

Todd Kapuni GTP
Monitoring Programme
Annual Report
2019-2020

Technical Report 2020-03

Taranaki Regional Council
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Executive summary

Todd Petroleum Mining Company Ltd operates a gas treatment plant (Kapuni Gas Treatment Plant, KGTP) located on Palmer Road at Kapuni, in the Kapuni catchment, South Taranaki. The site was previously operated by Vector Gas Ltd, with ownership changing to Todd Petroleum Mining Company (the Company) in April 2020.

This report for the period July 2019 to June 2020 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the Company's environmental and consent compliance performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of the Company's activities.

During the year the Company held a total of nine resource consents, which included a total of 85 conditions setting out the requirements that they must satisfy. The Company held one consent to allow it to take water, two consents to discharge effluent /stormwater into the Kapuni stream, three consents to discharge to land, two land use permits, and one consent to discharge emissions into the air at the site. Two certificates of compliance were also held in relation to activities permitted under the Regional Freshwater Plan.

Two of these consents and both of the certificates of compliance were surrendered on 3 April 2020 as they were no longer required in relation to site activities.

During the monitoring period, the Company demonstrated an overall high level of environmental performance.

The Council's monitoring programme for the year under review included three inspections, six water samples collected for physicochemical analysis and inter-laboratory comparisons, a review of four biomonitoring surveys for receiving waters and two fish surveys. Also, a review of monthly provided effluent data and surface water abstraction data was undertaken throughout the monitoring period. Daily surface water abstraction data was also assessed.

The monitoring indicated that the effects of the discharge of stormwater and process waters into the Kapuni Stream were minimal. Inter-laboratory analysis indicated overall good agreement between both parties. Surface water abstraction was compliant across the whole monitoring period.

The review of the biological monitoring concluded that overall, the MCI scores for nearly all sites were similar to or higher than their respective means. The Kapuni Stream was generally in 'good' to 'excellent' health and the impact (if any) of the industrial activity at Kapuni was not discernible.

The findings of the fish surveys concluded that electric fishing from the neighbouring Kapuni catchment do not provide any conclusive indication that the petrochemical industries are having any significant adverse effects on fish communities in the Kapuni catchment, with results being affected by sedimentation and a significant number of preceding freshes.

In terms of emissions to the air, the triennial report required under special condition 4 consent 4087 was provided during the monitoring year. The associated analyses indicated that CO₂ emissions, steam use per unit of gas, and metal depositions all exhibited reduced or similar levels to previous reporting from 2015-2019.

Additional ambient air quality monitoring for carbon monoxide (CO) and nitrogen dioxide (NO₂) was conducted per the Company's request under conditions 8 and 9 from consent 4087-2. The results indicated the KGTP was rated in the Ministry for Environment National Environmental Standards and Ambient Air Quality Guidelines "excellent" to "acceptable" categories for 1-hour and 24-hour average NO₂ concentrations, and "excellent" for 1-hour and 8-hour average CO concentrations throughout the November 2019 to January 2020 period.

The Council were notified by the Company on two occasions in respect to incidents on site. These two incidents did not result in a consent non-compliance, though on one occasion the incident led to a slight tweak of site processes. There were zero incidences requiring further investigation in respect of this consent holder during the period under review.

During the year, the Company demonstrated a high level of environmental and administrative performance with the resource consents.

For reference, in the 2019-2020 year, consent holders were found to achieve a high level of environmental performance and compliance for 81% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 17% of the consents, a good level of environmental performance and compliance was achieved.

In terms of overall environmental and compliance performance by the consent holder over the last several years, this report shows that the consent holder's performance remains at a high level in the year under review.

This report includes recommendations for the 2020-2021 year.

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1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

This report is for the period July 2019 to June 2020 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by Todd Petroleum Mining Company Limited (the Company). The Company operate a gas treatment plant Kapuni Gas Treatment Plant (KGTP) which is situated on Palmer Road, at Kapuni, in the Kapuni catchment, South Taranaki.

The report includes the results and findings of the monitoring programme implemented by the Council in respect of the consents held by the Company that relate to abstractions and discharges of water within the Kapuni catchment, and the air discharge permit held by the Company to cover emissions to air from the site.

One of the intents of the Resource Management Act 1991 (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective.

Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of the Company's use of water, land and air, and is the twenty-ninth combined annual report by the Council for the Company.

1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about:

- Consent compliance monitoring under the RMA and the Council's obligations;
- The Council's approach to monitoring sites through annual programmes;
- The resource consents held by the Company in the Kapuni catchment;
- The nature of the monitoring programme in place for the period under review; and
- A description of the activities and operations conducted in the Company's site/catchment.

Section 2 presents the results of monitoring during the period under review, including scientific and technical data.

Section 3 discusses the results, their interpretations, and their significance for the environment.

Section 4 presents recommendations to be implemented in the 2020-2021 monitoring year.

A glossary of common abbreviations and scientific terms, and a bibliography, are presented at the end of the report.

1.3 The Resource Management Act 1991 and monitoring

The RMA primarily addresses environmental 'effects' which are defined as positive or adverse, temporary or permanent, past, present or future, or cumulative. Effects may arise in relation to:

- a. The neighbourhood or the wider community around an activity, and may include cultural and social-economic effects;
- b. Physical effects on the locality, including landscape, amenity and visual effects;
- c. Ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;

- d. Natural and physical resources having special significance (for example recreational, cultural, or aesthetic); and
- e. Risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Council is recognising the comprehensive meaning of 'effects' inasmuch as is appropriate for each activity. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the RMA to assess the effects of the exercise of consents. In accordance with Section 35 of the RMA, the Council undertakes compliance monitoring for consents and rules in regional plans, and maintains an overview of the performance of resource users and consent holders. Compliance monitoring, including both activity and impact monitoring, enables the Council to continually re-evaluate its approach and that of consent holders to resource management and, ultimately, through the refinement of methods and considered responsible resource utilisation, to move closer to achieving sustainable development of the region's resources.

1.4 Evaluation of environmental and administrative performance

Besides discussing the various details of the performance and extent of compliance by the Company, this report also assigns them a rating for their environmental and administrative performance during the period under review.

Environmental performance is concerned with actual or likely effects on the receiving environment from the activities during the monitoring year. Administrative performance is concerned with the Company's approach to demonstrating consent compliance in site operations and management including the timely provision of information to Council (such as contingency plans and water take data) in accordance with consent conditions.

Events that were beyond the control of the consent holder and unforeseeable (that is a defence under the provisions of the RMA can be established) may be excluded with regard to the performance rating applied. For example loss of data due to a flood destroying deployed field equipment.

The categories used by the Council for this monitoring period, and their interpretation, are as follows:

Environmental Performance

High: No or inconsequential (short-term duration, less than minor in severity) breaches of consent or regional plan parameters resulting from the activity; no adverse effects of significance noted or likely in the receiving environment. The Council did not record any verified unauthorised incidents involving environmental impacts and was not obliged to issue any abatement notices or infringement notices in relation to such impacts.

Good: Likely or actual adverse effects of activities on the receiving environment were negligible or minor at most. There were some such issues noted during monitoring, from self reports, or during investigations of incidents reported to the Council by a third party but these items were not critical, and follow-up inspections showed they have been dealt with. These minor issues were resolved positively, co-operatively, and quickly. The Council was not obliged to issue any abatement notices or infringement notices in relation to the minor non-compliant effects; however abatement notices may have been issued to mitigate an identified potential for an environmental effect to occur.

For example:

- High suspended solid values recorded in discharge samples, however the discharge was to land or to receiving waters that were in high flow at the time;
- Strong odour beyond boundary but no residential properties or other recipient nearby.

Improvement required: Likely or actual adverse effects of activities on the receiving environment were more than minor, but not substantial. There were some issues noted during monitoring, from self reports, or during investigations of incidents reported to the Council by a third party. Cumulative adverse effects of a persistent minor non-compliant activity could elevate a minor issue to this level. Abatement notices and infringement notices may have been issued in respect of effects.

Poor: Likely or actual adverse effects of activities on the receiving environment were significant. There were some items noted during monitoring, from self reports, or during investigations of incidents reported to the Council by a third party. Cumulative adverse effects of a persistent moderate non-compliant activity could elevate an 'improvement required' issue to this level. Typically there were grounds for either a prosecution or an infringement notice in respect of effects.

