803/F-823)	2.47E-05	22.8%
D - KGTP Site East	KGT13_PGS_16_V_85mm	Product Gas from Gas Storage Compressor (D4-0401) Discharge via Gas Storage Compressor Cooler (D2-0402) to Coalescer (D11-0417) inlet	6.65E-07	32.9%
	KGT13_PGS_15_V_85mm	Product Gas to Gas Storage Compressors (D4-0401/0402) Inlet (D4-0402 is on standby)	3.87E-07	19.1%
E- LPG Area	KGT01_TGS_10_V_212mm	Treated gas from Strippers via Gas/Gas Heat Exchangers (E-313-1/2) and Gas Chiller (E-313-3) to Low Temperature Separator (M-313) inlet	2.84E-07	20.4%
	KGT01_PGS_01_V_245mm	Product Gas header from Dehydration and Dew Point Unit to Product Gas Compressors Inlet header, domestic supply and sending Product Gas export to KPS and Whareroa (up to KPS/KGTP Site Boundary)	1.32E-07	9.5%

The major risk contributors for Sensitivity Case 2 are consistent with the major risk contributors for Base Case, with just slight differences on the fraction of risk contribution.

9 POTENTIAL CUMULATIVE RISK FROM KPS AND KGTP

The KPS plant, which is located to the north of the KGTP plant, is also under Todd's ownership / control. Risk from KPS was assessed and presented in the KPS QRA report [Ref. 29]. That report was commissioned for the South Taranaki District Plan Environment Court process.

Consistent assumptions and methodologies have been adopted for both QRAs, which followed the Todd Energy QRA Methodology Guideline [Ref. 2]. The KPS base case LSIR contour is shown in Figure 9-1.

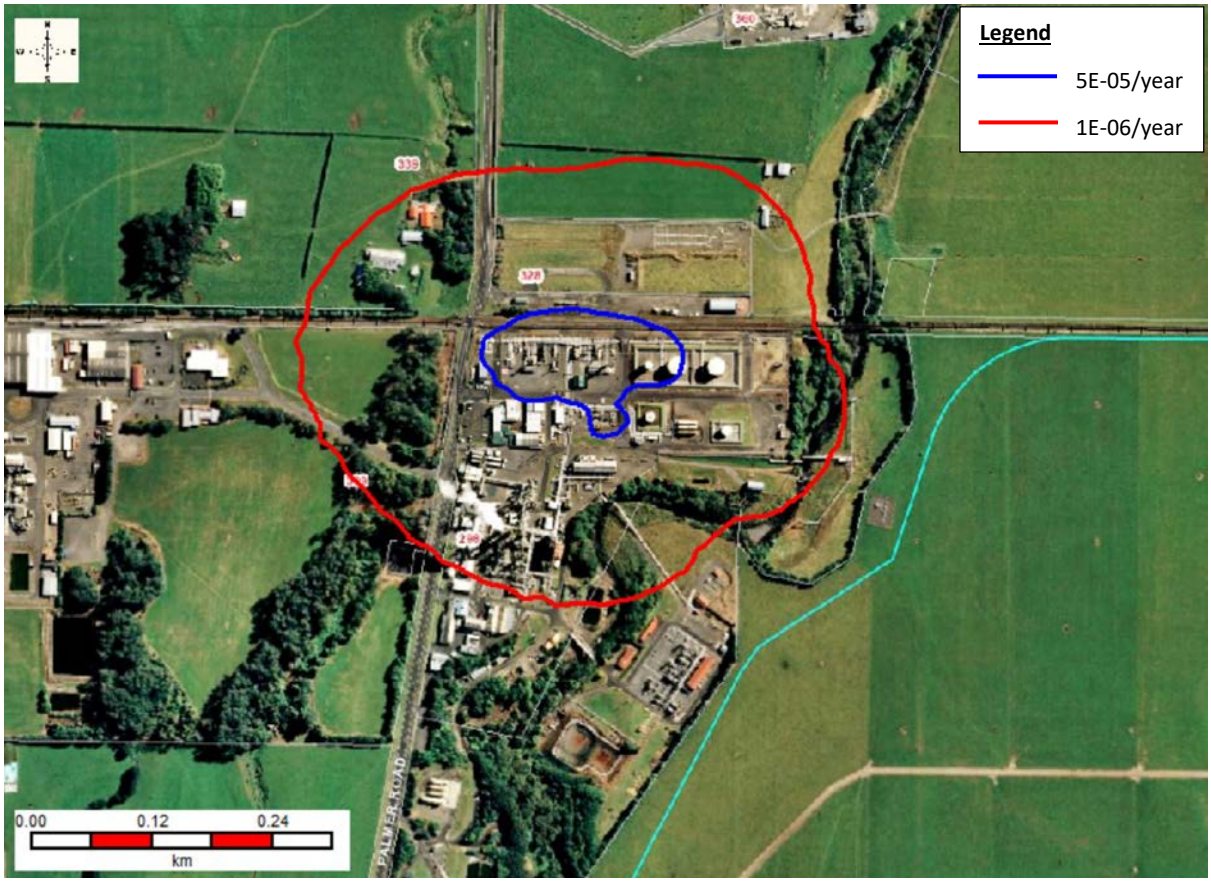

Figure 9-1: KPS LSIR Contour

The KPS QRA was completed using DNV Safeti software version 6.7 (formerly known as Phast Risk). Newer versions of the software have since been released, and one of the improvements made allows more accurate modelling of vapour dispersion distances, especially for large releases. The older version (e.g. Phast Risk 6.7) generally produced more conservative dispersion distances.

The plant has also been modified since the KPS QRA was finalised and accepted by the South Taranaki District Council in July 2020. The stabilizer replacement project, including additional isolation valves to reduce the inventory for some isolatable sections. This was considered in the KPS QRA (as sensitivity case 3) and has led to further risk reduction.

The KPS model was then upgraded to Safeti version 8.22 and combined with the KGTP Safeti model to generate the integrated QRA model. Releases from both plants and the interaction between them (e.g. a flammable vapour cloud from one plant entering the congested area at another plant) were taken into consideration when run as a single model to produce the cumulative risk.

The cumulative risk contours considering risks from both KPS and KGTP are presented in Figure 9-2.

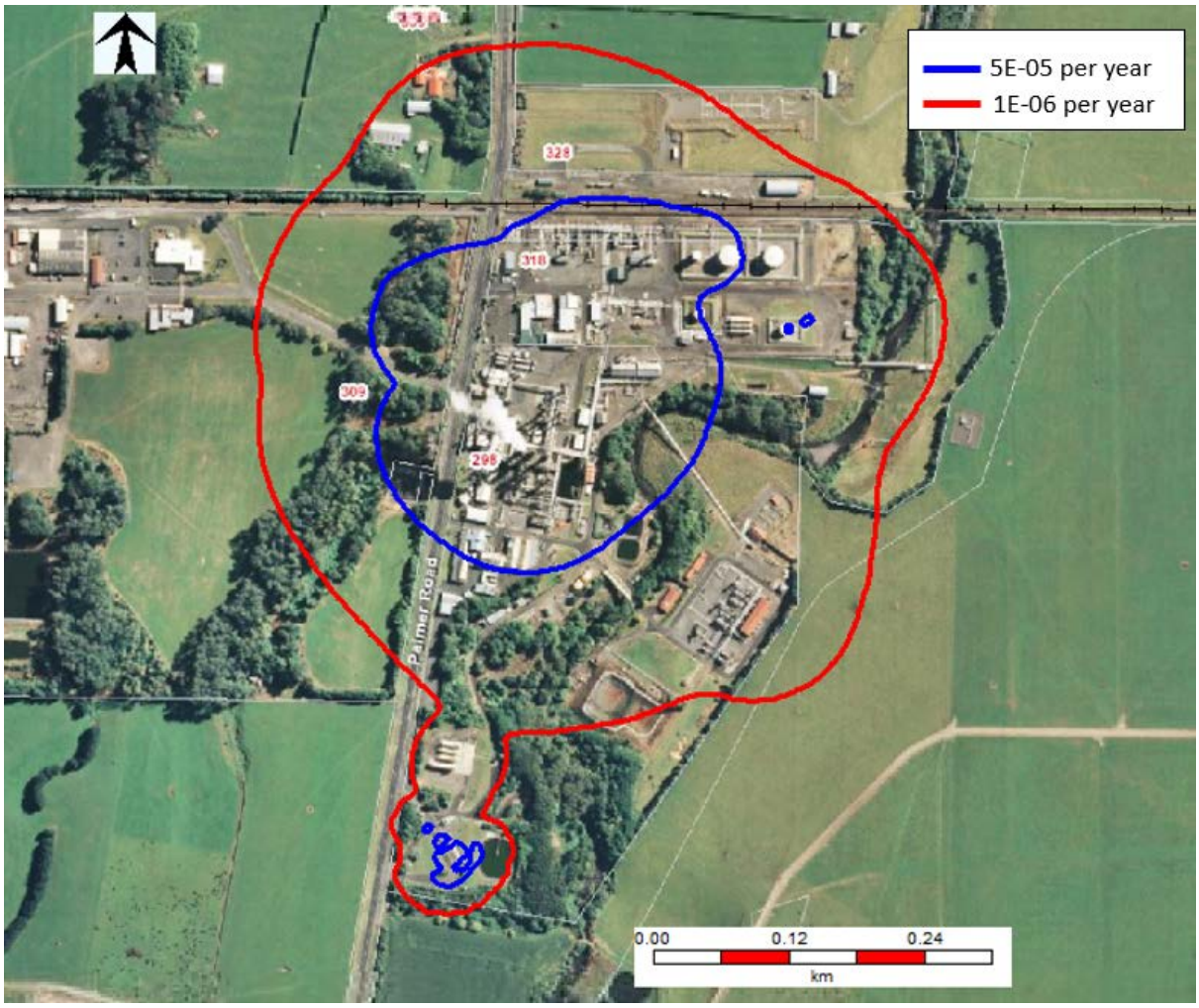

Figure 9-2: KPS and KGTP Integrated LSIR Contours

The risk contour for the cumulative risk does not extend further offsite in any direction, than the individual plant contours. This shows that there are no noticeable potential synergistic or cumulative offsite risks from Todd owned and operated plant. The risk assessment against the HIPAP4 criteria is as presented in Table 9-1.

Table 9-1: Risk Assessment Against HIPAP4 Criteria for the Cumulative Risk

Overall LSIR	Risk Contour	Risk Criteria	Observations
5E-05 / year	**Blue**	*Industrial* 5E-05 / year risk contour should, as a target, be contained within the boundaries of the industrial site where applicable.	1. The 5E-05 per year risk contour remains mostly within the Todd Energy site boundary, with the exception at the west boundary. 2. The 5E-05 per year contour extends across Palmer Road and into the bushes at the west boundary of the Ballance site.
1E-06 / year	**Red**	*Residential* 1E-06 / year risk contour should not extend to residential, hotels, motels, tourist resorts	1. The 1E-06 per year risk contour extends onto the dwelling and farm building in the immediate vicinity of KPS to the northwest.

10 CONCLUSIONS

A quantitative risk assessment (QRA) was carried out to assess the risk levels at Kapuni Gas Treatment Plant (KGTP) due to fire, explosion and toxic hazards.

The assessment considers risks from KGTP for the following cases:

- Base Case – all facilities currently in operation;
- Sensitivity Case 1 – all facilities currently in operation with reduced ESDV success rate of 98% instead of 100%; and
- Sensitivity Case 2 – all facilities currently in operations including standby and mothballed facilities which might be brought back to operation in the future.

The overall risk levels are compared to the NSW HIPAP 4 [Ref. 8] risk criteria. The main findings of the QRA for all 3 cases are summarised in Table 10-1.

Table 10-1: QRA Main Findings

Case	Main Findings
Base Case	1. The 5E-05 per year contour extends into the KPS site to the north but remains within the Todd Energy site boundary. 2. The 5E-05 per year contour extends across Palmer Road and into the bushes at the west boundary of the Ballance site. 3. The 1E-06 per year contour extends onto the property of the neighbour to the northwest (approximately 180m NW of KGTP northern boundary) but does not extend as far as the dwelling and farm buildings. 4. The main risk contributors to the shed area are ammonia toxic events from the 71 mm leaks from the Liquid Receivers (KGT80_AMM_04_L_71mm) and Ammonia Condensers (KGT80_AMM_03_L_71mm) within the CO2 Recovery Unit at approximately 15°C and 15 barg. 5. The main risk contributors to the Ballance site bushes are ammonia toxic events from the 22 mm leaks from the Liquid Receivers (KGT80_AMM_04_L_22mm) and Ammonia Condensers (KGT80_AMM_03_L_22mm) within the CO2 Recovery Unit at approximately 15°C and 15 barg. 6. The main risk contributors to the rural land area to the east of the plant are Product Gas jet fire events from the 85 mm leaks from the Product Gas from the Gas Storage Compressor (D4-0401) to Coalescer (KGT13_PGS_16_V_85mm), and Product Gas feeding to the Gas Storage Compressor (KGT13_PGS_15_V_85mm) within the Product Gas Lines and Compressors unit (at approximately 15°C and 40 barg).

Case	Main Findings
Sensitivity Case 1 – ESDV Success Probability of 98%	1. There are no significant changes to the risk contours with modification of the ESDV success probability. The assessment made against the HIPAP 4 criteria remains the same as per the base case. 2. The similar risk contours finding is due to: - The ESDV failure probability change is only 2%, therefore the frequencies of hazardous events (fire explosion or toxic) associated with increased consequences (if any) are not expected to be apparent in the risk contours; and - In most modelling cases, especially gas releases, it is expected that the consequence effects would have reached the steady state condition before the inventory depletes. Hence the additional inventory may lead to a prolonged fire event, but not increase the magnitude of the consequence.
Sensitivity Case 2 – Future Operations	1. The risk contours for Sensitivity Case 2 risk contours is slightly larger when compared to the Base Case risk contours, however the contour increase is relatively small. The assessment made against the HIPAP 4 criteria remains the same as per the base case. 2. The slight increase in risk contours is due to: - The additional nodes/sections considered in Sensitivity Case 2 only formed a small part of the overall KGTP hazardous nodes/sections. There is approximately 18% increase in total release frequency for Sensitivity Case 2 as compared to the Base Case, with 50% of the increase is from the “1-3 mm” leak category; and - In most modelling cases, especially gas releases, it is expected that the consequence effects would have reached the steady state condition before the inventory depletes. Hence the additional inventory may lead to a prolonged fire event, but not increase the magnitude of the consequence.

11 REFERENCES

1. Kapuni Gas Treatment Plant – Assumptions Register for FEA and QRA, 610115-RPT-R0001-R0, Worley, July 2020.
2. Todd Energy Fire and Explosion Analysis and Quantitative Risk Assessment Methodology Guideline, NZ-1005-TECD721654, Rev. 0.
3. Onshore QRA Method Statement, PCD-473, Rev. A, Worley, May 2015.
4. KGTP Process Conditions Summary provided by Todd Energy (Kelly Wilson) via email: New Process Conditions for KGTP QRA, 7 May 2020
5. Email communication between Worley (Hailey Lee) and Todd Energy (Kelly Wilson) on 25 May 2020; Email Subject: KGTP QRA Discussion Note (25 May 2020).
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8. New South Wales Hazardous Industry Planning Advisory Paper No. 4, Risk Criteria for Land Use Safety Planning, January 2011
9. Taranaki Regional Council, https://maps.trc.govt.nz/LocalMapsViewer/?map=5113f49337a84cf098db177c728b1361
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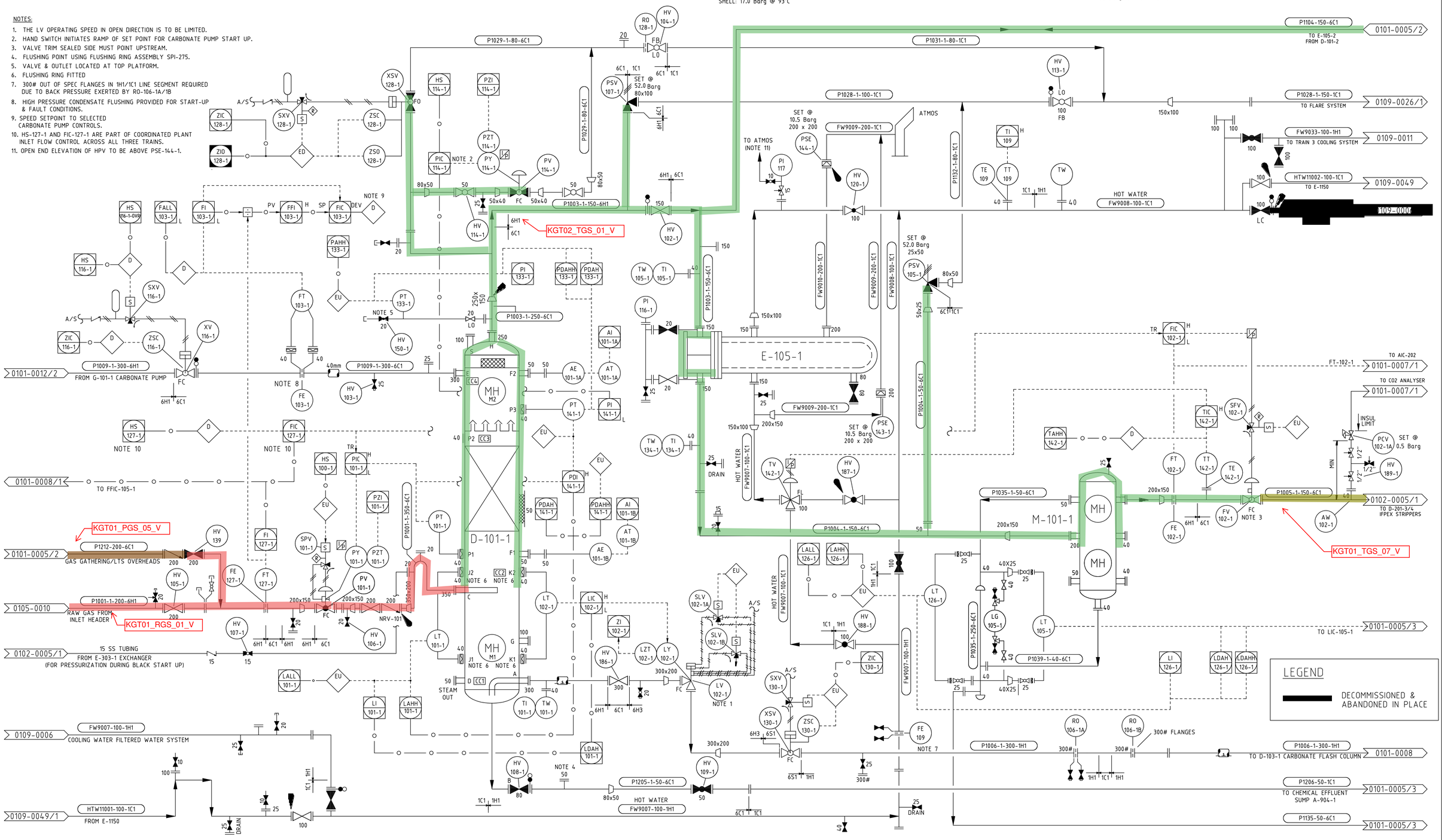
27. Vapour Cloud Formation, Experiments and modelling, UK Health and Safety Executive Research Report (RR908), 2012.
28. Letter dated 16 November 2020 to Nik Pyselman, Subject: LPG Storage & Loadout Risk Contribution (610115-LTO-C0001).
29. Kapuni Production Station – Quantitative Risk Assessment Report, 620052-RPT-R0002-R4, June 2020.

Appendix 1.
Sectionalised P&IDs

EQUIPMENT No.	D-101-1	E-105-1	M-101-1
DESCRIPTION	CO2 ABSORBER TOWER	GAS COOLER	GAS SEPARATOR
CAPACITY	64m3	1.1m3	4.1m3
MAWP @ TEMP	55.2 Barg @ 127°C OR 49.4 @ 146°C	TUBE: 60.33 Barg @ 138°C SHELL: 17.0 Barg @ 93°C	52 Barg @ 0°C to 138°C

NOTES:

1. THE LV OPERATING SPEED IN OPEN DIRECTION IS TO BE LIMITED.
2. HAND SWITCH INITIATES RAMP OF SET POINT FOR CARBONATE PUMP START UP.
3. VALVE TRIM SEALED SIDE MUST POINT UPSTREAM.
4. FLUSHING POINT USING FLUSHING RING ASSEMBLY SPI-275.
5. VALVE & OUTLET LOCATED AT TOP PLATFORM.
6. FLUSHING RING FITTED
7. 300# OUT OF SPEC FLANGES IN 1H1/1C1 LINE SEGMENT REQUIRED DUE TO BACK PRESSURE EXERTED BY RO-106-1A/1B
8. HIGH PRESSURE CONDENSATE FLUSHING PROVIDED FOR START-UP & FAULT CONDITIONS.
9. SPEED SETPOINT TO SELECTED CARBONATE PUMP CONTROLS.
10. HS-127-1 AND FIC-127-1 ARE PART OF COORDINATED PLANT INLET FLOW CONTROL ACROSS ALL THREE TRAINS.
11. OPEN END ELEVATION OF HPV TO BE ABOVE PSE-144-1.



REV	AMENDMENT	BY	CHK	ENG	APP	DATE	REV	AMENDMENT	BY	CHK	ENG	APP	DATE
42	AS BUILT P84-875 VALVE HV-186-1 REPLACEMENT	RL	SR	AM	SES	08/2013	32	AS BUILT WS1256761 GAS VALVE PROXIMITY SWITCH	ES	RL/CB	LH	SES	05/08
41	SITE AS BUILT PDI-141-1	RL	AAB	AM	SES	07/2013							
40	AS BUILT P84-1041 FLARE GAS MEASUREMENT	ES/RL	TC	AM	SES	09/12							
39	AS BUILT P84-1067 GAS COOLER HIGH TEMP TRIP	ES/RL	AAB	SRH	SES	10/11	49	AS BUILT P84-1274 DEMIN 2 DECOMMISSIONED	RL	JCC	AM	TC	10/2019
38	PARTIAL AS BUILT FOR PROJECT 520421	CJ	NB	JS	LH	03/11	48	AS BUILT P84-2105 HIGH POINT VENT ON GAS COOLER	RL	JC	AM	TC	03/2019
37	PARTIAL AS BUILT P84-1042 FLASH COL PSV REPLACEMENT	CJ	NB	JS	LH	01/11	47	AS BUILT FOR P84-1405 INLET PRESS/FLOW CONTROL	JC/RL	AAB	AM	TC	08/2018
36	AS BUILT AIT-102-1 MOVED TO DRG 0101-0007/1	ES/RL	TC	LH	SES	10/10	46	AS BUILT SCR-640 HS-116-1-OVR	JC/RL	AAB	AM	SES	09/2016
35	AS BUILT WS2007362 BENFIELD CO2 SLIP IN DCS	ES	RL	LH	SES	05/10	45	AS BUILT P84-848 WOBBE CONTROL	ES/RL	AAB	AM	SES	08/2014
34	AS BUILT WS1404939 BENFIELD RELIEF VALVE UPGRADE	VB	KS	PWM	LH	09/09	44	AS-BUILT P84-832 GAS SEPARATOR LEVEL TRANSMITTER	JB	JC	AM	SES	05/2014
33	AS BUILT WS1333085 M-101-1&2 SYSTEM RE-RATE	VB	KS	KS	LH	09/09	43	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	AC	AM	SES	10/2013

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REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0082
CAUSE & EFFECTS - 0780-0083

		DATE			DATE
DRN	P.RAWLES	03/03/1987	ENG	R.VanLIJF	02/07/1987
CHK	R.VaNLIJF	02/07/1987	APP		

CO2 REMOVAL
PIPING & INSTRUMENT DIAGRAM
CO2 ABSORBER TRAIN 1

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0101	0005	01 OF 03 SHTS	49

1000000-0101-0005-01.DWG

NOTES:

1. FV-102-2 OPENING TO BE INHIBITED IN CASE OF INCORRECT VALVE LINE UP OR IF LSHH-6345 / FSLL-103-2 IS ACTIVATED.
2. HAND SWITCH INITIATES RAMP OF SET POINT FOR CARBONATE PUMP START UP.
3. THE LV OPERATING SPEED IN OPEN DIRECTION IS TO BE LIMITED.
4. VALVE TRIM SEALED SIDE MUST POINT UPSTREAM.
5. FLUSHING POINT USING FLUSHING RING ASSEMBLY SPI-275.
6. HV WILL CLOSE ON OPERATOR INITIATION OR STOP SIGNAL FROM LINED OUT CARBONATE PUMP.
7. THE RUPTURE DISC SHOULD BE LOCATED AS CLOSE AS PRACTICABLE TO THE EXCHANGER.
8. 300# OUT OF SPEC FLANGES IN 1H1/1C1 LINE SEGMENT REQUIRED DUE TO BACK PRESSURE EXERTED BY RO-106-2A/2B
9. HIGH PRESSURE CONDENSATE FLUSHING PROVIDED FOR STARTUP & FAULT CONDITIONS.
10. SPEED SET POINT TO SELECTED CARBONATE PUMP CONTROLS.
11. VALVE & OUTLET LOCATION AT TOP PLATFORM.
12. NRV-105 INTERNALS TEMPORARILY REMOVED UNTIL REPLACEMENT IS OBTAINED (DEC 2016). W/O 100129873.

NOTES CONTINUED:

13. RO-102-2B INSTALLED DEC 2016, PROJECT P84-1370.
14. HS-127-2 AND FIC-127-2 ARE PART COORDINATED PLANT INLET CONTROL ACROSS ALL THREE TRAINS.
15. OPEN END ELEVATION OF HPV TO BE ABOVE PSE-144-2.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE	REV	AMENDMENT	BY	CHK	ENG	APP	DATE
41	AS BUILT P84-3007 ESD LEVEL TRANS DEVIATION ALARMS	ES	TC	LH	SES	03/10	51	AS-BUILT P84-832 GAS SEPARATOR LEVEL TRANSMITTER	JB	JC	AM	SES	05/2014
							50	HAND VALVE NUMBER HV-189-2 ADDED FOR ISOLATIONS	RL	CR	AM	SES	12/2013
							49	AS BUILT P84-875 VALVE HV-186-2 REPLACEMENT	RL	SR	AM	SES	08/2013
58	AS BUILT P84-1496 P1142, REMOVAL OF THREADED FITTINGS	RL	JCC	AM	TC	07/2019	48	AS BUILT SPI-269 ADDED TO NOZZLES G & E ON D-101-2 (WERE 200NB)	RL/ES	CR	AM	SES	04/2013
57	AS BUILT P84-2015 PT-134-2 & P84-2105 HPV ON GAS COOLER	JC/RL	AC/JC	AM	TC	03/2019	47	AS BUILT HV-107-2 RELOCATED TO NEW LOCATION	ES/RL	TC	AM	SES	12/2012
56	AS BUILT P84-1405 INLET PRESSURE/FLOW CONTROL	JC/RL	AAB	AM	TC	08/2018	46	AS BUILT P84-1041 FLARE GAS MEASUREMENT	ES/RL	TC	AM	SES	09/2012
55	AS BUILT P84-1277 REPLACE FV-102-2 & P84-1370 RO-102-2B	RL	JCC	AM	TC	12/2016	45	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL/ES	CR	AM	SES	07/2012
54	AS BUILT COMMENTS INCORPORATED INCLUDING NOTE 12	RL	JCC	AM	TC	12/2016	44	AS BUILT - P84-1067 GAS COOLER HIGH TEMP TRIP	ES/RL	AAB	SRH	SES	10/11
53	REVISED FOR LOCKED VALVE STATUS AND VALVE NUMBERRING	RL	JC/NM	AM	SES	08/2015	43	AS BUILT - P84-2052 CO2 SLIP ANALYSER - TRAIN 2	ES/RL	TC	JS	SES	07/11
52	AS BUILT P84-848 WOBBE CONTROL	ES/RL	AAB	AM	SES	08/2014	42	PARTIAL AS BUILT FOR 520421	NK	CJ	JS	LH	01/11

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CAUSE & EFFECTS - 0780-0081
CAUSE & EFFECTS - 0780-0082
CAUSE & EFFECTS - 0780-0083

		DATE			DATE
DRN	P.RAWLES	02/07/1987	ENG	R.VanLIJF	02/07/1987
CHK	R.VanLIJF	02/07/1987	APP		

CO2 REMOVAL
PIPING & INSTRUMENT DIAGRAM
CO2 ABSORBER TRAIN 2

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0101	0005	02 OF 03 SHTS	58

1000000-0101-0005-02.DWG

EQUIPMENT No. M-111

DESCRIPTION: HYDROCARBON SEPARATOR
CAPACITY: DIA = 1.2m, TT = 4.6m
MAWP @ TEMP: 15 Barg @ 150°C

0101-0005/1 P1206-50-1C1 FROM CO2 ABSORBER TOWER D-101-1

0101-0005/1 P1135-50-6C1 FROM GAS SEPARATOR M-101-1

0101-0005/1 FROM LT-105-1

0101-0005/2 P1142-25-6C1 CONDENSATE FROM M-101-2

P1206-50-1C1 TO CHEMICAL EFFLUENT SUMP A-904-1 0101-0011

P1139-80-1C1 TO FLARE SYSTEM 0109-0026/1

P1207-1-25-6C1

P1140-1-50-1C1

KGT01_PGS_13_V

0102-0006/1 P1134-50-6C1

KGT01_MPG_23_L

P1143-50-1C1 TO LPG SURGE VAPOURISER F-201 0109-0025

0102-00005/3 1/2" SS TUBING (0.049" WT) FROM M-302

P1141-50-1C1

P1135-25-6C1

P1020-1-25-1C1

P1020-1-40-1C1

From mothballed facilities

0101-0006 P1138-50-1C1 DRAINS FROM E-101-3/1&2

0101-0006 P1136-25-1C1 CONDENSATE FROM M-101-3

0102-0006/1 P1137-3-25-1C1 CONDENSATE FROM D-201-3/4

0101-0006/1 15mm TUBING DRAIN FROM M-101-3

0102-0006/1 15mm TUBING DUMP FROM D-201-3

P1083-1-25-1C1 NOTE 2 TO REGEN TOWER D-102-1 0101-0008

P1083-2-25-1C1 NOTE 2 TO REGEN TOWER D-102-2 0101-0009

P1020-1-40-1C1 TO CARBONATE FLASH COLUMN D-103-1 0101-0008

P1020-2-40-1C1 TO CARBONATE FLASH COLUMN D-103-2 0101-0009

0101-0010

M-111

NOTES
1. OPEN FOR WASH WATER FROM M-307 DURING IFPEXOL COLUMN OUTAGE.
2. PROVISION FOR FLOW BALANCING RO

LEGEND
MOTHBALLED

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
14	AS BUILT P84-1367 MOTHBALL BENFIELD TRAIN 3	JB	CJ	AM	TC	09/2019
13	AS BUILT P84-1429 ELIMINATE INEFFICIENCY IN WASH WATER	JS	CJ	AM	SES	01/2018
12	NRV No's ADDED & HV No's ADDED FOR ISOLATIONS	RL	JCC	AM	SES	08/2015
11	VENTS & DRAINS ADDED TO M-111 LEVEL BRIDLES	RL	JA	AM	SES	11/2014
10	HAND VALVE NUMBER HV-190-3 ADDED FOR ISOLATION	RL	CR	AM	SES	11/2013
9	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL/ES	CR	AM	SES	04/2013
8	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL/ES	CR	AM	SES	06/2012
7	AS BUILT P84-2001 M-111 Tr3 RELOCATION WS2007432	RL	WB	SRH	SES	11/2011
6	AS BUILT WS1148373 LPG SPEC DURING IFP COLUMN OUTAGE	VB	NS	PWM	LH	04/09
5	CLOSED SPECTACLE BLIND ADDED - LINE P1207-1-25-6C1	ES	RL	LH	SS	11/07
4	LEVEL GUAGE BRIDLES FOR LG-124, 112 & 125 AS BUILT	RL	ES	LH	DS	11/2007
3	AS BUILT FOR WS884580 CORRODED BAFFLES & TIE RODS	VB	MR	MP	LH	11/06
2	TUBING DRAINS TO M-111 AS BUILT	RL	KC	LH	PJR	07/2005
1	AS BUILT FOR PEP PROJECT	RL	JBH	CP\LH	PJR	01/2004
A	M-111 MOVED FROM SHT 1 - SYSTEM NUMBERS ADDED	VB	TMA	MH		04/03

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REFERENCE DRAWINGS
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CAUSE & EFFECTS - 0780-0083

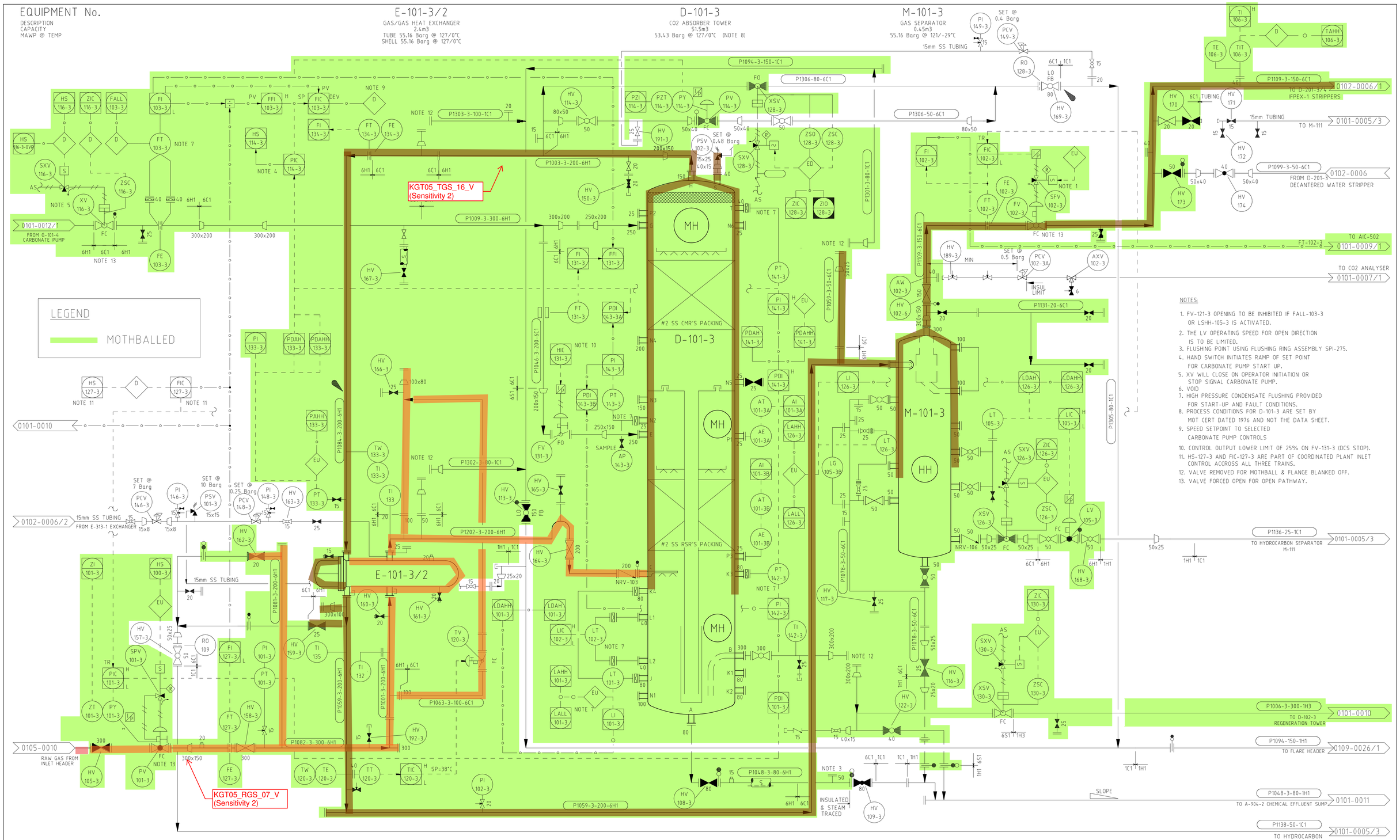
		DATE			DATE
DRN	P.RAWLES	02/03/1987	ENG	R.Van LIJF	02/07/1987
CHK	R.Vab LIJF	02/07/1987	APP		02/07/1987

CO2 REMOVAL
PIPING & INSTRUMENT DIAGRAM
HYDROCARBON SEPARATOR
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
N/A	1000000	0101	0005	03 OF 03 SHTS	14

1000000-0101-0005-03.DWG

EQUIPMENT No.	E-101-3/2	D-101-3	M-101-3
DESCRIPTION	GAS/GAS HEAT EXCHANGER	CO2 ABSORBER TOWER	GAS SEPARATOR
CAPACITY	2.4m3	51.5m3	0.45m3
MAWP @ TEMP	TUBE 55.16 Barg @ 127/0°C SHELL 55.16 Barg @ 127/0°C	53.43 Barg @ 127/0°C (NOTE 8)	55.16 Barg @ 121/-29°C



REV	AMENDMENT	BY	CHK	ENG	APP	DATE
42	AS BUILT P84-832 GAS SEPARATOR LEVEL TRANSMITTER REPLACE	LN	CJ	AM	SES	01/2014
41	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL/ES	CR	AM	SES	04/2013
40	AS BUILT P84-1041 FLARE GAS MEASUREMENT	ES/RL	TC	AM	SES	09/12
39	AS BUILT P84-1067 GAS COOLER HIGH TEMP TRIP	ES/RL	AAB	SRH	SES	10/11
38	AS BUILT 25 NB VALVE ADDED TO NOZZLE NS OF D-101-3	RL	CR	LH	SES	03/2011
37	AS BUILT INTERNALS & NOZZLE NUMBERS FOR D-101-3	ES/RL	CR	LH	SES	12/2010
36	AS BUILT AIT-101-3 MOVED TO DRG 0101-0007/1	ES/RL	TC	LH	SES	10/10
35	AS BUILT WS2007362 BENFIELD CO2 SLIP IN DCS	ES	TC	LH	SES	05/10
34	AS BUILT CW9002 REMOVED WITH E-101-3/2 DEMOLITION	TL	RL	LH	SES	11/2009
33	AS BUILT WS1404939 BENFIELD RELIEF VALVE UPGRADE	VB	KS	PWM	LH	09/09

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
51	AS BUILT P84-1367 MOTHBALL BENFIELD TRAIN 3	JB	CJ	AM	TC	09/2019
50	AS BUILT. NOTE 3 ADDED FOR FLUSHING POINT ASSEMBLY	RL	JCC	AM	TC	07/2019
49	AS BUILT P84-1405 INLET PRESSURE/FLOW CONTROL	JC/RL	AAB	AM	TC	08/2018
48	AS BUILT FOR SCR-640 HS-116-3-OVR	JC/RL	AAB	AM	SES	09/2016
47	AS BUILT P84-1289 ADDED AXV-102-3 LIQUID SHUT OFF VALVE	JCC	RL/CB	AM	SES	04/2016
46	AS BUILT P84-1044 REPLACE LV-105-3, MOD TO LT-105-3 & ADD NRV No's	RL	JCC	AM	SES	08/2015
45	AS BUILT - P84-944 REPLACE TRAIN 3 THINNED PIPE WORK	JC	LN	AM	SES	02/15
44	AS BUILT - P84-848 WOBBE CONTROL ON PROCESSED/EXPORT GAS	ES/RL	AAB	AM	SES	04/14
43	3 ADDITIONAL HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	03/2014

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE			DATE
DRN	P.RAWLES	01/03/1987	ENG	R.VanLIJF	02/07/1987
CHK	R.VanLIJF	01/03/1987	APP	R.VanLIJF	02/07/1987

CO2 REMOVAL
PIPING & INSTRUMENT DIAGRAM
CO2 ABSORBER TRAIN 3
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0101	0006	01 OF 01 SHTS	51

1000000-0101-0006-01.DWG

KGT90_CO2_16_V

EQUIPMENT No. | D-103-1 | E-102-1 | F-101-1 | D-102-1 | A-102-1 | M-801-1
DESCRIPTION | CARBONATE FLASH COLUMN | REGENERATOR REBOILER | CARBONATE TANK | REGENERATOR TOWER | REGENERATOR TOWER SILENCER | CO2 PRIMARY SEPARATOR
CAPACITY | 17 m3 | 1.4m3 | 52.3 m3 | 315m3 | | 3.35 m3
MAWP @ TEMP | 9.65 Barg @ 143°C | T: 5.2 Barg @ 140.6°C S: 10.3 Barg @ 284°C | 1 Barg @ 127°C | 1.05 Barg @ 127°C | | 0.49 Barg @ 98°C

NOTES:
1. MINIMUM FLOW SET POINT TO LIMIT SOLUTION CARRYOVER
2. FLUSHING POINT.
3. LOCATE VALVE AT PLATFORM.
4. OVERRIDE CLOSING OF LV-806 DEEMED TO BE SAFE.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
42	AS BUILT P84-1598 LINE PW45-1-25-1C1 DISCONNECTED FROM D-103-1	RL	JCC	CC	AM	06/2020
41	AS BUILT P84-1524 PRESSURISE TR 1 & 2 FLASH COLs WITH CO2	RL	JCC	AM	TC	10/2019
40	AS BUILT BYPASS VALVE ON LINE MPC9004 NOW SHOWN OPEN	RL	JCC	AM	TC	07/2019
39	AS BUILT P84-1429 ELIMINATE INEFFICIENCY IN WASH WATER	JS	CJ	AM	SES	01/2018
38	AS BUILT SCR-350 LV-806 & AS BUILT E-102-1 NOZZLES / PIPING	RL	JCC	AM	SES	08/2017
37	AS BUILT SCR-589 FAL-105-1	JCC	RL/AB	AM	SES	07/2016
36	AS BUILT P84-1289 RETROFIT FLASH COLUMN PCV	GH	CJ	AM	SES	03/2016
35	HV No's ADDED FOR ISOLATIONS & M-801-1 PROCESS COND. REVISED	RL	AC	AM	SES	10/2013
34	AS BUILT - LAHH-107 ADDED	ES/RL	AAB	AM	SES	02/13
33	AS-BUILT P84-130	LN	CJ	AM	SES	11/2012
32	AS BUILT P84-141 CARBONATE SOLUTION INVENTORY CONTROL	ES/RL	AAB	AM	SES	08/12
31	AS BUILT DELAY ADDED TO LOW FLOW ALARM	ES/RL	AC	SRH	SES	10/11
30	PARTIAL AS BUILT P84-1042 PSV FLASH COL REPLACEMENT	CJ	NB	JS	LH	01/2011
29	AS BUILT WS2007362 BENFIELD CO2 SLIP IN DCS	ES	TC	LH	SES	05/10
28	AS BUILT P84-2852	ES	TC	LH	SES	10/09
27	AS BUILT WS1343179 REGEN BOILER EFFICIENCY &					
	WS1498381 CHEM HOSE COUP. & WS1448350 SAMPLE POINT	RL	TC	LH	SES	05/2009
26	AS BUILT WS1343081, TRAIN 1 CO2 XSV INSPECTION PORT	RL	SR	LH	SES	01/2008
25	DRAIN FROM LINE P1026-1-150-1H1 WAS SHOWN CLOSED	RL	CP	LH	DS	11/2007
24	AS BUILT WS1266302 POLISHING TANK REMOVAL	RL	CP	LH	PJR	10/2007

VECTOR KAPUNI LIMITED
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AUTOCAD | ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0082/01, 02, 03, 07 & 08

		DATE			DATE
DRN	P.RAWLES		ENG		
CHK	A.vanGAMEREN		APP	J.F.STUART	10/02/1988

CO2 REMOVAL
PIPING & INSTRUMENT DIAGRAM
CARBONATE REGENERATION TRAIN 1

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0101	0008	01 OF 01 SHTS	42

1000000-0101-0008-01.DWG

KGT90_CO2_16_V

EQUIPMENT No.	D-103-2	E-102-2	D-102-2	F-101-2	M-801-2
DESCRIPTION	CARBONATE FLASH COLUMN	REGENERATOR REBOILER	REGENERATOR TOWER	CARBONATE TANK	CO2 PRIMARY SEPARATOR
CAPACITY	17 m3	1.4m3	315m3	52.3 m3	1.8m3
MAWP @ TEMP	9.65 Barg @ 143°C	5.10.3 Barg @ 284°C T5.2 Barg @ 140.6°C	1 Barg @ 127°C	1 Barg @ 127°C	3.4 Barg @ 98°C

0108-0001 FROM CO2 BOOSTER FAN C623 SUCTION PT-818

0108-0001 P8117-50-1SS FROM G-825 RECOVERED WATER PUMP

0108-0001 TO RECOVERED WATER FLOW CONTROL

0108-0001/1 FROM FT-804-B

0109-0024 MPW9005-2-40-1H1 FROM G-919-1&3 CONDENSATE

0101-0005/3 P1083-2-25-1C1 FROM M-111 HYDROCARBON SEPARATOR

0101-0005/3 P1028-2-40-1C1 FROM M-111 HYDROCARBON SEPARATOR

0101-0005/2 FROM FI-127-2

0101-0012/1 FROM FI-104-2

0101-0012/2 FROM FI-104-3

0102-0005/1 FROM E-303-1 EXCHANGER

0102-0005/1 TO SPV-385

0101-0005/2 P1006-2-300-1H1 FROM D-101-2 ABSORBER COLUMN

0101-0012/2 LPS9004-250-1H1 FROM G-101-2 CARBONATE PUMP TURBINE EXHAUST

0109-0031/1 IA9035-25-1H1 PROCESS AIR

0101-0011 P1016-2-100-1H1 FROM M-102-3

0109-0023/1 MPS9005-2-150-1H1 STEAM

0101-0008 P1025-1-80-1H1 TO/FROM F-101-1 CARBONATE TANK

0101-0010 P1025-3-80-1H1 TO/FROM F-101-3 CARBONATE TANK

0101-0008 NOTE 4 MPW9006-2-40-1H1 FROM SOLUTION CHARGE PUMPS

0109-0023/1 MPS9009-2-40-1H1 STEAM

P4167-50-1S2 TO COLD FLARE HEADER 0109-0026/2

TO ATMOS TUNDISH

15mm TUBING

DRAIN AT BASE OF COLUMN

P8023-2-300-1H3

P8024-2-300-1H3 TO CO2 RECOVERY E-8216-801 0108-0001

P8025-2-300-1H3

P1007-2-300-1H3

P1026-2-150-1H1

LPS9004-250-1H1

IA9035-25-1H1

P1011-2-450-1H1

P1010-2-200-1H1

P1025-2-80-1H1

P1024-2-25-1H1

P1206-50-1C1

P1033-2-50-1C1

P1017-2-50-1S1

SYPHON BREAKER

SET @ 9.65 Barg 80x 100

FLUSHING CONDENSATE

HOLD

NOTE 1

NOTE 2

NOTE 3

NOTE 7

PIPE TUBE

10mm SS TUBING

20mm SS TUBING DRAIN TO CHEMICAL EFFLUENT SUMP A-904-1

HOSE COUPLING

MPC9004-2-50-1H1 F-915-1 CONDENSATE TANK 0109-0024

P1008-2-450-1H1 TO G-101-2 CARBONATE PUMPS 0101-0012/1

P1014-2-150-1H1 TO G-103-2 SOLUTION CHARGE PUMP 0101-0011

P1206-50-1C1 TO CHEMICAL EFFLUENT SUMP A-904-1 0101-0011

P1849-2-150-1H1 TO G-103-2 SOLUTION CHARGE PUMP 0101-0011

MPC9007-2-25-1H1 P1206-80-1C1 TO CHEMICAL EFFLUENT SUMP A-904-1 0101-0011

NOTES:

1. MINIMUM FLOW SET POINT TO LIMIT SOLUTION CARRYOVER
2. FLUSHING POINT.
3. R.O. TO PREVENT FLASHING ALONG THE PIPE.
4. VOID
5. VOID
6. VOID
7. OVERRIDE CLOSING OF LV-802 WHEN DEEMED TO BE SAFE.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
41	AS BUILT P84-1566 REMOVE REDUNDANT LINE P5112	RL	CC	JC	AM	05/2020
40	AS BUILT P84-1524 PRESSURISE TR 1 & 2 FLASH COLs WITH CO2	RL	JCC	AM	TC	10/2019
39	AS BUILT P84-1233, VALVES ON MPC9004-2 & FT-108-2	RL	JCC	AM	TC	07/2019
38	AS BUILT P84-1429 ELIMINATE INEFFICIENCY IN WASH WATER	JS	CJ	AM	SES	01/2018
37	AS BUILT SCR-350 LV-802 & E-102-2 NOZZLES & PIPING	RL	JCC	AM	SES	08/2017
36	AS BUILT SCR-589 FAL-105-2	JCC	RL/AB	AC	TC	07/2016
35	AS BUILT P84-1209 RETROFIT FLASH COLUMN PCV	LN	CJ	AM	SES	10/2015
34	PI-115 REMOVED, M-801-2 PROCESS COND. REVISED & NRV No. ADDED	RL	JC/CR	AM	SES	05/2015
33	AS BUILT LAHH-107-2 ADDED	ES	AAB	AM	SES	02/13
32	AS BUILT P84-130 DISCHARGE RECOVERED WATER	LN	CJ	AM	SES	12/2012
31	AS BUILT P84-141 CARBONATE SOLUTION INVENTORY CONTROL	ES/RL	AAB	AM	SES	08/12
30	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL/ES	CR	AM	SES	06/2012
29	AS BUILT DELAY ADDED TO LOW FLOW ALARM	ES/RL	AC	SRM	SES	10/11
28	AS BUILT P84-820 LCV-103-2 REPLACED	MW	ES	JS	SES	08/11
27	PARTIAL AS BUILT FOR P84-1942 PSV FLASH COL REPLACMENT	NK	CJ	JS	LH	01/11
26	AS BUILT P84-3007 ESD LEVEL TRANS DEVIATION ALARMS	ES	TC	LH	SES	03/10
25	AS BUILT P84-2852 BENFIELD REBOILER STEAM CHANGES	ES	TC	LH	SES	10/09

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0082/01, 2, 3, 7 & 8.

		DATE			DATE
DRN	P.RAWLES		ENG		
CHK	A.vanGAMEREN		APP	J.F.STUART	10/02/1988

CO2 REMOVAL
PIPING & INSTRUMENT DIAGRAM
CARBONATE REGENERATION TRAIN 2

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0101	0009	01 OF 01 SHTS	41

1000000-0101-0009-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

E-102-3
REGENERATOR REBOILER
1.9m3
SHELL:10.3 Barg @ 204°C TUBE: 5.2 Barg @ 140.6°C

F-101-3
CARBONATE TANK
CAPACITY XXm3
MAWP XXBarg @ XXX°C

D-102-3
REGENERATOR TOWER
Xm3
1 Barg @ 127°C

M-801-3
CO2 PRIMARY SEPARATOR
1.8m3
3.4 Barg @ 98°C

KGT90_CO2_23_V

KGT90_CO2_16_V

LEGEND

MOTHBALLED

NOTE:

1. MINIMUM FLOW SET POINT TO LIMIT SOLUTION CARRYOVER
2. PV-102-3 ACTUATOR AND INTERNALS REMOVED.
3. TRIPS C-823 (P&ID 0108-0001) WHEN SELECTED.
4. XSV-117 REMAINS CLOSED WHEN HS-802-3 NOT SELECTED FOR TRAIN 3 CO2 PRODUCTION.
5. OVERRIDE CLOSING OF LV-801 WHEN DEEMED TO BE SAFE.
6. WEATHER CAP INSTALLED FOR MOTHBALL.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
24	AS BUILT WS1343179 REGEN BOILER EFFICIENCY & WS1498381 CHEMICAL HOSE COUPLING ADDED	RL	TC	LH	SES	06/2009
23	AS BUILT WS1042819-BENFIELD SYSTEM HAZARD REPORT	ES	CP	LH	PJR	03/07
22	AS BUILT WS1236269 CTRL RECOVERED WATER TO REGENS	ES	TC	LH	PJR	01/07
21	AS BUILT FOR WS933791 FILTER DRAIN	RL	ES	LH	PJR	06/2006
20	AS BUILT POST PEP TRAIN 1, REDLINE MARKUPS INCORP.	RL	RL	LH	PJR	10/2004
36	AS BUILT P84-1367 MOTHBALL BENFIELD TRAIN 3	JB	CJ	AM	TC	09/2019
35	AS BUILT SCR-358 LV-801 CHANGED FROM FO TO FC AND FV-105-3 BYPASS WAS 150NB GATE VALVE	RL	JCC	AM	TC	07/2019
34	AS BUILT SCR-589 FAL-105-3	JCC	RL/AB	AM	SES	07/2016
33	AS BUILT P84-1142 PV-102-3 ACT. AND INTERNALS REMOVED	JCC	RL/TC	AM	SES	05/2015
32	HAND VALVE No's ADDED FOR ISOLATIONS & MAWP FOR M-801-3	RL/ES	TC	AM	SES	06/2013
31	AS BUILT P84-130	LN	CJ	AM	SES	11/2012
30	AS BUILT P84-141 CARBONATE SOLUTION INVENTORY CONTROL	ES/RL	AAB	AM	SES	08/12
29	AS BUILT P84-2001 M-111 Tr 3 RELOCATION WS2007432	RL	WB	SRH	SES	11/2011
28	AS BUILT DELAY ADDED TO LOW FLOW ALARM	ES/RL	AC	SRH	SES	10/11
27	AS BUILT ISOLATION VALVES ADDED TO FT-105-3	RL	ES	LH	SES	07/10
26	AS BUILT WS2007362 BENFIELD CO2 SLIP IN DCS	ES	RL	LH	SES	05/10
25	AS BUILT P84-2852 BENFIELD REBOILER STEAM CHANGES	ES	TC	LH	SES	10/09

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0082/01, 02, 07, 08

		DATE			DATE
DRN	P.RAWLES		ENG		
CHK	A.R.G.		APP	J.F.STUART	10/02/1988

CO2 REMOVAL
PIPING & INSTRUMENT DIAGRAM
CARBONATE REGENERATION TRAIN 3
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0101	0010	01 OF 01 SHTS	36

1000000-0101-0010-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

E-303-1
GAS/GAS HEAT EXCHANGER
2.1m3
TUBE: 82.74 Barg @ -48/38°C
SHELL: 82.74 Barg @ -48/38°C

E-303-2
GAS/GAS HEAT EXCHANGER
2.1m3
TUBES: 82.74 Barg @ -48/38°C
SHELL: 82.74 Barg @ -48/38°C

KGT55_MOH_02_L
KGT01_TGS_12_V
KGT01_PGS_01_V
KGT01_TGS_11_V (Sensitivity 2)
KGT01_TGS_07_V
KGT01_PGS_03_V (Sensitivity 2)

0109-0036 FROM METHANOL METERING PUMP G-309-1/2
15 TUBING
0102-0005/3 P3212-80-6H1 FROM M-307 HT SEPARATOR
0102-0005/2 FROM PIC-338
P2001-1-150-6C1
P2001-1-200-6C1
0102-0006/2 P2001-2-200-6H1 FROM D-201-3/4 IFPEX-1 CONTACTORS
0102-0006/2 FROM FI-383
FFI 383
FI 384
FT 384
FE 384
EXIST/NEW
6H1 6C1
40
200x80
200x150
P2001-1-200-6C1 TO E-303-4 EXCHANGER
0102-0005/2
P3117-200-6H1 TO 300mm PRODUCT LINE
0102-0006/2
0109-0036 TO FFIC-309
0101-0008/1 FROM PIC-103-1
0101-0009/1 FROM PIC-103-2
0105-0014/2 FROM GAS GATHERING LINE
0101-0009 TO D-103-2 FLASH COLUMN
0101-0008 TO D-103-1 FLASH COLUMN
0101-0005/2 TO D-101-2 ABSORBER TOWER
0101-0005/1 TO D-101-1 ABSORBER TOWER
0102-0005/3 TO G-301-1/2
SPV 385
A/S
PV 385
NOTE 2
FC
PI 385
15 SS TUBING
6C1 TUBING
P3101-150-6H1
P3008-25-6C1
20x25
HV 313
NRV-217
ZI 338
ZT 338
PY 338
PV 338
HV 307-C
SAMPLE POINT
AP 303
150x100
FI 388
EU
SPV 338
TE 379
TT 379
TI 379
TI 321
TT 321
TE 321
HV 307-B
SAMPLE
15mm SS TUBING
PDAH 385
PDIT 385
PDI 385
HV 312
HV 307-A
E-303-1
E-303-2
TW 383
PI 384
NRV-216
TI 320
TT 320
TE 320
P3020-100-6C1 TO E-303-3 EXCHANGER
0102-0005/2
P1075-200-6C1 TO D-201-3/4 IFPEX-1 STRIPPERS
0102-0006/1
0101-0005/1 P1005-1-150-6C1 FROM M-101-1 GAS SEPARATOR
HV 147-1
HV 149-1
HV 148-1
NRV-201
NOTE 1.
0101-0005/2 P1005-2-150-6C1 FROM M-101-2 GAS SEPARATOR
HV 147-2
HV 149-2
HV 148-2
NRV-202
0102-0005/2 P3030-150-6C4 FROM M-306 SEPARATOR

NOTE
1. FOR CO2 ABSORBER PRESSURIZATION DURING HOT START-UP.
2. TEMPORARY PRESSURING GAS LINE, 15 SS TUBING, NORMALLY DISCONNECTED.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
22	PV-338 INSTRUMENT BALOON ADDED	RL	ES	LH	SES	07/2008
21	STRAINER, ISOLATION VALVES & BYPASS ADDED TO FI-388	RL	ES	LH	DS	11/2007
20	AS BUILT WS146704 CRIT. CONTROL VALVE FEEDBACK	VB	MP	PR	LH	03/07
19	AS BUILT FOR WS956053	VB	MP	PR	LH	07/06
18	AS BUILT PTL COM'TS FOR TUBING TO ABSORBER TOWERS	RL	JM	LH	PJR	06/2005
17	LINE NUMBERS/SPEC BREAKS REVISED	RH	RL	LH	PJR	12/04
16	AS BUILT PEP REDLINES & SAMPLE PT's AP-303,4 INCORP.	RH	RL	LH	PJR	12/2004
15	AS BUILT FOR PEP PROJECT	RL	RH	CP/LH	PJR	02/2004
14	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
13	DESIGN DATA RATIONALISED FOR E-303-1 & E-303-2	CMW	RL	AvG	AIM	08/02

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
31	P&ID SPLITTING CONTIUATION FROM 0105-0014-02	JCC	RL	AM	SES	06/2016
30	NRV AND HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	JCC	AM	SES	11/2015
29	AS BUILT P84-1091 ENHANCED LPG RECOVERY	JT	JC	AM	SES	08/2014
28	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	AC	AM	SES	10/2013
27	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL/ES	CR	AM	SES	06/2012
26	PARTIAL AS BUILT FOR P84-2992 MEOH INJECTION	AA	GH	WB	JS	10/11
25	AS BUILT PGC HAZOP COMMENTS WS1324841	RL/ES	TC	JS	SES	08/2011
24	AS BUILT P84-1070 PRESS. GAS FM GAS GATHERING LINE	RL/MW	LR	JS	SES	07/2011
23	STRAINER REMOVED FROM FI-388	ES	RL/JY	LH	SES	09/08

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

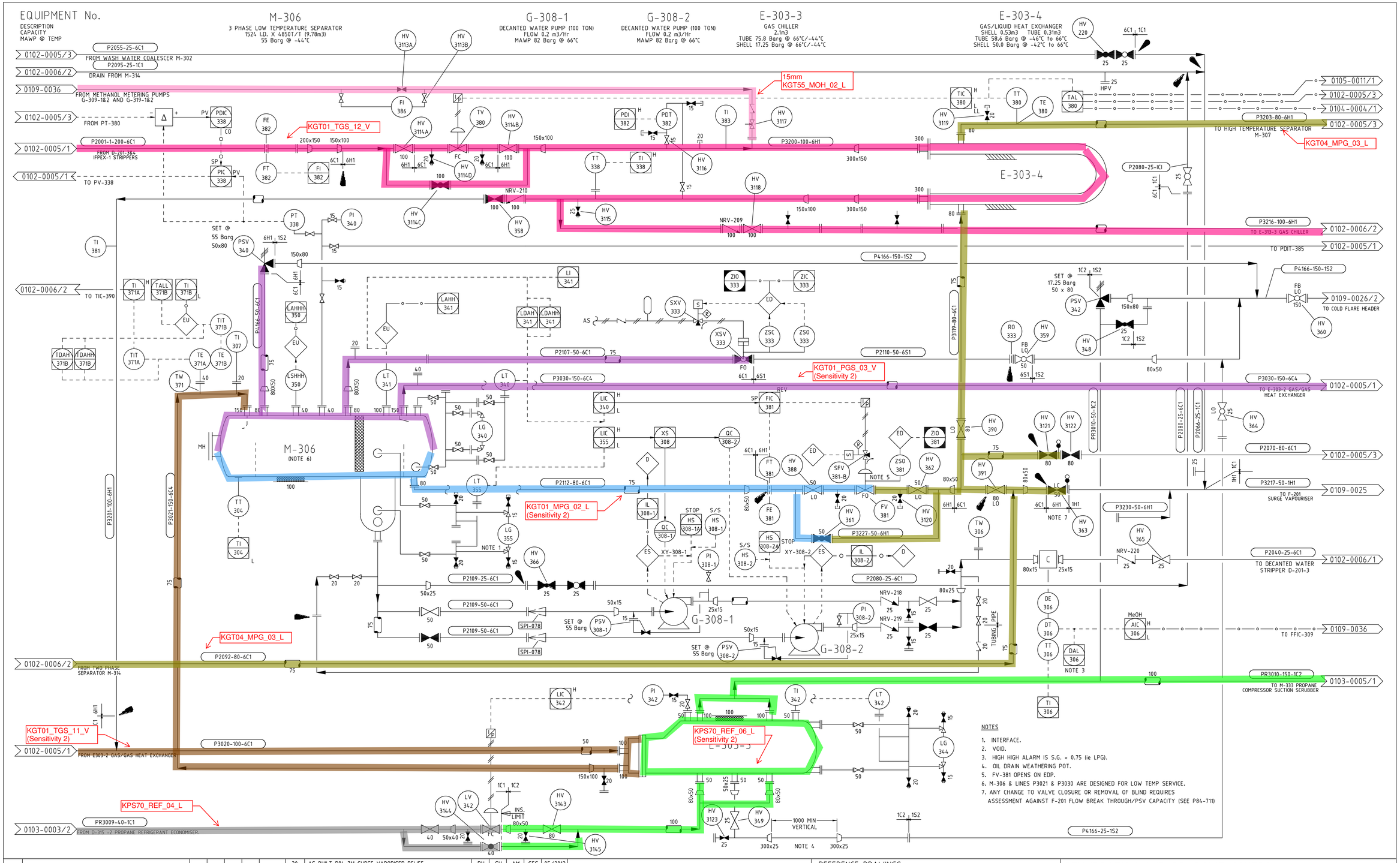
AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0082/04

DEHYDRATION AND DEWPOINT CONTROL
PIPING & INSTRUMENT DIAGRAM
GLYCOL ABSORPTION TRAIN 1&2 (100 TON)
.

		DATE			DATE
DRN	P.RAWLES	01/03/87	ENG	R.VanLIJF	02/07/87
CHK	R.VanLIJF		APP	R.VanLIJF	02/07/87

SCALE: NTS
CAD NO: BC000501
JOB NO. 1000000
SERIES 0102
DRG NO. 0005
SHT 01 OF 03 SHTS
REVISION 31



REV	AMENDMENT	BY	CHK	ENG	APP	DATE
39	AS BUILT - P84-1332 HIGH LEVEL PRO. 100T & 200T CHILLERS	RL	JCC	AM	TC	07/2019
38	AS BUILT - P84-1332 HIGH LEVEL PRO. 100T & 200T CHILLERS	WPG	SHA	AM	SES	08/2017
37	AS BUILT MODS P84-1242 IMPROVEMENTS TO PROPANE REFRIG	RL	JCC	AM	SES	04/2017
36	AS BUILT P84-1242 IMPROVEMENTS TO PROPANE REFRIG	RL	JCC	AM	SES	01/2017
35	AS BUILT MODS & HV NUMBERS ADDED FOR ISOLATIONS	RL	JCC	AM	SES	12/2015
34	HAND VALVE NUMBERS ADDED ON LOCKED VALVES	RL	JC	AM	SES	02/2015
33	AS-BUILT P84-1193 ENHANCED LPG RECOVERY	JB	TH	AM	SES	10/2014
32	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	JC	AM	SES	08/2014
31	AS BUILT P84-3257 200T INLET BACK PRESSURE CONTROL	LN	JC	AM	SES	05/2014
30	AS BUILT P84-711 SURGE VAPORISER RELIEF	DH	SH	AM	SES	05/2013
29	AS BUILT P84-3299 RERATE. PSV-308-1 & 2 WERE 82 BARG	RL/ES	PR	AM	SES	05/2013
28	AS BUILT P84-3166 - PROCESS VARIABILITY STUDY	ES/RL	TC	JS	SES	05/11
27	AS BUILT TW-371 AND VENT SIZES CORRECTED	RL/ES	TC	LH	SES	09/10
26	AS BUILT P84-3007 ESD LEVEL TRANS DEVIATION ALARMS	ES	TC	LH	SES	03/10
25	AS BUILT WS980053 METHANOL METERS	ES	CB	LH	SES	06/09
24	AS BUILT LINE LIST COMMENTS ADDED	ES	RL	LH	SES	02/09
23	AS BUILT WS1131635 LT SEP UNDER TEMP PROTECTION	VB	WF	PWM	LH	09/08
22	AS BUILT WS1131635 LT SEP UNDER TEMP PROTECTION	VB	LH	MP	PJR	07/07
21	TT-306 ON M-306 NOW TAGGED TT-304	JLM	ES	AAB	PJR	10/05

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
0780-0082/06 EDP CAUSE AND EFFECTS

		DATE			DATE
DRN	P.RAWLES	01/03/1987	ENG	R.VanLIJF	02/07/1987
CHK	R.VanLIJF		APP	R.VanLIJF	02/07/1987

DEHYDRATION AND DEWPOINT CONTROL
PIPING & INSTRUMENT DIAGRAM
GAS CHILLER & SEPARATOR TRAIN 1&2 (100 TON)

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0102	0005	02 OF 03 SHTS	39

1000000-0102-0005-02.dwg

EQUIPMENT No. | M-305 | M-307 | G-301-1 | G-301-2 | M-302

DESCRIPTION | COALESCER PRE-FILTER | HIGH TEMPERATURE SEPARATOR | HT SEPARATOR CONDENSATE PUMP | HT SEPARATOR CONDENSATE PUMP | WASH WATER COALESCER

CAPACITY | CAPACITY 0.01m3 | 1219 ID x 3650 T/T (4.74m3) | FLOW 28.4m3/Hr | FLOW 28.4m3/Hr | CAPACITY HOLDm3

MAWP @ TEMP | MAWP 90 BarG @ 120°C | 55 BarG @ 66/-29°C (NOTE 9) | MAWP 58.6 BarG @ 66°C | MAWP 58.6 BarG @ 66°C | MAWP 58.6 BarG @ 66°C

NOTES:

1. INTERFACE.
2. AUTOMATIC RECIRCULATION VALVE.
3. LAHH-381 TRIPS SPV-380
4. LALL-381 TRIPS G-301-1&2
5. CLOSED FOR WASH WATER TO M-111 DURING IFPEXOL COLUMN OUTAGE.
6. OPEN FOR WASH WATER TO M-307/M-111 DURING IFPEXOL COLUMN OUTAGE.
7. PDAHH-341 TRIPS FIC-380 TO MANUAL AND FULLY CLOSED.
8. VALVE THROTTLED TO SLOW RATE OF OPENING OF LV-380-2 TO APPROX. 2 SECONDS AND HANDLE REMOVED.
9. M-307 AND ASSOCIATED PIPEWORK HAVE BEEN CHECKED AND CONFIRMED SUITABLE TO OPERATE DOWN TO -35°C.

40	CONTINUATION FROM P&ID SPLITTING 0104-0004	JCC	RL	AM	SES	06/2016	30	AS BUILT P84-159 REMOVE ZSC-334 INHIBIT FROM ESD SYS	RM	CJ	SES	AM	10/2013
39	HAND VALVE NUMBER HV-314 ADDED FOR ISOLATIONS	RL	JCC	AM	SES	04/2016	29	AS BUILT P84-2992 MEOH INJECTION WORK RE-INSTATED	RL/ES	AAB	AM	SES	11/2012
38	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	JCC	AM	SES	12/2015	28	AS BUILT P84-1131 HTS VAPOUR 3 TRAIN OP.	ES/RL	AAB	AM	SES	10/12
37	REVISED FOR FOR ISOLATIONS & LO REMOVED FROM HV-373-2	RL	JCC	AM	SES	10/2015	27	PARTIAL AS BUILT FOR P84-2992 MEOH INJECTION	AA	GH	WB	JS	10/11
36	LEVEL BRIDLE LT-381, LT-380, LT-346, HV NUMBERS ADDED	JCC	RL/CB	AM	SES	04/2015	26	AS BUILT M-305 DV & PGC HAZOP COMMENTS	RL/ES	JHS	JS	SES	08/11
35	HAND VALVE NUMBERS, NRV NUMBERS, CSO AND NOTE 8 ADDED	RL	JCC/NM	AM	SES	04/2015	25	AS BUILT P84-3166 - PROCESS VARIABILITY STUDY	ES/RL	TC	JS	SES	05/11
34	AS BUILT P84-1166 HT SEP CONTROL MODS & P&ID SPLITTING	RL	JCC/AB	AM	SES	02/2015							
33	AS BUILT. DRAIN VALVE DETAILED ON LT-346 OF M-302	RL	JCC	AM	SES	09/2014							
32	HAND VALVE No's ADDED FOR ISOLATIONS & PDAHH-341 ADDED	RL	JCC	AM	SES	08/2014							
31	AS BUILT P84-3257 200T INLET BACK PRESSURE CONTROL	LN	JC	AM	SES	05/2014	41	AS BUILT FAL-346 & NOTE 9 ADDED, M-305 DATA REVISED	RL	JCC	AM	TC	07/2019
REV	AMENDMENT	BY	CHK	ENG	APP	DATE	REV	AMENDMENT	BY	CHK	ENG	APP	DATE

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD | ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0082/04 & 0780-0082/05

DEHYDRATION AND DEWPOINT CONTROL
PIPING & INSTRUMENT DIAGRAM
HT SEPARATOR & WASH WATER COALESCER

		DATE			DATE
DRN	J.WELLS	17/08/1996	ENG	K.EDEN	01/12/1987
CHK	M.LU	01/02/1987	APP		

SCALE: NONE | JOB NO. 1000000 | SERIES 0102 | DRG. NO 0005 | SHT 03 OF 03 SHTS | REVISION 41

1000000-0102-0005-03.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

D-201-3
DECANTED WATER STRIPPER
6.6m3
55.16 Barg @ 121/0°C

D-201-4
WASH WATER STRIPPER
8.1m3
55.16 Barg @ 121/0°C

NOTES:

1. TRAYS REMOVED AND REPLACED BY RANDOM PACKING.
2. TRAYS REMOVED AND REPLACED BY STRUCTURED PACKING
3. BOTTOM OF 25NB HYDOCARBON DRAIN IS 13% ABOVE BOTTOM LEVEL RANGE OF LT-201-4.
4. FOR FUTURE CORIOLIS
5. LT-201-4 RADAR TRANSMITTER HAS BENT ROD ANTENNA SPAN = 265MM. CAUTION IS REQUIRED WHEN REMOVING FROM VESSEL.

LEGEND

MOTHBALLED

KGT01_PGS_01_V
KGT01_PGS_13_V
KGT01_TGS_10_V
KGT01_TGS_07_V
KGT01_TGS_16_V (Sensitivity 2)
KGT01_RGS_01_V
KGT01_PGS_05_V

Confirmed with operation: normally open
Confirmed with operation: normally open

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
42	AS-BUILT P84-1377 AP-201-3A ADDED & AP-201-3 RELOCATED	RL	NM	AM	SES	05/2016
41	AS-BUILT - P84-1233 TRAYS REMOVED, ADDED AXV-102-3	JCC	RL/CB	AM	SES	04/2016
40	NRV No's ADDED & HV No's ADDED FOR ISOLATIONS ETC.	RL	JCC	AM	SES	09/2015
39	AS BUILT P84-944 REPLACE TRAIN 3 THINNED PIPEWORK	JC	LN	AM	SES	02/15
38	AS BUILT FOR P84-176 UPGRADE IFPEX	KM	CJ	AM	SES	11/13
37	HAND VALVE NUMBER ADDED FOR ISOLATIONS & SPI-264	RL	CR	AM	SES	06/2013
36	PGC/IFPEXOL HAZOP MARK UPS WS 1324841	MW	LR	JS	SES	08/11
35	AS BUILT P84-3007 ESD LEVEL TRANS DEVIATION ALARMS	ES	TC	LH	SES	03/10
34	AS BUILT D-201-3 & 4 NOZ. CONFIG. & TYPE. WS2007270	RL	WB	LH	SES	10/09
33	AS BUILT AP-201-3 RE-POSITIONED	ES	RL	LH	SES	10/09
32	FROM ARROW CORRECTED FOR GATH GAS & WS1384042	RL	SR	LH	SES	02/09
31	SAMPLE POINT AP-201-4B ADDED WS1368350	ES	RL	LH	SES	12/08
30	AS BUILT WS1043310 IMPROVE IFPXOL CONTROL	ES	MD	LH	SES	04/08
29	LINE No SPECS FOR P1086, P1087, P1088 REVISED TO 600#	RL	RH	LH	DS	11/2007
45	AS BUILT P84-1367 MOTHBALL BENFIELD TRAIN 3	JB	CJ	AM	TC	09/2019
44	AS BUILT P84-1356 ADDED AP-201-3B, AP-201-4C	JCC	RL/AC	AM	SES	03/2017
43	P&ID SPLITTING CONTIUATION FROM 0105-0014-02	JCC	RL	AM	SES	06/2016

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE AND EFFECT - 0780-0082/04

		DATE			DATE
DRN	P.RAWLES	02/04/1987	ENG	R.VanLIJF	03/07/1987
CHK	R.VanLIJF		APP	R.VanLIJF	03/07/1987

DEHYDRATION AND DEWPOINT CONTROL
PIPING & INSTRUMENT DIAGRAM
IFPEX-1 STRIPPERS
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SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0102	0006	01 OF 02 SHTS	45

1000000-0102-0006-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

E-313-3
GAS CHILLER
2.7m3
TUBE 75.8 Barg @ 66°C/-44°C
SHELL 17.25 Barg @ 66°C/-44°C

M-313
LOW TEMPERATURE SEPARATOR
2.9m3
55 Barg @ 66/-35°C

M-314
TWO PHASE SEPARATOR (200 TON)
896 ID x 4572 T/T (3.1m3)
MAWP 75.8 Barg @ 66/-46°C

G-318-1
DECANTED WATER PUMP (200 TON)
FLOW 0.2 m3/Hr
MAWP 82 Barg @ 66°C

G-318-2
DECANTED WATER PUMP (200 TON)
FLOW 0.2 m3/Hr
MAWP 82 Barg @ 66°C

E-313-1
GAS/GAS HEAT EXCHANGER
2.2m3
TUBE 55 Barg @ 66/-40°C
SHELL 55 Barg @ 66/-40°C

E-313-2
GAS/GAS HEAT EXCHANGER
2.2m3
TUBE 55 Barg @ 66/-40°C
SHELL 55 Barg @ 66/-40°C

KGT01_PGS_01_V
KGT01_TGS_10_V
KGT01_TGS_12_V
KGT55_MOH_02_L
KGT01_TGS_12_V
KPS70_REF_11_V
KGT01_PGS_02_V
KPS70_REF_05_L
KGT01_MPG_01_L
KGT04_MPG_03_L
KPS70_REF_04_L

0102-0005/1 — P3117-200-6H1 — TO FFI-383 — 0102-0005/1
0102-0005/3 — FROM PT-380 — TO FFIC-319 — 0109-0036
0102-0006/1 — P2001-2-200-6H1 — FROM D-201-3&4 IFPEX-1 STRIPPERS — P3312-200-6C1 — TO PRODUCT GAS LINE — 0102-0006/1
0102-0005/1 — P2001-2-200-6H1 — TO GAS/GAS HEAT EXCHANGER E-303-1 — P3117-150-6C1 — P3117-200-6H1 — 15 SS TUBING — TO E101-3/2 EXCHANGER — 0101-0006/1
0102-0005/2 — P3216-100-6H1 — FROM E-303-4 GAS/LIQUID EXCHANGER — SAMPLE
0109-00036 — FROM METHANOL METERING PUMPS G-319-1/2 — 15mm SS TUBING
P2046-80-1S2 — P3113-200-6H1 — P9012-150-1S2 — TO COLD FLARE HEADER — 0109-0026/2
PR3012-200-1C2 — TO M-333 PROPANE COMPRESSOR SUCTION SCRUBBER — 0103-0005/1
P2050-80-6S1 — P2051-80-1S2 — TO COLD FLARE HEADER — 0109-0026/2
P3122-100-1C2 — P2045-25-1C2 — P3115-200-6C4 — P3114-150-6C4
P2090-80-6C1 — P2091-100-6C1 — P2092-80-6C1 — TO E-303-4 GAS/LIQUID EXCHANGER & SURGE VAPOURISER — 0102-0005/2
P2094-25-6C1 — TO DECANTED WATER STRIPPER D-201-3 — 0102-0006/1
P2093-50-6C1 — P2093-25-6C1 — P2095-25-1C1 — DRAIN TO SURGE VAPOURISER F-201 — 0102-0005/2
0103-0005/1 — TO PIC-305
0103-0003/2 — 10 SS TUBING
0103-0005/1 — 19mm SS TUBING — FROM M-333 PROPANE COMPRESSOR SUCTION SCRUBBER
0102-0005/2 — FROM TT-371
0103-0003/2 — PR3007-50-1C1 — TUBING — FROM D-315-2 PROPANE REFRIGERANT ECONOMISER
0109-0036 — TO FFIC-319

DRAIN AT GRADE
15mm SS TUBING
1000 MIN VERTICAL NOTE 4
TUBE
INS. LIMIT
SET @ 17.25 Barg 8x8
SET @ 55 Barg 65 x 100
SET @ 55 Barg 8x8
SPI-214 STRAINER
TUBING PIPE
8mm TUBING
15 mm TUBING
NV-211
NV-212
NV-213
NV-214
NV-215
TALL 331B NOTE 7
MH

NOTES:
1. FV-357 IS TO BE LOCATED ADJACENT TO E-303-4 AREA.
2. LOW ALARM IS S.G. < 0.75 (i.e. LPG).
3. VOID.
4. OIL DRAIN WEATHERING POT.
5. METHANOL CONTENT DETERMINED FROM DENSITY VS. TEMPERATURE.
6. FV-357 OPENS ON EDP.
7. SET POINT LOWER THAN DESIGN RATING BUT COMPLIANT WITH ASME VIII MIN ALLOWABLE TEMP. PROJECT P84-1091
8. 20NB VENT VALVE IS FAULTY AND IS NOW NON FUNCTIONAL.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
40	AS BUILT TW-318 & TE-318 REMOVED FROM P2094-25-6C1	RL	JCC	AM	TC	05/2017
39	AS BUILT P84-1342 IMPROVE PROPANE SUCT. SCRUBBER DRAIN	RL	JCC	AM	TC	11/2016
38	HV No's ADDED FOR ISOLATIONS & LT-356, LT-354 MODS	RL	JCC	AM	SES	08/2015
37	AS-BUILT P84-1168 REPLACE M-313 LEVEL BRIDLE	CJ	SH	AM	SES	01/2015
36	AS-BUILT P84-1168 ON SITE	JB	JC	AM	SES	09/2014
35	AS-BUILT P84-1091 ENHANCED LPG RECOVERY	JB	JC	AM	SES	08/2014
34	AS-BUILT P84-929 PROPANE THERMAL RELIEFS	JB	SH	AM	SES	06/2014
33	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	04/2014
32	AS BUILT P84-3299 RERATE. PSV-318-1 & 2 WERE 82 BARG	RL/ES	PR	AM	SES	05/2013
31	SPEC CHANGE AT PSV-357 CORRECTED FROM 1C1 TO 6C1	RL	CR	AM	SES	10/2012

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
30	PARTIAL AS BUILT FOR P84-2992 MEOH INJECTION	AA	GH	WB	JS	10/11
29	AS BUILT PGC HAZOP COMMENTS WS1324841	RL/ES	TC	JS	SES	08/11
28	AS BUILT P84-3166 - PROCESS VARIABILITY STUDY	ES/RL	TC	JS	SES	05/11
44	AS BUILT P84-1517 REMOVE LG-354 FROM M-314	RL	JCC	AM	TC	07/2019
43	AS BUILT P84-1509, PI-350 REMOVED & HV-309-1 No. ADDED	RL	JCC	AM	TC	06/2019
42	AS BUILT P84-1332 HIGH LVL PROTECTION	JCC	AAB	AM	SES	08/2018
41	AS BUILT P84-1332 HIGH LVL PROTECTION & P84-1305	JCC	MM	AM	SES	07/2017

AUTOCAD — ORIGINAL SHEET SIZE A1

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

REFERENCE DRAWINGS
0780-0082/06 EDP CAUSE AND EFFECTS

		DATE			DATE
DRN	P.RAWLES	07/04/1987	ENG	R.VaNLIJF	02/07/1987
CHK	R.VanLIJF	03/07/1987	APP	R.VanLIJF	02/07/1987

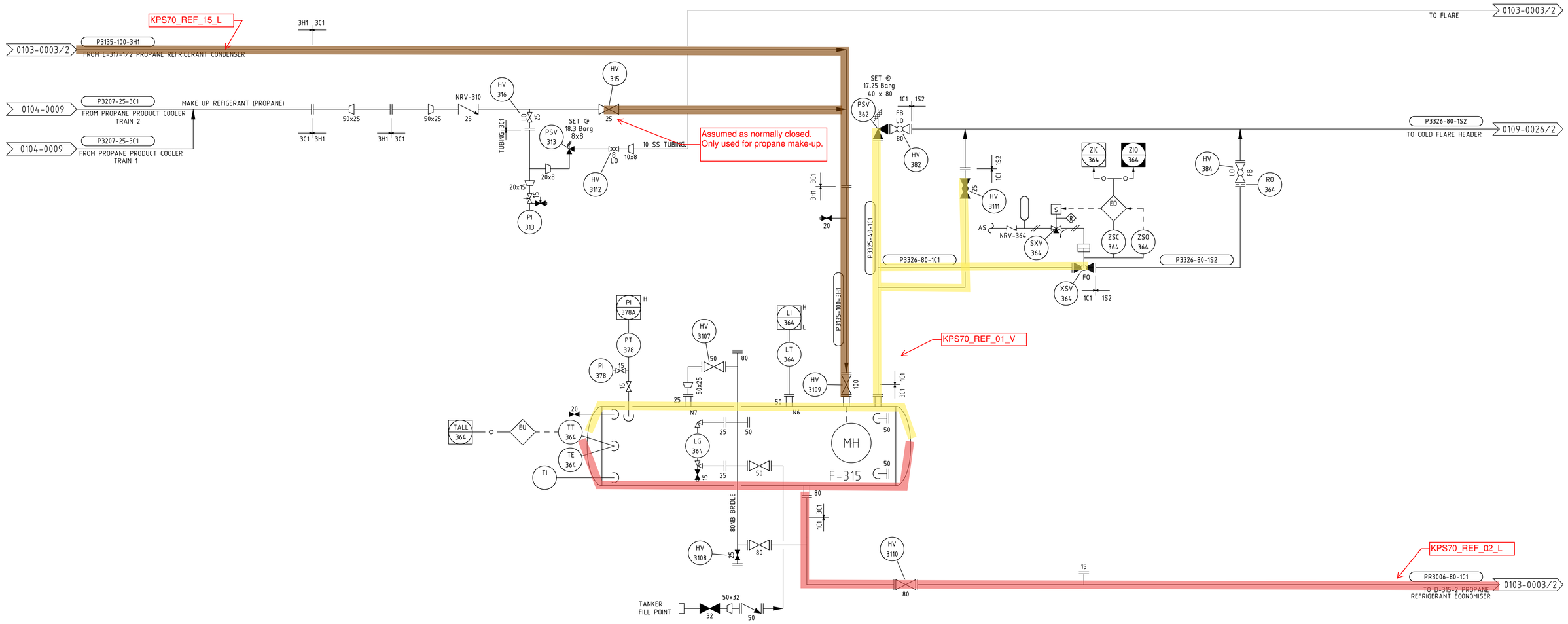
DEHYDRATION AND DEWPOINT CONTROL
PIPING & INSTRUMENT DIAGRAM
GAS CHILLER & SEPARATOR TRAIN 3 (200 TON)
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0102	0006	02 OF 02 SHTS	44

1000000-0102-0006-02.DWG

EQUIPMENT No. F-315

DESCRIPTION PROPANE REFRIGERANT SURGE DRUM
CAPACITY 9.2 m3
MAWP @ TEMP 18.27 Barg @ 93/-29°C



REV	AMENDMENT	BY	CHK	ENG	APP	DATE
18	AS BUILT P84-1525 FILL CONN FOR PROPANE REFRIG SYSTEM	RL	JC	AM	TC	02/2020
17	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	JCC	AM	SES	12/2015
16	AS BUILT FOR P&ID SPLITTING - CONT. DRG. No's REVISED	RL	JCC	AM	SES	01/2015
15	AS-BUILT P84-856 INTERLOCH LOW TEMP PROTECHTION	LN	JC	AM	SES	10/2014
14	AS-BUILT P84-929 PROPANE THERMAL RELIEFS	JB	SH	AM	SES	06/2014

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
13	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	10/2013
12	AS BUILT WS1059590 F-315 LEVEL TRANSMITTER UPGRADE	RL	MD	LH	PJR	07/2007
11	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
10	DESIGN DATA RATIONALISED FOR F-315	CMW	RL	AvG	AIM	08/02
9	REVISED FOR NEW PRINT.DRAWING CONTENT NOT CHANGED	VB	RL	EJH	RS	10/99
8	AS BUILT & SITE CHECKED FOR REFURBISHMENT PROJECT	V.B.	G.R.	K.E.	G.M.	02/98
7	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
6	REVISED FOR CONTINUITY CHECK	P.T.D.	D.G.M.	A.V.G.	C.J.	10/94
5	AS BUILT & UPDATED TO VERSION 11.52	W.D.	J.C.	G.M.	J.R.	3/94
4	REDRAWN ON ACD AS 2 SHEETS	J.C.	M.W.	D.K.M.	J.R.	7/93

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE			DATE
DRN	G.BUTLER	01/03/1974	ENG	E.DRUMMOND	05/05/1974
CHK	J.GARNIE	01/03/1974	APP	P.DOKTER	05/05/1974

REFRIGERATION SYSTEM
PIPING & INSTRUMENT DIAGRAM
PROPANE REFRIGERATION SURGE DRUM
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SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0103	0003	01 OF 02 SHTS	18

1000000-0103-0003-01.DWG

EQUIPMENT No.	D-315-2	ED-317-1	ED-317-2	E-317-1A	E-317-1B	E-317-2
DESCRIPTION	PROPANE REFRIGERANT ECONOMISER	PROPANE REFRIGERANT CONDENSER FAN	PROPANE REFRIGERANT CONDENSER FAN	PROPANE REFRIGERANT CONDENSER	PROPANE REFRIGERANT CONDENSER	PROPANE REFRIGERANT CONDENSER
CAPACITY	17.6 m3			X m3	X m3	1.0 m3
MAWP @ TEMP	18.27 Barg @ 149/-29°C			TUBE: 24.13 Barg @ 94°C	TUBE: 17.24 Barg @ 94°C	RECYCLE: 17.2 Barg @ 93°C CONDENSER: 24.13 Barg @ 121°C

KPS70_REF_14_V
0103-0004/2 PR3003-150-1C1 FROM PROPANE REFRIGERATION COMPRESSOR C-330-1/2

KPS70_REF_02_L
0103-0003/1 PR3006-80-1C1 FROM F-315 PROPANE REFRIGERANT SURGE DRUM

KPS70_REF_03_V

KPS70_REF_04_L

0104-0004/1 FROM LIC-404-2

0102-0006/2 FROM PSV-312

0103-0003/1 FROM PSV-313

PR3016-150-1C1 TO COMPRESSOR INTERSTAGE SUCTION HEADER 0103-0004/2

P3324-80-1C1 TO COLD FLARE HEADER 0109-0026/2

P3323-200-1C1 TO COLD FLARE HEADER 0109-0026/2

KPS70_REF_15_L
P3135-100-3H1 TO F-315 PROPANE REFRIGERANT SURGE DRUM 0103-0003/1

PR3011-40-1C1 TO E-420-2 DE-ETHANISER OVERHEAD CONDENSER 0104-0004/1

PR3009-40-1C1 TO E-303-3 GAS CHILLER 0102-0005/2

PR3007-50-1C1 TO E-313-3 GAS CHILLER 0102-0006/2

PR3007-80-1C1

TO FLARE 0109-0026/2

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
19	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	JCC	AM	SES	01/2017
18	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	JCC	AM	SES	12/2015
17	AS BUILT P84-1220 RE LT-367 & HV NUMBERS ADDED	RL	JCC	AM	SES	08/2015
16	AS BUILT FOR PPIC-387 LOGIC	JCC	RL	AM	SES	01/2015
15	AS BUILT P84-929 PROPANE THERMAL RELIEFS	JB	JC	AM	SES	06/2014
14	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	10/2013
13	CAPACITY OF D-315-2 CHANGED,LINE P3151-150-3H1 ADDED	ES	RL	LH	SES	10/09
12	AS BUILT TV-365, TV-366 AND TV367 DELETED	RL	GS	LH	PJR	02/2007
11	AS BUILT FOR PEP PROJECT	RL	JBH	CP/LH	PJR	02/2004

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
10	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
9	DESIGN DATA RATIONALISED D-315,E-317's,&ED's1&2 ADDED	CMW	RL	AvG	AIM	08/02
8	EQUIPMENT TAGS ON CONDENSERS MODIFIED	VB	RL	EJH	RJW	02/01
7	REVISED FOR NEW PRINT.DRAWING CONTENT NOT CHANGED	VB	RL	EJH	RS	10/99
6	AS BUILT & SITE CHECKED FOR REFURBISHMENT PROJECT	V.B.	G.R.	K.E.	G.M.	02/98
5	AS BUILT COMMENTS ADDED	J.B.H.	R.L.	AvG	A.M.B.	05/12/96
4	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
3	REVISED FOR CONTINUITY CHECK	P.T.D.	O.G.M.	A.V.G.	C.J.	10/94
2	AS BUILT & UPDATED TO VERSION 11.52	W.T.	J.B.E.	G.M.	J.R.	3/94
1	REDRAWN ON CAD AS 2 SHEETS	J.C.	M.W.	D.K.M.	J.R.	7/93

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0082/6

		DATE			DATE
DRN	G.BUTLER	03/03/1974	ENG	E.DRUMMOND	05/05/1974
CHK	J.GARNIE	03/03/1974	APP	P.DOKTER	05/05/1974

REFRIGERATION SYSTEM PIPING & INSTRUMENT DIAGRAM PROPANE REFRIGERATION CONDENSER

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0103	0003	02 OF 02 SHTS	19

1000000-0103-0003-02.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

E-330-1
OIL COOLER
HEAT LOAD 128kW CAPACITY 0.044m3
TUBE: 12 Barg @ 100/-20°C
SHELL: 30 Barg @ 100/-20°C

M-331-1
OIL FILTER
CAPACITY 0.0134m3
MAWP 42 Barg @ 0°C TO 120°C

M-332-1
OIL FILTER
CAPACITY 0.0134m3
MAWP 42 Barg @ 0°C TO 120°C

C-330-1
COMPRESSOR
-34°C 1.21/14.5 Barg CAPACITY 619 kWR SHAFTPOWER 441 kWe
-27.7°C 1.52/14.5 Barg CAPACITY 778 kWR SHAFTPOWER 462 kWe

M-330-1
OIL SEPARATOR
CAPACITY 1.54m3
MAWP 20.68 Barg @ 100-44°C

E-331-1
OIL HEATER
HEAT LOAD 0.6kW

KPS70_REF_03_V
KPS70_REF_11_V
KPS70_REF_14_V

0103-0004/2 FROM D-315-2 ECONOMISER SUCTION HEADER
PR3016-150-1C1
PR3017-100-1C1
0103-0005 FROM M-333 PROPANE COMPRESSOR SUCTION SCRUBBER
PR3013-250-1C2
PR3013-200-1C2
TO C-330-2 PROPANE REFRIGERATION COMPRESSOR SUCTION
PR3014-200-1C2
SUCTION
TUBING
ECONOMISER SUCTION
0103-0005/1 FROM PIC-305
LOAD
UNLOAD
LOCAL/REMOTE
START
STOP
XY-330-1
FILTER
C-330-1
M-330-1
INSUL LIMIT
HEAT TRACING
E-331-1
NRV-308
20 TUBING
TO M-333 PROPANE COMPRESSOR SUCTION SCRUBBER
SET @ 17.25 Barg 50 x 80
PROPANE DISCHARGE
PR3001-100-1C1
TO PROPANE REFRIGERATION COMPRESSOR DISCHARGE HEADER
XY-324-1
RELIEF HEADER
P3320-80-1C1
0109-0026/2
TO COLD FLARE HEADER
SET @ 17.25 Barg 15 x 25
SAMPLE
15mm TUBING
40x25
80x40
M-331-1
M-332-1
SET @ 17.25 Barg 15 x 25
SEAL VENT
TUBING 1C1
NOTE:
1. BLEED VALVE USED TO MANUALLY OPEN TCV-326-1 DURING BACKFLUSH OF E-330-1
E-330-1
COOLING WATER SUPPLY
COOLING WATER RETURN
CW3001-80-1C1
CW3003-80-1C1
TCV 326-1
NOTE 1
TO GRADE
SKID LIMITS
0109-0009/1 FROM COOLING WATER SUPPLY HEADER
CW3000-100-1C1
TO E-330-2 PROPANE COMPRESSOR LUBE OIL COOLER
0103-0004/2 FROM E-330-2 PROPANE COMPRESSOR LUBE OIL COOLER
CW3005-100-1C1
TO COOLING WATER RETURN HEADER
0109-0009/1

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
17	20NB VENT ADDED TO LINE P3320-80-1C1	RL	JCC	AM	TC	07/2019
16	AS BUILT XT-001 REMOVED & VENT ADDED TO LINE P3320-80-1C1	RL	JCC	AM	TC	07/2019
15	AS BUILT P84-1242 PROPANE REFRIG. IMPROVEMENTS	PM	JT	AM	SES	10/15
14	NRV No's ADDED & HAND VALVE No's ADDED FOR ISOLATIONS	RL	JC	AM	SES	05/2015
13	AS BUILT P84-1091 ENHANCED LPG RECOVERY	JT	JC	AM	SES	08/2014
12	HAND VALVE NUMBER ADDED FOR ISOLATIONS	RL	CR	AM	SES	03/2014
11	AS BUILT P84-1041 FLARE GAS MEASUREMENT	ES/RL	TC	AM	SES	09/12

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
10	AS BUILT 15NB GATE VALVE ADDED TO TUBING BYPASS	RL	ES	LH	SES	08/2010
9	AS BUILT WS2007279 PROPANE AVOIDABLE LOSSES	RL	MB	LH	SES	02/2010
8	AS BUILT WS1415208 LPG ENHANCEMENTS	AJW	TC	LH	SES	07/2008
7	AS BUILT WS1292113 OIL COOLER BACKFLUSH & WS1281537	ES	GS	LH	SES	02/08
6	AS BUILT WS1266290 C-330-1/2 PRESS. SWITCH TO TRANS	KN	LH	KC	PJR	11/07
5	AS BUILT WS1131635 LT SEP UNDER TEMP PROTECTION	VB	LH	MP	PJR	07/07
4	DESIGN DATA RATIONALISED E-330-1 & M-330-1	CMW	RL	AvG	AIM	08/02
3	HEAT TRACING NOTE ADDED. TSH/L 324-1 NOW TT-324-1	VB	RL	EJH	RJW	02/01
2	REVISED FOR NEW PRINT. DRAWING CONTENT NOT CHANGED	VB	RL	EJH	RS	10/99
1	AS BUILT & SITE CHECKED FOR REFURBISHMENT PROJECT	V.B.	G.R.	K.E.	G.M.	02/98

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
C7182-01 - ABB P&ID
0780-0080-01 LPG CAUSE & EFFECT

		DATE			DATE
DRN	J.WELLS	25/03/1996	ENG	K.EDEN	25/03/1996
CHK	T.LIM	25/03/1996	APP	G.MUIR	25/03/1996

REFRIGERATION SYSTEM
PIPING & INSTRUMENT DIAGRAM
PROPANE COMPRESSOR NO. 1
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0103	0004	01 OF 02 SHTS	17

1000000-0103-0004-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

E-330-2
OIL COOLER
HEAT LOAD 128kW CAPACITY 0.044m3
TUBE: 12 Barg @ 100/-20°C
SHELL: 30 Barg @ 100/-20°C

M-331-2
OIL FILTER
CAPACITY 0.0134m3
MAWP 42 Barg @ 0°C TO 120°C

M-332-2
OIL FILTER
CAPACITY 0.0134m3
MAWP 42 Barg @ 0°C TO 120°C

C-330-2
COMPRESSOR
-34°C 1.21/14.5 Barg CAPACITY 619 kWR SHAFTPOWER 441 kWE
-27.7°C 1.52/14.5 Barg CAPACITY 778 kWR SHAFTPOWER 462 kWe

M-330-2
OIL SEPARATOR
CAPACITY 1.54m3
MAWP 20.68 Barg @ 100/-44°C

E-331-2
OIL HEATER
HEAT LOAD 0.6kW

0103-0004/1 PR3001-100-1C1 FROM C-330-1 PROPANE REFRIGERATION COMPRESSOR DISCHARGE
KPS70_REF_14_V
0103-0003/2 PR3016-150-1C1 FROM D-315-2 ECONOMISER
KPS70_REF_03_V
0103-0004/1 PR3013-250-1C2 FROM M-333 PROPANE COMPRESSOR SUCTION SCRUBBER
KPS70_REF_11_V
0103-0005/1 FROM PIC-305
PR3019-25-1C1 TO M-333 SPARGE
PR3003-150-1C1 TO E-317-1 & 2 PROPANE REFRIGERANT CONDENSER
PR3016-150-1C1 TO C-330-1 PROPANE REFRIGERATION COMPRESSOR
PR3002-100-1C1
0103-0005/1 TO M-333 PROPANE COMPRESSOR SUCTION SCRUBBER
PR3018-100-1C1
PR3015-200-1C2
NOTE 1
SUCTION
ECONOMISER SUCTION
FILTER
NRV-309
20 TUBING
PROPANE DISCHARGE
HEAT TRACING
INSUL LIMIT
RELIEF HEADER
P3321-80-1C1
0109-0026/2 TO COLD FLARE HEADER
SEAL VENT
TUBING
15mm TUBING
SAMPLE
SET @ 17.25 Barg 15 x 25
SET @ 17.25 Barg 50 x 80
SET @ 17.25 Barg 15 x 25
SET @ 17.25 Barg 15 x 25
M-331-2
M-332-2
E-330-2
C-330-2
M-330-2
E-331-2
XY-330-2
XY-324-2
LOAD
UNLOAD
LOCAL/REMOTE
START
STOP
STOP
TUBING
TUBING
SKID LIMITS

NOTES:
1. FOR FUTURE CONNECTION.
2. VOID

NOTES:
1. FOR FUTURE CONNECTION
2. BLEED VALVE USED TO MANUALLY OPEN TCV-326-2 DURING BACKFLUSH OF E-330-2

CW3002-80-1C1 COOLING WATER SUPPLY
CW3004-80-1C1 COOLING WATER RETURN
0103-0004/1 CW3000-100-1C1 FROM COOLING WATER SUPPLY HEADER
CW3005-100-1C1 TO COOLING WATER RETURN HEADER 0103-0004/1
NOTE 1
NOTE 2
TO GRADE

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
15	AS BUILT XT-002 REMOVED AND HV-324-2 WAS CSO	RL	JCC	AM	TC	07/2019
14	AS BUILT P84-1242 PROPANE REFRIG. IMPROVEMENTS	PM	JT	AM	SES	10/15
13	NRV No's & HAND VALVE No's ADDED FOR ISOLATIONS	RL	JC	AM	SES	05/2015
12	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	10/2013
11	AS BUILT P84-1041 FLARE GAS MEASUREMENT	ES/RL	TC	AM	SES	09/12
10	AS BUILT 15NB GATE VALVE ADDED TO TUBING BYPASS	RL	ES	LH	SES	08/2010
9	AS BUILT WS2007279 PROPANE AVOIDABLE LOSSES	RL	MB	LH	SES	02/2010
8	AS BUILT WS14-15208 LPG ENHANCEMENTS	AJW	TC	LH	SES	07/08
7	AS BUILT WS1292113 OIL COOLER BACKFLUSH & WS1281537	ES	GS	LH	SES	02/08
6	AS BUILT WS1266290 C-330-1/2 PRESS. SWITCH TO TRANS	KN	LH	KC	PJR	11/07
5	AS BUILT WS1131635 LT SEP UNDER TEMP PROTECTION	VB	LH	MP	PJR	07/07
4	DESIGN DATA RATIONALISED FOR E-330-2 & M-330-2	CMW	RL	AvG	AIM	08/02
3	HEAT TRACING NOTE ADDED. TSH/L 324-2 NOW TT-324-2	VB	RL	EJH	RJW	02/01
2	REVISED FOR NEW PRINT. DRAWING CONTENT NOT CHANGED	VB	RL	EJH	RS	10/99
1	AS BUILT & SITE CHECKED FOR REFURBISHMENT PROJECT	V.B.	G.R.	K.E.	G.M.	02/98

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
C7182-01 - ABB P&ID
0780-0080-01 LPG CAUSE & EFFECT

		DATE			DATE
DRN	J.WELLS	25/03/1996	ENG	K.EDEN	25/03/1996
CHK	T.LIM	25/03/1996	APP	G.MUIR	25/03/1996

REFRIGERATION SYSTEM
PIPING & INSTRUMENT DIAGRAM
PROPANE COMPRESSOR NO. 2
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SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0103	0004	02 OF 02 SHTS	15

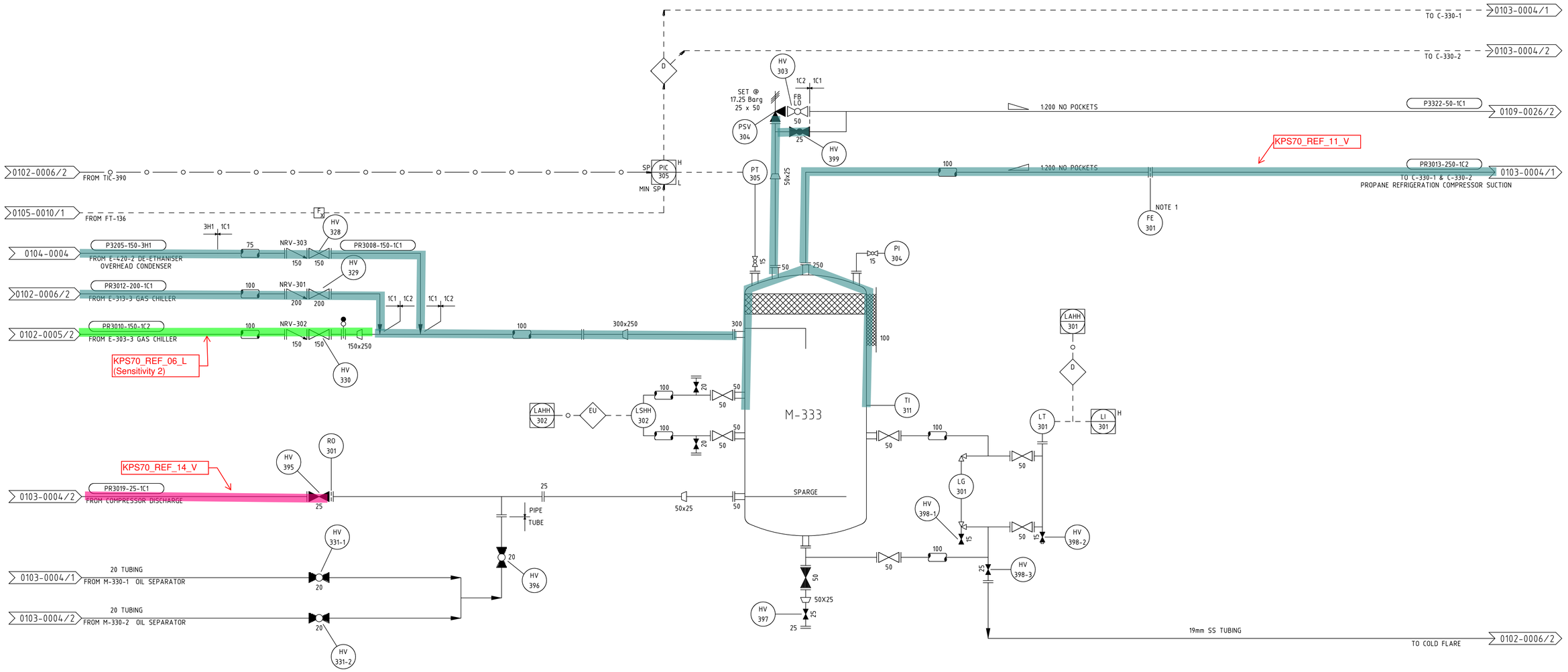
1000000-0103-0004-02.DWG

EQUIPMENT No.