Administrative performance

High: The administrative requirements of the resource consents were met, or any failure to do this had trivial consequences and were addressed promptly and co-operatively.

Good: Perhaps some administrative requirements of the resource consents were not met at a particular time, however this was addressed without repeated interventions from the Council staff. Alternatively adequate reason was provided for matters such as the no or late provision of information, interpretation of 'best practical option' for avoiding potential effects, etc.

Improvement required: Repeated interventions to meet the administrative requirements of the resource consents were made by Council staff. These matters took some time to resolve, or remained unresolved at the end of the period under review. The Council may have issued an abatement notice to attain compliance.

Poor: Material failings to meet the administrative requirements of the resource consents. Significant intervention by the Council was required. Typically there were grounds for an infringement notice.

For reference, in the 2019-2020 year, consent holders were found to achieve a high level of environmental performance and compliance for 81% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 17% of the consents, a good level of environmental performance and compliance was achieved.

1.5 Process description

The KGTP was originally owned and operated by Vector Limited, known originally as National Gas Company (NGC). It was built during 1969-1970. In the monitoring period covered by this report KGTP was acquired by Todd Petroleum Mining Company Limited. This occurred on 1 April 2020.

The original plant was designed to process high carbon dioxide Kapuni gas to a quality suitable for use in general domestic, commercial and industrial appliances. The process involves the removal of carbon dioxide from the gas, which is then dried and chilled to remove some of the heavier hydrocarbons which could affect pipeline operation and appliance efficiency. The pipeline quality gas is then distributed via the transmission distribution network.

The first of several plant expansions occurred in 1973 with the addition of plant to process the heavier hydrocarbons into LPG (liquefied petroleum gas) and natural gas. In 1979-1980, further additions were

made to process Maui gas and to recover, purify and liquefy some of the carbon dioxide from the gas. The liquid carbon dioxide is used in the beverage, food processing and refrigeration markets.



Photo 1 Kapuni Gas Treatment Plant (KGTP) during three train operation¹

In 1985, the gas treatment plant was expanded with the installation of the low temperature separation (LTS) gas conditioning plant which processed the high carbon dioxide content Kapuni gas for water and heavy hydrocarbon removal only. The conditioned gas was supplied to the region's methanol plants so that it could be blended with the much lower carbon dioxide content Maui gas for more efficient methanol production. Methanex reduced its production capacity and as a result the gas conditioning plant was mothballed in May 2005.

During 1997, the KGTP refrigeration systems were upgraded, enabling more natural gas liquids to be removed from the raw gas. Reliability and efficiencies were further improved with the completion in 1998 of a \$25 million, three-year refurbishment of the plant's processes and control systems.

The Company and Todd Energy were 50:50 partners in Kapuni Energy which had developed a \$37 million, 25MW cogeneration plant within the Company's gas treatment plant complex at Kapuni. It provides the electricity and steam requirements of the KGTP and Fonterra's Lactose factory at Kapuni. It also exports excess electricity into the national grid.

¹ The Council has used these compliance grading criteria for 15 years. They align closely with the 4 compliance grades in the MfE Best Practice Guidelines for Compliance, Monitoring and Enforcement, 2018

During the 2004-2005 period, NGC completed a \$7 million upgrade of the treatment plant, involving re-commissioning one of the plant's three process trains, adding a further 100 tonnes of LPG storage, and installing a reverse osmosis water treatment plant.

In April 2006 NGC changed its name to Vector Ltd. NGC remains a legal entity holding previously issued consents, but consents applied for after this date were granted in the name of Vector Gas Ltd and more recently, Vector Ltd.

The gas supply for the plant comes from the adjacent Kapuni Gas Production Station formerly operated by Shell Taranaki Ltd and now by Todd Petroleum Mining Company Limited.

Water is drawn from the Kapuni Stream via the intake structure and raw water supply line for Hawera water treatment plant. Water discharges are from the gas treatment process, plant utilities, domestic effluent and site stormwater. Solid waste discharges are from settling basins for water treatment and waste storage. Air discharges are from the gas treatment process.

1.6 Resource consents

During the 2019-2020 monitoring period the Company held nine resource consents, as well as two certificates of compliance. Consents 5091-1 and 7281-1, and certificates of compliance 7633-0 and 7756-0 were surrendered on 3 April 2020 as they were no longer required in relation to site activities.

A summary of the various consent types issued by the Council is included in Appendix I, as are copies of all permits held by the Company during the period under review.

Table 1 Summary of resource consents held by the Company

Consent Number	Purpose	Consent Granted/ Commencement Date	Change to Conditions Date	Next Review Date	Expiry Date
<i>Discharge to Air Permits</i>					
4087-2	Discharge emissions to air from on-site activities and ancillary activities	Jan 1997	-	2023	2029
<i>Discharge to Water Permits</i>					
1123-3	Discharge cooling and wastewater to Kapuni Stream	Jun 2012	-	2023	2035
5091-1*	Discharge steam pipeline construction materials and associated stormwater onto land and into the Motumate Stream and an unnamed tributary of the Waiokura Stream	Jan 1997	-	N/A	N/A
7755-1	Discharge stormwater from (non-process areas) containing natural gas into Kapuni Stream	Jun 2012	-	2023	2035
<i>Discharge to Land Permits</i>					
1225-3	Discharge up to 13.5m ³ /day (0.97 L/s) of treated sewage and process wastes to land	Jun 2012	-	2023	2035
7043-1	Discharge stormwater, settling and filter backwash ponds sludge to land	Jan 2010	-	2023	2023
<i>Water Use Permits</i>					

Consent Number	Purpose	Consent Granted/ Commencement Date	Change to Conditions Date	Next Review Date	Expiry Date
1125-4	Take up to 33 L/s from Kapuni Stream	Jun 2012	-	2020	2035
<i>Land Use Permits</i>					
5090-1	Structures for pipeline crossings above and around the Motumate Stream and an unnamed tributary of the Waiokura Stream for electrical supply	Jan 1997	-	2023	2032
7281-1*	Remove weir structure from Kapuni Stream and undertake works for river bank protection	Apr 2008	-	N/A	N/A
<i>Certificate of Compliances</i>					
7633-0*	Structures in, on, over or under Kapuni Stream	Mar 2010	-	-	-
7756-0*	Discharge stormwater from LPG load-out to land	Dec 2010	-	-	-

* These consents and certificates of compliance were surrendered on 3 April 2020 as they were no longer required in relation to site activities

1.7 Monitoring programme

1.7.1 Introduction

Section 35 of the RMA sets obligations upon the Council to gather information, monitor and conduct research on the exercise of resource consents within the Taranaki region. The Council is also required to assess the effects arising from the exercising of these consents and report upon them.

The Council may therefore make and record measurements of physical and chemical parameters, take samples for analysis, carry out surveys and inspections, conduct investigations and seek information from consent holders.

The monitoring programme for the Company consisted of four primary components.

1.7.2 Programme liaison and management

There is generally a significant investment of time and resources by the Council in:

- Ongoing liaison with resource consent holders over consent conditions and their interpretation and application;
- Discussion over monitoring requirements;
- Preparation for any consent reviews, renewals or new consent applications;
- Advice on the Council's environmental management strategies and content of regional plans; and
- Consultation on associated matters.

1.7.3 Site inspections

The site was visited on three occasions during the monitoring period. With regard to consents for the abstraction of or discharge to water, the main points of interest were plant processes with potential or

actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters. Air inspections focused on plant processes with associated actual and potential emission sources and characteristics, including potential odour, dust, noxious or offensive emissions. Sources of data being collected by the Company were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

1.7.4 Chemical sampling

Chemical sampling undertaken by the Council in this monitoring period was focused on the discharge from the facility and the effects on the receiving waters. The Company holds consent 1123-3. This allows for the discharge of cooling and waste waters to the Kapuni Stream throughout the year. The process of the discharge is controlled by the facility and checked through chemical analysis prior to the discharge occurring. The analysis of the discharge is provided to the Council in the form of a monthly report.

In order to ascertain the quality of the results provided by the Company, the Council conducted inter-laboratory comparison exercises which encompassed the following methodology.

A sample of the discharge waters is collected and split between two samples. The same is performed on the preceding, upstream and the downstream (below the discharge point) sample locations.

These samples are then analysed separately, (one set is analysed at the Company, the other by the Council via RJ Hill laboratory in Hamilton) and the results compared.

Table 2 The Company inter-laboratory comparison analytes

Discharge sample analytes	Upstream and downstream sample analytes
Chlorine (Free)	Conductivity
Chlorine (Total)	Dissolved reactive phosphate (DRP)
Conductivity	Potassium
Dissolved reactive phosphate (DRP)	Sodium
Hydrocarbon	Ammonia and Un-ionised
Potassium	pH
Sodium	Temperature
Ammonia and Un-ionised	Turbidity
pH	Vanadium
Suspended solids	
Temperature	
Turbidity	
Vanadium	
Zinc	

1.7.5 Biomonitoring surveys

A biological macroinvertebrate survey was performed on four occasions during the 2019-2020 monitoring year by the third party consultant Stark Environmental. In addition, two electric fish netting surveys were also carried out. These were undertaken in the Kapuni Stream and associated tributaries at established monitoring locations. The Council reviews the reports formulated by Stark Environmental. The review is provided within this report and is also available on request.

2 Results

2.1 Water

2.1.1 Inspections

Three inspections of the Company site were undertaken this monitoring period by an officer of the Council. The inspections were undertaken on 25 September 2019, 21 February 2020 and 16 June 2020. One additional inspection was also required, however due to the national escalation to alert level four for Covid management, only three inspections were undertaken in this time period.

The focus of these inspections included the following:

- Upcoming operations and current operation;
- Heat recovery steam generator operation;
- Discharge process effluent and stormwater management;
- Kapuni Stream monitoring;
- Liquid transfer system;
- Dry and wet chemical storage;
- On-site sewage treatment system;
- Land treatment;
- River gauging;
- LPG load out facility; and
- Housekeeping.

Overall, the Company plant was found to be in a very tidy condition, with staff knowledgeable about processes and compliance requirements. Further liaison with the Company was also undertaken through inter-laboratory comparison exercises. Stream gauging to establish Kapuni Stream flows is planned to be undertaken by the Council in the upcoming monitoring period, this will replace the current flo-dar stream flow monitor.

2.1.2 Abstraction and discharge monitoring

Surface water abstraction

Water for the Company is drawn from the Kapuni Stream about 1.4 km above the plant via the intake structure and raw water supply line for Hawera water treatment plant. South Taranaki District Council (STDC) holds land use permit 7413-1 for the structure and water permit 0146-2 to take.

Under its own water permit 1125-4, the Company must install and maintain a meter and datalogger at the point where the water enters the supply line for the Company site. The monitoring equipment must be certified by an appropriately qualified person at least every five years.

The water permit conditions are consistent with the Resource Management (Measurement and Reporting of Water Takes) Regulations 2011, which required the Company by 10 November 2012 to keep daily records of volume taken, and thereafter supply by 31 July each year the record for the preceding 1 July to 30 June period. By stipulating a monitoring point other than the take location, the grant of consent 1125-4 constitutes an approval by Council under the Regulations.

Volumes supplied to the Company had been measured and recorded on STDC's supervisory control and data acquisition (SCADA) system since 6 January 2010. Telemetry directly to Council was connected in January 2014.

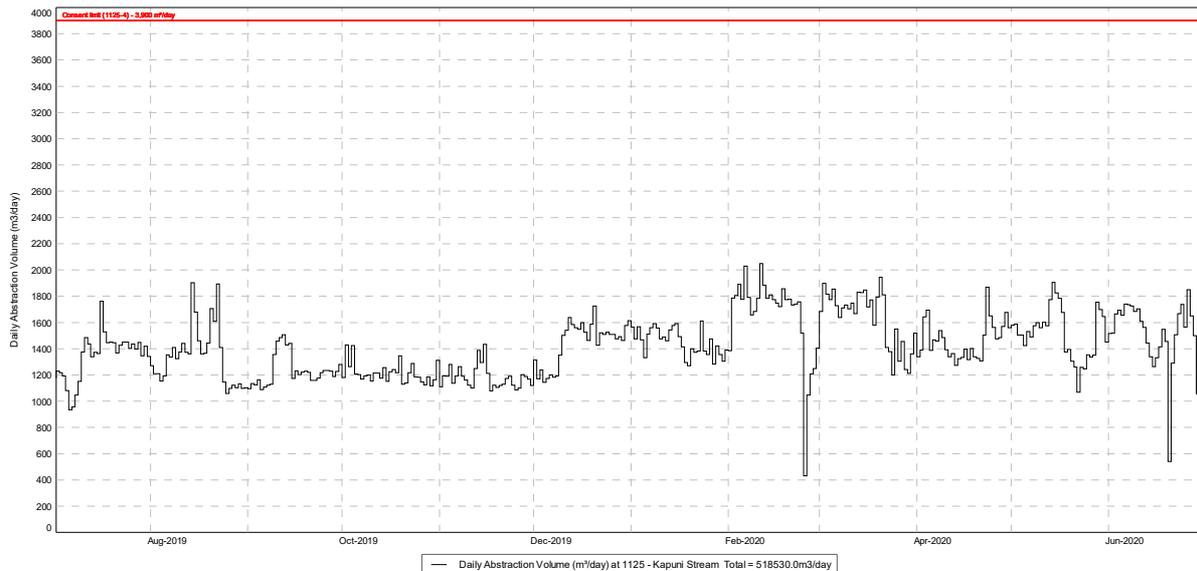


Figure 1 Daily surface water abstraction volumes (1125-4) the Company KGTP

The daily surface water extraction record 19 provided above in Figure 1. Consent 1125-4 allows for a maximum daily surface water abstraction of 3,900 m³ per day. In this monitoring period the Company were well below this limit. The total volume abstracted was recorded at 518,530 m³.

This is a reduction of 366,295 m³ when compared to the 2018-2019 monitoring period. The Company only utilised 36.4% of its total abstraction allowance in the 2019-2020 monitoring period.

2.1.3 Provision of consent holder data

Monitoring of the discharge constituents and the Kapuni Stream is undertaken by the Company, prior to each discharge and one hour following commencement of the discharges authorised by discharge consent 1123-3.

Consent 1123-3 requires the preparation of an effluent disposal management plan. The plan includes the reporting on the exercise of the consents. As such the Company provided, at approximately monthly intervals, discharge data in relation to these consents for the monitoring period.

On two occasions in this monitoring period the Council carried out inter-laboratory comparisons with the Company site laboratory. The results are discussed in the following section 2.14.

The following pertains to assessment of the Company discharge and stream monitoring data. This data was provided to the Council at monthly intervals throughout the year.

Temperature

Temperature is recorded continuously by the Company both upstream and downstream of the discharge point. In 2019-2020, the maximum temperature differential recorded was 1.6°C. This occurred on one occasion (20 March 2020). This was within consent limits, which stipulates a maximum allowable increase of 2.0°C.

pH

Consent **1123-3** requires the discharge to not cause the pH within the Kapuni Stream to be outside the range 6.5-9.0 pH when measured at the downstream (KPN000293) monitoring location. Results provided by the Company detailed that compliance was achieved throughout the monitoring period. In 2019-2020, the maximum recorded pH at the downstream sampling site was 8.12 pH recorded on the 12th February 2020.

The corresponding upstream pH was 7.55 pH. The minimum pH recorded downstream was 6.68 pH recorded on the 8th December 2019. The corresponding upstream pH value was 6.81 pH.

Ammonia

Special condition 6 of consent **1123-3** limits the concentration of unionised-ammonia to not exceed 0.006 g/m³ when measured at the downstream monitoring location on the Kapuni Stream except under specific circumstances, and, in any case the discharge shall not cause the concentration of un-ionised ammonia to exceed 0.025 g/m³ in the Kapuni Stream at this point. This limit is set for the protection of aquatic species.

Results provided by the Company show that compliance was achieved throughout the monitoring period. In 2019-2020, unionised ammonia was recorded above the Company limit of detection (0.00 g/m³) once on the 11th December 2019 at 0.01 g/m³.