DESCRIPTION
CAPACITY
MAWP @ TEMP

M-333

PROPANE COMPRESSOR SUCTION SCRUBBER
1090 Ø x 2150
MAWP 17.25BarG @ +60°C TO -44°C



NOTES:
1. FLOW ELEMENT REPLACED WITH A FULL BORE ORIFICE.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
13	AS BUILT P84-1342 IMPROVE PROPANE SUCT. SCRUBBER DRAIN	RL	JCC	AM	TC	11/2016
12	AS BUILT M-333 LEVEL HIGH HIGH	JCC	RL/AC	AM	SES	06/2016
11	AS BUILT P84-1242 PROPANE REFRIG. IMPROVEMENTS	PM	JT	AM	SES	10/2015

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
10	LEVEL BRIDLE LT-301, NRV, HV NUMBERS ADDED	JCC	RL/CB	AM	SES	04/2015
9	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	10/2013
8	M-333 LEVEL BRIDLE AND DRAIN AS BUILT	RL	MB	LH	SES	02/2011
7	AS BUILT WS955915 PERMANENT DRAIN FROM M-333	RL	MB	LH	SES	03/2010
6	AS BUILT WS2007279 PROPANE AVOIDABLE LOSSES	RL	MB	LH	SES	02/2010
5	AS BUILT REDUCER CHANGED	ES	RL	LH	SES	10/09
4	AS BUILT WS1131635 LT SEP UNDER TEMP PROTECTION	VB	LH	MP	PJR	07/07
3	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
2	MANHOLE ON M-333 REMOVED	VB	RL	EJH	RS	10/99
1	AS BUILT FOR REFURBISHMENT PROJECT	V.B.	G.R.	K.E.	G.M.	02/98

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE			DATE
DRN	J.WELLS	27/03/1996	ENG	K.EDEN	26/03/1996
CHK	T.LIM	26/03/1996	APP		26/03/1996

REFRIGERATION SYSTEM
PIPING & INSTRUMENT DIAGRAM
PROPANE COMPRESSOR SEPARATORS
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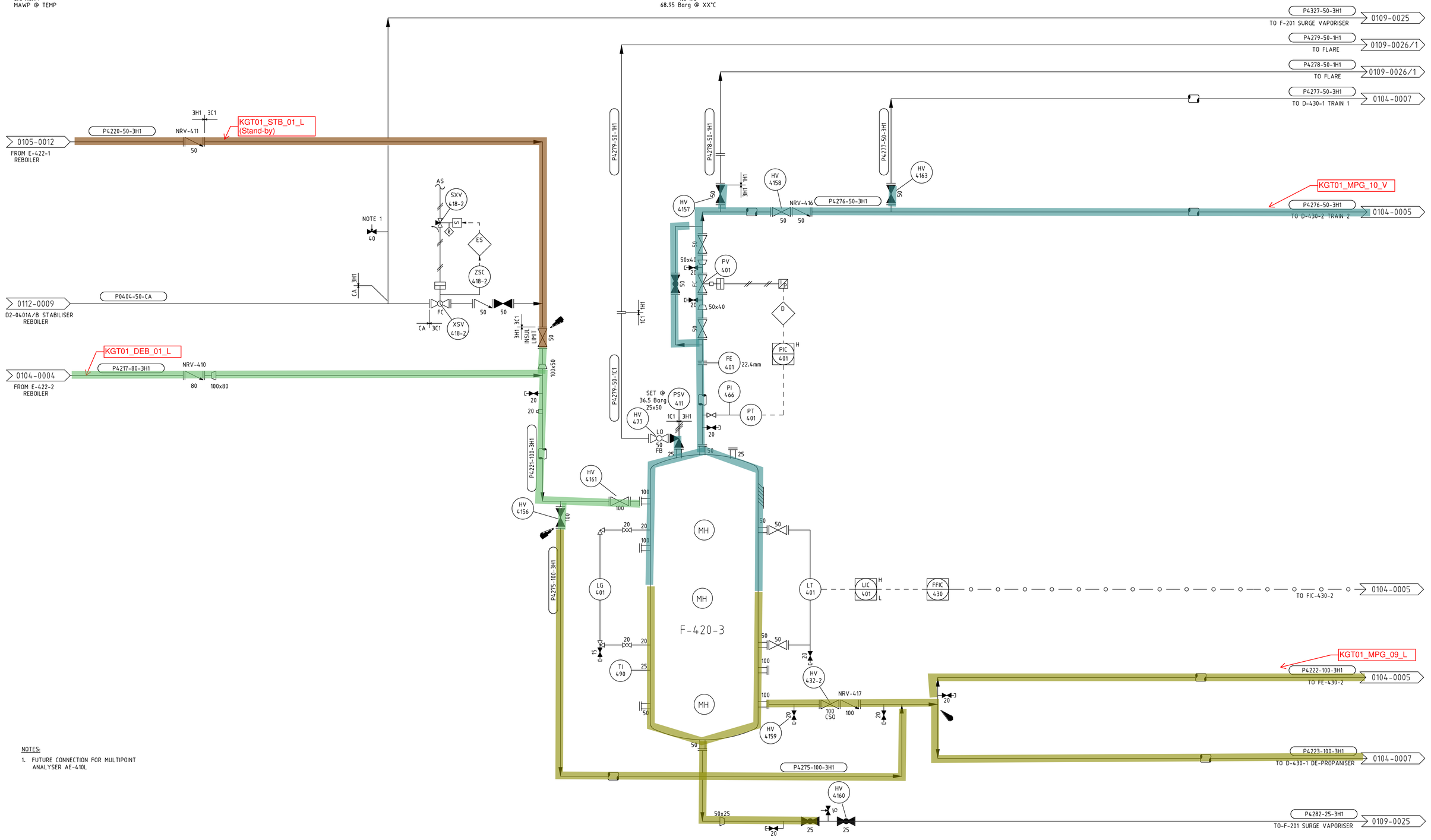
SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0103	0005	01 OF 01 SHTS	13

1000000-0103-0005-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

F-420-3
DE-PROPANISERS FEED SURGE DRUM
1.5 m3
68.95 Barg @ XX°C



NOTES:

1. FUTURE CONNECTION FOR MULTIPOINT ANALYSER AE-410L

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
6	AS BUILT P84-1438 LPG HAZOP COMMENTS	RL	JCC	AM	TC	11/2019
5	AS BUILT CSO REMOVED FROM VALVE XSV-418-2	RL	JCC	AM	TC	07/2019
4	AS BUILT P84-1142 DEPROPANISER TRIPS	JCC	RL/AB	AM	SES	07/2016
3	HAND VALVE No's ADDED FOR ISOLATIONS	RL	JCC	AM	SES	10/2015
2	HAND VALVE No's ADDED FOR ISOLATIONS. NRV No's ADDED	RL	JC	AM	SES	03/2015
1	P&ID SPLIT PROJECT. CONTENTS MOVED FROM 0104-0005/01	RL	JC	AM	SES	12/2014

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
0780-0082/06 EDP CAUSE AND EFFECTS
0780-0080 CAUSE AND EFFECTS

		DATE			DATE
DRN	R LOCHHEAD	01/12/2014	ENG	A MANN	01/12/2014
CHK	J CERDA	01/12/2014	APP	S SMITH	01/12/2014

LPG PRODUCTION FACILITY
PIPING & INSTRUMENT DIAGRAM
DE-PROPANISER FEED SURGE DRUM
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0104	0003	01 OF 01 SHTS	6

1000000-0104-0003-01.DWG

EQUIPMENT No.	D-420-2	E-422-2	E-420-2	F-420-2	G-420-1	G-420-2	F-421-1	F-421-2	H-401
DESCRIPTION	DE-ETHANISER	DE-ETHANISER REBOILER	DE-ETHANISER OVERHEAD CONDENSER	DE-ETHANISER REFLUX DRUM	DE-ETHANISER REFLUX PUMP	DE-ETHANISER REFLUX PUMP	BUFFER POT	BUFFER POT	WEATHERING POT
CAPACITY	33.5m3	1.5m3	2.0m3	1.36m3	7.8m3/hr	7.8m3/hr	69 Barg @ 50/18°C	69 Barg @ 50/18°C	CAPACITY 0.11m3
MAWP @ TEMP	36.56 Barg @ 149/0°C	TUBE 34.5 Barg @ 343°C SHELL 36.55 Barg @ 149/-10°C	TUBE 36.55 Barg @ 38/-12°C SHELL 20.7 Barg @ 66/-24°C	36.5 Barg @ 38/-10°C	34.8 Barg @ -12.2°C	34.8 Barg @ -12.2°C			20.17 Barg @ 65/-30°C

KGT55_MOH_02_L
KPS70_REF_04_L
KGT01_PGS_10_V (Sensitivity 2)
KGT01_PGS_01_V
KGT01_DET_01_V
KPS70_REF_07_L
KPS70_REF_11_V
KGT01_PGS_10_V (Sensitivity 2)
KGT01_PGS_04_V
KGT01_DEX_01_L
KGT01_DEB_01_L
KGT01_MPG_07_L

0109-0036 — 15mm TUBING FROM METHANOL METERING PUMPS G-309-1/2 AND G-319-1/2
0103-0003/2 — PR3011-40-1C1 — FROM D-315-2 PROPANE REFRIGERANT ECONOMISER
0105-0012 — TO HS-414-2
0105-0012 — FROM HS-414-2
0102-0005/3 — VAPOUR FROM HT SEPARATOR M-307
0102-0005/2 — SHUTS FV-380-2 ON LOW HTS TEMP FROM TAL-380
0102-0005/3 — SIGNAL FROM LIC-380
0102-0005/3 — FROM FIC-380
0109-0023/1 — STEAM
0104-0012/1 — TO TIC-470
0104-0012/1 — FROM E-420-3 DE-ETHANIZER FEED PRE-HEATER
P4340-80-1S2 — TO FLARE SYSTEM — 0109-0026/2
0103-0003/2 — TO PPIC-387 ON D-315-2
P3205-150-3H1 — TO M-333 PROPANE COMPRESSOR SUCTION SCRUBBER — 0103-0005/1
P4395-80-6C1 — TO M-421 SUCTION SCRUBBER — 0105-0012
P4339-50-1S2 — TO FLARE SYSTEM — 0109-0026/2
0105-0014 — PT-407-2
0105-0014 — RSP
P4224-80-3H1 — TO M-422 SUCTION SCRUBBER — 0105-0014
P4341-25-1S2 — TO COLD FLARE HEADER — 0109-0026/2
P4362-50-1S2 — TO COLD FLARE HEADER — 0109-0026/2
P4217-80-3H1 — TO F-420-3 DE-PROPANISER FEED SURGE DRUM — 0104-0003
P4218-50-3H1 — TO F-201 SURGE VAPOURISER — 0109-0025
P4219-50-3H1 — TO F-201 SURGE VAPOURISER — 0109-0025
P4355-50-1C1 — TO FLARE SYSTEM — 0104-0012/1
P4354-25-1C1 — TO FLARE SYSTEM — 0104-0012/1
MPC9201-50-1H1 — TO F-945 CONDENSATE TANK — 0109-0024/1
12mm S/S TUBING — TO SURGE VAPOURISER — 0104-0005

Assumed as Normally Closed
Assumed as stand-by
Assumed as Normally Closed

NOTES:
1. FOR SAMPLING DETAILS REFER P&ID 0101-0013/01
2. FAIL TO PREHEATER BYPASS.
3. ALL SAMPLING BOXES (TYPES 1, 2 & 3) IN LPG PRODUCTION FACILITIES ARE TO BE INSTALLED AS PER VENDORS REQUIREMENTS.
4. VOID
5. VOID
6. ROTAMETER.
7. VOID
8. SEE P&ID 0105-0013/2 FOR MASS SPEC ANALYSER DETAIL

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
53	AS BUILT P84-1399 DE-ETH, DE-PROP DEWATERING	RL	JC/CC	AM	MM	05/2018
52	AS BUILT RE P84-1399, LOCKED VALVES & XT-003 DELETED	RL	NM	AM	SES	05/2017
51	HAND VALVE No's ADDED FOR ISOLATIONS	RL	JCC	AM	SES	01/2017
50	P&ID SPLIT MOVED TO 0104-0012/1, HV & NRV NUMBERS ADDED	JCC	RL/NM	AM	SES	01/2016
49	AS BUILT P84-1089 NATURAL GASOLINE & COALESCER SAMPLE POINTS	CJ	JT	AM	SES	10/2015
48	AS BUILT P84-1242 PROPANE REFRIG. IMPROVEMENTS	CJ	JT	AM	SES	10/2015
47	AS BUILT P84-1143 DE-ETHANISER OH CONDENSER LOW TEMP, ETC.	WPG	SHA	AM	SES	08/2015
46	AS BUILT P84-1219 F-201 OVERPRESSURE	LN	CJ	AM	SES	06/2015
45	CONTIN. DRG. No's REVISED FOR P&ID SPLITTING PROJECT &	RL	JCC	AM	SES	12/2014
	AS BUILT FOR PPIC-387 LOGIC					
44	HAND VALVE No's REVISED FOR "-2 ETC" WHERE APPLICABLE	RL	JCC	AM	SES	09/2014
43	HAND VALVE No's ADDED FOR ISOLATIONS & AS BUILT MODS	RL	JCC	AM	SES	09/2014
42	AS BUILT P84-3257 200T INLET BACK PRESSURE CONTROL	LN	JC	AM	SES	05/2014
41	AS BUILT P84-1131 HTS VAPOUR RECYCLE 3 TRAIN OP	ES/RL	AAB	AM	SES	10/12
40	AS BUILT P84-1041 FLARE GAS MEASUREMENT	ES/RL	TC	AM	SES	09/12
39	PARTIAL AS BUILT P84-1102 REPLACE LV 404-2	LN	GH	WB	SH	02/2012
54	AS BUILT P84-1438 LPG HAZOP COMMENTS	RL	JCC	AM	TC	11/2019

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD — ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0080/01, 02, 03

		DATE			DATE
DRN	P.RAWLES	01/04/1987	ENG	R.VanLIJF	
CHK	R.VanLIJF		APP	R.VanLIJF	02/07/1987

LPG PRODUCTION FACILITY
PIPING & INSTRUMENT DIAGRAM
DE-ETHANISER
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0104	0004	01 OF 01 SHTS	54

1000000-0104-0004-01.dwg

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

D-430-2	E-430-2	E-430-2A	E-430-2B	E-432-2	G-430-3	G-430-4	F-430-2
DE-PROPANISER	DE-PROPANISER CONDENSER	DE-PROPANISER CONDENSER FAN	DE-PROPANISER CONDENSER FAN	DE-PROPANISER REBOILER	DE-PROPANISER REFLUX PUMP	DE-PROPANISER REFLUX PUMP	DE-PROPANISER REFLUX DRUM
20.9 m3	0.57 m3			1.5 m3	23 m3/hr	23 m3/hr	3.95 m3
20 Barg @ 149/-29°C	24.14 Barg @ 93/-4°C			TUBE: 34.5 Barg @ 343/XX°C SHELL: 24.13 Barg @ 149/-10°C	20 Barg @ 49°C	20 Barg @ 49°C	24.13 Barg @ 79/-10°C

NOTES:

1. ONE VARIABLE AND ONE FIXED PITCH BLADE FAN.
2. AUTOMATIC RECIRCULATION VALVE.
3. PIPING SPOOL FOR COMMISSIONING STRAINER.
4. PV-411-2A IS TO HAVE A MINIMUM STOP AT 10% OPENING.
5. DISCHARGE ORIFICE SUPPLIED BY PUMP VENDOR.
6. VOID.
7. SEE P&ID 0105-0013/2 FOR MASS SPECTROMETER ANALYSER DETAIL.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
29	AS BUILT P84-1101 TEMP INDIC FLAME LINE EXIT LPG	ES/RL	AAB	LH	SES	08/10
28	AS BUILT WITH COMMENTS FROM LINE LIST	RL	ES	LH	SES	08/10
27	AS BUILT PER INCIDENT No. 510811	ES	AAB	LH	SES	05/10
26	AS BUILT P84-3007 ESD LEVEL TRANS DEVIATION ALARMS	ES	AW	LH	SES	03/10
43	HAND VALVE No's ADDED FOR ISOLATIONS & GEN AS BUILDS	RL	JCC	AM	TC	01/2020
42	AS BUILT P84-1438 LPG HAZOP COMMENTS ETC.	RL	JCC	AM	TC	11/2019
41	VALVES ADDED TO LEVEL BRIDLE ON D-430-2	RL	JCC	AM	TC	07/2019
40	HV-4340-2 ADDED FOR ISOLATIONS	RL	JCC	AM	TC	08/2018

REV	REV	AMENDMENT	BY	CHK	ENG	APP	DATE
39	AS BUILT P84-1399 DE-ETH, DE-PROP DEWATERING	RL	JC/CC	AM	MM	05/2018
38	AS BUILT P84-3399, HV-433-2 CONFIG & VENT ADDED P4351	RL	JCC	AM	SES	05/2017
37	AS BUILT SCR-631 DE-BUTANISER TRIPS	JCC	RL/AB	AC	SES	07/2016
36	AS BUILT - P84-1148 ADDED PT-410-2	JCC	RL/AB	AM	SES	01/2016
35	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	JC	AM	SES	11/2015
34	AS BUILT P84-1089 NATURAL GASOLINE & COALESCER SAMPLE POINTS	CJ	JT	AM	SES	10/2015
33	P84-844 LPG SAMPLE POINTS CONNECTED TO FLARE AS BUILT	CJ	JT	AM	SES	08/2015
32	LT-413-2, LT-412-2, LT-408-2 BRIDLE, NRV, HV NUMBERS ADDED	JCC	RL/CB	AM	SES	04/2015
31	P&ID SPLIT INTO 3 DRGS IE. 0104-0003/01, 0005/01 & 0009/01	RL	JC	AM	SES	12/2014
30	AS BUILT WS2029090 DE PROP STEAM LINE REPAIR. MPC9202	RL/ES	RM	LH	SES	11/2010

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
0780-0082/06 EDP CAUSE AND EFFECTS
0780-0080/01, 02 & 03 CAUSE AND EFFECTS
0780-0149 CAUSE AND EFFECTS

		DATE			DATE
DRN	P.RAWLES	01/05/1987	ENG	R.VanLIJF	
CHK	R.VanLIJF		APP	R.VanLIJF	02/07/1987

LPG PRODUCTION FACILITY
PIPING & INSTRUMENT DIAGRAM
DE-PROPANISER TRAIN 2

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0104	0005	01 OF 01 SHTS	43

1000000-0104-0005-01.dwg

EQUIPMENT No.	D-440-2	E-440-2	E-440-2A	E-440-2B	F-440-2	G-440-3	G-440-4	E-442-2
DESCRIPTION	DE-BUTANISER	DE-BUTANISER CONDENSER	DE-BUTANISER CONDENSER FAN	DE-BUTANISER CONDENSER FAN	DE-BUTANISER REFLUX DRUM	DE-BUTANISER REFLUX PUMP	DE-BUTANISER REFLUX PUMP	DE-BUTANISER REBOILER
CAPACITY	9.89m3	0.25m3			1.7m3	16.3m3/hr	16.3m3/hr	1.2m3
MAWP @ TEMP	17.23 Barg @ 177/-10°C	17.24 Barg @ 93/-4°C			17.2 Barg @ 79/-10°C	15.6 Barg @ 50°C	15.6 Barg @ 50°C	TUBE 34.5 Barg @ 343/XX°C SHELL 17.25 Barg @ 177/-10°C

KGT01_DBX_01_L (Sensitivity 2)

0104-0008 — P4037-40-3H1 — BUTANE PRODUCT FROM G-440-1&2 REFLUX PUMP

0104-0033 — FROM PSV-4032

0104-0010 — P4342-25-1C1 — FROM PSV-555

0104-0008 — P4032-50-3H1 — FROM D-440-1 DE-BUTANISER — NOTE 5

NOTES

1. VOID.
2. E-440-2B IS A VARIABLE PITCH BLADE FAN AND E-440-2A IS A FIXED PITCH BLADE FAN.
3. AUTOMATIC RECIRCULATION VALVE.
4. PIPING SPOOL FOR COMMISSIONING STRAINER.
5. LINES P4032-50-3H1 AND P4304-80-3H1 REDRAWN TO SHOW CONNECTION UPSTREAM
6. PV-420-2A IS TO HAVE A MINIMUM STOP AT 10% OPENING.
7. PUMP DISCHARGE ORIFICE SUPPLIED BY VENDOR.
8. SEE P&ID 0105-0013/2 FOR MASS SPEC ANALYSER DETAIL

KGT01_DBT_11_V

0109-0040 — P4392-40-3C1 — FROM COGEN SPILLBACK G-441

KGT01_DBX_11_L

KGT01_DPB_01_L (Sensitivity 2)

0104-0007 — P4029-50-3C1 — FROM E-432-1 REBOILER

KGT01_DPB_11_L

0104-0005 — P4242-150-3H1 — FROM E-432-2 REBOILER

KGT01_NGL_01_L

0104-0005 — FROM FIC-410-2

0104-0007 — FROM FIC-425-1

0109-0023/1 — MPS9203-50-1H1 — STEAM

KGT41_PC4_04_L

Confirmed by operation 60/40 Blending is mothballed.

Butane ratio control decommissioned

0109-0026/2 — P4334-150-1C1 — TO FLARE

0109-0025 — P4304-50-3C1 — TO F-201 SURGE VAPORISER

0104-0010 — 50-75% — TO PLC LOGIC

0109-0025 — P4264-50-3H1 — TO F-201 SUIRGE VAPORISER

0104-0026 — P4014-50-3CA — BUTANE TO E-450 60/40 BLENDING

0104-0010 — TO 60/40 BLENDING

0104-0033 — P4004-80-3CA — BUTANE PRODUCT TO F-4001 OR F-4002 STORAGE VESSEL

0109-0040 — P4391-50-3C1 — TO BUTANE INJECTION PUMP G-441

0109-0024/1 — MPC9203-25-1H1 — F-945 CONDENSATE TANK

0109-0025 — P4303-50-3H1 — TO F-201 SURGE VAPOURIZER

0104-0012 — P4261-50-3H1 — NATURAL GASOLINE TO E-420-3 DE-ETHANISER FEED PRE-HEATER

0109-0026/1 — P4312-10-TUBING — TO FLARE

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
24	AS BUILT MSCR 317 - LOW FLOW ALARM ADDED TO FIC-420-2	RL/ES	AL	AM	SES	02/2013
23	AS BUILT P84-3025 LPG ESD LOGIC. PSV-4054 WAS 18.86 BARG.	RL/ES	RM	LH	SES	09/2010
22	AS BUILT PER INCIDENT No. 510811	ES	AAB	LH	SES	05/10
21	AS BUILT P84-3007 ESD LEVEL TRANS DEVIATION ALARMS	ES	AW	LH	SES	03/10
20	AS BUILT WS2006869 LPG COLUMN CONTROL STRATEGY	ES	AAB	LH	SES	02/09
19	AS BUILT FLANGED VALVES SHOWN CORRECTLY	ES	RL	LH	SES	12/08
35	HAND VALVE No's ADDED FOR ISOLATIONS & GEN AS BUILDS	RL	JCC	AM	TC	01/2020
34	AS BUILT P84-1438 LPG HAZOP COMMENTS	RL	JCC	AM	TC	11/2019
33	AS BUILT- VARIABLE PITCH FAN CHANGED FROM E-440-2A TO 2B	RL	JCC	AM	TC	07/2019
32	AS BUILT - P84-1310 NAT. GASOLINE & VARIABLE PITCH FAN	JCC	RL	AM	SES	10/2017
31	AS BUILT - SCR 767, SCR 631 DEBUTANISER TRIPS	JCC	RL/AB	AM	TC	11/2016
30	AS BUILT P84-1310 NATURAL GASOLINE TEMPORARY STORAGE	RL	JC/JS	AM	TC	09/2016
29	AS BUILT P84-1281 DEBUTANISER 2 STEAM TRAP REPLACEMENT	RL	JCC	AM	SES	09/2016
28	AS BUILT P84-1354. TUBING GASOLINE FROM DEBUT 2 TO SV	RL	JC/CR	AM	SES	09/2016
27	HAND VALVE AND NRV No's ADDED FOR ISOLATIONS & REGISTERS	RL	JC	AM	SES	11/2015
26	P84-844 LPG SAMPLE POINTS CONNECTED TO FLARE AS BUILT	CJ	JT	AM	SES	08/2015
25	CONTIN. DRG. No's REVISED FOR P&ID SPLITTING PROJECT	RL	JCC	AM	SES	12/2014

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD — ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0080/01, 02

		DATE			DATE
DRN	P.RAWLES	01/05/1987	ENG	R.Van LIJF	
CHK	R.Van LIJF		APP	R.Van LIJF	02/07/1987

LPG PRODUCTION FACILITY
PIPING & INSTRUMENT DIAGRAM
DE-BUTANISER TRAIN 2
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SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0104	0006	01 OF 01 SHTS	35

1000000-0104-0006-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

D-430-1
DE-PROPANISER
14.3m3
24.13 Barg @ 149/-29°C

E-432-1
DE-PROPANISER REBOILER
1.5m3
TUBES: 34.47 Barg @ 343/-29°C
SHELL: 24.13 Barg @ 148/-29°C

E-430-1
DE-PROPANISER CONDENSER
Xm3
24.13 @ 121/0°C

E-430-1A
DE-PROPANISER CONDENSER FAN

E-430-1B
DE-PROPANISER CONDENSER FAN

F-430-1
DE-PROPANISER REFLUX DRUM
1.8m3
24.13 Barg @ 121/-29°C

G-430-1
DE-PROPANISER REFLUX PUMP
27.3m3/hr
21 Barg @ 49°C

G-430-2
DE-PROPANISER REFLUX PUMP
27.3m3/hr
21 Barg @ 49°C

NOTES:
1. REFLUX DRUM MANHOLE COVER TO BE MODIFIED TO ACC A NEW 80mm OUTLET SPOOL TO CATER FOR PSV.
2. AUTOMATIC RECIRCULATION VALVE.
3. PUMPS G-430-1&2 ARE TO BE REPLACED AND THE SUCTION LINE SIZE TO BE INCREASED TO 100.
4. PIPING SPOOL FOR COMMISSIONING STRAINER.
5. DE-PROPANISER CONDENSER FANS (E-430-1A/1B) SERVICE DE-PROPANISER CONDENSER (E-430-1) AND GASOLINE COOLER (E-460).
6. PV-411-1A IS TO HAVE A MINIMUM STOP AT 10% OPENING.
7. DISCHARGE ORIFICE SUPPLIED BY PUMP VENDOR.
8. SEE P&ID 0105-0013/2 FOR MASS SPEC ANALYSER DETAIL

KGT01_DPT_01_V (Sensitivity 2)
KGT01_DPX_01_L (Sensitivity 2)
KGT01_PC3_01_L (Sensitivity 2)
KGT01_MPG_09_L
KGT01_DPB_01_L (Sensitivity 2)
(Downstream of FV 430-1 inlet to D-430-1) This section is included in MPG_09_L (Base Case).
From NC valve
Unit Trip (ED)

0104-0008 FROM AP-410J
0104-0003 FROM F-420-3 DE-PROPANISERS FEED SURGE DRUM
0104-0005 FROM FFIC-430 RATIO CONTROLLER
0104-0003 FROM F-420-3 FEED SURGE DRUM
0109-0023/1 STEAM

P4016-150-3H1
P4044-65-1H1
P4314-10-TUBING
P4025-50-3H1
P4311-8-TUBING
P4017-50-3H1
P4018-80-3H1
P4346-80-3C1
P4370-50-3C1
P4369-50-3C1
P4367-80-3C1
P4365-100-3C1
P4366-100-3C1
P4277-50-3H1
P4368-80-3C1
P4022-50-3H1
P4028-150-3H1
P4027-100-3H1
P4223-100-3H1
MPS9028-50-1H1
MPS9028-50-3H1
P4338-150-1C1
P4347-150-1C1
P4360-20-1C1
P4054-50-3H1
P4026-50-3H1
P4029-50-3C1
P4052-50-3H1
MPC9011-25-3H1
MPC9011-25-1H1

0109-0026/2 TO FLARE
0104-0010 15-40% AVAILABLE PROPANE TO 60/40 BLENDING
0104-0009 50-100% TO LV-414-1
0109-0025 TO F-201 SURGE VAPORIZER
0104-0010 AI-410H-C4 TO 60/40/BLENDING
0104-0009 TO E-4001-1 PROPANE GAS COOLER
0104-0008 LOGIC FOR TIC-416-1
0104-0006 LOGIC FOR TIC-416-2
0104-0008 TO D-440-1 DE-BUTANISER
0104-0006 TO D-440-2 DEBUTANISER
0109-0025 TO F-201 SURGE VAPORIZER
0109-0024/1 CONDENSATE TANK TO F-945

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
26	P84-844 LPG SAMPLE POINTS CONNECTED TO FLARE AS BUILT	CJ	JT	AM	SES	08/2015
25	P&ID SPLITTING. E-4001-1 MOVED TO DRG. No. 0104-0009/01	RL	JCC	AM	SES	12/2014
24	AS BUILT PER INCIDENT 510811	ES	AAB	LH	SES	05/10
23	AS BUILT P84-3007 ESD LEVEL TRANS DEVIATION ALARMS	ES	TC	LH	SES	03/10
22	AS BUILT WS2006869 'LPG COLUMN CONTROL STRATEGY	ES	AAB	LH	SES	02/09
21	AS BUILT WS1042819-BENFIELD SYSTEM HAZARD REPORT	ES	CP	LH	PJR	01/07
20	PAH-411-1 ADDED AND CAUSE & EFFECTS DRG NUMBER	RL	CP	LH	PJR	11/2006
19	ISOLATION VALVE FROM SHELLSIDE E-4001-1 REMOVED	RL	ES	LH	PJR	05/2006
18	TAGS REPLACED WITH HS-430-1A/1B	JM	WN	LH	PJR	01/06/05
17	VIBRATION SWITCHES ADDED TO E-430-1. AS BUILT	JBH	RL	LH	PJR	11/06/03
16	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CW	AIM	10/02
15	AS BUILT FOR WS133241 EDP COMM & DESIGN DATA ADDED	CMW	RL	AvG	AIM	08/02
14	PSV-430-1 MODIFIED. FLANGES ADDED TO P3207	VB	RL	EJH	RJW	02/01
13	REDUCER ON P4044 CORRECTED	VB	RL	EJH	RS	10/99
30	HAND VALVE No's ADDED FOR ISOLATIONS & GEN AS BUILDS	RL	JCC	AM	TC	01/2020
29	SCR-631 DE- BUT TRIPS & LINE MPS9028 SPEC CHANGE	RL	JCC	AM	SES	01/2017
28	AS BUILT - P84-1148 ADDED PT-410-1	JCC	RL/AB	AM	SES	01/2016
27	HV AND NRV NUMBERS ADDED FOR ISOLATIONS	RL	JCC	AM	SES	10/2015

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0080/01, 02, 03
CAUSE & EFFECTS - 0780-0082/06
CAUSE & EFFECTS - 0780-0149

		DATE			DATE
DRN	P.RAWLES	02/07/1987	ENG	R.VanLIJF	
CHK	R.VanLIJF		APP	R.VaNLIJF	02/07/1987

LPG PRODUCTION FACILITY
PIPING & INSTRUMENT DIAGRAM
DE-PROPANISER TRAIN 1
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0104	0007	01 OF 01 SHTS	30

1000000-0104-0007-01.dwg

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

D-440-1
DE-BUTANISER
5.6m3
17.24 Barg @ 177/-10°C

E-442-1
DE-BUTANISER REBOILER
1.1m3
TUBES: 10.34 Barg @ 177/-10°C
SHELL: 17.24 Barg @ 177/-10°C

E-440-1
DE-BUTANISER CONDENSER
0.33m3
17.24 Barg @ 65/0°C

E-440-1A
DE-BUTANISER CONDERSER FAN

F-440-1
DE-BUTANISER REFLUX DRUM
0.4m3
17.24 Barg @ 177/-29°C

G-440-1
DE-BUTANISER REFLUX PUMP
16.3m3/hr @ 15.8 Barg

G-440-2
DE-BUTANISER REFLUX PUMP
16.3m3/hr @ 15.8 Barg

Butane ratio control decommissioned

KGT01_DBT_01_V (Sensitivity 2)

KGT01_DBX_01_L (Sensitivity 2)

KGT01_DPB_11_L

KGT01_DBB_01_L (Sensitivity 2)

KGT01_DPB_01_L (Sensitivity 2)

60/40 Blending is mothballed. KGT01_PC4_12_L Sensitivity 2

Butane ratio control decommissioned

KGT01_NGL_01_L

to NC valve

NOTES

1. AUTOMATIC RECIRCULATION VALVE.
2. PIPING SPOOL FOR COMMISSIONING STRAINER.
3. PV-420-1A IS TO HAVE A MINIMUM STOP AT 10% OPENING.
4. SEE P&ID 0105-0013 FOR MASS SPEC ANALYSER DETAILS.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
20	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	10/2013
19	AS BUILT MSCR 317 - LOW FLOW ALARM ADDED TO FIC-420-1	RL/ES	AL	AM	SES	02/2013
18	AS BUILT PER INCIDENT No. 510811	ES	AAB	LH	SES	05/10
17	AS BUILT P84-3007 ESD LEVEL TRANS DEVIATION ALARMS	ES	TC	LH	SES	03/10
16	AS BUILT VALVES TO F-440-1 & WS1476991 STEAM TRAP	RL	SR	LH	SES	05/2009
15	AS BUILT WS2006869 LPG COLUMN CONTROL STRATEGY	ES	AAB	LH	SES	02/09
14	AS BUILT WS 1042819-BENFIELD SYSTEM HAZARD REPORT	ES	CP	LH	PJR	01/07
13	PAH-420-1 ADDED AND CAUSE & EFFECTS DRAWING No.	RL	CP	LH	PJR	11/2006
12	TAGS REPLACED WITH HS-E440-1A	JM	WN	LH	PJR	01/06/5
11	VIBRATION SWITCH ADDED TO E-440-1A	JBH	RL	LH	PJR	11/06/03

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
10	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
26	AS BUILT HP VENT ADDED TO P4309 & LINE No. P4096 ADDED	RL	JCC	AM	TC	07/2019
25	SCR-631 DE-BUTANIZER TRIPS	JCC	RL/AB	AM	SES	08/2016
24	CONTINUATION FROM P&ID SPLITTING 0104-0004	JCC	RL	AM	SES	06/2016
23	AS BUILT P84-871 BUTANE INJECTION PUMP DEMO	JCC	RL/CB	AM	TC	11/2015
22	P84-844 LPG SAMPLE POINTS CONNECTED TO FLARE AS BUILT	CJ	JT	AM	SES	08/2015
21	P&ID SPLIT. DRG. No. WAS 0104-0007/02 & PART OF	RL	JCC	AM	SES	12/2014
	DRAWING RELOCATED TO 0104-0009					

VECTOR KAPUNI LIMITED
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NEW PLYMOUTH 4342
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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0080/01, 02
CAUSE & EFFECTS - 0780-0082/06
CAUSE & EFFECTS - 0780-0149

		DATE			DATE
DRN	P.RAWLES	03/07/1987	ENG	R.VanLIJF	
CHK	R.VanLIJF		APP	R.VanLIJF	

LPG PRODUCTION FACILITY
PIPING & INSTRUMENT DIAGRAM
DE-BUTANISER TRAIN 1
DRAWING NUMBER WAS 0104-0007/02

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0104	0008	01 OF 01 SHTS	26

1000000-0104-0008-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

E-4001-1
PROPANE PRODUCT COOLER
0.3m3
TUBE: 18.67 Barg @ 65°C
SHELL:28.0 Barg @ 90°C

E-4001-2
PROPANE PRODUCT COOLER
0.34m3
TUBE: 18.67 Barg @ 65°C
SHELL:28.0 Barg @ 90°C

KGT01_PC3_13_L
Sensitivity 2
60/40 blending is mothballed.

KGT01_PC3_01_L
(Sensitivity 2)

KGT01_PC3_02_L

KGT37_PC3_05_L

KGT01_PC3_13_L
Sensitivity 2
60/40 blending is mothballed.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
3	AS BUILT HV-459-1 WAS LC, LO ADDED TO HV-4186-1 AND 2	RL	JCC	AM	TC	07/2019
2	NRV AND HV NUMBERS ADDED FOR ISOLATIONS	RL	JCC	AM	SES	10/2015
1	P&ID SPLIT. CONTENTS MOVED FROM 0104-0005/01, 0007/01 & 02	RL	JC	AM	SES	12/2014

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
0780-0082/06 EDP CAUSE AND EFFECTS
0780-0080 CAUSE AND EFFECTS
0780-0149 CAUSE AND EFFECTS

LPG PRODUCTION FACILITY
PIPING & INSTRUMENT DIAGRAM
PROPANE PRODUCT COOLERS TRAIN 1 AND 2
.

		DATE			DATE
DRN	R LOCHHEAD	01/12/2014	ENG	A MANN	01/12/2014
CHK	J CERDA	01/12/2014	APP	S SMITH	01/12/2014

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0104	0009	01 OF 01 SHTS	3

1000000-0104-0009-01.DWG

EQUIPMENT No. M-430

DESCRIPTION 60/40 CONDENSING TANK
CAPACITY 0.1 m3
MAWP @ TEMP 24.13 Barg @ X°C

AVAILABLE BUTANE 0104-0008
AVAILABLE BUTANE 0104-0006
AVAILABLE PROPANE 0104-0007
AVAILABLE BUTANE 0104-0005
AI-410J-C4 0104-0008
AI-410E-C4 0104-0006
A1-410H-C4 0104-0007
AI-410L-C4 0104-0005
HV-402 0104-0026
HV-401 0104-0026

NOTES
1. TRUSEAL TYPE VALVE WITH INTERGRAL BLEED.
2. SIGNAL DUPLICATED TO STOS
3. PCV-432 IS A FISHER 'EZR' BACK PRESSURE CONTROL VALVE
4. FY-430 & FY-431 HAVE SEVERAL SUB TAG's WITH UNIQUE SUFFIX's

PSV 555 SET @ 24.10 Barg 20 x 25
P4342-25-1C1
0104-0006
0104-0026 FIC-436 CASC SP
TO STOS
0104-0026 FIC-435 CASC SP
ZIC 434, ES, SXV 434, ZSC 434, AS, EFV, PI 432, FC, XSV 434
PSV 434 SET @ 24.13 Barg 15 x 10, ATMOS
HV 4149, LO, 20x10, 10 TUBE (TYP)
P4108-50-3C1
NOTE 3, PCV 432
SS TUBING
FIC 430, DIC 430
PI 435, PI 436
HV 4150, HV 4151, NOTE 1
P4022-50-3C1
FY 430, FI 430, DI 430, TI 430, NOTE 4, NOTE 2
FYI 430, FT 430, FE 430, TT 430, TE 430, PI 430
FY 431, FYI 431, FT 431, FE 431, TT 431, TE 431, TI 431, PI 431
SET @ 24.13 Barg 15 x 10, PSV 449, ATMOS.
SET @ 24.13 Barg 40 x 40, PSV 453
SET @ 24.13 Barg 10 x 10, PSV 430
SET @ 24.13 Barg 10 x 10, PSV 431
HV 4152
From NC valve
P4022-40-3H1
0104-0009 PROPANE PRODUCT FROM E-4001-1 COOLER
From NC valve
P4237-50-3H1
0104-0009 PROPANE PRODUCT FROM E-4002-2 COOLER
P40147-50-3CA
0104-0026 60/40 PRODUCT FROM BLENDING STATION
KGT01_LPG_04_L Sensitivity 2
M-430
CORIOLIS
PI 460-1, SAMPLE
INDEPENDANT TEST CONNECTIONS FOR LPG HOSES
P4150-20-1C1

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
32	P&ID SPLITTING PROJECT. DRG No. WAS 0104-0008/01	RL	JCC	AM	SES	12/2014
31	P84-165 AS BUILT FLOW COMPUTER ADDITION	ARJ	RL	AM	SES	12/2013
30	AS BUILT REVERSE CHK VLV'S RE WITH TRU SEAL VLV'S	RL/ES	CR	LH	SES	10/2010
29	AS BUILT 50 VALVE D/STREAM OF FE-431 WAS CLOSED	RL/ES	CB	LH	SES	10/2010
28	AS BUILT FOR INCIDENT No. 510811	ES	AAB	LH	SES	04/10
27	8mm BLEED VALVES FOR TRUESEAL VALVES WERE CLOSED	RL	JIY	LH	SES	02/2010
26	AS BUILT WS1216971 SPEC BLIND SHIFTED AT LPG METER	RL	MS	LH	PJR	01/2007
25	TUBING ASSOCIATED WITH TRUSEAL VALVES AS BUILT	RL	ES	LH	PJR	11/2006
24	AS BUILT	ES	WN	LH	PJR	10/06
23	AS BUILT - WS177367 STOS BACK PRESSURE VALVE	PL	RL	LH	AIM	01/03
22	DESIGN DATA RATIONALISED M-430	JBH	RL	AvG	AIM	08/02
21	AS BUILT-DECOMMISSION OF BULLETS PROJECT WS104846	VB	RL	EJH	RJW	02/01
20	P4094 REROUTED TO F-431-2, P4323 TERMINATED	VB	RL	EJH	RW	12/00
19	AS BUILT F-431-1 REMOVED	VB	RL	EJH	RJW	10/00
18	P4216, P4095 REMOVED, BLINDS & PSV-433 ADDED	VB	RL	EJH	RS	10/99
17	SAMPLE POINTS ADDED	VB	RL	EJH	RS	10/98
33	HV HAND VALVE NUMBERS ADDED TO LOCKED VALVES	RL	JCC	AM	TC	07/2019

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0149/01

		DATE			DATE
DRN	P.RAWLES	02/07/1987	ENG	R.VanLIJF	02/07/1987
CHK	R.VanLIJF	02/07/1987	APP	R.VanLIJF	02/07/1987

LPG PRODUCTION FACILITY
PIPING & INSTRUMENT DIAGRAM
60/40 STORAGE
DRAWING NUMBER WAS 0104-0008/01

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0104	0010	01 OF 01 SHTS	33

1000000-0104-0010-01.dwg

E-420-3
DE-ETHANISER FEED PRE-HEATER
0.1m3
TUBE 58.6 Barg @ 66°C
SHELL 17.25 Barg @ 177°C

E-460
GASOLINE COOLER
1302 kg/hr
17.24 Barg @ 163/0°C

0104-0004 FROM PSV-418-2
P4355-50-1C1
0104-0004 FROM PSV-480
P4354-25-1C1
HV 497 LO 150 FB
SLOPE
P4336-150-1C1 TO FLARE SYSTEM 0109-0026/2
P4041-50-3H1
P4265-50-3H1
20
P4320-50-3H1
0104-0008 E-442-1 NATURAL GASOLINE FROM DE-BUTANISER RE-BOILER
50 NRV-449
P4261-50-3H1
0104-0006 E-442-2 NATURAL GASOLINE FROM DE-BUTANISER RE-BOILER
50 NRV-432
KGT01_NGL_01_L
HV 479
HV 478
50x25
NOTE 5
TV 470
P4383-25-3C1
25
0104-0004 FROM TT-470
TIC 470
HV 470
100x50
HV 494
TI 479
PI 462
15
PI 480
P4384-25-3C1
P4336-150-1C1
SET @ 17.2 Barg 25 x 50
PSV 481
E-420-3
PSE 484
SET @ 17.3 Barg 150 x 150
RO 481
HV 4050
HV 4051
P4387-25-3C1
PI 464
TI 481
P4268-80-6H1
P4005-80-6H1
0102-0005/3 M-307 LIQUIDS FROM HT SEPARATOR
KGT01_MPG_07_L
HV 495
TI 480
PI 463
KGT01_NGL_02_L
HV 496
HV 403
P4266-50-3H1
P4266-50-3C1
PI 419
PAHH 419
PT 419
TZ 417
TIC 417
NOTE 4
E-460
NOTE 1
HV 4052
FQI 434-A
TI 439
DI 439
FQI 439
TT 434
TE 434
TI 434
PI 434-A
PDI 434
FE 434
FT 434
FE 439
FIT 439
SP-060
SAMPLE 6
P4042-50-3H1
6H1 | 6C1
NOTE 6
P4207-80-6H1 TO D-420-2 DE-ETHANISER 0104-0004
NOTE 2
40
P4042-40-3H1
P4030-40-3H1 TO F-201 SURGE VAPOURISER 0109-0025
P4388-50-1C1
PSV 435 SET @ 24.1 Barg 20 x 6
P4389-25-1C1
HV 422
P4388-50-1C1 TO FLARE SYSTEM 0109-0026/1
ZIC 416
ZIO 416
PSV 420 SET @ 17.2 Barg 20 x 25
P9035-25-1C1 0109-0026/1
SXV 416-B
SXV 416
ZSC 416
ZSO 416
XSV 416
PCV 434 SET @ 3 Barg
PI 434-B
HV 4053
MALE
KGT32_NGL_05_L
P4267-50-3H1
STOS NATURAL GASOLINE TO STOS
KGTP STOS
HV 4055
HV 4185
SXV 481-1B
SXV 481-1A
ZSO 481-1
ZSC 481-1
XSV 481-1
ZIO 481-1
ZIC 481-1
SAMPLE AP 418 NATURAL GASOLINE
NC
10mm SS TUBING
HV 4284
P4011-40-3C1
0104-0033 NATURAL GASOLINE TO STORAGE
KGT33_NGL_06_L
HS 416
XA 416
AP 416 SAMPLE
8 SS TUBING
0104-0005

NOTES:
1. DE-PROPANISER CONDENSER FANS (E-430-1A/2B) SERVICE DE-PROPANISER CONDENSER (E-430-1) AND GASOLINE COOLER (E-460)
2. NON-RETURN VALVE TO BE LOCATED IN HORIZONTAL POSITION.
3. ALL SAMPLING BOXES (TYPES 1, 2 & 3) IN LPG PRODUCTION FACILITIES ARE TO BE INSTALLED AS PER VENDORS REQUIREMENTS.
4. LOUVERS MANUALLY OPEN 100%. TIC-417 ABANDONED IN SITU.
5. TV-470 FAIL OPEN TO BYPASS.
6. SECTION OF LINE P4207-80-6H1 REPLACED WITH SPEC 6C1 SCH80, WS2360013.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
5	AS BUILT P84-1438 LPG HAZOP COMMENTS, P84-1451 LO VALVE WS2360013 PIPE REPLACED FOR CUI &SCR995 NAT GAS LINE OUT	RL	JCC	AM	TC	11/2019
4	AS BUILT P84-1310B NATURAL GASOLINE TEMP STORAGE.	RL	JC/JS	AM	SES	05/2018
3	AS BUILT - P84-1310 PERMANENT NATURAL GASOLINE STORAGE	JT	DV	AM	SES	09/2017
2	AS BUILT P84-1310 NATURAL GASOLINE TEMP STORAGE	RL	JC/JS	AM	TC	10/2016
1	P&ID SPLIT CONTENTS FROM 0104-0004/1	JCC	RL/NM	AM	SES	01/2016

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0080/01, 02, 03
0780-0149/01

		DATE			DATE
DRN	P.RAWLES	01/04/1987	ENG	R.VanLIJF	01/04/1987
CHK	R.VanLIJF	01/04/1987	APP	R.VanLIJF	02/07/1987

LPG PRODUCTION FACILITY
PIPING & INSTRUMENT DIAGRAM
GASOLINE METERING
P&ID SPLIT FROM 0104-0004-01

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0104	0012	01 OF 01 SHTS	5

1000000-0104-0012-01.dwg

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

E-450
BUTANE COOLER
70kW
SHELL 14.0 Barg @ 85°C
TUBE 25.0Barg @ 100°C
SURFACE AREA 4.35m2
VOLUME SHELL 0.16m3, TUBE 0.03m3

F-450
FLARE K/O POT

SET @ 14 Barg 40 x 50 — PSV 446 — HV 4140 — HV 4141 — TW 499 — TO GRADE

FIC-430 0104-0010/1

CW40151-50-1CA 0109-0009/1
COOLING WATER RETURN
F-901-1, 2, 3 COOLING TOWERS

P40148-50-1CA 0109-0026/1
BUTANE TO FLARE LINE
No. P9201-150-1H1

PSV 443 — SET @ 25 Barg 25 x 50

P40148-50-1CA

HV 4144 — TI 497 — HV 4145 — PSV 444 — SET @ 31 Barg 15 x 10 — TO ATMOS.

FE 436 — FT 436 — PI 446 — NOTE 1

HS 435 — INST.AIR SUPPLY — SFV 436 — S — HS 436 — FUSIBLE LINK — FY 436 — FCV 436 — FC

F-450 — 1210mm

PSV 447 — SET @ 31 Barg 15 x 10 — TO ATMOS.

P40146-25-3CA — P40147-50-3CA 0104-0010
60/40 PRODUCT TO METERING

KGT01_LPG_04_L
Sensitivity 2

Confirmed with operation, 60/40 LPG facilities mothballed. Sensitivity 2

E-450

DRAIN — HV 4143 — DRAIN — HV 4142

TW 496 — HV 4147 — HV 4146

SET @ 31 Barg 15 x 10 — PSV 445 — 10 TUBING (TYP.) — TO ATMOS.

PIPING INST. — PI 441

600mm

HV-102 0104-0010

AP 410M SAMPLE — SP 001

10x8 — P4313-10-TUBING — TO FLARE 0109-0026/01

MASS SPEC STREAM 25 NOTE 3 — AI 410M

HV-101 0104-0010

CW40150-50-1CA 0109-0009/1
COOLING WATER SUPPLY FROM T-901-1,2&3 COOLING TOWERS

60/40 Blending is mothballed. KGT01_PC4_12_L Sensitivity 2

PSV 422-1 — SET @ 31 Barg 15 x 10 — TO ATMOS. — HV 4032-1 — HV 102 — ZS 402-1 — HCV 402

P40141-50-3CA 0104-0008
BUTANE FROM G-440-1&2 REFLUX PUMPS

PSV 422-2 — SET @ 31 Barg 15 x 10 — TO ATMOS. — HV 4032-2 — ZS 402-2

P40145-50-3CA

P40143-50-3CA 0104-0006
BUTANE FROM G-440-3&4 REFLUX PUMPS

PSV 412-1 — SET @ 31 Barg 15 x 10 — TO ATMOS. — HV 4033-1 — HV 101 — ZS 401-1 — HCV 401

P40140-50-3CA 0104-0009
PROPANE FROM E-4001-1 COOLER

PSV 412-2 — SET @ 31 Barg 15 x 10 — TO ATMOS. — HV 4033-2 — ZS 401-2

P40142-50-3CA 0104-0009
PROPANE FROM E-4001-2 COOLER

PSV 441 — SET @ 31 Barg 15 x 10 — TO ATMOS. — HV 4034

PSV 442 — SET @ 31 Barg 15 x 10 — TO ATMOS. — HV 4015

FE 435 — FT 435 — PI 445 — NOTE 1 — DRAIN

INST.AIR SUPPLY — SFV 435 — HS 435 — S — FUSIBLE LINK — FC — FY 435 — FCV 435

P40144-25-3CA

KGT01_PC3_13_L
Sensitivity 2

NOTES
1) MINIMUM METER RUN OF 25 DIAS. UPSTREAM AND 5 DIAS. DOWNSTREAM
3) SEE P&ID 0105-0013/2 FOR MASS SPEC ANALYSER DETAIL.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
16	HV HAND VALVE NUMBERS ADDED TO LOCKED VALVES	RL	JCC	AM	TC	07/2019
15	P84-844 LPG SAMPLE POINTS CONNECTED TO FLARE AS BUILT	CJ	JT	AM	SES	08/2015
14	REVISED FOR P&ID SPLITTING. CONT. DRG. No's REVISED	RL	JCC	AM	SES	01/2015
13	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	11/2014
12	AS BUILT PO-KGP-10-KCOM-002 PSV-446 WAS 19 BARG. P84-3023	RL	CR	LH	SES	02/2011
11	AS BUILT FOR INCIDENT No. 510811	ES	AAB	LH	SES	04/10
10	AS BUILT WS1404955-LPG RELIEF VALVE ISOLATION	ES	TL	LH	SES	07/08
9	AS BUILT WS1042819-BENFIELD SYSTEM HAZARD REPORT	ES	CP	LH	PJR	03/07
8	AS BUILT TO WS1121373 PSV-443 BYPASS MODIFICATIONS	PJ	LH	MP	SR	01/07
7	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
6	E-450 SHELL & TUBE DESIGN DATA ADDED	JBH	RL	AvG	AIM	08/02
5	CONTINUATION OF P40147 MODIFIED	VB	RL	EJH	RJW	02/01
4	PROCESS CONDITIONS REVISED	RL	JBH	EJH	RS	10/98
3	AS BUILT FOR REFURBISHMENT PROJECT	J.W.	G.R.	K.E.	G.M.	02/98
2	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
1	REVISED FOR CONTINUITY CHECK	P.T.D.	O.G.M.	A.V.G.	C.J.	10/94
B	NGC REVISED COMMENTS ADDED.	V.B.	M.W.	G.M.	J.R.	7/94
A	REDRAWN ON AUTOPLANT	J.B.C.	V.B.	G.M.	J.R.	4/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE		DATE
DRN	N.B.	18/08/1992	ENG	
CHK			APP	

LPG LOADING FACILITY
PIPING & INSTRUMENT DIAGRAM
60/40 BLENDING
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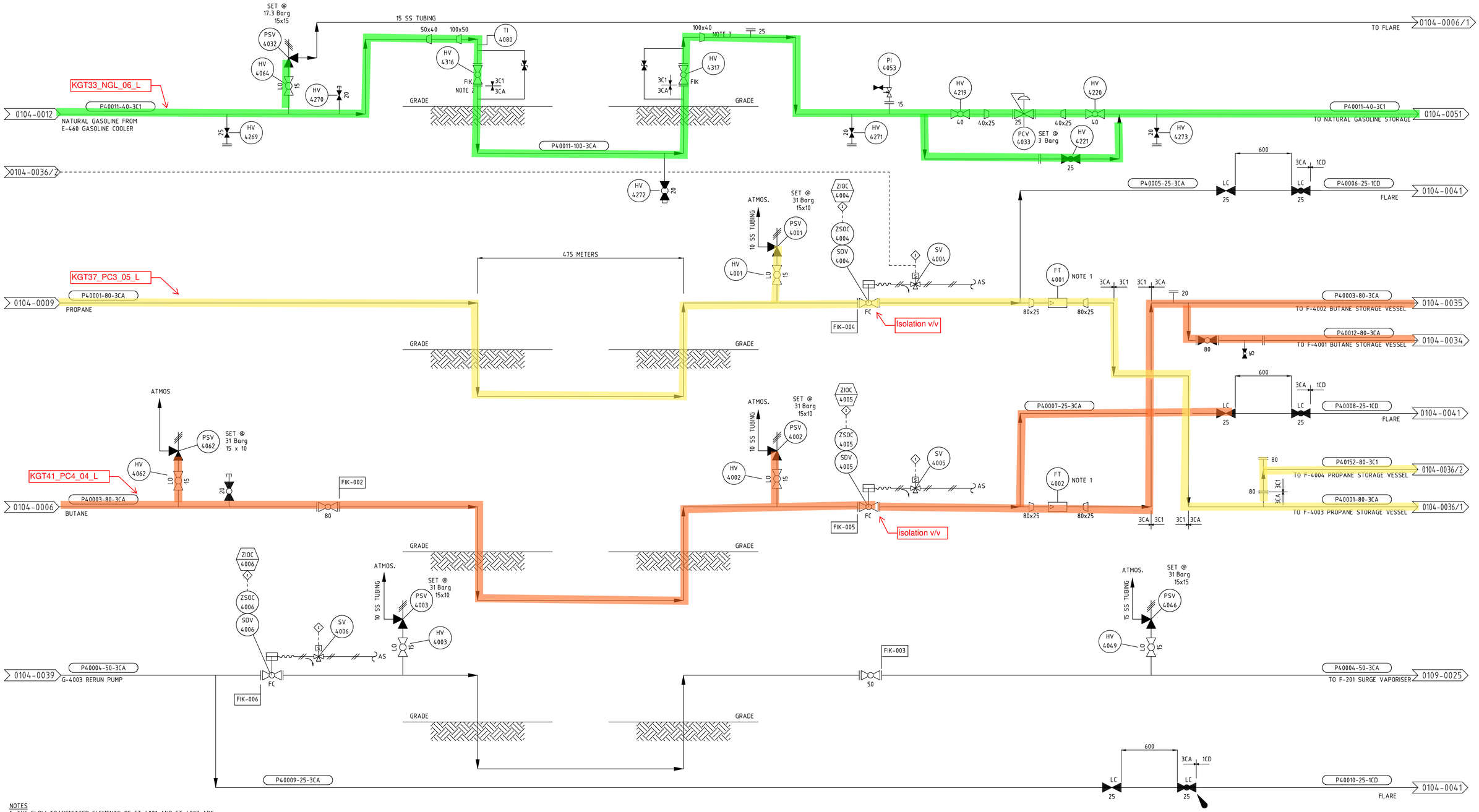
SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0104	0026	01 OF 01 SHTS	16

1000000-0104-0026-01.DWG



NOTES
1. THE FLOW TRANSMITTER ELEMENTS OF FT-4001 AND FT-4002 ARE DECOMMISSIONED, BUT WITH THE BODY LEFT IN SITU AS A SPOOL PIECE.
2. P40011-100-3CA HAS BEEN DE-RATED TO 17.3 BARG DESIGN PRESSURE.
3. P40011-100-3C1 FROM UNDERGROUND TO F-4033 LIMITED BY PRESSURE RATING OF PCV-4033.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
11	HV HAND VALVE NUMBERS ADDED TO LOCKED VALVES	RL	JCC	AM	TC	07/2019
10	AS BUILT - P84-1310 PERMANENT NATURAL GASOLINE STORAGE	JT	DV	AM	SES	09/2017
9	REVISED FOR P&ID SPLITTING. CONT. DRG. No's REVISED	RL	JCC	AM	SES	01/2015
8	NOTE 1 ADDED REGARDING FT-4001 & FT-4002	RL/ES	CB	AM	SES	04/2013
7	AS BUILT P84-3025 LPG ESD LOGIC. PSV-4062 WAS 18.86 BARG.	RL/ES	RM	LH	SES	09/2010
6	PSV-4062 ADDED & VALVE MOVED TO 0104-0005	ES	RL	LH	SES	12/08
5	AS BUILT WS1404955-LPG RELIEF VALVE ISOLATION	ES	TL	LH	SES	07/08
4	AS BUILT FOR PEP PROJECT WS822071	RL	RH	LH	GE	05/2004
3	AS BUILT PSV-4046 ADDED TO LINE P40004	JBH	RL	LH	RJW	28/05/01
2	TITLE BLOCK REVISED. DRAWING CONTENT NOT CHANGED	VB	RL	EJH	RS	10/99
1	REDRAWN ON AUTOPLANT, WAS 104-10	D.R.	J.C.	G.M.	C.J.	09/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE			DATE
DRN	J.TERRILL	01/11/1991	ENG	C.SIEDZUIK	01/11/1991
CHK	RDK	01/11/1991	APP	B.NICHOLLS	01/02/1992

LPG LOADING FACILITY
PIPING & INSTRUMENT DIAGRAM
IMPORT / EXPORT PIPE LINES
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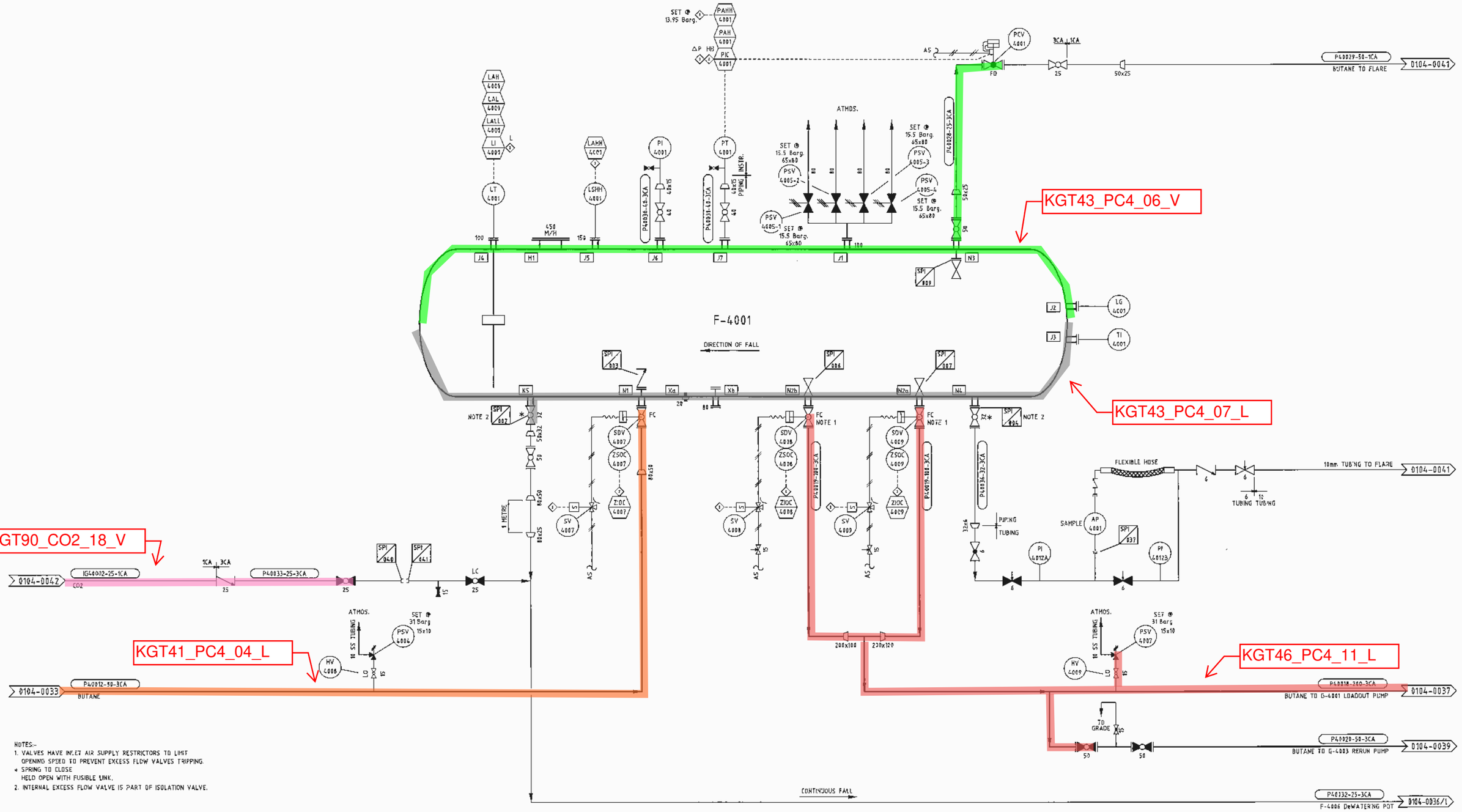
SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
N/A	1000000	0104	0033	01 OF 01 SHTS	11

1000000-0104-0033-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

F-4001
BUTANE STORAGE VESSEL (30 TONNES)
66m3
15.51 Barg @ 45/-10°C



NOTES:-
1. VALVES HAVE INLET AIR SUPPLY RESTRICTORS TO LIMIT OPENING SPEED TO PREVENT EXCESS FLOW VALVES TRIPPING.
* SPRING TO CLOSE HELD OPEN WITH FUSIBLE LINK.
2. INTERNAL EXCESS FLOW VALVE IS PART OF ISOLATION VALVE.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
14	AS BUILT P84-1576 ADD EXCESS FLOW VALVES TO DRAINS	RL	JCC	NA	AM	06/2020
13	HAND VALVE NUMBERS ADDED TO LOCKED VALVES	RL	JCC	AM	TC	07/2019
12	BUILT P84-945 PSV TAIL PIPE REVISED	DL	CJ	AM	SES	12/2012
11	AS BUILT P84-1103 LPG BULLETS ACTUATION L/O VALVES	RL/ES	TC	JS	SES	06/2011
10	AS BUILT WS13742B2, SAP33204A1 LPG SAMPLE POINTS	RL	MS	LH	SES	06/2009
9	AS BUILT WS15121175 PSV TAIL PIPE LENGTHS REDUCED	RL	JS	LH	SES	05/2009
8	AS BUILT WS14041955-LPG RELIEF VALVE ISOLATION	ES	TL	LH	SES	07/08
7	AS BUILT FOR PEP PROJECT WS822471	RL	RH	LH	GE	05/2004
6	RELIEF VALVES ON F-4001 TAGGED. AS BUILT	JBH	RL	LH	AIM	15/04/03
5	DESIGN DATA RATIONALISED FOR F-4011	CHW	RL	AvG	AIM	08/02
4	SAMPLE POINT ADDED & VALVES ADDED TO SV-4008/4009	VB	RL	EJH	JS	10/98
3	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G	C.J.	5/95
2	REDRAWN ON AUTOPLANT, WAS 184-21	D.R.	J.C.	G.M.	C.J.	10/94
REV	AMENDMENT	BY	CHK	ENG	APP	DATE

FILENAME

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE			DATE
DRN	J.TERRILL	01/11/1991	ENG	C.SIEDZUIK	01/11/1991
CHK	RDK	01/11/1991	APP	B.NICHOLLS	01/02/1992

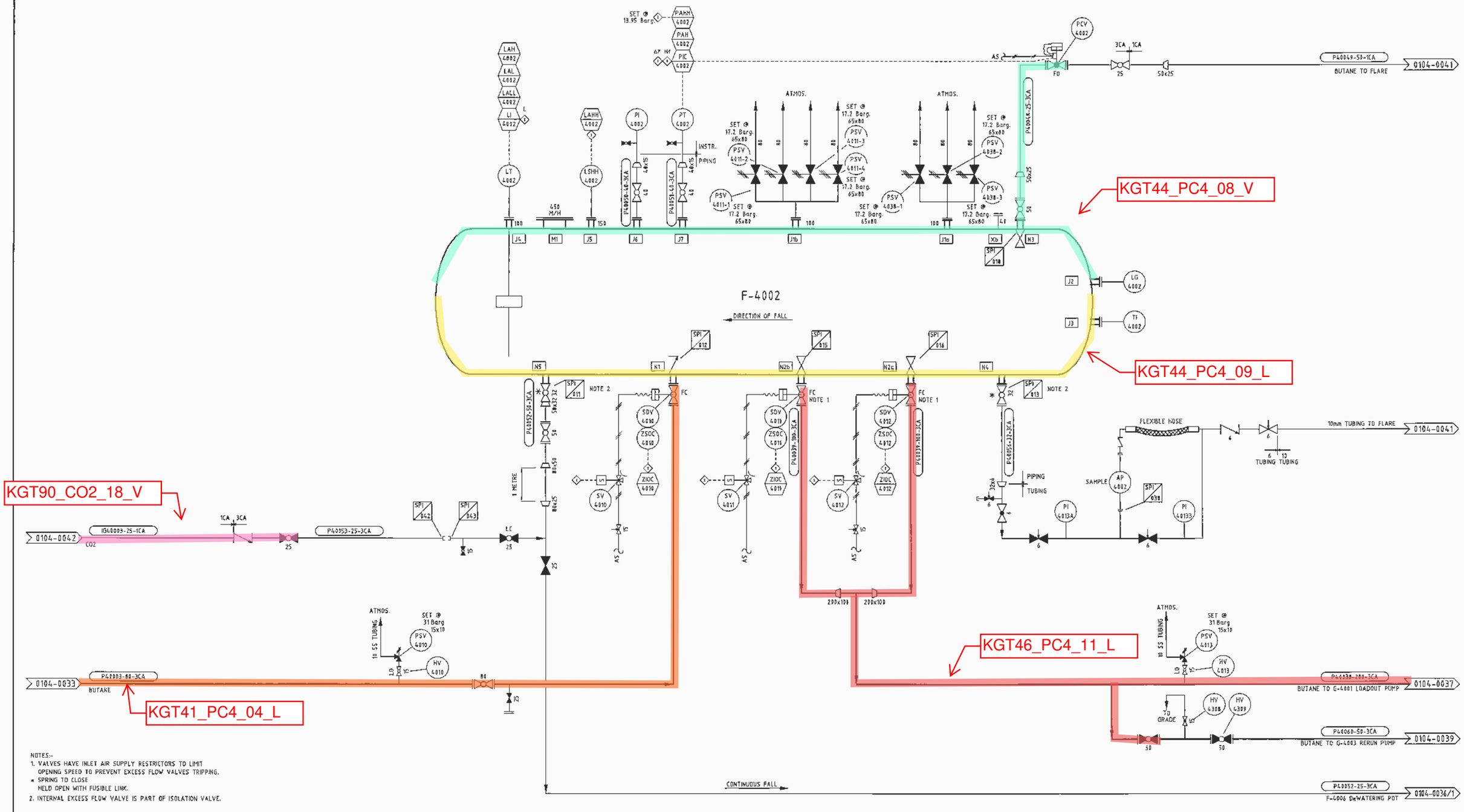
LPG LOADING FACILITY
PIPING & INSTRUMENT DIAGRAM
F-4001 STORAGE VESSEL

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
N/A	1000000	0104	0034	01 OF 01 SHTS	14

1000000-0104-0034-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

F-4002
BUTANE STORAGE VESSEL 150 TONNES)
113m3
17.24 Barg @ 50/0°C



NOTES:-
1. VALVES HAVE INLET AIR SUPPLY RESTRICTORS TO LIMIT OPENING SPEED TO PREVENT EXCESS FLOW VALVES TRIPPING.
* SPRING TO CLOSE
HELD OPEN WITH FUSIBLE LINK.
2. INTERNAL EXCESS FLOW VALVE IS PART OF ISOLATION VALVE.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
15	AS BUILT P&I-1576 ADD EXCESS FLOW VALVES TO DRAINS	RL	JCC	NA	AM	06/2020
14	AS BUILT MODIFICATIONS TO SAMPLE AP-4002 COMPLETED	RL	JCC	AM	TC	07/2019
13	HV No's ADDED FOR ISOLATIONS & LOCKED VALVE REGISTER	RL	JCC	AM	SES	01/2017
12	BUILT P&I-945 PSV TAIL PIPE REVISED	DL	CS	AM	SES	12/2012
11	AS BUILT P&I-1103 LPG BULLETS ACTUATION L/O VALVES	RL/ES	TC	JS	SES	06/2011
10	AS BUILT WS3376282, SAP30206B1 LPG SAMPLE POINTS	RL	MS	LH	SES	06/2009
9	AS BUILT WS3512171 PSV TAIL PIPE LENGTHS REDUCED	RL	JS	LH	SES	05/2009
8	AS BUILT WS1406955-LPG RELIEF VALVE ISOLATION	ES	TL	LH	SES	07/08
7	AS BUILT FOR PEP PROJECT WS822071	RL	RH	LH	GE	05/2004
6	RELIEF VALVES ON F-4002 TAGGED. AS BUILT	JBH	RL	LH	AM	15/04/13
5	DESIGN DATA RATIONALIZED FOR F-4002-PSV-4038 SET PT	CHW	RL	AvG	AM	08/12
4	SAMPLE POINT ADDED & VALVES ADDED TO SV-4010/4012	VB	RL	EJH	RS	10/98
3	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G	C.J.	5/95
2	REDRAWN ON AUTOPLANT. WAS 104-12	D.R.	J.C.	G.M.	C.J.	10/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

Vector

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE			DATE
DRN	J.TERRILL	01/11/1991	ENG	C.SIEDZUIK	01/11/1991
CHK	RDK	01/11/1991	APP	B.NICHOLLS	01/02/1992

LPG LOADING FACILITY
PIPING & INSTRUMENT DIAGRAM
F-4002 STORAGE VESSEL
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SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
N/A	1000000	0104	0035	01 OF 01 SHTS	15

FILENAME
1000000-0104-0035-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

F-4003
PROPANE STORAGE VESSEL (50 TONNES)
113m3
15.51 Barg @ 45/8°C

F-4006
DeWATERING POT
0.34m3
17.24 Barg @ 50/-30°C

NOTES:-
1. VALVES HAVE INLET AIR SUPPLY RESTRICTORS TO LIMIT OPENING SPEED TO PREVENT EXCESS FLOW VALVES TRIPPING.
   * SPRING TO CLOSE
   HELD OPEN WITH FUSIBLE LINK.
2. INTERNAL EXCESS FLOW VALVE IS PART OF ISOLATION VALVE.