The inter-laboratory comparison sample collected by the Council (which is assessed to a lower concentration than the periodic batch testing undertaken by the Company) indicated a value of 0.0007 g/m³ for NH₃ at the lower monitoring location of KPN000293 (21st February 2020). This was also confirmed by the Company laboratory during the inter-laboratory comparison, with a result below the limit of detection (LOD).

Sodium

Special condition 7 of consent limit **1123-3** limits the sodium concentration of the Kapuni Stream to 40 g/m³. The sodium concentration is also further limited to 22 g/m³ in accordance with an agreement with the Company's neighbours; Ballance.

Results provided by the Company in this monitoring period indicated that compliance was achieved for this condition. During the 2019-2020 monitoring period the results indicated that the maximum recorded downstream sodium concentration was 16.70 g/m³. This was recorded on the 3 February 2020. The corresponding upstream value was 11.40 g/m³.

Water treatment chemicals

Special condition 12 of consent **1123-3** requires the consent holder to notify the Council of any change in water treatment chemical or increase in maximum concentration of any water treatment chemical at least one month prior to change of a water treatment programme.

No changes of water treatment chemicals were observed throughout this monitoring period.

2.1.4 Results of receiving environment monitoring

The Council carried out compliance monitoring checks on the Company's method of wastewater discharge. This included the monitoring of the discharge and the Kapuni Stream on the 25th September 2019 and the 21st February 2020.

Split samples were collected by the Company and the Council from the Company's discharge point, and from the Kapuni Stream, both upstream and downstream of the discharge point. Results are presented in Table 3.

Table 3 Council KGTP inter laboratory comparisons 2019-2020

		KGTP	TRC	KGTP	TRC	KGTP	TRC	KGTP	TRC	KGTP	TRC	KGTP	TRC
Site		Upstream KPN000290		Downstream KPN000293		A-705 Outfall IND002008		Upstream KPN000290		Downstream KPN000293		A-705 Outfall IND002008	
Parameter	Unit	Inter-laboratory comparison one						Inter-laboratory comparison two					
Date		25 Sep 2019		25 Sep 2019		25 Sep 2019		21 Feb 2020		21 Feb 2020		21 Feb 2020	
Time	NZST	1340		1320		1330		1020		1055		1035	
Temperature	°C	11	11.8	10.9	11.8	17.7	18.6	19	18.9	20.1	19.9	26.2	26
pH	pH Units	7.65	7.7	7.63	7.7	7.74	7.6	7.58	7.5	7.83	7.8	8.76	8.7
Free Ammonia	g/m ³	<0.001	0.00056	<0.001	0.00061	0.0047	0.0027	<0.001	<0.00012	<0.001	0.0007	0.039	0.028
Ammonia	g/m ³	0	0.052	0.0558	0.054	<u>0.2604</u>	0.18	0.0186	<0.010	0.0372	0.03	0.1488	0.182
Sodium	g/m ³	9.6	8.9	10.4	10.9	35.2	33	11.6	10.3	15.8	14.6	49.6	47
Potassium	g/m ³	3.8	3.6	4	4.1	8.1	7.2	4.4	3.9	4.4	4.4	8.7	7.8
Vanadium	g/m ³	0.01	0.0016	0.01	0.0043	0.29	0.076	0.01	0.0024	0.01	0.0086	0.31	0.06
Chlorine (Free)	mg/L	N/A	N/A	N/A	N/A	N/A	0.01	N/A	N/A	N/A	N/A	N/A	N/A
Chlorine (Total)	mg/L	N/A	N/A	N/A	N/A	N/A	0.01	N/A	N/A	N/A	N/A	N/A	N/A
Dissolved Zinc	g/m ³						0.08						0.119
Conductivity	µS /m	116.3	114	121.3	121	244	239	133.1	131	154.6	151	319	306
Dissolved reactive phosphorus	g/m ³		0.011		0.025		0.56		0.01		0.09		0.75
Total suspended solids	g/m ³						19						33
TPH (C7-C36)	g/m ³						<4						<4
Turbidity	NTU						10.4						14.2
Turbidity	FNU		1.5		1.65				0.38		1.92		
Hardness as CaCO ₃	g/m ³												42

The results of the two inter-laboratory comparisons undertaken in this monitoring period are provided in the above Table 3. The results indicated the following:

- All results were within consent limits.
- Temperature comparisons indicated fairly good agreement between laboratories across both exercises undertaken this monitoring period. The largest variation observed was 0.9 °C on the 25 September 2019 at both the outfall and downstream sites with KGTP underestimating the temperature. However, results from the 21 Feb were more consistent with the Council's results.
- Potassium comparisons indicated good agreement between the laboratories. The largest variation observed was 0.9 g/m³ at both outfall sites.
- Sodium comparisons, in similarity to the potassium readings, indicated good agreement. The largest variation was 2.2 g/m³ at the outfall discharge on the 25 September 2019.
- Ammonia comparisons indicated a slight variation between results on the 25 September 2019. This was a difference of 0.0804 g/m³, with the Company's value indicating a higher result than the Council. This is a slight variation between results. Accuracy at trace concentrations is inherently difficult to gain an accurate agreement.
- pH variations were found to be relatively minor, with the largest variation being 0.14 pH units recorded in the outfall discharge sample on the 25 September 2019.
- In similarity to the previous monitoring period, the vanadium results indicated slight variations. The largest variation (0.25 g/m³) was recorded at the outfall on the 21 February 2020. The reason for this variation was due to the method of analysis undertaken by the Company. The Company requires a swift result as they are required to discharge almost daily. The Company infers vanadium concentration based on the ratio between vanadium and potassium in the Benfield solution (this is the source of vanadium in the KGTP effluent). As potassium concentrations may increase from other sources in the process effluent, it results in an over-estimate of the true vanadium in the effluent. The Company treats the effluent vanadium value as true which allows for a margin of error with respect to the discharge concentration.
- Un-ionised ammonia concentrations were all below, or close to, the limit of detection.
- Total and free chlorine monitoring of the outfall discharge was undertaken on the 25 September 2019. The associated analysis indicated values below the limit of the detection.
- This is the first monitoring period where dissolved zinc and CaCO₃ hardness were recorded at the outfall discharge site. The highest result indicating 0.119 g/m³ dissolved zinc present, with a corresponding CaCO₃ hardness of 42 g/m³ recorded on the 21st February 2020.

2.1.5 Biomonitoring in Kapuni catchment 2019-2020

Four macroinvertebrate surveys and two fish surveys were scheduled for the Kapuni Catchment for the 2019-2020 monitoring period by the consultant; Stark Environmental, on behalf of the Company. A review of the reports was performed by an officer of the Council. A brief synopsis of the survey review is provided below with associated dates provided in the following Table 4. The sample locations are also provided in Figure 2.

Table 4 Overview of the monitoring programme for the Kapuni Catchment

Survey dates	Report number	Taxa	Number of sites	
			Kapuni Stream	Tributaries
29/07/19 8/08/19	2019-07	Macroinvertebrate	7	2

Survey dates	Report number	Taxa	Number of sites	
			Kapuni Stream	Tributaries
8/10/19	2019-08	Fish	11	
8/10/19	2019-09	Macroinvertebrate	11	2
14/01/20	2020-02	Macroinvertebrate	7	2
27/05/20	2020-05	Fish	7	
27/05/20	2020-06	Macroinvertebrate	7	2



Figure 2 Biomonitoring sites in the Kapuni Catchment

2.1.5.1 Macroinvertebrate monitoring

Targets for MCI values have been set for the Kapuni main stem and gully system. For the Kapuni Stream a hard bottom MCI (MCI-hb) target of 100 has been obtained from historical data and the expected mild enrichment in the mid-catchment. The gully system (site 5) previously had a MCI target of 72 using the hard bottom score but this has been revised to a soft bottomed MCI (MCI-sb) of 73 units based on the 25th percentile of historical data. Site 13 has a tentative target of MCI-sb 90.

The MCI-sb is generally not used by Taranaki Regional Council due to staff finding it unreliable. Furthermore, the streams may be naturally hard bottom, the current NPS-FM criteria would categorise both

tributaries as hard bottom both based on their REC categories (WW/L/VA) and both have been observed to have significant gravel substrate, especially during periods after significant freshes.