KGT39_PC3_07_V

KGT39_PC3_08_L

KGT90_CO2_18_V

KGT37_PC3_05_L

KGT45_PC3_12_L

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
16	AS BUILT P84-1576 ADD EXCESS FLOW VALVES TO DRAINS	RL	JCC	NA	AM	06/2020
15	AS BUILT MODIFICATIONS TO SAMPLE AP-4003 COMPLETED	RL	JCC	AM	TC	07/2019
14	HAND VALVE NUMBERS AND PSV SIZES ADDED	RL	JCC	AM	SES	09/2015
13	AS BUILT P84-945 PSV TAIL PIPE REVISED	DL	CJ	AM	SES	12/2012
12	AS BUILT P84-1103 LPG BULLETS ACTUATION L/D VALVES	RL/ES	TC	JS	SES	06/2011
11	AS BUILT WS1374282, SAP30204A1 LPG SAMPLE POINTS	RL	MS	LH	SES	06/2009
10	AS BUILT WS1512171 PSV TAIL PIPE LENGTHS REDUCED	RL	JS	LH	SES	05/2009
9	AS BUILT WS1404955 - PSV-4019 ISOLATION	RL	ES	LH	SES	11/2008
8	AS BUILT WS1404955-LPG RELIEF VALVE ISOLATION	ES	TL	LH	SES	12/08
7	AS BUILT FOR PEP PROJECT WS822071	RL	RH	LH	GE	05/2004
6	RELIEF VALVES ON F-4003 TAGGED. AS BUILT	JBH	RL	LH	AIM	15/04/03
5	F-4133, 4006 DESIGN DATA & PSV-4040 SP RATIONALISED	JBH	RL	AvG	AIM	08/02
4	SAMPLE POINT ADDED, F-4006 CAPACITY MODIFICATION	VB	RL	EJH	RS	10/98
3	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
2	REDRAWN ON AUTOPLANT, WAS 0104-0019	V.B.	J.C.	G.H.	C.J.	09/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

Vector

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE			DATE
DRN	J.TERRILL	01/11/1991	ENG	C.SIEDZUIK	01/11/1991
CHK	R.D.K.	01/11/1991	APP	B.NICHOLLS	01/02/1992

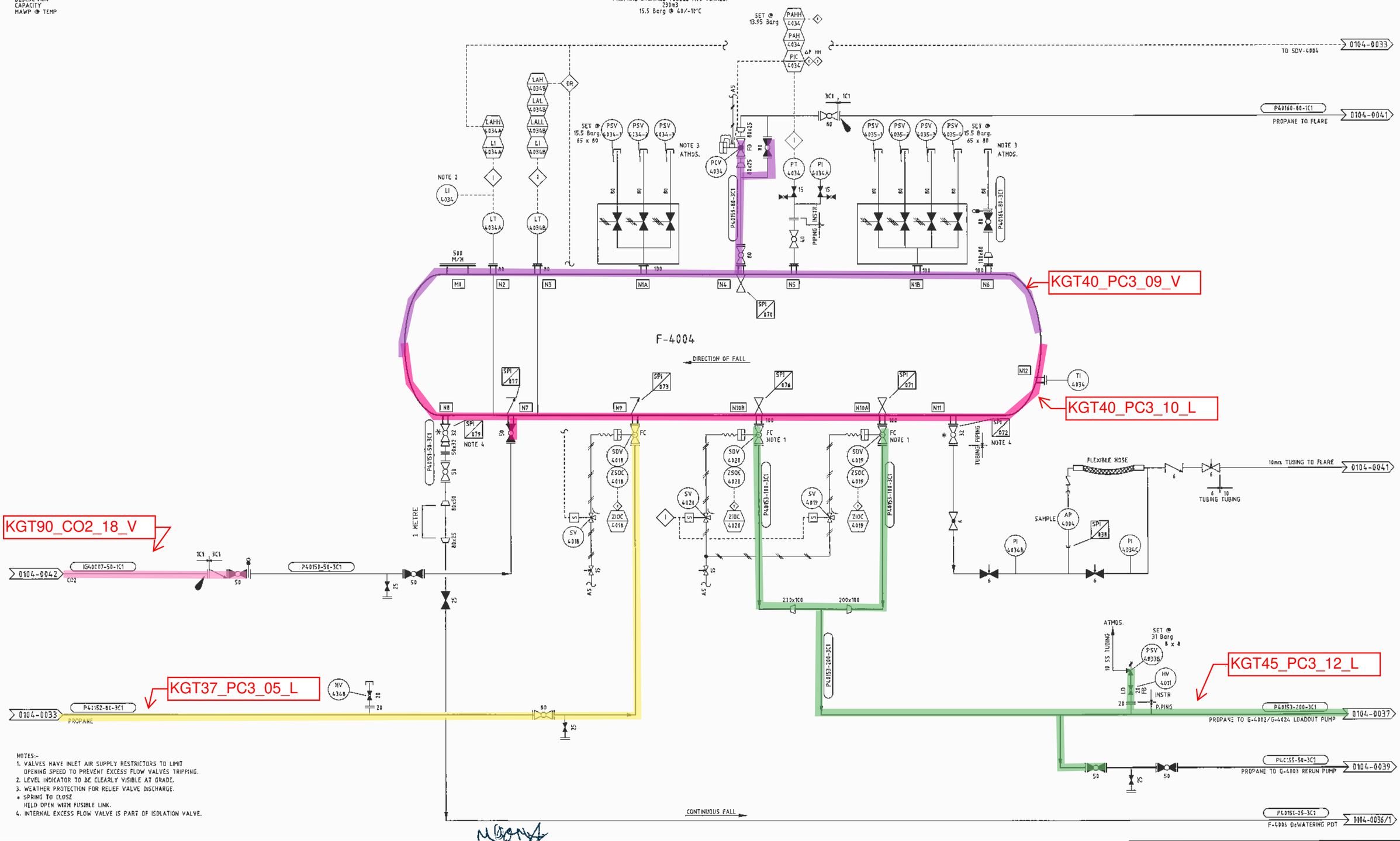
LPG LOADING FACILITY
PIPING & INSTRUMENT DIAGRAM
F-4003 STORAGE VESSEL
-

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
N/A	1000000	0104	0036	01 OF 02 SHTS	16

1000000-0104-0036-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

F-4004
PROPANE STORAGE VESSEL (100 TONNES)
230m3
15.5 Barg @ 40/-10°C



NOTES:-
1. VALVES HAVE INLET AIR SUPPLY RESTRICTORS TO LIMIT OPENING SPEED TO PREVENT EXCESS FLOW VALVES TRIPPING.
2. LEVEL INDICATOR TO BE CLEARLY VISIBLE AT GRADE.
3. WEATHER PROTECTION FOR RELIEF VALVE DISCHARGE.
* SPRING TO CLOSE HELD OPEN WITH FUSIBLE LINK.
4. INTERNAL EXCESS FLOW VALVE IS PART OF ISOLATION VALVE.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
10	AS BUILT P84-1557, PSV-4037-A & P84-1575 NOTE 4	RL	JCC	CC/NA	AM	06/2020
9	AS BUILT P84-1557 LOCKED OPEN VALVE ADDED TO PSV-4337B	RL	JCC	AM	TC	11/2019
8	AS BUILT P84-1483 & SPI ADDED TO NOZZLE N4	RL	MW	AM	TC	03/2019
7	AS BUILT P84-1253 PLC CHANGEOUT, SPEC BLIND, PSV	JCC	RL/CB	AM	SES	01/2016
6	BUILT P84-945 PSV TAIL PIPE REVISED	DL	CJ	AM	SES	12/2012
5	AS BUILT P84-1143 LPG BULLETS ACTUATION L/D VALVES	RL/ES	TC	JS	SES	06/2011
4	AS BUILT WS1374282, SAP3220401 LPG SAMPLE POINTS	RL	MS	LH	SES	06/2009
3	AS BUILT WS1512171 PSV TAT, PIPE LENGTHS REDUCED	RL	JS	LH	SES	05/2009
2	AS BUILT WS1392191 F-4004 LVL INPUT RATIONALISATION	ES	AAB	LH	SES	08/08
1	AS BUILT FOR PEP PROJECT WS822471	RL	RH	LH	GE	05/2004

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE			DATE
DRN	T ALLERTON	03/03/2003	ENG	L HUNT	03/03/2003
CHK	G ROBERTSON	03/03/2003	APP	G EATON	03/03/2003

LPG LOADING FACILITY
PIPING & INSTRUMENT DIAGRAM
F-4004 STORAGE VESSEL

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0104	0036	02 OF 02 SHTS	10

1000000-0104-0036-02.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

G-4001
BUTANE PUMP
71m3/Hr
3 Barg

G-4002
PROPANE PUMP
52m3/Hr
3 Barg

G-4024
PROPANE PUMP
71m3/Hr
4.5 Barg

0104-0034 P40018-200-3CA BUTANE FROM F-4001 STORAGE VESSEL
0104-0035 P40038-200-3CA BUTANE FROM F-4002 STORAGE VESSEL
HV 4310
PDAH 4001
PDSH 4001
SET @ 6 Barg
P40089-80-3CA
INST. PIPING
TEMP SP 033
FOT 200x100
PI 4004
PSV 4023 SET @ 6.5 Barg 50x80
P40088-50-3CA
SET @ 24 Barg 15x10
PSV 4022
ATMOS. 10 SS TUBING
HV 4021
SET @ 31 Barg 15x10
PSV 4024
HV 4022
NRV-452
FIK-007
AG UG
P40087-100-3CA 0104-0038 BUTANE TO LOADOUT SKID
G-4001 NOTE 1
HV 4311
HV 4312
600 MIN.
P40093-25-3CA 0104-0036/1 DRAIN TO F-4006 DeWATERING POT
KGT46_PC4_11_L

0104-0042 IG40006-25-1CA CO2
SP 032
KGT90_CO2_18_V
0104-0036/1 P40063-200-3CA PROPANE FROM F-4003 STORAGE VESSEL
0104-0036/2 P40153-200-3C1 PROPANE FROM F-4004 STORAGE VESSEL
3CA 3C1 3CA
PDAH 4002
PDSH 4002
SET @ 6 Barg
P40098-80-3CA
PSV 4026 SET @ 6.5 Barg 50x80
P40097-50-3CA
PI 4050
Confirmed with operation : Stand-by
G-4002
PDAL 4024 LL
PDAH 4024 HH
PDI 4024 H L
NOTE 1 SI 4024
NOTE 2 FY 4024
PDT 4024
FIC 4024
VSD
P40162-200-3C1
P40163-100-3C1
PSV 4025 SET @ 24 Barg 15x10
HV 4017
PSV 4027 SET @ 31 Barg 15x10
HV 4018
FIK-008
KGT45_PC3_12_L
NRV-453
P40096-100-3CA 0104-0038 PROPANE TO LOADOUT SKID
P40102-25-3CA 0104-0036/1 DRAIN TO F-4006 DeWATERING POT
PSV 4024B SET @ 31 Barg 10x10
HV 4020B
PSV 4024A SET @ 24 Barg 10x10
HV 4020A
PIPING INST.
PI 4024A
NRV-454
INST. PIPING
PAH 4024
PSH 4024
PI 4024B
RO 4024
15mm SS TUBING
10mm SS TUBING
VENT SEAL TO FLARE 0104-0041/1
P40161-25-3C1 0104-0036/1 DRAIN TO F-4006 DeWATERING POT

NOTES :
1. DRIVER AND DRIVEN PULLEYS OF PUMPS G-4001 & G-4002 TO BE INTERCHANGED.
2. CALCULATES FLOW FROM SPEED, DP AND PUMP CURVE.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
7	HV No's ADDED FOR ISOLATIONS AND LOCKED VALVE REGISTER	RL	JCC	AM	SES	01/2017
6	AS BUILT WS140955-LPG RELIEF VALVE ISOLATION	ES	TL	LH	SES	07/08
5	AS BUILT FOR PEP PROJECT WS822071	RL	RH	LH	GE	05/2004
4	PSV-4023 & PSV-4026 SET POINTS RATIONALISED	JBH	RL	AvG	AIM	08/02
3	TITLE BLOCK REVISED. DRAWING CONTENT NOT CHANGED	VB	RL	EJH	RS	10/99
2	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
1	REDRAWN ON AUTOPLANT, WAS 104-14	D.R.	J.C.	G.M.	C.J.	10/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0030/1 & 2

		DATE			DATE
DRN	J.TERRILL	01/11/1991	ENG	C.SIEDZUIK	01/11/1991
CHK	RDK	01/11/1991	APP	B.NICHOLLS	01/02/1992

LPG LOADING FACILITY
PIPING & INSTRUMENT DIAGRAM
LOADOUT PUMPS
VSD OPTION

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
N/A	1000000	0104	0037	01 OF 01 SHTS	7

1000000-0104-0037-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

T-4003
NATURAL GASOLINE LOADOUT ARM
50m3/hr

T-4002
LPG LOADOUT ARM
24Barg @ -48/120°C

T-4001
WEIGHBRIDGE

TO G-4011 ODOURANT INJECTION PUMP 0104-0040

0104-0042 IA40006-50-1CB FROM INST. AIR
PIPING INST. 50x6 6 SV-4026 GATE BOOM

DEV FAD 4003 FC 4003 FIQ 4003
HV 4056
SV 4023 S AS
6x6 SET @ 6 Barg PCV 4023
XV 4023 FC
INST. PIPING HV 4058
R G

KGT50_EMC_01_L

0104-0040 ODOURANT 10SS TUBING
FT 4003
HV 4057

SV 4016 S AS ZIOC 4016 ZSOC 4016 SDV 4016
0104-0037 P40087-100-3CA FROM BUTANE PUMP G-4001
BUTANE
UG AG FIK-009 FC
KGT46_PC4_11_L

SV 4017 S AS ZIOC 4017 ZSOC 4017 SDV 4017
0104-0037 P40096-100-3CA FROM PROPANE PUMP G-4002/G-4024
PROPANE
UG AG FIK-010 FC
KGT45_PC3_12_L

FUTURE
SET @ 31 Barg 15 x 10 PSV 4028 ATMOS 10SS TUBING
HV 4030
PI 4006
P40106-100-3CA
NRV-456
100x80 80 100x80 100 100

SET @ 24 Barg 10 x 10 PSV 4031
SET @ 20 Barg PCV 4031
HV 4031
PI 4005 PT 4005 PI 4007
P40108-20-3CA
100x80

KGT47_LPG_01_L

P40107-25-3C1
10SS TUBING
HV 4339
HV 4059
INST. PIPING
15SS TUBING
HV 4313
HV 4314
600 MIN
3CA 1CA
NRV-457
P40109-50-1CA
PCV 4006

KGT47_LPG_02_L
LPG Load-out
SWIVEL JOINTS
T-4002
YI 4023 ZS 4023 HV 4315
BREAKAWAY COUPLING
SPI 127 LPG TANKER LOADOUT
SPI 290
80x50 20x15 NOTE 1 HV 4023
VENT LINE TO FLARE
P40106-15-SS

EARTH CONNECTED
YA 4004 YI 4004 YS 4004
T-4001
WE 4001A WE 4001B WE 4001C WE 4001D WE 4001E WE 4001F
WC 4001 WI 4001 WCI 4001

8 8 8 8 8 8 DRIVER DISPLAY
1 2 3 / 4 5 6 / 7 8 9 / * 0 ** DRIVER INTERFACE
CARD READER
LOADOUT PANEL

0104-0042 IA40001-50-1CB FROM INST. AIR
NRV-458 50 50 SPI 046 EMERGENCY TRUCK AIR
0104-0042 IG40001-50-1CA CO2
NRV-459 50 50 CO2 SPI 047
KGT90_CO2_18_V

NOTES:
1. HAND OPENED SPRING CLOSE VALVE.
2. FLEXIBLE HOSE & BREAKAWAY COUPLING (MAWP 30Barg @ -40°C)
3. XSV-4068 ONLY SHUTS VIA "SCULLY" LOSS OF PERMISSIVE XSV-4068 WILL OPEN AUTOMATICALLY ONCE PERMISSIVE IS RETURNED TO ENSURE A FREE FLOW PATH FOR THERMAL EXPANSION.
4. DRY BREAK COUPLING.
5. INCLUDES HIGH LEVEL AND EARTH CONNECTED DETECTION
6. SPILL CONTROL IS VIA EXISTING INTERCEPTOR (OIL-WATER SEPARATOR). SEE P&ID 0104-0038.
7. XSV, "SCULLY" AND LOAD-OUT ARM ARE EX. KAHILI.
8. PROVISION FOR METER PROVING.
9. 3 MINUTE DEAD MAN TIMER CONNECTED TO FQI-4062, INCLUDES WARNING BEACON.
10. SPRING SET @ 1 barg DIFFERENTIAL FOR OVERPRESSURE FLOW PATH BACK TO F-4033.

0104-0051 P40070-80-1C1 CONDENSATE FROM LOADOUT PUMP G-4033
FIK UG AG
KGT35_NGL_09_L

I/A S SV 4068 ZIOC 4068 NOTE 3 XSV 4068 ZSOC 4068
SET @ 10 Barg 15 x 15 PSV 4066 PI 4074 HV 4074 HV 4335
FQI 4062 FC 4062 FT 4062 TE 4062 FE 4062 TW 4062
XI 4062B XI 4062C XI 4062A
SV 4062C FAST/SLOW SV 4062B OPEN/CLOSE SV 4062A DWELL FV 4062
HV 4328 HV 4336 HV 4245 HV 4274
KGT36_NGL_10_L
NRV-467 NOTE 10
15 SS TUBING

SET @ 10 Barg 15x15 PSV 4064 HV 4275
SPI-286 HV 4230 NOTE 8 NOTE 8
P40061-200-1C1 200NB 200x80 80x25 F.O.B. HV 4276
NOTE 9 HS 4075 HS 4076
P40070-100-1C1
HV 4236

KGT36_NGL_11_L
NGL Load-out
SWIVEL JOINTS
T-4003
YA 4064A YI 4064A YS 4064A NATURAL GASOLINE
YA 4064B YI 4064B YS 4064B NOTE 5 SCULLY PERMISSIVE
SPI 283 SCULLY CONNECTED
YI 4078 YS 4078 NATURAL GASOLINE TANKER LOADOUT HOSE PARKED
NOTE 4
P40040-100-1CA FIK TO FLARE 0104-0041
P40079-150-GALV UG AG 0104-0043

TANKER DEPRESSURISE
PI 4008 YI 4024 ZS 4024 SPI 014 50 50 50x32 NC NOTE 1

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
22	AS BUILT SPI-290 AND LINE NUMBER P40106 ADDED	RL	JCC	AM	TC	07/2019
21	AS BUILT P84-1502 REDUCE NG LOADOUT LINE OPERATING PRESSURE	RL	DW	AM	TC	08/2018
20	AS BUILT - P84-1310 PERMANENT NATURAL GASOLINE STORAGE	JT	DV	AM	SES	09/2017
19	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	JCC	AM	SES	01/2017
17	AS BUILT TAG CHANGE PCV-4023 & CLARITY TO T-4002	JCC	RL	AM	SES	04/2016
16	AS BUILT P84-1253 PLC CHANGEOUT, HV TAGS	JCC	RL/CB	AM	SES	01/2016
15	HAND VALVE AND NON RETURN VALVE NUMBERS ADDED	RL	JCC	AM	SES	09/2015
14	AS BUILT P84-231 REPLACE LPG LOADOUT ARM	JB	CJ	AM	SES	06/2015
13	AS BUILT P84-231 PCV-4031 ADDED TO LOADOUT ARM	JB	CJ	AM	SES	12/13
12	HV-4023 ADDED	ES	KH	JS	SES	05/11

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
11	AS BUILT FOR PROJECT P84-3022	SA	CJ	WB	LH	08/2010
10	PIPING AND VALVES AS BUILT ON LINE P40109-50-1CA	RL	WB	LH	SES	01/2010
9	AIR LINE TO GATE BOOM AS BUILT	RL	WB	LH	SES	11/2009
8	AS BUILT WS1404955-LPG RELIEF VALVE ISOLATION	ES	TL	LH	SES	07/08
7	AS BUILT FOR PEP PROJECT WS822071	RL	RH	LH	GE	05/2004
6	25mm FLANGE ADDED TO P40040-100-1CA. AS BUILT	JBH	RL	LH/MB	PJR	11/09/03
5	HV-4003 TAG ADDED, PCV-4003 ADDED	VB	RL	EJH	RS	10/98
4	NEEDLE VALVE ADDED UPSTREAM OF SDV 4023.	P.T.D.	R.L.	A.V.G.	J.B.G.	08/95
3	AS BUILT COMMENTS INCORPORATED	V.B	B.T.	A.V.G.	C.J.	5/95
2	REDRAWN ON AUTOPLANT, WAS 0104-0015	V.B.	J.C.	G.M.	C.J.	09/94

AUTOCAD ORIGINAL SHEET SIZE A1

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0030/1 & 2

		DATE			DATE
DRN	J.TERRILL	02/11/1991	ENG	C.SIEDZUIK	02/11/1991
CHK	R.D.K	02/11/1991	APP	B.NICHOLLS	02/02/1992

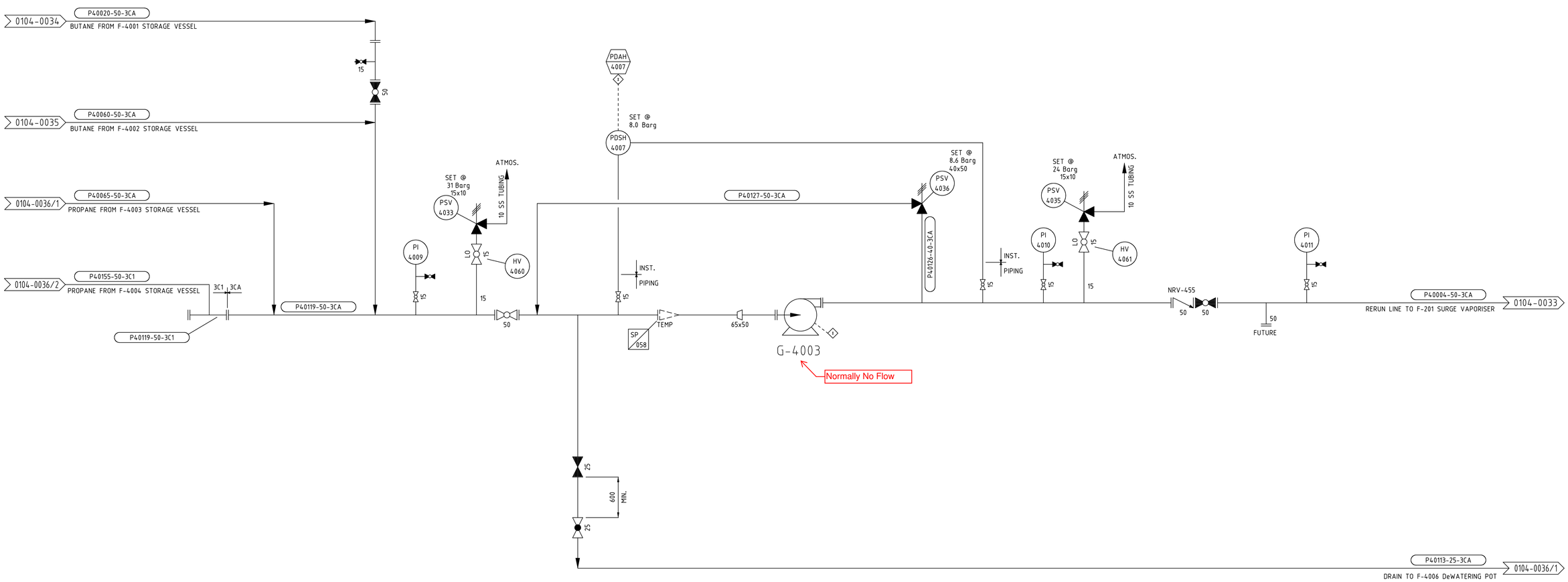
LPG LOADING FACILITY
PIPING & INSTRUMENT DIAGRAM
TANKER FILLING

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0104	0038	01 OF 01 SHTS	22

1000000-0104-0038-01.DWG

EQUIPMENT No. G-4003

DESCRIPTION OFF-SPEC RERUN PUMP
CAPACITY 6m3/hr
MAWP @ TEMP 8 Barg



REV	AMENDMENT	BY	CHK	ENG	APP	DATE
7	HV HAND VALVE NUMBERS ADDED TO LOCKED VALVES	RL	JCC	AM	TC	07/2019
6	AS BUILT WS1404955-LPG RELIEF VALVE ISOLATION	ES	TL	LH	SES	07/08
5	AS BUILT FOR PEP PROJECT WS822071	RL	RH	LH	GE	05/2004
4	TITLE BLOCK REVISED. DRAWING CONTENT NOT CHANGED	VB	RL	EJH	RS	10/99
3	REDRAWN ON AUTOPLANT, WAS 104-16	D.R.	J.C.	G.M.	C.J.	09/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

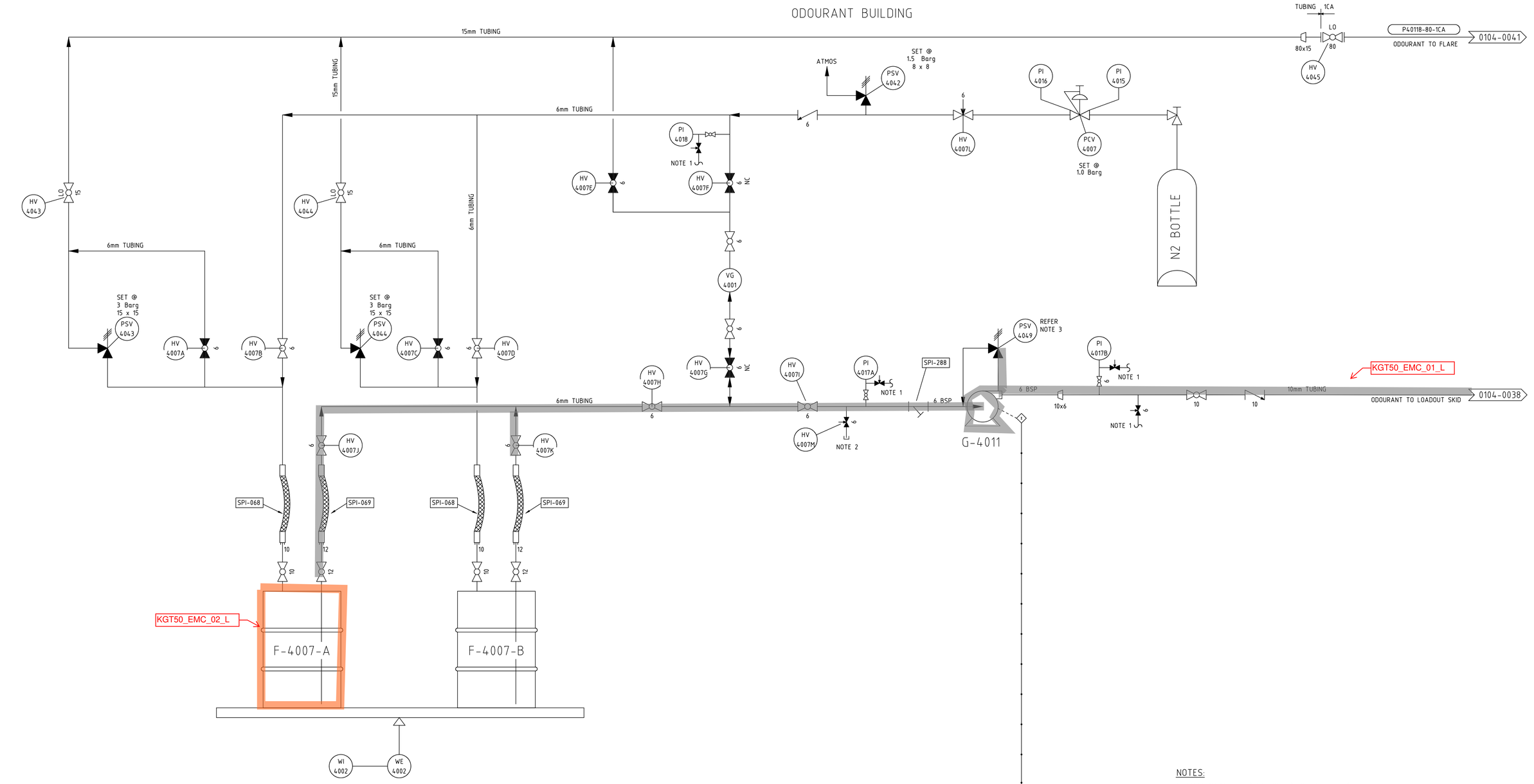
REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0030/1 & 2

		DATE			DATE
DRN	J.TERRILL	11/91	ENG	C.SIEDZUIK	11/91
CHK	RDK	11/91	APP	B.NICHOLLS	2/92

LPG LOADING FACILITY
PIPING & INSTRUMENT DIAGRAM
OFF-SPEC RERUN PUMP
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS BE003901	1000000	0104	0039	01 OF 01 SHTS	7

EQUIPMENT No.	F-4007-A	F-4007-B	G-4011	N2 BOTTLE
DESCRIPTION	TRANSPORTABLE ODOURANT DRUM	TRANSPORTABLE ODOURANT DRUM	ODOURANT INJECTION PUMP	
CAPACITY	CAPACITY 200L	CAPACITY 200L	1.9-66 L/hr	
MAWP @ TEMP	MAWP 10BarG @ AMBIENT	MAWP 10BarG @ AMBIENT	0-123 Barg	
			0.37kW	



NOTES:

1: DRAINS MARKED THUS ARE ROUTED TO FLARE TUBING.
2: DIESEL FLUSH POINT.
3: PSV-4049 IS INTERNAL AND INTEGRAL WITH PUMP G-4011.

0104-0038 FROM FC-4003 AT TANKER LOADOUT

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
8	AS BUILT P84-1375 ADDITION SPI-288 & 3 HV No's ADDED	RL	JC	AM	MM	05/2018
7	AS BUILT WS2060791 REPLACE ODORANT INJECTION PUMP	RL	MK	AM	SES	11/2013
6	NOTE 3 ADDED REGARDING STATUS OF PSV-4049	RL	MK	AM	SES	07/2013
5	AS BUILT FOR WS145015 TRANSPOR. ODOURANT DRUMS	VB	RL	LH	RJW	05/01
4	TITLE BLOCK REVISED. DRAWING CONTENT NOT CHANGED	VB	RL	EJH	RS	10/99
3	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	05/95
2	REDRAWN ON AUTOPLANT, WAS 0104-0017	V.B.	J.C.	G.M.	C.J.	09/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0030/01 & 02

		DATE			DATE
DRN	J.TERRILL	01/11/1991	ENG	C.SIEDZUIK	01/11/1991
CHK	R.D.K.	01/11/1991	APP	B.NICHOLLS	01/02/1992

LPG LOADING FACILITY
PIPING & INSTRUMENT DIAGRAM
ODOURANT STORAGE & PUMPS
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0104	0040	01 OF 01 SHTS	8

1000000-0104-0040-01.DWG

CO2 DISTRIBUTION

KGT90_CO2_18_V

0108-0011 — IG40001-50-1CA — CO2 HEADER — 50 — FIK-012

IG40005-50-1CA — 50 — FIK-014

50x25 — 50 — FIK-015

PI 4019 — 15 — 50 — FIK-016

1CA 1C1

50 — IG40007-50-1C1 — CO2 TO F-4004 — 0104-0036/2

25 — IG40004-25-1CA — CO2 TO F-4003 — 0104-0036/1

25 — IG40003-25-1CA — CO2 TO F-4002 — 0104-0035

25 — IG40002-25-1CA — CO2 TO F-4001 — 0104-0034

IG40006-25-1CA — CO2 TO LOADOUT PUMPS — 0104-0037

IG40001-50-1CA — CO2 TO LOADOUT — 0104-0038

GRADE — GRADE

INSTRUMENT AIR DISTRIBUTION

0109-0027/5 — IA40001-50-1CB — INST. AIR HEADER — 50 — 1CB 1CA 50 — FIK-013

PI 4023 — TUBING GALV PIPE — 15 — RO 4012 — 50x15 — IA40005-50-GALV — 10 TUBING

15 — 25x15 — 15 — 15 — PSL 4018 — PAL 4018

1CA GALV PIPE — 50 — FIK-017

1CA 1CB — 50 — FIK-018

GRADE — GRADE

INSTR. PIPING | TUBING

IA40002-25-1CB — 25x15 — 15 — 15 — INST. AIR TO F-4001 PCV — PCV-4001

IA40002-25-1CB — 25 — 25x15 — INST. AIR TO F-4001 SDV'S — SV-4009 — SV-4008 — SV-4007

IA40003-25-1CB — 25x15 — 15 — 15 — INST. AIR TO F-4002 PCV — PCV-4002

IA40003-25-1CB — 15 — 25x15 — 15 — INST. AIR TO PROPANE FEED & RERUN PUMPS — SV-4006 — SV-4004

IA40008-25-1CB — 25 — 25x15 — INST. AIR TO F-4002 SDV's — SV-4012 — SV-4011 — SV-4010

IA40004-25-1CB — 25x15 — 15 — 15 — INST. AIR TO F-4003 PCV — PCV-4003

IA40004-25-1CB — 25 — INST. AIR TO F-4003 SDV's — SV-4015 — SV-4014 — SV-4013

IA40007-25-1CB — 25x15 — 15 — INST. AIR TO SDV-4005 — SV-4005

GALV TUBING — IA40009-15-GALV — INST. AIR TO F-4004 — SV-4018 — SV-4019 — SV-4020 — PCV-4034

FIK — 50x25 — GALV 1C1 — 50 — 25 — INST. AIR TO F-4033 — HV 4318 — 1C1 TUBING — 25mm SS TUBING — IAM-0405 — SV-4071 — SV-4073

HV 4319 — 25

10 TUBING — FIREWATER BULLET SENSE TUBE — 0104-0044

IA40006-50-1CB — INST. AIR TO GATE BOOM SV-4026 — 0104-0038

PI 4020 — RO 4011 — PI 4025 — PIPING | TUBING

50x25 — 50x15 — 15 — 10 TUBING — FIREWATER TANKER SENSE TUBE — 0104-0044 — SV-4023

IA40001-50-1CB — INST. AIR TO TRUCK 1 EMERGENCY AIR — 0104-0038

PIPING | TUBING

IA40010-25-1CB — 25 — 25x15 — INST. AIR TO LOADING MANIFOLD — SV-4016 — SV-4017

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
6	AS BUILT - P84-1310 PERMANENT NATURAL GASOLINE STORAGE	JT	DV	AM	SES	09/2017
5	AS BUILT PC-KGP-09-KOPS-002 ISOLATION VALVES ADDED	RL/ES	WB	LH	SES	10/2010
4	AS BUILT FOR LPG LOADOUT AREA	RL	WB	LH	SES	10/2009
3	AS BUILT FOR PEP PROJECT WS822071	RL	RH	LH	GE	05/2004
2	CONTINUATION 0108-0004 NOW 0108-0011	VB	RL	EJH	RS	10/98
1	REDRAWN ON AUTOPLANT, WAS 104-19	D.R.	J.C.	G.M.	C.J.	09/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD — ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0030/01 & 02

		DATE			DATE
DRN	J.TERRILL	01/11/1991	ENG	C.SIEDZUIK	01/11/1991
CHK	RDK	01/11/1991	APP	B.NICHOLLS	01/12/1992

LPG LOADING FACILITY
PIPING & INSTRUMENT DIAGRAM
UTILITIES PIPE LINES
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0104	0042	01 OF 01 SHTS	6

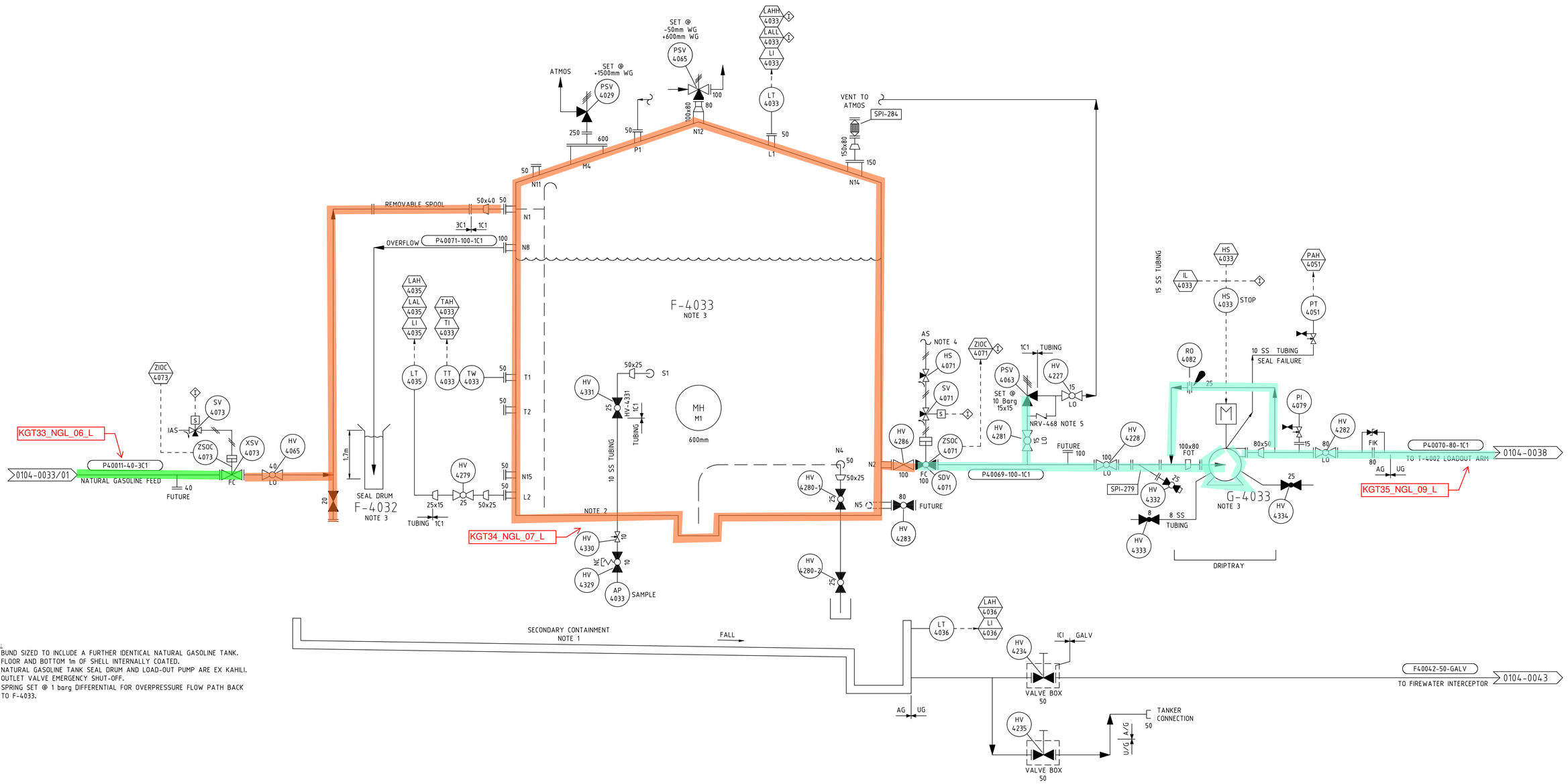
1000000-0104-0042-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

F-4032
NATURAL GASOLINE STORAGE SEAL DRUM
250NB x 1.9m HIGH

F-4033
NATURAL GASOLINE STORAGE TANK (EX KAHILI)
4.5Øm x 6m HIGH
TOTAL VOLUME: 95.4m3
WORKING VOLUME: 73.4m3 (LAL to LAH) 80.5m3 (LALL to LAHH)
PRESSURE: 1741mm WG @ 80°C (DESIGN)
VACUUM: -65mm WG @ 80°C (DESIGN)

G-4033
NATURAL GASOLINE LOAD OUT PUMP
50m3/hr DP 2.9 Barg
19.6 Barg @ 45°C



NOTES:
1. BUND SIZED TO INCLUDE A FURTHER IDENTICAL NATURAL GASOLINE TANK.
2. FLOOR AND BOTTOM 1m OF SHELL INTERNALLY COATED.
3. NATURAL GASOLINE TANK SEAL DRUM AND LOAD-OUT PUMP ARE EX KAHILI.
4. OUTLET VALVE EMERGENCY SHUT-OFF.
5. SPRING SET @ 1 barg DIFFERENTIAL FOR OVERPRESSURE FLOW PATH BACK TO F-4033.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
3	AS BUILT HV-4234 & 4235 CHANGED TO FLANGED & GALV SHOWN	RL	JCC	AM	TC	07/2019
2	AS BUILT P84-1502 REDUCE NG LOADOUT LINE OPERATING PRESSURE	RL	DW	AM	TC	08/2018
1	AS BUILT - P84-1310 PERMANENT NATURAL GASOLINE STORAGE	JT	DV	AM	SES	09/2017

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE			DATE
DRN	B KNOX	21/04/2016	ENG	S HARPER	21/04/2016
CHK	C JAMIESON	21/04/2016	APP	W WANG	21/04/2016

KAPUNI GAS TREATMENT PLANT
PIPING & INSTRUMENT DIAGRAM
NATURAL GASOLINE STORAGE TANK F-4033
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0104	0051	01 OF 01 SHTS	3

1000000-0104-0051-01.dwg

EQUIPMENT No. M-502

DESCRIPTION FILTER / SEPARATOR
CAPACITY 0.73m3
MAWP @ TEMP 55.16 Barg @ 66/-29°C

FROM STOS — P5021-200-1H1 — STAB GAS FROM STOS

0105-0010 — INLET COALESCER SAMPLE POINT — 15mm SS TUBING

0105-0011 — P5077-100-6H1 — FROM M-506 STAB. GAS COMPRESSOR DISCHARGE SEPARATOR

C-501 at mothball status until PSV-505 is replaced.

0105-0010 — P5110-25-6H1 — FROM M-507 LTS GAS INLET SEPARATOR

KGT01_RCS_01_L

TO STOS — P5006-300-6H1 — SPEC GAS TO STOS

KGT01_PGS_01_V

P5033-25-1C1

P5007-200-6C1

P5111-25-1H1

P5114-25-6C1

Assumed : Blind (closed) added due to mothballing of M-502

INSUL. LIMIT

END CLOSURE

M-502
REFER NOTE 3, 4 & 5

SET @ 55Barg 25 x 25

REFER NOTE 4

REFER NOTE 5

NOTE 7

AIT-400 GC OVEN 2 STREAM 2

NOTE 6

d=93.94

P5027-50-1C1 — TO COLD FLARE HEADER — 0109-0026/2

P5015-150-1H1 — TO C-501 STAB GAS COMP. — 0105-0011

P5050-50-1H1 — TO F-201 SURGE VAPOURISER — 0109-0025

TO SURGE VAPOURISER — 0109-0025

To NC valve

P4061-100-6C1 — 0105-0014/2

P4228-100-6C1 — STABILISER OVERHEADS/H.T.S VAPOUR — 0105-0014/2

P1002-100-6H1 — TO CO2 REMOVAL TRAINS 1, 2 & 3 — 0105-0010

TO STOS — TO PV-0601A LOCATED AT STOS KPS

FROM STOS — FROM PI-0601A-S

0105-0014/2 — P3067-200-6C1 — FROM GAS GATHERING

0105-0012 — P4202-80-6H1 — FROM C-420-1 & 2 STABILISER OVERHEADS COMPRESSORS

KGT01_PGS_11_V (Sensitivity 2)

NOTES:

1. FUTURE CONNECTION FOR MULTIPOINT ANALYSER
2. FUTURE CONNECTION FOR MULTIPOINT ANALYSER
3. VALVES & SPOOLS REMOVED AS PART OF THE MOTHBALLING OF M-502 & REMOVAL OF M-501. FLANGED CONNECTIONS SHOWN WITHOUT BLIND FLANGES ARE FITTED WITH WEATHER PROTECTION COVERS.
4. SPADES & BLINDS ADDED FOR MOTHBALLING OF M-502 & REMOVAL OF M-501.
5. VALVES STATUS CHANGED TO CLOSED FOR MOTHBALLING OF M-502 & REMOVAL OF M-501.
6. PV-0601A IS NORMALLY 100% OPEN. FIC-574 IS A FLOW LIMITER FOR STARTUP. PIC-0601A CONTROLS PRESSURE FOR FTJV OUTAGES
7. SEE P&ID 0105-0013/2 FOR GAS CHROMATOGRAPH ANALYZER DETAIL.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
21	SPADE OPEN (SPACER) ADDED TO LINE P5006-300-6H1	TL	RL	LH	SES	01/2010
20	AS BUILT-TODD - PO-K3P-09-KGTH-002	MAW	VWP	CRP	LH	08/2009
19	AS BUILT WS992071 PREVENT OIL TO BALLANCE	RL	ES	LH	SES	04/2008
18	AS BUILT WS1292009 M-502 DEMOLITION	EA	CB	AAB	PJR	09/07
17	AS BUILT WS1042819-BENFIELD SYSTEM HAZARD REPORT	ES	CP	LH	PJR	04/07
16	M-501 REMOVED FROM SITE	RL	ES	LH	PJR	05/2006
15	AS BUILT FOR WS833005 RECYCLE STAB & DE-ETH O/H's	VB	CWM	LH	CF	09/05
14	AS BUILT WS853855 BLEND TO BALLANCE & MOTHBALLED	RL	AK	LH	PJR	07/2004
13	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
12	M-501 & M-502 DESIGN DATA RATIONALISED	JBH	RL	AvG	AIM	08/02

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
27	AS BUILT - P84-1434 INLET COALESCER SP	WPG	PMO	AM	TC	08/2018
26	P&ID SPLITTING CONTIUATION FROM 0105-0014-02	JCC	RL	AM	SES	06/2016
25	AS BUILT - P84-1140 AI-510M SAMPLE RELOCATION	JCC	RL/CB	AC	TC	05/2016
24	AS BUILT FOR ISOLATED EQUIPMENT BY ADDING SPADES ETC.	RL	NA	AM	SES	08/2015
23	P84-866 AS BUILT LOWER WHAREROA SUPPLY LINE PRESSURE	LN	AB	AM	SES	04/2014
22	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	03/2014

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0083/1
CAUSE & EFFECTS - 0780-0149/1

		DATE			DATE
DRN	P.RAWLES	07/04/1994	ENG		
CHK	J.STEWART	07/04/1994	APP	R.VanLIJF	24/03/1987

PRODUCT LINES AND COMPRESSORS
PIPING & INSTRUMENT DIAGRAM
INLET LINES - STAB & LPS
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
N/A	1000000	0105	0009	01 OF 01 SHTS	27

1000000-0105-0009-01.DWG

EQUIPMENT No. M-507
DESCRIPTION INLET SEPARATOR
CAPACITY 8 m3
MAWP @ TEMP 52 BarG @ 49 °C

M-918 PIG RECEIVER

M-105 CLANTON SEPARATOR

0101-0007/1 FROM AIC-202
0105-0014/2 FROM FI-532
0102-0006/1 FROM FI-201-3/4

300 PIPELINE 3000062-
0110-001-01
GAS FROM PIPELINE ELTHAM - KAPONGA No. 2 OFFTAKE

309 PIPELINE 1000001-
0110-001-03
(TRANSMISSION P&ID)

C-501 at mothball status until PSV-505 is replaced.

0105-0011 STAB. GAS FROM M-506 DISCHARGE SEPARATOR P5214-100-6H1

0105-0009 LPS GAS P1002-100-6H1

Empty line

KGT01_PIG_01_V

KGT01_MAU_01_V

KGT01_RCS_01_L

KGT01_RGS_01_L

Isolation v/v XSV-516

CYCLONE BANK

M-507

M-918

M-105

TRANSMISSION | KGTP

PECPR REGULATIONS
PIPELINE REGULATIONS

REFER NOTE 12

REFER NOTE 13

NOTE 2

NOTE 4

NOTE 6

NOTE 9

NOTE 10 & 11

NOTE 3

NOTE 5

NO POCKETS SELF DRAINING

3/8" SS TUBING

15mm SS TUBING

VORTEX BREAKER

INSUL LIMIT

LIMIT OF STEAM TRACE

LOW PROCESS FLOW

SAMPLE POINT

MASS SPEC STREAM 11 NOTE 1

(FUTURE)

0105-0011 STAB. GAS FROM M-506 DISCHARGE SEPARATOR P5018-100-6H1

0105-0009 INLET COALESCER SAMPLE POINT P5001-450-6H1

FROM TODD LTS GAS FROM TODD

C-501 at mothball status until PSV-505 is replaced.

0105-0013/1 FROM AIC-502
0105-0014/2 FROM FI-114
0105-0023/1 FROM FY-9612 & FIQ-9621
0105-0013/1 FROM AIC-502-A CO2 CONTROL

CO2 Removal Train 3 : Currently Air-gapped.

Confirmed with operation team. Manually closed.

P5108-100-6H1 MAUI GAS 0105-0023/1
P1108-300-6H1 300 LINE BYPASS 0105-0023/1
TO AIC-202 0101-0007/1
P2108-80-6C1 0102-0006/1
P1081-300-6H1 TO E-101-3/2 GAS/GAS EXCHANGER 0101-0006/1
P5026-80-1C1 TO FLARE HEADER 0109-0026/2
P5229-100-6C1 TO AUP BLENDING 0105-0023/1
P5110-25-6H1 TO F-201 SURGE VAPOURISER 0105-0009
P5228-40-6C1 RAW LTS TO COGEN FUEL 0109-0040/1
P1001-2-200-6H1 TO D-101-2 ABSORBER TOWER 0101-0005/2
TO PIC-305 0103-0005/1
0109/0026/02 TO FLARE HEADER
P1001-1-200-6H1 TO D-101-1 ABSORBER TOWER 0101-0005/1
P1123-100-6H1 RAW LTS BYPASS FROM STOS TO 300 PRODUCT LINE 0105-0014/2
TO FLARE SYSTEM 0109-0026/1
P5003-450-6H1 TO LTS PLANT 0112-0002
TO STOS TO STOS LTS ESD VALVE XSV-0001-LTS
TO FQI-0103B MASS FLOW 0112-0002/1

NOTES
1. SEE P&ID 0105-0013/02 FOR MASS SPEC ANALYSER DETAIL.
2. EXISTING 12" BYPASS VALVE TO BE REMOVED FOR SAFETY REASONS.
3. RAW GAS BYPASS FLOWRATE IS FLOW RATIO CONTROLLED BASED ON TOTAL PRODUCT FLOWRATE RESET BY CO2 ANALYSER.
4. SPOOL REMOVED FOR SAFETY REASONS.
5. FIC-120 REQUIRED BUT IN MANUAL.
6. 25NB PIPE BETWEEN LV-109 AND HV-546-B ASSUME TO BE SCH 40 REF PETQ125.
7. DELETED.
8. DELETED.
9. VALVE HANDLE REMOVED.
10. PSV-510 STEAM TRACED.
11. PSV-510 IS PILOT TYPE.
12. FIK INCLUDES PCR (POLARISATION CELL REPLACEMENT).
13. 20NB VALVE IS FAULTY IN CLOSED POSITION (DEC 2015).

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
43	CONTIN. DRG. No. REVISED FOR EXPORT COMPRESSOR RE-NUMBERING	RL/ES	MH	AM	SES	05/12
42	AS BUILT P84-3402 LTS TEMPERATURE TRANSMITTER	ES/RL	TC	AM	SES	02/12
41	AS BUILT P84-1040 PHASE 1 INLET SAMPLE COALESCER	RL/ES	AB	LH	SES	03/11
40	PARTIAL AS BUILT FOR P84-701 LTS SEP. M-507 LEVEL CTR	CJ	NB	JS	LH	03/11
39	HAND VALVE NUMBERS ADDED FOR FLANGE INSUL. KITS	RL	ES	LH	SES	08/2009
56	AS BUILT P84-1312 REMOVE XSV-124 & P84-1587 REMOVE LC-109	RL	JCC	AM	TC	03/2020
55	AS BUILT P84-1459 PSV-510	LBU	GHE	AM	TC	11/2019
54	AS BUILT P84-1430 INST BRIDLE DRAINS FROM M-507	RL	JS	AM	TC	07/2019

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
53	AS BUILT - P84-1434 INLET COALESCER SP	WPG	PMO	AM	TC	08/2018
52	NOTE 6 ADDED RE PETQ125 & DEMARC ADDED RE PECPR REGS	RL	JC/CR	AM	SES	05/2017
51	DEMARC REVISED AT XSV-594 & DEMARC CHANGE POINT No's ADDED	RL	JCC	AM	SES	03/2017
50	BLEED VALVE ADDED TO HV-518 - MOC 3604	NK	RH	DT	RS	10/2016
49	TRANSMISSION / KGTP DEMARCATION ADDED RE INCIDENT ACTION	RL	JC	AM	SES	05/2016
48	AS BUILT FOR XC-XO-15-XPLN-005 FIK ADDED TO HV-511 ETC.	RL	CR	AM	SES	12/2015
47	AS BUILT FOR ISOLATED EQUIPMENT BY ADDING SPADES ETC.	RL	NA	AM	SES	08/2015
46	AS BUILT FIK NOW SHOWN A/G, FT-501-2A REMOVED, NRV No's ADDED	RL	JC	AM	SES	05/2015
45	AS BUILT - P84-848 WOBBE CONTROL ON PROCESSED/EXPORT GAS	ES/RL	AAB	AM	SES	04/2014
44	HAND VALVE No's ADDED & CONT REVISED FOR 300 PIPELINE	RL	CR	AM	SES	02/2014

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
0780-0081 SHT 1 TO 3 CAUSE AND EFFECTS
0780-0082 SHT 5 & 6 CAUSE AND EFFECTS
0780-0083 SHT 1 CAUSE AND EFFECTS
0780-0149 SHT 1 CAUSE AND EFFECTS

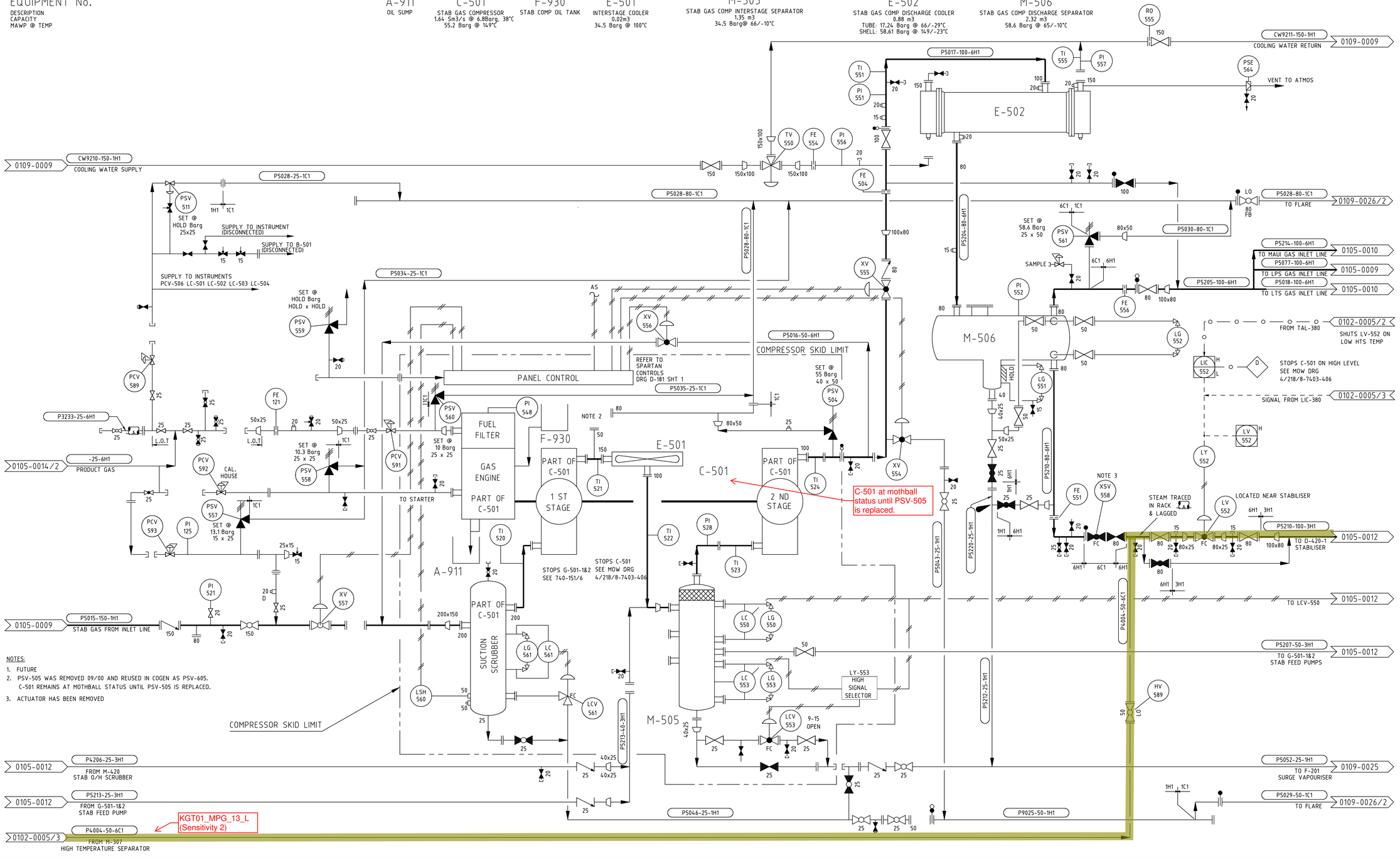
		DATE			DATE
DRN	P.RAWLES	08/04/1994	ENG		
CHK	J.STEWART	08/04/1994	APP	R.vanLIJF	25/03/1987

PRODUCT LINES AND COMPRESSORS
PIPING & INSTRUMENT DIAGRAM
INLET LINES - LTS AND MAUI
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0105	0010	01 OF 01 SHTS	56

1000000-0105-0010-01.dwg

EQUIPMENT No.	A-911	C-501	F-930	E-501	M-505	E-502	M-506
DESCRIPTION	OIL SUMP	STAB GAS COMPRESSOR	STAB COMP OIL TANK	INTERSTAGE COOLER	STAB GAS COMP INTERSTAGE SEPARATOR	STAB GAS COMP DISCHARGE COOLER	STAB GAS COMP DISCHARGE SEPARATOR
CAPACITY		NOTE 2		0.02m3	1.35 m3	0.88 m3	2.32 m3
MAWP @ TEMP		1.64 Sm3/s @ 6.8Barg, 38°C 55.2 Barg @ 149°C		34.5 Barg @ 100°C	34.5 Barg@ 66/-10°C	TUBE: 17.24 Barg @ 66/-29°C SHELL: 58.61 Barg @ 149/-23°C	58.6 Barg @ 65/-10°C



NOTES:

1. FUTURE
2. PSV-505 WAS REMOVED 09/00 AND REUSED IN COGEN AS PSV-605. C-501 REMAINS AT MOTHBALL STATUS UNTIL PSV-505 IS REPLACED.
3. ACTUATOR HAS BEEN REMOVED

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
23	CONTINUATION FROM 0105-0014 REMOVED	RL	ES	LH	PJR	06/2006
22	ALARM LV-552/H ADDED	JM	MD	LH	PJR	06/2005
21	AS BUILT FOR PEP PROJECT WS821933	RL	JBH	LH	PJR	07/2004
20	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
19	E-501, M-505, E-502 & M-506 DESIGN DATA RATIONALISED	JBH	RL	AvG	AIM	08/02
18	P2516 REMOVED	VB	RL	EJH	RJW	02/01
17	PSV-505 REMOVED. AS BUILT	VB	RL	EJH	RJW	10/00
16	REVISED FOR NEW PRINT. DRAWING CONTENT NOT CHANGED	VB	RL	EJH	RS	10/99
15	AS BUILT FOR REFURBISHMENT PROJECT	V.B.	G.R.	K.E.	G.M.	02/98
14	HV-549 ADDED IN PNEUMATIC LINE FOR LCV-552	J.B.H.	R.L.	AvG	A.M.B.	02/02/96
13	P&ID SPLITTING CONTIUATION FROM 0105-0014-02	JCC	RL	AM	SES	06/2016
12	AS BUILT - P84-871 STAB GAS COMPRESSOR DEMO PROJ.	JCC	RL/CB	AM	SES	11/2015
11	AS BUILT FOR EQUIPMENT ISOLATIONS WITH SPADES ETC.	RL	JC/NA	AM	SES	08/2014
10	FT-121 & FQI-121 REMOVED FOR P84-1148	RL	JCC	AM	SES	08/2014
9	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	JCC	AM	SES	08/2014
8	AS BUILT P84-3257 200T INLET BACK PRESSURE CONTROL	LN	JC	AM	SES	05/2014
7	AS BUILT WS1449299 XSV-551 REMOVAL FROM ESD PANEL	ES	CB	LH	SES	05/09
6	AS BUILT WS1225210 'TRU SEAL' VALVE REMOVED	ES	MS	LH	SR	01/2007

AUTOCAD ORIGINAL SHEET SIZE A1

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
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REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0081/1
CAUSE & EFFECTS - 0780-0082/5

		DATE			DATE
DRN	P.RAWLES	01/01/1987	ENG	K.EDEN	
CHK	R.vanLIJF	01/01/1987	APP	R.vanLIJF	24/03/1987

PRODUCT LINES AND COMPRESSORS PIPING & INSTRUMENT DIAGRAM INLET LINES - STAB GAS COMPRESSOR

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0105	0011	01 OF 01 SHTS	31

1000000-0105-0011-01.DWG

EQUIPMENT No.	D-420-1	G-501-1	G-501-2	M-420	M-421	E-422-1	CF-420-1A/2A	C-420-2	C-420-1	CF-420-1B/2B	E-420-5	E-420-4
DESCRIPTION	STABILISER	STABILISER FEED PUMP	STABILISER FEED PUMP	STABILISER O/H SCRUBBER	SUCTION SCRUBBER	STABILISER REBOILER	SUCTION PULSATION BOTTLE	STABILISER O/H COMPRESSOR	STABILISER O/H COMPRESSOR	DISCHARGE PULSATION BOTTLE	STABILISER O/H COMPRESSOR COOLER	STABILISER O/H COMPRESSOR COOLER
CAPACITY	10.3m3	-	-	0.47m3	0.12m3	-	0.028m3	-	-	0.028m3	0.2 m3	0.2m3
MAWP @ TEMP	SHELL: 31.0 Barg @ 120/-29°C			31.0 Barg @ 65/-10°C	44.47 Barg @ 149°C	TUBE 34.47 Barg @ 343/-29°C SHELL 31.03 Barg @ 148/-29°C	51.7/FV @ -29/177°C	45.2 Barg @ 63°C	45.2 Barg @ 63°C	51.7/FV @ -29/177°C	51.7 Barg @ 177°C	51.7 Barg @ 177°C

FROM ZIC-414-2 0104-0004
TO SXV-414-2B 0104-0004
0102-0005/3 TO PIC-421-B
HTS VAPOUR MODE SELECT
STABILISER MODE SELECT
TRIP
SET @ 31 Barg 40 x 80
KGT01_STT_01_V (Sensitivity 2)
TO HIC-421 0102-0005/3
0104-0004 FROM HT SEPARATOR M-307
P4395-80-6C1
KGT01_MPG_13_L (Sensitivity 2)
0105-0011 FROM M-307 HIGH TEMP SEPARATOR
P5210-100-3H1
TRAY 1
TRAY 25
MH
D-420-1
P4200-80-3H1
P4201-80-3H1
M-420
M-421
P4012-80-1H1
P4280-50-1H1
P4333-50-3C1
P4201-80-3H1
KGT01_PGS_10_V (Sensitivity 2)
REFER SPARTAN CONTROLS DRG. No. 0740-0530
CONTROL PANEL
CF-420-2B
C-420-2
CF-420-2A
KGT01_PGS_11_V (Sensitivity 2)
E-420-5
P4328-40-1C1
P4328-50-6C1
P4204-50-6H1
P4202-80-6H1
0105-0009 TO LPS INLET LINE
P4203-80-3H1
P4203-50-6C1
CF-420-1B
C-420-1
CF-420-1A
Stand-by
E-420-4
P4329-40-1C1
P4329-50-6C1
P4330-25-3H1 TO F-201 SURGE VAPORISER 0109-0025
TO PIC-421-B 0102-0005/3
P4206-25-3H1 TO M-505 STAB.COMP.INTER. SEPARATOR 0105-0011
P4306-25-3H1 TO F-201 SURGE VAPORISER 0109-0025
P4007-150-3H1
E-422-1
P4008-50-3H1
P4051-50-3H1
P4220-50-3H1 TO F-420-3 DE-PROPANISERS FEED SURGE DRUM 0104-0003
P4050-50-3H1 TO F-201 SURGE VAPORISER 0109-0025
MPC9026-25-1H1 TO NEW CONDENSATE TANK 0109-0024/1
P5213-25-3H1 TO M-505 STAB COMP INTER COOLER 0105-0011
0105-0011 FROM LC-550
P5208-25-3H1
0109-0023/1 STEAM FROM SUPPLY HEADER
MPS9027-50-1H1
MPS9027-50-3H1
C-501 at mothball status
0105-0011 FROM M-505 STAB COMP SEPARATOR
P5207-50-3H1
P5206-65-3H1
G-501-1
G-501-2
KGT01_STB_01_L (Sensitivity 2)
Stabiliser system is in stand-by condition. Only considered in Sensitivity case 2.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
22	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	07/2013
21	AS BUILT P84-1131 HTS VAPOUR RECYCLE 3 TRAIN OP.	ES/RL	AAB	AM	SES	10/12
20	AS BUILT P84-1041 FLARE GAS MEASUREMENT	ES/RL	TC	AM	SES	09/12
19	AS BUILT P84-1541 AUTOMATIC LEVEL CONTROL	ES/RL	TC	SH	SES	10/11
18	AS BUILT P84-1131 HTS VAPOUR RECYCLE 3 TRAIN OP.	CJ	GH	JS	LH	09/10
17	AS BUILT WS1366493 HTS VAPOUR TO DEC2	VB	KS	PWM	LH	01/10
16	AS BUILT WS2017750 STABILISER LEVELS	ES	TC	LH	SES	09/09
15	AS BUILT WS 1449299	ES	CB	CJ	SES	05/09
14	FI-407-1 LOW ALARM DELETED	JM	MD	LH	PJR	06/2005
13	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
12	AS BUILT FOR WS133241 EDP COMM & DESIGN DATA ADDED	CMW	RL	AvG	AIM	08/02
11	FLANGES ADDED TO VALVES ON P4051	VB	RL	EJH	RJW	02/01
10						
9						
8						
7	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	JCC	AM	TC	09/2018
6	SPEC CHANGE ON LINE MPS9027, REMOVE XT-005 & LO ON XSV-420	RL	JCC	AM	SES	01/2017
5	P84-844 LPG SAMPLE POINTS CONNECTED TO FLARE AS BUILT	CJ	JT	AM	SES	08/2015
4	AS BUILT LO VALVES, VALVE NUMBERING AND ISOLATED EQUIP.	RL	JC/NA	AM	SES	08/2015
3	AS BUILT P84-1219 F-201 OVERPRESSURE	LN	CJ	AM	SES	06/2015
2	REVISED FPR P&ID SPLITTING. CONT. DRG. No's REVISED	RL	JCC	AM	SES	01/2015
1	AS BUILT FOR WS133241 EDP COMM & DESIGN DATA ADDED	CMW	RL	AvG	AIM	08/02

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0080/2
CAUSE & EFFECTS - 0780-0080/3

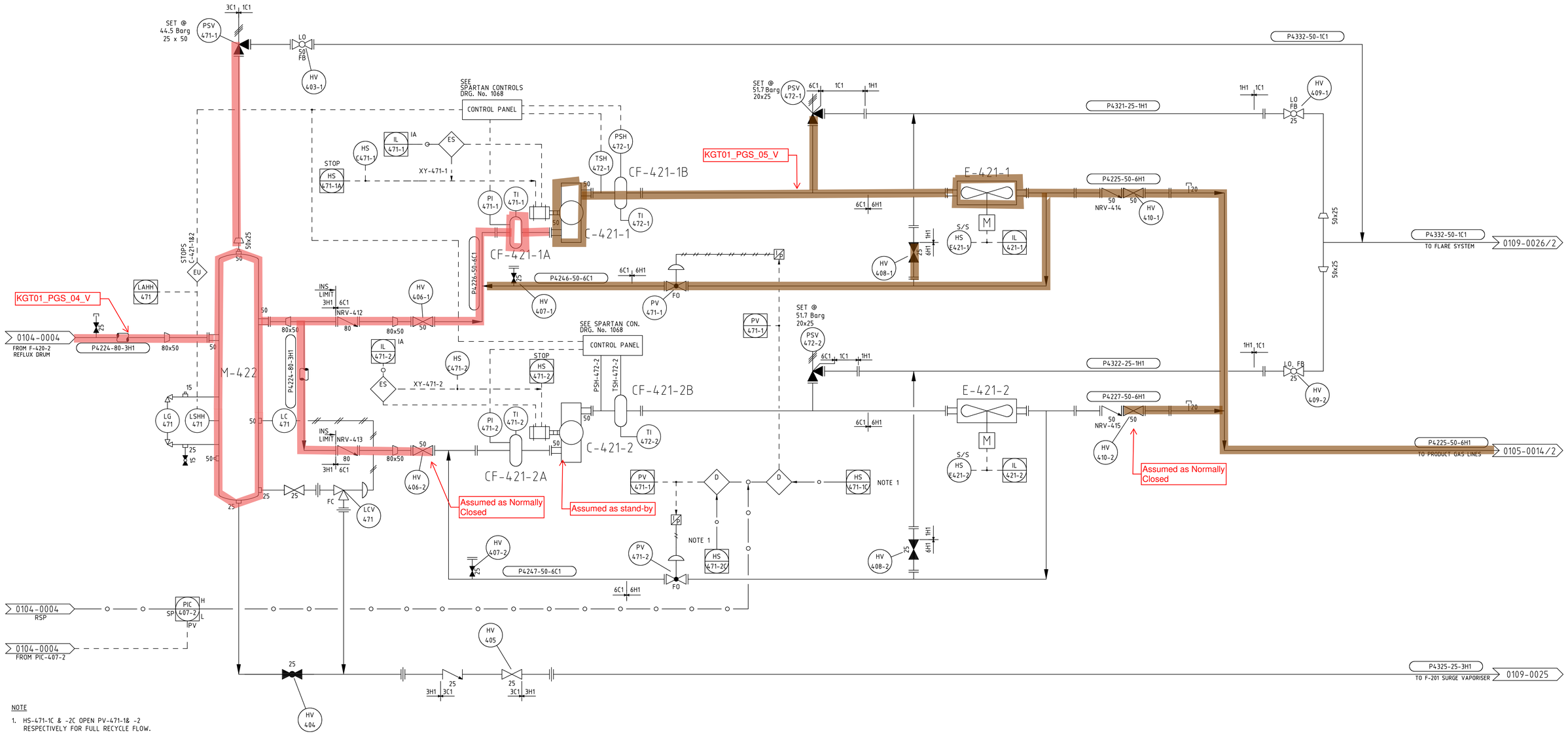
		DATE			DATE
DRN	P.RAWLES	01/02/1987	ENG		
CHK	R.vanLIJF	01/02/1987	APP	R.vanLIJF	24/03/1987

PRODUCT LINES AND COMPRESSORS PIPING & INSTRUMENT DIAGRAM STABILISER AND OVERHEADS COMPRESSION

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0105	0012	01 OF 01 SHTS	28

1000000-0105-0012-01.DWG

EQUIPMENT No.	M-422	C-421-1	C-421-2	CF-421-1A/2A	CF-421-1B/2B	E-421-1	E-421-2
DESCRIPTION	DE-ETHANISER O/H COMP SUCTION SCRUBBER	DE-ETHANISER O/H COMPRESSOR	DE-ETHANISER O/H COMPRESSOR	SUCTION PULSATION BOTTLE	DISCHARGE PULSATION BOTTLE	DE-ETHANISER O/H COMPRESSOR COOLER	DE-ETHANISER O/H COMPRESSOR COOLER
CAPACITY	0.12m3	Xm3	Xm3	0.024m3	0.021m3	0.014m3	0.014m3
MAWP @ TEMP	44.5 Barg @ 149°C	43.4 Barg @ X°C	43.4 Barg @ X°C	51.7@ -29/149°C	75@ -29/177°C	51.7 Barg @ 177°C	51.7 Barg @ 177°C



NOTE

1. HS-471-1C & -2C OPEN PV-471-1& -2 RESPECTIVELY FOR FULL RECYCLE FLOW.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
45	AS BUILT VENTS D/STREAM OF PSV-540 & 541 RUN TO COMMON HEADER	RL/ES	MB	LH	SES	09/2010
62	AS BUILT P84-1438 LPG HAZOP COMMENTS & REMOVE XT-006	RL	JCC	AM	TC	11/2019
61	P&ID SPLITTING 015-0014-01	JCC	RL/NM	AM	SES	06/2016
60	AS BUILT P84-1140 SAMPLE REL., DEMARCATION ADDED	JCC	RL	AM	SES	05/2016
59	AS BUILT LO VALVES, HV-543-A WAS LO & HV-9601 WAS LC	RL	JC	AM	SES	02/2016
58	AS BUILT LO VALVES, VALVE NUMBERING & ISOLATED EQUIP.	RL	JC/NA	AM	SES	08/2015
57	HAND VALVE NUMBER HV-403-1 WAS HV-403	RL	JCC	AM	SES	09/2014
56	AS BUILT P84-2004 PCV-548 REMOVAL & P84-848 WOBBE	RL	NA/AB	AM	SES	07/2014
55	HAND VALVE NUMBERS ADDED FOR ISOLATIONS					
54	AS BUILT P84-1041 FLARE GAS MEASUREMENT	ES/RL	TC	AM	SES	09/2012
53	CONTIN. DRG. No. REVISED FOR EXPORT COMPRESSOR RE-NUMBERING	ES/RL	MH	AM	SES	05/2012
52	P84-814 AS BUILT PORT. ODORANT TANK. PSV-586 SET PRESS ADDED	RL	JG	AM	SES	04/2012
51	P84-814 PARTIAL AS BUILT PORTABLE ODORANT TANK	LN	CJ	AM	SES	03/2012
50	P84-3100 PARTIAL AS BUILT DE-ETH STAB OVHD COMP PSV	CJ	WB	AM	SES	02/2012
49	AS BUILT P84-1070 PRESSURISING GAS FROM GAS GATHERING LINE	RL/MW	LR	JS	SES	07/2011
48	LOGIC ASSOCIATED WITH ZSC-9601 AS BUILT	RL/ES	TC	JS	SES	06/2011
47	HOLD NOTE 1 CLARIFIED	RL/ES	TC	LH	SES	03/2011
46	AS BUILT P84-35. FT-114 FLOW CONDIT. PLATES. PC-KGP-11-KGTH-003.	RL/ES	TC	LH	SES	10/2010

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

0780-0080/01, 02 & 03 CAUSE & EFFECTS
0780-0081/01, 02 & 03 CAUSE & EFFECTS
885-0007 LOGIC DIAGRAM

		DATE		DATE
DRN	P.RAWLES	23/01/1988	ENG	
CHK	R.THAMBYAH	23/01/1988	APP	J.STUART 10/02/1988

LPG PRODUCTION FACILITY
PIPING & INSTRUMENT DIAGRAM
DE-ETHANISER OVERHEAD COMPRESSORS
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0105	0014	01 OF 03 SHTS	62

1000000-0105-0014-01.DWG

EQUIPMENT No.

DESCRIPTION
CAPACITY
MAWP @ TEMP

KGT01_PGS_05_V

0105-0014/1 — P4225-50-6H1 — FROM DE-ETHANISER COMPRESSORS

FT 407-2 | FI 407-2 | FE 407-2 | 30.18mm | 100x50 | 6H1 6C1

0105-0009 — P4228-100-6C1 — STABILISER OVERHEADS/H.T.S. VAPOUR

KGT01_PGS_11_V (Sensitivity 2)

KGT01_MAU_02_V

0105-0023/1 — P5231-100-6C1 — BLENDED MAUI GAS

0105-0013/1 — FROM AIT-114

0112-0002 — FROM LTS PLANT — PI 543 — UG AG 250x200 — 50x20 — FIK — 80x50 — 15 — 80x50 — P1124-50-6H1 — KGTP TRANSMISSION 6H1 6C1 — P3162-50-6C1

TRANSMISSION KGTP

0109-0025/1 — TO FI-976
0108-0041/1 — TO FI-801
TI 593 | TIT 593 | TW 593

0105-0010/1 — TO FI-202
0101-0007/1 — TO AIC-202
FI 532 | PI 532 | TI 532 | FQI 532

KGT01_PGS_01_V

0102-0006/1 — P1089-300-6H1 — PRODUCT GAS FROM GAS CHILLERS

HV 5001 | HV 5002 | HV 531 | HV 548 | HV 5003 | HV 5004 | HV 5005 | HV 529 | HV 528

0105-0010 — P1123-100-6H1 — LTS BY-PASS

0102-0005/1 — 15 SS TUBING

SET @ 55 Barg 80 x 100 — PSV 144

P3077-100-1C1

0109-0026/1 — TO FLARE HEADER — HV 544 — 100 LO — 1C1 6C1

KGT01_PGS_05_V

NOTE 5

FT 532 | TT 532 | PT 532 | FE 532 | PI 523 | TI 532

0101-0005/2 — P1212-200-6C1

KGT01_PGS_11_V (Sensitivity 2)

0105-0009 — P4061-100-6C1

P3001-200-6H1 — P4065-100-6C1

PC 112 | PCV 112

NOTE

1. SEE P&ID 0105-0013/2 FOR MASS SPEC ANALYSER DETAIL.
2. VOID
3. FLOW COMPUTER CONNECTED TO TRANSMISSION RTU.
4. FLOW CONDITIONING PLATES INSTALLED.
5. TEMPORARY PRESSURING GAS LINE, 15 SS TUBING, NORMALLY DISCONNECTED.
6. VOID
7. SERIAL DCS LINK, MULTIPLE TAGS.

KGT01_FGA_01_V

P5226-80-6C1 — PROCESS GAS TO COGEN — 0109-0040
-25-6H1 — TO C-501 STAB COMP — 0105-0011
P9093-40-6H1 — DI-4100A & B FLARE — 0109-0035/3

KGT01_PGS_21_V

HV 532 | 6mm TUBING | MASS SPEC STREAM 12 NOTE 1 | AI 510J | KGTP TRANSMISSION | HV 300 | AW 510J

P3162-100-6H1 — FEED GAS TO A/U PLANT - 112 LINE — TRANSMISSION DRG. No. 1000001-0160-001/1

INS. LIMIT

KGT01_PGS_22_V Sensitivity 2

P1098-40-6H1 — TO BOILER FUEL — 0109-0025

KGT01_PGS_19_V

FG9026-50-6H1 — FUEL GAS TO CO2 RECOVERY SECTION — 0108-0041

KGT01_PGS_01_V

50NB PIPE DOMESTIC SUPPLY — 0105-0014/3

TO FY-601 — 0109-0040/1

TO FI-976 — 0109-0025

TO FY-801 — 0108-0041

TO FIQ-9621 — 0105-0023/1

TO FFIC-120 — 0105-0010

P1089-400-6H1 — TO C-903 PRODUCT GAS COMPRESSORS — 0105-0023/1

SPI-137 | HV 5006 | PI 547 | HV 5008 | HV 527 | AP 510D | P3162-100-6H1 | P5232-40-6C1 | P5232-80-6C1 | FG9026-50-6C1

PI 114 | FYI 114 | TI 114 | FI 114 | HV 5010 | NOTE 7 | NOTE 3

HV 5009 | PIT 114 | FY 114 | TIT 114 | FT 114 | SPI-262 NOTE 4 | HV 5007 | AW 114 | INST | PCV 559

HV 5011 | FYSL 9621 | HS 9621 | ZSO 9601 | ZSC 9601 | ZIC 9601 | ZIO 9601 | XDA 9621 | HV 9601

TO SV-9621 — 0105-0023/1

0105-0013/1

FROM FIC-0106 — 0112-0002/1

TI 9602 | TW 9602 | PI 9621 | FV 0106 | HV 9602 | PI 9602 | AP 510H | P9094-200-6C1

KGT01_PGS_14_V

FROM GAS GATHERING/ SPEC GAS TO 070 LINE — 0105-0031/1

P3067-200-6C1 — TO STOS AND WHAREROA — 0105-0009/1

TO AE-114 — 0105-0013/1

PRODUCT GAS TO SAMPLING — 0105-0013/1

25NB PIPE FROM DOMESTIC SUPPLY — 0105-0014/3

P3235-80-1H1 — TO FLARE HEADER — 0109-0026/1

Confirmed with operation: upstream control valve (FV-120) is manually closed. So, this valve is also assumed to be closed.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
2	HIGH POINT VENT ADDED TO P5231 & HAND VALVE No's ADDED	RL	JCC	AM	RC	01/2019
1	P&ID SPLIT FROM 0105-0014-01	JCC	RL/NM	AM	SES	05/2016

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
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AUTOCAD | ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE			DATE
DRN	P.RAWLES	23/01/1988	ENG		
CHK	R.THAMBYAH	23/01/1988	APP	J.STUART	10/02/1988

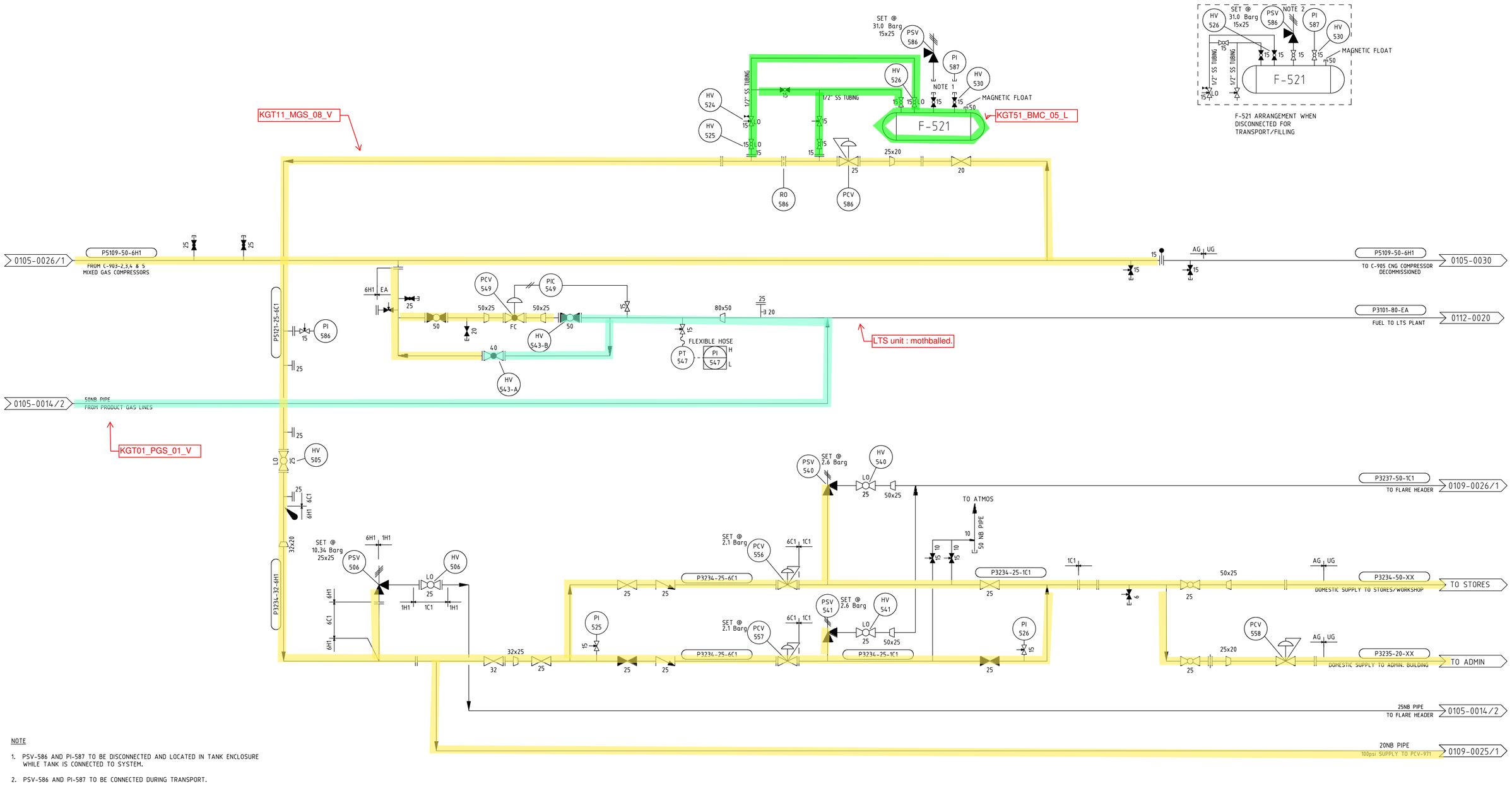
PRODUCT LINES AND COMPRESSORS PIPING & INSTRUMENT DIAGRAM PRODUCT GAS LINES P&ID SPLIT FROM 0105-0014-01

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0105	0014	02 OF 03 SHTS	2

1000000-0105-0014-02.dwg

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

F-521
PORTABLE ODORANT TANK
0.05m3
31.0 Barg @ -29/100°C



NOTE

1. PSV-586 AND PI-587 TO BE DISCONNECTED AND LOCATED IN TANK ENCLOSURE WHILE TANK IS CONNECTED TO SYSTEM.
2. PSV-586 AND PI-587 TO BE CONNECTED DURING TRANSPORT.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
1	P&ID SPLIT 0105-0014-01, CHANGED NOTE 1, ADDED NOTE 2	JCC	RL/NM	AM	SES	05/2016

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE			DATE
DRN	P.RAWLES	23/01/1988	ENG		
CHK	R.THAMBYAH	23/01/1988	APP	J.STUART	10/02/1988

PRODUCT LINES AND COMPRESSORS
PIPING & INSTRUMENT DIAGRAM
DOMESTIC SUPPLY AND PORTABLE ODORANT
P&ID SPLIT FROM 0105-0014-01

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0105	0014	03 OF 03 SHTS	1

1000000-0105-0014-03.DWG

EQUIPMENT No.	B-552	G-553	F-553	G-552-A	G-552-B
DESCRIPTION	PORTABLE FLARE	ODORANT FLUSHING PUMP	ODORANT INJECTION TANK	ODORANT INJECTION PUMP	ODORANT INJECTION PUMP
CAPACITY		FLOW XXSm3/Hr @ XX hp	38m3	3.5 l/h	3.5 l/h
MAWP @ TEMP		MAWP XXXBarG @ XX°C	3.8 Barg @ 50/0°C	86 Barg	86 Barg

1000001-0110-001-01 (TRANSMISSION P&ID) GAS FLOW SIGNAL FROM FY-09004A

1000001-0110-001-01 (TRANSMISSION P&ID) FROM FI-09004A

1000001-0110-001-02 (TRANSMISSION P&ID) FROM PRODUCT GAS COMPRESSORS — P9154-50-1H1

KGT11_MGS_09_V

P9155-6-1H4 — S — XV 553 — BE 552 — BS 552 — HS 552 — XA 552 — SPARK PLUG — HV 564 — FLARE CONTROL BOX

PI 558 — HV 563 — LC — B-552 — HV 562 — P9157-15-1H4

ATMOS — SET @ 1.65 Barg 15 x 15 — PSV 553

SET @ 8 Barg 15 x 15 — PSV 554 — ATMOS — PI 580 — SET @ 1.5 Barg — PCV 552

SET @ 1.0 Barg — PCV 551 — PI 555 — SET @ 1.1 Barg 15 x 15 — PSV 552 — ATMOS

SET @ 1.875 Barg 100 x 150 — PSV 551 — ATMOS — PI 578 — PSE 550

P9152-40-1H4 — 6mm TUBING — SET @ 1.2 Barg 40 x 50 — PSV 550 — P9160-100-1H4

HV 558 — HV 568 — HV 565 — PI 550 — HV 569 — PI 553 — 6mm TUBING

ODORANT CONCENTRATION — FFI 555 — FFAL 555 — FFAH 555 — FQI 555 — COMMON ALARM — XA 9004

MEASURED FLOW — FI 555 — PULSE

FDA 557 — D — FI 557 CALCULATED FLOW — FT 557 — FC 552A/B — XA 550 ODORANT FAILURE

P9158-25-1H1 — STAINLESS — 6mm TUBING

HV 556 — HV 557 — HV 555 — HV 566

P9155-25-1H4 — P9156-25-1H4 — P9153-40-1H4 — P9150-25-1H4

HV 550 — HV 551 — HV 552 — HV 554 — HV 553

M. STEM — GAS PRESSURE — M. STEM — GAS TO FLARE — M. STEM — ODORANT FILL — F. BODY — ODORANT TRANSFER

KGT52_BMC_03_L Odorant filling

KGT51_BMC_05_L Used for transport odourant to F-521

F-553 — N6 N3 M1 N4 C1 N1 C2 N2 N5A N5B — DRAIN

HV 567 — HV 559 — HV 561 — HV 560

LG 555 — LSL 555 — P9159-15-6H4 — ODORANT SHED

ZSOC 552A — XV 552A — PI 579 — G-552-A — N4 FLUSH IN — ZSOC 552B — XV 552B — N5 FLUSH OUT

FE 555 — FT 555 — P9151-15-1H4 — G-552-B — N4 FLUSH IN — N5 FLUSH OUT — Stand-by

PDI 559 — N5 FLUSH OUT

ATMOS — 15mm TUBING — DRIVES PUMP — FLUSH IN RUBBER HOSE — G-553

KGT52_BMC_01_L

KGT52_BMC_02_L — TO NORTH/SOUTH PIPELINES — 1000001-0110-001-02 (TRANSMISSION P&ID)

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
14	CAD MASTER HANDED TO FGL. KGTP COPY FOR REF ONLY	RL	JCC	AM	SES	08/2016
13	AS BUILT FFAL-555 & FFAH-555 ADDED	RL	JCC	AM	SES	02/2016
12	AS BUILT COMMENTS RE PSE SYMBOL & NOTE 1 DELETED	RL	JCC	AM	SES	04/2015
11	KGTP/TRANSMISSION DEMARCATION UPDATE	ES	AvG	LH	PJR	01/07
10	KGTP/TRANSMISSION DEMARCATION UPDATE	SKM	RH	LH	PJR	11/2005
9	AS-BUILT TO W/O #793881	ST	MB	PB	EL	06/05
8	DESIGN DATA RATIONALISED FOR F-553	CMW	RL	AvG	AIM	08/02
7	G-553 NUMBER & DESCRIPTION ADDED	VB	RL	EJH	RS	10/98
6	AS BUILT FOR REFURBISHMENT PROJECT	V.B.	G.R.	K.E.	G.M.	02/98
5	P9157-15-1H4 NOW FROM BOTTOM OF B-552	J.B.H.	R.L.	D.T.	AvG	20/11/95
4	0105-0023 WAS TO PRODUCT GAS COMP.	P.T.D	R.L.	A.V.G.	J.B.G.	9/95
3	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
2	REDRAWN ON AUTOPLANT	V.B.	J.C.	G.M.	C.J.	9/94
REV	AMENDMENT	BY	CHK	ENG	APP	DATE

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE			DATE
DRN	MF	01/12/1987	ENG	G.G.	01/04/1988
CHK	R.S.	01/12/1987	APP	G.G.	01/05/1988

PRODUCT LINES AND COMPRESSORS
PIPING & INSTRUMENT DIAGRAM
ODOURANT INJECTION TO PRODUCT GAS

SCALE	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0105	0022	01 OF 01 SHTS	14

1000000-0105-0022-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

M-512
DRY GAS IN-LINE FILTER
11600 m3
68 Barg @ 20°C

NOTES

1 HV-9622 MAY BE USED TO OVERRIDE ESD OPERATION TO MAINTAIN GAS FLOW TO AUP/BALLANCE. SHOWN IN NORMAL (NOT OVERRIDEN) STATE.
2 LTS CV AVAILABLE FROM STOS, VECTOR MASS SPEC BACKUP.
3 LTS CO2, N2, SG AND BACKUP CV SIGNALS AVAILABLE FROM MASS SPEC.
4 VECTOR ESD TRIP LOGIC.
5 SONIC NOZZLE TO RESTRICT FLOW TO 120% OF METER MAX.
6 GAS FLOW TOTALISERS AND ENERGY FLOW TOTALISERS FOR VECTOR TRANSMITTED SERIALLY VIA FY-9612 TO NORTH METERING HUT SCADA RTU.
7 HEAT TRACE AND INSULATE IMPULSE TUBING.
8 BALL VALVE WITH TRUNNION MOUNTING AND BODY VENT/DRAIN.
9 TRIP CONTROLLER TO MANUAL, ZERO OUTPUT ON PDALL-9625B AND FFAHH-9625B.
10 SETPOINT OF FIC-9625B LIMITED TO LTS/TOTAL = 0.5. FIC-9625 LOCATED IN BALLANCE DCS.
11 FE-9625 316LSS WITH 900# FLANGES TO MEET 6C1 PRESSURE RATING.
12 THESE SIGNALS FROM AUP VIA FIBRE LINK.
13 AW-9612 INSTALLED BY TX PROJECT XC-XO-11-XSTN-014 BUT NOT COMMISSIONED.
14 50NB BALL VALVE REMOVED AND FLANGES BLANKED OFF.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
23	AS BUILT FOR WS96701 CHANGE XSV-9621 RESET LATCH	JMP	LH	MP	PJR	05/07
22	AS BUILT FOR WS1160575 BALLANCE RAW LTS FLOW	ES	AAB	LH	PJR	05/07
39	HIGH POINT VENT ADDED TO LINE P5230-80-6C1	RL	JCC	AM	RC	01/2019
38	HAND VALVE NUMBER HV-9621 ADDED TO BYPASS VALVE	RL	JCC	AM	RC	01/2019
37	AS BUILT CLOSED BLIND SPADE ADDED TO ISOLATE FT-9621	RL	JCC	AM	TC	12/2016
36	AS BUILT BALL VALVE REMOVED FROM LINE P5229-50-6C1	RL	JCC	AM	TC	11/2016
35	AS BUILT XC-XO-11-XSTN-014 FT-9612 ANALYSER PROBE	RL	JC/MM	AM	SES	09/2016
34	TRANSMISSION / KGTP DEMARCATION ADDED RE INCIDENT ACTION	RL	JC	AM	SES	05/2016

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
33	AS BUILT FOR PIPELINE DEMARCATION, NRV No's ETC.	RL	JCC	AM	SES	02/2016
32	AS BUILT P84-055 WHAREROA HIGH PRESSURE LINE TRIP	AJA	PMO	AM	SES	07/2015
31	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL/ES	CR	AM	SES	04/2013
30	DRG No. REVISED FOR EXP. COMP. RE-NUMBERING. WAS 0105-0025/01	RL/ES	MH	AM	SES	05/12
29	AS BUILT DRAIN ADDED TO P5320 & NGC REPLACED WITH VECTOR	RL/ES	JR	AM	SES	02/2012
28	NOTE & TRANS P&ID ADDED TO CLARIFY -TO AUP & LACTOSE	RL/ES	JY/MB	JS	SES	09/2011
27	AS BUILT HAND VALVE HV-9617 NUMBER ADDED	RL	ES	LH	SES	04/2011
26	AS BUILT WS1467593 IMPROVE PROD COMP SUCT PRESS CTRL	ES	AAB	LH	SES	08/09
25	HAND VALVE NUMBERS ADDED FOR FLANGE INSUL. KITS	RL	ES	LH	SES	08/2009
24	AS BUILT WS1214596 LOCAL CONTROL OF MAUI BYPASS	VB	KC	KS	LH	12/07

VECTOR KAPUNI LIMITED
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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
DRAWING NUMBER WAS 0105-0025/01
0105-0029/01 - COMPRESSOR LUBRICATION & VENTS P&ID
0885-0009/01 - LOGIC DIAGRAM
121-X0101/1 BALLANCE FEED GAS DESUPERHEATERS

		DATE		DATE
DRN	W. BAKER	01/12/1985	ENG	
CHK			APP	

PRODUCT LINES AND COMPRESSORS
PIPING & INSTRUMENT DIAGRAM
PRODUCT GAS COMPRESSORS MAUI BYPASS
DRAWING NUMBER WAS 1000000-0105-0025/01

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
N/A	1000000	0105	0023	01 OF 01 SHTS	39

1000000-0105-0023-01.dwg

EQUIPMENT No.	CF-903-2A/CF-903-2B	CF-903-2C/CF-903-2D	CD-903-2	C-903-2	CF-903-2	CE-903-2	CE-903-2-FAN
DESCRIPTION	SUCTION PULSATION BOTTLES	DISCHARGE PULSATION BOTTLES	PRODUCT GAS COMPRESSOR	PRODUCT GAS COMPRESSOR UNIT	PRODUCT GAS COMPRESSOR ENGINE	DISCHARGE AFTERCOOLER UNIT	PRODUCT GAS COMPRESOR FAN
CAPACITY				12.6 Sm3/s @ 41 Barg, 29°C			
MAWP @ TEMP				100 Barg @ HOLD°C			

0105-0023/1 PIC-9604 OUTPUT — TO QIC-9604-5 — 0105-0026/1

P3001-400-6H1 — MIXED GAS — 0105-0026/1

ESD STOP — 0105-0026/1

KGT01_MGS_01_V

400x200 — 25 — 25 — 50 — P3167-200-6H1 — INSTRUMENT GAS — 6 — 200

PGCS F&G — KGTP ESD — ES — ES — OR — 1oo2

NOTE 2 — AS — SV 9650C — SV 9650B — S — R

TO ATMOS. — P9126-50-1H1

UNIT LOCKED OUT — IL 9604-2
START — HS 9676-2
STOP — HS 9680-2
ES
RUN — IL 9676-2
UNIT READY TO LOAD — IL 9677-2
LOAD UNIT — HS 9678-2
UNIT LOADED — IL 9678-2
SPEED CONTROL — QIC 9604-2
QAL 9604-2
UNIT STOPPED — XDA 9602-2

DCS LOGIC

PS 9604-2 — SV 9676-2 — SV 9680-2 — PS 9676-2 — PS 9677-2 — SV 9678-2 — PS 9678-2 — SPEED CONTROL QY 9604-2 — ENGINE SPEED QT 9604-2 — XDS 9602-2

C-903-2
COMPRESSOR CONTROLS
(REF DRG 0710-0110/01 & 02)

HS 9605-2

TO PDSL-9699-2 (Drg 0710-0110/01) 6mm — HV 9636-2

ZSO 9692-2 — HV 9628-2 — ZSC 9692-2 — PV 9692-2 — 200 — FC — P3168-200-6C1

6C1 — 6H1 — 6C1 — HV 9634-2 — 25 — 15 — HV 9629-2 — PV 9693-2 — 25

PSLL 9692-2 SET @ 37 Barg — NOTE 3 — RO 9692-2 — TI 9692-2 — 250x200 — 250x200 — 200NB x 600# RF (TYP-2)

6C1 — VENDOR PACKAGE — STRAINER — 200NB 600# RF

CF-903-2A — CF-903-2B — 100NB x 900# RF (TYP-4)

RO 9693-2A — RO 9694-2A — RO 9694-2B — RO 9693-2B

C-903-2

CD-903-2

TI 9694-C2 — TSH 9694-C2 — TI 9694-D2 — TSH 9694-D2

TI 9694-A2 — TSH 9694-A2 — TI 9694-B2 — TSH 9694-B2

100NB x 900# RF (TYP-4)

CF-903-2D — CF-903-2C — 150NB 600# RF — 200NB 600# RF — 150NB

RO 9693-2D — RO 9694-2D — RO 9693-2C — RO 9694-2C

PSHH 9696-2 SET @ 85.7 Barg

SET @ 93.1 Barg 65 x 100 — PSV 9623-2 — VENDOR PACKAGE — 1H1

CF-903-2
REFER 0105-0025/02

ENGINE JACKET WATER

REFER 0105-0025/03

AUXILLARY COOLING WATER

CE-903-2-FAN

200NB 600# RF

TSH 9697-2 — TI 9697-2 — GAS COOLING

CE-903-2

200NB 600# RF — 6H1 — VENDOR PACKAGE

P9068-200-6H1 — 200x100

KGT01_MGS_03_V

HV 9633-2 — RO 9601-2 — XV 9694-2B — 80 — NRV-506 — 80 — 1H1 6H1 — 100x80

ZSC 9691-2 — FV 9691-2 — 6C1 6H1

P9074-100-6H1 — P9066-80-6H1

P9105-100-1H1 — 150x100 — 1H1 1C1 — 25

XV 9694-2A — HV 9635-2 — 200 — HV 9632-2 — ZSO 9694-2A — 200 — 25

KGT11_MGS_05_V

HV 9631-2 — 25 — 1H1 1C1

LO 150 FB

P9065-100-1H1

0105-0025/2 — P9110-40-1C1 — FUEL GAS RELIEF VENT

0105-0025/2 — P5008-25-1C1 — FROM FUEL GAS SKID

0105-0026/1 — P9061-100-1H1

P9061-100-1C1 — TO FLARE — 0109-0026/2

P5025-150-1C1 — TO FLARE — 0109-0026/2

P9067-350-6H1 — 0105-0026/1

200 — 25 — 25 — 50 — 350x200

NOTES
1. DRAWING NUMBER WAS 0105-0025/02
2. SV TRIP - MANUAL BYPASS DRG No. 0760-0263
3. R09692-1 AND STRAINER ARE A SINGLE UNIT

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
22	AS BUILT P84-1506 PSH-9696-2 CHANGED FROM 89.6 BARG	RL	JCC	AM	TC	06/2019
21	ADD 8 RO'S TO PULSATION BOTTLES & DELETE XT-018	RL	JC	AM	SES	06/2016
20	AS-BUILT - PRODUCT GAS COMP. CONTROL IMPROVEMENTS	JCC	RL/AC	AM	SES	04/2016
19	AS-BUILT DRAIN ADDED TO LINE P9105 & NRV No. ADDED	RL	JC	AM	SES	02/2016
18	AS-BUILT P84-1128 KGTP#2 PGC PULSATION	JB	CJ	AM	SES	10/2014
17	AS BUILT P84-2085 CONTROL HUT RW PENSTOCK	ES/RL	TC	AM	SES	01/2014
16	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	10/2013
15	AS BUILT P84-1041 FLARE GAS MEASUREMENT	ES/RL	TC	AM	SES	09/2012
14	COMPRESSOR VENDOR PACKAGE DETAILED ADDING AFTERCOOLER ETC.	RL/ES	AC	AM	SES	07/2012
13	DRG No. REVISED FOR EXP. COMP. RE-NUMBERING. WAS 0105-0025/02	RL/ES	MH	AM	SES	05/2012
12	AS BUILT NOTE TO PDSL-9699-2 ADDED	ES	JY	LH	SES	12/08
11	MAC UNIONS & 15NB VENT ADDED TO PV-9693-2	ES	RL	LH	SES	05/08
10	AS BUILT WS133145, A-910 PRESSURE PROTECTION PROJECT	RL	DC	LH	RJW	10/01
9	AS BUILT COMMENTS ADDED	VB	RL	EJH	RS	10/98
8	AS BUILT FOR REFIRBISHMENT PROJECT	V.B.	G.R.	K.E.	G.M.	10/97
7	AS BUILT - AUP GAS SUPPLY MODS	J.W.	B.T.	G.E.	A.V.G.	12/95
6	AS BUILT McKEE STAGE 1. ZSOC-9606, 8 & SLU REMOVED	J.B.H.	R.L.	AvG	J.B.G.	10/95
5	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
4	REDRAWN ON AUTOPLANT, NOW 4 SHEETS.	D.R.	J.C.	G.M.	C.J.	09/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD — ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
COMPRESSOR CONTROLS - 0710-0110/01 & 02
CAUSE & EFFECTS - 0780-0092/01
FUEL GAS AND START GAS SYSTEM - 0105-0025/02
COOLING WATER, LUBE OIL, UTILITIES - 0105-0025/03
COMPRESSOR VENDOR PACKAGE - 0303-0040/01

		DATE			DATE
DRN	W.BAKER	01/12/1985	ENG		
CHK			APP		

PRODUCT LINES AND COMPRESSORS PIPING & INSTRUMENT DIAGRAM PRODUCT GAS COMPRESSOR C-903-2 PRODUCT GAS SYSTEM

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0105	0025	01 OF 02 SHTS	22

1000000-0105-0025-01.DWG

CM-903-2
FUEL GAS FILTER SEPARATOR
CAPACITY XXm3
MAWPT 15.86 Barg @ 38°C

CF-903-2
PRODUCT GAS COMPRESSOR ENGINE

PSV 9621-2 SET @ 11.4 Barg 25 x 40
PSV 9622-2 SET @ 11.4 Barg 25 x 40
40NB
50NB
15NB
VENDOR PACKAGE 1C1
P9110-40-1C1 FUEL GAS RELIEF 0105-0025/1
PI 9681-2
PCV 9681B-2
PCV 9681A-2
COOLING WATER TO ENGINE JACKET REFER 0303-0040/01
6H1 VENDOR PACKAGE
FUEL GAS PRE HEATER
FG9035-50-6H1
HV 9641-2
HV 9630-2
LSH 9681-2U
LV 9681-2U
LI 9681-2U
FC
DPI 9683-2
INSTRUMENT GAS SUPPLY TO PV-9692-2
LSH 9681-2L
LV 9681-2L
LI 9681-2L
FQI 9681-2
PCV 9681-2
XCV 9682-2
PNEUMATIC SHUTOFF VALVE
FROM CONTROL PANEL
50x40
50x25
25x15
25x20
FLEXIBLE HOSE
XSV 9686-2
XSV 9688-2
STARTER CRANK
PCV 9661-2
PCV 9662-2
PCV 9663-2
ENGINE PRE & POST LUBE PUMP
POST COOLANT PUMP
COMPRESSOR PRE & POST LUBE PUMP
TO ATMOSPHERE
SILENCER
SECONDARY EXHAUST
ENGINE EXHAUST MUFFLER
PRE LUBE P9109-25-1H1
START GAS P9106-80-1H1
ENGINE EXHAUST P9097-450-1H1
CONTROL PANEL P9107-50-1H1
CF-903-2
ENGINE CARB. MANIFOLD
ENGINE CARB. MANIFOLD
450x350
VENDOR PACKAGE 1H1 (TYP-3)
CONTROL PANEL
TO ATMOS
P9160-25-150#
PCV 9684-2
PCV 9685-2
VENDOR PACKAGE 1H1
P9098-350-1H1
AIR FILTER
1H1 VENDOR PACKAGE
CM-903-2
10 TUBING
25NB
1C1 VENDOR PACKAGE
SET @ 2.1 Barg 15 x 15
PSV 9681-2
LO 25 FB
PIPING TUBING
NOTE 1
8mm TUBING
P5008-25-1C1 TO PS025-150-1C1 0105-0025/1
TO A-910 DRAIN LINE 0105-0029/1
KGT01_MGS_01_V
0105-0023/1 P3163-400-6H1 MIXED GAS FROM MAUI MIXING
P3163-400-6H1 MIXED GAS TO C-903-3 0105-0026/2

NOTES
1. DRAIN VALVE HAS SPRING TO CLOSE.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
9	AS BUILT HAND VALVE NUMBER HV-9641-2 ADDED	RL	JCC	AM	TC	12/2019
8	AS BUILT P84-1436 EXTERNAL VENT FROM XCV-9682-2	RL	JC	AM	TC	08/2018
7	AS BUILT P84-055 WHAREROA HIGH PRESSURE LINE TRIP	AJA	PMO	AM	SES	07/2015
6	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	10/2013
5	COMPRESSOR VENDOR PACKAGE DETAILED ADDING ENGINE ETC.	RL/ES	AC	AM	SES	07/2012
4	DRG No. REVISED FOR EXP. COMP. RE-NUMBERING. WAS 0105-0026/01	RL/ES	MH	AM	SES	05/2012
3	PGC HAZOP MARK UPS WS 1324841	MW	ES	JS	SES	08/11
2	PSV-9621-2 & 9622-2 WERE 11.38 Barg	CMW	RL	AvG	AIM	08/02
1	AS BUILT WS133145, A-910 PRESSURE PROTECTION PROJECT	RL	DC	LH	RJW	10/01

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
DRAWING NUMBER WAS 1000000-0105-0026/01
COMPRESSOR PROCESS GAS SYSTEM - 0105-0025/01
COMPRESSOR VENDOR PACKAGE - 0303-0040/01

		DATE			DATE
DRN	V.BRENNAN	18/12/2000	ENG	K.PAGE	18/12/2000
CHK	R LOCHHEAD	18/12/2000	APP	R.WELLINGTON	18/12/2000

PRODUCT LINES AND COMPRESSORS
PIPING & INSTRUMENT DIAGRAM
PRODUCT GAS COMPRESSOR C-903-2
FUEL GAS AND START GAS SYSTEM

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0105	0025	02 OF 02 SHTS	9

1000000-0105-0025-02.dwg

EQUIPMENT No. | CF-903-3A/CF-903-3B | CF-903-3C/CF-903-3D | CD-903-3 | C-903-3 | CF-903-3 | CE-903-3 | CE-903-3-FAN

DESCRIPTION | SUCTION PULSATION BOTTLES | DISCHARGE PULSATION BOTTLES | PRODUCT GAS COMPRESSOR | PRODUCT GAS COMPRESSOR UNIT 12.6 Sm3/s @ 41 Barg 29°C 100 Barg @ HOLD°C | PRODUCT GAS COMPRESSOR ENGINE | DISCHARGE AFTERCOOLER UNIT | PRODUCT GAS COMPRESOR FAN

CAPACITY

MAWP @ TEMP

0105-0025/1 PIC-9604 OUTPUT

0105-0025/1 MIXED GAS

0105-0025/1 ESD STOP

0105-0026/2 MIXED GAS

HV 9606 400

HV 9608 400

P3001-400-6H1

P3163-400-6H1

KGT01_MGS_01_V

KGT01_MGS_01_V

TO QIC-9604-5 0105-0027/1

P3163-400-6H1

MIXED GAS TO C-903-4 & 5 / FROM RECYCLE 0105-0027/1

ESD STOP 0105-0027/1

TO ATMOS.

UNIT LOCKED OUT IL 9604-3

START HS 9676-3

STOP HS 9680-3

ES

TO LOAD IL 9676-3

UNIT READY TO LOAD IL 9677-3

LOAD UNIT HS 9678-3

UNIT LOADED IL 9678-3

SPEED CONTROL QIC 9604-3

QAL 9604-3

UNIT STOPPED XDA 9602-3

DCS LOGIC

P9126-50-1H1

PS 9604-3 | SV 9676-3 | SV 9680-3 | PS 9676-3 | PS 9677-3 | SV 9678-3 | PS 9678-3 | QY 9604-3 SPEED CONTROL | QT 9604-3 ENGINE SPEED | XDS 9602-3

C-903-3 COMPRESSOR CONTROLS (REF DRG 0710-0108/01 & 02)

HS 9605-3

TO PDSL-9699-3 (Drg 0710-0108/01) 6mm

HV 9636-3

ZSO 9692-3

HV 9628-3 | ZSC 9692-3 | PV 9692-3

200

Assumed as closed

P3169-200-6H1

HV 9634-3

15

25 25

HV 9629-3

PV 9693-3

PSLL 9692-3 SET @ 37 Barg

6H1 VENDOR PACKAGE

RO 9692-3

TI 9692-3

250x200 250x200

200NB x 600# RF (TYP-2)

Stand-by

C-903-3

STRAINER

CF-903-3A

CF-903-3B

200NB 600# RF

100NB x 900# RF (TYP-4)

RO 9693-3A

RO 9694-3A

RO 9693-3B

RO 9694-3B

CD-903-3

TI 9694-C3 | TSH 9694-C3 | TI 9694-D3 | TSH 9694-D3

TI 9694-A3 | TSH 9694-A3

TI 9694-B3 | TSH 9694-B3

100NB x 900# RF (TYP-4)

CF-903-3D

CF-903-3C

150NB 600# RF

200NB 600# RF

150NB

SET @ 85.7 Barg PSHH 9696-3

RO 9693-3D | RO 9694-3D | RO 9693-3C | RO 9694-3C

CF-903-3 REFER 0105-0026/02

SET @ 93.1 Barg 65 x 100 PSV 9623-3

VENDOR PACKAGE 1H1

ENGINE JACKET WATER

REFER 0105-0026/03

AUXILLARY COOLING WATER

CE-903-3-FAN

200NB 600# RF

GAS COOLING

CE-903-3

TSH 9697-3 | TI 9697-3

6H1 VENDOR PACKAGE

P9069-200-6H1

200x100

HV 9635-3

XV 9694-3A

ZSO 9694-3A

Assumed as closed

200

HV 9632-3

PECPR REGULATIONS | PIPELINE REGULATIONS

KGT11_MGS_09_V

PAH 9614 | HV 9607

FIK

P9067-350-6H1

1000001-0110-001-01 (TRANSMISSION P&ID)

M-919 OIL COALESCER

PI 9613 | PSH 9614

FIK

P5109-50-6H1

0105-0014/3

50

KGT11_MGS_08_V

P9072-350-6H1

0105-0027/1

TRANSMISSION KGTP

KGT11_MGS_05_V

P5024-150-1C1

TO FLARE 0109-0026/2

P9061-100-1H1

0105-0025/1

HV 9631-3 | HV 9605 | HV 9604

350

LO 150 FB

P9099-100-1H1

1C1 1H1

150x100

25

FV 9691-3

ZSC 9691-3

100

P9075-100-6H1

P9112-80-6H1

HV 9633-3 | RO 9601-3 | XV 9694-3B

80 80 NRV-507

1H1 6H1

100x80

P9112-100-1H1

P9104-40-1C1

0105-0026/2 FUEL GAS RELIEF VENT

KGT11_MGS_05_V

P9067-350-6H1

0105-0025/1

P5009-25-1C1

0105-0026/2 FROM CM-903-3

P9061-100-1H1

0105-0027/1

NOTES

1. SEE P&ID 0105-0013/02 FOR MASS SPEC ANALYSER DETAILS.
2. VOID.
3. DRAWING NUMBER WAS 0105-0025/03

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
23	PIPELINE / PECPR REGULATION DEMARCATION ADDED ETC.	RL	JC/NM	AM	SES	01/2016
22	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	10/2013
21	AS BUILT P84-1041 FLARE GAS MEASUREMENT	ES/RL	TC	AM	SES	09/2012
20	COMPRESSOR VENDOR PACKAGE DETAILED ADDING AFTERCOOLER ETC.	RL/ES	AC	AM	SES	07/2012
19	DRG No. REVISED FOR EXP. COMP. RE-NUMBERING. WAS 0105-0025/03	RL/ES	MH	AM	SES	05/2012
18	PSV-9590 & 9591 SET PRESSURE ADDED	ES	RL	LH	SES	11/09
17	AS BUILT NOTE TO PDSL-9699-3 ADDED	ES	JY	LH	SES	12/08
16	MAC UNIONS & 15NB VENT ADDED TO PV-9693-3	ES	RL	LH	SES	05/08
15	AS BUILT WS1141075 DOMESTIC GAS METERING SUPPLY	VB	LH	KC	PJR	11/07
14	AS BUILT WS1042819-BENFIELD SYSTEM HAZARD REPORT	ES	CP	LH	PJR	01/07
13	KGTP/TRANSMISSION DEMARCATION UPDATE	SKM	RH	LH	PJR	11/2005
12	DESIGN DATA & LINE NUMBERS RATIONALISED	JBH	RL	AvG	AIM	08/02
11	AS BUILT WS133145, A-910 PRESSURE PROTECTION PROJECT	RL	DC	LH	RJW	10/01
10	ANALYSER INSTRUMENTATION MOVED TO 0105-0013/1	VB	RL	EJH	RS	11/98
27	AS BUILT P84-1506. PSH-9696-3 CHANGED FROM 89.6 BARG	RL	JCC	AM	TC	06/2019
26	ADD 8 RO'S TO PULSATION BOTTLES & DELETE XT-019	RL	JC	AM	SES	06/2016
25	TRANSMISSION / KGTP DEMARCATION ADDED RE INCIDENT ACTION	RL	JC	AM	SES	05/2016
24	AS BUILT - PRODUCT GAS COMP. CONTROL IMPROVEMENTS	JCC	RL/AC	AM	SES	04/2016

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD | ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
COMPRESSOR CONTROLS - 0710-0108/01 & 02
CAUSE & EFFECTS - 0780-0092/01
FUEL GAS AND START GAS SYSTEM - 0105-0026/02
COOLING WATER, LUBE OIL, UTILITIES - 0105-0026/03
COMPRESSOR VENDOR PACKAGE - 0303-0040/01

		DATE			DATE
DRN	W.BAKER	02/12/1985	ENG		
CHK			APP		

PRODUCT LINES AND COMPRESSORS PIPING & INSTRUMENT DIAGRAM PRODUCT GAS COMPRESSOR C-903-3 PRODUCT GAS SYSTEM

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0105	0026	01 OF 02 SHTS	27

1000000-0105-0026-01.dwg

CM-903-3
FUEL GAS FILTER SEPARATOR
CAPACITY XXm3
MAWPT 15.86 Barg @ 38°C

CF-903-3
PRODUCT GAS COMPRESSOR ENGINE

PSV 9621-3 SET @ 11.4 Barg 25 x 40
PSV 9622-3 SET @ 11.4 Barg 25 x 40
40NB
50NB
VENDOR PACKAGE 1C1
P9104-40-1C1
FUEL GAS RELIEF
0105-0026/1
PI 9681-3
PCV 9681B-3
PCV 9681A-3
COOLING WATER TO ENGINE JACKET REFER 0303-0040/01
6H1 VENDOR PACKAGE
FUEL GAS PRE HEATER
FG9036-50-6H1
HV 9641-3
HV 9630-3
Assumed that C-903-3 is in stand-by status. This valve is assumed as closed.
LSH 9681-3U
LI 9681-3U
LV 9681-3U
FC
LSH 9681-3L
LI 9681-3L
LV 9681-3L
DPI 9683-3
FQI 9681-3
INSTRUMENT GAS SUPPLY TO PV-9692-3
CM-903-3
10 TUBING
25NB VENDOR PACKAGE 1C1
LO
FB
NOTE 1
PIPING TUBING
8mm TUBING
FG9036-50-6H1
P3163-400-6H1
0105-0025/2
MIXED GAS FROM C-903-2
P5009-25-1C1
TO PS025-150-1C1
0105-0026/1
TO A-910 DRAIN LINE
0105-0029/1
TO MASS SPEC STREAM 8 AI-510F
0105-0013/1
P3163-400-6H1
MIXED GAS
0105-0026/1
TO ATMOSPHERE
SILENCER
SECONDARY EXHAUST
ENGINE EXHAUST MUFFLER
PCV 9661-3
PCV 9662-3
PCV 9663-3
FROM CONTROL PANEL
FLEXIBLE HOSE
XSV 9686-3
XSV 9688-3
STARTER CRANK
ENGINE LUBRICATOR PUMP
POST COOLANT PUMP
COMPRESSOR PRE LUBE PUMP
PRE LUBE P9103-25-1H1
START GAS P9100-80-1H1
ENGINE EXHAUST P9095-450-1H1
CONTROL PANEL P9101-50-1H1
450x350
VENDOR PACKAGE 1H1 (TYP-3)
CF-903-3
ENGINE CARB. MANIFOLD
TO ATMOS
P9141-25-150#
PCV 9684-3
PCV 9685-3
VENDOR PACKAGE 1H1
P9096-350-1H1
AIR FILTER
CONTROL PANEL
XCV 9682-3
PCV 9681-3
PNEUMATIC SHUTOFF VALVE
FROM CONTROL PANEL
SET @ 2.1 Barg 15 x 15
PSV 9681-3
PI 9616
AP 9616
SAMPLE
TUBING
SET @ 12 Barg 6 NPT
PSV 9590
PSV 9591
PI 9606
PI 9607
PCV 9588
PCV 9587
KGTP TRANSMISSION
TI 9616

NOTES
1. DRAIN VALVE HAS SPRING TO CLOSE.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
10	AS BUILT HAND VALVE NUMBER HV-9641-3 ADDED	RL	JCC	AM	TC	12/2019
9	AS BUILT SAMPLE STREAM LINES CAPPED OFF AT PCV-9587 & 9588	RL	JCC	AM	TC	06/2019
8	AS BUILT P84-1436 EXTERNAL VENT FROM XCV-9682-2	RL	JC	AM	TC	08/2018
7	TRANSMISSION / KGTP DEMARCATION ADDED RE INCIDENT ACTION	RL	JC	AM	SES	05/2016
6	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	10/2013
5	COMPRESSOR VENDOR PACKAGE DETAILED ADDING ENGINE ETC.	RL/ES	AC	AM	SES	07/2012
4	DRG No. REVISED FOR EXP. COMP. RE-NUMBERING. WAS 0105-0027/01	RL/ES	MH	AM	SES	05/2012
3	PGC HAZOP MARK UPS WS 1324841	RL	ES	AC	SES	09/2011
2	PSV-9621-3 & 9622-3 WERE 11.38 Barg	CMW	RL	AvG	AIM	08/02
1	AS BUILT WS133145, A-910 PRESSURE PROTECTION PROJECT	RL	DC	LH	RJW	10/01

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
DRAWING NUMBER WAS 1000000-0105-0027/01
COMPRESSOR PROCESS GAS SYSTEM - 0105-0026/01
COMPRESSOR VENDOR PACKAGE - 0303-0040/01

		DATE			DATE
DRN	V.BRENNAN	18/12/2000	ENG	K PAGE	18/12/2000
CHK	R.LOCHHEAD	18/12/2000	APP	R.WELLINGTON	18/12/2000

PRODUCT LINES AND COMPRESSORS
PIPING & INSTRUMENT DIAGRAM
PRODUCT GAS COMPRESSOR C-903-3
FUEL GAS AND START GAS SYSTEM

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0105	0026	02 OF 02 SHTS	10

1000000-0105-0026-02.dwg

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

CD-903-4
PRODUCT GAS COMPRESSOR
DECOMMISSIONED

C-903-4
PRODUCT GAS COMPRESSOR UNIT
13.3 Sm3/s @ 41.3 Barg, 38°C
93 Barg @ 149°C
DECOMMISSIONED

CF-903-4
PRODUCT GAS COMPRESSOR ENGINE
DECOMMISSIONED

CE-903-4
DISCHARGE AFTERCOOLER UNIT
REMOVED FROM SITE

CE-903-4-FAN
PRODUCT GAS COMPRESSOR FAN
REMOVED FROM SITE

0105-0026/1 — PIC-9604 OUTPUT — P3163-400-6H1 — MIXED GAS FROM MAUI MIXING / FROM RECYCLE — ESD STOP — KGT01_MGS_01_V

TO QIC-9604-5 — 0105-0028/1 — P3163-400-6H1 — MIXED GAS TO C-903-5 / FROM RECYCLE — ESD STOP

COMMON ALARM 1 UA 9604-4 | START HS 9676-4 | STOP HS 9680-4 | ES | RUN IL 9676-4 | UNIT READY TO LOAD IL 9677-4 | LOAD UNIT HS 9678-4 | UNIT LOADED IL 9678-4 | LOAD END 1 HS 9679-A4 | END 1 LOADED IL 9679-A4 | LOAD END 2 HS 9679-B4 | END 2 LOADED IL 9679-B4 | AUTO/MANUAL END LOADING HS 9604-4 | SPEED CONTROL QIC 9604-4 | QAL 9604-4

DCS LOGIC

PS 9604-4 | SV 9676-4 | SV 9680-4 | PS 9676-4 | PS 9677-4 | SV 9678-4 | SV 9679-A4 | PS 9679-A4 | SV 9679-B4 | PS 9679-B4 | QY 9604-4 | SPEED CONTROL QT 9604-4 | ENGINE SPEED FY 9676-4 | STARTING FUEL BYPASS VALVE

C-903-4 COMPRESSOR CONTROLS (REF DRGS 0710-0105, 0710-0109, 0710-0122) — HS 9605-4

P3165-200-6H1

PROCESS SUCTION — SCRUBBER DECOMMISSIONED

C-903-4

CD-903-4
DECOMMISSIONED
ENGINE UTILITIES ON 0105-0029/01

CF-903-4

CE-903-4-FAN

CE-903-4

50 — 25 — 25 — FG9030-50-6H1 — FUEL GAS

SET @ 88 Barg PSH 9696-4

SET @ 93.1 Barg PSV 9623-4 80 x 150 — 6H1, 1H1 — PSV VALVE NOT BLANKED OFF — EXISTING DEMOLISHED

PIPE CUT AND DISCONNECTED

DEMOLISHED
EXISTING
PIPE CUT AND DISCONNECTED

P9062-80-6H1

XV 9694-4B — 80 — NRV-508 — 80 — LC — RO 9601-4 — 1H1, 6H1 — 100x80

NRV-504 — 150 — XV 9694-4A — ZSO 9694-4A — 25 — LC — 150

P9057-150-6H1 — 25 — 25

SET @ 51.7 Barg PSV 9624-4 100 x 150 — 6C1, 1C1 — 200x100 — LO — 150 FB — HV 9637-4

HV 9628-4 — 6H1, 6C1 — LO — 200 — P3165-200-6C1 — 25

P5023-150-1C1

LO — 150 FB — HV 9631-4

0105-0028/1 — P9061-100-1H1 — To Flare header — P9061-100-1H1 — TO FLARE — 0105-0026/1

P5023-150-1C1 — 0109-0026/2

KGT11_MGS_05_V

0105-0026/1 — P9072-350-6H1 — P9072-350-6H1 — 0105-0028/1

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
15	AS-BUILT - LINE No. P3165-200-6H1 WAS SHOWN AS 6C1	RL	JCC	AM	SES	02/2017
14	AS-BUILT - PRODUCT GAS COMP. CONTROL IMPROVEMENTS	JCC	RL/AC	AM	SES	04/2016
13	AS-BUILT FLOW PATH CORRECTIONS AND NRV No's ADDED	RL	JC/NM	AM	SES	01/2015
12	AS-BUILT TO SHOW STATUS OF EXISTING AND DEMOLISHED ASSETS	RL	JCC/NA	AM	SES	12/2014
11	AS-BUILT WBS XC-XO-13-XCOM-010 OVERPRESSURE PROTECTION	LC	CJ	AM	SES	11/2014
10	DRG No. REVISED FOR EXP. COMP. RE-NUMBERING. WAS 0105-0025/04	RL/ES	MH	AM	SES	05/2012
9	AS BUILT COMMENTS ADDED	VB	RL	EJH	RS	10/98
8	AS BUILT FOR REFURBISHMENT PROJECT	V.B.	G.R.	K.E.	G.M.	10/97
7	AS BUILT - AUP GAS SUPPLY MODS	J.W.	B.T.	G.E.	A.V.G.	12/95
6	AS BUILT McKEE STAGE 1. ZSOC-9606, 8 & SLU REMOVED	J.B.H.	R.L.	AvG	J.B.G.	10/95
5	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
4	REDRAWN ON AUTOPLANT, NOW 4 SHEETS.	D.R.	J.C.	G.M.	C.J.	09/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD — ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
DRAWING NUMBER WAS 0105-0025/04

		DATE		DATE
DRN	W.BAKER	02/12/1985	ENG	
CHK			APP	

PRODUCT LINES AND COMPRESSORS
PIPING & INSTRUMENT DIAGRAM
PRODUCT GAS COMPRESSOR C-903-4
DRAWING NUMBER WAS 1000000-0105-0025/04

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0105	0027	01 OF 01 SHTS	15

1000000-0105-0027-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

CM-903-5
SUCTION SCRUBBER
1219 OD X 1800 T/T
51.7 BARG @ 149°C

C-903-5
PRODUCT GAS COMPRESSOR
13.3 Sm3/S @ 41.3 Barg, 38°C
93 Barg @ 149°C

CE-903-5B
GAS COOLER
1488 kW
94.8 Barg @ 177°C

0105-0027/1 PIC-9604 OUTPUT
0105-0027/1 ESD STOP

COMMON ALARM 1 UA 9604-5
START HS 9676-5
ES
RUN IL 9676-5
LOAD UNIT HS 9678-5
LOAD END 1 HS 9679-A5
AUTO/MANUAL END LOADING HS 9604-5
SPEED CONTROL QIC 9604-5
QAL 9604-5

DCS LOGIC

PS 9604-5 | SV 9676-5 | SV 9680-5 | PS 9676-5 | PS 9677-5 | SV 9678-5 | PS 9605-5 | SV 9679-A5 | PS 9679-A5 | SV 9679-B5 | PS 9679-B5 | SPEED CONTROL QY 9604-5 | ENGINE SPEED QT 9604-5 | STARTING FUEL BYPASS VALVE FY 9676-5

UNIT LOADED

C-903-5 COMPRESSOR CONTROLS
(REF DRGS 0710-0111, 0710-0123)
HS 9605-5

NOTES
ASSOCIATED EQUIPMENT NUMBERS:
CD-903-5 - PRODUCT GAS COMPRESSOR
CE-903-5 - DISCHARGE AFTERCOOLER UNIT
CE-903-5A - JACKET WATER COOLER
CE-903-5-FAN - PRODUCT GAS COMPRESSOR FAN
CF-903-5 - PRODUCT GAS COMPRESSOR ENGINE
CF-903-5A - SUCTION PULSATION BOTTLE (WEST)
CF-903-5B - SUCTION PULSATION BOTTLE (EAST)
CF-903-5C - DISCHARGE PULSATION BOTTLE (WEST)
CF-903-5D - DISCHARGE PULSATION BOTTLE (EAST)

1. P9073-150-6C1* FLANGE RATING AS PER ASME B16.5 CL900.
2. P9058-150-6C1 CONTAINS CL900 FLANGE SET.

KGT01_MGS_01_V
0105-0027/1 MIXED GAS FROM MAUI MIXING / FROM RECYCLE
P3163-400-6H1
400x250
P3166-250-6H1
FG9032-50-6H1
KGT01_MGS_07_V
FUEL GAS
C-903-5 ENGINE UTILITIES ON 0105-0029/01
PROCESS SUCTION (REFER REFERENCE DRAWINGS BELOW)
PROCESS SUCTION
PROCESS DISCHARGE
CM-903-5
CE-903-5B
P9051-200-6H1
P9052-200-6H1
P9073-150-6H1
P9073-150-6C1*
*NOTE 1
P5092-80-6H1
P5092-80-6C1
P5022-150-1C1
P5031-150-1C1
P9058-150-6C1 *
* NOTE 2
P9061-80-6C1
P9061-100-1H1
To Flare header
0105-0027/1
P5096-40-1C1
0105-0029/1 FUEL GAS RELIEF VENT
P5088-40-1C1
0105-0029/1 START GAS RELIEF VENT
P5086-25-1C1
SPI-282
P3163-150-6H1
0105-0023/1 FROM PIC-9604
P5022-150-1C1
TO FLARE
0109-0026/2
TUBING 25x8
8mm SS TUBING
TO WASTE OIL SUMP A-910
0105-0029/1
P9058-200-6H1
KGT11_MGS_05_V
P9072-350-6H1
0109-0027/1

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
23	AS BUILT XC-XO-12-XCOM-002 COMPR COOLER REPLACEMENT	RL	KS	AMI	SS/DS	01/2013
22	AS BUILT P84-1041 FLARE GAS MEASUREMENT	ES/RL	TC	AM	SES	09/12
21	DRG No. REVISED FOR EXP. COMP. RE-NUMBERING. WAS 0105-0025/05	RL/ES	MH	AM	SES	05/2012
20	PARTIAL AS BUILT V118 #5 COOLER REPLACEMENT	NK	CJ	JS	AS	10/10
19	PARTIAL AS BUILT P84-3208 NEW RO FOR #5 PGC	SA	CJ	WB	LH	10/10
18	AS BUILT WS1467593 IMPROVE PROD COMP SUCT PRESS CTRL	ES	AAB	LH	SES	08/09
17	AS BUILT TO WS146704 CRIT. CONTROL VALVE FEEDBACK	KN	LH	MP	PJR	09/07
16	AS BUILT ZSO/ZSC-9692-5 ADDED	VB	ES	AAB	PJR	11/06
15	AS BUILT RE JULY SHUTDOWN COMP 5 INCIDENT	VB	CP	LH	PJR	08/06
14	PSV-9623-5 WAS SET AT 93.1 Barg	CMW	RL	DC	AIM	08/02

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
32	AS BUILT HAND VALVE TAG NUMBER HV-9641-5 ADDED	RL	JCC	AM	TC	12/2019
31	AS BUILT P84-1506 FIRST GAS LOWERED PIPELINE RATING	RL	JCC	AM	TC	06/2019
30	AS BUILT-DRAIN ADDED TO LINE P5031-150-1C1 & XT-017 REMOVED	RL	JCC	AM	SES	05/2017
29	AS BUILT - P84-1294 LO REMOVED FROM VALVE HV-9639-5	RL	JCC	AM	SES	02/2017
28	AS BUILT - P84-1294 MODIFY #5 PGC SCRUBBER OIL DRAIN	JB	CJ	AM	TC	11/2016
27	AS BUILT - PRODUCT GAS COMP. CONTROL IMPROVEMENTS	JCC	RL/AC	AM	SES	04/2016
26	AS BUILT FLOW PATH, PV-9616 SET PRESSURE & NRV No's ADDED	RL	JC/MY	AM	SES	01/2016
25	AS BUILT WBS XC-XO-13-XCOM-010 KGTP SUCTION OVERPRESSURE	JS	CJ	AM	SES	09/2015
24	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	10/2013

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
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AUTOCAD ORIGINAL SHEET SIZE A1

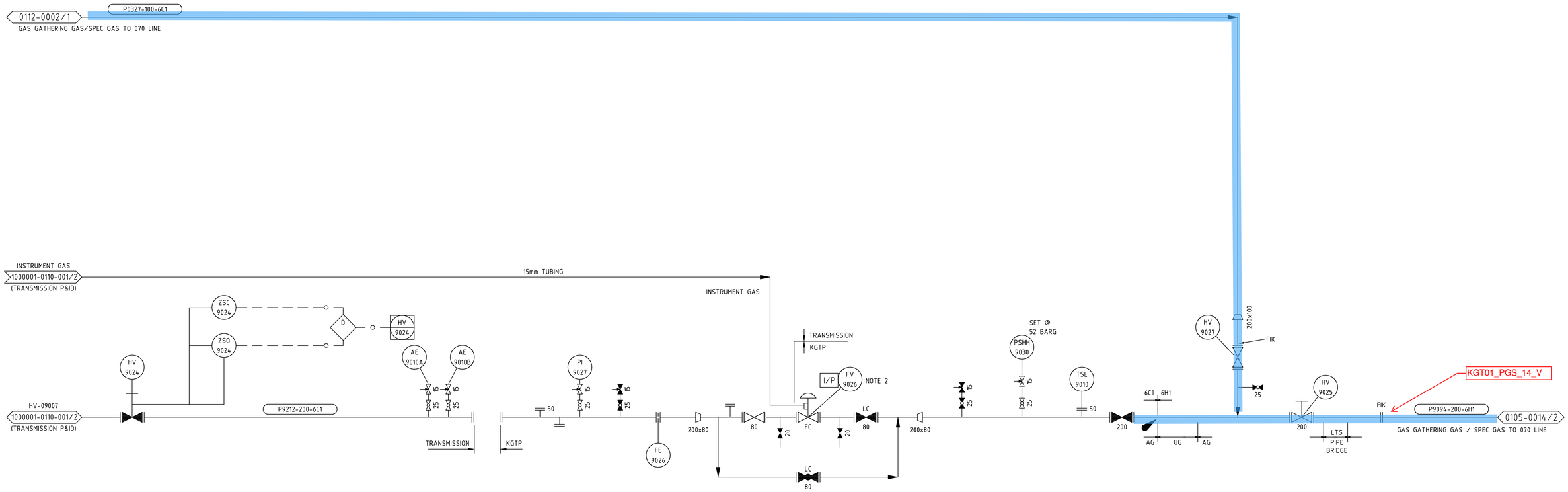
REFERENCE DRAWINGS
DRAWING WAS 0105-0025/05
COMPRESSOR VENDOR PACKAGE P&ID'S - 0303-0002/01, 2, 3 & 4

		DATE		DATE
DRN	W.BAKER	02/12/1985	ENG	
CHK			APP	

PRODUCT LINES AND COMPRESSORS
PIPING & INSTRUMENT DIAGRAM
PRODUCT GAS COMPRESSOR C-903-5
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0105	0028	01 OF 01 SHTS	32

1000000-0105-0028-01.DWG



NOTES

1. 50mm METHANOL INJECTION POINT VIA PORTABLE PUMP
2. WARNING - SIZE OF RELIEF VALVE PSV-144 IS SET BY MAX STOP OF FV-9026

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
12	TRANSMISSION / KGTP DEMARCATION ADDED RE INCIDENT ACTION	RL	JC	AM	SES	05/2016
11	DRG No. REVISED FOR EXP. COMP. RE-NUMBERING. WAS 0105-0029/01	RL/ES	MH	AM	SES	05/2012
10	KGTP/TRANSMISSION DEMARCATION UPDATE	ES	AvG	LH	PJR	01/07

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
9	GAS GATHERING MODE	RL	ES	LH	PJR	06/2006
8	AS BUILT TO NGC ENGINEERING MARK-UP	ES	KC	LH	PJR	06/05
7	WS971915 AS BUILT. GAS TO METHANEX	JBH	RL	LH	PJR	03/02/05
6	AS BUILT FOR WS860238 GAS GATHERING / KGTP TIE IN'S	RL	DT	LH	PJR	11/2004
5	AS BUILT FOR LTS OVERHEADS PROJECT	RL	JBH	EJH	RS	05/00
4	REVISED FOR NEW PRINT. DRAWING CONTENT NOT CHANGED	VB	RL	EJH	RS	10/99
3	AS BUILT FOR REFURBISHMENT PROJECT	V.B.	G.R.	K.E.	G.M.	10/97
2	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	6/95
1	AS-BUILT FOR MCKEE GAS PROJECT STAGE 1	J.T.	M.C.	R.V.	C.J.	5/95
0	ISSUED FOR CONSTRUCTION	J.T.	M.C.	R.V.		3/95

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
DRAWING NUMBER WAS 0105-0029/01

		DATE			DATE
DRN	J.TERRILL	22/02/1995	ENG	R. VERNON	22/02/1995
CHK	D. AITKEN	22/02/1995	APP	C. JANATA	01/03/1995

PRODUCT LINES AND COMPRESSORS
PIPING & INSTRUMENT DIAGRAM
McKEE GAS METERING & CONTROL
DRAWING NUMBER WAS 1000000-0105-0029/01

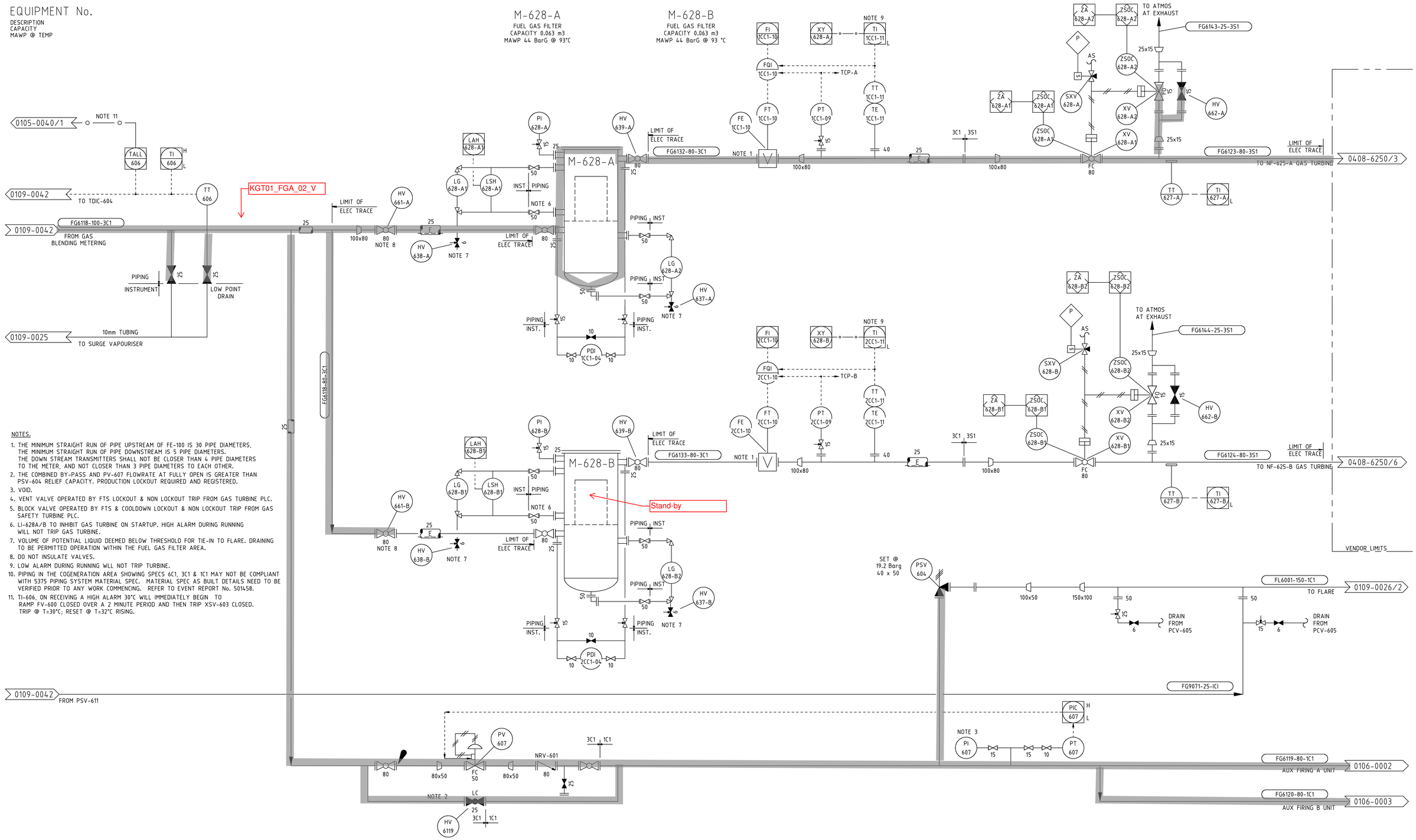
SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
N/A	1000000	0105	0031	01 OF 01 SHTS	12

1000000-0105-0031-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

M-628-A
FUEL GAS FILTER
CAPACITY 0.063 m3
MAWP 44 BarG @ 93°C

M-628-B
FUEL GAS FILTER
CAPACITY 0.063 m3
MAWP 44 BarG @ 93 °C



NOTES:

1. THE MINIMUM STRAIGHT RUN OF PIPE UPSTREAM OF FE-100 IS 30 PIPE DIAMETERS, THE MINIMUM STRAIGHT RUN OF PIPE DOWNSTREAM IS 5 PIPE DIAMETERS. THE DOWN STREAM TRANSMITTERS SHALL NOT BE CLOSER THAN 4 PIPE DIAMETERS TO THE METER, AND NOT CLOSER THAN 3 PIPE DIAMETERS TO EACH OTHER.
2. THE COMBINED BY-PASS AND PV-607 FLOWRATE AT FULLY OPEN IS GREATER THAN PSV-604 RELIEF CAPACITY. PRODUCTION LOCKOUT REQUIRED AND REGISTERED.
3. VOID.
4. VENT VALVE OPERATED BY FTS LOCKOUT & NON LOCKOUT TRIP FROM GAS TURBINE PLC.
5. BLOCK VALVE OPERATED BY FTS & COOLDOWN LOCKOUT & NON LOCKOUT TRIP FROM GAS SAFETY TURBINE PLC.
6. LI-628A/B TO INHIBIT GAS TURBINE ON STARTUP. HIGH ALARM DURING RUNNING WILL NOT TRIP GAS TURBINE.
7. VOLUME OF POTENTIAL LIQUID DEEMED BELOW THRESHOLD FOR TIE-IN TO FLARE. DRAINING TO BE PERMITTED OPERATION WITHIN THE FUEL GAS FILTER AREA.
8. DO NOT INSULATE VALVES.
9. LOW ALARM DURING RUNNING WLL NOT TRIP TURBINE.
10. PIPING IN THE COGENERATION AREA SHOWING SPECS 6C1, 3C1 & 1C1 MAY NOT BE COMPLIANT WITH 5375 PIPING SYSTEM MATERIAL SPEC. MATERIAL SPEC AS BUILT DETAILS NEED TO BE VERIFIED PRIOR TO ANY WORK COMMENCING. REFER TO EVENT REPORT No. 501458.
11. TI-606, ON RECEIVING A HIGH ALARM 30°C WILL IMMEDIATELY BEGIN TO RAMP FV-600 CLOSED OVER A 2 MINUTE PERIOD AND THEN TRIP XSV-603 CLOSED. TRIP @ T=30°C; RESET @ T=32°C RISING.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
18	PDI-1CC1 & PDI-2CC1 WERE SHOWN CLOSED & COD No. REVISED	RL	JCC	AM	TC	08/2019
17	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	JCC	AM	TC	09/2016
16	NON RETURN VALVE NUMBER NRV-601 ADDED	RL	JC	AM	SES	07/2015
15	HAND VALVE NUMBERS ADDED FOR ISOLATIONS & PROCESS	RL/ES	CR	AM	SES	08/2013
	CONDITIONS UPDATED FOR M-628-A AND B					
14	AS BUILT P84-3017. REPLACE PV-607.	RL	SAR	AM	SES	02/2012
13	AS BUILT P84-3021 GT GAS FLOW TO DCS	ES	AAB	LH	SES	10/10
12	AS BUILT WS2006877 KEJV SOLAR 50/50 SPLIT	ES	AAB	LH	SES	05/09
11	AS BUILT INCIDENT REPORT 503502 -3S1 LINE No.s REVISED	RL	MD	LH	PJR	07/07

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
10	AS BUILT WS998333 COGEN FUEL SUPPLY	PJ	LH	MP	PJR	05/07
9	NOTE 10 ADDED RE INCIDENT REPORT NUMBER 501458	RL	DS	LH	PJR	04/2007
8	AS BUILT FOR WS1062668 IMPLEMENT KVAERNER REPORT	VB	LH	MP	PJR	03/07
7	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	LH/CM	AIM	11/02
6	AS BUILT WS156953 COGEN AUX. FUEL	CMW	RL	DC	AIM	11/02
5	WS189886 GT FUEL GAS TEMPERATURES TO DCS AS BUILT	JBH	RL	AAB	PJR	08/02
4	FLOW & TEMPERATURE TAGS RATIONALISED	JBH	RL	AvG	AIM	08/02
3	6mm TUBING CORRECTED TO 10mm	VB	RL	EJH	RS	10/99
2	AS BUILT COMMENTS INCORPORATED	VB	RL	EJH	RS	06/99
1	REDRAWN ON CAD FROM SOLAR DRAWING	VB	RL	EJH	RS	11/98

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
SOLAR DRAWING 5163-1500-F001

		DATE			DATE
DRN	V BRENNAN	16/11/1998	ENG	E J HURLEY	14/05/1999
CHK	R LOCHHEAD	14/05/1999	APP	R SUMBALY	14/05/1999

COGENERATION AREA
PIPING & INSTRUMENT DIAGRAM
FUEL GAS FILTERS
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SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
N/A	1000000	0106	0001	01 OF 01 SHTS	18

1000000-0106-0001-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

C-624-1
COOLING AIR FAN
FLOW XXSm3/Hr @ XX hp
MAWP XXXBarg @ XX*C

C-624-2
COOLING AIR FAN
FLOW XXSm3/Hr @ XX hp
MAWP XXXBarg @ XX*C

B-604-A1
DUCT BURNER
CAPACITY XXm3
MAWP XXXBarg @ XXX*C

B-604-A2
DUCT BURNER
CAPACITY XXm3
MAWP XXXBarg @ XXX*C

B-604-A3
DUCT BURNER
CAPACITY XXm3
MAWP XXXBarg @ XXX*C

0106-0003 FROM PSL-693B
0106-0023 FROM PIC-657A
0109-0042 FROM SURGE VAPOURISER
KGT01_MPG_21_V
KGT01_FGA_02_V
0106-0001 FROM GAS METERING SKID
FG9069-80-1C1
FG6119-80-1C1
NOTE 1
NOTE 2
NOTE 3
INSUL LIMIT
1C1 150#
TO ATMOS
TO DRAIN
COMMON FOR BOTH UNITS
NRV-602
NRV-603
NRV-604
NRV-605
150x80squ DUCT
C-624-1
C-624-2
HS 624-1 STOP
HS 624-2 STOP
HI 624-1
HI 624-2
CA6002-150-150#
FQIC 666A CONTREC
FI 666A
PI 690A
TI 690A
RO 690A
TT 690A
PT 690A
TE 690A
FT 666A
FE 666A
HV 658A
HV 659A
HV 690A
PCV 690A1
PSH 690A7
PI 690A
PV 690A2
ZT 690A2
ZSC 690A2
PI 690A1
ZSC 690A
PIT 690A1
DCS
PCV 690A
PI 691A
SET @ 5.1 Barg
SET @ 3.5 Barg
SET @ 6.0 Barg
SET @ 2.3 Barg
SET @ 0.7 Barg
FG6145-15-TUBE
1/2" SS TUBING
FG6129-25-150#
FG6125-150-150#
6mm TUBING
MAIN RELAY TRIP LOGIC
HGPR-A
LGPR-A
CA6000-150-150#
ZI 690A2
ZIC 690A7
PSH 690A5
ZIC 690A5
PSH 690A3
ZIC 690A3
PSH 690A1
PSL 690A2
ZIC 690A4
PSL 690A4
ZIC 690A6
PSL 690A6
ZIC 690A8
RUNNER 1 BMS CONTROLLER
RUNNER 2 BMS CONTROLLER
RUNNER 3 BMS CONTROLLER
SXV 690A15
SXV 690A16
XV 690A3
XV 690A4
ZSC 690A3
ZSC 690A4
SV 690A9
SV 690A10
PI 604-A1
SXV 690A17
SXV 690A18
XV 690A5
XV 690A6
ZSC 690A5
ZSC 690A6
SV 690A11
SV 690A12
PI 604-A2
SXV 690A19
SXV 690A20
XV 690A7
XV 690A8
ZSC 690A7
ZSC 690A8
SV 690A13
SV 690A14
PI 604-A3
CA6001-150-150#
TO DUCT BURNER B-604-B1,B2 & B3
TO PIC-605
TO PIC-657A
HV 660B
HV 660A
SXV 692A6
SXV 692A7
BE 604A1
BS 604A1 R1 UVS
SXV 692A8
SXV 692A9
BE 604A2
BS 604A2 R2 UVS
SXV 692A10
SXV 692A11
BE 604A3
BS 604A3 R3 UVS
XV 692A
ZSC 692A
XV 692A1
ZSC 692A1
XV 692A2
ZSC 692A2
XV 692A3
ZSC 692A3
XV 692A4
ZSC 692A4
XV 692A5
ZSC 692A5
TO FLAME SUPERVISION
PILOT
IGNITOR
ING
SIGHT GLASS
FG6130-25-150#
FG6126-80-150#
FG6131-25-150#
FG6127-80-150#
FG6128-80-150#
TO 7 INLET DUCT VIEWPORTS
25 NB
PAL 693A
PSL 693A
25x15
B-604-A1
B-604-A2
B-604-A3
GAS TURBINE EXHAUST
DUCT BURNER (REFER DRG 0106-0025/01)

NOTES.

1. STEAM JACKETTED OR THERMAL CEMENT TO ENSURE TEMPERATURE OF 100°C IS MAINTAINED.
2. PIPING IN THE COGENERATION AREA SHOWING SPECS 6C1, 3C1 & 1C1 MAY NOT BE COMPLIANT WITH 5375 PIPING SYSTEM MATERIAL SPEC. MATERIAL SPEC AS BUILT DETAILS NEED TO BE VERIFIED PRIOR TO ANY WORK COMMENCING. REFER TO EVENT REPORT No. 501458.
3. SPRING TO CLOSE VALVE

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
13	NON RETURN VALVE (NRV) NUMBERS ADDED	RL	JCC	AM	TC	09/2019
12	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	08/2013
11	AS BUILT P84-1061 VENT LINE	LN	RL	AM	SES	04/2013

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
10	P84-1061 HRSG PLC UPGRADE - PARTIAL AS BUILT	LN	CJ	AM	SES	07/2012
9	AS BUILT P84-1152 PI-604-A1, A2 AND A3 ADDED	RL	WB	LH	SES	08/2010
8	NOTE 2 ADDED RE INCIDENT REPORT NUMBER 501458	RL	SR	LH	PJR	01/2007
7	AS BUILT - GAS PRESSURE SWITCH MODS	ES	AAB	LH	PJR	11/05
6	EQUIP. No. FOR HRSG MOVED TO 0106-0025/01	PL	RL	DT	PJR	24/06/03
5	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
4	WS184313 SURGE VAPOURISER TO COGEN FUEL AS BUILT	JBH	RL	AvG	AIM	06/08/02
3	PI-690A SIGNAL CORRECTED FROM TT-690A TO PT-690A	VB	RL	EJH	RS	10/99
2	AS BUILT COMMENTS INCORPORATED	VB	RL	EJH	RS	06/99
1	REDRAWN ON CAD FROM SENIOR DWG	VB	RL	EJH	RS	11/98

VECTOR LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4620
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
SENIOR DRAWING No. 4256 B1 TC

		DATE			DATE
DRN	V BRENNAN	09/11/1998	ENG	E HURLAY	14/05/1999
CHK	R LOCHHEAD	14/05/1999	APP	R SUMBALY	14/05/1999

COGENERATION AREA
PIPING & INSTRUMENT DIAGRAM
DUCT BURNERS FOR HRSG 'A'
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SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0106	0002	01 OF 01 SHTS	13

1000000-0106-0002-01.dwg

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

B-604-B1
DUCT BURNER
CAPACITY XXm3
MAWP XXXBarg @ XXX°C

B-604-B2
DUCT BURNER
CAPACITY XXm3
MAWP XXXBarg @ XXX°C

B-604-B3
DUCT BURNER
CAPACITY XXm3
MAWP XXXBarg @ XXX°C

0106-0002 FROM COOLING AIR FANS
CA6001-150-150#
0106-0024 FROM PIC-657B
KGT01_MPG_21_V
0109-0042 FROM SURGE VAPOURISER
FG9069-80-1C1
NOTE 1
0106-0001 FROM GAS METERING SKID
FG6120-80-1C1
KGT01_FGA_02_V
INSUL LIMIT
1C1 150#
FQIC 666B CONTREC
FI 666B
PI 690B
TI 690B
TT 690B
PT 690B
TE 690B
FT 666B
FE 666B
HV 658B
TO ATMOS
RO 690B
NRV-606
FG6146-15-TUBE 1/2" SS TUBING
HGPR-B
LGPR-B
MAIN RELAY TRIP LOGIC
SET @ 5.1 Barg
SET @ 3.5 Barg
PCV 690B1
PSH 690B7
PSH 690B7-1
PSL 690B8
NRV-607
HV 659B
HV 690B
SET @ 6.0 Barg
SET @ 2.3 Barg
PI 690B
PV 690B2
ZT 690B2
ZSC 690B2
PI 690B1
ZSC 690B
DCS
PIT 690B1
FG6140-25-150#
FG6134-150-150#
SET @ 0.7 Barg
PCV 690B
PI 691B
6mm TUBING
TO DRAIN
ZI 690B2
ZIC 690B7
PSH 690B5
ZIC 690B5
PSH 690B3
ZIC 690B3
PSH 690B1
PSL 690B2
ZIC 690B4
PSL 690B4
ZIC 690B6
PSL 690B6
ZIC 690B8
RUNNER 1 BMS CONTROLLER
SXV 690B15
SXV 690B16
XV 690B3
XV 690B4
PSH 690B1
PSL 690B2
ZSC 690B3
ZSC 690B4
SV 690B9
SV 690B10
PI 604-B1
RUNNER 2 BMS CONTROLLER
SXV 690B17
SXV 690B18
XV 690B5
XV 690B6
PSH 690B3
PSL 690B4
ZSC 690B5
ZSC 690B6
SV 690B11
SV 690B12
PI 604-B2
RUNNER 3 BMS CONTROLLER
SXV 690B19
SXV 690B20
XV 690B7
XV 690B8
PSH 690B5
PSL 690B6
ZSC 690B7
ZSC 690B8
SV 690B13
SV 690B14
PI 604-B3
6mm TUBING
150x100
RUNNER 1 BMS CONTROLLER
SXV 692B6
SXV 692B7
BE 604B1
BS 604B1 R1 UVS
XV 692B
ZSC 692B
ZSC 692B1
XV 692B1
FG6138-25-150#
ING
10 TUBING
SIGHT GLASS
PILOT
IGNITOR
40x25
NOTE 4
FG6135-80-150#
B-604-B1
RUNNER 2 BMS CONTROLLER
SXV 692B8
SXV 692B9
BE 604B2
BS 604B2 R2 UVS
XV 692B2
ZSC 692B2
ZSC 692B3
XV 692B3
FG6139-25-150#
FG6136-80-150#
B-604-B2
TO 7 INLET DUCT VIEWPORTS
25NB
RUNNER 3 BMS CONTROLLER
SXV 692B10
SXV 692B11
BE 604B3
BS 604B3 R3 UVS
XV 692B4
ZSC 692B4
ZSC 692B5
XV 692B5
FG6140-25-150#
FG6137-80-150#
B-604-B3
PAL 693B
PSL 693B
25x15
GAS TURBINE EXHAUST
TO C-626-1&2 COOLING AIR FAN 0106-0002
TO FLAME SUPERVISION
TO PIC-657B 0106-0024
TO PIC-605 0109-0042
DUCT BURNER (REEFER DWG 0106-0026/011)

NOTES.
1. STEAM JACKETTED OR THERMAL CEMENT TO ENSURE TEMPERATURE OF 100°C IS MAINTAINED.
2. PIPING IN THE COGENERATION AREA SHOWING SPECS 6C1, 3C1 & 1C1 MAY NOT BE COMPLIANT WITH 5375 PIPING SYSTEM MATERIAL SPEC. MATERIAL SPEC AS BUILT DETAILS NEED TO BE VERIFIED PRIOR TO ANY WORK COMMENCING. REFER TO EVENT REPORT No. 501458.
3. SPRING TO CLOSE VALVE
4. SMALL BORE ORIFICE (REDUCER) FITTING

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
13	AS BUILT - NOTE 4 SMALL BORE ORIFICE REDUCER	JCC	RL/TW	AM	SES	11/2016
12	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	08/2013
11	AS BUILT P84-1061 VENT LINE	LN	RL	AM	SES	04/2013

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
10	P84-1061 HRSG PLC UPGRADE - PARTIAL AS BUILT	LN	CJ	AM	SES	07/2012
9	AS BUILT P84-1152 PI-604-B1, B2 AND B3 ADDED	RL	WB	LH	SES	08/2010
8	NOTE 2 ADDED RE INCIDENT REPORT NUMBER 501458	RL	SR	LH	PJR	01/2007
7	AS BUILT - GAS PRESSURE SWITCH MODS	ES	AAB	LH	PJR	11/05
6	EQUP. No. FOR HRSG MOVED TO 0106-0026/01	PL	RL	DT	PJR	06/03
5	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
4	WS184313 SURGE VAPOURISER TO COGEN FUEL AS BUILT	JBH	RL	AvG	AIM	06/08/02
3	PI-690B SIGNAL CORRECTED FROM TT-690B TO PT-690B	VB	RL	EJH	RS	10/99
2	AS BUILT COMMENTS INCORPORATED	VB	RL	EJH	RS	06/99
1	REDRAWN ON CAD FROM SENIOR DRAWING	VB	RL	EJH	RS	11/98

AUTOCAD ORIGINAL SHEET SIZE A1

VECTOR LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4620
PHONE 0800 734 567

REFERENCE DRAWINGS
SENIOR DRAWING 4344 B1 TC

		DATE			DATE
DRN	V BRENNAN	19/11/1998	ENG	E J HURLEY	14/05/1999
CHK	R LOCHHEAD	14/04/1999	APP	R SUMBALY	14/05/1999

COGENERATION AREA
PIPING & INSTRUMENT DIAGRAM
DUCT BURNERS FOR HRSG 'B'
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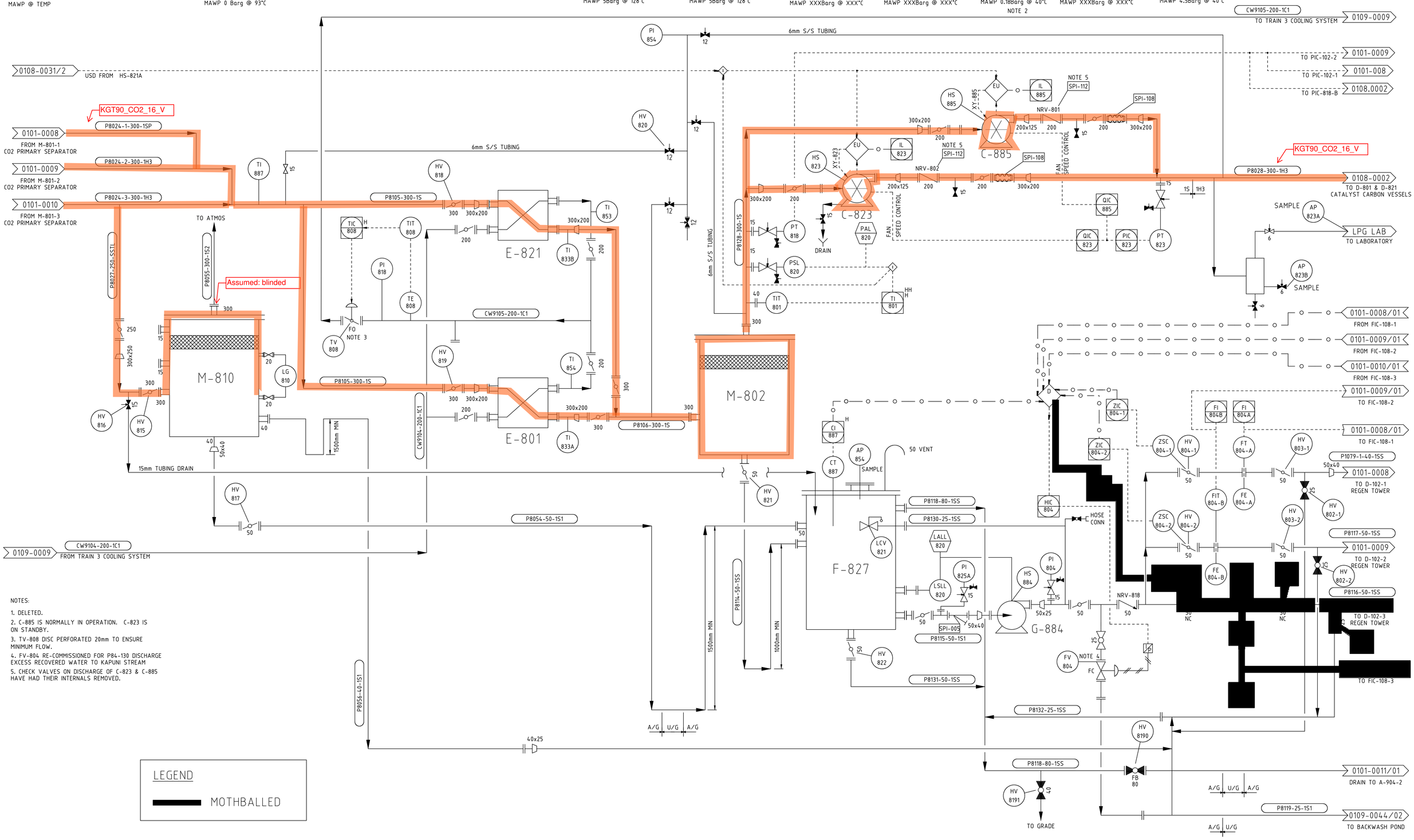
SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0106	0003	01 OF 01 SHTS	13

1000000-0106-0003-01.dwg

EQUIPMENT No.	M-810	E-821	E-801	M-802	C-823	C-885	F-827	G-884
DESCRIPTION	CO2 STEAM VENT SEPARATOR	HEAT EXCHANGER	HEAT EXCHANGER	RAW GAS SEPARATOR	RAW GAS BOOSTER	RAW GAS BOOSTER	RECOVERED WATER TANK	RECOVERED WATER PUMP
CAPACITY	CAPACITY HOLD			CAPACITY XXm3	FLOW XXm3 Hr @ XXhp	FLOW 3429m3 Hr @ 32kw	CAPACITY XXm3	FLOW 5.3m3/Hr @ XX hp
MAWP @ TEMP	MAWP 0 Barg @ 93°C	MAWP 5Barg @ 128°C	MAWP 5Barg @ 128°C	MAWP XXXBarg @ XXX°C	MAWP XXXBarg @ XXX°C	MAWP 0.18Barg @ 40°C NOTE 2	MAWP XXXBarg @ XXX°C	MAWP 4.5Barg @ 40°C



REV	AMENDMENT	BY	CHK	ENG	APP	DATE
26	AS BUILT WS1236269 CTRL RECOVERED WATER TO REGENS	ES	TC	LH	PJR	01/07
25	AS BUILT TRAIN 1, 2, 3 WASH WATER WS993196	ES	RL	LH	ST	12/06
24	AS BUILT WS1043230 CATT VENT & WS1112602 RECOV WTR	RL	ES	LH	ST	04/06
23	AS BUILT FOR WS884521 CO2 UPGRADE PCN004	WXB	CL	MP	LH	02/06
22	AS BUILT FOR WS884521 CO2 UPGRADE	JMP	VB	MP	CF	09/05
21	AS BUILT FOR PEP PROJECT	RL	RH	CP/LH	PJR	02/2004
38	AS BUILT P84-1418 INSTRUMENTS & SITE AS BUILDING MODS	RL	JC/MM	AM	TC	11/2019
37	AS BUILT P84-1418 DISCHARGE RECOVERED WATER TO RIVER	RL	JC/MM	AM	TC	10/2019

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
36	AS BUILT P84-1367 MOTHBALL BENFIELD TRAIN 3	JB	CJ	AM	TC	09/2019
35	AS BUILT P84-1142 PV-102-3 REMOVED, ADDED NRV NUMBERS	JCC	RL/TC	AM	SES	05/2015
34	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	16/2013
33	HAND VALVE NUMBERS FOR G-884 DISCHARGE RE-ASSIGNED	RL	AC	AM	SES	12/2012
32	AS BUILT P84-130 DISCH EXCESS RECOVERED WATER TO STREAM	LN	CJ	AM	SES	11/2012
31	P84-130 DEMOILTION AS BUILT	CJ	JG	AM	SES	06/2012
30	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL/ES	CR	AM	SES	06/2012
29	INCIDENT 511093. CHECK VALVE INTERNALS AS NOTE 5	RL/ES	CA	LH	SES	11/2010
28	TAG NOS. MODIFIED	ES	CB/RL	LH	SES	07/08
27	VALVES SWAPPED-LINE P8119-25-1S1, PI-818 ADDED	ES	RL	LH	SES	01/08

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE			DATE
DRN	P.MILLS	28/04/1980	ENG	R.VanLIJF	
CHK	R.LOGAN	28/04/1980	APP	R.VanLIJF	

CO2 RECOVERY
PIPING & INSTRUMENT DIAGRAM
PRIMARY TREATMENT
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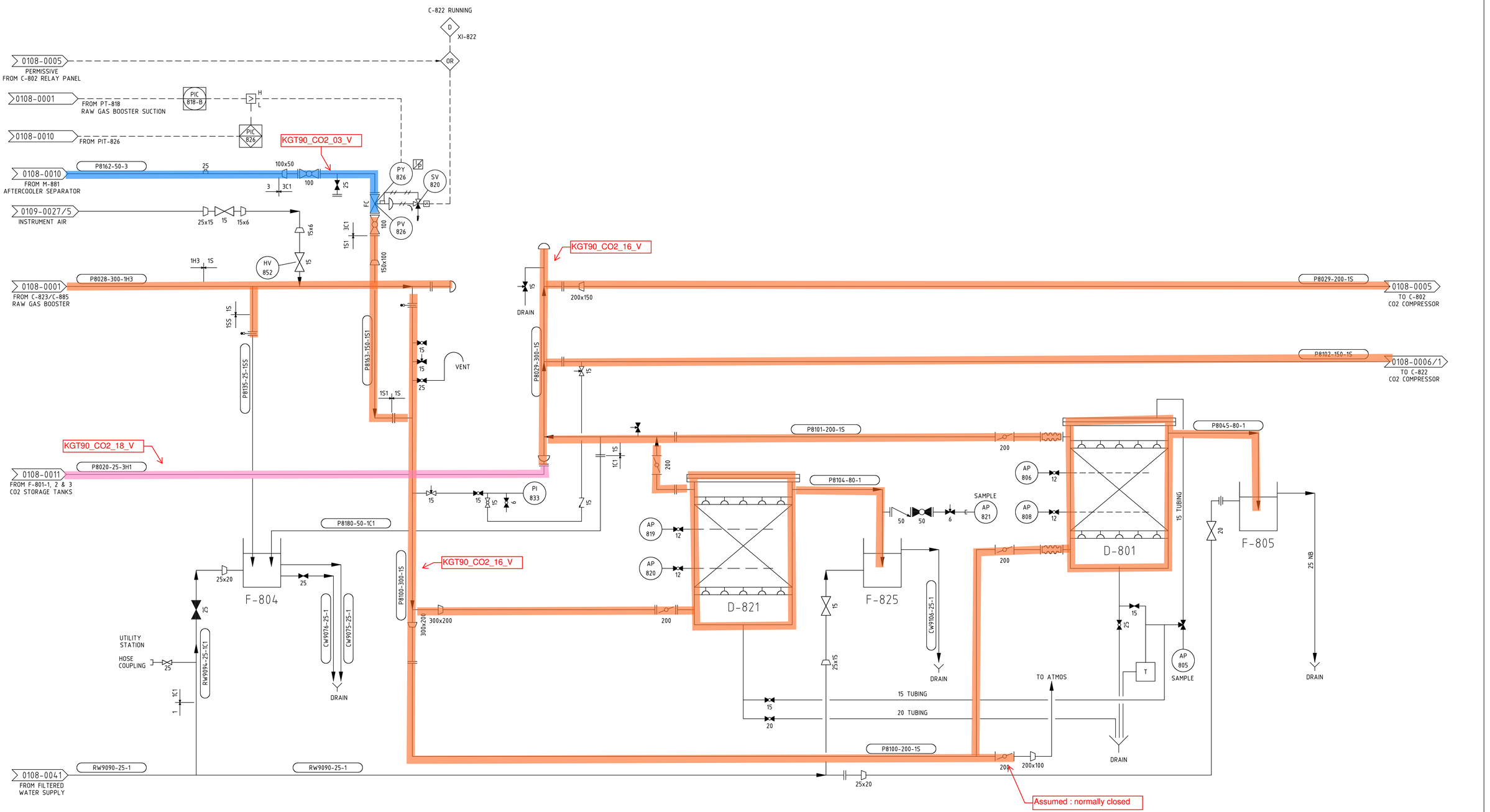
SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0108	0001	01 OF 01 SHTS	38

1000000-0108-0001-01.DWG

EQUIPMENT No.	F-804	D-821	F-825	D-801	F-805
DESCRIPTION	SEAL POT	CATALYST CARBON VESSEL	SEAL POT	CATALYST CARBON VESSEL	SEAL POT
CAPACITY	CAPACITY XXm3	CAPACITY 7.955 m3	CAPACITY 0.15m3	CAPACITY XXm3	CAPACITY XXm3
MAWP @ TEMP	MAWP XXXBarg @ XXX°C	0.345 Barg @ 60/°C	MAWP 0.0Barg @ 60°C	MAWP XXXBarg @ XXX°C	MAWP XXXBarg @ XXX°C



REV	AMENDMENT	BY	CHK	ENG	APP	DATE
17	AS BUILT P84-1355 EXTEND FILTERED WATER LINE	JCC	MK/RL	AM	SES	07/2017
16	HAND VALVES ADDED FOR ISOLATIONS	RL	CR	AM	SES	02/2014
15	AS BUILT P84-846 REPLACE C-822 MICROGUARD PLC	RL/ES	AB	AM	SES	10/2013
14	LINE P8162-100-3C1 AS BUILT	RL	AW	LH	SES	12/2009
13	AS BUILT	ES	RL	LH	PJR	06/06
12	AS BUILT FOR WS884521 CO2 UPGRADE	JMP	VB	MP	CF	09/05
11	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
10	D-821 DESIGN DATA RATIONALISED	JBH	RL	AvG	AIM	08/02
9	SAFETY SHOWER REMOVED, GARDEN HOSE ADDED	VB	RL	EJH	RS	10/99
8	DWG No. WAS 0108-0025/01 & SAMPLE POINTS ADDED	GMF	RL	EJH	RS	10/98
7	AS BUILT FOR NEW S.S. CO2 SUCTION LINES	J.B.H.	R.L.	AvG	A.M.B.	20/08/96
6	SV-826 NOW SV-820	J.B.H.	R.L.	AvG	J.B.G.	10/95
5	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
4	REVISED FOR CONTINUITY CHECK	J.B.H.	O.G.M.	A.VG.	C.J.	10/94
3	AS BUILT. SAFETY SHOWER ADDED	P.T.D.	P.M.	D.T.	A.VG.	09/94
2	AS BUILT USING PID VERSION 11.52	B.A.T.	J.S.T.	T.H.	J.R.S.	04/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
DRAWING NUMBER WAS 0108-0025/01

		DATE		DATE
DRN	P.MILLS	28/04/1980	ENG	
CHK	R.LOGAN	28/04/1980	APP	

CO2 RECOVERY
PIPING & INSTRUMENT DIAGRAM
CATALYST CARBON VESSELS
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SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
N/A	1000000	0108	0002	01 OF 01 SHTS	17

1000000-0108-0002-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

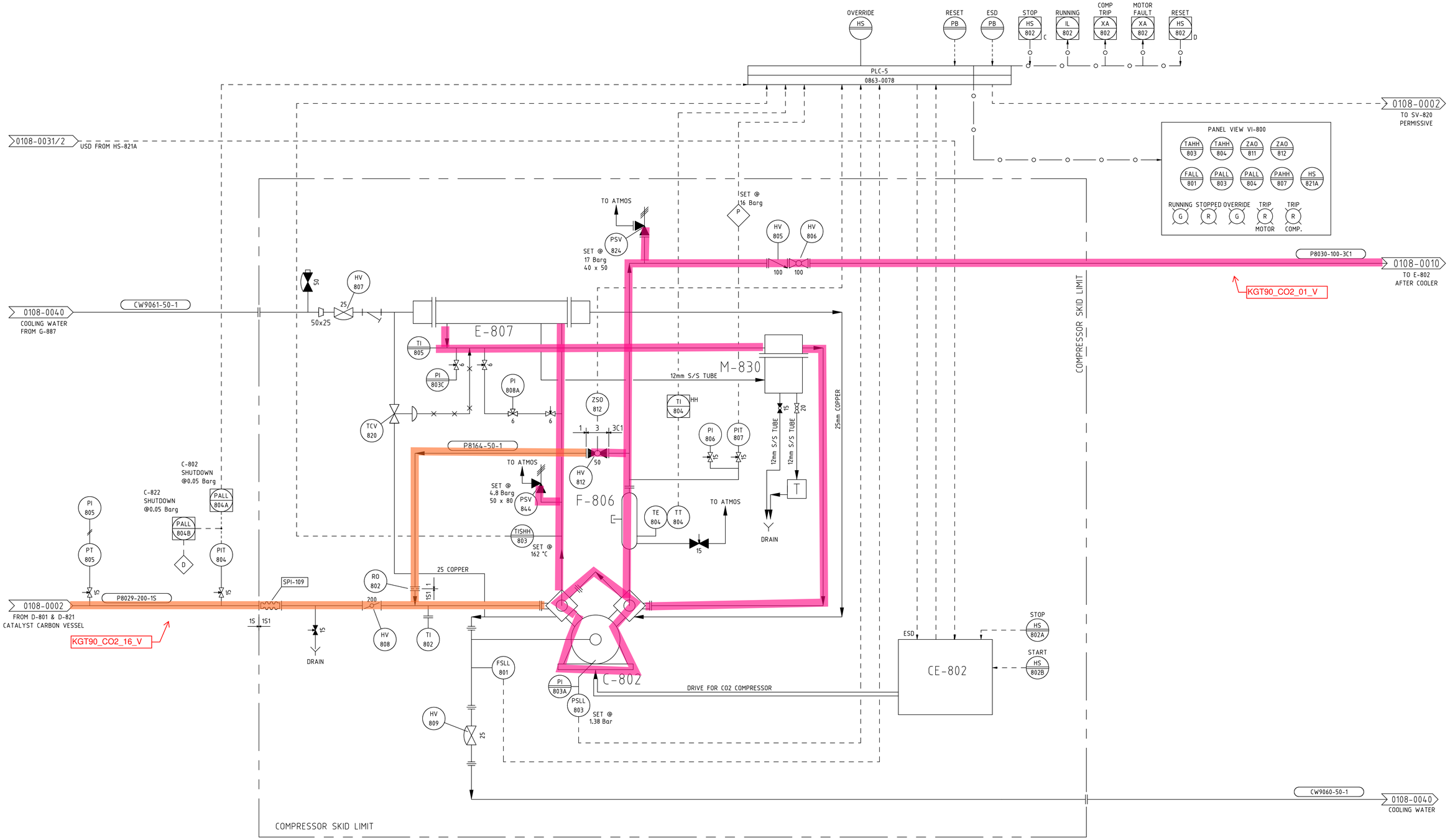
E-807
INTERCOOLER
XXm3
XXXBarg @ XXX°C

C-802
CO2 COMPRESSOR
XXm3
XXXBarg @ XXC°C

F-806
PULSATION VESSEL
295mm ID
17Barg @ 200°C

M-830
INSTERSTAGE SEPARATOR
CAPACITY 31.2 litres
MAWP 4.5 Barg @ 100°C

CE-802
CO2 COMPRESSOR MOTOR



REV	AMENDMENT	BY	CHK	ENG	APP	DATE
23	AS BUILT P84-1555 PI-806 MOVED & NEEDLE VALVES ADDED	RL	JCC	AM	TC	09/2019
22	AS BUILT P84-860 CO2 PLANT CONTROL UPGRADE	WPG	SHA	AM	SES	08/2017
21	AS BUILT M-830 ADDED	RL	JCC	AM	SES	05/2017
20	AS BUILT PI-808-A, HV-812, REMO ZSO-811	JCC	RL	AM	SES	01/2016
19	PALL 804A & B SETPOINT CORRECTED	JCC	RL	AM	SES	10/2015
18	AS BUILT P84-846 REPLACE C-822 MICROGUARD PLC	RL/ES	AB	AM	SES	10/2013
17	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL/ES	CR	AM	SES	04/2013
16	AS BUILT TIE IN POINT FOR ZSO-811 RELOCATED	RL/ES	CR	AM	SES	08/2012
15	AS BUILT P84-3263. PSV-844 REPLACEMENT	RL/ES	AM	SRH	SES	02/2012
14	AS BUILT FOR WS884521 CO2 UPGRADE	JMP	VB	MP	CF	09/05
13	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
12	PI-805 TAG REMOVED, PSV-844 NOW 3.8 BARG	VB	RL	EJH	RS	10/99
11	DRG No. WAS 0108-0002/01 & RO-802, AP-802 ADDED	GMF	DV	EJH	HG	10/98
10	REVISED FOLLOWING I&E MAINTENANCE SURVEY	J.B.H.	R.L.	AvG	A.M.B.	08/08/96
9	AS BUILT DISCHARGE LINE	P.T.D.	R.L.	A.V.G.	J.B.G.	08/95
8	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
7	REVISED FOR CONTINUITY CHECK	J.B.H.	O.G.M.	A.VG.	C.J.	10/94
6	NOTE AND TIS-818 ADDED ON CE-802	P.T.D.	P.M.	D.T.	A.VG.	09/94
5	AS BUILT USING PID VERSION 11.52	B.A.T.	J.S.T.	T.H.	J.R.S.	04/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0090/2
DRAWING NUMBER WAS 0108-0002/01

		DATE			DATE
DRN	P.MILLS	29/08/1980	ENG		
CHK	R.LOGAN	29/08/1980	APP		

CO2 RECOVERY
PIPING & INSTRUMENT DIAGRAM
CO2 COMPRESSION TRAIN A C-802 AND CE-802

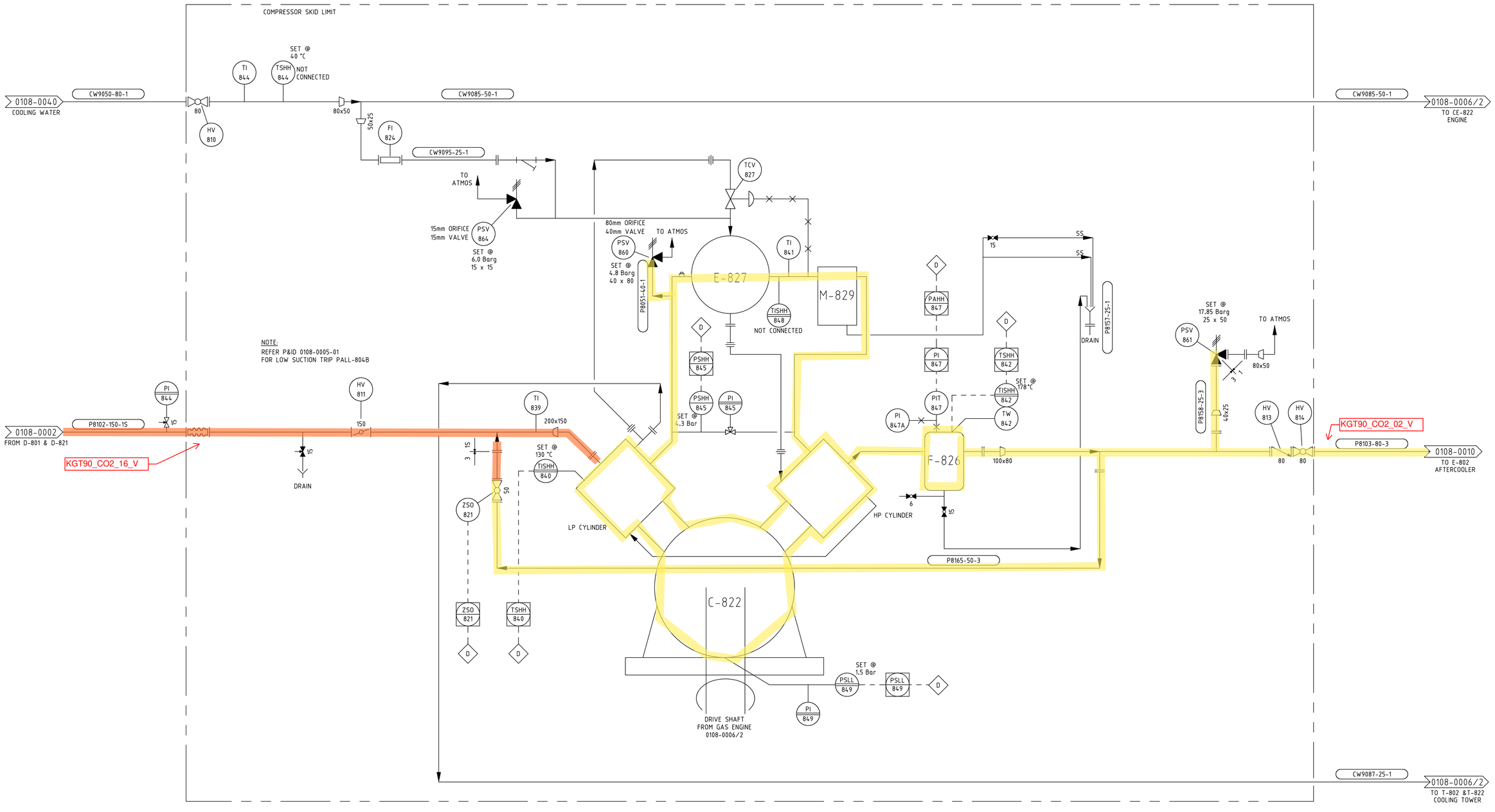
SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0108	0005	01 OF 01 SHTS	23

1000000-0108-0005-01.DWG

EQUIPMENT No.