The gully site 5 is approximately 2,200 m downstream from the boundary with Ballance Kapuni and gully site 13 is approximately 2,000 m downstream of the boundary. The relatively large distance from the site boundary produces two problems. Firstly, effects of any nutrient enrichment will be less apparent the further downstream samples are collected. Weedy streams would be expected to take up significant amounts of nitrogen and therefore the ability to detect effects of nutrient enrichment from the Balance Kapuni site at the point where samples were collected is limited. Secondly, the two streams run through a dairy farm and if any degradation were detected it would be difficult to disentangle potential enrichment from the dairy farm (e.g. inappropriate irrigating of dairy shed effluent) from enrichment from Ballance Kapuni.

Based on the large distance from the site, use of the MCI-sb score, and natural variability at sites, having a target for the two gully sites is in itself of little value and relevance. Macroinvertebrate sampling does still have limited value in the context that if a spill or discharge were to occur that was acutely toxic to macroinvertebrates and would effectively eliminate populations from the monitoring sites, then this would still be detectable. Stark Environment Ltd also concluded that the gully sites were of little practical use and macroinvertebrate communities at the sites were relatively insensitive to nutrient enrichment.

During all four surveys, the Kapuni Stream had scores above 100 MCI-hb indicating 'excellent' to 'good' macroinvertebrate health while the two tributary sites had MCI-sb scores between 87 to 107 indicating 'good' to 'fair' health. No sites recorded a taxa richness below 10 indicating that sites had not been exposed to any toxic discharges.

Linear trends in MCI values at the sites are also reported, by plotting MCI and taxa richness versus time using the LOWESS (Locally Weighted Scatterplot Smoothing) method (used with Tension = 0.4). The statistical significance of the trends was assessed using Mann-Kendall tests in STATISTICA 8. The Benjamini-Hochberg false discovery rate (FDR) was also used, to control the overall Type-I error rate in time series analyses. All sites, apart from Opunake Road and site 13, exhibited a statistically significant positive trend over the entire date range (e.g. since 1982). The Opunake Road and site 13 sites had positive, non-significant trends. The last 5-10 years show a levelling off or decrease in scores, but as the control site was also plateauing, it appears to be due to factors unrelated to activities associated with Ballance Kapuni, probably sand inundation from slips within Egmont National Park.

Some additional analyses were done, where recorded MCI scores were compared with that predicted using relationships developed between MCI scores and altitude for ringplain streams. There were three predicted values provided, the first based on a relationship developed using all generic ringplain data, the second using Kapuni Stream data collected since 1981 only and the third using Kapuni Stream data collected since 2000. The latter predicts the highest MCI scores, and this is the relationship against which the reported results were compared. Observed results were generally lower than expected for all surveys.

Overall, the Kapuni Stream was generally in 'good' to 'excellent' health and the impact (if any) of the industrial activity at Kapuni was not discernible.

Copies of biomonitoring reports for this site are available from the Council upon request.

2.1.5.2 Electric fishing

Two reports that detail the monitoring of fish communities undertaken in the Kapuni Stream in 8 October 2019 (11 sites) and 27 May 2020 (7 sites) have been received by the Council. The total area of streambed fished in the Kapuni Stream was approximately 346 m² in October 2019 and 232 m² in May 2020. The tributaries were not fished in either survey.

Table 5 Results of spring fish survey in the Kapuni Stream conducted on 8 October 2019

Site	Fish Species						Total number of species
	Brown trout	Redfin bully	Koaro	Torrentfish	Eels	Koura	
O	-	-	-	-	-	-	0
P	-	-	-	-	-	-	0
E	3	-	-	-	-	-	1
9	3	-	-	-	-	-	1
11	4	1	-	-	-	-	2
12	1	3	-	-	-	-	2
10	-	-	-	-	-	-	0
6	-	3	-	-	1	-	2
7	-	2	-	-	4	-	2
8/K	1	-	-	1	2	-	3
N	4	2	-	-	1	-	3
Total abundance	16	11	0	0	8	0	3

Table 6 Results of fish survey in the Kapuni Stream conducted on 27 May 2020

Site	Fish Species						Total number of species
	Brown trout	Redfin bully	Koaro	Torrentfish	Eels	Koura	
9	-	1	-	-	-	-	1
11	-	-	-	-	1	-	1
12	-	-	-	-	-	-	0
10	-	-	-	-	-	-	0
6	-	-	-	-	-	-	0
7	-	-	-	-	-	2	1
8/K	-	-	-	-	-	-	0
Total abundance	0	1	0	0	1	2	3

All sites were surveyed for fish using the single pass electric fishing technique. The results of these surveys were given in the above Table 5 and Table 6.

A total of 35 fish, in three taxa, were caught at 10 sites during the October 2019 survey. During the May 2020 survey, only four animals (two fish and two koura) in three taxa were caught. The October survey result was within the range (3-221) of total numbers and variety (2-8 taxa) recorded in previous years; the May

survey had the second lowest recorded numbers to date but was within the range of taxa caught. Typically, the autumn survey has lower numbers and taxa recorded than the spring survey.

In October 2019, brown trout were the most abundant taxa comprising 46% of the total number of animals recorded. Eels are normally the dominant fish recorded from the Kapuni Stream.

In May 2020, Redfin bully, Torrentfish and koura were present. The poor results were likely caused by fine sand deposition and significant freshes.

It has been noted in previous reports that fine sand has been a dominant feature on the streambed, due in part to the erosion on the mountain. This has continued in both reports reviewed and it is likely to have reduced the suitability of habitat for some taxa, such as koura. It is thought that this reduction in available habitat is also responsible for a reduction in the numbers of brown trout recorded per site. The catch per unit effort has dropped from a high of 4.27 brown trout per site in 1982 – 1983 to less than 0.5 from late 2008 to mid-2012. An improvement was recorded in the October 2019 survey. However, none were recorded during the May 2020 survey. It was suggested that trout records may increase in the near future as Fish and Game is now more actively stocking this river than has happened in the recent past, but so far trout numbers do not appear to be improving.

One additional point worth noting is the fact that the v-notch weir at the Todd Kapuni site has been removed. The weir's removal will have improved fish passage in this reach of the Kapuni Stream, and this may result in improved fish communities. Furthermore, New Zealand Railways Corporation has undertaken works to improve fish passage at the railway bridge, which also may lead to improved fish communities.

Overall, these electric fishing results from the Kapuni catchment do not provide any conclusive indication that the petrochemical industries are having any significant adverse effects on fish communities in the Kapuni catchment, with results being affected by sedimentation and significant number of preceding freshes.

Copies of biomonitoring reports for this site are available from the Council upon request.

2.2 Air

2.2.1 Inspections

There were no noted issues pertaining to visible plumes or odour during the three inspections undertaken this period. No complaints were received from the public with respect to potential odour generation from this facility in the 2019-2020 monitoring period.

2.2.2 Provision of consent holder data

Special condition 4 of the Company's air discharge permit (4087) states:

That the consent holder shall provide to the General Manager, Taranaki Regional Council, by 1 June 1999 and every three years thereafter a written report:

- a. Reviewing any technological advances in the reduction or mitigation of discharges to air from the site, and the costs and benefits of these advantages; and*
- b. Detailing an inventory of the discharges to air from the site of such contaminants as the General manager may from time to time specify following consultation with the consent holder; and*
- c. Detailing any measures that have been taken by the consent holder to improve the energy efficiency of the site's activities and processes; and*
- d. Addressing any other issue relevant to the minimisation or mitigation of discharges of contaminants to air from the site that the General Manager, Taranaki Regional Council, considers should be included.*

Such reports have been provided in 1999, 2002, 2005, 2009, 2011, 2014, 2017, with the latest report received in October 2020 and accepted by the Council.

To fulfil the requirements of special condition 4, the Company provided information pertaining to the following:

1. A summary of annual emissions of carbon dioxide (CO₂) from the gas treatment plant for the period 2004-2020; (Figure 3).
2. A summary of plant process and operational enhancements as measured by steam use efficiency; (Figure 4).
3. A summary of metal deposition monitoring 2008-2020; (Figures 5-7) and
4. Significant flaring from the facility in the period 2014-2020.

Carbon dioxide emissions

Annual CO₂ emissions in calendar years since 2000 are shown in Figure 3. The amounts released to atmosphere from the Benfield process and from fuel combustion are distinguished. The reductions in 2013 and 2016 are a reflection of reduced quantities of gas processed by the plant compared to previous years.



Figure 3 Annual CO₂ emissions from the Company in tonnes per annum (tpa)

Processing and operational enhancements

The efficiency of steam use in the Benfield CO₂ removal plant is a key performance indicator (KPI) for the operation of the gas treatment plant in relation to fuel use. Annual steam use per CO₂ loading since 2000-2001 is depicted in Figure 4. The Company reports that the continual improvement in steam use efficiency from 2009 onwards is not due to any particular process improvement, but rather a continued focus on consistently running the plant at higher efficiency targets from year to year, and that further improvements are likely to be small as maximum efficiency is approached. The recent plateau may indicate the site is approaching the limit on further improvements to efficiency possible with the current plant. The Company reports that there have been no further upgrades to improve efficiency at the KGTP facility in this reporting period.

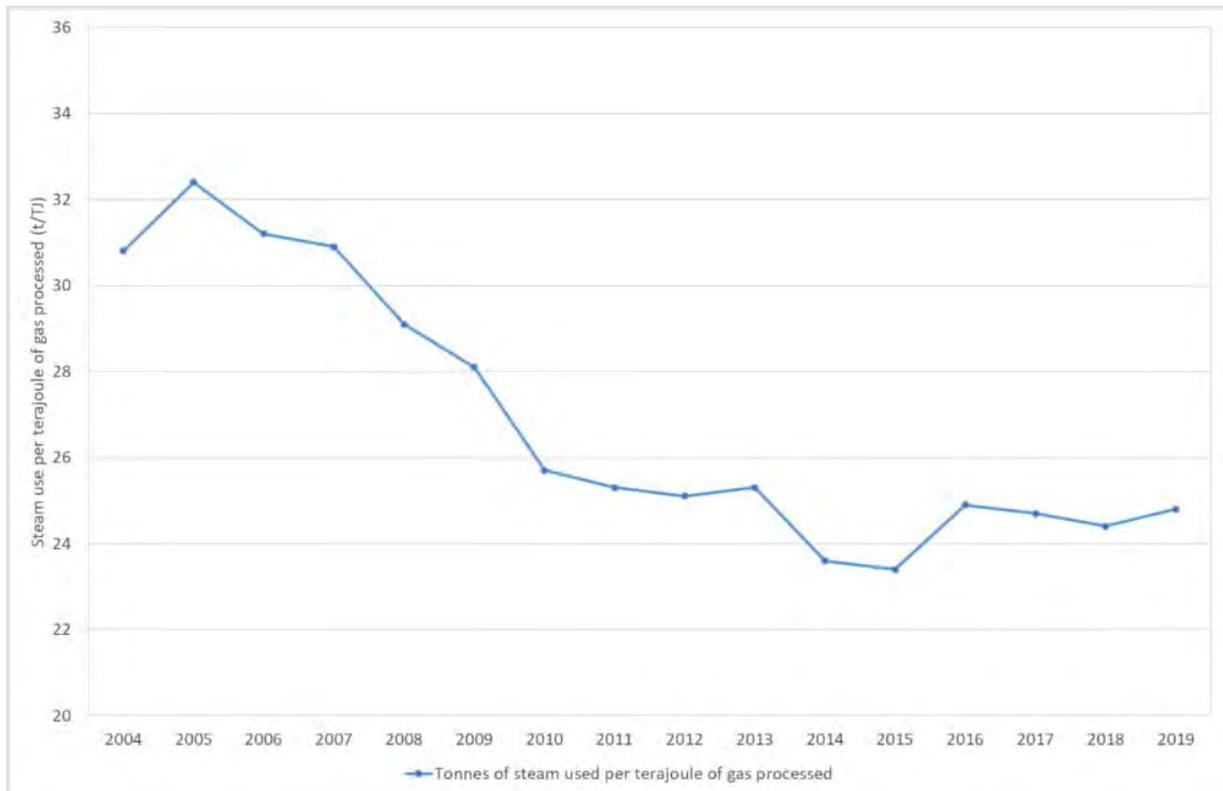


Figure 4 Annual steam use per CO₂ loading

Metal deposition

Monitoring of metal deposition, for potassium, vanadium and zinc, is conducted annually at three sites around KGTP by deployment of air deposition gauges. The locations of the sites are immediately east and south of the processing area, that is, downwind and crosswind relative to the prevailing westerly wind, and beside Palmer Road to the southwest. There are no guidelines or standards for metals deposition. The data has been tabulated in the following Figure 5, 6 and 7. While there is considerable variation in some of the samples, the data do not show any significant change in metal deposition rates over time.