DESCRIPTION
CAPACITY
MAWP @ TEMP

E-827	C-822	M-829	F-826
INTERCOOLER	CO2 COMPRESSOR	INTERSTAGE SEPARATOR	PULSATION VESSEL
CAPACITY XXm3	CAPACITY XXm3	CAPACITY XXm3	CAPACITY 0.034m3
MAWP XXXBarg @ XXX°C	MAWP XXXBarg @ XXX°C	MAWP 4.50 Barg @ 100/XX°C	MAWP 26.0Barg @ -10/200°C



REV	AMENDMENT	BY	CHK	ENG	APP	DATE
15	AS BUILT P84-208 PSV-861 WAS SET AT 24.65 BARG	RL	JC/JS	AM	SES	07/2017
14	AS BUILT P84-846 REPLACE C-822 MICROGUARD PLC	RL/ES	AB	AM	SES	10/2013
13	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL/ES	CR	AM	SES	04/2013
12	AS BUILT P84-809 C-822 DISCHARGE TEMP SWTICH	LN	SH	AM	SES	02/13
11	AS BUILT PALL-804B WAS PSLL-844	ES/RL	AC	AM	SES	11/12
10	PSV-864 & PSV-861 SET PRESSURE AND SIZES AS BUILT	RL	MC	SRH	SES	01/2012
9	AS BUILT FOR WS884521 CO2 UPGRADE PCN006	PJ	WXB	MP	CF	01/06
8	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
7	DESIGN DATA RATIONALISED FOR M-829 & F-826	CMW	RL	AvG	AIM	08/02
6	INLET AND OUTLET SIZE ADDED TO PSV-861	VB	RL	EJH	RJW	02/01
5	PI-847B ADDED	VB	RL	EJH	RS	10/99
4	DRAWING NUMBER WAS 0108-0033/01	GMF	DV	EJH	MB	10/98
3	REVISED FOLLOWING I&E MAINTENANCE SURVEY	J.B.H.	R.L.	AvG	A.M.B.	21/08/96
2	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
1	REVISED FOR CONTINUITY CHECK	J.B.H.	O.G.M.	A.V.G.	C.J.	10/94
H	AS BUILT USING PID VERSION 11.52	B.A.T.	P.H.	J.R.	J.R.S.	04/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0090/3
DRAWING NUMBER WAS 0108-0033/01

		DATE		DATE
DRN	J.HAYCOCK	01/05/1992	ENG	
CHK			APP	

CO2 RECOVERY
PIPING & INSTRUMENT DIAGRAM
CO2 COMPRESSION TRAIN B C-822
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SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0108	0006	01 OF 02 SHTS	15

1000000-0108-0006-01.DWG

EQUIPMENT No.	F-829	X-822-E1	CF-822
DESCRIPTION	LUBE OIL HEADER TANK	AUXILARY COOLER	CO2 COMPRESSOR ENGINE
CAPACITY	4 x 140 LITRE	CAPACITY XXm3	CAPACITY XXm3
MAWP @ TEMP	ATMOSPHERE	MAWP XXXBarG @ XXX°C	MAWP XXXBarG @ XXX°C

0108-0006/1 COOLING WATER FROM C-822 CO2 COMPRESSOR — CW9087-25-1 — 6 — 25 — HV 826 — 80 — CW9051-80-1 — 0108-0040 TO T-802 & T-822 COOLING TOWERS

TP — TP — CW9094-50-1 — X-822-E1 — TP — TP — 6 — 80x50 — CW9091-80-1 — 6 — 80x50 — CW9089-80-1 — 50 — 80x50

0108-0006/1 COOLING WATER FROM C/W HEADER — CW9085-50-1 — CW9088-80-1

FSLL 822 — D — FSLL 822 — TI 852

LSLL 827 — D — LG 827 — LSLL 827 — LG 825 — LSLL 825 — LSLL 825 — D — 50kPa — 50kPa

TI 848 — CW9092-50-1 — AUXILIARY HEADER TANK — WATER JACKET HEADER TANK — TUBE PIPE

D — LSLL 826 — D — PSLL 848 — 20 TUBING (TYPICAL) — FILL LINES — F-829 — 0108-0031/2 TO CE-821 LUBE OIL — 40 — 40 — TCV 829 — 15 TUBING — 15 SS TUBING — 6 SS TUBING

PSLL 848 SET @ 2.05 Bar — TO ENGINE COMPONENTS — 20 — PI 848 — TI 861 — KENCO — LIC 826 — LSLL 826 SET @ HOLD mm — DRIP TO SUMP — OVERFLOW — SUMP — OIL PUMP — OIL COOLER — AUX. WATER PUMP — SS TUBING — AIR FILTER — TO ATMOS — MUFFLER

INTERCOOLER — TURBOCHARGER — 200

HV 824 — 40 — 40 — PCV 824 — SET @ 580mm H2O — 6 — 40 — S — SV 827 — D — AP 822B — CARBURETTOR — SELECTOR SWITCH — TI 850 EXHAUST THERMOCOUPLES

0108-0041 FUEL GAS — FG9050-40-1 — KGT01_PGS_19_V — TISHH 847 SET @ 60 °C NOT CONNECTED — PI 856 — ADJUST MANUALLY 3-15 psi — PCV 828 — A/S — ENGINE GOVERNOR

HV 828 — 40 — NOTE 2 — 50x40 — 40 — XSV 828 — 40 — 40 — 0108-0041 FUEL GAS — FG9052-50-1 — STARTER MOTOR — FLYWHEEL — CF-822 — DRIVE FOR C-822 COMPRESSOR SEE 0108-0006/1

SV 828 — STARTING GAS — S — D — HS — LOCAL START — HS — STOP — MAGNETO — D — WATER PUMP — TCV 828

QE 826 — SPEED — AP 822A — TI 843 — QI 826 — QAHH 826 — D — QALL 826 — D

D — TSHH 843 — SET @ 98 °C — TSHH 843

LOCAL CONTROL PANEL

C-822 EMERGENCY STOP — HS 822-5 — HS 822-5 — D

C-822 START BUTTON — HS 822-2 — D

C-822 STOP BUTTON — HS 822-3 — D

C-822 RESET BUTTON — HS 822-4 — D

C-822 RESET LAMP — XI 822-R — D

COMPRESSOR SKID LIMIT

50x40 — FG9056-50-1 — 0108-0041 TO COMMON VENT

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
10	CO2 COMPRESSOR ENGINE TAG REVISED FROM CE-822 TO CF-822	RL	JCC	AM	TC	09/2019
9	AS BUILT P84-846 REPLACE C-822 MICROGUARD PLC	RL/ES	AB	AM	SES	10/2013
8	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	07/2013
7	AS BUILT PALL-804B WAS PSLL-844	ES/RL	AC	AM	SES	11/12
6	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
5	SPEED HIGH TRIP AMENDED TO 1980 RPM	VB	RL	EJH	RS	10/99
4	DRG No. WAS 0108-0034/01 AND AP-822A & B ADDED	GMF	DV	EJH	HG	10/98
3	REVISED FOLLOWING I&E MAINTENANCE SURVEY	J.B.H.	R.L.	AvG	A.M.B.	27/08/96
2	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
1	REVISED FOR CONTINUITY CHECK	J.B.H.	O.G.M.	A.V.G.	C.J.	10/94
H	AS BUILT USING PID VERSION 11.52	B.A.T.	J.S.T.	J.R.	J.R.S.	04/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD — ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0090/3
DRAWING NUMBER WAS 0108-0034/01

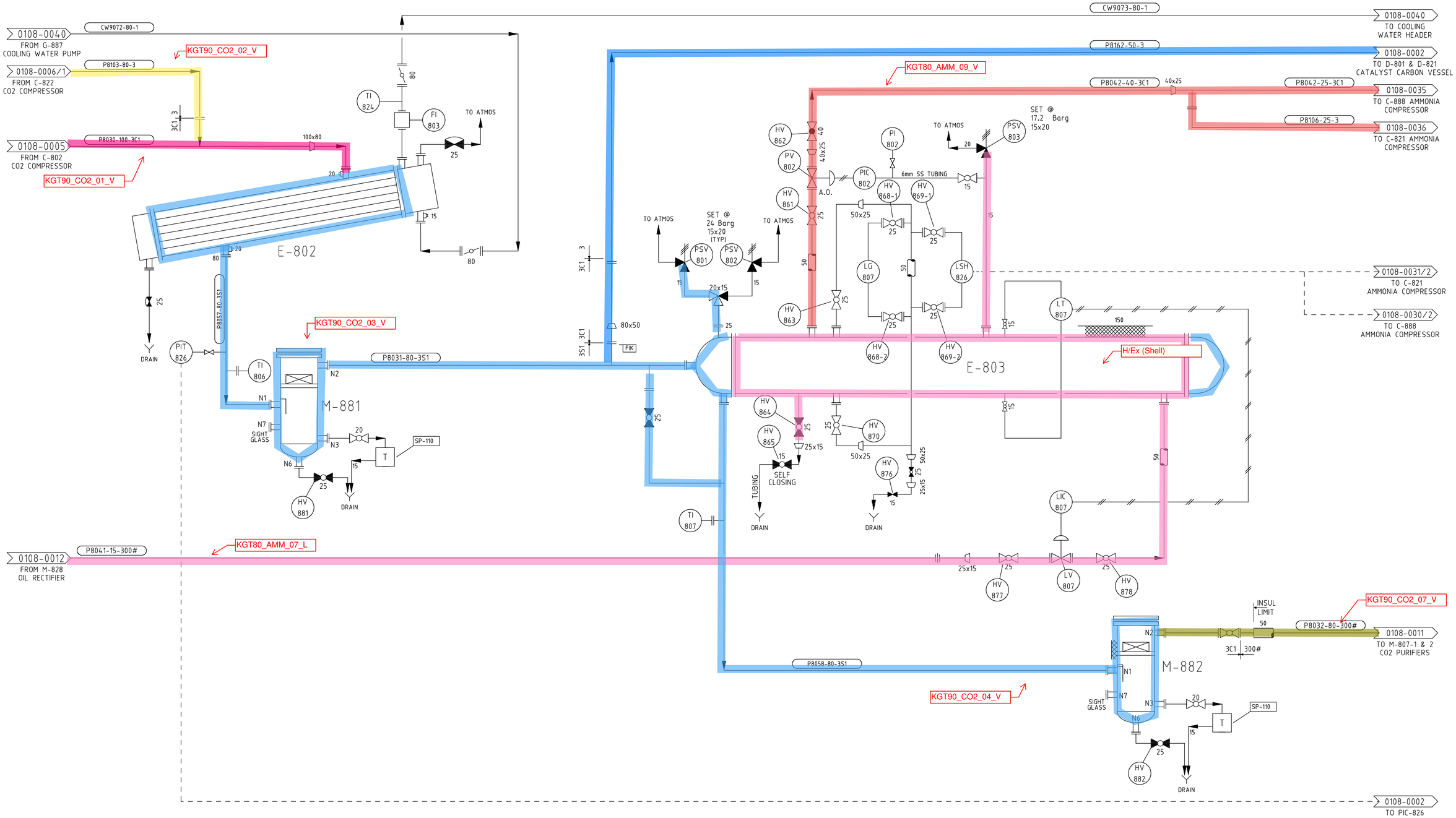
		DATE			DATE
DRN	JH	01/04/1994	ENG	E.DRUMMOND	01/04/1994
CHK	R.LOGAN	01/04/1994	APP	J. STUART	01/04/1994

CO2 RECOVERY
PIPING & INSTRUMENT DIAGRAM
CO2 COMPRESSOR ENGINE TRAIN B CE-822

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0108	0006	02 OF 02 SHTS	10

1000000-0108-0006-02.DWG

EQUIPMENT No.	E-802	M-881	E-803	M-882
DESCRIPTION	CO2 AFTERCOOLER	AFTERCOOLER SEPARATOR	CO2 CHILLER	CHILLER SEPARATOR
CAPACITY	CAPACITY 0.47m3	CAPACITY 0.25 m3	CAPACITY 0.43 m3	CAPACITY 0.25m3
MAWP @ TEMP	TUBE: 6.89 Barg @ -29/200°C SHELL: 24.13 Barg @ -46/200°C	24.13 Barg @ 175/-3°C	TUBE: 24.13 Barg @ 35/2°C SHELL: 20.68 Barg @ 35/2°C	24.3 Barg @ 50/-3°C



REV	AMENDMENT	BY	CHK	ENG	APP	DATE
21	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	02/2014
20	AS BULT P84-809 C-822 DISCHARGE TEMP SWITCH	LN	SH	AM	SES	02/13
19	HV-881 & HV-882 ADDED	ES/RL	KH	JS	SES	05/11
18	LINES P8162, P8058, P8031, P8032 AS BUILT	RL	AW	LH	SES	12/2009
17	AS BUILT WS1392042 REPLACE SELF CLOSING NH3 VALVE	RL	LR	LH	SES	10/2008
16	EVENT REPORT 501638 - WS1194927- E-803 BRIDLE DRAIN	RL	SY	LH	PJR	03/2007
15	AS BUILT FOR WS884521 CO2 UPGRADE	JMP	VB	MP	CF	09/05
14	PROCESS ISOLATION PONITS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
13	DESIGN DATA RATIONALISED FOR E-802,803 & 804 + M-803	CMW	RL	AvG	AIM	08/02
12	LINE P8106-25-3 REMOVED RE DUPLICATION	VB	RL	EJH	RJW	09/00
11	DRAWING NUMBER WAS 0108-0003/01	GMF	DV	EJH	MB	10/98
10	PCV-802 AND LCV-807 NOW PV-802 AND LCV-807	J.B.H.	R.L.	AvG	A.M.B.	09/08/96
9	PIC-807 NOW 802. P8031-80 NOW 300#	J.B.H.	R.L.	AvG	J.B.G.	10/95
8	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
7	REVISED FOR CONTINUITY CHECK	J.B.H.	O.G.M.	A.VG.	C.J.	10/94
6	AS BUILT USING PID VERSION 11.52	J.S.T.	P.H.	J.R.	J.R.S.	04/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
DRAWING NUMBER WAS 0108-0003/01

		DATE		DATE
DRN	P.MILLS	28/04/1980	ENG	
CHK	R.LOGAN	28/04/1980	APP	

CO2 RECOVERY
PIPING & INSTRUMENT DIAGRAM
CO2 COOLING AND CHILLING
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SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0108	0010	01 OF 01 SHTS	21

1000000-0108-0010-01.DWG

EQUIPMENT No.	B-802	B-803	M-807-1	M-807-2	B-801-1	B-801-2	M-879-1	M-879-2
DESCRIPTION	REGENERATION HEATER	REGENERATION HEATER	CO2 PURIFIER	CO2 PURIFIER	CO2 DRIER	CO2 DRIER	CO2 PARTICULATE FILTER	CO2 PARTICULATE FILTER
CAPACITY	CAPACITY 15kW	CAPACITY 15kW	CAPACITY 2.24m3	CAPACITY 2.24m3	CAPACITY XXm3	CAPACITY XXm3	VOLUME 0.04m3	VOLUME 0.04m3
MAWP @ TEMP	XXXBarg @ XXX°C	12.0 Barg @ 250/XX°C	24.13 Barg @ -4.8/245°C 21.00 Barg @ -9.5°C 13.60 Barg @ -14.8°C 9.00 Barg @ -48°C	24.13 Barg @ -4.8/245°C 21.00 Barg @ -9.5°C 13.60 Barg @ -14.8°C 9.00 Barg @ -48°C	24.13 Barg @ -6.8/245°C 21.10 Barg @ -14.4°C 13.60 Barg @ -16.4°C 9.6 Barg @ -48°C	24.13 Barg @ -6.8/245°C 21.10 Barg @ -14.4°C 13.60 Barg @ -16.4°C 9.6 Barg @ -48°C	25 Barg -20°C to 250°C	25 Barg -20°C to 250°C

Assumed N.C. LTS plant in moth-balled status

TO LTS PLANT ACROSS PIPE BRIDGE 0112-0032

KGT90_CO2_18_V

KGT90_CO2_19_V

KGT90_CO2_07_V

KGT90_CO2_07_V

0108-0020 FROM F-801-1, 2 & 3 STORAGE TANKS — P8020-25-3H1 — INSUL LIMIT

0108-0010 FROM M-882 CHILLER SEPARATOR — P8032-80-300#

IG40001-50-1CA LPG LOADOUT 0104-0042

P8020-25-3H1 TO C-802 COMPRESSOR SUCTION 0108-0002

P8020-25-3P1B TO E-804 COS CONDENSER 0108-0012

P8036-80-3C2 TO E-804 CO2 CONDENSER 0108-0012

0108-0025 TO CO2 ANALYSERS

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
22	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	03/2014
21	AS BUILT P84-2908 CO2 PLANT VENT DRIER & PURIFIER	LN	CJ	AM	SES	01/14
20	AS BUILT MODS TO B-801-1 & 2 VALVES & M-879-1 & 2	RL/ES	CR	AM	SES	04/2013
19	AS BUILT P84-2587 CO2 PURIFIER AND DRIER RERATE	LN	CJ	AM	SES	11/12
18	AS BUILT WS1418134 CO2 NON COMPLIANT VALVE & FLANGES	VB	WF	PWM	LH	10/08
17	AS BUILT WS1335996 VECTOR CO2 FILTERS	VB	KC	PWM	LH	04/08
16	AS BUILT TO SITE MARK UP	VB	RL	LH	SES	03/08
15	AS BUILT NRV CO2 PURGE SYSTEM WS1013735	VB	MS	LH	PJR	09/07
14	AS BUILT TO SITE MARK-UP	VB	ES	NH	PJP	10/06
13	PROCESS ISOLATION POINTS ADDED TO INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
12	DESIGN DATA RATIONALISED	CMW	RL	AvG	AIM	08/02
11	SET PRESSURE ADDED FOR PSV-870	VB	RL	EJH	RJW	09/00
10	DRG No. WAS 0108-0004/01 AND AP-871 E & G ADDED	GMF	DV	EJH	HG	10/98
26	AS BUILT MOISTURE ANALYSER AIT-877 & AI-877 REMOVED	RL	JCC	AM	TC	09/2019
25	AS BUILT P84-860 CO2 PLANT CONTROL UPGRADE	WPG	SHA	AM	SES	08/2017
24	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	JCC	AM	TC	11/2016
23	ADDED NRV-805, NRV-806; CHANGED HV-8152-2	JCC	RL	AM	SES	04/2015

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
DRAWING NUMBER WAS 0108-0004/01

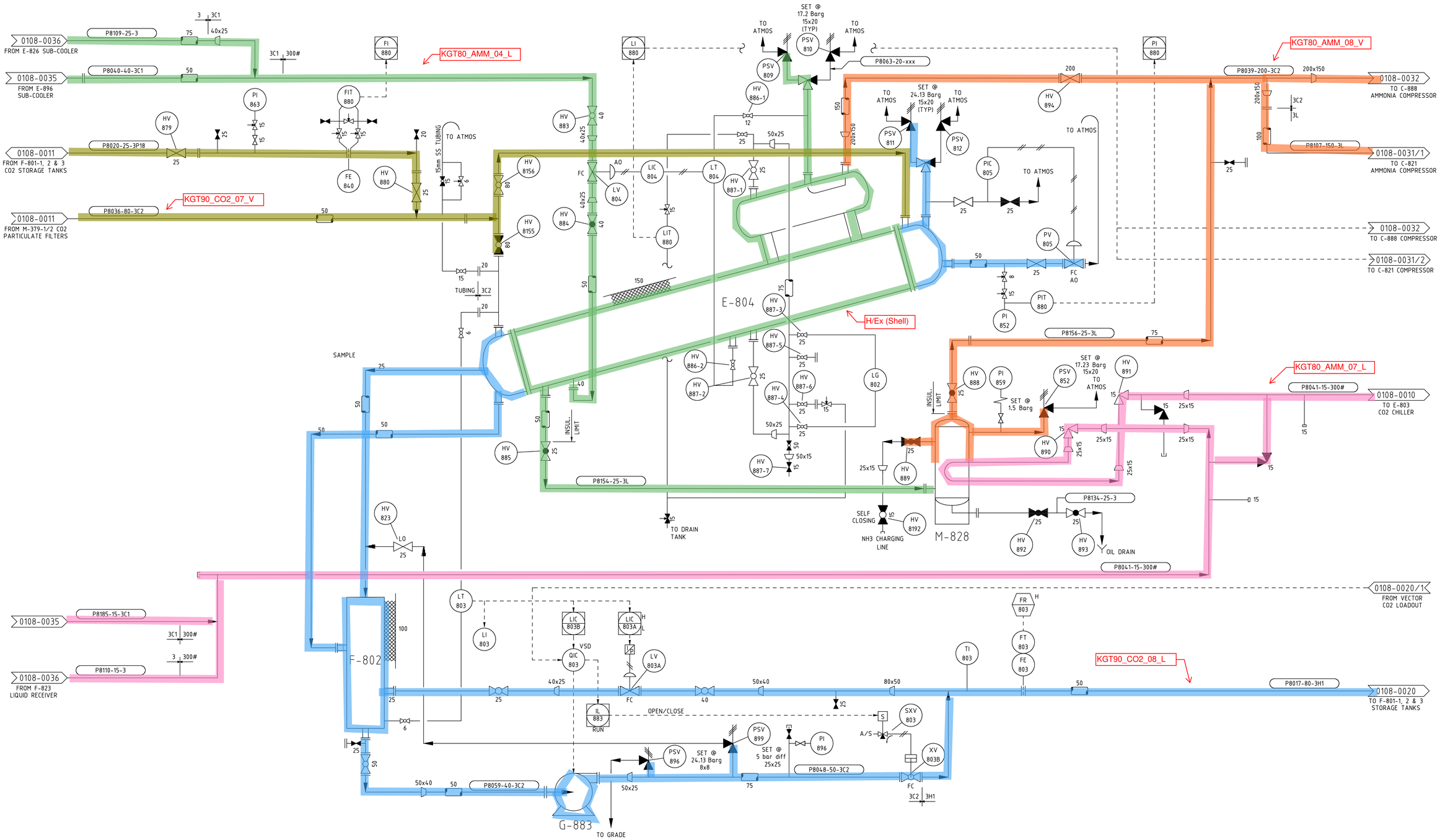
		DATE			DATE
DRN	P.MILLS	28/04/1980	ENG		
CHK	R.LOGAN	28/04/1980	APP		

CO2 RECOVERY
PIPING & INSTRUMENT DIAGRAM
CO2 PURIFICATION AND DRYING

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0108	0011	01 OF 01 SHTS	26

1000000-0108-0011-01.DWG

EQUIPMENT No.	F-802	E-804	G-883	M-828
DESCRIPTION	CO2 LIQUID RECEIVER	CO2 CONDENSER	CO2 CONDENSER PUMP	OIL RECEIVER
CAPACITY	0.039 m3	PRIMARY : 2.33 m3, SECONDARY : 0.76 m3	5.8m3/Hr @ 0.76 kw	XXm3
MAWP @ TEMP	MAWP 24.13 Barg @ XX/-50°C	TUBE : 24.13 Barg @ A/-46.4 °C SHELL : 20.68 Barg @ A/-46.4 °C	MAWP 24.1Barg @ -34°C	SHELL : 20.7 Barg @ 149/-46 °C COIL : 52 Barg @ 149/-46 °C



REV	AMENDMENT	BY	CHK	ENG	APP	DATE	REV	AMENDMENT	BY	CHK	ENG	APP	DATE
25	AS BUILT - P84-1164 CO2 CONDENSER RECONFIGURE	JB	JC	AM	SES	07/2014	15	AS BUILT FOR WS884521 & WS1034350	WXB	MP	CG	LH	02/06
24	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	02/2014	14	AS BUILT FOR WS884521 CO2 UPGRADE	JMP	VB	MP	CF	09/05
23	MAWP OF F-802 AS BUILT FROM 24.30 BARG TO 24.13 BARG	RL/ES	CR	AM	SES	08/2012	13	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
22	ASBUILT WS1392042 NH3 VALV & PSV-852 WAS 20.7 BARG	RL	ES	LH	SES	11/2008							
21	AS BUILT WS1418134 CO2 NON COMPLIANT VALVE & FLANGES	VB	WF	PWM	LH	10/08							
20	PSV-852 CORRECTLY NUMBERED	ES	RL	LH	SES	04/08	30	AS BUIILT 25 NB VENT REMOVED ON P8048-50-3C2	RL	JCC	AM	TC	09/2019
19	AS BUILT WS1343128 - PRESS. GAUGE CO2 OIL RECTIFIER	ES	JY	LH	SES	01/08	29	AS BUILT IL-883 WAS IL-803 & HAND VALVE No's ADDED	RL	JCC	NM	SES	06/2018
18	AS BUILT - HIGH ALARM ADDED TO FR-803	ES	RL	LH	DS	11/07	28	AS-BUILT P84-1292 CO2 OVERPRESSURE PROTECTION	AJA	LEL	AM	SES	01/16
17	4 FLG SETS ADDED WS1043344 & DRAIN VLV WS1194927	RL	SR	LH	PJR	11/2006	27	AS-BUILT P84-1099 REPLACE XV-803B	JB	CJ	AM	SES	06/15
16	AS BUILT WS1162423 CO2 STORAGE PLAN B	VB	MP	AvE	LH	11/06	26	AS-BUILT P84-1164 CO2 CONDESNSER RECONFIGURE	JB	CJ	AM	SES	10/14

VECTOR KAPUNI LIMITED
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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
DRAWING NUMBER WAS 0108-0005/01

		DATE			DATE
DRN	P.MILLS	28/04/1980	ENG		
CHK	R.LOGAN	28/04/1980	APP		

CO2 RECOVERY
PIPING & INSTRUMENT DIAGRAM
LIQUIFICATION
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SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0108	0012	01 OF 01 SHTS	30

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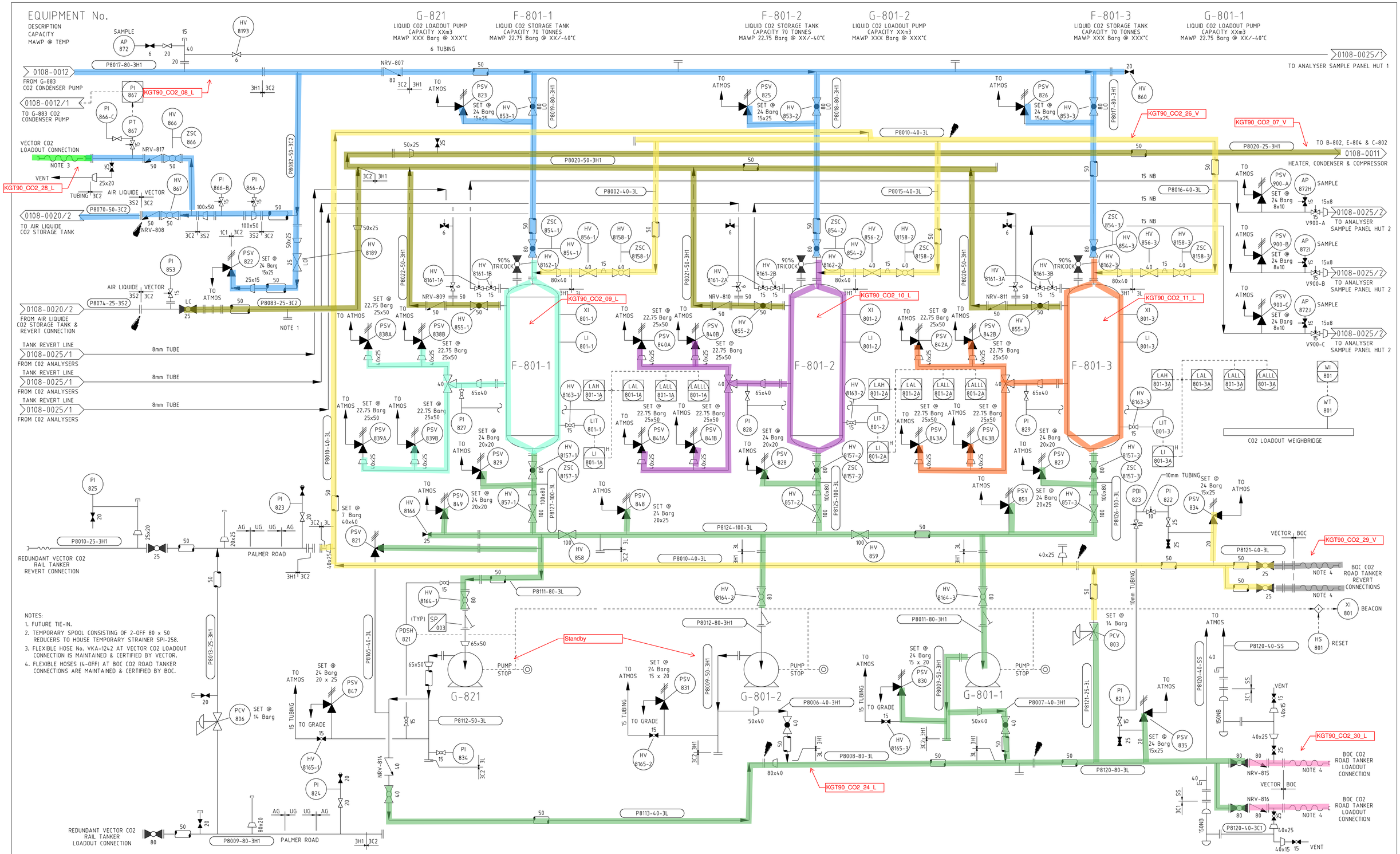

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
45	RESPONSIBILITY OF CO2 LOADOUT HOSES CLARIFIED	RL	JCC	AM	TC	07/2019
44	HAND VALVE NUMBER HV-8193 ADDED FOR ISOLATIONS	RL	JCC	AM	SES	06/2018
43	AS BUILT PSV-900-A, B & C AND 3 LO's REMOVED	RL	JCC	AM	SES	04/2018
42	AS BUILT SCR 702 CO2 STORAGE	JCC	RL/PG	AM	SES	11/2016
41	AS BUILT COMMENTS FROM SITE CHECK, GA & ISO DRAWINGS	RL	JC	AM	SES	06/2016
40	AS BUILT P84-1138 CO2 RAIL LOADING STATION	JSI	BK	AM	SES	06/2016
39	P84-1271 CO2 LOADOUT VENT MODS AS BUILT	RL	JC/CR	AM	SES	05/2016
38	P84-1292 CO2 OVERPRESSURE PROTECTION AS BUILT	AJA	LEL	AM	SES	02/2016
37	AS BUILT FOR LOCKED OPEN VALVES AND FLANGED VALVES	RL	JC	AM	SES	10/2015
36	AS BUILT P84-1105 & NRV & HV NUMBERS ADDED	RL	JC	AM	SES	05/2015
35	AS BUILT P84-1096 PROXIMITY SWITCHES	JCC	RL	AM	SES	04/2015
34	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	02/2014
33	AS BUILT REVERT LINES AND ANALYSER SAMPLE LINES ADDED	ES/RL	CB	AM	SES	02/2014
32	AS BUILT P84-217 RESOLVE PSV-822 ICING ISSUES	SE	CJ	AM	SES	01/2014
31	AS BUILT P84-3312 WEIGHBRIDGE & TEMP STRAINERS REMOVED	RL	AB	AM	SES	07/2013
30	PSV-833, PSV-846 & RAIL TANKER LOADOUT REMOVED P84-3275	RL/ES	SR	AM	SES	06/2012
29	SET PRESSURES ADDED FOR PSV-830 & PSV-831	RL/ES	CR	AM	SES	05/2012
28	AS BUILT P84-910 CO2 CONN ADDED FOR VECTOR GAS	RL/ES	LR	KR	SES	05/2011
27	PI-853 WAS PI-858, P8083 WAS P8082, PSV SIZES ADDED	RL/ES	WB	LH	SES	10/2010
26	AS BUILT WS1476959 CO2 LOADOUT PUMP GAUGES	ES	RL/KS	LH	SES	07/09

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
DRAWING NUMBER WAS 0108-0008/01

		DATE			DATE
DRN	P.MILLS	28/04/1980	ENG		
CHK	R.LOGAN	28/04/1980	APP		

CO2 RECOVERY
PIPING & INSTRUMENT DIAGRAM
CO2 STORAGE

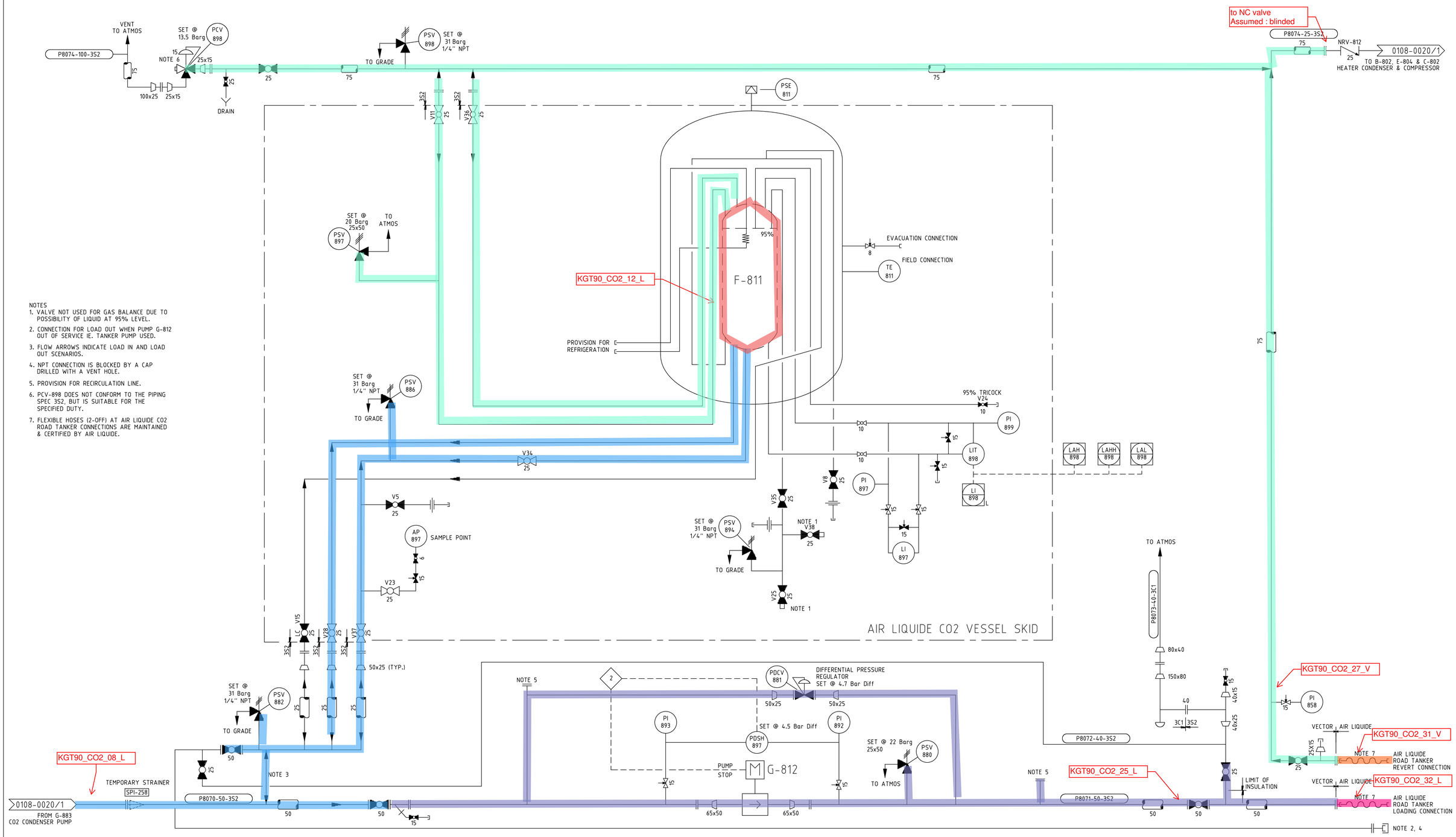
SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0108	0020	01 OF 02 SHTS	45

1000000-0108-0020-01.dwg

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

G-812
LIQUID CO2 LOADOUT PUMP
CAPACITY 16m3/hr
DESIGN 27.6 Barg @ -40/85°C
DIFFERENTIAL PRESSURE OP/MAX: 3.5/5 bar

F-811
LIQUID CO2 STORAGE VESSEL
CAPACITY 18 TONNES
MAWP 20 Barg @ -196°C



NOTES
1. VALVE NOT USED FOR GAS BALANCE DUE TO POSSIBILITY OF LIQUID AT 95% LEVEL.
2. CONNECTION FOR LOAD OUT WHEN PUMP G-812 OUT OF SERVICE IE. TANKER PUMP USED.
3. FLOW ARROWS INDICATE LOAD IN AND LOAD OUT SCENARIOS.
4. NPT CONNECTION IS BLOCKED BY A CAP DRILLED WITH A VENT HOLE.
5. PROVISION FOR RECIRCULATION LINE.
6. PCV-898 DOES NOT CONFORM TO THE PIPING SPEC 3S2, BUT IS SUITABLE FOR THE SPECIFIED DUTY.
7. FLEXIBLE HOSES (2-OFF) AT AIR LIQUIDE CO2 ROAD TANKER CONNECTIONS ARE MAINTAINED & CERTIFIED BY AIR LIQUIDE.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
13	RESPONSIBILITY OF CO2 LOADOUT HOSES CLARIFIED	RL	JCC	AM	TC	07/2019
12	AS BUILT P84-1449 AIR LIQUIDE TANK THERMAL PSV REPLACEMENT	RL	JCC	AM	TC	10/2018
11	F-811 CAPACITY WAS SHOWN AS 22m3 & CONTIN NOTES UPDATED	RL	MB	AM	SES	07/2013
10	CO2 TANK OWNERSHIP CHANGED FROM ASCO TO AIR LIQUIDE	RL/ES	TVG	AM	SES	06/2012
9	AS BUILT WS2007229 FINAL MOD. PCV-898 WAS SET 15 BARG	RL/ES	WB	LH	SES	11/2010
8	PARTIAL AS BUILT P84-1064 REMOVE NRV ON ASCO REVERT LINE	CJ	GH	WB	LH	09/2010
7	AS BUILT WS2007229 - ASCO TANK PRESSURE	RL	KS	LH	SES	04/2010
6	AS BUILT WS1418193 - ASCO CO2 STORAGE SAMPLE POINT	RL	ES	LH	SES	12/08
5	AS BUILT WS1141041 - ASCO CO2 STORAGE VESSEL	ES	RL	LM	LH	12/07

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE			DATE
DRN	E STARNS	13/12/2007	ENG	L McLELLAN	13/12/2007
CHK	R LOCHHEAD	13/12/2007	APP	L HUNT	13/12/2007

KAPUNI GAS TREATMENT PLANT
PIPING & INSTRUMENT DIAGRAM
AIR LIQUIDE CO2 STORAGE VESSEL
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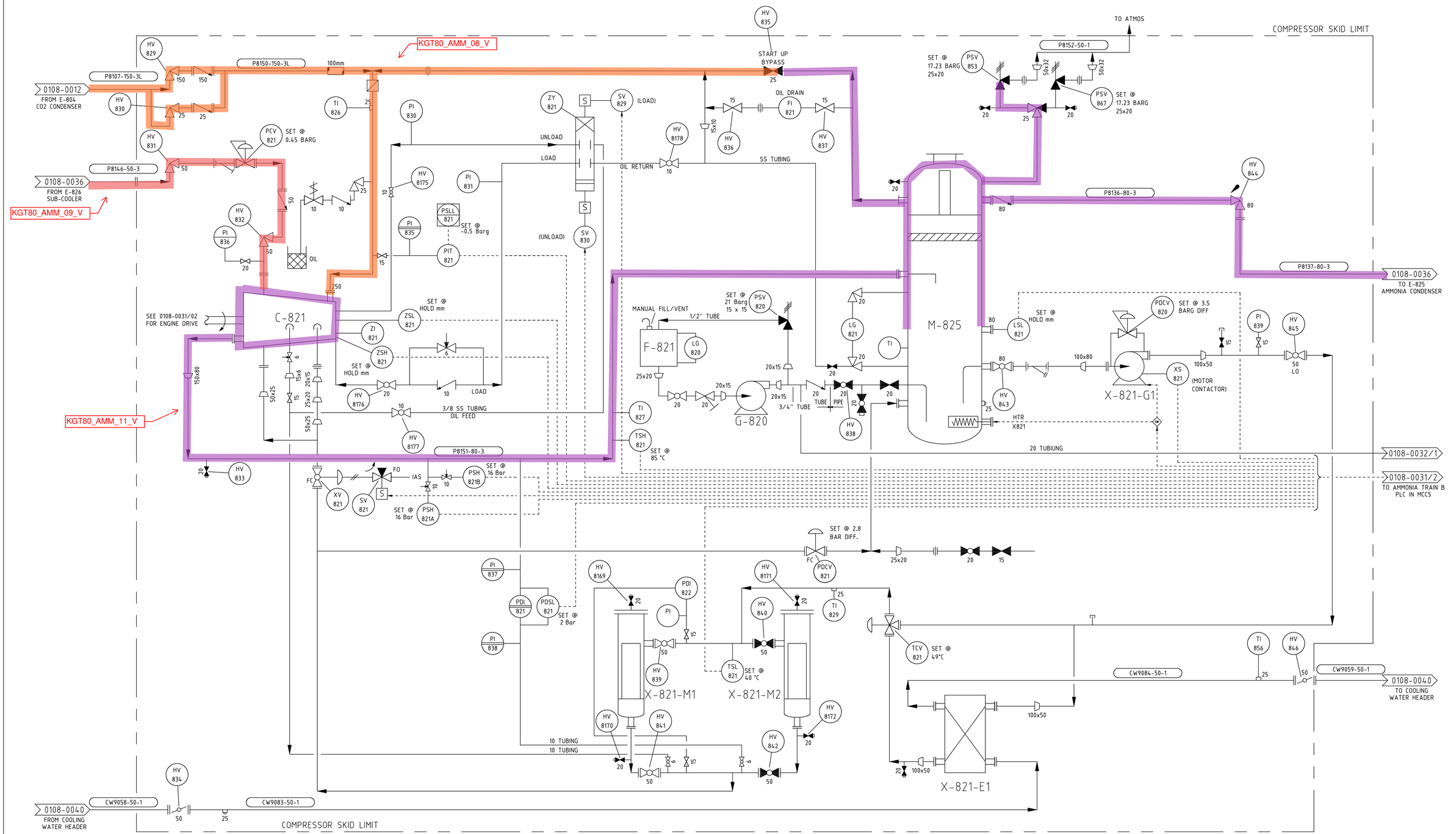
SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0108	0020	02 OF 02 SHTS	13

1000000-0108-0020-02.dwg

EQUIPMENT No.	C-821	X-821-M1	F-821	G-820	X-821-M2	M-825	X-821-E1	X-821-G1
DESCRIPTION	AMMONIA COMPRESSOR	OIL FILTER	LUBE OIL SUPPLY TANK	LUBE OIL FILL PUMP	OIL FILTER	OIL SEPARATOR	OIL COOLER	OIL PUMP
CAPACITY	CAPACITY XXm3	CAPACITY XXm3	CAPACITY 0.06m3	FLOW 0.168m3/Hr	CAPACITY XXm3	CAPACITY XXm3	CAPACITY XXm3	FLOW XXSm3/Hr @ XX hp
MAWP @ TEMP	MAWP XXXBarg @ XXX°C	MAWP 20.70 Barg @ 149/-29°C	MAWP ATMOS	MAWP XXXBarg @ XX°C	MAWP 20.70 Barg @ 149/-29°C	MAWP 20.70 Barg @ 149/-29°C	MAWP XXXBarg @ XXX°C	MAWP XXXBarg @ XX°C



REV	AMENDMENT	BY	CHK	ENG	APP	DATE
18	P84-2010 REPLACE PSL-821	JCC	RL/CB	AM	SES	03/2018
17	P84-1323 - LOADER SOL VLV SYMBOL, ADDED PI-TAGS	JCC	RL/CB	AM	SES	07/2016
16	HAND VALVE NUMBERS ADDED FOR NEW ISOLATIONS	RL	JC	AM	SES	05/2016
15	HAND VALVE NUMBERS ADDED FOR NEW ISOLATIONS	RL	JC	AM	SES	07/2015
14	AS BUILT P84-836 PSV-854 REMOVAL	RL	NA	AM	SES	07/2014
13	AS BUILT PSL-821 WAS 0.5 BAR A	ES/RL	MY	AM	SES	03/2014
12	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	AC	AM	SES	10/2013
11	AS BUILT DRAIN RELOCATED ON P8151 & P8152 WAS P1852	ES	RL	AM	SES	12/2012
10	AS BUILT	ES	RL	LH	PJR	06/06

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
9	AS BUILT FOR WS884521 CO2 UPGRADE	JMP	VB	MP	CF	09/05
8	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
7	PSV SET POINTS & DESIGN DATA RATIONALISED	GJHJ	DJP	AvG	AIM	09/02
6	LINE NUMBER P8137-80-3 ADDED	VB	RL	EJH	RJW	02/01
5	REVISED FOR NEW PRINT. DRAWING CONTENT NOT CHANGED	VB	RL	EJH	RS	10/99
4	DRAWING NUMBER WAS 0108-0030/01	GMF	DV	EJH	MB	10/98
3	AS BUILT FOR LUBE OIL FILLING SYSTEM & I&E SURVEY	J.B.H.	R.L.	AvG	A.M.B.	21/08/96
2	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
1	REVISED FOR CONTINUITY CHECK	J.B.H.	D.G.M.	A.VG.	C.J.	10/94
D	AS BUILT USING PID VERSION 11.52	B.A.T.	J.S.T.	J.R.	J.R.S.	04/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0090/5
DRAWING NUMBER WAS 0108-0030/01
0108-0031/02 COMPRESSOR ENGINE P&ID

		DATE			DATE
DRN	D.WHITMORE	07/05/1994	ENG	E.DRUMMOND	07/05/1994
CHK	R.LOGAN	07/05/1994	APP	J. STUART	07/05/1994

CO2 RECOVERY
PIPING & INSTRUMENT DIAGRAM
AMMONIA COMPRESSION TRAIN B
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0108	0031	01 OF 02 SHTS	18

1000000-0108-0031-01.dwg

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

X-821-E2
AUXILARY COOLER
CAPACITY XXm3
MAWP XXXBarG @ XXX°C

CE-821
AMMONIA COMPRESSOR ENGINE
CAPACITY XXm3
MAWP XXXBarG @ XXX°C

0108-0012 FROM LSH-825 CO2 CONDENSER E-804
0108-0010 FROM LSH-826 CO2 CHILLER E-803
0108-0031/1 FROM AMMONIA COMP TRAIN B SWITCHES
SV-821 ZSH-821 ZSL-821 SV-830 SV-829 X-821-G1
CO2 CHILLER LAH 826
CO2 CONDENSER LAH 825
COMP OIL TAL 821
COMP OIL PDAL 821
COMP DISCHARGE PAH 821
COMP SUCTION PAL 821
COMP DISHARGE TAH 821
PUMP ON / PUMP OFF XA 821 A
OIL PUMP HTR ON
COMPRESSOR OIL LAL 821

LOAD VALVE POSITION HI
LOCAL/ REMOTE HS
SPEED LOCAL ONLY QC
SPEED REM ONLY QC
RUN YA
USD ON PIPE RACK EAST CO2 SHED HS 821A
LOCAL STOP HS
LOCAL LAMP TEST HS
SUPPLY ON A
CPS.1 ANNUN RESET HS
CRANK HS 821B
LOAD VALVE HC
SPEED QI 827
REMOTE YA
SPEED QI 827
ESD HS
LOCAL START HS
LOCAL LAMP RESET HS
SPEED QAL 827 / QAH 827
ALLEN BRADLEY SLC 5/02 PLC
REF TO CO2 PLANT UPGRADE, REFRIG PACKAGE, VENDOR DATA VOLUME 1A
REM ESD YA
LP S/D YA
ESD ON RACK YA
START O.K YA

TO C-885 0108-0001
TO CE-802 0108-0005
TO CE-888 0108-0032

TAH 846 / TAH 845
PAL 822
TAH 822
FAL 821 ALARM ON DOOR OF CP5.1 MCC5 (TYPICAL)
LAMP ON LOCAL PANEL (TYPICAL)
LAL 823
LAL 822
LAL 829

JACKET WATER HEADER TANK
AUXILLARY HEADER TANK
LG 822
LG 823
LSL 822 SET @ HOLD mm
LSL 829 SET @ HOLD mm

KGT01_PGS_19_V
0108-0041 START GAS
FG9053-50-1
FG9063-40-1
HV 847
TI 830
TI 831
TI 832
FSL 821
X-821-E2
CW9079-50-1
CW9078-50-1

TO ATMOS
FG9066-200-1
MUFFLER
XSV 822
SV 822 IAS
TI 857
HV 850
CW9080-80-1
0108-0040 TO COOLING WATER HEADER

0108-0040 FROM G-823 COOLING WATER PUMP
CW9077-80-1
HV 848

CE-821
WATER PUMP
TO ENGINE
FROM ENGINE
SET @ 100 °C
TI 838
TSH 822
TCV 822 SET @ 85°C
AP 836A
AUX WATER PUMP
AP 836B SAMPLE
TI 847 EXHAUST THERMOCOUPLES
HS MAGNETO
AIR FILTER
PI 840
PSL 822 SET @ 1 Bar
INTERCOOLER
STARTER
HV 851
FI 822
FG9057-50-1
0108-0041 TO START GAS VENT
DRIVE FOR COMPRESSOR C-821. SEE 0108-0031 SHT 01
GEARBOX
QT 827
QY 821
GOVERNOR
SET @ 5 kPag
SET @ 70 °C TSH 846
INLET MANIFOLD
TI 858
PI 851
CARB
PCV 822
OIL DRAIN
TO ATMOS
FG9065-15-1
FO
XSV 826
SV 826 IAS

0108-0006/2 FROM F-829 LUBE OIL HEADER TANK
20 TUBING
LIC 823 / LSL 823 LUBE OIL
KENCO OIL LEVEL CONTROL
SET @ HOLD mm
OVERFLOW
TO ENGINE
TSH 845 SET @ 95 °C
OIL FILTER
TI 845
SET @ 29°C
TCV 823
LUBE OIL COOLER
OIL PUMP

KGT01_PGS_19_V
0108-0041 FUEL GAS
FG9051-40-1
FG9061-50-1
HV 849

0108-0036 TO SV-825 AMMONIA TO CO2 CHILLER
0108-0036 TO SV-823 AMMONIA TO SUB COOLER
0108-0036 TO SV-824 AMMONIA TO CO2 CONDENSER

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
9	COD 0108-0041 NOTE CHANGED FROM FUEL GAS TO START GAS	RL	JCC	AM	TC	09/2019
8	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	AC	AM	SES	10/2013
7	AS BUILT FOR WS884521 CO2 UPGRADE	JMP	VB	MP	CF	09/05
6	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
5	TITLE BLOCKED REVISED	VB	RL	EJH	RS	10/99
4	DRG No. WAS 0108-0032/01 AND AP-836 A & B ADDED	GMF	DV	EJH	HG	10/98
3	REVISED FOLLOWING I&E MAINTENANCE SURVEY	J.B.H.	R.L.	AvG	A.M.B.	21/08/96
2	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
1	REVISED FOR CONTINUITY CHECK	J.B.H.	O.G.M.	A.V.G.	C.J.	10/94
0	AS BUILT USING PID VERSION 11,52	B.A.T.	P.H.	J.R.	J.R.S.	04/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0090/5
DRAWING NUMBER WAS 0108-0032/01
0108-0031/01 COMPRESSOR P&ID

		DATE		DATE
DRN	D.WHITMORE	01/05/1992	ENG	
CHK			APP	

CO2 RECOVERY
PIPING & INSTRUMENT DIAGRAM
TRAIN B AMMONIA COMPRESSION ENGINE CE-821
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0108	0031	02 OF 02 SHTS	9

1000000-0108-0031-02.DWG

EQUIPMENT No.	CE-888	C-888	M-889-A & M-889-B	M-892	E-893	G-894
DESCRIPTION	CO2 COMPRESSOR MOTOR	AMMONIA COMPRESSOR	OIL FILTERS	OIL SEPARATOR	OIL COOLER	OIL PUMP
CAPACITY		1150m3/hr DESIGN	203mmID x 580 S/S	2400mmL X 600mmID	188kW MAX.	25.6m3/hr @ 3.5 bar
MAWP @ TEMP			2070 KPag @ 149°C	2070 kPag @ 149°C	OIL SIDE 2070 kPag @ 150°C	
			2070 KPag @ 149°C	591mm IDx2450 S/S	CW SIDE 1034 kPag @ 93°C	

COMPRESSOR SKID LIMIT

0108-0012 FROM E-804 CO2 CONDENSER
KGT80_AMM_08_V
P8150-150-3C2
HV 897-1, HV 897-2, HV 897-3, HV 897-4
KGT80_AMM_09_V
0108-0035 FROM E-896 SUB COOLER
P8186-50-3C1
HV 898
TI 888A, PI 888E, PT 888E, PT 888F
TO PANEL (SHUTDOWN) SET @ -0.45 Barg
TO UNOADER CONTROLLER
PIPING TUBING
PI 888B
TUBING PIPING
PI 881
HV 8180, HV 8181
UNLOAD
OIL RETURN
OIL FEED
ZCV 889B
FROM PANEL (LOAD)
FROM PANEL (UNLOAD)
ZCV 889A
0108-0031/2 FROM HS-821A
CE-888
C-888
ZSL 888, ZE 888, ZT 888, ZI 888, ZSH 888
TO PANEL CAP CONTROL
TUBING PIPING
1/2" SS TUBING
HV 8182, PI 882
LOAD
HV 8179
PIPING TUBING
25x20
1/2" SS TUBING
50x25
TT 888B, TI 888B
TO PANEL (SHUTDOWN)
PI 888C, PT 888C, PT 888D, PI 888D, PDI 888A
PDCV 893 SET @ 2.8 BAR DIFF
HV 8183
PIPING TUBING
50x25
FC
XSC 888A, XSO 888A
TO PANEL (SHUTDOWN)
TO PANEL (START UP)
SXV 888A
IAS
PI 883
PIPING TUBING
PDI 889A
1/2" SS TUBING
TUBING PIPING
TI 889, TT 889
100x50
TCV 889 SET @ 49°C
HV 8167-A, HV 8104-A, HV 8104-B, HV 8167-B
HV 8168-A, HV 8105-A, HV 8105-B, HV 8168-B
M-889-A
M-889-B
START UP BYPASS
HV 899-1
HV 899-2, HV 899-3
FI 892
25x15
TUBING PIPING
1/2" SS TUBING
HV 8104
M-892
LG 892
HV 8101
TI 892
HTR X892 SET @ 40°C
LSL 892
TO PANEL
P8193-50-1C1
PSV 892A, PSV 892B SET @ 17.2 Barg 25x32
VENT TO ATMOS.
KGT80_AMM_01_V
P8181-80-3C1
HV 8103
0108-0035 TO E-895 AMMONIA CONDENSER
PDCV 894 SET @ 3.5 BAR DIFF
G-894
PI 894
HV 8102
100x50
100x80
50 LO
RIL 894 MOTOR CONTACTOR
TO PANEL (SHUTDOWN)
PIPING TUBING
20 TUBING
0108-0031/1
P8151-80-3C1
HV 8100
HV 895
CW8013-50-1
0108-0040 FROM COOLING WATER HEADER
E-893
TI 893B
TI 893A
CW8014-80-1C1
HV 896
0108-0040 TO COOLING WATER HEADER

LEGEND

- FIELD MOUNTED
- PANEL MOUNTED
- IN PANEL OR TB
- (A) LUBE OR FEEDING
- (B) OIL INJECTION
- (C) FEMALE ROTOR SIDE LUBE OIL FEEDING
- (D) CAPACITY CONTROL NO LOAD
- (E) CAPACITY CONTROL FULL LOAD
- (F) OIL DRAIN
- (G) ELECTROMIZER
- (S) SENSE GUAGE PORT

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
14	HAND VALVE NUMBERS ADDED FOR NEW ISOLATIONS	RL	JC	AM	SES	05/2016
13	VALVE NUMBERS ADDED FOR NEW ISOLATIONS	RL	JC	AM	SES	07/2015
12	AS BUILT PI-881, 882 & 883 ADDED	RL	JCC	AM	SES	10/2014
11	AS BUILT P84-836 PSV-854 REMOVAL	RL	NA	AM	SES	07/2014

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
10	AS BUILT PT-888E WAS -0.3 BARG	ES/RL	MY	AM	SES	03/2014
9	VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	03/2014
8	TI-888B & TT-888B ADDED. PROCESS COND. OF E-893 REVISED	ES/RL	CR	AM	SES	12/12
7	20NB VLV ON TUBING TO M-892 REVISED TO NORM. CLOSED	RL/ES	RL	SRH	SES	11/2011
6	WITCHES HAT STRAINER ADDED TO P8150	ES/RL	MB	JS	SES	05/11
5	AS BUILT - PDI-889A WAS PDI-888A	ES	RL	LH	DS	11/07
4	M-892 HEATER SYMBOL ADDED & M-889-A WAS M-889A	RL	ES	LH	PJR	03/2007
3	LINE No. P8186 WAS P8146 & TYPO ERRORS AS BUILT	RL	ES	LH	PJR	10/2006
2	AS BUILT	ES	RL	LH	PJR	06/06
1	AS BUILT FOR WS884521 CO2 UPGRADE	JMP	VB	MP	CF	09/05

AUTOCAD ORIGINAL SHEET SIZE A1

VECTOR LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4620
PHONE 0800 734 567

REFERENCE DRAWINGS
CAUSE & EFFECTS - 0780-0090/4

		DATE			DATE
DRN	D VOSS	01/11/2004	ENG	A SMITH	01/11/2004
CHK	K GILKISON	01/11/2004	APP	A HOOKER	01/11/2004

CO2 RECOVERY
PIPING & INSTRUMENT DIAGRAM
AMMONIA COMPRESSION TRAIN A

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0108	0032	01 OF 01 SHTS	14

1000000-0108-0032-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

E-895
AMMONIA CONDENSER 819kW
COLD SIDE 6.9 barG @ 93°C
HOT SIDE 20.7 barG @ 149°C

E-896
LIQUID SUB-COOLER 105kW
COLD SIDE 20.7 barG @ -29/45°C
HOLD SIDE 20.7 barG @ -29/45°C

F-803
LIQUID RECEIVER
CAPACITY XXm3
MAWP 17.2 Barg @ 55/0°C

KGT80_AMM_01_V
0108-0032 FROM M-892 OIL SEPARATOR
P8181-80-3C1
100x80
0108-0036 TO/FROM E-825 AMMONIA CONDENSER
P8189-25-3C1
0108-0036 NON CONDENSABLE PURGER X-B21-M3
TO ATMOS
AV8001-50-1C1
HV 8108
HV 8159
HV 8160
PSV 813
PSV 814
SET @ 17.2 Barg 20 x 25
HV 8187
HV 8188
PSV 815
PSV 816
HV 8111
HV 8107
TI 864
E-895
P8181-32-3C1
P8198-32-3C1
KGT80_AMM_02_V
P8190-25-3C1
0108-0036 TO/FROM F-823 LIQUID RECEIVER
F-803
LG 803
HV 8112
HV 8106-B
HV 8106-A
TI 895
0108-0040 FROM G-887 COOLING WATER PUMP
CW8011-100-1C1
KGT80_AMM_03_L
HV 8109-A
HV 8109-B
HV 8109-C
HV 8110-A
P8182-50-3C1
P8197-40-3C1
P8141-40-3C1
0108-0036 TO/FROM F-823 RECEIVER
TO COOLING WATER HEADER 0108-0040
CW8012-100-1C1
FROM PLC-5
HV 8113-A
HV 8113-B
HV 8113-C
SV 896C
NOTE 1
KGT80_AMM_07_L
P8185-15-3C1
0108-0012 TO M-828 OIL RECEIVER/E-803
KGT80_AMM_09_V
0108-0010 FROM E-803 CHILLER
P8042-25-3C1
HV 8120
HV 8121
P8192-15-3C1
0108-0036 TO/FROM NCG PURGER
KGT80_AMM_04_L
0108-0036
P8191-40-3C1
HV 8116
HV 8110-B
HV 8117
HV 8118
HV 8119
TO ATMOS
PSV 896B
SET @ 17.23 Barg 20 x 25
P8194-25-1C1
PSV 896A
PI 896A
TI 896A
HV 8115-B
75mm COLD
P8186-50-3C1
0108-0032 TO C-888 COMPRESSOR
P8187-50-3C1
0108-0036 TO C-821 COMPRESSOR
HV 8122
E-896 (PHE)
TI 896B
HV 8114-A
HV 8114-B
HV 8114-C
SV 896B
NOTE 1
KGT80_AMM_04_L
P8040-40-3C1
0108-0012 TO E-804 CO2 CONDENSER
SV 896A
TCV 896A
HV 8115-A
P8144-15-3C1

NOTES:
1. SOLENOID VALVES COMPLETE WITH INTERGRAL STRAINER.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
19	HAND VALVE NUMBERS ADDED TO 4 LO VALVES AT PSV's	RL	JCC	AM	TC	09/2019
18	HAND VALVES HV-8107 & HV-8111 WERE SHOWN NORMALLY OPEN	RL	JA	AM	SES	11/2014
17	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	03/2014
16	AS BUILT P84-859 CO2 PLANT AMMONIA SAFETY VALVES	JB	CJ	AM	SES	11/13
15	40NB VALVE ADDED TO P8197-40-3C1 & VENT RELOCATED	RL	ES	LH	SES	07/2008
14	AS BUILT WS1014156 LG-803 REPLACEMENT	RL	JM	LH	PJR	02/06
13	AS BUILT FOR WS884521 CO2 UPGRADE	JMP	VB	MP	CF	09/05
12	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
11	PSV SET POINTS & DESIGN DATA RATIONALISED	GJH	RL	AvG	AIM	09/02
10	DRAWING NUMBER WAS 0108-0006/01	GMF	DV	EJH	MB	10/98
9	AS BUILT COMMENTS INCORPORATED	V.B	B.T.	A.V.G.	C.J.	5/95
8	REVISED FOR CONTINUITY CHECK	J.B.H.	O.G.M.	A.V.G.	C.J.	10/94
7	AS BUILT USING PID VERSION 11.52	J.S.T.	P.H.	J.R.	J.R.S.	04/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
DRAWING NUMBER WAS 0108-0006/01

		DATE		DATE
DRN	P.MILLS		ENG	
CHK	R.LOGAN	28/04/1980	APP	

CO2 RECOVERY
PIPING & INSTRUMENT DIAGRAM
AMMONIA CONDENSING TRAIN A CONDENSER SUB-COOLER
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0108	0035	01 OF 01 SHTS	19

1000000-0108-0035-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

E-825
AMMONIA CONDENSER
CAPACITY 0.05 m3
MAWP 20.7 Barg @ 85°C

F-823
AMMONIA RECEIVER
CAPACITY 1.52 m3
MAWP 20.7 Barg @ 149/-29°C

E-826
LIQUID SUB-COOLER
CAPACITY XXm3
SHELL: 20.70 Barg @ 149/-29°C
TUBE: 20.70 Barg @ 149/-29°C

X-821-M3
NON CONDENSABLE PURGER
CAPACITY XXm3
MAWP XXXBarg @ XXX°C

KGT80_AMM_01_V
KGT80_AMM_11_V
KGT80_AMM_02_V
KGT80_AMM_03_L
KGT80_AMM_09_V
KGT80_AMM_04_L
KGT80_AMM_07_L

0108-0035 TO/FROM E-895 AMMONIA CONDENSER
0108-0031/1 FROM M-825 OIL SEPARATOR
0108-0035 FROM E-895 & F-803
0108-0040 FROM G-887 COOLING WATER PUMP
0108-0035 TO/FROM LIQUID RECEIVER F-803
0108-0035 TO/FROM F-803 RECEIVER
0108-0035 FROM E-896 SUB COOLER
0108-0010 FROM E-803 CHILLER
0108-0031/2 FROM SLC 5/02 PLC IN CP5.1 MCC5
0108-0031/2 FROM SLC 5/02 PLC IN CP5.1 MCC5
0108-0031/2 FROM SLC 5/02 PLC IN CP5.1 MCC5

0108-0040 TO COOLING WATER HEADER
0108-0035 TO/FROM E-896 SUB COOLER
0108-0035 TO E-896 SUB COOLER
0108-0012 TO M-828 OIL RECEIVER/E-803
0108-0031/1 TO C-821 COMPRESSOR
0108-0012 TO E-804 CO2 CONDENSER

SKID LIMIT
SUB COOLER ASSEMBLY LIMIT

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
15	AS BUILT P84-1223 PSV-858 & PSV-859 CHANGED FROM 15x20	RL	JCC	AM	TC	09/2019
14	VALVES CHANGED FOR NORMALLY OPEN OR NORMALLY CLOSED	RL	JA	AM	SES	11/2014
13	HV No's FOR ISOLATIONS & E-825 PROCESS CONDITIONS ADDED	RL	CR	AM	SES	03/2014
12	SET PRESSURES OF PSV-855 & 856 CHANGED FROM 20.7	RL	ES	LH	SES	10/2008
11	PCV-862 AND STRAINER ADDED	ES	RL	LH	SES	09/2008
10	NEEDLE VALVE DRAIN REPLACED CLIENT CONN ON P8189	RL	ES	LH	SES	07/2008

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
9	AS BUILT FOR WS884521 CO2 UPGRADE	JMP	VB	MP	CF	09/05
8	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
7	DESIGN DATA RATIONALISED	GJH	DJP	AvG	AIM	09/02
6	AS BUILT	VB	RL	EJH	RJW	09/00
5	PSV-857 ADDED	VB	RL	EJH	RS	10/99
4	DRG No. WAS 0108-0031/01 & PROCESS CONDITIONS ADDED	GMF	DV	EJH	HG	10/98
3	PCV-823 SET PRESS NOW 1.6 & SOLENOID SIGNALS ADDED	J.B.H.	R.L.	AvG	A.M.B.	21/08/96
2	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
1	REVISED FOR CONTINUITY CHECK	J.B.H.	D.G.M.	A.V.G.	C.J.	10/94
D	AS BUILT USING PID VERSION 11.52	B.A.T.	P.H.	J.R.	J.R.S.	04/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

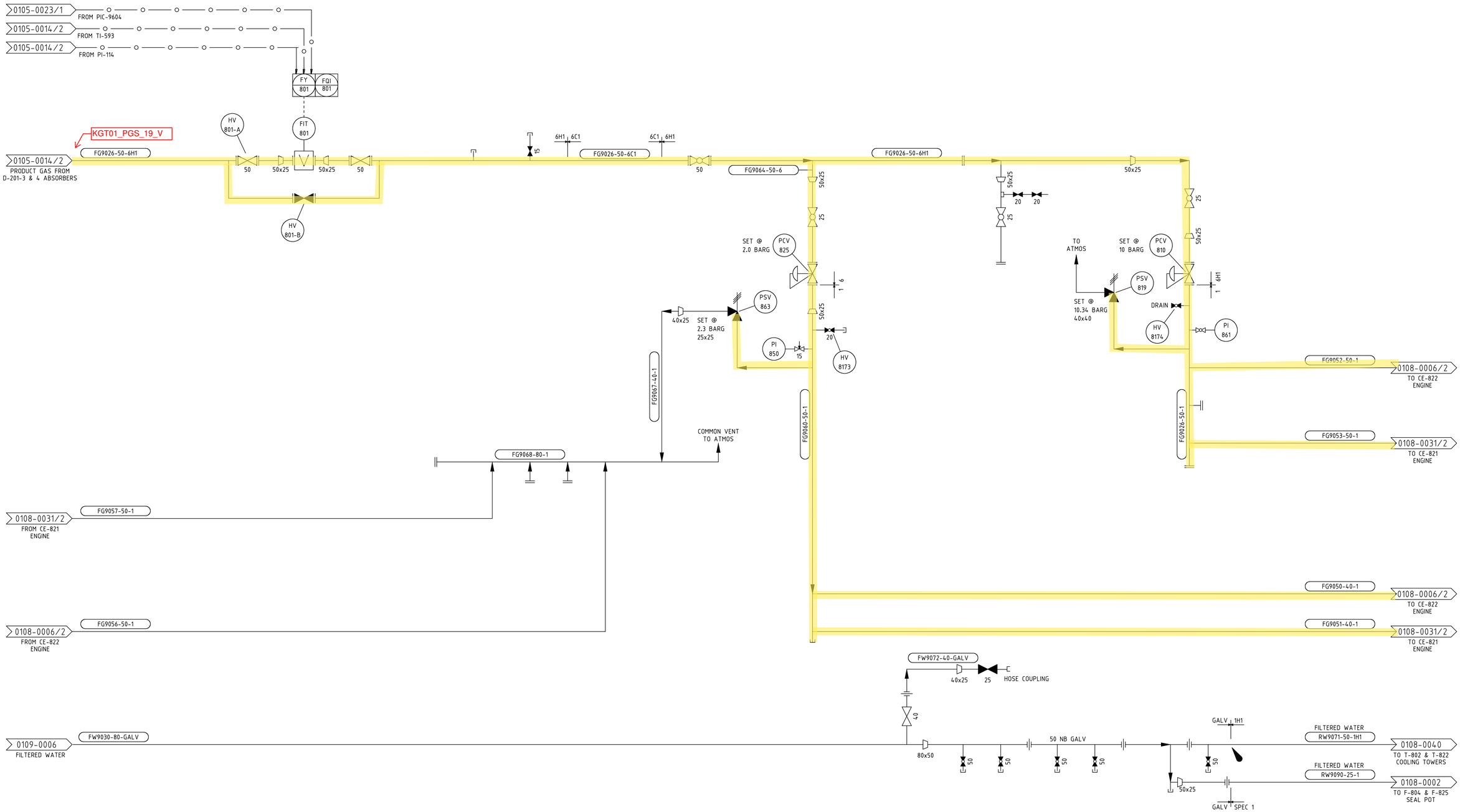
REFERENCE DRAWINGS
DRAWING NUMBER WAS 0108-0031/01

		DATE		DATE
DRN	D.WHITMORE	17/03/1994	ENG	
CHK			APP	

CO2 RECOVERY
PIPING & INSTRUMENT DIAGRAM
AMMONIA REFRIGERATION
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0108	0036	01 OF 01 SHTS	15

1000000-0108-0036-01.DWG



REV	AMENDMENT	BY	CHK	ENG	APP	DATE
14	HAND VALVE No's ADDED FOR ISOLATIONS & PIPE SPEC REVISED	RL	JCC	AM	TC	11/2016
13	P&ID SPLITTING CONTIUATION FROM 0105-0014-02	JCC	RL	AM	SES	06/2016
12	CONTIN. DRG. No. REVISED FOR EXPORT COMPRESSOR RE-NUMBERING	RL/ES	MH	AM	SES	05/2012
11	AS BUILT FOR WS993217 FT-114 TO CUSTOMER METER STD.	VB	LH	MP	PJR	03/07
10	AS BUILT WS185498 DEMO PRIMARY COOLING TOWER T-821	RL	ES	LH	PJR	05/2006
9	AS BUILT FOR WS884521 CO2 UPGRADE VO12	WXB	PR	MP	LH	02/06
8	AS BUILT FILTERED WATER LINE WAS TO 0109-0024	RL	ES	LH	PJR	09/2005
7	AS BUILT FOR WS884521 CO2 UPGRADE	JMP	VB	MP	CF	09/05
6	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	10/02
5	DRG No. WAS 0108-0026/01 & FILT'D WATER LINE ADDED	GMF	DV	EJH	HG	10/98
4	LINE TO F-805 ON 108-025 REMOVED	J.B.H.	R.L.	AvG	A.M.B.	21/08/96
3	AS BUILT COMMENTS INCORPORATED	V.B.	B.T.	A.V.G.	C.J.	5/95
2	REVISED FOR CONTINUITY CHECK	J.B.H.	O.G.M.	A.VG.	C.J.	10/94
1	AS BUILT USING PID VERSION 11.52	B.A.T.	J.S.T.	J.R.	J.R.S.	04/94

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
DRAWING NUMBER WAS 0108-0026/01

		DATE		DATE
DRN	P.MILLS	28/04/1980	ENG	
CHK	R.LOGAN	28/04/1980	APP	

CO2 RECOVERY
PIPING & INSTRUMENT DIAGRAM
FUEL GAS & RAW WATER
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SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0108	0041	01 OF 01 SHTS	14

1000000-0108-0041-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

BG-901-1
BOILER STACK

B-901-1
BOILER
20412 kg/hr
BOILER DRUM DESIGN PRESSURE 35.85 Barg @ 274°C
SUPERHEATER DESIGN PRESSURE 35.85 Barg @ 343°C

0109-0010 COOLING WATER SUPPLY RW9014-15-1H1

0109-0023

BG-901-1

NOTE 4
PIC 951-1 BIAS
PI 951-1A HH H
PT 951-1
PI 951-1A
TO ATMOS
NOTE 6
LI 952-1 HH LL
LT 952-1
LIC 950-1 HH H
LIT 950-1
FIC 950-1B
HS 953-1
ZIC 953-1
LG 950-1A
LG 950-1B
LSLL 951-1
BD9011-50-3C1
STEAM DRUM
AB
SUPERHEATER
TO ATMOS
BD9014-40-3C1
DRAIN TO GRADE
AP 911-1 SAMPLE
SXV 953-1
ZSC 953-1
XSV 953-1
PI 957-1
FY 950-1
HV 9100-1
FV 950-1
FE 950-1B
FIT 950-1B
TI 950-1A
TT 950-1A
LPB901-1
DRAIN TO GRADE
HS B901-1
FORCED DRAUGHT FAN
NOTE 5
BE 901-1
IGNITION TXFMR
BT 901-1
PIT 950-1
ZSC 955-1
ZSO 955-1
TI 950-1B
TT 950-1B
LPB901-1
0109-0017/2
FROM G-902-1,2,3 & 5 BOILER FEED WATER PUMPS
BFW9001-80-3C1
FC, NOTE 7
3H1 3C1
HV 937-1
ATMOS
SXV 950-1
ZSOC 950-1
SXV 952-1A
SXV 952-1B
ZSOC 952-1A
ZSOC 952-1B
PI 956-1B
FG9078-20-1C1
FC, NOTE 7
N-901-1
BOILER IGNITOR
1H1 1C1
0109-0025/1
FROM McKEE/MAUI PRODUCTION LINES
FG9072-80-1C1
FG9075-40-1C1
PIT 955-1
NOTE 2
HV 936-1
PCV 952-1
XSV 952-1A
XSV 952-1B
XSV 954-1A
ZSOC 954-1A
PIT 956-1A
XSV 954-1B
ZSOC 954-1B
PIT 956-1B
BS
100x80
FV 951-1
BE 902-1
FY 951-1
PI 953-1
BT 902-1
IGNITION TRANSFORMER
U-TUBE MANOMETER
B-901-1
WATER DRUM
DRAIN
HPS9002-150-3H1
0109-0023/1
TO STEAM SYSTEM
HV 9101-1
HV 939-1
TI 950-1C
LPB901-1
TT 950-1C
FI 950-1
FIT 950-1
FE 950-1
HV 938-1
ZSO 954-1C
HV 923-1
ZIO 954-1C
HV 941-1
BD9002-40-3H1
0109-0023/2
F-914 BLOWDOWN
HV 940-1
DRAIN TO GRADE
STEAM TRACING
DRAIN TO GRADE

KGT01_PGS_22_V
(Sensitivity case 2)

TRIPS ON HH & LL

HIMA PLC SAFETY SHUTDOWN SYSTEM
REFER CAUSE AND EFFECTS DIAGRAM 0780-0094/01
PLC-B901-1

XA 950-1 PLC DATA NOTE 3
UA 950-1 LOCAL DISPLAY
XY 950-1C SAFETY INTERLOCK NOTE 1
XY 950-1 ESD TRIP
HS 950-1A EMERGENCY STOP
HS 950-1C EMERGENCY STOP
HS 950-1B RESET
HS 950-1D START STOP
A BURNER ON
YI 950-1A PURGE INDICATION
YI 950-1B READY FOR MODULATION
YI B901-1C BOILER TRIPPED
R BOILER TRIPPED
G POWER ON
HS 951-1 LEVEL SWITCH BYPASS

LEGEND
MOTHBALLED

NOTES
1. DCS INTERLOCKS TO HIMA BOILER SAFETY SYSTEM.
2. INSTRUMENTS WITH NO ISOLATING VALVES FOR COMPLIANCE REASONS.
3. PLC DATA VIEWABLE ON DCS CONSOLE.
4. ALGORITHM IN DCS FOR 3 BOILERS TO CONTROL O/P TO VALVES.
5. FAN AIR INLETS CLOSED OFF.
6. PSV REMOVED FOR MOTHBALL, AND FLANGES BLANKED OFF.
7. VALVE HELD OPEN WITH INSTRUMENT AIR FOR OPEN PATHWAY.

0109-0020 FROM B-901-2 BOILER

BD9010-50-3C1 TO F-914 BLOWDOWN DRUM 0109-0023/2

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
21	SAMPLE POINT AP-911-1 ADDED	RL	MY	AM	SES	01/2014
20	AS BUILT P84-2017 DOWN STEAM STEAM TRAPS	JB	CJ	AM	SES	12/13
19	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	07/2013
18	BOILER PROCESS CONDITIONS & PSV SIZES AS BUILT	RL/ES	AM	SRH	SES	02/2012
17	AS BUILT 1141024 UPDATE ADV CONTROL DESC'S	ES	CJ	LH	SES	02/08
16	AS BUILT WS998510 BOILER RELIABILITY	KN	LH	MP	PJR	10/07
15	AS BUILT WS1236285 - BOILER MANOMETER ADDED	ES	SR	LH	DS	09/07
14	AS BUILT FOR WS917716 B-901,2&3 BOILER FEED WATER	PJ	MP	CF	LH	03/06
13	WS823841 AS BUILT. BOILER CONTROL UPGRADE	JBH	RL	LH	PJR	06/07/04
12	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	11/02
11	PSV SET POINTS & DESIGN DATA RATIONALISED	GJH	DJP	AvG	AIM	09/02
10	AS BUILT FOR WS104731 INLET & COOLING WATER MODS.	VB	RL	LH	DC	01/02
9	BD9007 NOW BD9005 AND LT-951-1 NOW LSLL-951-1	JBH	RL	EJH	RW	7/07/00
25	AS BUILT P84-1348 MOTHBALL BOILERS	JB	CJ	SES	SES	09/2017
24	REVISED FOR LOCKED VALVE REGISTER	RL	JCC	AM	TC	11/2016
23	AS BUILT P84-1229 REPLACE GWR TRANSMITTER	LN	CJ	SES	AM	05/2015
22	HAND VALVE NUMBERS ADDED FOR ISOLATIONS & CSO	RL	JCC	AM	SES	04/2015

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECT 0780-0094/1

		DATE			DATE
DRN	P.RAWLES		ENG		
CHK	A vanGAMEREN		APP	J.F.STUART	10/02/1986

UTILITIES
PIPING & INSTRUMENT DIAGRAM
B-901-1 BOILER NO. 1

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
N/A	1000000	0109	0019	01 OF 01 SHTS	25

1000000-0109-0019-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

BG-901-2
BOILER STACK

B-901-2
BOILER
204.12 kg/hr
BOILER DRUM DESIGN PRESSURE 35.85 Barg @ 274°C
SUPERHEATER DESIGN PRESSURE 35.85 Barg @ 343°C

COOLING WATER SUPPLY
RW9015-15-1H1

0109-0010

0109-0023

NOTE 4
PIC 951-2 BIAS

BG-901-2
BOILER STACK

FLUE

STEAM DRUM

SUPERHEATER

B-901-2
WATER DRUM

FORCED DRAUGHT FAN

N-901-2
BOILER IGNITOR

IGNITION TXFMR

U-TUBE MANOMETER

IGNITION TRANSFORMER

TRIPS ON HH & LL

HIMA PLC SAFETY SHUTDOWN SYSTEM

REFER CAUSE AND EFFECTS DIAGRAM 0780-0095/01

PLC-B901-2

XA 950-2 PLC DATA NOTE 3
UA 950-2 LOCAL DISPLAY
XY 950-2C SAFETY INTERLOCK NOTE 1
XY 950-2 DCS TRIP
HS 950-2A EMERGENCY STOP
HS 950-2C EMERGENCY STOP
HS 950-2B RESET
HS 950-2C START STOP
A BURNER ON
YI 950-2A PURGE INDICATION
YI 950-2B READY FOR MODULATION
YI B901-2C BOILER TRIPPED
R BOILER TRIPPED
G POWER ON
HS 951-2 LEVEL SWITCH BYPASS

0109-0017/2
FROM G-902-1,2,3 & 5 BOILER FEED WATER PUMPS
FC, NOTE 7
BFW9002-80-3C1

0109-0025
FG9073-80-1C1
FG9076-40-1C1
FG9079-20-1C1

0109-0021
FROM B-901-3 BOILER

TO ATMOS
DRAIN TO GRADE
LPB901-2
BD9012-50-3C1
BD9005-40-3C1
BD9003-40-3H1
BD9006-40-3C1
HPS9003-150-3H1
0109-0023/1
TO STEAM SYSTEM
0109-0023/2
F-914 BLOWDOWN
AP 911-2 SAMPLE
STEAM TRACING
DRAIN
BD9010-50-3C1
0109-0019
TO F-914 BLOWDOWN DRUM

LEGEND
MOTHBALLED

NOTES
1. DCS INTERLOCKS TO HIMA BOILER SAFETY SYSTEM.
2. INSTRUMENTS WITH NO ISOLATING VALVES FOR COMPLIANCE REASONS.
3. PLC DATA VIEWABLE ON DCS CONSOLE.
4. ALGORITHM IN DCS FOR 3 BOILERS TO CONTROL O/P TO VALVES.
5. FAN AIR INLETS CLOSED OFF.
6. PSV REMOVED FOR MOTHBALL, AND FLANGES BLANKED OFF.
7. VALVE HELD OPEN WITH INSTRUMENT AIR FOR OPEN PATHWAY.

KGT01_PGS_22_V
(Sensitivity case 2)

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
21	AS BUILT P84-2017 DOWN STREAM STEAM TRAPS	JB	CJ	AM	SES	12/2013
20	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	07/2013
19	BOILER PROCESS CONDITIONS & PSV SIZES AS BUILT	RL/ES	AM	SRH	SES	02/2012
18	PSV-953-2 EXCHANGED FOR PSV-953-3 FROM BOILER 3	RL/ES	MK	CR	SES	09/2011
17	AS BUILT WS998510 BOILER RELIABILITY	VB	WF	PWM	LH	08/08
16	AS BUILT 1141024 UPDATE ADV CONTROL DESC'S	ES	CJ	LH	SES	02/08
15	AS BUILT WS1236285 - BOILER MANOMETER ADDED	ES	SR	LH	DS	09/07
14	AS BUILT FOR WS917716 B-901,2&3 BOILER FEED WATER	PJ	MP	CF	LH	03/06
13	WS823841 AS BUILT, BOILER CONTROL UPGRADE	JBH	RL	LH	PJR	16/09/04
12	PROCESS ISOLATION POINTS ADDED ON INDIVIUAL LAYERS	CMW	RL	CM	AIM	11/02
11	PSV SET POINTS & DESIGN DATA RATIONALISED	GJH	DJP	AvG	AIM	09/02
10	AS BUILT FOR WS104731 INLET & COOLING WATER MODS.	VB	RL	LH	DC	01/02
26	AS BUILT P84-1348 MOTHBALL BOILERS	JB	CJ	AM	SES	09/2017
25	REVISED FOR LOCKED VALVE REGESTER	RL	JCC	AM	TC	11/2016
24	AS BUILT P84-1229 REPLACE GWR TRANSMITTER	LN	CJ	AM	SES	05/2015
23	HAND VALVE NUMBERS ADDED FOR ISOLATIONS & CSO	RL	JCC	AM	SES	04/2015
22	SAMPLE POINT AP-911-2 ADDED	RL	MY	AM	SES	01/2014
	AMENDMENT	BY	CHK	ENG	APP	DATE

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECT 0780-0095/1

		DATE			DATE
DRN	P.RAWLES		ENG		
CHK	A vanGAMEREN		APP	J.F.STUART	10/02/1988

UTILITIES
PIPING & INSTRUMENT DIAGRAM
B-901-2 BOILER NO. 2

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
N/A	1000000	0109	0020	01 OF 01 SHTS	26

1000000-0109-0020-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

F-201
LPG SURGE VAPOURISER
4.5m3
SHELL 10.34 Barg @ 149°C
TUBE 6.55 Barg @ 149°C

M-201-2
RICH FUEL GAS SEPARATOR
0.16m3
MAWP 10.34 Barg @ 121/0°C

H-206
FLARE/DRAIN FILTER
0.04m3
X Barg @ XX°C

KGT01_PGS_22_V
(Sensitivity case 2)

Assume B-901-3
Mothballed.

LEGEND
MOTHBALLED

NOTES
1. VOID
2. DEAD MANS HANDLE (SPRING RETURN) VALVE
3. PUMPED STEAM TRAP.
4. VALVE TO FLARE MUST BE OPENED BEFORE THE VALVE TO THE SURGE VAPOURISER IS CLOSED.
5. STEAM TRACING AND THERMAL CEMENT TO MAINTAIN 100°C.
6. VOID
7. VALVE TO FLARE MUST BE OPENED BEFORE THE VALVE TO THE SURGE VAPOURISER IS CLOSED.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
23	AS BUILT WS1043299 UPGRADE DOMESTIC GAS SUPPLY	RL	MD	LH	SES	11/2007
22	AS BUILT FOR WS993217 FT-114 TO CUSTODY METER	VB	LH	MP	PJR	03/07
38	AS BUILT P84-1348 MOTHBALL BOILERS AM SES	JB	CJ	AM	SES	09/2017
37	AS BUILT P84-1309 RELOCATE STEAM TRACING SOURCE ON LT-971	RL	JCC	AM	TC	11/2016
36	CONTINUATION P&ID SPLITTING 0104-0004 & 0105-0014	JCC	RL	AM	SES	06/2016
35	VALVES REMOVED FROM LINE P3209-40-6H1 & CSO FROM HV-980	RL	JCC/IM	AM	SES	10/2015
34	ADDED HV-939, HV-999-1,2,3; LEVEL BRIDLE LT-972	JCC	RL/CB	AM	SES	04/2015

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
33	REVISED FOR P&ID SPLITTING, CONT. DRG. No's REVISED	RL	JCC	AM	SES	01/2015
32	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	04/2014
31	AS BUILT & SITE CHECKED	ES/RL	TC	AM	SES	11/12
30	AS BUILT P84-1041 FLARE GAS MEASUREMENT	ES/RL	TC	AM	SES	09/12
29	AS BUILT P84-3007 ESD LEVEL TRANS DEVIATION ALARMS	ES	TC	LH	SES	03/10
28	AS BUILT WS1285853 - BOILER DEAD LEG TRIP HAZARD	ES	MS	LH	SES	04/09
27	PI-979-A & D MODIFIED FOR OVER PRESSURE PROTECTION	RL	MD	LH	SES	06/08
26	AS BUILT PCV-971 PER INCIDENT REPORT No. 506675	ES	JY	LH	SES	05/08
25	AS BUILT WS1266020 VENT NGC BOILER FUEL ON START	RL	ES	LH	SES	04/2008
24	PI-979-C, PI-979-D, PIC-979 ADDED	ES	CB	LH	SES	01/08

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE			DATE
DRN	P.RAWLES	09/12/1987	ENG		
CHK	P.THAMBYAH	08/12/1987	APP	J.F.STUART	21/12/1987

UTILITIES
PIPING & INSTRUMENT DIAGRAM
LPG SURGE VAPOURISER & FUEL SYSTEM

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0109	0025	01 OF 01 SHTS	38

1000000-0109-0025-01.DWG

EQUIPMENT No.

DESCRIPTION
CAPACITY
MAWP @ TEMP

F-201
LPG SURGE VAPOURISER
4.5m3
SHELL 10.34 Barg @ 149°C
TUBE 6.55 Barg @ 149°C

M-201-2
RICH FUEL GAS SEPARATOR
0.16m3
MAWP 10.34 Barg @ 121/0°C

H-206
FLARE/DRAIN FILTER
0.04m3
X Barg @ XX°C

LEGEND
MOTHBALLED

[redacted]

NOTES
1. VOID
2. DEAD MANS HANDLE (SPRING RETURN) VALVE
3. PUMPED STEAM TRAP.
4. VALVE TO FLARE MUST BE OPENED BEFORE THE VALVE TO THE SURGE VAPOURISER IS CLOSED.
5. STEAM TRACING AND THERMAL CEMENT TO MAINTAIN 100°C.
6. VOID
7. VALVE TO FLARE MUST BE OPENED BEFORE THE VALVE TO THE SURGE VAPOURISER IS CLOSED.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
23	AS BUILT WS1043299 UPGRADE DOMESTIC GAS SUPPLY	RL	MD	LH	SES	11/2007
22	AS BUILT FOR WS993217 FT-114 TO CUSTODY METER	VB	LH	MP	PJR	03/07
38	AS BUILT P84-1348 MOTHBALL BOILERS AM SES	JB	CJ	AM	SES	09/2017
37	AS BUILT P84-1309 RELOCATE STEAM TRACING SOURCE ON LT-971	RL	JCC	AM	TC	11/2016
36	CONTINUATION P&ID SPLITTING 0104-0004 & 0105-0014	JCC	RL	AM	SES	06/2016
35	VALVES REMOVED FROM LINE P3209-40-6H1 & CSO FROM HV-980	RL	JCC/IM	AM	SES	10/2015
34	ADDED HV-939, HV-999-1,2,3; LEVEL BRIDLE LT-972	JCC	RL/CB	AM	SES	04/2015

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
33	REVISED FOR P&ID SPLITTING, CONT. DRG. No's REVISED	RL	JCC	AM	SES	01/2015
32	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	04/2014
31	AS BUILT & SITE CHECKED	ES/RL	TC	AM	SES	11/12
30	AS BUILT P84-1041 FLARE GAS MEASUREMENT	ES/RL	TC	AM	SES	09/12
29	AS BUILT P84-3007 ESD LEVEL TRANS DEVIATION ALARMS	ES	TC	LH	SES	03/10
28	AS BUILT WS1285853 - BOILER DEAD LEG TRIP HAZARD	ES	MS	LH	SES	04/09
27	PI-979-A & D MODIFIED FOR OVER PRESSURE PROTECTION	RL	MD	LH	SES	06/08
26	AS BUILT PCV-971 PER INCIDENT REPORT No. 506675	ES	JY	LH	SES	05/08
25	AS BUILT WS1266020 VENT NGC BOILER FUEL ON START	RL	ES	LH	SES	04/2008
24	PI-979-C, PI-979-D, PIC-979 ADDED	ES	CB	LH	SES	01/08

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

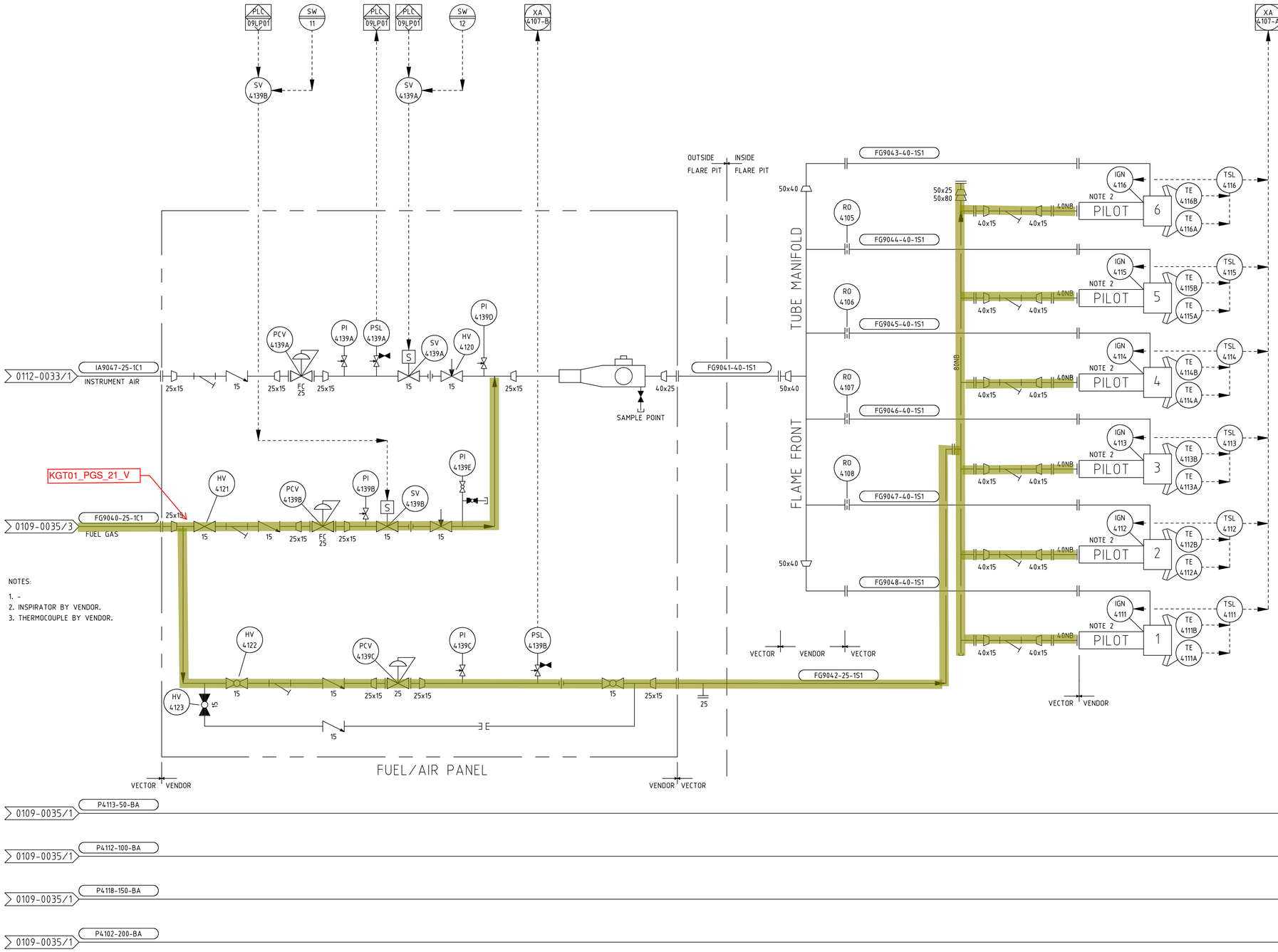
		DATE			DATE
DRN	P.RAWLES	09/12/1987	ENG		
CHK	P.THAMBYAH	08/12/1987	APP	J.F.STUART	21/12/1987

UTILITIES
PIPING & INSTRUMENT DIAGRAM
LPG SURGE VAPOURISER & FUEL SYSTEM
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0109	0025	01 OF 01 SHTS	38

1000000-0109-0025-01.DWG

D1-4100B
GAS FLARE SYSTEM BURNER
CAPACITY 3.6m3/h
MAWP 20.7BarG @ 16°C



NOTES:

1. -
2. INSPIRATOR BY VENDOR.
3. THERMOCOUPLE BY VENDOR.

D1-4100B

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
11	AS BUILT P84-1536 DEMOLISHED GROUND FLARE EXCITER JB	JCC	RL	AM	TC	03/2020
10	AS BUILT P84-1234 RENEW GROUND FLARE FLAME FRONT GENERATOR	CJ	JT	AM	SES	10/2015
9	AS BUILT P84-1193 GROUND FLARE MODIFICATIONS	LN	JT	AM	SES	12/14
8	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	12/2013
7	09LP01 ADDED	ES	CB/RL	LH	SES	07/08
6	JUNCTION BOX 09IJB04 WAS 09IJB01	ES	RL	LH	DS	10/07
5	AS BUILT FOR WS969591 GROUND FLARE MODS	VB	MK	ST	LH	09/06
4	AS-BUILT WS969831	KJ	AS	CL	LH	11/05
3	AS BUILT TO SITE MARK-UP	ES	WN	LH	PJR	10/05
2	PCV DESIGN DATA RATIONALISED	GJH	DJP	AvG	AIM	09/02
1	AS BUILT FOR GAS FLARE FLAMEFRONT IGNITION SYSTEM	JBH	RL	EJH	RS	03/04/00
REV	AMENDMENT	BY	CHK	ENG	APP	DATE

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
VENDOR DRAWING - 0406-0011/03

		DATE			DATE
DRN	V BRENNAN	16/02/1999	ENG	J LOMAX	16/02/1999
CHK	P MILLS	16/02/1999	APP	G EATON	16/02/1999

UTILITIES
PIPING & INSTRUMENT DIAGRAM
FLARE
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
	1000000	0109	0035	02 OF 03 SHTS	11

1000000-0109-0035-02.dwg

EQUIPMENT No.