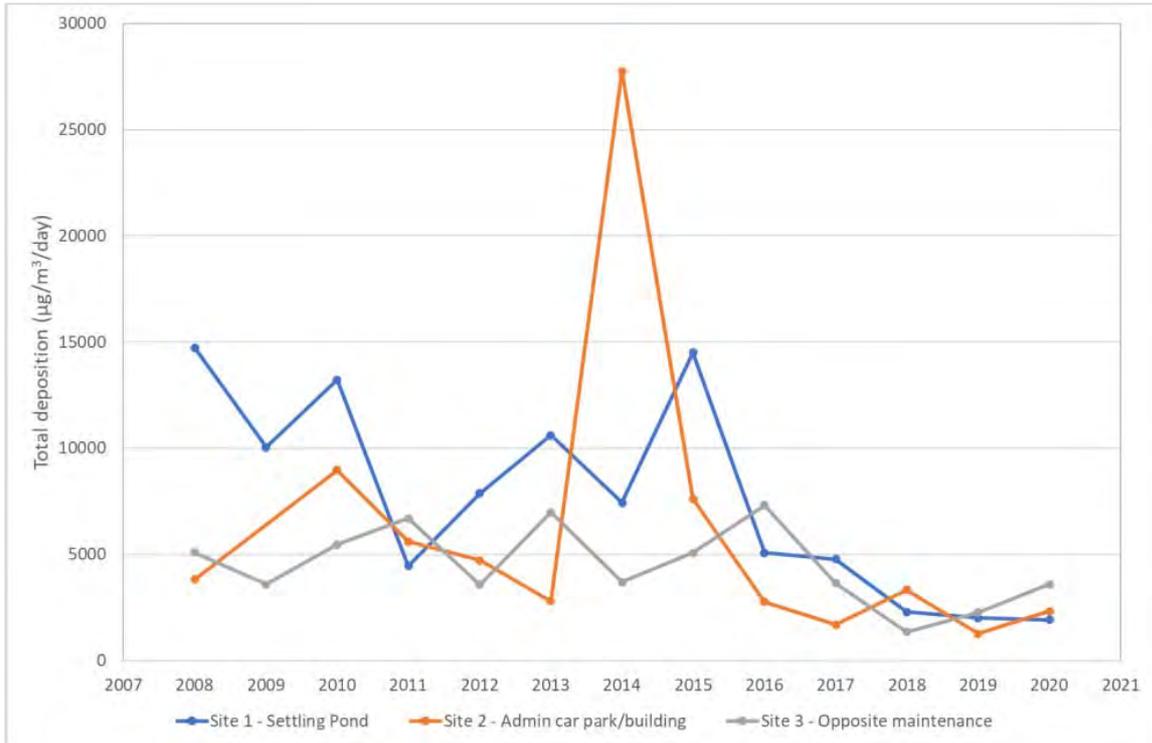


Figure 5 Total potassium deposition 2008-2020

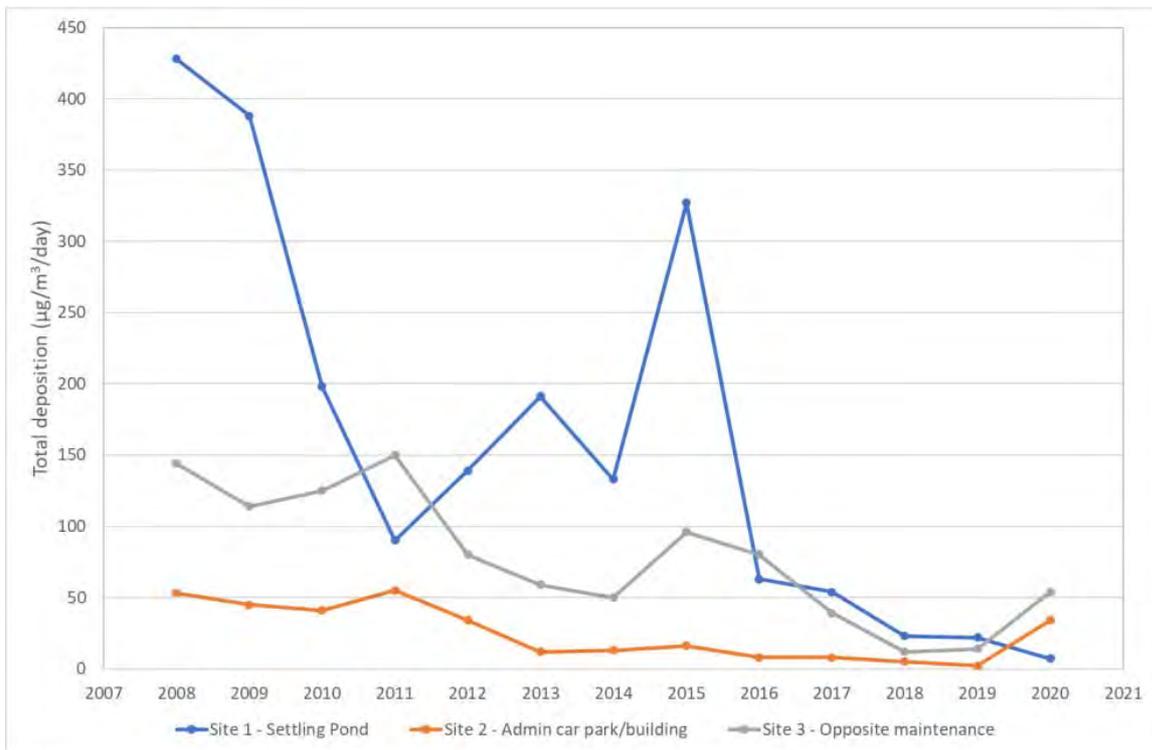


Figure 6 Total vanadium deposition 2008-2020

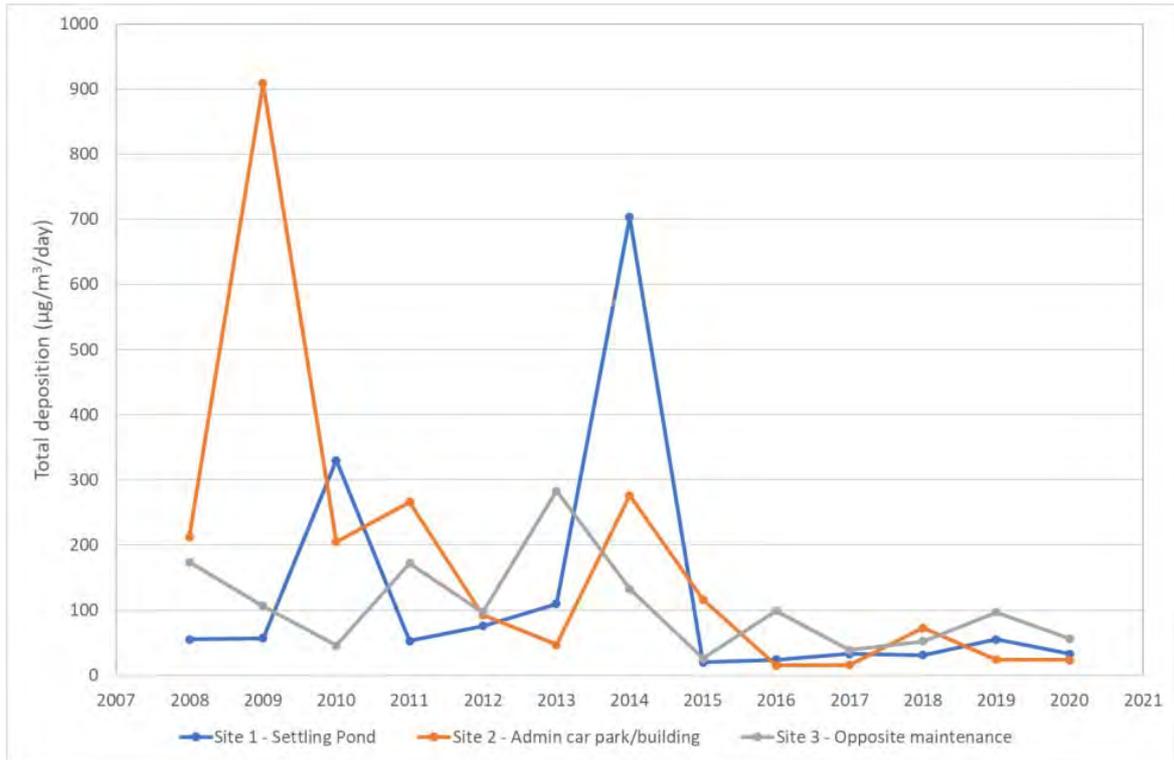


Figure 7 Total zinc deposition 2008-2020

Flaring

Flaring occurs solely as a safety measure. The Company states that any flaring is a financial loss; hence there is a strong drive to minimise any flaring activity. The largest flaring episodes occur during the emergency shutdown (ESD) tests, which have been carried out annually since 1997, normally in February. With the exception of the ESD test, no significant flaring events have occurred since 2017.

2.2.3 Ambient air quality monitoring November 2019 – January 2020

Previously nitrogen dioxide (NO₂) and carbon monoxide (CO) discharges were reported on for compliance under consent 4087-2 conditions 8 and 9 in the 2004 and 2008 monitoring periods. Additional monitoring was conducted continuously throughout November 2019 to January 2020. A summary of the results is included below in tables 7 and 8, along with the relevant Ministry for the Environment (MfE) standards. These are Ambient Air Quality Guidelines 2002 (AAQG) and National Environmental Standards (NES).

The results show that levels of NO₂ and CO were in compliance with consent condition limits and all relevant standards set by the MfE. The complete report is attached in Appendix III.

Table 7 Summary of CO monitoring, November 2019 - January 2020

CO (mg/m ³)	Maximum	Minimum	Average	Exceedances	MfE AAQG Consent 4087-2	MfE NES
<i>November 2019 to January 2020</i>						
CO 1-hour	1.7	0.0	0.1	None	30 mg/m ³	-
CO 8-hour	0.9	0.0	0.1	None	10 mg/m ³	10 mg/m ³ 1 exceedance/year

Table 8 Summary of NO₂ monitoring, November 2019 - January 2020

NO ₂ (µg/m ³)	Maximum	Minimum	Average	Exceedances	MfE AAQG Consent 4087-2	MfE NES
<i>November 2019 to January 2020</i>						
NO ₂ 1-hour	98.6	0.3	15.2	None	200 µg/m ³ *300 µg/m ³	200 µg/m ³ 9 exceedances/year
NO ₂ 24-hour	61.6	2.7	15.2	None	100 µg/m ³	-

* Consent 4807-2 specifies 300 µg/m³ as the NO₂ 1-hour average

2.3 Incidents, investigations, and interventions

The monitoring programme for the year was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with the Company. During the year matters may arise which require additional activity by the Council, for example provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach, that in the first instance avoids issues occurring, is favoured.

The Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The incident register includes events where the Company has itself notified the Council. The register contains details of any investigation and corrective action taken.

Complaints may be alleged to be associated with a particular site. If there is potentially an issue of legal liability, the Council must be able to prove by investigation that the identified company is indeed the source of the incident (or that the allegation cannot be proven).

Table 9 below sets out details of any incidents recorded, additional investigations, or interventions required by the Council in relation to the Company's activities during the 2019-2020 period. This table presents details of all events that required further investigation or intervention regardless of whether these were found to be compliant or not.