DESCRIPTION
CAPACITY
MAWP @ TEMP

[redacted]

LEGEND

DECOMMISSIONED & ABANDONED IN PLACE

NOTES

1. VOID.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
4	AS BUILT FOR P84-1419 MOTHBALL THE LIUQID FLARE	BJS	CJ	WB	AM	12/2019
3	AS BUILT FOR I.G.S. TUBING TO GAS FLARE SYSTEM	RL	JCC	AM	TC	08/2019
2	P&ID SPLITTING 0105-0014/2 CONTINUATION	JCC	RL	AM	SES	09/2016
1	CREATED FROM SHEET 01 SPLIT	NK	RL	AM	SES	12/2013

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
0780-0082/06 EDP CAUSE AND EFFECTS

		DATE			DATE
DRN	N KNIGHT	02/12/2013	ENG	A MANN	02/12/2013
CHK	R LOCHHEAD	02/12/2013	APP	S SMITH	02/12/2013

UTILITIES
PIPING & INSTRUMENT DIAGRAM
FLARE - BURNER SYSTEM
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
N/A	1000000	0109	0035	03 OF 03 SHTS	4

1000000-0109-0035-03.DWG

EQUIPMENT No.	F-502-1	F-502-2	F-502-4	F-502-6	G-309-1	G-309-2	G-319-1	G-319-2
DESCRIPTION	METHANOL STORAGE TANK	METHANOL STORAGE TANK	METHANOL STORAGE TANK	METHANOL STORAGE TANK	METHANOL METERING PUMP (100 TON)	METHANOL METERING PUMP (100 TON)	METHANOL METERING PUMP (200 TON)	METHANOL METERING PUMP (200 TON)
CAPACITY	CAPACITY 4.0m3	CAPACITY 4.0m3	CAPACITY 4.0m3	CAPACITY 4.0m3	FLOW 0.013 m3 /Hr	FLOW 0.013 m3 /Hr	FLOW 0.041 m3 /Hr	FLOW 0.041 m3 /Hr
MAWP @ TEMP	MAWP 1.0 Barg @ -3 to 27°C	MAWP 1.0 Barg @ -3 to 27°C	MAWP 1.0 Barg @ -3 to 27°C	MAWP 1.0 Barg @ -3 to 27°C	MAWP 75.8 BargG @ 30°C	MAWP 75.8 BargG @ 30°C	MAWP 75.8 BargG @ 30°C	MAWP 75.8 BargG @ 30°C

0102-0005/1 FROM FI-384

0102-0005/2 FROM METHANOL CONCENTRATION CONTROLLER DIC-306

SP FFIC 309

SPI-287 FLAME ARRESTER NOTE 2

HV 3151 HV 3152 NOTE 6

Assumed : Empty

F-502-1 LG 304 NOTE 5

KGT55_MOH_01_L

F-502-2 LI 305 LG 305 LT 305

KGT55_MOH_03_L Methanol filling

P9046-40-1C1

F-502-4 LG 306

P9044-40-1C1

P9210-80-1C1 MT9002-25-1C1 MT9001-25-1C1

SPI-300 IA9046-25-1C1 0109-0031/2 FROM PLANT AIR HEADER

FILTER NOTE 1

F-502-6 LG 307

MT9001-25-1C1

TUBING 1C1 15mmTUBING 25x15 100x80

XS 309 RESET HS 309 NOTE 4 LG 309

QC 309-1 HS 309-1A XY-309-1 HS 309-1 ES SET @ 74 Barg 8 x 8 PSV 309-1 PI 309-1 IL 309-1

G-309-1

KGT55_MOH_02_L

15mm TUBING 0102-0005/1 TO E-303-1/2 GAS GAS HEAT EXCHANGERS (100 TON)

QC 309-2 HS 309-2A XY-309-2 HS 309-2 ES SET @ 74 Barg 8 x 8 PSV 309-2 PI 309-2 IL 309-2

G-309-2 Stand-by

LG 319 NOTE 4

15mm TUBING 0104-0004 TO DE-ETHANISER OVERHEAD P4208-100-3H1

15mm TUBING 0102-0005/2 TO E-304 GAS LIQUID HEAT EXCHANGER

QC 319-1 HS 319-1A XY-319-1 HS 319-1 ES SET @ 74 Barg 8 x 8 PSV 319-1 PI 319-1 PI 319-3 IL 319-1

SPI-319 DUAL FILTERS 12mm 20mmTUBING

G-319-1

15mm TUBING 0102-0006/2 TO E-313-1/2 GAS GAS HEAT EXCHANGERS (200 TON)

QC 319-2 HS 319-2A XY-319-2 HS 319-2 ES SET @ 74 Barg 8 x 8 PSV 319-2 PI 319-2 PI 319-4 IL 319-2

G-319-2 Stand-by

100NB TO CATCH BASIN A-706 0109-0030/2

0102-0006/2 FROM FI-383

0102-0006/2 FROM METHANOL CONCENTRATION CONTROLLER DIC-305

SP FFIC 319 XS 319 RESET HS 319

100 NC

NOTES:

1. DRY BREAK COUPLING.
2. VENT TO SAFE LOCATION 1.5 metres ABOVE TOP OF F-502-1 SHELL.
3. VARIABLE STROKE.
4. LEVEL GAUGE; A SIGHT GLASS FOR PUMP FLOW RATE CALIBRATION.
5. DRAIN NOZZLE FOR F-502-1 TO PROJECT 25mm ABOVE THE BOTTOM OF TANK TO PREVENT SEDIMENT IN THE LINE.
6. TEMPORARY VENT CONNECTION FOR FLAME ARRESTER MAINTENANCE.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
8	AS BUILT P84-1458 METHANOL STORAGE FLAME ARRESTER	CJ	GH	SH	AM	09/2019
7	SPI-287 NUMBER ADDED & SIZES FOR PSV'S	RL	JCC	AM	SES	03/2018
6	AS BUILT WS1324664 METH PIPE SUCTION LINE UPGRADE	ES	RL	LH	SES	02/08
5	AS BUILT	ES	RL	LH	PJR	06/06
4	AS BUILT WS121380 METHANOL DOSING	RL	ES	LH	PJR	10/2005
3	AS BUILT WS187805 METHANOL STORAGE TANK ADDED	RL	PL	LH	PJR	07/03
2	FW9011 & SAFETY SHOWER REMOVED	VB	RL	EJH	RS	10/99
1	AS BUILT FOR REFURBISHMENT PROJECT	V.B.	G.R.	K.E.	G.M.	10/97

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE AND EFFECT - 0780-0082/5

		DATE			DATE
DRN	J.WELLS	19/08/1996	ENG	K.EDEN	
CHK	M.LU		APP		

UTILITIES
PIPING & INSTRUMENT DIAGRAM
METHANOL STORAGE AND METERING
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0109	0036	01 OF 01 SHTS	8

1000000-0109-0036-01

EQUIPMENT No. G-441

DESCRIPTION: BUTANE INJECTION PUMP
CAPACITY: FLOW 4.1m3/Hr @ 490m DIFFERENTIAL HEAD
MAWP @ TEMP

0112-0002/1 FROM TT-0102

MEDIAN PRESSURE 0109-0042/1

0105-0023/1 FROM PT-9604
0105-0014/2 FROM TT-114
0109-0042/1 FROM FT-606-MAX

0105-0014/2 PROCESS GAS
0105-0013/1
0106-0001/1

P5228-40-6C1
0105-0010/1 RAW LTS GAS

KGT01_FGA_01_V
KGT01_RGS_01_V

P5226-80-6C1
P5227-25-6C1

NOTE 1 HS 601

TDI 600-A

FI 601KG NOTE 12
FI 601
FY 601
FT 601
FFAHH 601
FFI 601
HS-FFIC 601
FFFIC 600
FI 600
FI 600 NOTE 11
FFIC 600 SP H L
TT 600
PT 600
FT 600
XSV 603
ZIC 603
ZIO 603
ZSC 603
ZSO 603
SXV 603-B
SXV 603-A

PIC 601-A H L
PIC 601-B H L
NOTE 14
SPV 601A
SPV 601B
PV 601A
PV 601B
HV 601-A LO
HV 6101
HV 6102
HV 676
HV 677
HV 678
HV 6103
FC
FV 600
HV 6105
LIMIT OF STEAM TRACE
NRV-648
NOTE 14
PIC 601 H L
PI 608
HV 6104
NRV-647
PSV 605 SET @ 33 Barg 50 x 80
HV 602 LO FB
HV 6107 FB
PI 609

SKID LIMITS

0109-0042/1 FROM PT-601-C
FG6117-80-1C1 → 0109-0041/1
P6124-80-3C1 COGEN FUEL GAS BYPASS → 0109-0042/1
P5226-100-3C1 TO FUEL GAS HEATER E-602 → 0109-0041/1
0105-0013/1 TO AY-9611A
0109-0042 TO CUSTODY TRANSFER PLC
0109-0042 TO CUSTODY TRANSFER PLC
0109-0042 TO CUSTODY TRANSFER PLC
0105-0013/1 TO AIC-9611A
P6118-40-3C1 → 0109-0041
P6120-25-1C1 TO FLARE → 0109-0026/2
CW6002-25-1C1 → 0109-0009/1

FT 602
PI 478
GEAR BOX
COOLER
MECH SEAL
G-441
NOTE 7
RO 473
RO 474
PI 474
PI 475
SP27-219
GRADE
FT 607 NOTE 5
FV 607
FO
NRV-651
NRV-649
NRV-650
HV 412-1
HV 412-2
HV 413-1
HV 413-2
XSV 600

0109-0009/1 CW6001-25-1C1
0104-0008 P4390-50-3C1 FROM G-440-1/2 DISCHARGE
0104-0006 P4391-50-3C1 FROM G-440-3/4 DISCHARGE
P6121-15-1C1
P6122-15-3C1
P6123-25-1C1
P4392-40-3C1
P4393-40-3C1 TO F-440-1 → 0104-0008
P4392-40-3C1 TO F-440-2 → 0104-0006

NOTES:

1. SET POINT BIASED + 0.2 BAR TO LEAD CONTROLLER.
2. TRANSMITTERS ARE REVERSE ACTING TO DRIVE VALVES SHUT IN THE EVENT OF A FAILURE.
3. DECOMMISSIONED
4. DECOMMISSIONED
5. DECOMMISSIONED
6. VOID
7. DECOMMISSIONED
8. VALVES FITTED WITH MECHANICAL MAXIMUM STOP, TO 73% OPEN MAX FLOW = 15000 kg/hr
9. VOID
10. VOID
11. FLOW SIGNAL INFERED FROM VALVE FV-600 DEMAND BELOW 5% OPEN.
12. CALCULATED FT-601 USED AS FT-601 UNREADABLE AT LOW FLOWS. -MASS FLOW RATE DISPLAYED AS KG/HR.
13. BUTANE RATIO CONTROLS DE-COMMISSIONED.
14. INSTRUMENT SIGNAL FROM MEDIAN SELECT TRANSMITTERS PT-601A, B & C.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
20	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	10/2013
19	CONTIN. DRG. No. REVISED FOR EXPORT COMPRESSOR RE-NUMBERING	RL/ES	MH	AM	SES	05/2012
18	SPEC BLINDS AS BUILT AT HV-412-1&2 AND HV-413-1&2	RL	ES	LH	SES	07/2009
17	AS BUILT WS1191988 RAW GAS BYPASS TO CHILLERS	ES	AAB	LH	SES	12/07
16	AS BUILT WS1191988 RAW GAS LTS BYPASS TO CHILLERS	KN	LH	MP	PJR	10/07
15	AS BUILT WS998333 COGEN FUEL SUPPLY	PJ	LH	MP	PJR	05/07
14	AS BUILT FOR BUTANE FUEL DELETION	VB	SS	AAB	LH	09/06
13	AS BUILT COMMENTS INCORPORATED	VB	RL	LH	PJR	06/06
12	AS BUILT TO SITE LOGIC	JM	AAB	LH	PJR	21/11/05
11	AS BUILT WS853855 MAUI LTS BLENDING TO BALLANCE	VB	RH	LH	PJR	8/2004
REV	AMENDMENT	BY	CHK	ENG	APP	DATE
10	WS853855 AS BUILT. CONDITIONED LTS GAS NOW RAW	JBH	AK	LH	PJR	20/07/04
9	PROCESS ISOLATION POINTS ADDED ON INDIVIDUAL LAYERS	CMW	RL	CM	AIM	11/02
26	CONTINUATION FROM P&ID SPLITTING 0105-0014	JCC	RL	AM	SES	06/2016
25	AS BUILT P84-871 DEMOLITION OF KGTP EQUIP & NRV No's ADDED	RL	JC/NA	AM	SES	04/2016
24	AS BUILT P84-871 BUTANE INJECTION PUMP DEMO PROJ.	JCC	RL/CB	AM	SES	11/2015
23	AS BUILT LO VALVE & EQUIPMENT ISOLATIONS	RL	NM/NA	AM	SES	08/2015
22	HAND VALVE NUMBER ADDED FOR ISOLATIONS	RL	JC	AM	SES	07/2015
21	REVISED FOR P&ID SPLITTING. DRG. No's REVISED	RL	JCC	AM	SES	01/2015

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
0780-0178/01 CAUSE & EFFECTS

		DATE			DATE
DRN	J. WELLS	11/10/1996	ENG	K. ALLUM	
CHK	K. EDEN		APP	G.MUIR	

UTILITIES
PIPING & INSTRUMENT DIAGRAM
COGENERATION GAS BLENDING METERING
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
N/A	1000000	0109	0040	01 OF 01 SHTS	26

1000000-0109-0040-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

E-602
FUEL GAS HEATER
SHELL 14.0 Barg @ 200°C AND FV
TUBE 43.4 Barg @ 100°C

M-601
FUEL GAS KO POT
760mm Ø x 2480 T/T
MAWP 43.4 Barg @ 100/0°C

0109-0023/1 MP STEAM
MPS6001-80-1C1
0109-0040 FROM PSV-605
FG6117-80-1C1
0109-0042 FROM PSV-603
FG6117-40-1C1
0109-0040/1 PROCESS/LTS GAS
P5226-100-3C1
KGT01_FGA_01_V
0109-0040
P6118-40-3C1
SKID LIMITS
MPC6002-20-1C1 0109-0042
MPS9046-25-1C1 MP STEAM 0105-0013/3
0109-0042 TO TDIC-604
MPS6001-40-1C1 TO FUEL GAS SUPERHEATER E-603 0109-0042
FG6116-100-3C1 TO FUEL GAS SUPERHEATER E-603 0109-0042
FG6117-150-1C1 0109-0026/2
P6119-50-3C1 TO SURGE VAPOURISER 0109-0025/1
MPC6001-25-1C1 TO CONDENSATE TANKS 0109-0042
MPS6001-50-1C1
P5226-80-3C1
MPS6001-100-1C1
FG6115-100-3C1
SP=8.0 Barg
SET @ 34 Barg 80 x 100
SET @ 8.6 Barg 80 x 100
NOTE 1
NOTE 2
NOTE 6
NOTE 7
NOTE 8
TO STEAM TRACING
VORTEX BREAKER
DRAIN
PP
NRV-652
HV 684, HV 681, HV 682, HV 683, HV 685-1, HV 685-2, HV 685-3, HV 686, HV 687
PSV 601, PSV 602
PAHH 603, PAHH 602, PI 602, PI 603, PI 608, PI 601
TI 603, TT 603, TT 602
PT 602, PT 603, PT 601
TV 602
ZIC 601, ZSC 601, XSV 601, SXV 601
TIC 602
LI 602
LDAH 602, LDAHH 602
LAHH 602, LAH 602
LT 601, LT 602
LIC 601
LG 601
LV 601
E-602, M-601

NOTES:
1. INERTS VENT.
2. PUMPED STEAM TRAP.
3. TRANSMITTERS ARE REVERSE ACTING TO DRIVE VALVES SHUT IN THE EVENT OF A FAILURE.
4. STEAM TRACING TO MAINTAIN 50°C.
5. STEAM TRACE INSTRUMENT IMPULSE LINE.
6. DECOMMISSIONED.
7. K-ORIFICE PSV SIZED FOR BLOCKED OUTLET.
8. DECOMMISSIONED.
9. VOID.
10. VOID.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
12	AS BUILT SCR-856 - PAHH-603	JCC	RL/AC	AM	SES	04/2018
11	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	04/2014
10	AS BUILT P84-1041 FLARE GAS MEASUREMENT	ES/RL	TC	AM	SES	09/12
9	AS BUILT P84-3007 ESD LEVEL TRANS DEVIATION ALARMS	ES	TC	LH	SES	03/10
8	AS BUILT WS1334854 FLANGES ADDED TO STEAM TRAP	ES	RL	LH	SES	10/09
7	AS BUILT WS998333 COGEN FUEL SUPPLY	PJ	LH	MP	PJR	05/07
6	AS BUILT TO SITE LOGIC	JM	AAB	LH	PJR	21/11/05
5	DESIGN DATA RATIONALISED	GJH	DJP	AvG	AIM	09/02
4	BARG FOR PAHH-602 MODIFIED	VB	RL	EJH	RJW	02/01
3	AS BUILT FOR COGEN FUEL GAS SKID BYPASS LINE	RL	JBH	EJH	RS	05/00
2	REVISED FOR NEW PRINT. DRAWING CONTENT NOT CHANGED	VB	RL	EJH	RS	10/99
1	AS BUILT FOR COGEN PROJECT	V.B.	G.R.	K.A.	G.M.	02/98

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECT 0780-0178/01

		DATE			DATE
DRN	J. WELLS	14/10/1996	ENG	K. ALLUM	14/10/1996
CHK	K. EDEN	14/10/1996	APP	G. MUIR	14/10/1996

UTILITIES
PIPING & INSTRUMENT DIAGRAM
COGENERATION GAS BLENDING METERING
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0109	0041	01 OF 01 SHTS	12

1000000-0109-0041-01.DWG

EQUIPMENT No. E-603

DESCRIPTION FUEL GAS SUPERHEATER
CAPACITY SHELL 14.0 BarG @ 200°C
MAWP @ TEMP TUBE 43.4 BarG @ 100°C

0106-0001 FROM TT-606
0109-0025 FROM TIC-971
0109-0040 FROM FT-600
0109-0040 FROM PT-600
0109-0040 FROM TT-600
0109-0041 FROM TT-602

MASS FQI 606-1A | CV AQI 606-A | WOBBE AI 606-1A | C1 C2 C3 C4 C5 C6+ AI 606-2A NOTE 4
MASS FQI 606-1B | CV AQI 606-B | WOBBE AI 606-1B | C1 C2 C3 C4 C5 C6+ AI 606-2B NOTE 4
MASS FQI 605-A | CV AQI 605 | WOBBE AI 605-A | C1 C2 C3 C4 C5 C6+ AI 605-B NOTE 4
FQI 600

CUSTODY TRANSFER DCS LOGIC
CUSTODY TRANSFER DCS LOGIC
CUSTODY TRANSFER DCS LOGIC
LTS CUSTODY TRANSFER

TDI 606
SP=8.0 Barg PAHH 604 | EU | PI 604 | TDIC 604 H/L | TI 604 H/L

SKID LIMITS

0109-0040 P6124-80-3C1 FUEL GAS SKID BYPASS LINE
From NC Valve

0109-0041 MPS6001-40-1C1 MP STEAM
NRV-653 40
TV 604 40x25 FC 80x25
PSV 603 SET @ 8.6 Barg 25 x 25 40x25
HV 688 LO 40 FB
HV 689 NOTE 2
PT 604
PI 606
TT 604
KGT01_FGA_01_V
0109-0041 FG6116-100-3C1 FROM FUEL GAS KO POT M-601
E-603
FG6118-100-3C1

HV 692A 100
DT 606A | DT 606A | FT 606A
100x80
HV 6108A 100
Assumed as open
NOTE 3
HV 6110 100
HV 6109 100
FG6118-100-3C1
HV 692B 100
DT 606B | DT 606B | FT 606B
HV 6108B 100

MEDIAN PRESSURE 0109-0040
SKID LIMITS
FT-606-MAX 0109-0040
MEDIAN
PI 601A | PI 601B | PI 601C
FG6117-40-1C1 0109-0041
PCV 606 SET @ 2 barg
0105-0013/1 TO AE-600, A1-606, AT-9611
PT 601A | PT 601B | PT 601C | PI
ATMOS
AP 606 SAMPLE
SPI-409 TO GRADE
MP STEAM 0105-0013/3 6mm INS. TUBING
AW 606
TO PIC-601-A 0109-0040/1
PIPING INST
FG6118-100-3C1 0106-0001
TO SOLAR TURBINE AND LET DOWN TO AUXILARIES
KGT01_FGA_02_V

ST NOTE 1
STEAM TRACING
HV 691 DRAIN
PP MPC6001-25-1C1
0109-0041 MPC6001-25-1C1
SKID LIMITS
0109-0041 MPC6002-20-1C1
HV 693 PP MPC6002-25-1C1 TO CONDENSATE TANK 0109-0024/2

0109-0025/1 FROM TIC-971
0106-0002/1 FROM PT-690-A NOTE 7
0106-0003/1 FROM PT-690-B NOTE 7
0106-0002/1 FROM FQIC-666-A
0106-0003/1 FROM FQIC-666-B

HS 693B | HS 693A
PSV 611 SET @ 11.0 Barg 15 x 25
HV 611 LO 25
FG9071-25-1C1 TO FLARE 0106-0001
FG9069-80-1C1 TO HRSG 'B' DUCT BURNER 0106-0003
SXV 693B | XV 693B | SXV 693A | XV 693A
FG9069-80-1C1 TO HRSG 'A' DUCT BURNER 0106-0002

SP FFIC 605 PV
PV 990
PIC 605 HH H
PT 605
PI 605
PDI 610
TI 605 | TDI 605 LL L | TT 605
DI 605 | DT 605 | FT 605
IN SITU BUT NOT CONNECTED TO PROCESS
MASS SPEC STREAM 11 NOTE 6
AP 605 SAMPLE
TO ATMOS
AW 605
SXV 602B | SXV 602A | XSV 602 | ZSC 602 | ZIC 602
NOTE 5

0109-0025/1 FG9069-80-1C1 FROM SURGE VAPOURISER / RICH FUEL GAS SEPARATOR
KGT01_MPG_21_V

NOTES:

1. PUMPED STEAM TRAP.
2. INERTS VENT.
3. SPECTACLE MUST BE SHUT EXCEPT DURING METER PROVING.
4. COMPLETE GAS ANALYSIS AVAILABLE.
5. STEAM TRACING AND THERMAL CEMENT OR STEAM JACKETTED PIPE TO MAINTAIN 100°C.
6. FOR SAMPLE CONDITIONING DETAILS REFER P&ID 0105-0013/02.
7. RATIO INTERLOCKED WITH BURNERS IN SERVICE AND POSSIBILITY OF HI CO2 SURGE VAPOURISER GAS PRESENT.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
20	AS BUILT HS-693A AND B ADDED	RL	ES/AB	LH	SES	04/2010
19	AS BUILT P84-3085 SURGE VAP TO HRSG BURN LAB S/P	ES	RL	LH	SES	10/09
18	AS BUILT WS1334854	ES	RL	LH	SES	10/09
17	PCV-606 TAKEN FROM P&ID 0105-0013/1	ES	JY	LH	SES	02/09
16	AS BUILT WS1042819 BENFIELD SYSTEM HAZARD REPORT	ES	CP	LH	DS	10/07
15	AS BUILT WS998333 COGEN FUEL SUPPLY	PJ	LH	MP	PJR	05/07
14	AS BUILT FOR WS998333 FUEL GAS HOT TAPS	VB	MP	PR	LH	10/06
13	AS BUILT TO SITE LOGIC	JM	AAB	LH	PJR	21/11/05
12	WS184313 SURGE VAPOURISER TO COGEN FUEL AS BUILT	ES	AAB	LH	PJR	08/05
11	TDI-606 ADDED. AS BUILT WS861110 SAMPLE POINT	JBH	RL	LH	PJR	12/2004

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
10	CONTINUATION NAMES REVISED	RL	JBH	LH	PJR	09/03
9	AS BUILT-BLOCK VALVE ADDED DOWNSTREAM OF PSV-611	PL	RL	LH	AIM	01/03
8	AS BUILT WS156953 COGEN AUX. FUEL	CMW	RL	DC	AIM	11/02
7	WS184313 SURGE VAPOURISER TO COGEN FUEL AS BUILT	JBH	RL	AAB	PJR	07/08/02
6	COGEN FUEL TRIP MODS ADDED	JBH	AB	LH	RJW	30/05/01
23	VALVE OPEN CLOSED STATUS CHANGED FOR FT-606-A & B	RL	CF	AM	TC	03/2020
22	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	JC	AM	SES	07/2015
21	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	04/2014

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECT 0780-0178/01

		DATE			DATE
DRN	J. WELLS	15/10/1996	ENG	K. ALLUM	15/10/1996
CHK	K. EDEN	15/10/1996	APP	G. MUIR	15/10/1996

UTILITIES
PIPING & INSTRUMENT DIAGRAM
COGENERATION GAS BLENDING METERING
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0109	0042	01 OF 01 SHTS	23

1000000-0109-0042-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

M-917
LTS PIG LAUNCHER

KGT01_PGS_14_V

P0327-100-6C1 — GAS STORAGE TO PROCESS / SPEC GAS FROM PROCESS — 0105-0031/1

P0410-50-EA — START UP GAS — 0112-0003/1

TO FV-0106 — 0105-0014/2

HIC 0106 — MODE SELECT

P1124-50-6H1 — TO 300 LINE GAS INTAKE AND PIGGING AREA — 0105-0014/2

KGTP TRANSMISSION

KGT11_MGS_09_V

KGT13_PGS_15_V

KGT13_PGS_17_V

KGT13_PIG_02_V

0112-0011/2 — FROM COALESCER D11-0417

0110-001-02 (TRANSMISSION P&ID) — 15 TUBING TO XSV-0107 INSTRUMENT GAS SUPPLY

P0328-100-6C1

P0328-150-6C1

P0314-500-EA

P0314-500-EA NOTE 11

P0314-50-6C1

P0314-150-6C1

P0314A-250-EA — 0112-0003/1 — RESIDUE GAS (TRAIN A)

P0314B-250-EA — 0112-0003/1 — RESIDUE GAS (TRAIN B)

P0314-500-EA

P0329-150-6C1

TO ATMOS.

PIPELINE REGULATIONS

PECPR REGULATIONS

PIPELINE REGULATIONS

0700187-0160-0001/1 — GAS STORAGE/SPEC GAS TO 070 PIPELINE

INSULATED JOINER

0105-0010/1 — FROM PI-573 LTS GAS PIPELINE

P70041-200-6C1 — TO GAS STORAGE COMPRESSORS — 0112-0011/1

TDJ-600-A — 0109-0040

P5003-300-6H1 — 0105-0010 — LTS GAS FROM STOS

P0202A-250-EA — INLET GAS TO TRAIN A — 0112-0003/1

P0202B-250-EA — INLET GAS TO TRAIN B — 0112-0003/1

PIPE BRIDGE

F.I.K.

KGT01_RGS_01_V
Assuming these vales are close from Raw gas header.

NOTES:
1. DELETED
2. METER TUBE VALVE HAND JACKED OPEN.
3. DELETED
4. DELETED
5. VALVE AND SPEC BLIND OPENED FOR PARK GAS OPERATION.
6. DELETED
7. DELETED
8. DELETED
9. DELETED
10. DELETED
11. RE-RATE TO 66.8 Barg [LIMITED BY CL400 FLANGE AT HV-0109].
12. VALVES SHOWN IN LOW PRESSURE FILL MODE.

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
20	METHANEX METERING DECOMMISSIONED	ES	TC	LH	SES	08/09
19	AS BUILT - TODD - PO-K3P-09-KGTH-002	PJB	MAW	CRP	LH	08/09
18	AS BUILT WS1467198 PARK GAS/IMPORT GAS	ES	TC	LH	SES	11/08
17	AS BUILT REVISIONS IE. PAL-0107B & PAH-0107B ADDED	RL	CP	LH	DS	10/2007
16	KGTP/TRANSMISSION DEMARCATION UPDATE	ES	AvG	LH	PJR	01/07
15	GAS GATHERING MODE	RL	ES	LH	PJR	07/2006
31	CONTINUATION DRAWING No. REVISED FOR 070 PIPELINE	RL	JCC	AM	TC	02/2019
30	AS BUILT P84-1423 SPEC BLIND ON M-917 VENT & NRV No's ADDED	RL	JCC	AM	TC	09/2018
29	TRANSMISSION / KGTP DEMARCATION ADDED RE INCIDENT ACTION	RL	JC	AM	SES	05/2016
28	AS BUILT FOR PIPELINE DEMARCATION & HAND VALVE NUMBERS	RL	JCC	AM	SES	02/2016
27	VALVE STATUS REVISED FOR HV-0102 & 0108 REGARDING LO, LC	RL	JCC	AM	SES	08/2015
26	ADDED HV TAG NUMBERS, ADDED PSV 0107A/B SIZE, MOVE PIT-0115	JCC	RL	AM	SES	05/2015
25	CONTIN. DRG. No. REVISED FROM 1000001-0110-001/2 TO 3000188-0110-001/1	RL/ES	CR	AM	SES	06/2012
24	CONTIN. DRG. No. REVISED FOR EXPORT COMPRESSOR RE-NUMBERING	RL/ES	MH	AM	SES	05/2012
23	AS BUILT GAS STORAGE-REDUNDANT GAS METERING INST'S	ES/RL	CB	AM	SES	02/12
22	AS BUILT P84-2749 ENHANCED GAS	SA	CJ	JS	SES	08/11
21	AS BUILT P84-920 PARK GAS	CJ	GH	JS	LH	09/10

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
PHONE 0800 734 567

AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECT 0780-0149/1
CAUSE & EFFECT 0780-0081/2

		DATE		DATE
DRN	G.ROBERTSON	01/07/1986	ENG	
CHK	B.CLARKE	01/07/1986	APP	

LTS CONDITIONING PLANT
PIPING & INSTRUMENT DIAGRAM
METERING & LTS GAS OUT
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NTS	1000000	0112	0002	01 OF 01 SHTS	31

1000000-0112-0002-01.dwg

EQUIPMENT No.	D4F-0401-2/D4F-0401-3	D4F-0401-1/D4F-0401-4	D4-0401	D8-0404	D4F-0402-2/D4F-0402-3	D4F-0402-1/D4F-0402-4	D4-0402	D2-0402	D8-0405	D8-0406
DESCRIPTION	SUCTION PULSATION BOTTLES	DISCHARGE PULSATION BOTTLES	GAS STORAGE COMPRESSOR	OIL TANK	SUCTION PULSATION BOTTLES	DISCHARGE PULSATION BOTTLES	GAS STORAGE COMPRESSOR	GAS STORAGE COMPRESSORS COOLER	OIL TANK	WASTE OIL TANK
CAPACITY	75 Barg @ 165°C	75 Barg @ 165°C	FLOW 3.57 Sm3/s @ 59 hp START- FLOW 0.39 Sm3/s @ 106 hp FINISH	CAPACITY XXm3	75 Barg @ 165°C	75 Barg @ 165°C	FLOW 3.57 Sm3/s @ 59 hp START- FLOW 0.39 Sm3/s @ 106 hp FINISH		CAPACITY XXm3	CAPACITY XXm3
MAWP @ TEMP			MAWP 75 Barg @ 165°C	MAWP XXXBarg @ XXX°C			MAWP 75 Barg @ 165°C	MAWP 88 Barg @ 165°C	MAWP XXXBarg @ XXX°C	MAWP XXXBarg @ XXX°C

NOTES:
1. LOW TEMPERATURE PIPING TO CL300
2. FINAL DISCHARGE PULSATION BOTTLES FITTED WITH PP INSULATION.
3. DELETED
4. VALVE LOCKED OPEN FOR PRESSURE RELIEF PATH FOR D11-0417.

Stand-by

KGT13_PGS_16_V

KGT13_PGS_15_V

Assumed :blinded

Assumed :blinded

REV	AMENDMENT	BY	CHK	ENG	APP	DATE	REV	AMENDMENT	BY	CHK	ENG	APP	DATE
17	LINES P4158, P4159, P5109 & P5110 MOVED TO SHEET 02	RL	ES	LH	SES	11/2010	7	RETURNED TO NGC POST KAHILI GAS GATHERING WS860238	RL	DT	LH	PJR	11/2004
16	PULSATION BOTTLE EQUIPMENT NUMBERS REVISED	CJ	GH	JS	LH	09/10	6	DESIGN DATA RATIONALISED	GJH	DJP	AvG	AIM	09/02
15	AS BUILT P84-920 PARK GAS	CJ	GH	JS	LH	08/10	5	UNDERGROUND AREA DEFINED FOR P0410	VB	RL	EJH	RS	10/99
14	AS BUILT P84-3007 ESD LEVEL TRANS DEVIATION ALARMS	ES	TC	LH	SES	04/10							
13	AS BUILT WS1460367 RECOVER GATHERED GAS TO LPG SV	RL	MB	LH	SES	07/09							
12	AS BUILT WS1498656 - REPLACEMENT OF MOD30 DCS	ES	TC	LH	SES	06/09	22	AS BUILT P84-3407 & HV-0403 VALVE NUMBER	JCC	RL	AM	SES	10/2015
11	AS BUILT WS1467198 - PARK GAS/IMPORT GAS	ES	TC	LH	SES	11/08	21	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	07/2013
10	AS BUILT WS 1023482	ES	AAB	TC	PJR	12/06	20	AS-BUILT VALVES ADDED TO LINES P3120 & P3119	RL/ES	MB	SRH	SES	12/2011
9	GAS GATHERING MODE	ES	RL	LH	PJR	06/06	19	AS-BUILT P84-2749 ENHANCED GAS COMMISSIONING	SA	CJ	JS	SES	08/2011
8	WS971015 AS BUILT. GAS TO METHANEX	JBH	RL	LH	PJR	03/02/05	18	AS BUILT P84-2749 ENHANCED GAS INTERIM WORKSCOPE	RL/ES	JG	JS	SES	05/2011

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS
CAUSE & EFFECT 0780-0081/2
PANEL PNEUMATICS 0710-0153 01/02

		DATE		DATE
DRN	G.ROBERTSON	08/06/1986	ENG	
CHK	B.CLARKE	08/06/1986	APP	

LTS CONDITIONING PLANT
PIPING & INSTRUMENT DIAGRAM
GAS STORAGE COMPRESSION
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0112	0011	01 OF 02 SHTS	22

1000000-0112-0011-01.DWG

EQUIPMENT No.
DESCRIPTION
CAPACITY
MAWP @ TEMP

D11-0417
COALESCER
0.47m3
95 Barg @ -29/80°C

D8-0402
COMPRESSOR SUCTION SCRUBBER
1.2m3
MAWP 27.60 Barg @ 66/-9°C
INSUL 40 C

D8-0403
COMPRESSOR SUCTION SCRUBBER
1.2m3
MAWP 27.60 Barg @ 66/-9°C
INSUL 40 C

0112-0011/1
BYPASS FROM PSV-0414
P0418-40-6C1

0112-0011/1
BYPASS FROM PSV-0413
P0411-40-6C1

P4158-50-1S2
TO COLD FLARE HEADER
0109-0026/2

P4159-50-1S2
TO COLD FLARE HEADER
0109-0026/2

HV 0429
HV 0430
HV 0418
HV 0416

2.5m ABOVE PLATFORM
RAIN CAP
P0431-25-6C1
NOTE 2

KGT13_PGS_17_V
KGT13_PGS_16_V

P0410-100-6C1
GAS TO EXPORT LINE
0112-0002

0112-0011/1
FROM D4-0401 & D4-0402
GAS STORAGE COMP.
P0410-100-6C1

0112-0007/1
FROM D8-0302A
CONDENSATE FLASH DRUM
P0315A-100-6C1

0112-0008/1
FROM D8-0302B
CONDENSATE FLASH DRUM
P0315B-100-6C1

PDI 0417
PDIT 0417
PI 0417
LG 0417-A
LG 0417-B
LI 0417
LIT 0417
LO NOTE 1
P0432-25-6C1

P0412-25-CA
P0413-40-CA
P0424-80-CA
P0419-25-CA
P0420-40-CK
P0425-80-CA
P5110-25-1P84
P5109-40-1P84
TO CLOSED DRAIN
0112-0003/1

PSV 0411
PSV 0412
SET @ 27.6 Barg 25x50

PI 0413
PI 0414
LG 0411
LG 0414
LSHH 0413
LSHH 0416
LSH 0412
LSH 0415
LSDH
LAH
760
1065
450 MW

D11-0417
D8-0402
D8-0403

NOTES:
1. VALVE IS LOCKED OPEN TO PROVIDE RELIEF PATH FOR COALESCER D11-0417.
2. DRILL 1/4" HOLE IN THE VENT PIPE AS CLOSE ABOVE VALVE AS POSSIBLE. INSTALL TUBING TO DISCHARGE DOWNWARDS TO A SAFE LOCATION

REV	AMENDMENT	BY	CHK	ENG	APP	DATE
5	HAND VALVE NUMBER HV-0429 WAS TAGGED HV-0419	RL	CR	AM	SES	10/2013
4	HAND VALVE NUMBERS ADDED FOR ISOLATIONS	RL	CR	AM	SES	07/2013
3	AS BUILT 50NB VALVES ON LINE P4158 & P4159 WERE LO	RL/ES	MB	AM	SES	04/2012
2	AS-BUILT P84-2749 ENHANCED GAS	SA	CJ	JS	SES	08/11
1	D8-0402 AND 0403 RELOCATED FROM SHEET 01	RL	ES	LH	SES	11/2010

VECTOR KAPUNI LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
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AUTOCAD ORIGINAL SHEET SIZE A1

REFERENCE DRAWINGS

		DATE			DATE
DRN	R LOCHHEAD	18/11/2010	ENG	L HUNT	18/11/2010
CHK	E STARNS	18/11/2010	APP	S SMITH	18/11/2010

LTS CONDITIONING PLANT
PIPING & INSTRUMENT DIAGRAM
GAS STORAGE COALESCER
.

SCALE:	JOB NO.	SERIES	DRG. NO	SHT	REVISION
NONE	1000000	0112	0011	02 OF 02 SHTS	5

• 1000000-0112-0011-02.dwg

DEMARCATION KEY

KGTP ASSETS

ALL ELSE = TRANSMISSION ASSETS

DEMARCATION AGREEMENT:

DATE: 1 MARCH 2016

DRAWN: R LOCHHEAD

TRANSMISSION: R PHIPPS

KGTP: S SMITH

A | B | C | D | E | F

A-913 OIL SUMP

M-09004 VOLUME BOTTLE

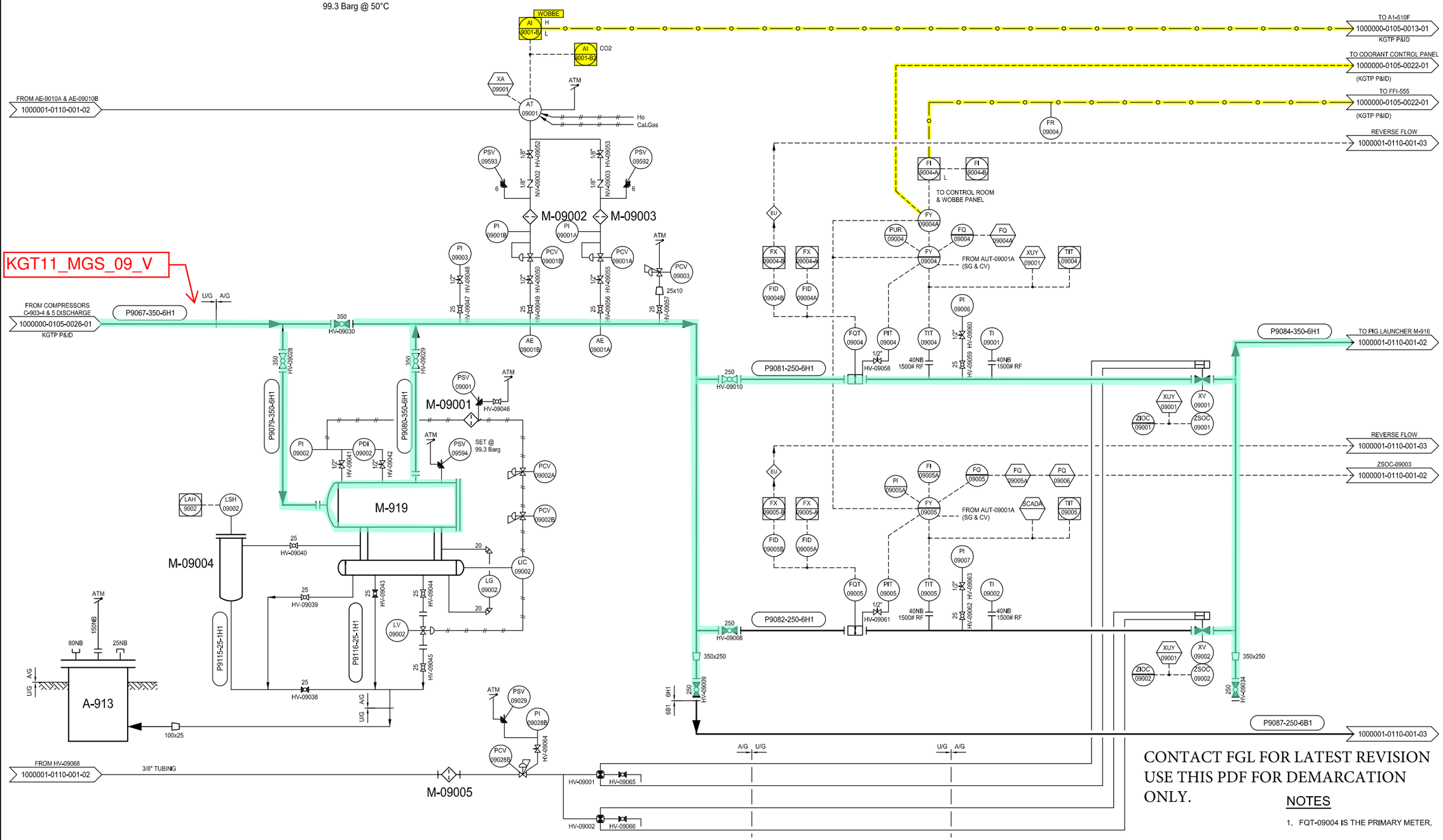
M-919 OIL COALESCER 4.1m3 99.3 Barg @ 50°C

M-09001 FILTER

M-09002 FILTER

M-09003 FILTER

M-09005 FILTER



CONTACT FGL FOR LATEST REVISION
USE THIS PDF FOR DEMARCATION ONLY.

NOTES

1. FQT-09004 IS THE PRIMARY METER.

REV	AMENDMENT	DRAWN	CHKD	ENG	APPR	DATE
13	METER TAG NUMBERS CORRECTED	SKM	AMS	DT	RS	08/2015
12	REVISED XV-9001 & 9002	JCC	RL / RH	DT	RS	06/2015
11	REVISED XV-9001 & 9002	NK	RH	DT	RS	01/2015
10	AS BUILT P84-318	ES	AC	TC	DI	07/2012
9	CONTIN DRG No. 0105-0026-01 REVISED	RL	SKM	DT	DS	05/2012
8	NOTE 1 ADDED	SKM	LR	DT	DI	02/2012
7	GENERAL AS BUILT	MW	SKM	DT	BJP	08/2011
6	DEMARCATION REMOVED	SKM	AJW	DT	BJP	12/2009
5	AS BUILT WS1131993 RAW GAS WOBBE CTL	ES	AAB	SES	DI	12/2007
4	FLOW CONTINUATIONS REVISED	RH	SKM	DT	PJR	09/2007
3	KGTP/TRANS DEMARCATION UPDATE	ES	AvG	LH	PJR	04/2007

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VECTOR GAS LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
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ACTUAL DRAWING SIZE : A1 FRAME A1-ENGFR

REFERENCE DRAWINGS

1000001-0110-001-02 PIG TRAPS
1000001-0110-001-03 300 LINE METERING

	BY	DATE
DRAWN	JST	08/05/1998
CHECKED	KJL	08/05/1998
ENGINEER	RCG	08/05/1998
APPROVED	DT	30/11/1999

KAPUNI GTP OUTLET METER STATION

FLOWSHEET - PIPING & INSTRUMENTATION DIAGRAM
M-919 OIL COALESCER & METERING

SCALES:	JOB NO.	SERIES	DRG NO.	SHT	REV
NTS DO NOT SCALE OFF DRG	1000001	0110	001	01 OF 03 SHTS	13

DEMARCATION KEY

KGTP ASSETS

ALL ELSE = TRANSMISSION ASSETS

DEMARCATION AGREEMENT:

DATE: 1 MARCH 2016

DRAWN: R LOCHHEAD

TRANSMISSION: R PHIPPS

KGTP: S SMITH

NOTE

1. RO-09023 TO FLOW 1m3/SEC FROM 86 BARG TO 45 BARG
2. DELETED
3. M-915 / M-916 1300mm MAJOR BARREL EXTENSION NOT ALWAYS INSTALLED. ONE OFF DN 250 CL 600 RF BARREL EXTENSION TO BE INTERCHANGEABLE BETWEEN BOTH LAUNCHERS, FOR TEMPORARY ILI TOOL FACILITIES.

* FAULTY VALVE

M-915 AVERAGING CHAMBER

M-915 KAPUNI NORTH PIG LAUNCHER

M-09007 FILTER

M-916 KAPUNI SOUTH PIG LAUNCHER

KGT11_PIG_03_V

KGT52_BMC_02_L

KGT11_PIG_04_V

KGT11_MGS_09_V

FROM FQ-09006 1000001-0110-001-01

FROM AT-09001B SG & CV

TO AT-09001 1000001-0110-001-01

ELTHAM-KAPONGA No.1 OFFTAKE 2000072-0110-001-01

P9090-200-6H1 (200 LINE)

P9212-200-6C1

to NC valve

FV-9026 1000000-0105-0031-01 (KGTP P&ID)

P9085-150-6H1

P-09086-80-6H1

P9159-1/2"-6H4

FROM ODORANT PUMPS G-552 1000000-0105-0022-01 (KGTP P&ID)

M-09006

P9084-350-6H1

FROM XV-09001 & XV-09002 1000001-0110-001-01

P-09087-300-6H1

P-09088-80-6H1

P-09089-100-6H1

P-09084-200-6H1

P9091-200-6H1 (100 LINE)

TRANSMISSION KGTP

INSTR. GAS SUPPLY XSV-0107 1000000-0112-0002-01 (KGTP P&ID)

MATAPU DELIVERY POINT 1000013-0110-001-01

P9154-50-6H1

TO ODORANT TANK F-553 1000000-0105-0022-01 (KGTP P&ID)

1/2" TUBING

INSTRUMENT GAS TO FV-9026 1000000-0105-0031-01 (KGTP P&ID)

TO M-09005 1000001-0110-001-01

CONTACT FGL FOR LATEST REVISION
USE THIS PDF FOR DEMARCATION ONLY.

REV	AMENDMENT	DRAWN	CHKD	ENG	APPR	DATE
11	METER TAG NUMBERS REVISED	SKM	AMS	DT	RS	08/2015
10	REVISED FOR DEMARCATION	JCC	RL / RH	DT	RS	06/2015
9	REVISED XV-9001 & 9002	NK	RH	DT	RS	01/2015
8	REVISED FOR M-915 & 916 MODS XC-XO-14-XPLN-009	CSM	RH	JF	SFI	07/2014
7	ISSUED FOR FAULTY VALVE	NK	RH	RS	RS	11/2013
6	CONTIN DRG No. 0105-0031-01 REVISED	RL	SKM	DT	DS	05/2012
5	PGC/IFPEXOL HAZOP MARK UPS WS 1324841	MW	SKM	DT	BJP	08/2011
4	FLOW CONTINUATIONS REVISED	RH	SKM	DT	PJR	09/2007
3	KGTP/TRANS DEMARCATION UPDATE	ES	AvG	LH	PJR	04/2007
2	AS BUILT WS962568 300 LINE REVERSE	SKM	RH	DT	SFI	11/2005
1	ISSUED AS BUILT	JST	KJL	RCG	DT	05/1998

Vector

VECTOR GAS LIMITED
PRIVATE BAG 2020
NEW PLYMOUTH 4342
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ACTUAL DRAWING SIZE : A1 FRAME A1-ENGFR

REFERENCE DRAWINGS

1000001-0110-001-01 M-919 COALESCER
1000001-0110-001-03 300 LINE METERING

	BY	DATE
DRAWN	JST	08/05/1998
CHECKED	KJL	08/05/1998
ENGINEER	RCG	08/05/1998
APPROVED	DT	19/11/2014

KAPUNI GTP OUTLET METER STATION

FLOWSHEET - PIPING & INSTRUMENTATION DIAGRAM
M-915 & M-916 PIG TRAPS

SCALES:	JOB NO.	SERIES	DRG NO.	SHT	REV
NTS DO NOT SCALE OFF DRG	1000001	0110	001	02 OF 03 SHTS	11

Appendix 2.
Parts Count Sheets

Raw Gas and Maui Gas Lines

Equipment	Size	KGT01_RGS_01_V	KGT01_RCS_01_L	KGT01_MAU_01_V	KGT01_MAU_02_V
Process Pipe	0-2"	0	0	0	0
	3"-6"	0	0	0	63
	7"-12"	0	0	0	0
	13"-18"	0	0	0	0
	19"-24"	0	0	0	0
	25"-36"	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0
	3"-6"	0	218	0	0
	7"-12"	0	0	0	0
	13"-18"	0	0	0	0
	19"-24"	259	0	111	0
	25"-36"	0	0	0	0
Flange	0-2"	13	16	8	8
	3"-6"	29	2	25	24
	7"-12"	41	0	22	0
	13"-18"	10	0	0	0
	19"-24"	2	0	1	0
	25"-36"	0	0	0	0
Manual Valves	0-2"	34	21	23	3
	3"-6"	10	1	9	9
	7"-12"	14	0	8	0
	13"-18"	3	0	0	0
	19"-24"	0	0	2	0
	25"-36"	0	0	0	0
Actuated Valves	0-2"	5	2	1	1
	3"-6"	2	0	4	0
	7"-12"	0	0	0	0
	13"-18"	0	0	0	0
	19"-24"	0	0	1	0
	25"-36"	0	0	0	0
Small Bore Fittings	2"	19	2	18	10
Process Vessel	<= 6"	1	0.5	0	0
	> 6 "	0.5	0	0	0
Centrifugal Pump	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Filters	<= 6"	0	0	0	1
	> 6 "	0	0	0	0
Pig Trap	<= 6"	0	0	0	0
	> 6 "	0	0	0	0

CO2 Removal

Equipment	Size	KGT02_TGS_01_V	KGT03_TGS_04_V	KGT05_RGS_07_V	KGT05_TGS_16_V
Process Pipe	0-2"	0	0	0	0
	3"-6"	0	0	0	0
	7"-12"	15	15	15	15
	13"-18"	0	0	0	0
	19"-24"	0	0	0	0
	25"-36"	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0
	3"-6"	0	0	0	0
	7"-12"	0	0	0	0
	13"-18"	0	0	0	0
	19"-24"	0	0	0	0
	25"-36"	0	0	0	0
Flange	0-2"	9	9	2	19
	3"-6"	15	18	8	19
	7"-12"	4	4	17	12
	13"-18"	0	0	0	0
	19"-24"	0	0	0	0
	25"-36"	0	0	0	0
Manual Valves	0-2"	5	5	5	10
	3"-6"	1	3	0	3
	7"-12"	0	0	4	0
	13"-18"	0	0	0	0
	19"-24"	0	0	0	0
	25"-36"	0	0	0	0
Actuated Valves	0-2"	2	2	0	2
	3"-6"	3	3	2	2
	7"-12"	0	0	0	0
	13"-18"	0	0	0	0
	19"-24"	0	0	0	0
	25"-36"	0	0	0	0
Small Bore Fittings	2"	12	11	7	19
Process Vessel	<= 6"	0.5	0	0	0
	> 6 "	0.5	1	0	1
Centrifugal Pump	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0
	> 6 "	0	0	1	0
Tube Side Heat Exchanger	<= 6"	1	1	0	0
	> 6 "	0	0	0	1
Plate Heat Exchanger	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Filters	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Pig Trap	<= 6"	0	0	0	0
	> 6 "	0	0	0	0

Dehydration and Dewpoint Control

Equipment	Size	KGT01_TGS_07_V	KGT01_TGS_10_V	KGT01_TGS_12_V	KGT01_PGS_02_V	KGT04_PGS_07_V	KGT01_MPG_01_L	KGT04_MPG_03_L
Process Pipe	0-2"	0	0	0	0	0	0	0
	3"-6"	0	0	0	0	15	15	35
	7"-12"	48	48	49	15	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0	0	0	0
	3"-6"	0	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Flange	0-2"	17	4	1	3	2	6	12
	3"-6"	28	2	20	10	9	5	12
	7"-12"	29	13	8	6	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Manual Valves	0-2"	17	3	5	1	1	3	8
	3"-6"	9	1	8	0	2	0	4
	7"-12"	7	3	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Actuated Valves	0-2"	2	0	0	0	1	1	0
	3"-6"	2	0	1	3	1	0	0
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Small Bore Fittings	2"	20	12	7	8	5	5	1
Process Vessel	<= 6"	0.5	0	0	0.5	0.5	1	0
	> 6 "	0.5	0	0	0.5	0	0	0
Centrifugal Pump	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0	0	0	1
	> 6 "	0	0	0	2	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	3	1	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Filters	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Pig Trap	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0

Equipment	Size	KGT04_MPG_04_L	KGT04_MPG_05_L	KGT04_MPG_06_L	KGT01_TGS_11_V	KGT01_PGS_03_V	KGT01_MPG_02_L
Process Pipe	0-2"	0	0	0	0	0	v
	3"-6"	15	15	15	0	15	15
	7"-12"	0	0	0	43	0	0
	13"-18"	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	v
Process Pipe (Inter-unit)	0-2"	0	0	0	0	0	0
	3"-6"	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0
Flange	0-2"	2	9	10	0	5	6
	3"-6"	7	7	14	13	7	2
	7"-12"	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0
Manual Valves	0-2"	2	2	7	1	2	3
	3"-6"	2	3	2	2	0	0
	7"-12"	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0
Actuated Valves	0-2"	0	0	3	0	2	1
	3"-6"	0	0	1	0	1	0
	7"-12"	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0
Small Bore Fittings	2"	2	1	9	7	11	4
Process Vessel	<= 6"	0.5	0	1	0	0.5	0.5
	> 6 "	0	0	0	0	0	0
Centrifugal Pump	<= 6"	0	1	0	0	0	0
	> 6 "	0	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0	2	0
	> 6 "	0	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	3	0	0
	> 6 "	0	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Filters	<= 6"	1	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Pig Trap	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0

Product Gas Lines and Compressors

Equipment	Size	KGT01_PGS_01_V	KGT01_PGS_13_V	KGT01_PGS_14_V	KGT13_PGS_15_V	KGT13_PGS_16_V	KGT13_PGS_17_V	KGT01_MGS_01_V
Process Pipe	0-2"	0	0	0	0	0	0	0
	3"-6"	0	15	0	0	51	0	0
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	91
	19"-24"	0	0	0	56	0	51	0
	25"-36"	0	0	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0	0	0	0
	3"-6"	0	0	0	0	0	0	0
	7"-12"	0	0	274	0	0	0	0
	13"-18"	229	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Flange	0-2"	24	20	3	4	6	0	45
	3"-6"	28	1	3	32	28	25	11
	7"-12"	46	0	7	4	0	2	31
	13"-18"	0	0	0	0	0	0	6
	19"-24"	0	0	0	0	0	1	0
	25"-36"	0	0	0	0	0	0	0
Manual Valves	0-2"	34	10	1	10	3	6	34
	3"-6"	12	0	1	5	5	3	2
	7"-12"	13	0	2	3	0	4	5
	13"-18"	0	0	0	0	0	0	2
	19"-24"	0	0	0	0	0	2	0
	25"-36"	0	0	0	0	0	0	0
Actuated Valves	0-2"	3	4	0	0	2	0	16
	3"-6"	2	0	1	1	1	5	2
	7"-12"	0	0	0	0	0	1	3
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	1	0
	25"-36"	0	0	0	0	0	0	0
Small Bore Fittings	2"	26	6	2	6	10	17	33
Process Vessel	<= 6"	0	0.5	0	2	2	1	1
	> 6 "	0	0	0	0	0	0	3
Centrifugal Pump	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	1	0	0
	> 6 "	0	0	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0	1	0	0
	> 6 "	0	0	0	0	0	0	0
Filters	<= 6"	0	0	0	1	0	0	1
	> 6 "	0	0	0	0	0	0	2
Pig Trap	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0

Equipment	Size	KGT01_MGS_03_V	KGT01_MGS_07_V	KGT11_MGS_05_V	KGT11_MGS_08_V	KGT11_MGS_09_V
Process Pipe	0-2"	0	0	0	0	0
	3"-6"	0	0	0	0	0
	7"-12"	15	15	0	0	0
	13"-18"	0	0	91	0	0
	19"-24"	0	0	0	0	0
	25"-36"	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	251	0
	3"-6"	0	0	0	0	0
	7"-12"	0	0	0	0	0
	13"-18"	0	0	0	0	278
	19"-24"	0	0	0	0	0
	25"-36"	0	0	0	0	0
Flange	0-2"	0	0	1	37	2
	3"-6"	12	13	8	0	26
	7"-12"	4	3	8	0	23
	13"-18"	0	0	6	0	8
	19"-24"	0	0	0	0	0
	25"-36"	0	0	0	0	0
Manual Valves	0-2"	0	2	12	24	29
	3"-6"	0	1	1	0	10
	7"-12"	1	1	4	0	11
	13"-18"	0	0	2	0	3
	19"-24"	0	0	0	0	0
	25"-36"	0	0	0	0	0
Actuated Valves	0-2"	0	0	0	9	13
	3"-6"	3	3	2	0	1
	7"-12"	1	1	0	0	4
	13"-18"	0	0	0	0	0
	19"-24"	0	0	0	0	0
	25"-36"	0	0	0	0	0
Small Bore Fittings	2"	13	4	5	5	31
Process Vessel	<= 6"	1	0	0	0	0
	> 6 "	1	0	0	0	1
Centrifugal Pump	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0
Centrifugal Compressor	<= 6"	1	1	0	0	0
	> 6 "	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	1	0	0	0
	> 6 "	1	0	0	0	0
Filters	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0
Pig Trap	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0

Pigging

Equipment	Size	KGT01_PIG_01_V	KGT13_PIG_02_V	KGT11_PIG_03_V	KGT11_PIG_04_V
Process Pipe	0-2"	0	0	0	0
	3"-6"	0	0	0	0
	7"-12"	0	0	0	0
	13"-18"	0	0	0	0
	19"-24"	0	0	0	0
	25"-36"	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0
	3"-6"	0	0	0	0
	7"-12"	0	0	0	0
	13"-18"	0	0	0	0
	19"-24"	0	0	0	0
	25"-36"	0	0	0	0
Flange	0-2"	2	1	3	3
	3"-6"	2	1	3	3
	7"-12"	1	1	1	1
	13"-18"	0	0	0	0
	19"-24"	0	0	0	0
	25"-36"	0	0	0	0
Manual Valves	0-2"	3	3	1	1
	3"-6"	1	1	1	1
	7"-12"	0	0	0	0
	13"-18"	0	0	0	0
	19"-24"	0	0	0	0
	25"-36"	0	0	0	0
Actuated Valves	0-2"	0	0	0	0
	3"-6"	0	0	0	0
	7"-12"	0	0	0	0
	13"-18"	0	0	0	0
	19"-24"	0	0	0	0
	25"-36"	0	0	0	0
Small Bore Fittings	2"	2	1	1	1
Process Vessel	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Centrifugal Pump	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Filters	<= 6"	0	0	0	0
	> 6 "	0	0	0	0
Pig Trap	<= 6"	0	0	0	0
	> 6 "	1	1	1	1

Utilities and Cogen Unit

Equipment	Size	KGT01_MPG_21_V	KGT01_MPG_22_L	KGT01_MPG_23_L	KGT01_FGA_01_V	KGT01_FGA_02_V	KGT01_PGS_19_V	KGT01_PGS_21_V	KGT01_PGS_22_V
Process Pipe	0-2"	0	15	50	0	0	0	0	0
	3"-6"	78	0	0	38	0	0	0	50
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0	0	154	0	0
	3"-6"	0	0	0	0	138	0	274	0
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Flange	0-2"	12	8	13	21	27	25	36	27
	3"-6"	33	0	0	51	89	2	1	41
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Manual Valves	0-2"	7	2	5	9	35	15	17	17
	3"-6"	8	0	0	16	23	1	1	7
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Actuated Valves	0-2"	4	0	1	2	19	9	5	9
	3"-6"	4	0	0	3	15	0	0	10
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Small Bore Fittings	2"	13	0	1	20	56	7	9	13
Process Vessel	<= 6"	1.5	0.5	0.25	1	1	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Centrifugal Pump	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	2	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Filters	<= 6"	1	1	0	0	2	4	8	0
	> 6 "	0	0	0	0	0	0	0	0
Pig Trap	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0

LPG Production Facility - Stabiliser, De-C2

Equipment	Size	KGT01_MPG_07_L	KGT01_DET_01_V	KGT01_PGS_04_V	KGT01_PGS_05_V	KGT01_DEX_01_L	KGT01_DEB_01_L	KGT01_MPG_09_L
Process Pipe	0-2"	0	0	0	0	0	0	0
	3"-6"	0	15	0	0	15	15	22
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0	0	0	0
	3"-6"	194	0	110	0	0	0	0
	7"-12"	0	0	0	143	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Flange	0-2"	3	3	8	22	30	5	9
	3"-6"	18	19	5	15	1	18	36
	7"-12"	0	0	0	7	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Manual Valves	0-2"	7	6	6	9	19	9	14
	3"-6"	8	4	2	5	0	6	12
	7"-12"	0	0	0	2	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Actuated Valves	0-2"	2	3	1	3	1	1	0
	3"-6"	0	1	0	1	0	0	2
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Small Bore Fittings	2"	5	7	7	10	5	10	11
Process Vessel	<= 6"	0	1	2	1	0.5	0.5	0.5
	> 6 "	0	0	0	0	0	0	0
Centrifugal Pump	<= 6"	0	0	0	0	1	0	0
	> 6 "	0	0	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	1	0	0	0
	> 6 "	0	0	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0	0	1	0
	> 6 "	0	0	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	1	1	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	1	0	0	0
	> 6 "	0	0	0	0	0	0	0
Filters	<= 6"	0	0	0	0	1	0	0
	> 6 "	0	0	0	0	0	0	0
Pig Trap	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0

Equipment	Size	KGT01_MPG_10_V	KGT01_MPG_13_L	KGT01_STT_01_V	KGT01_PGS_10_V	KGT01_PGS_11_V	KGT01_STB_01_L
Process Pipe	0-2"	0	0	0	0	0	0
	3"-6"	15	0	15	90	15	15
	7"-12"	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0	0	0
	3"-6"	0	144	0	0	0	0
	7"-12"	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0
Flange	0-2"	22	6	4	9	13	18
	3"-6"	1	10	16	17	21	4
	7"-12"	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0
Manual Valves	0-2"	11	4	3	6	8	9
	3"-6"	0	2	2	7	8	0
	7"-12"	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0
Actuated Valves	0-2"	2	2	2	1	2	1
	3"-6"	0	0	1	0	0	0
	7"-12"	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0
Small Bore Fittings	2"	4	2	19	12	3	20
Process Vessel	<= 6"	0.5	0	1.5	2	1	0.5
	> 6 "	0	0	0	0	0	0
Centrifugal Pump	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	1	0
	> 6 "	0	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0	0	1
	> 6 "	0	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0	1	0
	> 6 "	0	0	0	0	0	0
Filters	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Pig Trap	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0

LPG Production Facility - De-C3

Equipment	Size	KGT01_DPT_11_V	KGT01_DPX_11_L	KGT01_PC3_02_L	KGT01_DPB_11_L	KGT01_DPT_01_V	KGT01_DPX_01_L	KGT01_PC3_01_L	KGT01_DPB_01_L
Process Pipe	0-2"	0	0	15	0	0	0	22	0
	3"-6"	15	15	0	56	15	15	0	44
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0	0	0	0	0
	3"-6"	0	0	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Flange	0-2"	11	16	30	44	15	22	25	36
	3"-6"	12	21	1	11	11	11	0	4
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Manual Valves	0-2"	6	10	17	29	8	10	13	21
	3"-6"	0	7	0	4	0	5	0	0
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Actuated Valves	0-2"	2	1	3	2	2	1	2	2
	3"-6"	3	0	1	0	3	0	0	0
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Small Bore Fittings	2"	8	8	8	12	26	10	5	16
Process Vessel	<= 6"	1	0.5	0	0.5	1	0.5	0	0.5
	> 6 "	0	0	0	0	0	0	0	0
Centrifugal Pump	<= 6"	0	1	0	0	0	1	0	0
	> 6 "	0	0	0	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	1	1	0	0	1	1
	> 6 "	0	0	0	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	1	0	0	0	1	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Filters	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Pig Trap	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0

LPG Production Facility - De-C4

Equipment	Size	KGT01_DBT_11_V	KGT01_DBX_11_L	KGT01_NGL_01_L	KGT01_NGL_02_L	KGT01_DBT_01_V	KGT01_DBX_01_L	KGT01_DBB_01_L
Process Pipe	0-2"	0	0	0	0	0	0	0
	3"-6"	0	15	42	23	15	15	15
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0	0	0	0
	3"-6"	168	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Flange	0-2"	31	49	33	32	21	30	12
	3"-6"	18	6	4	1	6	6	4
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Manual Valves	0-2"	26	28	18	15	10	18	7
	3"-6"	3	2	0	0	0	2	0
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Actuated Valves	0-2"	2	4	2	5	2	2	1
	3"-6"	3	0	0	0	2	0	0
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Small Bore Fittings	2"	8	15	16	14	15	12	9
Process Vessel	<= 6"	1	0.5	0.5	0	1	0.5	0.5
	> 6 "	0	0	0	0	0	0	0
Centrifugal Pump	<= 6"	0	1	0	0	0	1	0
	> 6 "	0	0	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	1	1	0	0	1
	> 6 "	0	0	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	1	0	0	1	1	0	0
	> 6 "	0	0	0	0	0	0	0
Filters	<= 6"	0	1	0	1	0	0	0
	> 6 "	0	0	0	0	0	0	0
Pig Trap	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0

Equipment	Size	KGT01_PC4_12_L	KGT01_PC3_13_L	KGT01_LPG_04_L
Process Pipe	0-2"	0	15	0
	3"-6"	41	0	0
	7"-12"	0	0	0
	13"-18"	0	0	0
	19"-24"	0	0	0
	25"-36"	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	232
	3"-6"	0	0	0
	7"-12"	0	0	0
	13"-18"	0	0	0
	19"-24"	0	0	0
	25"-36"	0	0	0
Flange	0-2"	14	9	36
	3"-6"	0	0	0
	7"-12"	0	0	0
	13"-18"	0	0	0
	19"-24"	0	0	0
	25"-36"	0	0	0
Manual Valves	0-2"	13	10	23
	3"-6"	0	0	0
	7"-12"	0	0	0
	13"-18"	0	0	0
	19"-24"	0	0	0
	25"-36"	0	0	0
Actuated Valves	0-2"	6	5	6
	3"-6"	0	0	0
	7"-12"	0	0	0
	13"-18"	0	0	0
	19"-24"	0	0	0
	25"-36"	0	0	0
Small Bore Fittings	2"	5	3	11
Process Vessel	<= 6"	0	0	0
	> 6 "	0	0	0
Centrifugal Pump	<= 6"	0	0	0
	> 6 "	0	0	0
Reciprocating Pump	<= 6"	0	0	0
	> 6 "	0	0	0
Centrifugal Compressor	<= 6"	0	0	0
	> 6 "	0	0	0
Reciprocating Compressor	<= 6"	0	0	0
	> 6 "	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0
	> 6 "	0	0	0
Tube Side Heat Exchanger	<= 6"	1	0	0
	> 6 "	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0
	> 6 "	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0
	> 6 "	0	0	0
Filters	<= 6"	0	0	0
	> 6 "	0	0	0
Pig Trap	<= 6"	0	0	0
	> 6 "	0	0	0

LPG Production Facility - Product Export and Loadout

Equipment	Size	KGT32_NGL_05_L	KGT33_NGL_06_L	KGT34_NGL_07_L	KGT35_NGL_09_L	KGT36_NGL_10_L	KGT36_NGL_11_L	KGT37_PC3_05_L	KGT39_PC3_07_V
Process Pipe	0-2"	0	0	0	0	0	0	0	0
	3"-6"	0	0	0	15	15	0	0	0
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	210	0	0	0	0	0	0	0
	3"-6"	0	103	0	0	0	0	81	0
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Flange	0-2"	4	9	0	3	0	0	1	0
	3"-6"	0	4	0	12	16	0	14	0
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Manual Valves	0-2"	6	10	0	4	2	0	4	0
	3"-6"	0	2	0	2	3	0	3	0
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Actuated Valves	0-2"	1	3	0	1	1	0	3	0
	3"-6"	0	0	0	2	1	0	3	0
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Small Bore Fittings	2"	1	6	0	2	3	0	1	0
Process Vessel/ Storage Tank	<= 6"	0	0	1	0	1	0	0	0.5
	> 6 "	0	0	0	0	0	0	0	0
Centrifugal Pump	<= 6"	0	0	0	1	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Filters	<= 6"	0	0	0	1	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Pig Trap	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Loading Hose	-	0	0	0	0	0	1	0	0
Loading Arm	-	0	0	0	0	0	0	0	0

Equipment	Size	KGT39_PC3_08_L	KGT40_PC3_09_V	KGT40_PC3_10_L	KGT41_PC4_04_L	KGT43_PC4_06_V	KGT43_PC4_07_L	KGT44_PC4_08_V	KGT44_PC4_09_L
Process Pipe	0-2"	0	0	0	0	0	0	0	0
	3"-6"	0	0	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0	0	0	0	0
	3"-6"	0	0	0	87	0	0	0	0
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Flange	0-2"	0	0	0	4	0	0	0	0
	3"-6"	0	0	0	11	0	0	0	0
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Manual Valves	0-2"	0	0	0	8	0	0	0	0
	3"-6"	0	0	0	3	0	0	0	0
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Actuated Valves	0-2"	0	0	0	5	0	0	0	0
	3"-6"	0	0	0	2	0	0	0	0
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Small Bore Fittings	2"	0	0	0	1	0	0	0	0
Process Vessel/ Storage Tank	<= 6"	0.5	0.5	0.5	0	0.5	0.5	0.5	0.5
	> 6 "	0	0	0	0	0	0	0	0
Centrifugal Pump	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Filters	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Pig Trap	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Loading Hose	-	0	0	0	0	0	0	0	0
Loading Arm	-	0	0	0	0	0	0	0	0

Equipment	Size	KGT45_PC3_12_L	KGT46_PC4_11_L	KGT47_LPG_01_L	KGT47_LPG_02_L	KGT47_LPG_05_L
Process Pipe	0-2"	0	0	0	0	0
	3"-6"	0	0	15	0	0
	7"-12"	15	15	0	0	0
	13"-18"	0	0	0	0	0
	19"-24"	0	0	0	0	0
	25"-36"	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0	0
	3"-6"	0	0	0	0	0
	7"-12"	0	0	0	0	0
	13"-18"	0	0	0	0	0
	19"-24"	0	0	0	0	0
	25"-36"	0	0	0	0	0
Flange	0-2"	6	2	0	0	0
	3"-6"	18	12	11	0	0
	7"-12"	8	6	0	0	0
	13"-18"	0	0	0	0	0
	19"-24"	0	0	0	0	0
	25"-36"	0	0	0	0	0
Manual Valves	0-2"	13	6	4	0	0
	3"-6"	3	2	3	0	0
	7"-12"	2	2	0	0	0
	13"-18"	0	0	0	0	0
	19"-24"	0	0	0	0	0
	25"-36"	0	0	0	0	0
Actuated Valves	0-2"	5	4	2	0	0
	3"-6"	5	3	0	0	0
	7"-12"	0	0	0	0	0
	13"-18"	0	0	0	0	0
	19"-24"	0	0	0	0	0
	25"-36"	0	0	0	0	0
Small Bore Fittings	2"	4	3	3	0	0
Process Vessel/ Storage Tank	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0
Centrifugal Pump	<= 6"	1	1	0	0	0
	> 6 "	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0
Filters	<= 6"	0	0	0	0	0
	> 6 "	1	1	0	0	0
Pig Trap	<= 6"	0	0	0	0	0
	> 6 "	0	0	0	0	0
Loading Hose	-	0	0	0	0	1
Loading Arm	-	0	0	0	1	0

Propane Refrigeration

Equipment	Size	KGT70_REF_01_V	KGT70_REF_02_L	KGT70_REF_03_V	KGT70_REF_04_L	KGT70_REF_05_L	KGT70_REF_07_L	KGT70_REF_11_V
Process Pipe	0-2"	0	0	0	0	0	0	0
	3"-6"	15	15	22	0	15	15	0
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0	0	0	0
	3"-6"	0	0	0	0	0	0	0
	7"-12"	0	0	0	174	0	0	154
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Flange	0-2"	3	6	3	21	5	3	7
	3"-6"	1	8	23	1	3	2	13
	7"-12"	0	0	0	3	0	0	24
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Manual Valves	0-2"	2	2	2	15	1	1	12
	3"-6"	0	3	7	0	0	1	5
	7"-12"	0	0	0	0	0	0	6
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Actuated Valves	0-2"	1	1	1	6	0	0	3
	3"-6"	1	0	1	0	0	0	1
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Small Bore Fittings	2"	3	3	4	5	5	2	7
Process Vessel	<= 6"	0.5	0.5	0.5	0	0	0	0
	> 6 "	0	0	0	0.5	0	0	0.5
Centrifugal Pump	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0	1	1	0
	> 6 "	0	0	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Filters	<= 6"	0	0	2	0	0	0	0
	> 6 "	0	0	0	0	0	0	2
Pig Trap	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0

Equipment	Size	KGT70_REF_14_V	KGT70_REF_15_L	KGT70_REF_06_L
Process Pipe	0-2"	0	0	0
	3"-6"	0	0	64
	7"-12"	65	28	0
	13"-18"	0	0	0
	19"-24"	0	0	0
	25"-36"	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0
	3"-6"	0	0	0
	7"-12"	0	0	0
	13"-18"	0	0	0
	19"-24"	0	0	0
	25"-36"	0	0	0
Flange	0-2"	13	1	5
	3"-6"	22	4	8
	7"-12"	1	1	0
	13"-18"	0	0	0
	19"-24"	0	0	0
	25"-36"	0	0	0
Manual Valves	0-2"	7	5	1
	3"-6"	4	1	3
	7"-12"	0	0	0
	13"-18"	0	0	0
	19"-24"	0	0	0
	25"-36"	0	0	0
Actuated Valves	0-2"	2	0	0
	3"-6"	1	0	0
	7"-12"	0	0	0
	13"-18"	0	0	0
	19"-24"	0	0	0
	25"-36"	0	0	0
Small Bore Fittings	2"	20	8	4
Process Vessel	<= 6"	2	0	0
	> 6 "	0	0	0
Centrifugal Pump	<= 6"	0	0	0
	> 6 "	0	0	0
Reciprocating Pump	<= 6"	0	0	0
	> 6 "	0	0	0
Centrifugal Compressor	<= 6"	0	0	0
	> 6 "	0	0	0
Reciprocating Compressor	<= 6"	0	0	0
	> 6 "	2	0	0
Shell Side Heat Exchanger	<= 6"	0	0	1
	> 6 "	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0
	> 6 "	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0
	> 6 "	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	2	0
	> 6 "	0	1	0
Filters	<= 6"	0	0	0
	> 6 "	0	0	0
Pig Trap	<= 6"	0	0	0
	> 6 "	0	0	0

Mercaptans and Methanol Injection System

Equipment	Size	KGT50_EMC_01_L	KGT50_EMC_02_L	KGT51_BMC_05_L	KGT52_BMC_01_L	KGT52_BMC_02_L	KGT52_BMC_03_L	KGT55_MOH_01_L	KGT55_MOH_02_L	KGT55_MOH_03_L
Process Pipe	0-2"	15	0	0	0	15	0	0	0	0
	3"-6"	0	0	0	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0	0	0	0	343	0
	3"-6"	0	0	0	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0	0
Flange	0-2"	0	0	0	0	3	0	0	17	0
	3"-6"	0	0	0	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0	0
Manual Valves	0-2"	19	0	0	0	17	0	0	55	0
	3"-6"	0	0	0	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0	0
Actuated Valves	0-2"	3	0	0	0	0	0	0	2	0
	3"-6"	0	0	0	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0	0
Small Bore Fittings	2"	3	0	0	0	6	0	0	9	0
Storage Tank /Portable Drum	<= 6"	0	1	1	1	0	0	4	0	0
	> 6 "	0	0	0	0	0	0	0	0	0
Centrifugal Pump	<= 6"	1	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	1	0	0	2	0
	> 6 "	0	0	0	0	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0	0
Filters	<= 6"	1	0	0	0	2	0	0	4	0
	> 6 "	0	0	0	0	0	0	0	0	0
Pig Trap	<= 6"	1	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0	0
Loading Hose	-	0	0	0	0	0	1	0	0	1
Loading Arm	-	0	0	0	0	0	0	0	0	0

CO2 Recovery - Ammonia

Equipment	Size	KGT80_AMM_01_V	KGT80_AMM_11_V	KGT80_AMM_02_V	KGT80_AMM_03_L	KGT80_AMM_04_L	KGT80_AMM_07_L	KGT80_AMM_08_V	KGT80_AMM_09_V
Process Pipe	0-2"	0	0	15	0	0	38	0	0
	3"-6"	15	15	0	15	21	0	0	48
	7"-12"	0	0	0	0	0	0	15	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0	0	0	0	0
	3"-6"	0	0	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Flange	0-2"	6	2	2	6	21	8	6	37
	3"-6"	9	7	0	2	0	0	10	1
	7"-12"	0	0	0	0	0	0	4	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Manual Valves	0-2"	12	8	7	9	21	14	12	21
	3"-6"	4	3	0	0	0	0	4	0
	7"-12"	0	0	0	0	0	0	1	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Actuated Valves	0-2"	1	2	2	0	9	2	1	7
	3"-6"	0	0	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0
Small Bore Fittings	2"	6	7	4	2	6	4	4	7
Process Vessel	<= 6"	0.5	0.5	1	1	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Centrifugal Pump	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	1	1	0	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0	1	1	1	0
	> 6 "	0	0	0	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	2	2	0	0	2
	> 6 "	0	0	0	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0
Filters	<= 6"	0	0	0	0	3	0	1	2
	> 6 "	0	0	0	0	0	0	0	0
Pig Trap	<= 6"	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0

CO2 Recovery - CO2

Equipment	Size	KGT90_CO2_01_V	KGT90_CO2_02_V	KGT90_CO2_03_V	KGT90_CO2_07_V	KGT90_CO2_08_L	KGT90_CO2_16_V	KGT90_CO2_18_V	KGT90_CO2_19_V	KGT90_CO2_23_V
Process Pipe	0-2"	0	0	0	0	0	0	0	0	0
	3"-6"	15	15	31	89	71	0	0	15	0
	7"-12"	0	0	0	0	0	0	0	0	15
	13"-18"	0	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0	0	0	321	0	0
	3"-6"	0	0	0	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	180	0	0	0
	13"-18"	0	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0	0
Flange	0-2"	2	4	5	33	35	11	30	44	0
	3"-6"	9	6	15	26	11	11	0	5	2
	7"-12"	0	0	0	0	0	60	0	0	3
	13"-18"	0	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0	0
Manual Valves	0-2"	3	5	3	18	23	18	33	22	1
	3"-6"	2	2	1	15	7	2	0	1	0
	7"-12"	0	0	0	0	0	18	0	0	0
	13"-18"	0	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0	0
Actuated Valves	0-2"	2	2	1	1	12	0	2	5	0
	3"-6"	0	0	1	0	0	2	0	0	1
	7"-12"	0	0	0	0	0	2	0	0	1
	13"-18"	0	0	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0	0	0
Small Bore Fittings	2"	9	9	6	9	9	25	2	19	1
Process Vessel/ Storage Tank	<= 6"	2	2	2	2	1	0	0	2	0
	> 6 "	0	0	0	0	0	5.5	0	0	1
Centrifugal Pump	<= 6"	0	0	0	0	1	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	2	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	0	0	0	0	0
	> 6 "	1	1	0	0	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	1	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	1	1	1	0	1	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0	2	0	0	0
	> 6 "	0	0	0	0	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0	0	0	0	2	0
	> 6 "	0	0	0	0	0	0	0	0	0
Filters	<= 6"	0	0	0	1	1	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0	0
Pig Trap	<= 6"	0	0	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0	0	0
Loading Hose	-	0	0	0	0	0	0	0	0	0
Loading Arm	-	0	0	0	0	0	0	0	0	0

Equipment	Size	KGT90_CO2_09_L	KGT90_CO2_10_L	KGT90_CO2_11_L	KGT90_CO2_12_L	KGT90_CO2_24_L	KGT90_CO2_25_L	KGT90_CO2_26_V
Process Pipe	0-2"	0	0	0	0	0	15	23
	3"-6"	0	0	0	0	71	0	0
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0	0	0	0
	3"-6"	0	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Flange	0-2"	0	0	0	0	4	11	7
	3"-6"	0	0	0	0	17	0	0
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Manual Valves	0-2"	0	0	0	0	5	3	11
	3"-6"	0	0	0	0	13	0	0
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Actuated Valves	0-2"	0	0	0	0	10	2	1
	3"-6"	0	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0	0
Small Bore Fittings	2"	0	0	0	0	1	2	1
Process Vessel/ Storage Tank	<= 6"	1	1	1	1	0	0	0
	> 6 "	0	0	0	0	0	0	0
Centrifugal Pump	<= 6"	0	0	0	0	1	0	0
	> 6 "	0	0	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0	1	0
	> 6 "	0	0	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Filters	<= 6"	0	0	0	0	1	1	0
	> 6 "	0	0	0	0	0	0	0
Pig Trap	<= 6"	0	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0	0
Loading Hose	-	0	0	0	0	0	0	0
Loading Arm	-	0	0	0	0	0	0	0

Equipment	Size	KGT90_CO2_27_V	KGT90_CO2_28_L	KGT90_CO2_29_V	KGT90_CO2_30_L	KGT90_CO2_31_V	KGT90_CO2_32_L
Process Pipe	0-2"	15	0	0	0	0	0
	3"-6"	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0
Process Pipe (Inter-unit)	0-2"	0	0	0	0	0	0
	3"-6"	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0
Flange	0-2"	5	0	0	0	0	0
	3"-6"	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0
Manual Valves	0-2"	6	0	0	0	0	0
	3"-6"	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0
Actuated Valves	0-2"	3	0	0	0	0	0
	3"-6"	0	0	0	0	0	0
	7"-12"	0	0	0	0	0	0
	13"-18"	0	0	0	0	0	0
	19"-24"	0	0	0	0	0	0
	25"-36"	0	0	0	0	0	0
Small Bore Fittings	2"	1	0	0	0	0	0
Process Vessel/ Storage Tank	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Centrifugal Pump	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Reciprocating Pump	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Centrifugal Compressor	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Reciprocating Compressor	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Shell Side Heat Exchanger	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Tube Side Heat Exchanger	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Plate Heat Exchanger	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Air Cooled Heat Exchanger	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Filters	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Pig Trap	<= 6"	0	0	0	0	0	0
	> 6 "	0	0	0	0	0	0
Loading Hose	-	0	1	1	1	1	1
Loading Arm	-	0	0	0	0	0	0

Appendix 3.
Estimated Piping Lengths

Table A3- 1: Estimated Piping Lengths

From	To	Estimated length (m) Note1	After applied 25% Safety Factor (m)
Raw Gas from (M-507)	Absorber Towers (D-101-1/2) inlet Valves (PV-101-1/2) and bypass to Separator (D-201-4) top line	207	259
Inlet Separator (M-507)	LPG Surge Vaporiser (F-201)	174	218
300 line & 309 line (XSV-594)	AUP/ Ballance & Lactose Plant -306 line (up to XSV-9622)	88.7	111
High Temperature Separator (M-307)	KPS and Whareroa (up to KPS/KGTP Site Boundary)	183	229
Product Gas header near LTS pipe bridge	Gas Storage Compressors in LTS unit (via LTS pipe bridge)	219	274
Product Gas compressors (C-903-2/3/5)	Stores/ Workshop/ Admin. Building (end of pipe rack)	201	251
Product Gas compressors (C-903-2/3/5)	100/200 Pipelines in Transmission metering area (via LTS pipe bridge)	222	278
Fuel Gas Superheater (E-603)	HRSG A/B Burners (B-604-A-1/2/3, B-604-B1/2/3)	111	138
Product Gas header from Gas Treatment Plant	Ammonia/ CO_2 Compressor Engines (CE-821/822) in CO_2 Recovery Unit	123	154
Product Gas header from Gas Treatment Plant	Gas Flare System Burners (D1-4100B)	219	274
High Temperature Separator (M-307)	De-ethaniser (D-420-2)	155	194
De-Ethaniser(D-420-2)	OVHD Compressor (C-421-1/2)	88	110
De-Ethaniser OVHD Compressor (C-421-1)	Absorber Towers (D-101-1/2) and Decanted Water Strippers (D-201-3/4)	115	143
Wash Water Coalescer (M-302)	Stabiliser (D-420-1)	115	144
De-Butaniser (D-440-2)	Surge Vaporiser (F-201)	134	168
60/40 Condensing Tank (M-430)	XSV-434 on KPS export line (up to KPS/KGTP Site Boundary)	186	232
Gasoline Cooler (E-460)	KPS (up to KPS/KGTP Site Boundary)	168	210
Gasoline Cooler (E-460)	NGL Storage Tank (F-4033)	83 (aboveground) 475 (underground) Note2	578 Note2
Propane Product Coolers (E-4001-1/2)	Propane Storage Vessels (F-4003, F-4004)	81 (aboveground) 475 (underground) Note2	556 Note2
De-Butaniser Reflux Pumps (G-440-3/4)	Butane Storage Vessels (F-4001, F-4002)	70 (aboveground) 475 (underground) Note2	562 Note2
Propane Refrigerant Economiser (D-315-2)	Gas Chiller (E-313-3), De-Ethaniser Overhead Condenser (E-420-2)	140	174
Gas Chiller (E-313-3), De-Ethaniser Overhead Condenser (E-420-2)	Compressors (C-330-1/ 2)	123	154
Methanol Storage Tanks (F-502-1/2/4/6)	De-ethaniser (D-420-2), HT Separator Condensate Pumps (G-30101/2), Gas/gas Heat Exchanger (E-313-1/2)	274	343
Raw Gas Boosters (C-885 / C-823)	CO_2 Compressors (C-802/822)	144	180
CO_2 storages (F-801-1/2/3)	Utility CO_2 users: Product Gas Compressor Shelter and LPG Storage tanks	257 (aboveground) 475 (underground) Note2	796 Note2

Note:

1. The piping lengths are measured from KGTP Layout drawings using scale. A safety factor of 1.25 has been applied to all lengths measured from the map to account for bends and elevations which could not be determined from the 2D map.
2. Underground length (475m) is indicated on P&ID (1000000-0104-0033-01). 25% safety factor is only applied to aboveground section, assuming no bend and elevation change for underground piping section.

Appendix 4.
Leak Frequencies

Table A4- 1: Leak Frequencies

No	Node Section	Base Case/ Sensitivity Case 1 Release Frequencies (per year)							Sensitivity 2 (Future Production) Release Frequencies (per year)						
		1 - 3 mm (2 mm)	3 - 10 mm (6 mm)	10 - 50 mm (22 mm)	50 - 150 mm (85 mm)	> 150 mm (Rupture)	Total	% Contribution	1 - 3 mm (2 mm)	3 - 10 mm (6 mm)	10 - 50 mm (22 mm)	50 - 150 mm (85 mm)	> 150 mm (Rupture)	Total	% Contribution
Raw Gas and Maui Gas Lines															
1	KGT01_RGS_01_V	6.06E-03	2.72E-03	1.52E-03	2.82E-04	5.65E-05	1.06E-02	1.19%	6.06E-03	2.72E-03	1.52E-03	2.82E-04	5.65E-05	1.06E-02	1.00%
2	KGT01_RCS_01_L	1.31E-03	6.00E-04	3.07E-04	1.04E-04	2.44E-06	2.32E-03	0.26%	1.31E-03	6.00E-04	3.07E-04	1.04E-04	2.44E-06	2.32E-03	0.22%
3	KGT01_MAU_01_V	4.12E-03	1.83E-03	1.02E-03	1.39E-04	3.51E-05	7.14E-03	0.80%	4.12E-03	1.83E-03	1.02E-03	1.39E-04	3.51E-05	7.14E-03	0.67%
4	KGT01_MAU_02_V	3.54E-03	1.43E-03	6.57E-04	8.28E-05	9.16E-06	5.72E-03	0.64%	3.54E-03	1.43E-03	6.57E-04	8.28E-05	9.16E-06	5.72E-03	0.54%
CO_2 Removal															
5	KGT02_TGS_01_V	3.09E-03	1.42E-03	7.86E-04	1.97E-04	1.46E-05	5.51E-03	0.61%	3.09E-03	1.42E-03	7.86E-04	1.97E-04	1.46E-05	5.51E-03	0.52%
6	KGT03_TGS_04_V	3.03E-03	1.40E-03	7.73E-04	1.87E-04	2.11E-05	5.41E-03	0.60%	3.03E-03	1.40E-03	7.73E-04	1.87E-04	2.11E-05	5.41E-03	0.51%
7	KGT05_RGS_07_V	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	2.50E-03	1.13E-03	6.03E-04	9.17E-05	3.21E-05	4.36E-03	0.41%
8	KGT05_TGS_16_V	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	4.14E-03	1.86E-03	1.04E-03	1.35E-04	4.91E-05	7.23E-03	0.68%
Dehydration and Dewpoint Control															
9	KGT01_TGS_07_V	4.84E-03	2.14E-03	1.17E-03	1.55E-04	3.03E-05	8.34E-03	0.93%	4.84E-03	2.14E-03	1.17E-03	1.55E-04	3.03E-05	8.34E-03	0.79%
10	KGT01_TGS_10_V	3.37E-03	1.65E-03	9.73E-04	1.88E-04	1.03E-04	6.28E-03	0.70%	3.37E-03	1.65E-03	9.73E-04	1.88E-04	1.03E-04	6.28E-03	0.59%
11	KGT01_TGS_12_V	2.19E-03	1.03E-03	5.89E-04	9.96E-05	4.51E-05	3.95E-03	0.44%	2.19E-03	1.03E-03	5.89E-04	9.96E-05	4.51E-05	3.95E-03	0.37%
12	KGT01_PGS_02_V	3.63E-03	1.68E-03	8.67E-04	1.66E-04	5.65E-05	6.40E-03	0.71%	3.63E-03	1.68E-03	8.67E-04	1.66E-04	5.65E-05	6.40E-03	0.60%
13	KGT04_PGS_07_V	1.25E-03	5.44E-04	2.82E-04	4.54E-05	3.86E-06	2.12E-03	0.24%	1.25E-03	5.44E-04	2.82E-04	4.54E-05	3.86E-06	2.12E-03	0.20%
14	KGT01_MPG_01_L	1.32E-03	5.88E-04	3.08E-04	6.92E-05	1.44E-06	2.29E-03	0.25%	1.32E-03	5.88E-04	3.08E-04	6.92E-05	1.44E-06	2.29E-03	0.22%
15	KGT04_MPG_03_L	1.68E-03	7.74E-04	3.88E-04	1.33E-04	4.74E-06	2.98E-03	0.33%	1.68E-03	7.74E-04	3.88E-04	1.33E-04	4.74E-06	2.98E-03	0.28%
16	KGT04_MPG_04_L	1.87E-03	7.41E-04	3.10E-04	7.55E-05	2.13E-06	3.00E-03	0.33%	1.87E-03	7.41E-04	3.10E-04	7.55E-05	2.13E-06	3.00E-03	0.28%
17	KGT04_MPG_05_L	3.13E-03	8.28E-04	2.39E-04	3.09E-05	2.48E-06	4.23E-03	0.47%	3.13E-03	8.28E-04	2.39E-04	3.09E-05	2.48E-06	4.23E-03	0.40%
18	KGT04_MPG_06_L	2.33E-03	1.02E-03	5.32E-04	1.01E-04	3.86E-06	3.99E-03	0.45%	2.33E-03	1.02E-03	5.32E-04	1.01E-04	3.86E-06	3.99E-03	0.38%
19	KGT01_TGS_11_V	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	2.52E-03	1.28E-03	7.71E-04	3.57E-04	1.02E-05	4.94E-03	0.47%
20	KGT01_PGS_03_V	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	3.89E-03	1.75E-03	8.83E-04	2.48E-04	3.17E-06	6.78E-03	0.64%
21	KGT01_MPG_02_L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	1.01E-03	4.44E-04	2.28E-04	4.47E-05	1.44E-06	1.73E-03	0.16%
Product Gas Lines and Compressors															
22	KGT01_PGS_01_V	5.87E-03	2.59E-03	1.44E-03	1.84E-04	3.56E-05	1.01E-02	1.13%	5.87E-03	2.59E-03	1.44E-03	1.84E-04	3.56E-05	1.01E-02	0.96%
23	KGT01_PGS_13_V	1.83E-03	7.99E-04	3.99E-04	8.55E-05	1.44E-06	3.12E-03	0.35%	1.83E-03	7.99E-04	3.99E-04	8.55E-05	1.44E-06	3.12E-03	0.29%
24	KGT01_PGS_14_V	7.70E-04	3.48E-04	1.90E-04	2.66E-05	1.02E-05	1.34E-03	0.15%	7.70E-04	3.48E-04	1.90E-04	2.66E-05	1.02E-05	1.34E-03	0.13%
25	KGT13_PGS_15_V	3.71E-03	1.68E-03	8.83E-04	2.47E-04	5.23E-05	6.57E-03	0.73%	3.71E-03	1.68E-03	8.83E-04	2.47E-04	5.23E-05	6.57E-03	0.62%
26	KGT13_PGS_16_V	7.35E-03	3.16E-03	1.49E-03	4.24E-04	8.35E-06	1.24E-02	1.39%	7.35E-03	3.16E-03	1.49E-03	4.24E-04	8.35E-06	1.24E-02	1.17%
27	KGT13_PGS_17_V	3.88E-03	1.80E-03	1.01E-03	1.76E-04	6.43E-05	6.93E-03	0.77%	3.88E-03	1.80E-03	1.01E-03	1.76E-04	6.43E-05	6.93E-03	0.65%

No	Node Section	Base Case/ Sensitivity Case 1 Release Frequencies (per year)							Sensitivity 2 (Future Production) Release Frequencies (per year)						
		1 - 3 mm (2 mm)	3 - 10 mm (6 mm)	10 - 50 mm (22 mm)	50 - 150 mm (85 mm)	> 150 mm (Rupture)	Total	% Contribution	1 - 3 mm (2 mm)	3 - 10 mm (6 mm)	10 - 50 mm (22 mm)	50 - 150 mm (85 mm)	> 150 mm (Rupture)	Total	% Contribution
28	KGT01_MGS_01_V	1.38E-02	5.91E-03	2.89E-03	5.52E-04	1.22E-04	2.33E-02	2.60%	1.38E-02	5.91E-03	2.89E-03	5.52E-04	1.22E-04	2.33E-02	2.20%
29	KGT01_MGS_03_V	7.12E-03	3.08E-03	1.47E-03	3.68E-04	2.68E-05	1.21E-02	1.34%	7.12E-03	3.08E-03	1.47E-03	3.68E-04	2.68E-05	1.21E-02	1.14%
30	KGT01_MGS_07_V	5.42E-03	2.31E-03	1.05E-03	3.11E-04	1.11E-05	9.10E-03	1.01%	5.42E-03	2.31E-03	1.05E-03	3.11E-04	1.11E-05	9.10E-03	0.86%
31	KGT11_MGS_05_V	2.16E-03	1.07E-03	6.38E-04	1.48E-04	7.01E-05	4.09E-03	0.46%	2.16E-03	1.07E-03	6.38E-04	1.48E-04	7.01E-05	4.09E-03	0.39%
32	KGT11_MGS_08_V	2.76E-03	1.20E-03	5.70E-04	1.56E-04	0.00E+00	4.68E-03	0.52%	2.76E-03	1.20E-03	5.70E-04	1.56E-04	0.00E+00	4.68E-03	0.44%
33	KGT11_MGS_09_V	8.16E-03	3.57E-03	1.87E-03	2.89E-04	5.86E-05	1.39E-02	1.56%	8.16E-03	3.57E-03	1.87E-03	2.89E-04	5.86E-05	1.39E-02	1.32%
Pigging															
34	KGT01_PIG_01_V	9.52E-07	4.86E-07	2.70E-07	6.52E-08	2.91E-08	1.80E-06	0.00%	9.52E-07	4.86E-07	2.70E-07	6.52E-08	2.91E-08	1.80E-06	0.00%
35	KGT13_PIG_02_V	8.80E-07	4.56E-07	2.53E-07	6.52E-08	2.91E-08	1.68E-06	0.00%	8.80E-07	4.56E-07	2.53E-07	6.52E-08	2.91E-08	1.68E-06	0.00%
36	KGT11_PIG_03_V	8.76E-07	4.53E-07	2.52E-07	6.23E-08	2.91E-08	1.67E-06	0.00%	8.76E-07	4.53E-07	2.52E-07	6.23E-08	2.91E-08	1.67E-06	0.00%
37	KGT11_PIG_04_V	8.76E-07	4.53E-07	2.52E-07	6.23E-08	2.91E-08	1.67E-06	0.00%	8.76E-07	4.53E-07	2.52E-07	6.23E-08	2.91E-08	1.67E-06	0.00%
Utilities and Cogen Unit															
38	KGT01_MPG_21_V	5.40E-03	2.28E-03	1.08E-03	2.10E-04	1.72E-05	8.98E-03	1.00%	5.40E-03	2.28E-03	1.08E-03	2.10E-04	1.72E-05	8.98E-03	0.85%
39	KGT01_MPG_22_L	1.66E-03	6.53E-04	2.58E-04	8.39E-05	0.00E+00	2.65E-03	0.30%	1.66E-03	6.53E-04	2.58E-04	8.39E-05	0.00E+00	2.65E-03	0.25%
40	KGT01_MPG_23_L	1.22E-03	5.37E-04	2.53E-04	8.31E-05	0.00E+00	2.10E-03	0.23%	1.22E-03	5.37E-04	2.53E-04	8.31E-05	0.00E+00	2.10E-03	0.20%
41	KGT01_FGA_01_V	5.24E-03	2.41E-03	1.34E-03	3.48E-04	1.44E-05	9.35E-03	1.04%	5.24E-03	2.41E-03	1.34E-03	3.48E-04	1.44E-05	9.35E-03	0.88%
42	KGT01_FGA_02_V	1.51E-02	6.35E-03	3.12E-03	4.50E-04	3.52E-05	2.50E-02	2.79%	1.51E-02	6.35E-03	3.12E-03	4.50E-04	3.52E-05	2.50E-02	2.36%
43	KGT01_PGS_19_V	7.50E-03	2.91E-03	1.15E-03	2.79E-04	3.46E-07	1.18E-02	1.32%	7.50E-03	2.91E-03	1.15E-03	2.79E-04	3.46E-07	1.18E-02	1.12%
44	KGT01_PGS_21_V	1.21E-02	4.59E-03	1.73E-03	4.04E-04	2.98E-06	1.88E-02	2.10%	1.21E-02	4.59E-03	1.73E-03	4.04E-04	2.98E-06	1.88E-02	1.77%
45	KGT01_PGS_22_V	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	4.86E-03	2.11E-03	1.05E-03	1.77E-04	2.45E-05	8.23E-03	0.78%
LPG Production Facility - Stabiliser, De-C2															
46	KGT01_MPG_07_L	1.83E-03	8.53E-04	4.70E-04	1.57E-04	4.63E-06	3.32E-03	0.37%	1.83E-03	8.53E-04	4.70E-04	1.57E-04	4.63E-06	3.32E-03	0.31%
47	KGT01_DET_01_V	2.51E-03	1.16E-03	6.33E-04	2.10E-04	4.55E-06	4.52E-03	0.50%	2.51E-03	1.16E-03	6.33E-04	2.10E-04	4.55E-06	4.52E-03	0.43%
48	KGT01_PGS_04_V	1.94E-03	8.86E-04	4.73E-04	1.27E-04	1.75E-06	3.43E-03	0.38%	1.94E-03	8.86E-04	4.73E-04	1.27E-04	1.75E-06	3.43E-03	0.32%
49	KGT01_PGS_05_V	1.04E-02	4.62E-03	2.15E-03	7.04E-04	8.73E-06	1.79E-02	2.00%	1.04E-02	4.62E-03	2.15E-03	7.04E-04	8.73E-06	1.79E-02	1.69%
50	KGT01_DEX_01_L	5.37E-03	1.75E-03	6.47E-04	1.45E-04	1.44E-06	7.91E-03	0.88%	5.37E-03	1.75E-03	6.47E-04	1.45E-04	1.44E-06	7.91E-03	0.75%
51	KGT01_DEB_01_L	2.93E-03	1.32E-03	6.85E-04	1.63E-04	3.51E-06	5.10E-03	0.57%	2.93E-03	1.32E-03	6.85E-04	1.63E-04	3.51E-06	5.10E-03	0.48%
52	KGT01_MPG_09_L	2.56E-03	1.13E-03	6.19E-04	8.89E-05	9.72E-06	4.41E-03	0.49%	2.56E-03	1.13E-03	6.19E-04	8.89E-05	9.72E-06	4.41E-03	0.42%
53	KGT01_MPG_10_V	1.34E-03	5.95E-04	3.06E-04	7.36E-05	1.44E-06	2.31E-03	0.26%	1.34E-03	5.95E-04	3.06E-04	7.36E-05	1.44E-06	2.31E-03	0.22%
54	KGT01_MPG_13_L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	8.47E-04	3.63E-04	1.80E-04	3.18E-05	2.07E-06	1.42E-03	0.13%
55	KGT01_STT_01_V	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	3.49E-03	1.51E-03	8.04E-04	1.07E-04	3.86E-06	5.91E-03	0.56%
56	KGT01_PGS_10_V	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	3.46E-03	1.52E-03	7.82E-04	1.57E-04	1.11E-05	5.94E-03	0.56%

No	Node Section	Base Case/ Sensitivity Case 1 Release Frequencies (per year)							Sensitivity 2 (Future Production) Release Frequencies (per year)						
		1 - 3 mm (2 mm)	3 - 10 mm (6 mm)	10 - 50 mm (22 mm)	50 - 150 mm (85 mm)	> 150 mm (Rupture)	Total	% Contribution	1 - 3 mm (2 mm)	3 - 10 mm (6 mm)	10 - 50 mm (22 mm)	50 - 150 mm (85 mm)	> 150 mm (Rupture)	Total	% Contribution
57	KGT01_PGS_11_V	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	9.26E-03	4.12E-03	1.89E-03	6.85E-04	4.20E-06	1.60E-02	1.51%
58	KGT01_STB_01_L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	3.99E-03	1.75E-03	9.17E-04	1.58E-04	1.44E-06	6.82E-03	0.64%
LPG Production Facility - De-C3															
59	KGT01_DPT_11_V	3.06E-03	1.27E-03	6.12E-04	1.26E-04	6.62E-06	5.08E-03	0.57%	3.06E-03	1.27E-03	6.12E-04	1.26E-04	6.62E-06	5.08E-03	0.48%
60	KGT01_DPX_11_L	4.59E-03	1.47E-03	5.91E-04	8.80E-05	3.86E-06	6.75E-03	0.75%	4.59E-03	1.47E-03	5.91E-04	8.80E-05	3.86E-06	6.75E-03	0.64%
61	KGT01_PC3_02_L	2.98E-03	1.34E-03	6.74E-04	1.84E-04	1.73E-06	5.17E-03	0.58%	2.98E-03	1.34E-03	6.74E-04	1.84E-04	1.73E-06	5.17E-03	0.49%
62	KGT01_DPB_11_L	4.09E-03	1.84E-03	9.47E-04	2.36E-04	6.76E-06	7.12E-03	0.79%	4.09E-03	1.84E-03	9.47E-04	2.36E-04	6.76E-06	7.12E-03	0.67%
63	KGT01_DPT_01_V	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	5.26E-03	2.19E-03	1.11E-03	1.31E-04	6.62E-06	8.70E-03	0.82%
64	KGT01_DPX_01_L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	4.76E-03	1.54E-03	6.22E-04	8.62E-05	3.17E-06	7.01E-03	0.66%
65	KGT01_PC3_01_L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	2.42E-03	1.09E-03	5.45E-04	1.69E-04	0.00E+00	4.22E-03	0.40%
66	KGT01_DPB_01_L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	4.18E-03	1.86E-03	9.57E-04	2.07E-04	4.22E-06	7.21E-03	0.68%
LPG Production Facility - De-C4															
67	KGT01_DBT_11_V	3.56E-03	1.52E-03	7.58E-04	1.83E-04	7.83E-06	6.03E-03	0.67%	3.56E-03	1.52E-03	7.58E-04	1.83E-04	7.83E-06	6.03E-03	0.57%
68	KGT01_DBX_11_L	7.28E-03	2.56E-03	1.07E-03	1.93E-04	2.13E-06	1.11E-02	1.24%	7.28E-03	2.56E-03	1.07E-03	1.93E-04	2.13E-06	1.11E-02	1.05%
69	KGT01_NGL_01_L	4.11E-03	1.82E-03	9.36E-04	1.98E-04	4.03E-06	7.06E-03	0.79%	4.11E-03	1.82E-03	9.36E-04	1.98E-04	4.03E-06	7.06E-03	0.67%
70	KGT01_NGL_02_L	5.96E-03	2.45E-03	1.11E-03	2.48E-04	2.21E-06	9.77E-03	1.09%	5.96E-03	2.45E-03	1.11E-03	2.48E-04	2.21E-06	9.77E-03	0.92%
71	KGT01_DBT_01_V	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	3.88E-03	1.62E-03	8.01E-04	1.32E-04	4.90E-06	6.44E-03	0.61%
72	KGT01_DBX_01_L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	5.21E-03	1.74E-03	7.23E-04	1.12E-04	2.13E-06	7.78E-03	0.73%
73	KGT01_DBB_01_L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	2.61E-03	1.17E-03	6.03E-04	1.53E-04	1.44E-06	4.54E-03	0.43%
74	KGT01_PC4_12_L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	2.48E-03	1.12E-03	5.66E-04	2.02E-04	3.94E-06	4.37E-03	0.41%
75	KGT01_PC3_13_L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	1.47E-03	6.34E-04	2.96E-04	7.85E-05	0.00E+00	2.48E-03	0.23%
76	KGT01_LPG_04_L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	3.01E-03	1.30E-03	6.52E-04	1.29E-04	0.00E+00	5.10E-03	0.48%
LPG Production Facility - Product Export and Loadout															
77	KGT32_NGL_05_L	6.83E-04	2.98E-04	1.42E-04	4.45E-05	0.00E+00	1.17E-03	0.13%	6.83E-04	2.98E-04	1.42E-04	4.45E-05	0.00E+00	1.17E-03	0.11%
78	KGT33_NGL_06_L	1.49E-03	6.41E-04	3.22E-04	5.40E-05	1.68E-06	2.51E-03	0.28%	1.49E-03	6.41E-04	3.22E-04	5.40E-05	1.68E-06	2.51E-03	0.24%
79	KGT34_NGL_07_L	0.00E+00	1.00E-04	5.00E-06	0.00E+00	5.00E-06	1.10E-04	0.01%	0.00E+00	1.00E-04	5.00E-06	0.00E+00	5.00E-06	1.10E-04	0.01%
80	KGT35_NGL_09_L	4.77E-03	1.46E-03	4.84E-04	9.03E-05	5.59E-06	6.81E-03	0.76%	4.77E-03	1.46E-03	4.84E-04	9.03E-05	5.59E-06	6.81E-03	0.64%
81	KGT36_NGL_10_L	1.24E-03	5.63E-04	2.96E-04	7.35E-05	4.20E-06	2.18E-03	0.24%	1.24E-03	5.63E-04	2.96E-04	7.35E-05	4.20E-06	2.18E-03	0.21%
82	KGT36_NGL_11_L	0.00E+00	5.72E-02	0.00E+00	0.00E+00	5.72E-03	6.29E-02	7.02%	0.00E+00	8.00E-02	0.00E+00	0.00E+00	8.00E-03	8.80E-02	8.30%
82A	KGT36_NGL_12_L	0.00E+00	0.00E+00	0.00E+00	8.16E-08	8.16E-08	1.63E-07	0.00%	0.00E+00	0.00E+00	0.00E+00	1.14E-07	1.14E-07	2.28E-07	0.00%
83	KGT37_PC3_05_L	1.07E-03	4.68E-04	2.26E-04	5.09E-05	7.00E-06	1.82E-03	0.20%	1.07E-03	4.68E-04	2.26E-04	5.09E-05	7.00E-06	1.82E-03	0.17%
84	KGT39_PC3_07_V	0.00E+00	5.00E-06	2.50E-07	0.00E+00	2.50E-07	5.50E-06	0.00%	0.00E+00	5.00E-06	2.50E-07	0.00E+00	2.50E-07	5.50E-06	0.00%

No	Node Section	Base Case/ Sensitivity Case 1 Release Frequencies (per year)							Sensitivity 2 (Future Production) Release Frequencies (per year)						
		1 - 3 mm (2 mm)	3 - 10 mm (6 mm)	10 - 50 mm (22 mm)	50 - 150 mm (85 mm)	> 150 mm (Rupture)	Total	% Contribution	1 - 3 mm (2 mm)	3 - 10 mm (6 mm)	10 - 50 mm (22 mm)	50 - 150 mm (85 mm)	> 150 mm (Rupture)	Total	% Contribution
85	KGT39_PC3_08_L	0.00E+00	5.00E-06	2.50E-07	0.00E+00	2.50E-07	5.50E-06	0.00%	0.00E+00	5.00E-06	2.50E-07	0.00E+00	2.50E-07	5.50E-06	0.00%
86	KGT40_PC3_09_V	0.00E+00	5.00E-06	2.50E-07	0.00E+00	2.50E-07	5.50E-06	0.00%	0.00E+00	5.00E-06	2.50E-07	0.00E+00	2.50E-07	5.50E-06	0.00%
87	KGT40_PC3_10_L	0.00E+00	5.00E-06	2.50E-07	0.00E+00	2.50E-07	5.50E-06	0.00%	0.00E+00	5.00E-06	2.50E-07	0.00E+00	2.50E-07	5.50E-06	0.00%
88	KGT41_PC4_04_L	1.33E-03	5.78E-04	2.70E-04	7.22E-05	5.33E-06	2.25E-03	0.25%	1.33E-03	5.78E-04	2.70E-04	7.22E-05	5.33E-06	2.25E-03	0.21%
89	KGT43_PC4_06_V	0.00E+00	5.00E-06	2.50E-07	0.00E+00	2.50E-07	5.50E-06	0.00%	0.00E+00	5.00E-06	2.50E-07	0.00E+00	2.50E-07	5.50E-06	0.00%
90	KGT43_PC4_07_L	0.00E+00	5.00E-06	2.50E-07	0.00E+00	2.50E-07	5.50E-06	0.00%	0.00E+00	5.00E-06	2.50E-07	0.00E+00	2.50E-07	5.50E-06	0.00%
91	KGT44_PC4_08_V	0.00E+00	5.00E-06	2.50E-07	0.00E+00	2.50E-07	5.50E-06	0.00%	0.00E+00	5.00E-06	2.50E-07	0.00E+00	2.50E-07	5.50E-06	0.00%
92	KGT44_PC4_09_L	0.00E+00	5.00E-06	2.50E-07	0.00E+00	2.50E-07	5.50E-06	0.00%	0.00E+00	5.00E-06	2.50E-07	0.00E+00	2.50E-07	5.50E-06	0.00%
93	KGT45_PC3_12_L	6.16E-03	2.08E-03	7.99E-04	1.52E-04	2.13E-05	9.22E-03	1.03%	6.16E-03	2.08E-03	7.99E-04	1.52E-04	2.13E-05	9.22E-03	0.87%
94	KGT46_PC4_11_L	5.54E-03	1.80E-03	6.51E-04	1.16E-04	1.75E-05	8.13E-03	0.91%	5.54E-03	1.80E-03	6.51E-04	1.16E-04	1.75E-05	8.13E-03	0.77%
95	KGT47_LPG_01_L	9.71E-04	4.15E-04	2.06E-04	3.29E-05	2.48E-06	1.63E-03	0.18%	9.71E-04	4.15E-04	2.06E-04	3.29E-05	2.48E-06	1.63E-03	0.15%
96	KGT47_LPG_02_L	0.00E+00	8.71E-04	0.00E+00	0.00E+00	8.71E-05	9.58E-04	0.11%	0.00E+00	1.79E-03	0.00E+00	0.00E+00	1.79E-04	1.97E-03	0.19%
96A	KGT47_LPG_03_L	0.00E+00	0.00E+00	0.00E+00	1.66E-07	1.66E-07	3.32E-07	0.00%	0.00E+00	0.00E+00	0.00E+00	3.41E-07	3.41E-07	6.82E-07	0.00%
97	KGT47_LPG_05_L	0.00E+00	6.24E-04	0.00E+00	0.00E+00	6.24E-05	6.86E-04	0.08%	0.00E+00	1.20E-03	0.00E+00	0.00E+00	1.20E-04	1.32E-03	0.12%
97A	KGT47_LPG_06_L	0.00E+00	0.00E+00	0.00E+00	8.90E-10	8.90E-10	1.78E-09	0.00%	0.00E+00	0.00E+00	0.00E+00	1.71E-09	1.71E-09	3.42E-09	0.00%
Propane Refrigeration System															
98	KGT70_REF_01_V	9.37E-04	4.14E-04	2.08E-04	4.63E-05	3.17E-06	1.61E-03	0.18%	9.37E-04	4.14E-04	2.08E-04	4.63E-05	3.17E-06	1.61E-03	0.15%
99	KGT70_REF_02_L	9.71E-04	4.28E-04	2.21E-04	4.47E-05	2.48E-06	1.67E-03	0.19%	9.71E-04	4.28E-04	2.21E-04	4.47E-05	2.48E-06	1.67E-03	0.16%
100	KGT70_REF_03_V	3.80E-03	1.50E-03	6.23E-04	1.33E-04	6.26E-06	6.05E-03	0.68%	3.80E-03	1.50E-03	6.23E-04	1.33E-04	6.26E-06	6.05E-03	0.57%
101	KGT70_REF_04_L	2.12E-03	9.36E-04	4.65E-04	1.06E-04	9.60E-06	3.63E-03	0.41%	2.12E-03	9.36E-04	4.65E-04	1.06E-04	9.60E-06	3.63E-03	0.34%
102	KGT70_REF_05_L	1.70E-03	7.66E-04	3.87E-04	1.05E-04	1.44E-06	2.96E-03	0.33%	1.70E-03	7.66E-04	3.87E-04	1.05E-04	1.44E-06	2.96E-03	0.28%
103	KGT70_REF_07_L	1.34E-03	6.17E-04	3.05E-04	1.05E-04	1.79E-06	2.37E-03	0.26%	1.34E-03	6.17E-04	3.05E-04	1.05E-04	1.79E-06	2.37E-03	0.22%
104	KGT70_REF_11_V	4.91E-03	1.99E-03	9.02E-04	1.49E-04	3.14E-05	7.98E-03	0.89%	4.91E-03	1.99E-03	9.02E-04	1.49E-04	3.14E-05	7.98E-03	0.75%
105	KGT70_REF_14_V	1.80E-02	8.15E-03	3.84E-03	8.13E-04	2.48E-04	3.10E-02	3.46%	1.80E-02	8.15E-03	3.84E-03	8.13E-04	2.48E-04	3.10E-02	2.93%
106	KGT70_REF_15_L	4.01E-03	1.52E-03	6.46E-04	1.03E-04	1.10E-05	6.28E-03	0.70%	4.01E-03	1.52E-03	6.46E-04	1.03E-04	1.10E-05	6.28E-03	0.59%
107	KGT70_REF_06_L	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	2.13E-03	9.46E-04	4.61E-04	1.23E-04	7.18E-06	3.67E-03	0.35%
Mercaptans and Methanol															
108	KGT50_EMC_01_L	5.77E-03	1.95E-03	7.39E-04	2.37E-04	0.00E+00	8.70E-03	0.97%	5.77E-03	1.95E-03	7.39E-04	2.37E-04	0.00E+00	8.70E-03	0.82%
109	KGT50_EMC_02_L	1.20E-04	2.88E-05	0.00E+00	0.00E+00	4.00E-06	1.53E-04	0.02%	1.20E-04	2.88E-05	0.00E+00	0.00E+00	4.00E-06	1.53E-04	0.01%
110	KGT51_BMC_05_L	1.00E-06	2.40E-07	0.00E+00	0.00E+00	2.00E-06	3.24E-06	0.00%	1.00E-06	2.40E-07	0.00E+00	0.00E+00	2.00E-06	3.24E-06	0.00%
111	KGT52_BMC_01_L	0.00E+00	1.00E-05	5.00E-07	0.00E+00	5.00E-07	1.10E-05	0.00%	0.00E+00	1.00E-05	5.00E-07	0.00E+00	5.00E-07	1.10E-05	0.00%
112	KGT52_BMC_02_L	4.42E-03	1.97E-03	1.01E-03	5.79E-04	0.00E+00	7.98E-03	0.89%	4.42E-03	1.97E-03	1.01E-03	5.79E-04	0.00E+00	7.98E-03	0.75%

No	Node Section	Base Case/ Sensitivity Case 1 Release Frequencies (per year)							Sensitivity 2 (Future Production) Release Frequencies (per year)						
		1 - 3 mm (2 mm)	3 - 10 mm (6 mm)	10 - 50 mm (22 mm)	50 - 150 mm (85 mm)	> 150 mm (Rupture)	Total	% Contribution	1 - 3 mm (2 mm)	3 - 10 mm (6 mm)	10 - 50 mm (22 mm)	50 - 150 mm (85 mm)	> 150 mm (Rupture)	Total	% Contribution
113	KGT52_BMC_03_L	0.00E+00	2.66E-05	0.00E+00	0.00E+00	2.66E-06	2.93E-05	0.00%	0.00E+00	2.66E-05	0.00E+00	0.00E+00	2.66E-06	2.93E-05	0.00%
113A	KGT52_BMC_04_L	0.00E+00	0.00E+00	0.00E+00	3.80E-11	7.60E-10	7.98E-10	0.00%	0.00E+00	0.00E+00	0.00E+00	3.80E-11	7.60E-10	7.98E-10	0.00%
114	KGT55_MOH_01_L	0.00E+00	4.00E-05	2.00E-06	0.00E+00	2.00E-06	4.40E-05	0.00%	0.00E+00	4.00E-05	2.00E-06	0.00E+00	2.00E-06	4.40E-05	0.00%
115	KGT55_MOH_02_L	9.19E-03	4.12E-03	2.10E-03	1.23E-03	0.00E+00	1.66E-02	1.86%	9.19E-03	4.12E-03	2.10E-03	1.23E-03	0.00E+00	1.66E-02	1.57%
116	KGT55_MOH_03_L	0.00E+00	8.40E-03	0.00E+00	0.00E+00	8.40E-04	9.24E-03	1.03%	0.00E+00	1.20E-02	0.00E+00	0.00E+00	1.20E-03	1.32E-02	1.25%
116A	KGT55_MOH_04_L	0.00E+00	0.00E+00	0.00E+00	1.20E-08	2.40E-07	2.52E-07	0.00%	0.00E+00	0.00E+00	0.00E+00	1.71E-08	3.42E-07	3.59E-07	0.00%
CO2 Recovery - Ammonia															
117	KGT80_AMM_01_V	8.30E-03	3.77E-03	1.75E-03	3.93E-04	1.18E-04	1.43E-02	1.60%	8.30E-03	3.77E-03	1.75E-03	3.93E-04	1.18E-04	1.43E-02	1.35%
118	KGT80_AMM_11_V	8.46E-03	3.82E-03	1.77E-03	3.88E-04	1.18E-04	1.46E-02	1.62%	8.46E-03	3.82E-03	1.77E-03	3.88E-04	1.18E-04	1.46E-02	1.37%
119	KGT80_AMM_02_V	1.43E-03	6.42E-04	3.24E-04	9.75E-05	0.00E+00	2.49E-03	0.28%	1.43E-03	6.42E-04	3.24E-04	9.75E-05	0.00E+00	2.49E-03	0.24%
120	KGT80_AMM_03_L	1.21E-02	4.42E-03	1.58E-03	4.18E-04	1.44E-06	1.85E-02	2.06%	1.21E-02	4.42E-03	1.58E-03	4.18E-04	1.44E-06	1.85E-02	1.75%
121	KGT80_AMM_04_L	1.83E-02	6.86E-03	2.55E-03	6.83E-04	2.02E-06	2.84E-02	3.17%	1.83E-02	6.86E-03	2.55E-03	6.83E-04	2.02E-06	2.84E-02	2.68%
122	KGT80_AMM_07_L	2.48E-03	1.12E-03	5.45E-04	1.87E-04	0.00E+00	4.32E-03	0.48%	2.48E-03	1.12E-03	5.45E-04	1.87E-04	0.00E+00	4.32E-03	0.41%
123	KGT80_AMM_08_V	3.27E-03	1.40E-03	6.46E-04	1.89E-04	5.75E-06	5.51E-03	0.61%	3.27E-03	1.40E-03	6.46E-04	1.89E-04	5.75E-06	5.51E-03	0.52%
124	KGT80_AMM_09_V	1.64E-02	6.07E-03	2.23E-03	5.41E-04	4.61E-06	2.52E-02	2.81%	1.64E-02	6.07E-03	2.23E-03	5.41E-04	4.61E-06	2.52E-02	2.38%
CO2 Recovery - CO2															
125	KGT90_CO2_01_V	9.50E-03	4.37E-03	2.09E-03	5.57E-04	1.17E-04	1.66E-02	1.86%	9.50E-03	4.37E-03	2.09E-03	5.57E-04	1.17E-04	1.66E-02	1.57%
126	KGT90_CO2_02_V	9.52E-03	4.38E-03	2.10E-03	5.63E-04	1.17E-04	1.67E-02	1.86%	9.52E-03	4.38E-03	2.10E-03	5.63E-04	1.17E-04	1.67E-02	1.57%
127	KGT90_CO2_03_V	3.37E-03	1.60E-03	8.57E-04	3.36E-04	5.05E-06	6.17E-03	0.69%	3.37E-03	1.60E-03	8.57E-04	3.36E-04	5.05E-06	6.17E-03	0.58%
128	KGT90_CO2_07_V	4.78E-03	2.05E-03	9.86E-04	2.35E-04	1.37E-05	8.06E-03	0.90%	4.78E-03	2.05E-03	9.86E-04	2.35E-04	1.37E-05	8.06E-03	0.76%
129	KGT90_CO2_08_L	8.75E-03	3.25E-03	1.37E-03	3.95E-04	9.24E-06	1.38E-02	1.54%	8.75E-03	3.25E-03	1.37E-03	3.95E-04	9.24E-06	1.38E-02	1.30%
130	KGT90_CO2_16_V	2.50E-02	1.02E-02	4.48E-03	8.92E-04	1.99E-04	4.08E-02	4.55%	2.50E-02	1.02E-02	4.48E-03	8.92E-04	1.99E-04	4.08E-02	3.85%
131	KGT90_CO2_18_V	1.63E-03	7.45E-04	3.80E-04	1.36E-04	0.00E+00	2.89E-03	0.32%	1.63E-03	7.45E-04	3.80E-04	1.36E-04	0.00E+00	2.89E-03	0.27%
132	KGT90_CO2_19_V	6.14E-03	2.55E-03	1.23E-03	2.56E-04	1.79E-06	1.02E-02	1.13%	6.14E-03	2.55E-03	1.23E-03	2.56E-04	1.79E-06	1.02E-02	0.96%
133	KGT90_CO2_23_V	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00%	8.01E-04	3.82E-04	2.04E-04	4.31E-05	1.78E-05	1.45E-03	0.14%
134	KGT90_CO2_09_L	0.00E+00	1.00E-05	5.00E-07	0.00E+00	5.00E-07	1.10E-05	0.00%	0.00E+00	1.00E-05	5.00E-07	0.00E+00	5.00E-07	1.10E-05	0.00%
135	KGT90_CO2_10_L	0.00E+00	1.00E-05	5.00E-07	0.00E+00	5.00E-07	1.10E-05	0.00%	0.00E+00	1.00E-05	5.00E-07	0.00E+00	5.00E-07	1.10E-05	0.00%
136	KGT90_CO2_11_L	0.00E+00	1.00E-05	5.00E-07	0.00E+00	5.00E-07	1.10E-05	0.00%	0.00E+00	1.00E-05	5.00E-07	0.00E+00	5.00E-07	1.10E-05	0.00%
137	KGT90_CO2_12_L	0.00E+00	1.00E-05	5.00E-07	0.00E+00	5.00E-07	1.10E-05	0.00%	0.00E+00	1.00E-05	5.00E-07	0.00E+00	5.00E-07	1.10E-05	0.00%
138	KGT90_CO2_24_L	6.53E-03	2.19E-03	7.77E-04	1.78E-04	1.13E-05	9.69E-03	1.08%	6.53E-03	2.19E-03	7.77E-04	1.78E-04	1.13E-05	9.69E-03	0.91%
139	KGT90_CO2_25_L	2.85E-03	1.35E-03	7.40E-04	5.17E-04	0.00E+00	5.45E-03	0.61%	2.85E-03	1.35E-03	7.40E-04	5.17E-04	0.00E+00	5.45E-03	0.51%
140	KGT90_CO2_26_V	8.01E-04	3.57E-04	1.74E-04	6.00E-05	0.00E+00	1.39E-03	0.16%	8.01E-04	3.57E-04	1.74E-04	6.00E-05	0.00E+00	1.39E-03	0.13%

No	Node Section	Base Case/ Sensitivity Case 1 Release Frequencies (per year)							Sensitivity 2 (Future Production) Release Frequencies (per year)						
		1 - 3 mm (2 mm)	3 - 10 mm (6 mm)	10 - 50 mm (22 mm)	50 - 150 mm (85 mm)	> 150 mm (Rupture)	Total	% Contribution	1 - 3 mm (2 mm)	3 - 10 mm (6 mm)	10 - 50 mm (22 mm)	50 - 150 mm (85 mm)	> 150 mm (Rupture)	Total	% Contribution
141	KGT90_CO2_27_V	8.77E-04	3.78E-04	1.72E-04	5.31E-05	0.00E+00	1.48E-03	0.17%	8.77E-04	3.78E-04	1.72E-04	5.31E-05	0.00E+00	1.48E-03	0.14%
142	KGT90_CO2_28_L	0.00E+00	6.00E-03	0.00E+00	0.00E+00	6.00E-04	6.60E-03	0.74%	0.00E+00	6.00E-03	0.00E+00	0.00E+00	6.00E-04	6.60E-03	0.62%
143	KGT90_CO2_29_V	0.00E+00	2.40E-02	0.00E+00	0.00E+00	2.40E-03	2.64E-02	2.94%	0.00E+00	2.40E-02	0.00E+00	0.00E+00	2.40E-03	2.64E-02	2.49%
144	KGT90_CO2_30_L	0.00E+00	2.40E-02	0.00E+00	0.00E+00	2.40E-03	2.64E-02	2.94%	0.00E+00	2.40E-02	0.00E+00	0.00E+00	2.40E-03	2.64E-02	2.49%
145	KGT90_CO2_31_V	0.00E+00	4.60E-03	0.00E+00	0.00E+00	4.60E-04	5.06E-03	0.56%	0.00E+00	4.60E-03	0.00E+00	0.00E+00	4.60E-04	5.06E-03	0.48%
146	KGT90_CO2_32_L	0.00E+00	4.60E-03	0.00E+00	0.00E+00	4.60E-04	5.06E-03	0.56%	0.00E+00	4.60E-03	0.00E+00	0.00E+00	4.60E-04	5.06E-03	0.48%
147	KGT90_CO2_33_L	0.00E+00	0.00E+00	0.00E+00	8.56E-09	8.56E-09	1.71E-08	0.00%	0.00E+00	0.00E+00	0.00E+00	8.56E-09	8.56E-09	1.71E-08	0.00%
148	KGT90_CO2_34_L	0.00E+00	0.00E+00	0.00E+00	3.42E-08	3.42E-08	6.84E-08	0.00%	0.00E+00	0.00E+00	0.00E+00	3.42E-08	3.42E-08	6.84E-08	0.00%
149	KGT90_CO2_35_L	0.00E+00	0.00E+00	0.00E+00	6.56E-09	6.56E-09	1.31E-08	0.00%	0.00E+00	0.00E+00	0.00E+00	6.56E-09	6.56E-09	1.31E-08	0.00%
Total		**4.53E-01**	**3.19E-01**	**8.79E-02**	**2.14E-02**	**1.51E-02**	**8.97E-01**	**100%**	**5.31E-01**	**3.80E-01**	**1.05E-01**	**2.52E-02**	**1.81E-02**	**1.06E+00**	**100%**
% Contribution		**50.5%**	**35.6%**	**9.8%**	**2.4%**	**1.7%**	**100%**		**50.2%**	**35.9%**	**9.9%**	**2.4%**	**1.7%**	**100%**	

Appendix 5.
Ignited Event and Toxic Event Frequencies

Table A5- 1: Ignited and Toxic Event Frequencies

Line No.	Release Scenario	Release Rate (kg/s)	Explosion Probability	Base Case/ Sensitivity Case 1			Sensitivity 2 (Future Operation)		
				Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1	Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1
1	KGT01_RGS_01_V_2mm	0.03	0.04	1.82E-06	4.24E-06	6.05E-03	1.82E-06	4.24E-06	6.05E-03
2	KGT01_RGS_01_V_6mm	0.2	0.04	1.21E-06	2.83E-06	2.72E-03	1.21E-06	2.83E-06	2.72E-03
3	KGT01_RGS_01_V_22mm	3.1	0.12	3.56E-06	8.32E-06	1.51E-03	3.56E-06	8.32E-06	1.51E-03
4	KGT01_RGS_01_V_85mm	47	0.12	9.88E-06	2.30E-05	2.49E-04	9.88E-06	2.30E-05	2.49E-04
5	KGT01_RGS_01_V_274mm	485	0.3	1.10E-05	2.57E-05	1.98E-05	1.10E-05	2.57E-05	1.98E-05
6	KGT01_RCS_01_L_2mm	0.1	0.04	4.70E-07	1.10E-06	1.31E-03	4.70E-07	1.10E-06	1.31E-03
7	KGT01_RCS_01_L_6mm	1.1	0.12	5.04E-07	1.18E-06	5.99E-04	5.04E-07	1.18E-06	5.99E-04
8	KGT01_RCS_01_L_22mm	15	0.12	2.29E-06	5.34E-06	2.99E-04	2.29E-06	5.34E-06	2.99E-04
9	KGT01_RCS_01_L_71mm	160	0.3	4.14E-06	9.66E-06	9.23E-05	4.14E-06	9.66E-06	9.23E-05
10	KGT01_MAU_01_V_2mm	0.02	0.04	1.24E-06	2.88E-06	4.11E-03	1.24E-06	2.88E-06	4.11E-03
11	KGT01_MAU_01_V_6mm	0.2	0.04	7.98E-07	1.86E-06	1.83E-03	7.98E-07	1.86E-06	1.83E-03
12	KGT01_MAU_01_V_22mm	2.9	0.12	2.25E-06	5.24E-06	1.01E-03	2.25E-06	5.24E-06	1.01E-03
13	KGT01_MAU_01_V_85mm	44	0.12	4.57E-06	1.07E-05	1.23E-04	4.57E-06	1.07E-05	1.23E-04
14	KGT01_MAU_01_V_274mm	456	0.3	6.85E-06	1.60E-05	1.23E-05	6.85E-06	1.60E-05	1.23E-05
15	KGT01_MAU_02_V_2mm	0.02	0.04	1.06E-06	2.48E-06	3.54E-03	1.06E-06	2.48E-06	3.54E-03
16	KGT01_MAU_02_V_6mm	0.2	0.04	6.24E-07	1.46E-06	1.43E-03	6.24E-07	1.46E-06	1.43E-03
17	KGT01_MAU_02_V_22mm	2.9	0.12	1.45E-06	3.38E-06	6.52E-04	1.45E-06	3.38E-06	6.52E-04
18	KGT01_MAU_02_V_71mm	31	0.12	2.11E-06	4.93E-06	8.49E-05	2.11E-06	4.93E-06	8.49E-05
19	KGT02_TGS_01_V_2mm	0.02	0.04	9.28E-07	2.17E-06	3.09E-03	9.28E-07	2.17E-06	3.09E-03
20	KGT02_TGS_01_V_6mm	0.2	0.04	6.00E-07	1.40E-06	1.42E-03	6.00E-07	1.40E-06	1.42E-03
21	KGT02_TGS_01_V_22mm	2.7	0.12	1.58E-06	3.68E-06	7.80E-04	1.58E-06	3.68E-06	7.80E-04
22	KGT02_TGS_01_V_85mm	40	0.12	5.90E-06	1.38E-05	1.77E-04	5.90E-06	1.38E-05	1.77E-04
23	KGT02_TGS_01_V_212mm	249	0.3	2.73E-06	6.36E-06	5.52E-06	2.73E-06	6.36E-06	5.52E-06
24	KGT03_TGS_04_V_2mm	0.02	0.04	9.09E-07	2.12E-06	3.03E-03	9.09E-07	2.12E-06	3.03E-03
25	KGT03_TGS_04_V_6mm	0.2	0.04	5.90E-07	1.38E-06	1.40E-03	5.90E-07	1.38E-06	1.40E-03
26	KGT03_TGS_04_V_22mm	2.7	0.12	1.55E-06	3.63E-06	7.68E-04	1.55E-06	3.63E-06	7.68E-04
27	KGT03_TGS_04_V_85mm	40	0.12	5.60E-06	1.31E-05	1.68E-04	5.60E-06	1.31E-05	1.68E-04
28	KGT03_TGS_04_V_194mm	208	0.3	3.29E-06	7.68E-06	1.01E-05	3.29E-06	7.68E-06	1.01E-05
29	KGT05_RGS_07_V_2mm	0.03	0.04	0.00E+00	0.00E+00	0.00E+00	7.51E-07	1.75E-06	2.50E-03
30	KGT05_RGS_07_V_6mm	0.2	0.04	0.00E+00	0.00E+00	0.00E+00	5.04E-07	1.18E-06	1.13E-03
31	KGT05_RGS_07_V_22mm	3.1	0.12	0.00E+00	0.00E+00	0.00E+00	1.41E-06	3.30E-06	5.98E-04
32	KGT05_RGS_07_V_85mm	47	0.12	0.00E+00	0.00E+00	0.00E+00	3.21E-06	7.49E-06	8.10E-05
33	KGT05_RGS_07_V_212mm	290	0.3	0.00E+00	0.00E+00	0.00E+00	6.26E-06	1.46E-05	1.12E-05
34	KGT05_TGS_16_V_2mm	0.02	0.04	0.00E+00	0.00E+00	0.00E+00	1.24E-06	2.90E-06	4.14E-03
35	KGT05_TGS_16_V_6mm	0.2	0.04	0.00E+00	0.00E+00	0.00E+00	7.87E-07	1.84E-06	1.86E-03
36	KGT05_TGS_16_V_22mm	2.7	0.12	0.00E+00	0.00E+00	0.00E+00	2.09E-06	4.87E-06	1.03E-03
37	KGT05_TGS_16_V_85mm	40	0.12	0.00E+00	0.00E+00	0.00E+00	4.04E-06	9.43E-06	1.21E-04
38	KGT05_TGS_16_V_212mm	249	0.3	0.00E+00	0.00E+00	0.00E+00	9.16E-06	2.14E-05	1.85E-05
39	KGT01_TGS_07_V_2mm	0.02	0.04	1.45E-06	3.39E-06	4.83E-03	1.45E-06	3.39E-06	4.83E-03
40	KGT01_TGS_07_V_6mm	0.2	0.04	9.03E-07	2.11E-06	2.14E-03	9.03E-07	2.11E-06	2.14E-03
41	KGT01_TGS_07_V_22mm	2.7	0.12	2.36E-06	5.51E-06	1.17E-03	2.36E-06	5.51E-06	1.17E-03
42	KGT01_TGS_07_V_85mm	40	0.12	4.64E-06	1.08E-05	1.39E-04	4.64E-06	1.08E-05	1.39E-04
43	KGT01_TGS_07_V_212mm	249	0.3	5.66E-06	1.32E-05	1.15E-05	5.66E-06	1.32E-05	1.15E-05
44	KGT01_TGS_10_V_2mm	0.02	0.04	1.01E-06	2.36E-06	3.37E-03	1.01E-06	2.36E-06	3.37E-03
45	KGT01_TGS_10_V_6mm	0.2	0.04	6.95E-07	1.62E-06	1.65E-03	6.95E-07	1.62E-06	1.65E-03
46	KGT01_TGS_10_V_22mm	2.7	0.12	1.95E-06	4.56E-06	9.66E-04	1.95E-06	4.56E-06	9.66E-04
47	KGT01_TGS_10_V_85mm	40	0.12	5.63E-06	1.31E-05	1.69E-04	5.63E-06	1.31E-05	1.69E-04
48	KGT01_TGS_10_V_212mm	249	0.3	1.93E-05	4.50E-05	3.91E-05	1.93E-05	4.50E-05	3.91E-05
49	KGT01_TGS_12_V_2mm	0.02	0.04	6.57E-07	1.53E-06	2.19E-03	6.57E-07	1.53E-06	2.19E-03

Line No.	Release Scenario	Release Rate (kg/s)	Explosion Probability	Base Case/ Sensitivity Case 1			Sensitivity 2 (Future Operation)		
				Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1	Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1
50	KGT01_TGS_12_V_6mm	0.2	0.04	4.35E-07	1.02E-06	1.03E-03	4.35E-07	1.02E-06	1.03E-03
51	KGT01_TGS_12_V_22mm	2.7	0.12	1.18E-06	2.76E-06	5.85E-04	1.18E-06	2.76E-06	5.85E-04
52	KGT01_TGS_12_V_85mm	40	0.12	2.99E-06	6.97E-06	8.96E-05	2.99E-06	6.97E-06	8.96E-05
53	KGT01_TGS_12_V_173mm	166	0.3	5.60E-06	1.31E-05	2.64E-05	5.60E-06	1.31E-05	2.64E-05
54	KGT01_PGS_02_V_2mm	0.02	0.04	1.09E-06	2.54E-06	3.63E-03	1.09E-06	2.54E-06	3.63E-03
55	KGT01_PGS_02_V_6mm	0.2	0.04	7.03E-07	1.64E-06	1.68E-03	7.03E-07	1.64E-06	1.68E-03
56	KGT01_PGS_02_V_22mm	2.6	0.12	1.71E-06	3.98E-06	8.62E-04	1.71E-06	3.98E-06	8.62E-04
57	KGT01_PGS_02_V_85mm	39	0.12	4.88E-06	1.14E-05	1.50E-04	4.88E-06	1.14E-05	1.50E-04
58	KGT01_PGS_02_V_173mm	162	0.3	6.87E-06	1.60E-05	3.36E-05	6.87E-06	1.60E-05	3.36E-05
59	KGT04_PGS_07_V_2mm	0.02	0.04	3.74E-07	8.73E-07	1.25E-03	3.74E-07	8.73E-07	1.25E-03
60	KGT04_PGS_07_V_6mm	0.2	0.04	2.28E-07	5.32E-07	5.44E-04	2.28E-07	5.32E-07	5.44E-04
61	KGT04_PGS_07_V_22mm	2.6	0.12	5.54E-07	1.29E-06	2.80E-04	5.54E-07	1.29E-06	2.80E-04
62	KGT04_PGS_07_V_63mm	22	0.12	7.95E-07	1.85E-06	4.66E-05	7.95E-07	1.85E-06	4.66E-05
63	KGT01_MPG_01_L_2mm	0.1	0.04	4.25E-07	9.92E-07	1.32E-03	4.25E-07	9.92E-07	1.32E-03
64	KGT01_MPG_01_L_6mm	0.8	0.04	4.15E-07	9.68E-07	5.87E-04	4.15E-07	9.68E-07	5.87E-04
65	KGT01_MPG_01_L_22mm	11	0.12	1.78E-06	4.15E-06	3.02E-04	1.78E-06	4.15E-06	3.02E-04
66	KGT01_MPG_01_L_63mm	93	0.3	2.39E-06	5.58E-06	6.27E-05	2.39E-06	5.58E-06	6.27E-05
67	KGT04_MPG_03_L_2mm	0.1	0.04	5.41E-07	1.26E-06	1.68E-03	5.41E-07	1.26E-06	1.68E-03
68	KGT04_MPG_03_L_6mm	0.8	0.04	5.46E-07	1.27E-06	7.72E-04	5.46E-07	1.27E-06	7.72E-04
69	KGT04_MPG_03_L_22mm	11	0.12	2.24E-06	5.23E-06	3.80E-04	2.24E-06	5.23E-06	3.80E-04
70	KGT04_MPG_03_L_71mm	118	0.3	5.39E-06	1.26E-05	1.20E-04	5.39E-06	1.26E-05	1.20E-04
71	KGT04_MPG_04_L_2mm	0.1	0.04	6.03E-07	1.41E-06	1.87E-03	6.03E-07	1.41E-06	1.87E-03
72	KGT04_MPG_04_L_6mm	0.8	0.04	5.23E-07	1.22E-06	7.39E-04	5.23E-07	1.22E-06	7.39E-04
73	KGT04_MPG_04_L_22mm	11	0.12	1.79E-06	4.18E-06	3.04E-04	1.79E-06	4.18E-06	3.04E-04
74	KGT04_MPG_04_L_85mm	169	0.3	2.95E-06	6.87E-06	6.57E-05	2.95E-06	6.87E-06	6.57E-05
75	KGT04_MPG_04_L_150mm	527	0.3	8.31E-08	1.94E-07	1.85E-06	8.31E-08	1.94E-07	1.85E-06
76	KGT04_MPG_05_L_2mm	0.1	0.04	1.01E-06	2.36E-06	3.13E-03	1.01E-06	2.36E-06	3.13E-03
77	KGT04_MPG_05_L_6mm	0.8	0.04	5.84E-07	1.36E-06	8.26E-04	5.84E-07	1.36E-06	8.26E-04
78	KGT04_MPG_05_L_22mm	4.3	0.12	6.11E-07	1.43E-06	2.37E-04	6.11E-07	1.43E-06	2.37E-04
79	KGT04_MPG_05_L_71mm	4.3	0.12	8.54E-08	1.99E-07	3.31E-05	8.54E-08	1.99E-07	3.31E-05
80	KGT04_MPG_06_L_2mm	0.1	0.04	7.52E-07	1.75E-06	2.33E-03	7.52E-07	1.75E-06	2.33E-03
81	KGT04_MPG_06_L_6mm	0.8	0.04	7.23E-07	1.69E-06	1.02E-03	7.23E-07	1.69E-06	1.02E-03
82	KGT04_MPG_06_L_22mm	11	0.12	3.07E-06	7.16E-06	5.22E-04	3.07E-06	7.16E-06	5.22E-04
83	KGT04_MPG_06_L_71mm	118	0.3	4.08E-06	9.52E-06	9.10E-05	4.08E-06	9.52E-06	9.10E-05
84	KGT01_TGS_11_V_2mm	0.02	0.04	0.00E+00	0.00E+00	0.00E+00	7.56E-07	1.76E-06	2.52E-03
85	KGT01_TGS_11_V_6mm	0.2	0.04	0.00E+00	0.00E+00	0.00E+00	5.42E-07	1.27E-06	1.28E-03
86	KGT01_TGS_11_V_22mm	2.7	0.12	0.00E+00	0.00E+00	0.00E+00	1.55E-06	3.62E-06	7.66E-04
87	KGT01_TGS_11_V_85mm	40	0.12	0.00E+00	0.00E+00	0.00E+00	1.07E-05	2.50E-05	3.21E-04
88	KGT01_TGS_11_V_173mm	166	0.3	0.00E+00	0.00E+00	0.00E+00	1.27E-06	2.95E-06	5.97E-06
89	KGT01_PGS_03_V_2mm	0.02	0.04	0.00E+00	0.00E+00	0.00E+00	1.17E-06	2.72E-06	3.88E-03
90	KGT01_PGS_03_V_6mm	0.2	0.04	0.00E+00	0.00E+00	0.00E+00	7.35E-07	1.71E-06	1.75E-03
91	KGT01_PGS_03_V_22mm	2.6	0.12	0.00E+00	0.00E+00	0.00E+00	1.74E-06	4.05E-06	8.77E-04
92	KGT01_PGS_03_V_85mm	39	0.12	0.00E+00	0.00E+00	0.00E+00	7.27E-06	1.70E-05	2.23E-04
93	KGT01_PGS_03_V_150mm	122	0.3	0.00E+00	0.00E+00	0.00E+00	2.90E-07	6.76E-07	2.20E-06
94	KGT01_MPG_02_L_2mm	0.1	0.04	0.00E+00	0.00E+00	0.00E+00	3.27E-07	7.62E-07	1.01E-03
95	KGT01_MPG_02_L_6mm	0.8	0.04	0.00E+00	0.00E+00	0.00E+00	3.13E-07	7.31E-07	4.43E-04
96	KGT01_MPG_02_L_22mm	11	0.12	0.00E+00	0.00E+00	0.00E+00	1.31E-06	3.07E-06	2.23E-04
97	KGT01_MPG_02_L_71mm	118	0.3	0.00E+00	0.00E+00	0.00E+00	1.80E-06	4.20E-06	4.01E-05
98	KGT01_PGS_01_V_2mm	0.02	0.04	1.76E-06	4.11E-06	5.87E-03	1.76E-06	4.11E-06	5.87E-03
99	KGT01_PGS_01_V_6mm	0.2	0.04	1.08E-06	2.52E-06	2.58E-03	1.08E-06	2.52E-06	2.58E-03

Line No.	Release Scenario	Release Rate (kg/s)	Explosion Probability	Base Case/ Sensitivity Case 1			Sensitivity 2 (Future Operation)		
				Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1	Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1
100	KGT01_PGS_01_V_22mm	2.6	0.12	2.81E-06	6.56E-06	1.43E-03	2.81E-06	6.56E-06	1.43E-03
101	KGT01_PGS_01_V_85mm	39	0.12	5.36E-06	1.25E-05	1.66E-04	5.36E-06	1.25E-05	1.66E-04
102	KGT01_PGS_01_V_245mm	323	0.3	6.95E-06	1.62E-05	1.25E-05	6.95E-06	1.62E-05	1.25E-05
103	KGT01_PGS_13_V_2mm	0.02	0.04	5.50E-07	1.28E-06	1.83E-03	5.50E-07	1.28E-06	1.83E-03
104	KGT01_PGS_13_V_6mm	0.2	0.04	3.33E-07	7.78E-07	7.97E-04	3.33E-07	7.78E-07	7.97E-04
105	KGT01_PGS_13_V_22mm	2.6	0.12	7.78E-07	1.81E-06	3.96E-04	7.78E-07	1.81E-06	3.96E-04
106	KGT01_PGS_13_V_71mm	27	0.12	1.77E-06	4.12E-06	8.11E-05	1.77E-06	4.12E-06	8.11E-05
107	KGT01_PGS_14_V_2mm	0.02	0.04	2.31E-07	5.39E-07	7.69E-04	2.31E-07	5.39E-07	7.69E-04
108	KGT01_PGS_14_V_6mm	0.2	0.04	1.45E-07	3.39E-07	3.48E-04	1.45E-07	3.39E-07	3.48E-04
109	KGT01_PGS_14_V_22mm	2.6	0.12	3.70E-07	8.64E-07	1.88E-04	3.70E-07	8.64E-07	1.88E-04
110	KGT01_PGS_14_V_85mm	39	0.12	7.74E-07	1.80E-06	2.40E-05	7.74E-07	1.80E-06	2.40E-05
111	KGT01_PGS_14_V_173mm	161	0.3	1.23E-06	2.88E-06	6.12E-06	1.23E-06	2.88E-06	6.12E-06
112	KGT13_PGS_15_V_2mm	0.02	0.04	1.11E-06	2.59E-06	3.70E-03	1.11E-06	2.59E-06	3.70E-03
113	KGT13_PGS_15_V_6mm	0.2	0.04	7.03E-07	1.64E-06	1.68E-03	7.03E-07	1.64E-06	1.68E-03
114	KGT13_PGS_15_V_22mm	2.6	0.12	1.72E-06	4.02E-06	8.77E-04	1.72E-06	4.02E-06	8.77E-04
115	KGT13_PGS_15_V_85mm	39	0.12	7.18E-06	1.68E-05	2.23E-04	7.18E-06	1.68E-05	2.23E-04
116	KGT13_PGS_15_V_274mm	404	0.3	1.02E-05	2.38E-05	1.83E-05	1.02E-05	2.38E-05	1.83E-05
117	KGT13_PGS_16_V_2mm	0.02	0.04	2.20E-06	5.14E-06	7.34E-03	2.20E-06	5.14E-06	7.34E-03
118	KGT13_PGS_16_V_6mm	0.2	0.04	1.32E-06	3.08E-06	3.16E-03	1.32E-06	3.08E-06	3.16E-03
119	KGT13_PGS_16_V_22mm	2.6	0.12	2.90E-06	6.77E-06	1.48E-03	2.90E-06	6.77E-06	1.48E-03
120	KGT13_PGS_16_V_85mm	39	0.12	1.23E-05	2.88E-05	3.83E-04	1.23E-05	2.88E-05	3.83E-04
121	KGT13_PGS_16_V_150mm	121	0.3	7.58E-07	1.77E-06	5.83E-06	7.58E-07	1.77E-06	5.83E-06
122	KGT13_PGS_17_V_2mm	0.02	0.04	1.16E-06	2.72E-06	3.88E-03	1.16E-06	2.72E-06	3.88E-03
123	KGT13_PGS_17_V_6mm	0.2	0.04	7.51E-07	1.75E-06	1.79E-03	7.51E-07	1.75E-06	1.79E-03
124	KGT13_PGS_17_V_22mm	2.6	0.12	1.97E-06	4.60E-06	1.00E-03	1.97E-06	4.60E-06	1.00E-03
125	KGT13_PGS_17_V_85mm	39	0.12	5.12E-06	1.19E-05	1.59E-04	5.12E-06	1.19E-05	1.59E-04
126	KGT13_PGS_17_V_274mm	404	0.3	1.25E-05	2.93E-05	2.25E-05	1.25E-05	2.93E-05	2.25E-05
127	KGT01_MGS_01_V_2mm	0.02	0.04	4.14E-06	9.66E-06	1.38E-02	4.14E-06	9.66E-06	1.38E-02
128	KGT01_MGS_01_V_6mm	0.2	0.04	2.47E-06	5.76E-06	5.90E-03	2.47E-06	5.76E-06	5.90E-03
129	KGT01_MGS_01_V_22mm	2.6	0.12	5.63E-06	1.31E-05	2.87E-03	5.63E-06	1.31E-05	2.87E-03
130	KGT01_MGS_01_V_85mm	39	0.12	1.61E-05	3.75E-05	4.98E-04	1.61E-05	3.75E-05	4.98E-04
131	KGT01_MGS_01_V_245mm	323	0.3	2.38E-05	5.56E-05	4.28E-05	2.38E-05	5.56E-05	4.28E-05
132	KGT01_MGS_03_V_2mm	0.04	0.04	2.13E-06	4.98E-06	7.11E-03	2.13E-06	4.98E-06	7.11E-03
133	KGT01_MGS_03_V_6mm	0.3	0.04	1.55E-06	3.62E-06	3.07E-03	1.55E-06	3.62E-06	3.07E-03
134	KGT01_MGS_03_V_22mm	4.4	0.12	4.84E-06	1.13E-05	1.45E-03	4.84E-06	1.13E-05	1.45E-03
135	KGT01_MGS_03_V_85mm	66	0.3	1.81E-05	4.23E-05	3.08E-04	1.81E-05	4.23E-05	3.08E-04
136	KGT01_MGS_03_V_173mm	272	0.3	5.22E-06	1.22E-05	9.37E-06	5.22E-06	1.22E-05	9.37E-06
137	KGT01_MGS_07_V_2mm	0.04	0.04	1.63E-06	3.79E-06	5.41E-03	1.63E-06	3.79E-06	5.41E-03
138	KGT01_MGS_07_V_6mm	0.3	0.04	1.16E-06	2.71E-06	2.31E-03	1.16E-06	2.71E-06	2.31E-03
139	KGT01_MGS_07_V_22mm	4.4	0.12	3.46E-06	8.07E-06	1.04E-03	3.46E-06	8.07E-06	1.04E-03
140	KGT01_MGS_07_V_85mm	66	0.3	1.53E-05	3.56E-05	2.60E-04	1.53E-05	3.56E-05	2.60E-04
141	KGT01_MGS_07_V_173mm	272	0.3	2.17E-06	5.07E-06	3.90E-06	2.17E-06	5.07E-06	3.90E-06
142	KGT11_MGS_05_V_2mm	0.04	0.04	6.49E-07	1.52E-06	2.16E-03	6.49E-07	1.52E-06	2.16E-03
143	KGT11_MGS_05_V_6mm	0.3	0.04	5.41E-07	1.26E-06	1.07E-03	5.41E-07	1.26E-06	1.07E-03
144	KGT11_MGS_05_V_22mm	4.4	0.12	2.10E-06	4.90E-06	6.31E-04	2.10E-06	4.90E-06	6.31E-04
145	KGT11_MGS_05_V_85mm	66	0.3	7.26E-06	1.69E-05	1.23E-04	7.26E-06	1.69E-05	1.23E-04
146	KGT11_MGS_05_V_229mm	476	0.3	1.37E-05	3.19E-05	2.45E-05	1.37E-05	3.19E-05	2.45E-05
147	KGT11_MGS_08_V_2mm	0.04	0.04	8.28E-07	1.93E-06	2.76E-03	8.28E-07	1.93E-06	2.76E-03
148	KGT11_MGS_08_V_6mm	0.3	0.04	6.03E-07	1.41E-06	1.20E-03	6.03E-07	1.41E-06	1.20E-03
149	KGT11_MGS_08_V_22mm	4.4	0.12	1.88E-06	4.39E-06	5.64E-04	1.88E-06	4.39E-06	5.64E-04

Line No.	Release Scenario	Release Rate (kg/s)	Explosion Probability	Base Case/ Sensitivity Case 1			Sensitivity 2 (Future Operation)		
				Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1	Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1
150	KGT11_MGS_08_V_50mm	23	0.12	2.65E-06	6.18E-06	1.47E-04	2.65E-06	6.18E-06	1.47E-04
151	KGT11_MGS_09_V_2mm	0.04	0.04	2.45E-06	5.71E-06	8.15E-03	2.45E-06	5.71E-06	8.15E-03
152	KGT11_MGS_09_V_6mm	0.3	0.04	1.80E-06	4.19E-06	3.57E-03	1.80E-06	4.19E-06	3.57E-03
153	KGT11_MGS_09_V_22mm	4.4	0.12	6.17E-06	1.44E-05	1.85E-03	6.17E-06	1.44E-05	1.85E-03
154	KGT11_MGS_09_V_85mm	66	0.3	1.42E-05	3.32E-05	2.41E-04	1.42E-05	3.32E-05	2.41E-04
155	KGT11_MGS_09_V_229mm	476	0.3	1.14E-05	2.67E-05	2.05E-05	1.14E-05	2.67E-05	2.05E-05
156	KGT01_PIG_01_V_2mm	0.02	0.04	2.86E-10	6.67E-10	9.51E-07	2.86E-10	6.67E-10	9.51E-07
157	KGT01_PIG_01_V_6mm	0.2	0.04	2.12E-10	4.95E-10	4.85E-07	2.12E-10	4.95E-10	4.85E-07
158	KGT01_PIG_01_V_22mm	2.9	0.12	5.95E-10	1.39E-09	2.68E-07	5.95E-10	1.39E-09	2.68E-07
159	KGT01_PIG_01_V_85mm	44	0.12	2.15E-09	5.01E-09	5.80E-08	2.15E-09	5.01E-09	5.80E-08
160	KGT01_PIG_01_V_274mm	456	0.3	5.68E-09	1.32E-08	1.02E-08	5.68E-09	1.32E-08	1.02E-08
161	KGT13_PIG_02_V_2mm	0.02	0.04	2.64E-10	6.16E-10	8.79E-07	2.64E-10	6.16E-10	8.79E-07
162	KGT13_PIG_02_V_6mm	0.2	0.04	1.90E-10	4.44E-10	4.55E-07	1.90E-10	4.44E-10	4.55E-07
163	KGT13_PIG_02_V_22mm	2.6	0.12	4.94E-10	1.15E-09	2.51E-07	4.94E-10	1.15E-09	2.51E-07
164	KGT13_PIG_02_V_85mm	39	0.12	1.90E-09	4.43E-09	5.89E-08	1.90E-09	4.43E-09	5.89E-08
165	KGT13_PIG_02_V_274mm	404	0.3	5.68E-09	1.32E-08	1.02E-08	5.68E-09	1.32E-08	1.02E-08
166	KGT11_PIG_03_V_2mm	0.04	0.04	2.63E-10	6.13E-10	8.75E-07	2.63E-10	6.13E-10	8.75E-07
167	KGT11_PIG_03_V_6mm	0.3	0.04	2.28E-10	5.32E-10	4.52E-07	2.28E-10	5.32E-10	4.52E-07
168	KGT11_PIG_03_V_22mm	4.4	0.12	8.30E-10	1.94E-09	2.49E-07	8.30E-10	1.94E-09	2.49E-07
169	KGT11_PIG_03_V_85mm	66	0.3	3.06E-09	7.15E-09	5.20E-08	3.06E-09	7.15E-09	5.20E-08
170	KGT11_PIG_03_V_173mm	272	0.3	5.68E-09	1.32E-08	1.02E-08	5.68E-09	1.32E-08	1.02E-08
171	KGT11_PIG_04_V_2mm	0.04	0.04	2.63E-10	6.13E-10	8.75E-07	2.63E-10	6.13E-10	8.75E-07
172	KGT11_PIG_04_V_6mm	0.3	0.04	2.28E-10	5.32E-10	4.52E-07	2.28E-10	5.32E-10	4.52E-07
173	KGT11_PIG_04_V_22mm	4.4	0.12	8.30E-10	1.94E-09	2.49E-07	8.30E-10	1.94E-09	2.49E-07
174	KGT11_PIG_04_V_85mm	66	0.3	3.06E-09	7.15E-09	5.20E-08	3.06E-09	7.15E-09	5.20E-08
175	KGT11_PIG_04_V_173mm	272	0.3	5.68E-09	1.32E-08	1.02E-08	5.68E-09	1.32E-08	1.02E-08
176	KGT01_MPG_21_V_2mm	0.003	0.04	1.62E-06	3.78E-06	5.39E-03	1.62E-06	3.78E-06	5.39E-03
177	KGT01_MPG_21_V_6mm	0.03	0.04	6.83E-07	1.59E-06	2.27E-03	6.83E-07	1.59E-06	2.27E-03
178	KGT01_MPG_21_V_22mm	0.4	0.04	5.96E-07	1.39E-06	1.08E-03	5.96E-07	1.39E-06	1.08E-03
179	KGT01_MPG_21_V_71mm	4.4	0.12	7.45E-07	1.74E-06	2.25E-04	7.45E-07	1.74E-06	2.25E-04
180	KGT01_MPG_22_L_2mm	0.04	0.04	4.97E-07	1.16E-06	1.65E-03	4.97E-07	1.16E-06	1.65E-03
181	KGT01_MPG_22_L_6mm	0.4	0.04	3.46E-07	8.08E-07	6.52E-04	3.46E-07	8.08E-07	6.52E-04
182	KGT01_MPG_22_L_22mm	5.1	0.12	7.59E-07	1.77E-06	2.55E-04	7.59E-07	1.77E-06	2.55E-04
183	KGT01_MPG_22_L_50mm	26	0.12	9.81E-07	2.29E-06	8.06E-05	9.81E-07	2.29E-06	8.06E-05
184	KGT01_MPG_23_L_2mm	0.1	0.04	4.40E-07	1.03E-06	1.22E-03	4.40E-07	1.03E-06	1.22E-03
185	KGT01_MPG_23_L_6mm	1.1	0.12	4.51E-07	1.05E-06	5.35E-04	4.51E-07	1.05E-06	5.35E-04
186	KGT01_MPG_23_L_22mm	15	0.12	1.89E-06	4.40E-06	2.47E-04	1.89E-06	4.40E-06	2.47E-04
187	KGT01_MPG_23_L_50mm	79	0.3	2.46E-06	5.75E-06	7.48E-05	2.46E-06	5.75E-06	7.48E-05
188	KGT01_FGA_01_V_2mm	0.02	0.04	1.57E-06	3.67E-06	5.24E-03	1.57E-06	3.67E-06	5.24E-03
189	KGT01_FGA_01_V_6mm	0.2	0.04	1.00E-06	2.34E-06	2.40E-03	1.00E-06	2.34E-06	2.40E-03
190	KGT01_FGA_01_V_22mm	2.6	0.12	2.61E-06	6.10E-06	1.33E-03	2.61E-06	6.10E-06	1.33E-03
191	KGT01_FGA_01_V_85mm	39	0.12	1.01E-05	2.36E-05	3.14E-04	1.01E-05	2.36E-05	3.14E-04
192	KGT01_FGA_01_V_150mm	121	0.3	1.30E-06	3.04E-06	1.00E-05	1.30E-06	3.04E-06	1.00E-05
193	KGT01_FGA_02_V_2mm	0.02	0.04	4.53E-06	1.06E-05	1.51E-02	4.53E-06	1.06E-05	1.51E-02
194	KGT01_FGA_02_V_6mm	0.2	0.04	2.65E-06	6.19E-06	6.35E-03	2.65E-06	6.19E-06	6.35E-03
195	KGT01_FGA_02_V_22mm	2.6	0.12	6.09E-06	1.42E-05	3.10E-03	6.09E-06	1.42E-05	3.10E-03
196	KGT01_FGA_02_V_85mm	39	0.12	1.31E-05	3.06E-05	4.06E-04	1.31E-05	3.06E-05	4.06E-04
197	KGT01_FGA_02_V_150mm	121	0.3	3.19E-06	7.45E-06	2.46E-05	3.19E-06	7.45E-06	2.46E-05
198	KGT01_PGS_19_V_2mm	0.02	0.04	2.25E-06	5.25E-06	7.49E-03	2.25E-06	5.25E-06	7.49E-03
199	KGT01_PGS_19_V_6mm	0.2	0.04	1.22E-06	2.84E-06	2.91E-03	1.22E-06	2.84E-06	2.91E-03

Line No.	Release Scenario	Release Rate (kg/s)	Explosion Probability	Base Case/ Sensitivity Case 1			Sensitivity 2 (Future Operation)		
				Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1	Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1
200	KGT01_PGS_19_V_22mm	2.6	0.12	2.24E-06	5.23E-06	1.14E-03	2.24E-06	5.23E-06	1.14E-03
201	KGT01_PGS_19_V_50mm	13	0.12	2.81E-06	6.56E-06	2.69E-04	2.81E-06	6.56E-06	2.69E-04
202	KGT01_PGS_21_V_2mm	0.02	0.04	3.62E-06	8.45E-06	1.21E-02	3.62E-06	8.45E-06	1.21E-02
203	KGT01_PGS_21_V_6mm	0.2	0.04	1.91E-06	4.47E-06	4.58E-03	1.91E-06	4.47E-06	4.58E-03
204	KGT01_PGS_21_V_22mm	2.6	0.12	3.38E-06	7.89E-06	1.72E-03	3.38E-06	7.89E-06	1.72E-03
205	KGT01_PGS_21_V_71mm	27	0.12	8.27E-06	1.93E-05	3.79E-04	8.27E-06	1.93E-05	3.79E-04
206	KGT01_PGS_22_V_2mm	0.02	0.04	0.00E+00	0.00E+00	0.00E+00	1.46E-06	3.41E-06	4.86E-03
207	KGT01_PGS_22_V_6mm	0.2	0.04	0.00E+00	0.00E+00	0.00E+00	8.81E-07	2.06E-06	2.11E-03
208	KGT01_PGS_22_V_22mm	2.6	0.12	0.00E+00	0.00E+00	0.00E+00	2.05E-06	4.79E-06	1.04E-03
209	KGT01_PGS_22_V_85mm	39	0.12	0.00E+00	0.00E+00	0.00E+00	5.15E-06	1.20E-05	1.60E-04
210	KGT01_PGS_22_V_150mm	121	0.3	0.00E+00	0.00E+00	0.00E+00	2.22E-06	5.19E-06	1.71E-05
211	KGT01_MPG_07_L_2mm	0.1	0.04	5.60E-07	1.31E-06	1.83E-03	5.60E-07	1.31E-06	1.83E-03
212	KGT01_MPG_07_L_6mm	0.7	0.04	5.71E-07	1.33E-06	8.52E-04	5.71E-07	1.33E-06	8.52E-04
213	KGT01_MPG_07_L_22mm	10	0.12	2.39E-06	5.57E-06	4.62E-04	2.39E-06	5.57E-06	4.62E-04
214	KGT01_MPG_07_L_71mm	101	0.3	5.89E-06	1.37E-05	1.42E-04	5.89E-06	1.37E-05	1.42E-04
215	KGT01_DET_01_V_2mm	0.02	0.04	7.52E-07	1.75E-06	2.50E-03	7.52E-07	1.75E-06	2.50E-03
216	KGT01_DET_01_V_6mm	0.1	0.04	4.36E-07	1.02E-06	1.16E-03	4.36E-07	1.02E-06	1.16E-03
217	KGT01_DET_01_V_22mm	1.9	0.12	9.09E-07	2.12E-06	6.30E-04	9.09E-07	2.12E-06	6.30E-04
218	KGT01_DET_01_V_71mm	20	0.12	3.20E-06	7.48E-06	2.04E-04	3.20E-06	7.48E-06	2.04E-04
219	KGT01_PGS_04_V_2mm	0.02	0.04	5.82E-07	1.36E-06	1.94E-03	5.82E-07	1.36E-06	1.94E-03
220	KGT01_PGS_04_V_6mm	0.1	0.04	3.32E-07	7.74E-07	8.85E-04	3.32E-07	7.74E-07	8.85E-04
221	KGT01_PGS_04_V_22mm	1.9	0.12	6.78E-07	1.58E-06	4.70E-04	6.78E-07	1.58E-06	4.70E-04
222	KGT01_PGS_04_V_63mm	16	0.12	1.51E-06	3.53E-06	1.24E-04	1.51E-06	3.53E-06	1.24E-04
223	KGT01_PGS_05_V_2mm	0.02	0.04	3.12E-06	7.29E-06	1.04E-02	3.12E-06	7.29E-06	1.04E-02
224	KGT01_PGS_05_V_6mm	0.1	0.04	1.73E-06	4.03E-06	4.61E-03	1.73E-06	4.03E-06	4.61E-03
225	KGT01_PGS_05_V_22mm	1.9	0.12	3.09E-06	7.21E-06	2.14E-03	3.09E-06	7.21E-06	2.14E-03
226	KGT01_PGS_05_V_85mm	29	0.12	1.51E-05	3.52E-05	6.54E-04	1.51E-05	3.52E-05	6.54E-04
227	KGT01_PGS_05_V_173mm	118	0.3	7.74E-07	1.81E-06	6.14E-06	7.74E-07	1.81E-06	6.14E-06
228	KGT01_DEX_01_L_2mm	0.1	0.04	1.74E-06	4.07E-06	5.37E-03	1.74E-06	4.07E-06	5.37E-03
229	KGT01_DEX_01_L_6mm	0.9	0.04	1.24E-06	2.90E-06	1.74E-03	1.24E-06	2.90E-06	1.74E-03
230	KGT01_DEX_01_L_22mm	0.9	0.04	4.62E-07	1.08E-06	6.45E-04	4.62E-07	1.08E-06	6.45E-04
231	KGT01_DEX_01_L_63mm	0.9	0.04	1.05E-07	2.44E-07	1.46E-04	1.05E-07	2.44E-07	1.46E-04
232	KGT01_DEB_01_L_2mm	0.1	0.04	9.52E-07	2.22E-06	2.93E-03	9.52E-07	2.22E-06	2.93E-03
233	KGT01_DEB_01_L_6mm	0.9	0.04	9.36E-07	2.18E-06	1.31E-03	9.36E-07	2.18E-06	1.31E-03
234	KGT01_DEB_01_L_22mm	12	0.12	4.02E-06	9.38E-06	6.72E-04	4.02E-06	9.38E-06	6.72E-04
235	KGT01_DEB_01_L_85mm	172	0.3	6.37E-06	1.49E-05	1.42E-04	6.37E-06	1.49E-05	1.42E-04
236	KGT01_DEB_01_L_150mm	537	0.3	1.37E-07	3.20E-07	3.06E-06	1.37E-07	3.20E-07	3.06E-06
237	KGT01_MPG_09_L_2mm	0.1	0.04	8.30E-07	1.94E-06	2.55E-03	8.30E-07	1.94E-06	2.55E-03
238	KGT01_MPG_09_L_6mm	0.9	0.04	8.05E-07	1.88E-06	1.13E-03	8.05E-07	1.88E-06	1.13E-03
239	KGT01_MPG_09_L_22mm	12	0.12	3.63E-06	8.47E-06	6.07E-04	3.63E-06	8.47E-06	6.07E-04
240	KGT01_MPG_09_L_85mm	172	0.3	3.47E-06	8.09E-06	7.73E-05	3.47E-06	8.09E-06	7.73E-05
241	KGT01_MPG_09_L_150mm	537	0.3	3.79E-07	8.84E-07	8.45E-06	3.79E-07	8.84E-07	8.45E-06
242	KGT01_MPG_10_V_2mm	0.03	0.04	4.01E-07	9.35E-07	1.33E-03	4.01E-07	9.35E-07	1.33E-03
243	KGT01_MPG_10_V_6mm	0.2	0.04	2.71E-07	6.32E-07	5.94E-04	2.71E-07	6.32E-07	5.94E-04
244	KGT01_MPG_10_V_22mm	3.3	0.12	7.60E-07	1.77E-06	3.03E-04	7.60E-07	1.77E-06	3.03E-04
245	KGT01_MPG_10_V_71mm	35	0.12	1.94E-06	4.53E-06	6.86E-05	1.94E-06	4.53E-06	6.86E-05
246	KGT01_MPG_13_L_2mm	0.1	0.04	0.00E+00	0.00E+00	0.00E+00	2.59E-07	6.04E-07	8.46E-04
247	KGT01_MPG_13_L_6mm	0.7	0.04	0.00E+00	0.00E+00	0.00E+00	2.43E-07	5.67E-07	3.62E-04
248	KGT01_MPG_13_L_22mm	10	0.12	0.00E+00	0.00E+00	0.00E+00	9.13E-07	2.13E-06	1.77E-04
249	KGT01_MPG_13_L_85mm	145	0.3	0.00E+00	0.00E+00	0.00E+00	1.24E-06	2.90E-06	2.77E-05

Line No.	Release Scenario	Release Rate (kg/s)	Explosion Probability	Base Case/ Sensitivity Case 1			Sensitivity 2 (Future Operation)		
				Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1	Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1
250	KGT01_MPG_13_L_150mm	453	0.3	0.00E+00	0.00E+00	0.00E+00	8.09E-08	1.89E-07	1.80E-06
251	KGT01_STT_01_V_2mm	0.02	0.04	0.00E+00	0.00E+00	0.00E+00	1.05E-06	2.44E-06	3.48E-03
252	KGT01_STT_01_V_6mm	0.1	0.04	0.00E+00	0.00E+00	0.00E+00	5.67E-07	1.32E-06	1.51E-03
253	KGT01_STT_01_V_22mm	1.9	0.12	0.00E+00	0.00E+00	0.00E+00	1.15E-06	2.69E-06	8.00E-04
254	KGT01_STT_01_V_63mm	16	0.12	0.00E+00	0.00E+00	0.00E+00	1.31E-06	3.05E-06	1.07E-04
255	KGT01_PGS_10_V_2mm	0.02	0.04	0.00E+00	0.00E+00	0.00E+00	1.04E-06	2.42E-06	3.46E-03
256	KGT01_PGS_10_V_6mm	0.1	0.04	0.00E+00	0.00E+00	0.00E+00	5.70E-07	1.33E-06	1.52E-03
257	KGT01_PGS_10_V_22mm	1.9	0.12	0.00E+00	0.00E+00	0.00E+00	1.12E-06	2.62E-06	7.78E-04
258	KGT01_PGS_10_V_71mm	20	0.12	0.00E+00	0.00E+00	0.00E+00	2.51E-06	5.85E-06	1.59E-04
259	KGT01_PGS_11_V_2mm	0.02	0.04	0.00E+00	0.00E+00	0.00E+00	2.78E-06	6.48E-06	9.25E-03
260	KGT01_PGS_11_V_6mm	0.1	0.04	0.00E+00	0.00E+00	0.00E+00	1.54E-06	3.60E-06	4.12E-03
261	KGT01_PGS_11_V_22mm	1.9	0.12	0.00E+00	0.00E+00	0.00E+00	2.71E-06	6.32E-06	1.88E-03
262	KGT01_PGS_11_V_71mm	20	0.12	0.00E+00	0.00E+00	0.00E+00	1.03E-05	2.40E-05	6.55E-04
263	KGT01_STB_01_L_2mm	0.1	0.04	0.00E+00	0.00E+00	0.00E+00	1.30E-06	3.02E-06	3.99E-03
264	KGT01_STB_01_L_6mm	0.9	0.04	0.00E+00	0.00E+00	0.00E+00	1.24E-06	2.90E-06	1.75E-03
265	KGT01_STB_01_L_22mm	12	0.12	0.00E+00	0.00E+00	0.00E+00	5.38E-06	1.26E-05	8.99E-04
266	KGT01_STB_01_L_85mm	172	0.3	0.00E+00	0.00E+00	0.00E+00	6.16E-06	1.44E-05	1.37E-04
267	KGT01_STB_01_L_150mm	537	0.3	0.00E+00	0.00E+00	0.00E+00	5.62E-08	1.31E-07	1.25E-06
268	KGT01_DPT_11_V_2mm	0.01	0.04	9.19E-07	2.14E-06	3.06E-03	9.19E-07	2.14E-06	3.06E-03
269	KGT01_DPT_11_V_6mm	0.1	0.04	4.29E-07	1.00E-06	1.27E-03	4.29E-07	1.00E-06	1.27E-03
270	KGT01_DPT_11_V_22mm	1.4	0.12	6.55E-07	1.53E-06	6.10E-04	6.55E-07	1.53E-06	6.10E-04
271	KGT01_DPT_11_V_85mm	21	0.12	2.00E-06	4.68E-06	1.19E-04	2.00E-06	4.68E-06	1.19E-04
272	KGT01_DPT_11_V_150mm	66	0.3	3.29E-07	7.69E-07	5.53E-06	3.29E-07	7.69E-07	5.53E-06
273	KGT01_DPX_11_L_2mm	0.1	0.04	1.38E-06	3.22E-06	4.59E-03	1.38E-06	3.22E-06	4.59E-03
274	KGT01_DPX_11_L_6mm	0.7	0.04	9.55E-07	2.23E-06	1.47E-03	9.55E-07	2.23E-06	1.47E-03
275	KGT01_DPX_11_L_22mm	3.8	0.12	1.37E-06	3.19E-06	5.86E-04	1.37E-06	3.19E-06	5.86E-04
276	KGT01_DPX_11_L_71mm	3.8	0.12	2.13E-07	4.96E-07	9.11E-05	2.13E-07	4.96E-07	9.11E-05
277	KGT01_PC3_02_L_2mm	0.1	0.04	8.93E-07	2.08E-06	2.98E-03	8.93E-07	2.08E-06	2.98E-03
278	KGT01_PC3_02_L_6mm	0.7	0.04	8.65E-07	2.02E-06	1.33E-03	8.65E-07	2.02E-06	1.33E-03
279	KGT01_PC3_02_L_22mm	3.8	0.12	1.56E-06	3.64E-06	6.69E-04	1.56E-06	3.64E-06	6.69E-04
280	KGT01_PC3_02_L_50mm	3.8	0.12	4.31E-07	1.00E-06	1.84E-04	4.31E-07	1.00E-06	1.84E-04
281	KGT01_DPB_11_L_2mm	0.1	0.04	1.23E-06	2.86E-06	4.09E-03	1.23E-06	2.86E-06	4.09E-03
282	KGT01_DPB_11_L_6mm	0.7	0.04	1.19E-06	2.79E-06	1.83E-03	1.19E-06	2.79E-06	1.83E-03
283	KGT01_DPB_11_L_22mm	9.0	0.12	4.51E-06	1.05E-05	9.32E-04	4.51E-06	1.05E-05	9.32E-04
284	KGT01_DPB_11_L_85mm	135	0.3	9.20E-06	2.15E-05	2.05E-04	9.20E-06	2.15E-05	2.05E-04
285	KGT01_DPB_11_L_150mm	420	0.3	2.64E-07	6.15E-07	5.88E-06	2.64E-07	6.15E-07	5.88E-06
286	KGT01_DPT_01_V_2mm	0.01	0.04	0.00E+00	0.00E+00	0.00E+00	1.58E-06	3.68E-06	5.26E-03
287	KGT01_DPT_01_V_6mm	0.1	0.04	0.00E+00	0.00E+00	0.00E+00	7.39E-07	1.73E-06	2.19E-03
288	KGT01_DPT_01_V_22mm	1.4	0.12	0.00E+00	0.00E+00	0.00E+00	1.19E-06	2.77E-06	1.11E-03
289	KGT01_DPT_01_V_85mm	21	0.12	0.00E+00	0.00E+00	0.00E+00	2.09E-06	4.88E-06	1.24E-04
290	KGT01_DPT_01_V_150mm	66	0.3	0.00E+00	0.00E+00	0.00E+00	3.29E-07	7.69E-07	5.53E-06
291	KGT01_DPX_01_L_2mm	0.1	0.04	0.00E+00	0.00E+00	0.00E+00	1.43E-06	3.33E-06	4.75E-03
292	KGT01_DPX_01_L_6mm	0.7	0.04	0.00E+00	0.00E+00	0.00E+00	9.97E-07	2.33E-06	1.54E-03
293	KGT01_DPX_01_L_22mm	4.5	0.12	0.00E+00	0.00E+00	0.00E+00	1.66E-06	3.88E-06	6.17E-04
294	KGT01_DPX_01_L_71mm	4.5	0.12	0.00E+00	0.00E+00	0.00E+00	2.39E-07	5.58E-07	8.85E-05
295	KGT01_PC3_01_L_2mm	0.1	0.04	0.00E+00	0.00E+00	0.00E+00	7.25E-07	1.69E-06	2.41E-03
296	KGT01_PC3_01_L_6mm	0.7	0.04	0.00E+00	0.00E+00	0.00E+00	7.06E-07	1.65E-06	1.09E-03
297	KGT01_PC3_01_L_22mm	4.5	0.12	0.00E+00	0.00E+00	0.00E+00	1.46E-06	3.40E-06	5.40E-04
298	KGT01_PC3_01_L_50mm	4.5	0.12	0.00E+00	0.00E+00	0.00E+00	4.51E-07	1.05E-06	1.67E-04
299	KGT01_DPB_01_L_2mm	0.1	0.04	0.00E+00	0.00E+00	0.00E+00	1.26E-06	2.93E-06	4.18E-03

Line No.	Release Scenario	Release Rate (kg/s)	Explosion Probability	Base Case/ Sensitivity Case 1			Sensitivity 2 (Future Operation)		
				Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1	Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1
300	KGT01_DPB_01_L_6mm	0.7	0.04	0.00E+00	0.00E+00	0.00E+00	1.21E-06	2.82E-06	1.85E-03
301	KGT01_DPB_01_L_22mm	9.0	0.12	0.00E+00	0.00E+00	0.00E+00	4.56E-06	1.06E-05	9.42E-04
302	KGT01_DPB_01_L_85mm	135	0.3	0.00E+00	0.00E+00	0.00E+00	8.07E-06	1.88E-05	1.80E-04
303	KGT01_DPB_01_L_150mm	420	0.3	0.00E+00	0.00E+00	0.00E+00	1.65E-07	3.84E-07	3.67E-06
304	KGT01_DBT_11_V_2mm	0.01	0.04	1.07E-06	2.49E-06	3.56E-03	1.07E-06	2.49E-06	3.56E-03
305	KGT01_DBT_11_V_6mm	0.1	0.04	4.57E-07	1.07E-06	1.52E-03	4.57E-07	1.07E-06	1.52E-03
306	KGT01_DBT_11_V_22mm	0.8	0.04	5.24E-07	1.22E-06	7.56E-04	5.24E-07	1.22E-06	7.56E-04
307	KGT01_DBT_11_V_85mm	12	0.12	1.63E-06	3.79E-06	1.77E-04	1.63E-06	3.79E-06	1.77E-04
308	KGT01_DBT_11_V_150mm	37	0.12	2.17E-07	5.06E-07	7.11E-06	2.17E-07	5.06E-07	7.11E-06
309	KGT01_DBX_11_L_2mm	0.1	0.04	2.18E-06	5.10E-06	7.27E-03	2.18E-06	5.10E-06	7.27E-03
310	KGT01_DBX_11_L_6mm	0.5	0.04	1.50E-06	3.51E-06	2.56E-03	1.50E-06	3.51E-06	2.56E-03
311	KGT01_DBX_11_L_22mm	3.1	0.12	2.11E-06	4.91E-06	1.06E-03	2.11E-06	4.91E-06	1.06E-03
312	KGT01_DBX_11_L_63mm	3.1	0.12	3.83E-07	8.95E-07	1.94E-04	3.83E-07	8.95E-07	1.94E-04
313	KGT01_NGL_01_L_2mm	0.1	0.04	1.23E-06	2.88E-06	4.10E-03	1.23E-06	2.88E-06	4.10E-03
314	KGT01_NGL_01_L_6mm	0.5	0.04	1.06E-06	2.48E-06	1.81E-03	1.06E-06	2.48E-06	1.81E-03
315	KGT01_NGL_01_L_22mm	6.7	0.12	3.47E-06	8.09E-06	9.25E-04	3.47E-06	8.09E-06	9.25E-04
316	KGT01_NGL_01_L_85mm	100	0.3	7.12E-06	1.66E-05	1.74E-04	7.12E-06	1.66E-05	1.74E-04
317	KGT01_NGL_01_L_150mm	311	0.3	1.57E-07	3.67E-07	3.51E-06	1.57E-07	3.67E-07	3.51E-06
318	KGT01_NGL_02_L_2mm	0.1	0.04	1.79E-06	4.17E-06	5.96E-03	1.79E-06	4.17E-06	5.96E-03
319	KGT01_NGL_02_L_6mm	0.5	0.04	1.47E-06	3.43E-06	2.44E-03	1.47E-06	3.43E-06	2.44E-03
320	KGT01_NGL_02_L_22mm	7.2	0.12	4.39E-06	1.02E-05	1.10E-03	4.39E-06	1.02E-05	1.10E-03
321	KGT01_NGL_02_L_85mm	108	0.3	9.51E-06	2.22E-05	2.17E-04	9.51E-06	2.22E-05	2.17E-04
322	KGT01_NGL_02_L_150mm	335	0.3	8.61E-08	2.01E-07	1.92E-06	8.61E-08	2.01E-07	1.92E-06
323	KGT01_DBT_01_V_2mm	0.01	0.04	0.00E+00	0.00E+00	0.00E+00	1.17E-06	2.72E-06	3.88E-03
324	KGT01_DBT_01_V_6mm	0.1	0.04	0.00E+00	0.00E+00	0.00E+00	4.86E-07	1.13E-06	1.62E-03
325	KGT01_DBT_01_V_22mm	0.8	0.04	0.00E+00	0.00E+00	0.00E+00	5.53E-07	1.29E-06	7.99E-04
326	KGT01_DBT_01_V_71mm	8.3	0.12	0.00E+00	0.00E+00	0.00E+00	8.49E-07	1.98E-06	1.34E-04
327	KGT01_DBX_01_L_2mm	0.1	0.04	0.00E+00	0.00E+00	0.00E+00	1.56E-06	3.64E-06	5.20E-03
328	KGT01_DBX_01_L_6mm	0.5	0.04	0.00E+00	0.00E+00	0.00E+00	1.02E-06	2.38E-06	1.73E-03
329	KGT01_DBX_01_L_22mm	3.1	0.12	0.00E+00	0.00E+00	0.00E+00	1.42E-06	3.32E-06	7.19E-04
330	KGT01_DBX_01_L_63mm	3.1	0.12	0.00E+00	0.00E+00	0.00E+00	2.25E-07	5.25E-07	1.14E-04
331	KGT01_DBB_01_L_2mm	0.1	0.04	0.00E+00	0.00E+00	0.00E+00	7.84E-07	1.83E-06	2.61E-03
332	KGT01_DBB_01_L_6mm	0.5	0.04	0.00E+00	0.00E+00	0.00E+00	6.86E-07	1.60E-06	1.17E-03
333	KGT01_DBB_01_L_22mm	6.7	0.12	0.00E+00	0.00E+00	0.00E+00	2.23E-06	5.21E-06	5.96E-04
334	KGT01_DBB_01_L_85mm	100	0.3	0.00E+00	0.00E+00	0.00E+00	5.48E-06	1.28E-05	1.34E-04
335	KGT01_DBB_01_L_150mm	311	0.3	0.00E+00	0.00E+00	0.00E+00	5.62E-08	1.31E-07	1.25E-06
336	KGT01_PC4_12_L_2mm	0.1	0.04	0.00E+00	0.00E+00	0.00E+00	7.43E-07	1.73E-06	2.47E-03
337	KGT01_PC4_12_L_6mm	0.5	0.04	0.00E+00	0.00E+00	0.00E+00	6.57E-07	1.53E-06	1.12E-03
338	KGT01_PC4_12_L_22mm	6.7	0.12	0.00E+00	0.00E+00	0.00E+00	2.11E-06	4.93E-06	5.59E-04
339	KGT01_PC4_12_L_63mm	55	0.3	0.00E+00	0.00E+00	0.00E+00	4.50E-06	1.05E-05	1.91E-04
340	KGT01_PC3_13_L_2mm	0.1	0.04	0.00E+00	0.00E+00	0.00E+00	4.42E-07	1.03E-06	1.47E-03
341	KGT01_PC3_13_L_6mm	0.7	0.04	0.00E+00	0.00E+00	0.00E+00	4.10E-07	9.58E-07	6.33E-04
342	KGT01_PC3_13_L_22mm	8.9	0.12	0.00E+00	0.00E+00	0.00E+00	1.39E-06	3.25E-06	2.91E-04
343	KGT01_PC3_13_L_50mm	46	0.12	0.00E+00	0.00E+00	0.00E+00	1.47E-06	3.43E-06	7.36E-05
344	KGT01_LPG_04_L_2mm	0.1	0.04	0.00E+00	0.00E+00	0.00E+00	9.03E-07	2.11E-06	3.01E-03
345	KGT01_LPG_04_L_6mm	0.6	0.04	0.00E+00	0.00E+00	0.00E+00	8.09E-07	1.89E-06	1.30E-03
346	KGT01_LPG_04_L_22mm	7.9	0.12	0.00E+00	0.00E+00	0.00E+00	2.78E-06	6.50E-06	6.43E-04
347	KGT01_LPG_04_L_50mm	41	0.12	0.00E+00	0.00E+00	0.00E+00	2.19E-06	5.11E-06	1.22E-04
348	KGT32_NGL_05_L_2mm	0.1	0.04	2.05E-07	4.78E-07	6.82E-04	2.05E-07	4.78E-07	6.82E-04
349	KGT32_NGL_05_L_6mm	0.5	0.04	1.79E-07	4.18E-07	2.98E-04	1.79E-07	4.18E-07	2.98E-04

Line No.	Release Scenario	Release Rate (kg/s)	Explosion Probability	Base Case/ Sensitivity Case 1			Sensitivity 2 (Future Operation)		
				Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1	Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1
350	KGT32_NGL_05_L_22mm	7.2	0.12	5.59E-07	1.30E-06	1.40E-04	5.59E-07	1.30E-06	1.40E-04
351	KGT32_NGL_05_L_50mm	37	0.12	6.98E-07	1.63E-06	4.22E-05	6.98E-07	1.63E-06	4.22E-05
352	KGT33_NGL_06_L_2mm	0.1	0.04	4.47E-07	1.04E-06	1.49E-03	4.47E-07	1.04E-06	1.49E-03
353	KGT33_NGL_06_L_6mm	0.5	0.04	3.85E-07	8.99E-07	6.39E-04	3.85E-07	8.99E-07	6.39E-04
354	KGT33_NGL_06_L_22mm	7.2	0.12	1.27E-06	2.97E-06	3.18E-04	1.27E-06	2.97E-06	3.18E-04
355	KGT33_NGL_06_L_71mm	75	0.3	1.58E-06	3.69E-06	5.04E-05	1.58E-06	3.69E-06	5.04E-05
356	KGT34_NGL_07_L_10mm	0.01	0.04	3.00E-08	7.00E-08	9.99E-05	3.00E-08	7.00E-08	9.99E-05
357	KGT34_NGL_07_L_50mm	0.1	0.04	1.60E-09	3.74E-09	4.99E-06	1.60E-09	3.74E-09	4.99E-06
358	KGT34_NGL_07_L_FBR	1000	0.3	2.25E-08	5.25E-08	4.93E-06	2.25E-08	5.25E-08	4.93E-06
359	KGT35_NGL_09_L_2mm	0.04	0.04	1.43E-06	3.34E-06	4.77E-03	1.43E-06	3.34E-06	4.77E-03
360	KGT35_NGL_09_L_6mm	0.3	0.04	7.54E-07	1.76E-06	1.46E-03	7.54E-07	1.76E-06	1.46E-03
361	KGT35_NGL_09_L_22mm	4.7	0.12	1.33E-06	3.11E-06	4.80E-04	1.33E-06	3.11E-06	4.80E-04
362	KGT35_NGL_09_L_71mm	11	0.12	5.33E-07	1.24E-06	9.41E-05	5.33E-07	1.24E-06	9.41E-05
363	KGT36_NGL_10_L_2mm	0.04	0.04	3.73E-07	8.71E-07	1.24E-03	3.73E-07	8.71E-07	1.24E-03
364	KGT36_NGL_10_L_6mm	0.3	0.04	2.90E-07	6.77E-07	5.62E-04	2.90E-07	6.77E-07	5.62E-04
365	KGT36_NGL_10_L_22mm	4.7	0.12	8.16E-07	1.90E-06	2.94E-04	8.16E-07	1.90E-06	2.94E-04
366	KGT36_NGL_10_L_71mm	49	0.12	1.53E-06	3.58E-06	7.26E-05	1.53E-06	3.58E-06	7.26E-05
367	KGT36_NGL_11_L_10mm	1.0	0.04	4.24E-05	9.90E-05	5.71E-02	5.94E-05	1.39E-04	7.98E-02
368	KGT36_NGL_11_L_100mm	97	0.3	2.01E-04	4.69E-04	5.05E-03	2.81E-04	6.56E-04	7.06E-03
369	KGT37_PC3_05_L_2mm	0.1	0.04	3.20E-07	7.47E-07	1.07E-03	3.20E-07	7.47E-07	1.07E-03
370	KGT37_PC3_05_L_6mm	0.7	0.04	3.04E-07	7.08E-07	4.67E-04	3.04E-07	7.08E-07	4.67E-04
371	KGT37_PC3_05_L_22mm	8.9	0.12	1.07E-06	2.50E-06	2.23E-04	1.07E-06	2.50E-06	2.23E-04
372	KGT37_PC3_05_L_63mm	73	0.3	1.61E-06	3.75E-06	5.26E-05	1.61E-06	3.75E-06	5.26E-05
373	KGT39_PC3_07_V_10mm	0.2	0.04	1.94E-09	4.52E-09	4.99E-06	1.94E-09	4.52E-09	4.99E-06
374	KGT39_PC3_07_V_50mm	3.9	0.12	7.36E-10	1.72E-09	2.48E-07	7.36E-10	1.72E-09	2.48E-07
375	KGT39_PC3_07_V_FBR	1000	0.3	4.88E-08	1.14E-07	8.75E-08	4.88E-08	1.14E-07	8.75E-08
376	KGT39_PC3_08_L_10mm	1.3	0.12	4.70E-09	1.10E-08	4.98E-06	4.70E-09	1.10E-08	4.98E-06
377	KGT39_PC3_08_L_50mm	33	0.12	3.52E-09	8.20E-09	2.38E-07	3.52E-09	8.20E-09	2.38E-07
378	KGT39_PC3_08_L_FBR	1000	0.3	9.75E-09	2.28E-08	2.18E-07	9.75E-09	2.28E-08	2.18E-07
379	KGT40_PC3_09_V_10mm	0.2	0.04	1.94E-09	4.52E-09	4.99E-06	1.94E-09	4.52E-09	4.99E-06
380	KGT40_PC3_09_V_50mm	3.9	0.12	7.36E-10	1.72E-09	2.48E-07	7.36E-10	1.72E-09	2.48E-07
381	KGT40_PC3_09_V_FBR	1000	0.3	4.88E-08	1.14E-07	8.75E-08	4.88E-08	1.14E-07	8.75E-08
382	KGT40_PC3_10_L_10mm	1.3	0.12	4.70E-09	1.10E-08	4.98E-06	4.70E-09	1.10E-08	4.98E-06
383	KGT40_PC3_10_L_50mm	33	0.12	3.52E-09	8.20E-09	2.38E-07	3.52E-09	8.20E-09	2.38E-07
384	KGT40_PC3_10_L_FBR	1000	0.3	9.75E-09	2.28E-08	2.18E-07	9.75E-09	2.28E-08	2.18E-07
385	KGT41_PC4_04_L_2mm	0.1	0.04	3.98E-07	9.28E-07	1.32E-03	3.98E-07	9.28E-07	1.32E-03
386	KGT41_PC4_04_L_6mm	0.5	0.04	3.39E-07	7.92E-07	5.77E-04	3.39E-07	7.92E-07	5.77E-04
387	KGT41_PC4_04_L_22mm	6.8	0.12	1.01E-06	2.36E-06	2.67E-04	1.01E-06	2.36E-06	2.67E-04
388	KGT41_PC4_04_L_63mm	56	0.3	1.70E-06	3.97E-06	7.19E-05	1.70E-06	3.97E-06	7.19E-05
389	KGT43_PC4_06_V_10mm	0.1	0.04	1.50E-09	3.50E-09	5.00E-06	1.50E-09	3.50E-09	5.00E-06
390	KGT43_PC4_06_V_50mm	1.5	0.12	2.86E-10	6.66E-10	2.49E-07	2.86E-10	6.66E-10	2.49E-07
391	KGT43_PC4_06_V_FBR	1000	0.3	4.88E-08	1.14E-07	8.75E-08	4.88E-08	1.14E-07	8.75E-08
392	KGT43_PC4_07_L_10mm	0.7	0.04	3.38E-09	7.89E-09	4.99E-06	3.38E-09	7.89E-09	4.99E-06
393	KGT43_PC4_07_L_50mm	19	0.12	2.20E-09	5.13E-09	2.43E-07	2.20E-09	5.13E-09	2.43E-07
394	KGT43_PC4_07_L_FBR	1000	0.3	9.75E-09	2.28E-08	2.18E-07	9.75E-09	2.28E-08	2.18E-07
395	KGT44_PC4_08_V_10mm	0.1	0.04	1.50E-09	3.50E-09	5.00E-06	1.50E-09	3.50E-09	5.00E-06
396	KGT44_PC4_08_V_50mm	1.5	0.12	2.86E-10	6.66E-10	2.49E-07	2.86E-10	6.66E-10	2.49E-07
397	KGT44_PC4_08_V_FBR	1000	0.3	4.88E-08	1.14E-07	8.75E-08	4.88E-08	1.14E-07	8.75E-08
398	KGT44_PC4_09_L_10mm	0.7	0.04	3.38E-09	7.89E-09	4.99E-06	3.38E-09	7.89E-09	4.99E-06
399	KGT44_PC4_09_L_50mm	19	0.12	2.20E-09	5.13E-09	2.43E-07	2.20E-09	5.13E-09	2.43E-07

Line No.	Release Scenario	Release Rate (kg/s)	Explosion Probability	Base Case/ Sensitivity Case 1			Sensitivity 2 (Future Operation)		
				Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1	Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1
400	KGT44_PC4_09_L_FBR	1000	0.3	9.75E-09	2.28E-08	2.18E-07	9.75E-09	2.28E-08	2.18E-07
401	KGT45_PC3_12_L_2mm	0.1	0.04	1.85E-06	4.32E-06	6.16E-03	1.85E-06	4.32E-06	6.16E-03
402	KGT45_PC3_12_L_6mm	0.6	0.04	1.27E-06	2.97E-06	2.08E-03	1.27E-06	2.97E-06	2.08E-03
403	KGT45_PC3_12_L_22mm	7.6	0.12	3.28E-06	7.66E-06	7.88E-04	3.28E-06	7.66E-06	7.88E-04
404	KGT45_PC3_12_L_85mm	12	0.12	9.20E-07	2.15E-06	1.49E-04	9.20E-07	2.15E-06	1.49E-04
405	KGT45_PC3_12_L_173mm	12	0.12	1.29E-07	3.01E-07	2.09E-05	1.29E-07	3.01E-07	2.09E-05
406	KGT46_PC4_11_L_2mm	0.05	0.04	1.66E-06	3.88E-06	5.53E-03	1.66E-06	3.88E-06	5.53E-03
407	KGT46_PC4_11_L_6mm	0.4	0.04	9.96E-07	2.32E-06	1.80E-03	9.96E-07	2.32E-06	1.80E-03
408	KGT46_PC4_11_L_22mm	5.7	0.12	2.12E-06	4.94E-06	6.44E-04	2.12E-06	4.94E-06	6.44E-04
409	KGT46_PC4_11_L_85mm	14	0.12	7.92E-07	1.85E-06	1.14E-04	7.92E-07	1.85E-06	1.14E-04
410	KGT46_PC4_11_L_173mm	14	0.12	1.19E-07	2.79E-07	1.71E-05	1.19E-07	2.79E-07	1.71E-05
411	KGT47_LPG_01_L_2mm	0.1	0.04	2.91E-07	6.79E-07	9.70E-04	2.91E-07	6.79E-07	9.70E-04
412	KGT47_LPG_01_L_6mm	0.5	0.04	2.43E-07	5.67E-07	4.14E-04	2.43E-07	5.67E-07	4.14E-04
413	KGT47_LPG_01_L_22mm	6.7	0.12	7.67E-07	1.79E-06	2.03E-04	7.67E-07	1.79E-06	2.03E-04
414	KGT47_LPG_01_L_71mm	70	0.3	9.45E-07	2.21E-06	3.23E-05	9.45E-07	2.21E-06	3.23E-05
415	KGT47_LPG_02_L_8mm	0.9	0.04	6.27E-07	1.46E-06	8.69E-04	1.29E-06	3.01E-06	1.79E-03
416	KGT47_LPG_02_L_80mm	89	0.3	2.84E-06	6.63E-06	7.76E-05	5.84E-06	1.36E-05	1.60E-04
417	KGT47_LPG_05_L_5mm	0.3	0.04	3.21E-07	7.49E-07	6.23E-04	6.17E-07	1.44E-06	1.20E-03
418	KGT47_LPG_05_L_50mm	35	0.12	9.24E-07	2.16E-06	5.93E-05	1.78E-06	4.15E-06	1.14E-04
419	KGT70_REF_01_V_2mm	0.001	0.04	2.81E-07	6.56E-07	9.36E-04	2.81E-07	6.56E-07	9.36E-04
420	KGT70_REF_01_V_6mm	0.01	0.04	1.24E-07	2.90E-07	4.13E-04	1.24E-07	2.90E-07	4.13E-04
421	KGT70_REF_01_V_22mm	0.2	0.04	8.44E-08	1.97E-07	2.08E-04	8.44E-08	1.97E-07	2.08E-04
422	KGT70_REF_01_V_71mm	1.9	0.12	6.91E-08	1.61E-07	4.92E-05	6.91E-08	1.61E-07	4.92E-05
423	KGT70_REF_02_L_2mm	0.04	0.04	2.91E-07	6.80E-07	9.70E-04	2.91E-07	6.80E-07	9.70E-04
424	KGT70_REF_02_L_6mm	0.4	0.04	2.23E-07	5.21E-07	4.28E-04	2.23E-07	5.21E-07	4.28E-04
425	KGT70_REF_02_L_22mm	4.9	0.12	6.26E-07	1.46E-06	2.19E-04	6.26E-07	1.46E-06	2.19E-04
426	KGT70_REF_02_L_71mm	51	0.3	9.58E-07	2.23E-06	4.40E-05	9.58E-07	2.23E-06	4.40E-05
427	KGT70_REF_03_V_2mm	0.004	0.04	1.14E-06	2.66E-06	3.79E-03	1.14E-06	2.66E-06	3.79E-03
428	KGT70_REF_03_V_6mm	0.03	0.04	4.49E-07	1.05E-06	1.49E-03	4.49E-07	1.05E-06	1.49E-03
429	KGT70_REF_03_V_22mm	0.5	0.04	3.55E-07	8.28E-07	6.22E-04	3.55E-07	8.28E-07	6.22E-04
430	KGT70_REF_03_V_85mm	6.9	0.12	6.87E-07	1.60E-06	1.31E-04	6.87E-07	1.60E-06	1.31E-04
431	KGT70_REF_03_V_150mm	21	0.12	1.01E-07	2.35E-07	5.92E-06	1.01E-07	2.35E-07	5.92E-06
432	KGT70_REF_04_L_2mm	0.04	0.04	6.35E-07	1.48E-06	2.12E-03	6.35E-07	1.48E-06	2.12E-03
433	KGT70_REF_04_L_6mm	0.4	0.04	4.88E-07	1.14E-06	9.35E-04	4.88E-07	1.14E-06	9.35E-04
434	KGT70_REF_04_L_22mm	4.9	0.12	1.32E-06	3.07E-06	4.61E-04	1.32E-06	3.07E-06	4.61E-04
435	KGT70_REF_04_L_85mm	72	0.3	2.91E-06	6.78E-06	9.62E-05	2.91E-06	6.78E-06	9.62E-05
436	KGT70_REF_04_L_173mm	300	0.3	3.74E-07	8.74E-07	8.35E-06	3.74E-07	8.74E-07	8.35E-06
437	KGT70_REF_05_L_2mm	0.02	0.04	5.10E-07	1.19E-06	1.70E-03	5.10E-07	1.19E-06	1.70E-03
438	KGT70_REF_05_L_6mm	0.2	0.04	3.16E-07	7.37E-07	7.65E-04	3.16E-07	7.37E-07	7.65E-04
439	KGT70_REF_05_L_22mm	2.5	0.12	6.30E-07	1.47E-06	3.85E-04	6.30E-07	1.47E-06	3.85E-04
440	KGT70_REF_05_L_85mm	38	0.12	1.65E-06	3.85E-06	9.90E-05	1.65E-06	3.85E-06	9.90E-05
441	KGT70_REF_05_L_150mm	117	0.3	5.62E-08	1.31E-07	1.25E-06	5.62E-08	1.31E-07	1.25E-06
442	KGT70_REF_07_L_2mm	0.02	0.04	4.03E-07	9.39E-07	1.34E-03	4.03E-07	9.39E-07	1.34E-03
443	KGT70_REF_07_L_6mm	0.2	0.04	2.54E-07	5.94E-07	6.16E-04	2.54E-07	5.94E-07	6.16E-04
444	KGT70_REF_07_L_22mm	2.5	0.12	4.96E-07	1.16E-06	3.03E-04	4.96E-07	1.16E-06	3.03E-04
445	KGT70_REF_07_L_85mm	38	0.12	1.66E-06	3.88E-06	9.99E-05	1.66E-06	3.88E-06	9.99E-05
446	KGT70_REF_07_L_150mm	117	0.3	6.96E-08	1.62E-07	1.55E-06	6.96E-08	1.62E-07	1.55E-06
447	KGT70_REF_11_V_2mm	0.001	0.04	1.47E-06	3.44E-06	4.90E-03	1.47E-06	3.44E-06	4.90E-03
448	KGT70_REF_11_V_6mm	0.01	0.04	5.97E-07	1.39E-06	1.99E-03	5.97E-07	1.39E-06	1.99E-03
449	KGT70_REF_11_V_22mm	0.2	0.04	3.66E-07	8.54E-07	9.00E-04	3.66E-07	8.54E-07	9.00E-04

Line No.	Release Scenario	Release Rate (kg/s)	Explosion Probability	Base Case/ Sensitivity Case 1			Sensitivity 2 (Future Operation)		
				Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1	Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1
450	KGT70_REF_11_V_85mm	2.7	0.12	2.98E-07	6.95E-07	1.48E-04	2.98E-07	6.95E-07	1.48E-04
451	KGT70_REF_11_V_212mm	17	0.12	3.91E-07	9.13E-07	3.01E-05	3.91E-07	9.13E-07	3.01E-05
452	KGT70_REF_14_V_2mm	0.004	0.04	5.39E-06	1.26E-05	1.80E-02	5.39E-06	1.26E-05	1.80E-02
453	KGT70_REF_14_V_6mm	0.03	0.04	2.45E-06	5.71E-06	8.15E-03	2.45E-06	5.71E-06	8.15E-03
454	KGT70_REF_14_V_22mm	0.5	0.04	2.19E-06	5.11E-06	3.84E-03	2.19E-06	5.11E-06	3.84E-03
455	KGT70_REF_14_V_85mm	6.9	0.12	4.20E-06	9.81E-06	7.99E-04	4.20E-06	9.81E-06	7.99E-04
456	KGT70_REF_14_V_194mm	36	0.12	6.68E-06	1.56E-05	2.26E-04	6.68E-06	1.56E-05	2.26E-04
457	KGT70_REF_15_L_2mm	0.04	0.04	1.20E-06	2.81E-06	4.00E-03	1.20E-06	2.81E-06	4.00E-03
458	KGT70_REF_15_L_6mm	0.4	0.04	7.90E-07	1.84E-06	1.51E-03	7.90E-07	1.84E-06	1.51E-03
459	KGT70_REF_15_L_22mm	4.9	0.12	1.83E-06	4.26E-06	6.40E-04	1.83E-06	4.26E-06	6.40E-04
460	KGT70_REF_15_L_85mm	72	0.3	2.83E-06	6.60E-06	9.35E-05	2.83E-06	6.60E-06	9.35E-05
461	KGT70_REF_15_L_173mm	300	0.3	4.29E-07	1.00E-06	9.56E-06	4.29E-07	1.00E-06	9.56E-06
462	KGT70_REF_06_L_2mm	0.02	0.04	0.00E+00	0.00E+00	0.00E+00	6.40E-07	1.49E-06	2.13E-03
463	KGT70_REF_06_L_6mm	0.2	0.04	0.00E+00	0.00E+00	0.00E+00	3.90E-07	9.11E-07	9.45E-04
464	KGT70_REF_06_L_22mm	2.5	0.12	0.00E+00	0.00E+00	0.00E+00	7.51E-07	1.75E-06	4.59E-04
465	KGT70_REF_06_L_85mm	38	0.12	0.00E+00	0.00E+00	0.00E+00	1.94E-06	4.53E-06	1.16E-04
466	KGT70_REF_06_L_150mm	117	0.3	0.00E+00	0.00E+00	0.00E+00	2.80E-07	6.53E-07	6.25E-06
467	KGT50_EMC_01_L_2mm	0.02	0.04	1.73E-06	4.04E-06	5.76E-03	1.73E-06	4.04E-06	5.76E-03
468	KGT50_EMC_01_L_6mm	0.02	0.04	5.86E-07	1.37E-06	1.95E-03	5.86E-07	1.37E-06	1.95E-03
469	KGT50_EMC_01_L_12mm	0.02	0.04	2.93E-07	6.84E-07	9.76E-04	2.93E-07	6.84E-07	9.76E-04
470	KGT50_EMC_02_L_5mm	0.2	0.04	4.68E-08	1.09E-07	1.20E-04	4.68E-08	1.09E-07	1.20E-04
471	KGT50_EMC_02_L_10mm	0.6	0.04	1.84E-08	4.30E-08	2.87E-05	1.84E-08	4.30E-08	2.87E-05
472	KGT50_EMC_02_L_FBR	1000	0.3	1.56E-07	3.64E-07	3.48E-06	1.56E-07	3.64E-07	3.48E-06
473	KGT51_BMC_05_L_5mm	0.4	0.04	5.53E-10	1.29E-09	9.98E-07	5.53E-10	1.29E-09	9.98E-07
474	KGT51_BMC_05_L_10mm	1.7	0.12	2.81E-10	6.55E-10	2.39E-07	2.81E-10	6.55E-10	2.39E-07
475	KGT51_BMC_05_L_FBR	1000	0.3	7.80E-08	1.82E-07	1.74E-06	7.80E-08	1.82E-07	1.74E-06
476	KGT52_BMC_01_L_10mm	0.6	0.04	6.25E-09	1.46E-08	9.98E-06	6.25E-09	1.46E-08	9.98E-06
477	KGT52_BMC_01_L_50mm	15	0.12	3.66E-09	8.53E-09	4.88E-07	3.66E-09	8.53E-09	4.88E-07
478	KGT52_BMC_01_L_FBR	1000	0.3	1.95E-08	4.55E-08	4.35E-07	1.95E-08	4.55E-08	4.35E-07
479	KGT52_BMC_02_L_2mm	0.001	0.04	1.33E-06	3.10E-06	4.42E-03	1.33E-06	3.10E-06	4.42E-03
480	KGT52_BMC_02_L_6mm	0.001	0.04	5.90E-07	1.38E-06	1.97E-03	5.90E-07	1.38E-06	1.97E-03
481	KGT52_BMC_02_L_12mm	0.001	0.04	4.75E-07	1.11E-06	1.58E-03	4.75E-07	1.11E-06	1.58E-03
482	KGT52_BMC_03_L_5mm	0.2	0.04	1.02E-08	2.37E-08	2.66E-05	1.02E-08	2.37E-08	2.66E-05
483	KGT52_BMC_03_L_50mm	15	0.12	1.95E-08	4.54E-08	2.60E-06	1.95E-08	4.54E-08	2.60E-06
484	KGT55_MOH_01_L_10mm	0.01	0.04	1.20E-08	2.80E-08	4.00E-05	1.20E-08	2.80E-08	4.00E-05
485	KGT55_MOH_01_L_50mm	0.1	0.04	6.49E-10	1.52E-09	2.00E-06	6.49E-10	1.52E-09	2.00E-06
486	KGT55_MOH_01_L_FBR	1000	0.3	9.00E-09	2.10E-08	1.97E-06	9.00E-09	2.10E-08	1.97E-06
487	KGT55_MOH_02_L_2mm	0.01	0.04	2.76E-06	6.44E-06	9.19E-03	2.76E-06	6.44E-06	9.19E-03
488	KGT55_MOH_02_L_6mm	0.01	0.04	1.24E-06	2.88E-06	4.12E-03	1.24E-06	2.88E-06	4.12E-03
489	KGT55_MOH_02_L_16mm	0.01	0.04	1.00E-06	2.33E-06	3.33E-03	1.00E-06	2.33E-06	3.33E-03
490	KGT55_MOH_03_L_4mm	0.01	0.04	2.52E-06	5.88E-06	8.39E-03	3.60E-06	8.40E-06	1.20E-02
491	KGT55_MOH_03_L_40mm	1.1	0.12	6.78E-07	1.58E-06	8.38E-04	9.69E-07	2.26E-06	1.20E-03
492	KGT80_AMM_01_V_2mm	0.01	-	Toxic	Toxic	8.30E-03	Toxic	Toxic	8.30E-03
493	KGT80_AMM_01_V_6mm	0.1	-	Toxic	Toxic	3.77E-03	Toxic	Toxic	3.77E-03
494	KGT80_AMM_01_V_22mm	0.9	-	Toxic	Toxic	1.75E-03	Toxic	Toxic	1.75E-03
495	KGT80_AMM_01_V_85mm	14	-	Toxic	Toxic	3.93E-04	Toxic	Toxic	3.93E-04
496	KGT80_AMM_01_V_150mm	43	-	Toxic	Toxic	1.18E-04	Toxic	Toxic	1.18E-04
497	KGT80_AMM_11_V_2mm	0.01	-	Toxic	Toxic	8.46E-03	Toxic	Toxic	8.46E-03
498	KGT80_AMM_11_V_6mm	0.1	-	Toxic	Toxic	3.82E-03	Toxic	Toxic	3.82E-03
499	KGT80_AMM_11_V_22mm	0.9	-	Toxic	Toxic	1.77E-03	Toxic	Toxic	1.77E-03

Line No.	Release Scenario	Release Rate (kg/s)	Explosion Probability	Base Case/ Sensitivity Case 1			Sensitivity 2 (Future Operation)		
				Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1	Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1
500	KGT80_AMM_11_V_85mm	14	-	Toxic	Toxic	3.88E-04	Toxic	Toxic	3.88E-04
501	KGT80_AMM_11_V_150mm	43	-	Toxic	Toxic	1.18E-04	Toxic	Toxic	1.18E-04
502	KGT80_AMM_02_V_2mm	0.01	-	Toxic	Toxic	1.43E-03	Toxic	Toxic	1.43E-03
503	KGT80_AMM_02_V_6mm	0.1	-	Toxic	Toxic	6.42E-04	Toxic	Toxic	6.42E-04
504	KGT80_AMM_02_V_18mm	0.6	-	Toxic	Toxic	4.21E-04	Toxic	Toxic	4.21E-04
505	KGT80_AMM_03_L_2mm	0.1	-	Toxic	Toxic	1.21E-02	Toxic	Toxic	1.21E-02
506	KGT80_AMM_03_L_6mm	0.8	-	Toxic	Toxic	4.42E-03	Toxic	Toxic	4.42E-03
507	KGT80_AMM_03_L_22mm	11	-	Toxic	Toxic	1.58E-03	Toxic	Toxic	1.58E-03
508	KGT80_AMM_03_L_71mm	115	-	Toxic	Toxic	4.20E-04	Toxic	Toxic	4.20E-04
509	KGT80_AMM_04_L_2mm	0.1	-	Toxic	Toxic	1.83E-02	Toxic	Toxic	1.83E-02
510	KGT80_AMM_04_L_6mm	0.8	-	Toxic	Toxic	6.86E-03	Toxic	Toxic	6.86E-03
511	KGT80_AMM_04_L_22mm	11	-	Toxic	Toxic	2.55E-03	Toxic	Toxic	2.55E-03
512	KGT80_AMM_04_L_71mm	115	-	Toxic	Toxic	6.85E-04	Toxic	Toxic	6.85E-04
513	KGT80_AMM_07_L_2mm	0.1	-	Toxic	Toxic	2.48E-03	Toxic	Toxic	2.48E-03
514	KGT80_AMM_07_L_6mm	0.8	-	Toxic	Toxic	1.12E-03	Toxic	Toxic	1.12E-03
515	KGT80_AMM_07_L_16mm	5.9	-	Toxic	Toxic	7.33E-04	Toxic	Toxic	7.33E-04
516	KGT80_AMM_08_V_2mm	0.000	-	Toxic	Toxic	3.27E-03	Toxic	Toxic	3.27E-03
517	KGT80_AMM_08_V_6mm	0.001	-	Toxic	Toxic	1.40E-03	Toxic	Toxic	1.40E-03
518	KGT80_AMM_08_V_22mm	0.01	-	Toxic	Toxic	6.46E-04	Toxic	Toxic	6.46E-04
519	KGT80_AMM_08_V_85mm	0.1	-	Toxic	Toxic	1.89E-04	Toxic	Toxic	1.89E-04
520	KGT80_AMM_08_V_194mm	0.7	-	Toxic	Toxic	5.75E-06	Toxic	Toxic	5.75E-06
521	KGT80_AMM_09_V_2mm	0.000	-	Toxic	Toxic	1.64E-02	Toxic	Toxic	1.64E-02
522	KGT80_AMM_09_V_6mm	0.001	-	Toxic	Toxic	6.07E-03	Toxic	Toxic	6.07E-03
523	KGT80_AMM_09_V_22mm	0.01	-	Toxic	Toxic	2.23E-03	Toxic	Toxic	2.23E-03
524	KGT80_AMM_09_V_63mm	0.1	-	Toxic	Toxic	5.46E-04	Toxic	Toxic	5.46E-04
525	KGT90_CO2_01_V_2mm	0.01	-	Toxic	Toxic	9.50E-03	Toxic	Toxic	9.50E-03
526	KGT90_CO2_01_V_6mm	0.1	-	Toxic	Toxic	4.37E-03	Toxic	Toxic	4.37E-03
527	KGT90_CO2_01_V_22mm	1.7	-	Toxic	Toxic	2.09E-03	Toxic	Toxic	2.09E-03
528	KGT90_CO2_01_V_71mm	18	-	Toxic	Toxic	6.75E-04	Toxic	Toxic	6.75E-04
529	KGT90_CO2_02_V_2mm	0.01	-	Toxic	Toxic	9.52E-03	Toxic	Toxic	9.52E-03
530	KGT90_CO2_02_V_6mm	0.1	-	Toxic	Toxic	4.38E-03	Toxic	Toxic	4.38E-03
531	KGT90_CO2_02_V_22mm	1.7	-	Toxic	Toxic	2.10E-03	Toxic	Toxic	2.10E-03
532	KGT90_CO2_02_V_71mm	18	-	Toxic	Toxic	6.80E-04	Toxic	Toxic	6.80E-04
533	KGT90_CO2_03_V_2mm	0.01	-	Toxic	Toxic	3.37E-03	Toxic	Toxic	3.37E-03
534	KGT90_CO2_03_V_6mm	0.1	-	Toxic	Toxic	1.60E-03	Toxic	Toxic	1.60E-03
535	KGT90_CO2_03_V_22mm	1.7	-	Toxic	Toxic	8.57E-04	Toxic	Toxic	8.57E-04
536	KGT90_CO2_03_V_71mm	18	-	Toxic	Toxic	3.41E-04	Toxic	Toxic	3.41E-04
537	KGT90_CO2_07_V_2mm	0.01	-	Toxic	Toxic	4.78E-03	Toxic	Toxic	4.78E-03
538	KGT90_CO2_07_V_6mm	0.1	-	Toxic	Toxic	2.05E-03	Toxic	Toxic	2.05E-03
539	KGT90_CO2_07_V_22mm	1.7	-	Toxic	Toxic	9.86E-04	Toxic	Toxic	9.86E-04
540	KGT90_CO2_07_V_63mm	14	-	Toxic	Toxic	2.49E-04	Toxic	Toxic	2.49E-04
541	KGT90_CO2_08_L_2mm	0.1	-	Toxic	Toxic	8.75E-03	Toxic	Toxic	8.75E-03
542	KGT90_CO2_08_L_6mm	1.0	-	Toxic	Toxic	3.25E-03	Toxic	Toxic	3.25E-03
543	KGT90_CO2_08_L_22mm	2.1	-	Toxic	Toxic	1.37E-03	Toxic	Toxic	1.37E-03
544	KGT90_CO2_08_L_71mm	2.1	-	Toxic	Toxic	4.04E-04	Toxic	Toxic	4.04E-04
545	KGT90_CO2_16_V_2mm	0.001	-	Toxic	Toxic	2.50E-02	Toxic	Toxic	2.50E-02
546	KGT90_CO2_16_V_6mm	0.01	-	Toxic	Toxic	1.02E-02	Toxic	Toxic	1.02E-02
547	KGT90_CO2_16_V_22mm	0.2	-	Toxic	Toxic	4.48E-03	Toxic	Toxic	4.48E-03
548	KGT90_CO2_16_V_85mm	2.5	-	Toxic	Toxic	8.92E-04	Toxic	Toxic	8.92E-04
549	KGT90_CO2_16_V_212mm	15	-	Toxic	Toxic	1.99E-04	Toxic	Toxic	1.99E-04

Line No.	Release Scenario	Release Rate (kg/s)	Explosion Probability	Base Case/ Sensitivity Case 1			Sensitivity 2 (Future Operation)		
				Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1	Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1
550	KGT90_CO2_18_V_2mm	0.000	-	Toxic	Toxic	1.63E-03	Toxic	Toxic	1.63E-03
551	KGT90_CO2_18_V_6mm	0.003	-	Toxic	Toxic	7.45E-04	Toxic	Toxic	7.45E-04
552	KGT90_CO2_18_V_22mm	0.04	-	Toxic	Toxic	3.80E-04	Toxic	Toxic	3.80E-04
553	KGT90_CO2_18_V_50mm	0.2	-	Toxic	Toxic	1.36E-04	Toxic	Toxic	1.36E-04
554	KGT90_CO2_19_V_2mm	0.000	-	Toxic	Toxic	6.14E-03	Toxic	Toxic	6.14E-03
555	KGT90_CO2_19_V_6mm	0.003	-	Toxic	Toxic	2.55E-03	Toxic	Toxic	2.55E-03
556	KGT90_CO2_19_V_22mm	0.05	-	Toxic	Toxic	1.23E-03	Toxic	Toxic	1.23E-03
557	KGT90_CO2_19_V_63mm	0.4	-	Toxic	Toxic	2.57E-04	Toxic	Toxic	2.57E-04
558	KGT90_CO2_23_V_2mm	0.001	-	0.00E+00	0.00E+00	0.00E+00	Toxic	Toxic	8.01E-04
559	KGT90_CO2_23_V_6mm	0.01	-	0.00E+00	0.00E+00	0.00E+00	Toxic	Toxic	3.82E-04
560	KGT90_CO2_23_V_22mm	0.2	-	0.00E+00	0.00E+00	0.00E+00	Toxic	Toxic	2.04E-04
561	KGT90_CO2_23_V_85mm	2.5	-	0.00E+00	0.00E+00	0.00E+00	Toxic	Toxic	4.31E-05
562	KGT90_CO2_23_V_212mm	15	-	0.00E+00	0.00E+00	0.00E+00	Toxic	Toxic	1.78E-05
563	KGT90_CO2_09_L_10mm	2.8	-	Toxic	Toxic	1.00E-05	Toxic	Toxic	1.00E-05
564	KGT90_CO2_09_L_50mm	70	-	Toxic	Toxic	5.00E-07	Toxic	Toxic	5.00E-07
565	KGT90_CO2_09_L_FBR	1000	-	Toxic	Toxic	5.00E-07	Toxic	Toxic	5.00E-07
566	KGT90_CO2_10_L_10mm	2.8	-	Toxic	Toxic	1.00E-05	Toxic	Toxic	1.00E-05
567	KGT90_CO2_10_L_50mm	70	-	Toxic	Toxic	5.00E-07	Toxic	Toxic	5.00E-07
568	KGT90_CO2_10_L_FBR	1000	-	Toxic	Toxic	5.00E-07	Toxic	Toxic	5.00E-07
569	KGT90_CO2_11_L_10mm	2.8	-	Toxic	Toxic	1.00E-05	Toxic	Toxic	1.00E-05
570	KGT90_CO2_11_L_50mm	70	-	Toxic	Toxic	5.00E-07	Toxic	Toxic	5.00E-07
571	KGT90_CO2_11_L_FBR	1000	-	Toxic	Toxic	5.00E-07	Toxic	Toxic	5.00E-07
572	KGT90_CO2_12_L_10mm	2.8	-	Toxic	Toxic	1.00E-05	Toxic	Toxic	1.00E-05
573	KGT90_CO2_12_L_50mm	70	-	Toxic	Toxic	5.00E-07	Toxic	Toxic	5.00E-07
574	KGT90_CO2_12_L_FBR	1000	-	Toxic	Toxic	5.00E-07	Toxic	Toxic	5.00E-07
575	KGT90_CO2_24_L_2mm	0.1	-	Toxic	Toxic	6.53E-03	Toxic	Toxic	6.53E-03
576	KGT90_CO2_24_L_6mm	1.0	-	Toxic	Toxic	2.19E-03	Toxic	Toxic	2.19E-03
577	KGT90_CO2_24_L_22mm	14	-	Toxic	Toxic	7.77E-04	Toxic	Toxic	7.77E-04
578	KGT90_CO2_24_L_71mm	142	-	Toxic	Toxic	1.89E-04	Toxic	Toxic	1.89E-04
579	KGT90_CO2_25_L_2mm	0.1	-	Toxic	Toxic	2.85E-03	Toxic	Toxic	2.85E-03
580	KGT90_CO2_25_L_6mm	1.0	-	Toxic	Toxic	1.35E-03	Toxic	Toxic	1.35E-03
581	KGT90_CO2_25_L_22mm	14	-	Toxic	Toxic	7.40E-04	Toxic	Toxic	7.40E-04
582	KGT90_CO2_25_L_50mm	70	-	Toxic	Toxic	5.17E-04	Toxic	Toxic	5.17E-04
583	KGT90_CO2_26_V_2mm	0.01	-	Toxic	Toxic	8.01E-04	Toxic	Toxic	8.01E-04
584	KGT90_CO2_26_V_6mm	0.1	-	Toxic	Toxic	3.57E-04	Toxic	Toxic	3.57E-04
585	KGT90_CO2_26_V_22mm	1.7	-	Toxic	Toxic	1.74E-04	Toxic	Toxic	1.74E-04
586	KGT90_CO2_26_V_50mm	8.8	-	Toxic	Toxic	6.00E-05	Toxic	Toxic	6.00E-05
587	KGT90_CO2_27_V_2mm	0.01	-	Toxic	Toxic	8.77E-04	Toxic	Toxic	8.77E-04
588	KGT90_CO2_27_V_6mm	0.1	-	Toxic	Toxic	3.78E-04	Toxic	Toxic	3.78E-04
589	KGT90_CO2_27_V_16mm	0.9	-	Toxic	Toxic	2.25E-04	Toxic	Toxic	2.25E-04
590	KGT90_CO2_28_L_5mm	0.7	-	Toxic	Toxic	6.00E-03	Toxic	Toxic	6.00E-03
591	KGT90_CO2_28_L_50mm	70	-	Toxic	Toxic	6.00E-04	Toxic	Toxic	6.00E-04
592	KGT90_CO2_29_V_2.5mm	0.02	-	Toxic	Toxic	2.40E-02	Toxic	Toxic	2.40E-02
593	KGT90_CO2_29_V_25mm	2.2	-	Toxic	Toxic	2.40E-03	Toxic	Toxic	2.40E-03
594	KGT90_CO2_30_L_8mm	1.8	-	Toxic	Toxic	2.40E-02	Toxic	Toxic	2.40E-02
595	KGT90_CO2_30_L_80mm	180	-	Toxic	Toxic	2.40E-03	Toxic	Toxic	2.40E-03
596	KGT90_CO2_31_V_2.5mm	0.02	-	Toxic	Toxic	4.60E-03	Toxic	Toxic	4.60E-03
597	KGT90_CO2_31_V_25mm	2.2	-	Toxic	Toxic	4.60E-04	Toxic	Toxic	4.60E-04
598	KGT90_CO2_32_L_5mm	0.7	-	Toxic	Toxic	4.60E-03	Toxic	Toxic	4.60E-03
599	KGT90_CO2_32_L_50mm	70	-	Toxic	Toxic	4.60E-04	Toxic	Toxic	4.60E-04

Line No.	Release Scenario	Release Rate (kg/s)	Explosion Probability	Base Case/ Sensitivity Case 1			Sensitivity 2 (Future Operation)		
				Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1	Immediate Ignition Event Frequency	Delayed Ignition Event Frequency	Unignited Event Frequency Note 1
600	KGT36_NGL_12_L_100mm	97	0.3	2.87E-09	6.69E-09	8.16E-08	4.01E-09	9.35E-09	1.14E-07
601	KGT36_NGL_12_L_Cat	1000	0.3	3.18E-09	7.43E-09	8.16E-08	4.45E-09	1.04E-08	1.14E-07
602	KGT47_LPG_03_L_80mm	89	0.3	5.41E-09	1.26E-08	1.66E-07	1.11E-08	2.59E-08	3.41E-07
603	KGT47_LPG_03_L_Cat	1000	0.3	6.46E-09	1.51E-08	1.66E-07	1.33E-08	3.10E-08	3.41E-07
604	KGT47_LPG_06_L_50mm	35	0.12	1.32E-11	3.08E-11	8.90E-10	2.54E-11	5.92E-11	1.71E-09
605	KGT47_LPG_06_L_Cat	1000	0.3	3.47E-11	8.10E-11	8.90E-10	6.68E-11	1.56E-10	1.71E-09
606	KGT52_BMC_04_L_50mm	15	0.12	2.78E-13	6.48E-13	3.80E-11	2.78E-13	6.48E-13	3.80E-11
607	KGT52_BMC_04_L_Cat	1000	0.3	2.97E-11	6.92E-11	7.60E-10	2.97E-11	6.92E-11	7.60E-10
608	KGT55_MOH_04_L_40mm	1	0.12	9.68E-12	2.26E-11	1.20E-08	1.38E-11	3.23E-11	1.71E-08
609	KGT55_MOH_04_L_Cat	1000	0.3	9.35E-09	2.18E-08	2.40E-07	1.34E-08	3.12E-08	3.42E-07
610	KGT90_CO2_33_L_50mm	70	-	Toxic	Toxic	8.56E-09	Toxic	Toxic	8.56E-09
611	KGT90_CO2_33_L_Cat	1000	-	Toxic	Toxic	8.56E-09	Toxic	Toxic	8.56E-09
612	KGT90_CO2_34_L_80mm	180	-	Toxic	Toxic	3.42E-08	Toxic	Toxic	3.42E-08
613	KGT90_CO2_34_L_Cat	1000	-	Toxic	Toxic	3.42E-08	Toxic	Toxic	3.42E-08
614	KGT90_CO2_35_L_50mm	70	-	Toxic	Toxic	6.56E-09	Toxic	Toxic	6.56E-09
615	KGT90_CO2_35_L_Cat	1000	-	Toxic	Toxic	6.56E-09	Toxic	Toxic	6.56E-09

Notes:

1. Unignited frequency is the remaining portion of the leak frequency that is not ignited, i.e. Immediate ignition frequency + delayed ignition frequency + unignited frequency = total leak frequency

   For scenarios which consist of toxic materials, the unignited frequency is the toxic event frequency.

TODD ENERGY LTD

Kapuni Wellsites QRA
Assumptions Register

610114-RPT-R0001
July 2022

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Rev	Description	Originator	Reviewer	Worley Approver	Date	Client Approval	Date
A	Issued for Review/Comment	Y Lee	E Gloy	Y Lee	05/2020		
0	Approved for Use	Y Lee	L Ong	Y Lee	08/2020		
1	Re-Approved for Use	Y Lee	O Kilian	Y Lee	07/2022		

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1. ABBREVIATIONS

API	American Petroleum Institute
AWS	Automatic Weather Station
BLEVE	Boiling Liquid Expanding Vapour Explosion
BOP	Blowout Preventer
DNV GL	Det Norske Veritas Germanischer Lloyd
EI	Energy Institute
ESDV	Emergency Shutdown Valve
FBR	Full Bore Rupture
GOR	Gas Oil Ratio
HCRD	Hydrocarbon Release Database
HIPAP4	NSW Hazardous Industry Planning Advisory Paper No. 4
HMB	Heat and Material Balance
HPKO	High Pressure Knock Out
IOGP	International Association of Oil and Gas Producers
IRPA	Individual Risk Per Annum
KPS	Kapuni Production Station
LFL	Lower Flammable Limit
LPG	Liquefied Petroleum Gas
LSIR	Location Specific Individual Risk
LTS	Low Temperature Separator
PFD	Process Flow Diagram
PFP	Passive Fire Protection
P&ID	Piping & Instrumentation Diagram
PLL	Potential Loss of Life
QRA	Quantitative Risk Assessment
RADD	Risk Assessment Data Directory
STDC	South Taranaki District Council
UK HSE	United Kingdom Health and Safety Executive
VCE	Vapour Cloud Explosion
WSO	Water Shut-off

2. INTRODUCTION

This document sets out the assumptions to be used for the Todd Energy (Todd) Kapuni wellsites Quantitative Risk Assessment (QRA).

2.1 Objective

The objective of the QRA is to develop risk contours to meet the risk assessment requirements of the South Taranaki District Council (STDC) District Plan, Section 11: Hazardous Substances.

2.2 Scope

The scopes include:

1) Conduct risk assessment for seven (7) Kapuni wellsites with 17 wells; and
2) Update the existing KA-4/14 and KA-13 wellsites QRA [Ref. 1] and hence supersedes the results from the QRA.

The final report will be a combined QRA report for all nine (9) Kapuni wellsites with 20 wells.

Currently, seven (7) wellsites are producing, KA-3 is out of service and KA-9 is designed for water disposal only. The wellsite details are summarised in Table 2-1. Only producing wells will be considered in the QRA.

Table 2-1: Kapuni Wellsites

Wellsite	Number of wells	Producing	Scheduled for Abandon-ment Note 1	Suspended Note 2	Shut in Note 3	Observation / water Note 4	Notes
KA-1, KA-7, KA-19 and KA-20	4	1			1 (KA-7)	2 (KA-1 and KA-20)	
KA-2	1	1					
KA-3	1			1			
KA-4 and KA-14	2	2					KA-14 is only operating once (for 24 hours) every 10 days [Ref. 20].
KA-5 and KA-10	2	1				1 (KA-10)	
KA-6, KA-11 and KA-17	3	2		1 (KA-11)			
KA-8, KA-12, KA-15 and KA-18	4	2	1 (KA-12)		1 (KA-15)		
KA-9	2					2	A new well, KW03, is drilled in May 2021 for further water injection purposes.

Wellsite	Number of wells	Producing	Scheduled for Abandon-ment Note 1	Suspended Note 2	Shut in Note 3	Observation / water Note 4	Notes
KA-13	1	1					KA-13 is only operating in 1 out of every 3 months.
Total	20	10	1	2	2	5	

Notes:

1. Wells that are scheduled for abandonment are plugged with abandonment plans underway.
2. Suspended wells are plugged and major intervention is required to bring the well back to service.
3. Shut in wells are isolated but could be brought back into service. Note that KA-7 and KA-15 were considered as producing well in the Kapuni Safety Case [Ref. 2], however, the wells are currently shut-in and hence will not be included in the risk assessment [Ref. 3 and Ref. 4].
4. Water wells are for water injection only and will not be used for hydrocarbon / producing. Observation wells are only for monitoring reservoir conditions and informing development of reserves estimates. They are designed for instrumentation only and cannot inject or produce.

There is no plan to bring the non-producing wells back online in the future. In the unlikely event that this changes, the QRA will be updated to verify any impact on the risk contours. Engagement with STDC will be completed as part of this process and a new resource consent will be required.

2.2.1 Exclusions

The following will be excluded from the QRA scope:

- Risk from the gathering pipelines to Kapuni Production Station (KPS). The scope for each wellsite will include up to the pipeline isolation valves (if available) or when the pipelines go underground. Pipelines passing through the wellsites (e.g., at KA-4/14 and KA-5) are not considered in the base case. The pipeline sections will be assessed in the sensitivity case. Note that the pipeline (P/L) to PECPR on the P&ID will be used in some sections to identify the pipeline boundary;
- Risk other than hydrocarbon / process risk (e.g., transportation risk, seismic risk and volcanic risks);
- Decommissioned and/or mothballed equipment;
- Utilities such as produced water and instrument air as they do not contain any hydrocarbon inventory;
- Individual risk calculations, including Individual Risk Per Annum (IRPA) and Potential Loss of Life (PLL) as the wellsites are normally unmanned;
- Societal risk (F-N curve) as the wellsites are located as remote area with low populations;
- Corrosion Inhibitors present at the wellsites as they are not flammable;
- Methanol injecting pumps as they are only used during start-up (except for KA-8/12/15/18 wellsite where methanol dosing is required throughout the year). Note that methanol tanks are always full and connected to the methanol pumps, with the pumps turn off when methanol is not being injected [Ref. 19], hence the methanol tanks and tubing to the methanol pumps will be included.
- Toxic effect of carbon dioxide.

2.3 Facility Description

Kapuni is an onshore gas and condensate field located in South Taranaki, approximately 50 km south of New Plymouth. 20 Kapuni wells are located on nine (9) separate wellsites in the area surrounding the Kapuni Production Station (KPS). The production wellsite process is a simple separation of gas and liquids involving the direction of wellstream gas and liquids to a low temperature separator (LTS) unit on the wellsite. The LTS separates the gas and liquids by means of pressure reduction to cause cooling.

An aerial overview of the wellsites location with reference to KPS is shown in Figure 2-1.

The wellsites access are via vehicle gates which are normally adjacent to the main wellsite control huts for the wellsites. Each wellsite hut is a single storey building which contains the wellsite control logic systems, emergency and communications equipment.

The wellsites have an open layout with areas separated from each other to prevent knock-on effects. The open area reduces the potential for overpressure from an explosion and reduces fire damage / escalation potential.

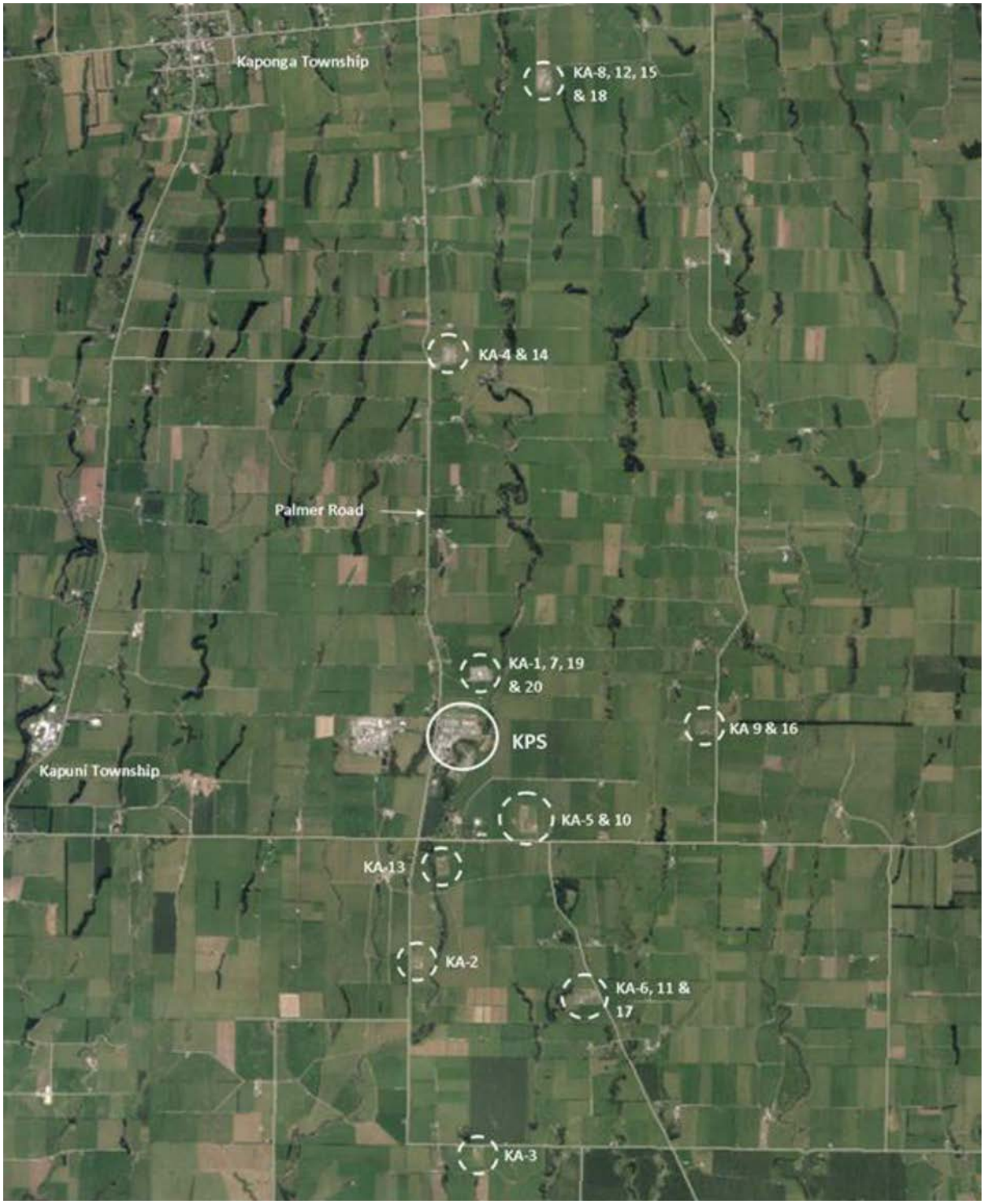

Figure 2-1: Kapuni Wellsites Location with reference to Kapuni Production Station

The details of each of the wellsite is as below.

2.3.1 Wellsite KA-1, KA-7, KA-19 and KA-20

Located just off Palmer Road, the site contains 4 wells. A wellstream heater is fitted to the KA-19 well. KA-1 well is suspended, KA-7 is not operational following the recent unsuccessful Water Shut-off (WSO) [Ref. 3] and KA-20 well is an observation well.

This site also acts as a distribution point for gas from the northern wells. It re-routes gas arriving from the gathering lines from wellsite KA-4/14 and KA-8/12/15/18 to KPS.

2.3.2 Wellsite KA-2

Located on Palmer Road, the site has an LTS unit and the flowline is equipped with two wellstream coolers.

2.3.3 Wellsite KA-3

This wellsite has been suspended and plugged.

2.3.4 Wellsite KA-4 and KA-14

Located just off Palmer Road, the site contains two wells, two LTS units, and a wellstream heater.

2.3.5 Wellsite KA-5 and KA-10

Located just off Skeet Road, this site contains one producing well (KA-5) and one observation well (KA-10), with a Desander unit for solids separation, and a PCV used on start-up.

2.3.6 Wellsite KA-6, KA-11 and KA-17

Located on Ahipaipa Road, this site contains two in service wells, and one suspended well (KA-11). KA-6 and KA-17 wellstream fluids are co-mingled, routed through a wellstream cooler and then to an LTS Unit.

2.3.7 Wellsite KA-8, KA-12, KA-15 and KA-18

Located just off Eltham Road, this site contains two (2) producing wells. KA-12 well is plugged and scheduled for abandonment and KA-15 well is shut-in and isolated [Ref. 4]. Two wellstream process skids and two wellhead compression units are fitted to the wells.

2.3.8 Wellsite KA-13

Located just off Skeet Road, this site contains one well, Desander, a flowline choke valve and a High Pressure Knock Out (HPKO) vessel. It connects into the KA-6/5 gathering lines.

2.3.9 Wellsite KA-9

Located on Lower Duthie Road, two wells were drilled on the site, KA-9 (referred to as KW-2) and KA-16. KA-16 is suspended and KW-2 is currently in service as a water injection well. There is very little equipment left on the wellsite, only the water injection line, a filter, and two pig receivers.

The wellsites flow schematic is presented in Figure 2-2.

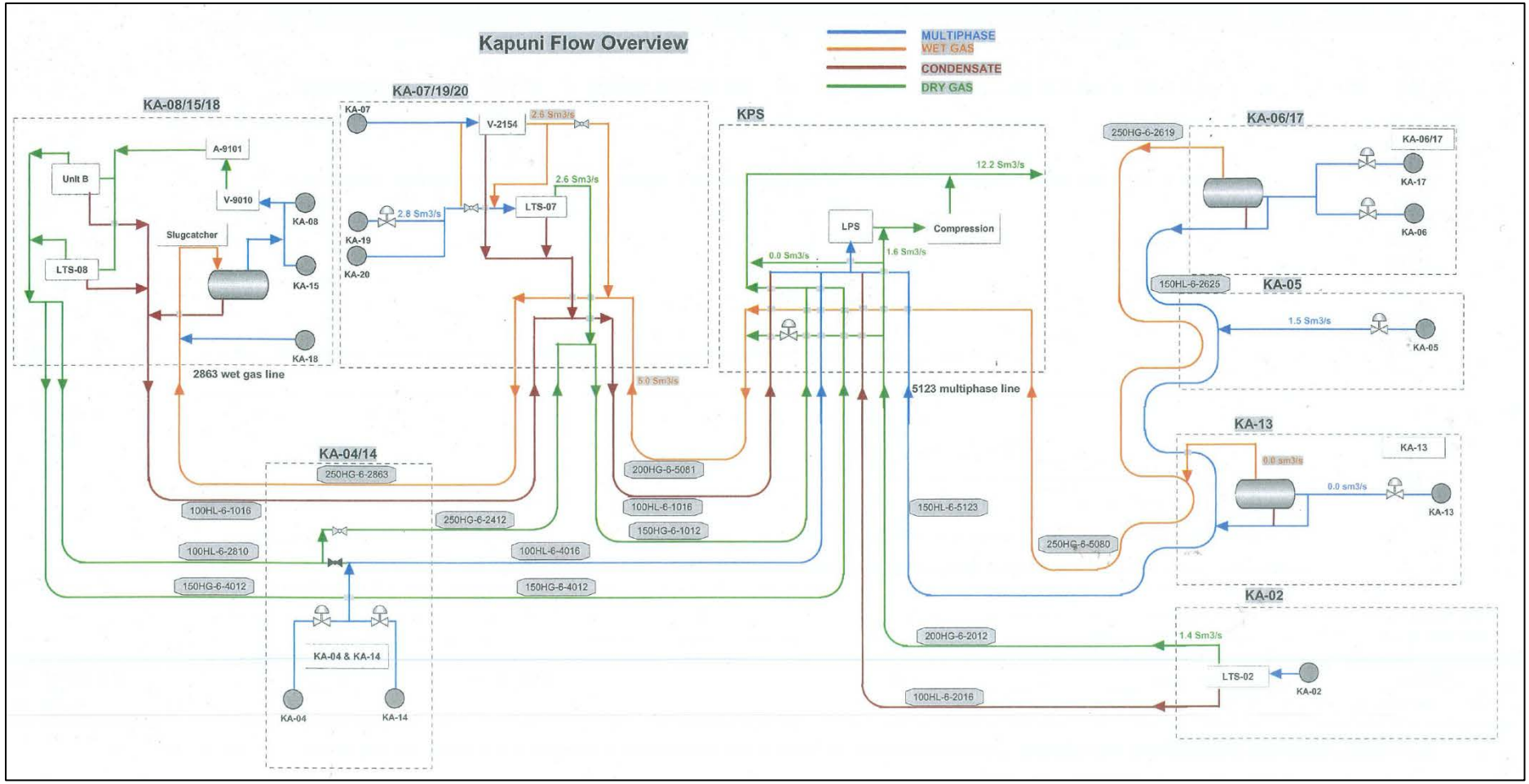

Figure 2-2: Kapuni Wellsites Flow Schematic

3. MODELLING INPUTS AND ASSUMPTIONS

This section outlines all modelling inputs and assumptions that will be used in the QRA. The assumptions and methodology will be consistent with those in the Todd Energy's Fire and Gas Analysis and Quantitative Risk Assessment Methodology Guideline [Ref. 5].

3.1 Assessment Tool

The risk assessment model will be set up using DNV GL Safeti version 8.22 [Ref. 6].

3.2 Definition of Parts Count Sections

3.2.1 Isolatable Inventory

Sectionalisation will be performed to segregate the facilities into a number of isolatable sections. Each potential leak source will be associated with a particular isolatable inventory. Primarily, the isolatable inventories will be defined by emergency shutdown valve (ESDV) boundaries. These sections will be split further where required, and the entire contained inventory was considered as available for release. Further segregations are based on:

- Significant change in operating parameters (temperature and pressure);
- Significant change in stream composition;
- Change in stream phase; and
- Equipment location.

The probability of successful detection and isolation is assumed to be 100%. At isolatable boundaries, the valve will be assumed as the last component of the upstream inventory. If a cap or blind flange is shown against a valve, it will be assumed to be closed, even if not indicated as such.

Node sections will be highlighted in the Process Flow Diagrams (PFDs) and will be detailed in a Node Definition table in the QRA report which presents details of all the nodes including unique identification code, definition of boundaries, operating temperature and pressure, maximum pipe diameter, etc.

Following sectionalisation, a parts counts will be conducted to perform the frequency analysis for the QRA.

3.2.2 Components

The definition of components within the parts count will be aligned with failure rate data published in the International Association of Oil and Gas Producers (IOGP) Risk Assessment Data Directory (RADD) Process Release Frequency [Ref. 7]. The parts count will consider the following:

- Equipment items;
- Valves;
- Flanges;
- Instrumentation and small-bore fittings; and
- Pipework.

The parts count will be recorded in an MS Excel spreadsheet, with each section broken down based on the piping and instrumentation diagrams (P&IDs). Marked up P&IDs will be attached with the QRA report.

3.3 Failure Frequency Data and Hole Size Distributions

3.3.1 General Leak Frequency

The leak frequencies for process equipment and piping will be taken from the IOGP Process Release Frequency [Ref. 7]. The release frequencies of the main process equipment items from IOGP are based on the UK HSE (UK Health and Safety Executive) hydrocarbon release database (HCRD) which has been compiled by the UK HSE over a 20-year period. Two sets of data are presented in IOGP Process Release Frequency, which include the 1992 – 2015 data and 2006 – 2015 data.

The recommended values based on experience in the period 2006 – 2015 (inclusive) will be used. The IOGP release notes state that the number of incidents recorded per year in the database has been steadily decreasing, and it is considered appropriate to base the frequency on more recent data on the assumption that this is more representative of what will occur in the future.

Failure frequency data from the HCRD contains detailed historical information on offshore hydrocarbon release incidents occurring in the UK offshore environment and is considered an industry standard for offshore QRA applications. The database categorises failure rates on a detailed basis of equipment type and size and provides a probabilistic hole size distribution associated with the failure.

The HCRD data are also normally used for QRA at onshore facilities, although the use of offshore failure rate may be considered to be conservative for use in most onshore applications, on the basis that:

- Offshore environments tend to be harsher, both external (saliferous environment) and internal (produced sand), increasing the rate of equipment corrosion and erosion;
- Congestion at offshore facilities increases the likelihood of damage through impact; and
- Restricted access to offshore facilities may limit maintenance campaigns, increasing the likelihood of failure.

Atmospheric Storage Tank

The IOGP Release Frequency Data does not provide the frequencies for atmospheric storage tanks. Therefore, the following leak frequencies as shown in Table 3-1 from the TNO Purple Book [Ref. 23] will be used for methanol tanks.

Table 3-1: Release Frequencies for Atmospheric Storage Tank

Type of Release	Storage Tanks, Atmospheric
Instantaneous release of the complete inventory	5.0E-06 per year
Continuous release of the complete inventory in 10 minutes at a constant rate	5.0E-06 per year
Continuous release from a hole with an effective diameter of 10 mm	1.0E-04 per year

3.3.2 Pigging

Pig traps are located at the wellsites to clean, condition and/or monitor the pipelines. The pigging frequency will be used to calculate a modification factor for the leak frequency from the pig receivers.

Table 3-2: Pigging Frequencies and Modification Factor [Ref. 19]

Tag	Description	To		Pigging Frequency (per year)	Average pigging duration (hours)	Modification Factor
KA-06/17						
A-2613	Hydrocarbon gas to gathering line	A-5001	KPS	4	1.5	0.001
A-2614	Hydrocarbon liquid to gathering line	A-5003	KPS	4	1.5	0.001
KA-02						
A-0101B	Hydrocarbon liquid to A-0501A (KPS)	A-0501A	KPS	2	8	0.002
A-0103	Hydrocarbon gas to A-0503 (KPS)	A-0503	KPS	4	1.5	0.001
KA-08/18						
A-2863	Wet gas from KA-4/14	A-2165	KA-19	4	1.5	0.001
A-2813	Dry gas to KA-4	A-0502D	KPS	2	1	0.0002
A-2814	Dry gas to KA-4	A-2440	KA-4/14	4	1.5	0.001
A-2864	Condensate to KA-1&7	A-0501B	KPS	4	7	0.003
KA-4/14						
A-2440	Dry gas to KA-7	A-2167	KA-19	1	1	0.0001
KA-19						
A-2165	Wet gas to KA-8/18 via KA-4/14	A-2863	KA-8/18	4	1	0.0005
A-2167	Dry gas from KA-4/14 wellsites	A-2440	KA-4/14	1	1	0.0001
A-2163	Wet gas from A-5002	A-5002	KPS	4	0.5	0.0002
A-2166	Dry gas to KPS A-502A	A-0502A	KPS	1	0.5	0.0001
A-2164	Vector Treated Gas from KPS A-5004	A-5004	KPS	1	0.5	0.0001
A-2169	(Hydrocarbon gas) To Kiwi Dairy Co. & Taranaki Byproducts Co.	N/A	Other	1	6	0.001

Note: No pig traps at KA-05 and KA-13.

3.3.3 Release Hole Sizes

For every component failure, there is a range of credible hole sizes ranging from pinhole leak to full bore rupture (FBR). The representative hole sizes to be used for process sites are as shown in Table 3-3.

The geometric mean for hole diameter will be used to represent a range in hole sizes as this approach has a mathematical basis that aligns with numbers that are exponential in nature, such as is the case for hole sizes where the consequence is dependent on the area of the hole size or square of the diameter. For example, the representative hole size for the range 10 – 50 mm is calculated as $(10 \times 50)^{0.5}$ = 22 mm. The use of geometric mean is also aligned with the recommendation in the latest IOGP Process Release Frequency [Ref. 7].

Table 3-3: Hole Size Distribution

IOGP Hole Size Group (mm)	Representative Hole Size (mm)
1 - 3	2
3 - 10	6
10 - 50	22
50 - 150	85
> 150	Range geometric mean

22 mm will be used as the maximum hole size for small bore fittings as per the Todd Energy's Methodology Guideline [Ref. 5].

The same approach will be taken to select the representative hole size for rupture cases (release > 150 mm). The selected hole size will be the geometric mean of 150 and the largest line size in the section. This is consistent with the approach used for other release size categories and may be appropriate given the limited FBR base data that is used by the algorithm to calculate frequency.

It is noted for methanol tanks that will reference to TNO Purple Book [Ref. 23] failure data, actual hole sizes following the failure data will be used as there are no sufficient leak size distribution data in Purple Book to calculate the geometric mean.

3.3.4 Leak Frequency Modification Factor

Several leak frequency modification factors will be applied to the release frequency database as per the Todd Energy's Methodology Guideline [Ref. 5]. These are listed below:

- Piping Release Frequency
  - Pipework will be split into categories: process (on skid) piping and interskid piping as described in the definition for equipment type 1: steel process pipes of IOGP Process Release Frequencies [Ref. 7].
  - For interskid piping, the modification factor for "inter-unit piping" (section 3.3.3 of IOGP Process Release Frequencies) which is 0.9 will be applied, i.e. there will be a 90% reduction in frequencies.
- Rupture Release Frequency
  - A review of the UK HSE Hydrocarbon Release Database (HCRD) from 1992 to 2015 has been performed and it was determined that there were 31 incidents in the full-bore release category within 24 years. These were reviewed by Todd to determine the applicability of these cases in comparison with Todd Energy facilities. For wellsites, 22 of the incidents can be discounted on the basis that the release scenarios cannot occur on an onshore wellsite. The frequency for rupture release will be reduced by 65%.

The maximum flange release hole size will also be limited to 22 mm as a release from a flange is normally limited to a segment of a gasket between bolts [Ref. 5].

3.4 Blowout Events

For normal operations, it is assumed that a blowout may occur during either production, well workover or well wireline activities. The categories applied for classifying the incidents [Ref. 11 and 12] are shown in Table 3-4.

Table 3-4: Categories of Blowout Incidents

Main	Category	Description
Blowout and well release	Blowout (surface flow)	• Uncontrolled incidents with surface flow, including subsea releases, e.g., from topside or subsea wellhead, drill floor or Christmas tree. • Considered as a full blowout event from the full well bore size. This will be modelled based on the expected maximum well fluid flowrate that the reservoir can supply to the wellbore instead of the wellhead pressure to avoid over-estimating the release rate and creating unrealistic results.
	Blowout (underground flow)	• Underground flow only or with limited surface flow where minor flow occurred and typically the Blowout Preventer (BOP) has been activated. • Considered to have no consequences on the surface and will therefore not considered in this study.
	Diverted well release	• An incident where the diverter system functioned as intended. • Assumed to be a well release that can be shut-in or diverted to flare in a short period of time. This event will not be included as the event frequency as given in Table 3-4 is equal to zero.
	Well release	• An incident where hydrocarbons (oil or gas) flow from the well at some point where flow was not intended, and the flow was stopped by use of the barrier system that was available on the well at the time the incident started. • Assumed to be release from the wellhead and Christmas trees. It will be modelled as a horizontal well fluid release at well pressures. Release sizes will be based on the same hole size distribution used for other release cases.

The blowout likelihood from the IOGP Blowout Frequencies [Ref. 11] will be used, specifically data for offshore operations in areas not operating according to North Sea Standard (Table 2-3 in the IOGP). It is noted that the Kapuni wellsites are located onshore, however, IOGP recommends the use of offshore data presented in Section 2 in the IOGP but noted that there will be a greater degree of uncertainty. The frequency for well wirelining considered in the KA-4/14 and KA-13 QRA [Ref. 1] is once per well per year, and no workover will be performed in the wells' life time. These assumptions will be used in this QRA as well.

Table 3-5: Blowout and Well Release Frequencies for Production Operation

Operation	Category	Frequency
Production (Excluding external causes [Note 1])	Blowout (surface flow)	3.3E-05 per well year
	Diverted well release	0 per well year
	Well release	2.9E-05 per well year
Wireline	Blowout (surface flow)	9.0E-06 per well year
	Diverted well release	0 per well year
	Well release	2.6E-05 per well year

Note 1: External causes are external loads such as storms or fire leading to blowout or well release.

3.5 Ignition Probabilities

The probability of ignition of a release is a function of the release rate, the nature of the material being released and the conditions of the surrounding plant. For this QRA, The Energy Institute (EI) ignition probability model referenced in IOGP Ignition Probabilities [Ref. 8] will be used for the estimation of overall ignition probability of loss of containment scenarios.

For wellsite, ignition probabilities should be taken from Scenarios 5 and 6 and they are assumed to particularly apply to a 'plant' where processing takes place. This is considered conservative for use at wellsites as not much processing takes place.

The scenarios are described as:

- Scenario 5 – Small Plant Gas LPG (Gas or LPG release from small onshore plant) - Releases of flammable gases, vapour or liquids significantly above their normal boiling point from small onshore plants (plant area up to 1200 m^2, site area up to 35,000 m^2).
- Scenario 6 - Small Plant Liquid (Liquid release from small onshore plant) - Releases of flammable liquids that do not have any significant flash fraction (10% or less) if released from small onshore plants (plant area up to 1200 m^2, site area up to 35,000 m^2) and which are not bunded or otherwise contained.

The graphs of ignition probabilities as a function of mass release rate are shown in Figure 3-1.

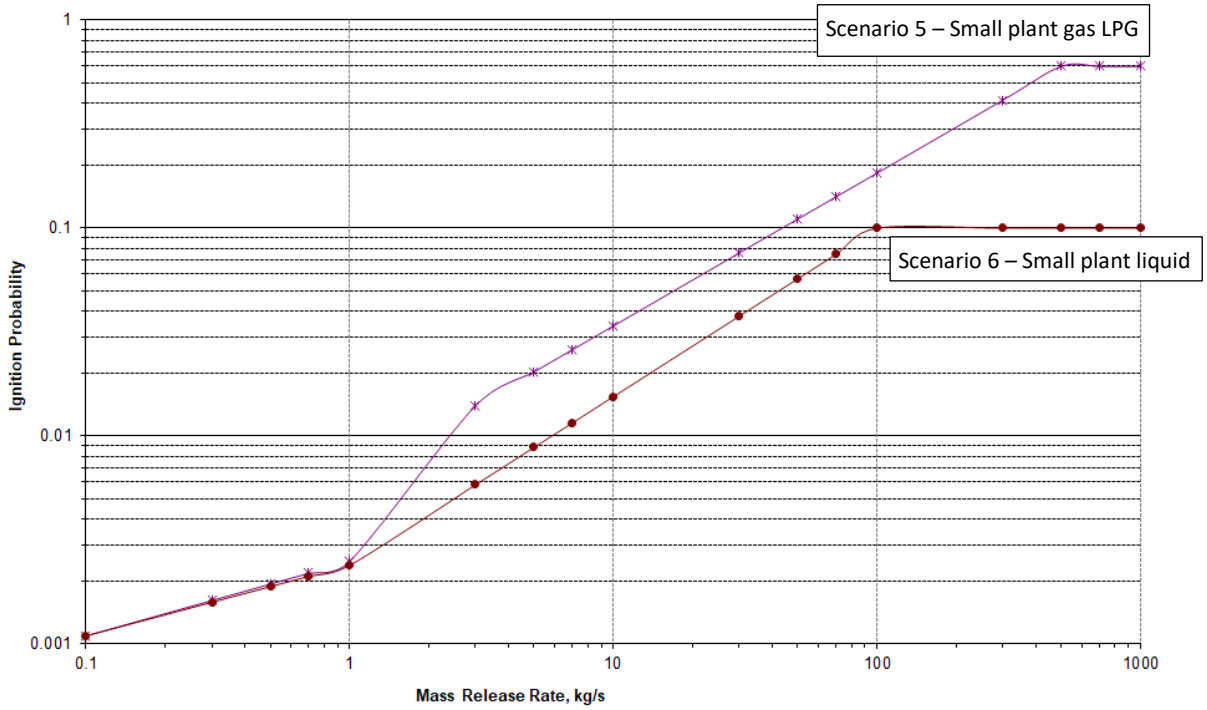

Figure 3-1: Ignition Probability

Early and Delayed Ignition Probabilities

The graph represents the total ignition probability. An overall distribution for early to delayed ignition ratio of 30:70 to 50:50 split is considered reasonable. The timing of ignition is used as a means to predict the nature of the ignited event. Early ignition is taken to indicate a jet fire or pool fire depending on the material released. Delayed ignition is taken to indicate that the ignition would initially result in a flash fire or explosion.

For this study, a 30:70 split for early to delayed ignition probability will be used. Given the maturity of the hazardous area for all wellsites, it can be assumed that probability of early ignition would be low.

3.6 Material Composition

The Heat and Material Balances (HMBs) will be provided by Todd Energy's process engineer [Ref. 9]. The wellstream fluid from each well have different flowrates, material compositions and operating conditions. Any stream that has unique consequences will be represented by dedicated sections. For sections with similar operating conditions or fluid composition that have similar consequence results, the worst-case scenario will be selected as representative, to rationalise the number of scenarios performed. This is to avoid the averaging out of inputs of different wellstreams, as it may create a stream with 'brand new' operating conditions, material compositions and flowrates which does not represent the actual release conditions.

As far as is reasonable, the compositions in each stream are simplified, i.e. isomers are summed together and the C6+ hypothetical materials (KP01, up to KP30) are represented by different heavy alkanes. The following alkanes are selected to represent different ranges of hypothetical materials found in the streams based on their properties:

- KP01 to KP10 are assumed to be C7;
- KP11 to KP20 are assumed to be C10; and
- KP21 to KP30 are assumed to be C20.

Note that the hypothetical materials in the Todd Energy's Methodology Guideline are represented in ST01 to ST30; whereas the hypothetical materials in the HMB provided by the process engineer are represented in KP01 to KP30. The hypotheticals STXX are the same as KPXX [Ref. 19].

The important characteristic of molecular weight is kept close to the actual value to ensure the release rate is representative.

The effects of water cut of the hydrocarbon on fire hazards will be considered to identify the streams that are considered not flammable due to high water content. According to Oil and Gas UK Fire and Explosion Guidance [Ref. 10], for water cuts under 50%, no significant reduction in heat fluxes to engulfed objects can be expected (<10%). However, for water cuts over 50%, the flames are significantly less radiative, and the overall heat flux to an obstacle can be reduced by 40% or more. To be in line with Oil and Gas UK Fire and Explosion Guidance, it is assumed that a mixture remains flammable if it has a water cut of up to 125% (defined as mass of water/ mass of fuel x 100%), although not necessarily capable of supporting a stable flame in the absence of some other supporting mechanisms.

Similarly, increasing concentrations of CO_2 were found to reduce the likelihood of ignition of a methane jet release. At CO_2 concentrations of 22–40% (v/v) it was possible for a self-sustaining flame to exist, but beyond these concentrations a pilot flame was required to aid combustion. Beyond 60% CO_2 the pilot flame had no effect and the mixture was completely inert [Ref. 22].

The average flammability of the mixtures will be calculated by Safeti software, considering the effects of the inert components (e.g., CO_2, N_2 and H_2O).

3.7 Release Scenarios

Release rates will be calculated based on the release hole size and operating pressure. All releases will be modelled at initial process conditions until the entire isolatable inventory has been depleted and will not take account of the depressurisation that occurs over time.

All wellsites have automated ESD on fire detection, and KA-8/18 has automatic ESD on gas detection as well. Hydrocarbon leaks at the wellsites or along the pipelines (other than minor leaks) will lead to pressure and/or liquid level drop at KPS, which will alert the operators to perform a check at the wellsite(s).

Given the proximity to the KPS, operators can generally arrive at the wellsites within 15 minutes. As such, 15 minutes delayed detection will be assumed, and 15 minutes of released inventory will be added. Full bore rupture cases are only considered credible when there is major work on site, and the wellsite would be manned to detect the leak immediately. Hence undetected full bore rupture is not considered credible.

The inventory for well blowout and well release events will be considered as unlimited because they can be supplied from the downhole reservoirs.

The wellsites bunding and drainage systems are designed to contain hazardous materials within the boundaries of the wellsite. Therefore, condensate pools are assumed to remain confined within the site.

Other assumptions to be applied in the QRA include:

- The height of release from all scenarios will be assumed to be at 1 m above ground, although some equipment may be located at the elevation higher than the ground level.
- For wellsite releases, 70% of the releases should be modelled as horizontal releases and 30% of the releases as vertical releases. Well blowout will be modelled as 100% vertical release.
- All outdoor releases are modelled as non-impinged (free) releases and are monitored at the downwind direction.
- A free-field condition is assumed although in real facility situations, multiple obstructions beyond the leak source could shield or deflect the jet fire. Obstructions in the path of the vapour cloud could also alter the concentration of gas in the cloud
- Fire durations are estimated based on the assumption that isolation and shutdown are immediate.
- In estimating piping length, a safety factor of 1.25 will be applied to all lengths measured from the map to account for bends and elevations which could not be determined from the 2D map.
- For liquid releases from pressurised sources, if the rainout is significant then a pool fire will result. If not, a spray fire (equivalent to a jet fire) will result. It is suggested in the Oil and Gas UK Fire and Explosion Guidance [Ref. 10] that for ignited two-phase releases:
  - If the Gas Oil Ratio (GOR) is low, at drive pressures above 10 bar(abs) a spray fire will result;
  - If the GOR is high, at drive pressures above 5 bar(abs) a spray fire will result.

Note: Gas oil ratio is the ratio of gas to oil within the hydrocarbon fluid. A high GOR indicates a high gas content which has implications for the potential for gas fires from a depressurisation and release [Ref. 10].

3.8 Congested Area

A flammable vapour cloud accumulation at congested area(s) is the prerequisite to a vapour cloud explosion (VCE). There is limited equipment at the wellsites, and these areas are generally open with good ventilation expected throughout the year. The possibility of flammable vapour accumulating and developing into subsequent vapour cloud explosions, are considered not credible. Hence, VCE modelling will not be carried out.

3.9 Atmospheric Conditions for Modelling

Meteorological conditions impact the outcomes of release modelling, including downwind flammable and toxic vapour cloud dispersion distance (influenced by atmospheric stability and wind speed), rate of pool vaporisation (ambient temperature), and atmospheric attenuation of radiant heat (temperature and relative humidity).

3.9.1 Wind Speed and Direction

Wind speed and direction data are taken from NIWA's CliFlo database [Ref. 16] for the Hawera Automatic Weather Station (AWS) to represent the atmospheric conditions at Kapuni. Data for 5-year period from January 2008 to December 2012 are taken, with wind speed and direction measurements taken every hour. The wind rose is shown in Figure 3-2.

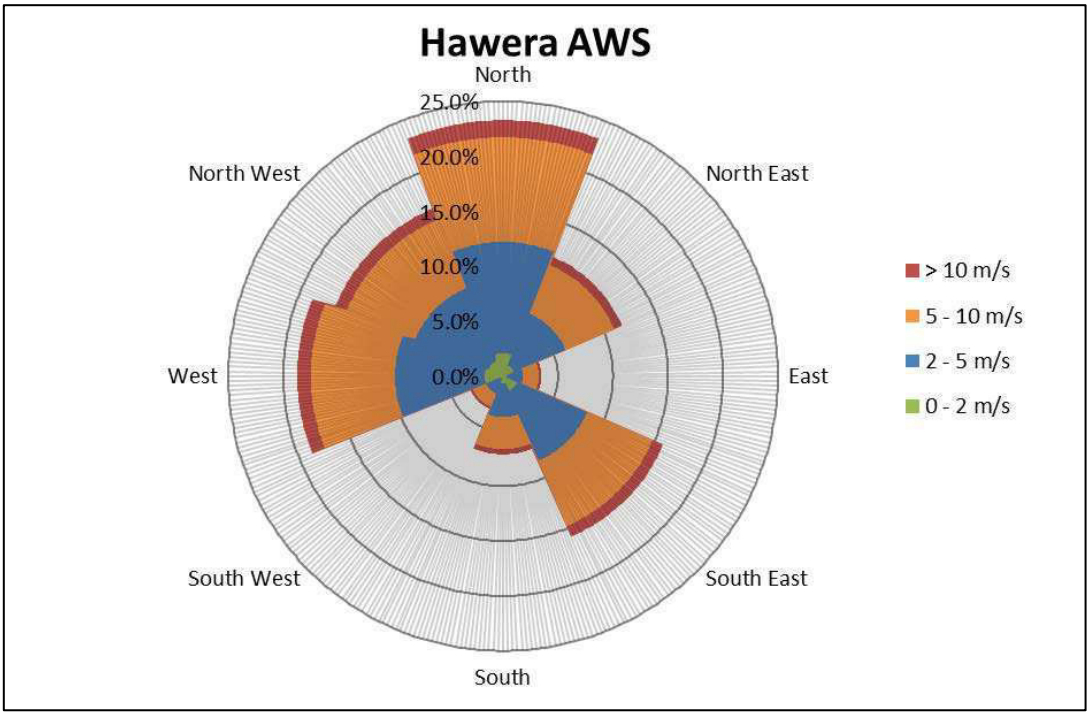

Figure 3-2: Hawera AWS Windrose

The following combinations of wind speed and atmospheric stability will be considered in the QRA that represents the typical wind speed conditions around the wellsites:

- 2/F – wind speed of 2 m/s with Pasquill Stability class F – stable, night with moderate clouds and light/moderate wind
- 5/D – wind speed of 5 m/s with Pasquill Stability class D – neutral, little sun and high wind or overcast/windy night
- 10/D – wind speed of 10 m/s with Pasquill Stability class D

For the modelling, wind speed reference height (the height at which the wind impacts a release) will be set at 1 m (i.e., so as to match the release height). The Power Law wind profile will be applied where the wind speed varies with height according to power-law profile.

By consideration of the Pasquill Stability class relationship with day and night and wind speeds, the wind data for use in the QRA model is calculated as shown in Table 3-6.

Table 3-6: Hawera AWS Wind Data

Wind Speed / Pasquill Stability	North	North East	East	South East	South	South West	West	North West	Total
0 - 2 m/s / F	2.1%	1.1%	0.3%	1.4%	0.6%	0.3%	1.7%	1.5%	9.0%

Wind Speed / Pasquill Stability	North	North East	East	South East	South	South West	West	North West	Total
2 - 5 m/s / D	10.1%	5.1%	1.5%	6.9%	3.1%	1.4%	8.2%	7.2%	43.5%
> 5 m/s / D	11.1%	5.6%	1.7%	7.5%	3.4%	1.5%	8.9%	7.9%	47.5%
Total	23.3%	11.8%	3.5%	15.9%	7.1%	3.2%	18.7%	16.5%	100.0%

3.9.2 Ambient Temperature and Relative Humidity

The following ambient temperature and relative humidity as consistent with those used in the KPS QRA [Ref. 18] will be used in the QRA:

- Ambient temperature: 14°C
- Relative humidity: 83%

3.9.3 Solar Radiation

The allowance for solar radiation will not be included in the thermal radiation effects consideration.

3.9.4 Surface Roughness

Safeti cannot take into account the effects of the local undulating topography for the gas dispersion. The surface roughness of 30 mm will be applied, which generally represents an area of “open flat terrain; grass, few isolated objects” to represent the open area of the wellsites.

3.10 Fatality Criteria

The physical effects from these consequences can have different impacts on humans. The variation of harm from different effects is reflected in a parameter known as the harm probability. In this study, human harm relates to high potential for fatality.

3.10.1 Heat Radiation

The method of calculating the probability of fatality for an individual, given known exposure duration and thermal heat radiation levels, is undertaken by using a Probit function. The Probit function is a general formula which takes the same form, but with various constants used. The Probit used for lethality calculations is taken from the TNO Green Book [Ref. 17]. The Probit function is defined as follows:

$$\text{Probit} = -36.38 + 2.56 \ln (t \times q^{4/3})$$

Where:

t = exposure duration in seconds

q = thermal radiation level in W/m^2

Safeti calculates the Probit values during the analysis.

An exposure duration of 20 seconds has been used as a base case, although it is noted that personnel are likely to find some form of shielding protection within this time frame.

3.10.2 Flash Fire

If personnel are within the 100% lower flammable limit (LFL) of the gas plume, 100% fatality is assumed. LFL is the lower end of the concentration range over which the flammable mixture of vapour in air can be ignited.

A flash fire occurs when a dispersed cloud of flammable vapour and air mixture is ignited within its flammable regions, causing a wall of flame to spread throughout the flammable region and back to the release point. The flame propagates through the cloud in a manner such that negligible or no damaging overpressure is generated. This flash is almost instantaneous as the flame propagates at high speed through the cloud and back to the source.

An assumption of 100% fatality rate within the footprint of the cloud is conservative and does not allow for potential risk reducing considerations such as:

- uneven mixing of flammable vapour and air in the cloud resulting in uneven propagation of the flame,
- topography,
- sparsely populated rural land use adjoining the site,
- availability of shelter,
- opportunity for escape, and
- clothing worn by persons exposed to the flash fire.

Thermal radiation outside of the flash fire footprint, reduces rapidly and is not sustained due to the instantaneous nature of the event. The potential for fatality outside the flash fire footprint is not considered credible.

3.10.3 BLEVE

Boiling Liquid Expanding Vapour Explosion (BLEVE) is an escalation scenario that occurs as a result of prolonged flame impingement on above ground pressurised vessels containing materials such as liquefied petroleum gas (LPG) or light end hydrocarbon. BLEVE would result in an explosion overpressure together with a fireball and missile generation over some distance. As the fireball tends to drift upward and to avoid double counting, only fatalities from the explosion overpressure effects are considered in this risk assessment. The probability of BLEVE depends on various factors, including the types of flammable material and liquid inventory in the vessel, material of construction of the vessel, types and number of fire protection systems (e.g. relief valves, cooling systems), mechanism of vessel failure (external impact, jet fire impingement or pool fire impingement), etc. Passive Fire Protection (PFP) can be provided on pressurised vessels to minimise the probability of BLEVE. There is no clear guideline or criteria to determine the likelihood of a BLEVE on a pressurised vessel. For this risk assessment, BLEVE will be considered credible if a pressurised vessel containing at least 4 m^3 of volatile hydrocarbon (liquid butane or lighter) is exposed to direct flame impingement for 5 minutes or longer.

Liquid volume calculation for the vessels at the wellsites are shown in Table 3-7.

Table 3-7: Kapuni Wellsites Vessels Liquid Volume Estimation

Tag	Description	Diameter (m)	Length / Height (m)	Volume (m^3)	Liquid Level (mm)	Liquid Volume (m^3)
KA-02						
V-201A	HP Knockout	0.686	4.572	1.69	343	0.84
V-204A	Secondary Knockout	0.914	3.048	2.00	457	1.00
V-0202A	LT Separator	1.219	3.810	4.45	1905	2.22
KA-05						
V-0516	KA-5 Desander	0.406	4.572	0.59	406	0.59

Tag	Description	Diameter (m)	Length / Height (m)	Volume (m^3)	Liquid Level (mm)	Liquid Volume (m^3)
KA-19						
V-2154	Wellhead Knockout	1.068	4.572	4.10	534	2.05
KA-8/18						
V-2803	HP Knockout Drum	0.685	4.570	1.68	342.5	0.84
V-9010	Wellstream Separator (2 phase)	1.600	4.500	9.05	800	**4.52**
V-9020	Wellstream Separator (2 phase)	1.600	4.500	9.05	800	**4.52**
V-2808	LT Separator	1.830	5.640	14.83	915	**7.42**
V-2804	Low Temperature Separator	1.220	3.810	4.45	1905	2.23
V-2805	Secondary Knockout	915	3.050	2.01	457.5	1.00

Based on the table, the liquid volume for the KA-8/18 Wellstream Separators (V-9010 & V-9020) and LT Separator (V-2808) might be greater than 4 m^3. However, based on the Heat and Material Balance, the composition of the liquid sections from the Wellstream Separators is mainly water (approx. 88 vol%), and the liquid from the LT Separator is mostly heavy hydrocarbons with volatile hydrocarbons making up only 15 vol% of the total composition. Therefore, it is considered that all vessels in Kapuni Wellsite do not have BLEVE potential.

3.10.4 Toxic Effects

Fatality probability when exposed to toxic gas as a function of exposure concentration and duration can be calculated by using a probit function of the form given below:

$$\text{Probit} = a + b \ln (C^n \times t)$$

where:

t = exposure duration in minutes

C = concentration in ppm

a, b and n = material specific probit constants

Toxic effect from methanol will be considered in the QRA. UK HSE gives the following toxic load values for methanol:

- SLOT = 8.02×10^5 $ppm^n \cdot min$ (1% fatality probability)
- SLOD = 2.67×10^6 $ppm^n \cdot min$ (50% fatality probability)

By solving the simultaneous equation, the other constants a and b can be calculated. The probit constants for methanol are:

a = -23.67

b = 1.94

n = 1

3.11 Risk Criteria

Risk is the combination of the likelihood and consequence of such accidents. It is defined as the probability of a specific adverse event occurring in a specific period or in specified circumstances. The likelihood may be expressed either as a frequency (i.e. the rate of events per unit time) or a probability (i.e. the chance of the event occurring in specified circumstances). The consequence is the degree of harm caused by the event.

Escape and evacuation fatalities are generally not considered for an onshore plant due to the open site layout and personnel's ready accessibility to the muster area. Hence, only immediate fatalities will be taken into account when performing the risk analysis to onsite workers.

Key deliverable for this study is the location specific individual risk (LSIR) in the form of risk contour. LSIR is the risk of fatality at a point in space to a hypothetical individual at a location for 365 days per year, 24 hours a day, unprotected and unable to escape. In real situation, people do not constantly remain in one location, so this risk value does not provide a realistic representation of the true level of risk.

However, this value allows different areas to be compared on the same basis and is a useful measure for establishing the most hazardous areas of the plant, or for the comparison of facility risk profiles against standard criteria. The LSIR can be expressed as follows:

$$LSIR = \sum F \times P$$

Where:

F = Frequency of an event outcome per year

P = Probability of death due to the event at the location

∑ = Sum over all modelled events

LSIR is usually presented as risk contours or by defining risks at selected locations (e.g. site boundary).

As there are no standard risk criteria which have been developed for the NZ context, this deliverable will be assessed against the suggested risk criteria in the NSW Hazardous Industry Planning Advisory Paper No. 4 (HIPAP4) "Risk Criteria for Land Use Planning" as shown in Table 3-8.

Table 3-8: HIPAP 4 Individual Fatality Risk criteria

Land Use	Risk Criteria Adopted (per annum)	Interpretation for QRA
Hospitals, schools, childcare facilities, old age housing	0.5×10^{-6} (or 5×10^{-7}) (1 in 2 million)	5×10^{-7} risk contour should not extend to these areas
Residential, hotels, motels, tourist resorts	1×10^{-6} (1 in 1 million)	1×10^{-6} risk contour should not extend to these areas
Commercial developments including retail centres, offices and entertainment centres	5×10^{-6} (1 in 200,000)	5×10^{-6} risk contour should not extend to these areas
Sporting complexes and active open space	10×10^{-6} (or 1×10^{-5}) (1 in 100,000)	1×10^{-5} risk contour should not extend to these areas
Industrial	50×10^{-6} (or 5×10^{-5}) (1 in 20,000)	5×10^{-5} risk contour should, as a target, be contained within the boundaries of the industrial site where applicable

NSW HIPAP 4 states that where these criteria are initially exceeded, commercial and industrial land development may be appropriate where mitigating measures can be implemented to reduce risk exposure to less than the target individual fatality risk level.

4. REFERENCES

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