Table 9 Incidents, investigations, and interventions summary table

Date	Details	Compliant (Y/N)	Enforcement Action Taken?	Outcome
13 Dec 2019	Butane leak from butane transfer pump at LPG load out facility detected by autonomous sensors	Y	N/A	Emergency shutdown system activated and seal repaired and investigated.
3 Feb 2020	<p>The consent holder notified the Council stating that an elevated potassium concentration was recorded in Kapuni Stream downstream, post the discharge. This was the result of standby pump utilised to discharge effluent from the A-701 basin.</p> <p>The standby pump had a larger flow rate than the normal pump which was out for maintenance, as a result this caused the elevated potassium.</p> <p>Corresponding downstream vanadium results, post the discharge, remained within consent limits.</p>	Y	N	<p>The Company are aware the incident could have caused an exceedance of in stream consent limit concentrations.</p> <p>As a result they have altered their pre discharge report to highlight reduced rates of discharge from A-701 basin.</p> <p>The post discharge analysis report has been updated to highlight any potential exceedance.</p> <p>Stocking of spare parts for the discharge pump has been undertaken so maintenance can occur quickly, without the requirement for a standby pump.</p>

3 Discussion

3.1 Discussion of site performance

Site performance by the Company in the 2019-2020 monitoring period had been compliant across all consent related requirements. Water abstraction was undertaken and no exceedance was reported with respect to maximum daily extractable volumes. The Company drew less water than the previous monitoring period, with only 36.4% of the total annual allowance utilised and reduction of 366,395 m³ when compared to the 2018-2019 monitoring period.

Discharge monitoring of effluent and stormwater was undertaken by the Company and reported monthly to the Council. The monthly reports were found to be compliant with consent conditions. Inter-laboratory sample analysis were also undertaken on two occasions this monitoring period and the results indicated good agreement across parameters. Some variation was observed, however gaining accuracy at low concentrations does present its own difficulties and considering the low concentrations of target parameters the variations do not indicate a cause for concern. However, continued calibration of key instruments is encouraged.

Communication between the Company and the Council is regular and open in the form of monthly reports, inspections and monitoring requirements.

Inspections of the site had indicated the site appears to be well managed with housekeeping prevalent across all areas. This included chemical storage areas, catch basins and discharge locations.

Kapuni Stream flow monitoring is a methodology which is undergoing some development. The planned flow gauging is ongoing and the rating curve is proposed to be developed throughout the upcoming monitoring period. In the meantime the flo-dar system will remain functional to assess the flow of the Kapuni Stream. It is further noted that gauging is required to be undertaken by the Council's hydrology department and this is scheduled for the 20220-2021 monitoring period.

3.2 Environmental effects of exercise of consents

Minimal environmental effects were noted during the period under review. A review of the Company's independent biological monitoring, on the Kapuni Stream catchment, was undertaken by one of the Council's biologists. The review indicated that overall, the MCI scores for nearly all sites were similar to or higher than their respective means. Overall, the Kapuni Stream was generally in 'good' to 'excellent' health and the impact (if any) of the industrial activity at Kapuni was not discernible.

The findings of the fish survey concluded with the following: overall, these electric fishing results from the Kapuni catchment do not provide any conclusive indication that the petrochemical industries are having any significant adverse effects on fish communities in the Kapuni catchment, with results being affected by sedimentation and a significant number of preceding freshes.

Discharge monitoring indicated compliance with consent defined parameters and no significant adverse effects were noted.

In terms of emissions to the air, the triennial report required under special condition 4 consent 4087 was provided in this report. The associated analyses indicated that CO₂ emissions, steam use per unit of gas, and metal depositions all exhibited reduced or similar levels to previous reporting from 2016-2019.

The Company commissioned an ambient air monitoring survey this monitoring period. The results indicated the Kapuni production station was rated in the Ministry for Environment National Environmental Standards and Ambient Air Quality Guidelines "excellent" to "acceptable" categories for 1-hour and 24-hour average

NO₂ concentrations, and “excellent” for 1-hour and 8-hour average CO concentrations throughout the November 2019 - January 2020 period.

3.3 Evaluation of performance

A tabular summary of the consent holder’s compliance record for the year under review is set out in Tables 10-19.

Table 10 Summary of performance for consent 1125-4

Purpose: To take water from the Kapuni Stream in association with the operation of a gas processing facility		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Limits to volume of water abstracted	Volume measurement by the Company and review of records by Council	Yes
2. Defines three take locations	Inspection by Council	Yes
3. Limit take duration at alternative locations	Not required by the Company this period	N/A
4. Adopt best practicable option to prevent or minimise adverse effects	Inspection and review of the Company records	Yes
5. Installation and maintenance of water meter and data logger	Inspection by Council. Telemetry to Council via STDC system established January 2014	Yes
6. Certification of water measuring equipment	Provision of certificate. Certification testing carried out 30 October 2014	Yes
7. Notification of equipment failure	Liaison with the consent holder	Not required this period
8. Metering equipment accessible to Council	Inspection	Yes
9. Details of take recording	Records in format required	Yes
10. Notification of details of emergency takes	Not required during period under review	N/A
11. Fish screen	Check screen, and intake design	Yes
12. Financial contributions for riparian planting and fencing in Kapuni catchment	Payments received, no further obligation	N/A
13. Option for Council to review consent conditions	Option available June 2020. Not exercised, as determined by Council	Yes
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administration performance in respect of this consent		High

N/A = not applicable

Table 11 Summary of performance for consent 1123-3

Purpose: To discharge process effluent and stormwater to the Kapuni Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option to prevent or minimise adverse effects	Inspection and liaison with consent holder	Yes
2. Limit on stormwater catchment area	Inspection	Yes
3. Monitor temperature from discharge and keep within limits	Company records and measurement, with review and checking by Council,	Yes
4. Monitor pH levels and keep within range	Company records and sampling, with review and checking by Council. Variation identified in previous monitoring period in relation to Kapuni Stream pH monitoring, now rectified	Yes
5. Discharge cannot produce visible effects on the surface of Kapuni Stream	Inspection	Yes
6. Concentration of un-ionised ammonia in Kapuni Stream not to exceed limits	Company records and sampling, with review and checking by Council	Yes
7. Concentration of sodium in Kapuni Stream not to exceed limits	Company records and sampling, with review and checking by Council	Yes
8. Concentration of vanadium in Kapuni Stream not to exceed limit	Company records and sampling, with review and checking by Council.	Yes Some elevated vanadium identified in the lower monitoring site through monthly reports, post January 2020. Communicated by consent holder in the previous monitoring period that this is due to the inferred concentrations of vanadium via potassium which over estimates vanadium concentration. The consent holder evaluates and discharges the process water with the over estimate
9. Discharge not to contain free available chlorine	Company records and sampling, with review and checking by Council	Yes

Purpose: To discharge process effluent and stormwater to the Kapuni Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
10. Submission of effluent disposal management plan to Council	Provision of plan as required	Yes
11. Effluent disposal management plan to be followed	Company records, inspection and sampling	Yes
12. Provision of programmes of water treatment and notification of any changes	Inspection and provision of information. Chemical changes notified. Also discharge conductivity monitoring implemented for contingency discharge by the Company	Yes
13. Review of programmes of chemical cleaning treatment and notification of any changes	Inspection and provision of information	Yes
14. Optional review provision re water treatment or chemical cleaning programmes	No review required this period	N/A
15. Option for Council to review consent conditions	Option next available June 2023	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administration performance in respect of this consent		High

N/A = not applicable

Table 12 Summary of performance for consent 1225-3

Purpose: To discharge domestic sewage, tri-ethylene glycol, methanol and some water treatment chemicals (i.e. phosphate corrosion inhibitor) from an aerated sewage treatment plant onto and into land		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option to prevent or minimise adverse effects	Inspection and liaison with consent holder	Yes
2. No direct discharge to surface water	Inspection	Yes
3. Discharge limit	Data provided by consent holder	Yes
4. Option for Council to review consent conditions	Option next available June 2023	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administration performance in respect of this consent		High

N/A = not applicable

Table 13 Summary of performance for consent 5091-1

Purpose: To discharge minor amounts of earth material and associated stormwater onto land and into various streams between and including the Motumate Stream and an unnamed tributary of the Waiokura Stream associated with the construction of two above ground pipelines, an electrical ring main and associated structures for steam and electricity supply purposes		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Every practicable measure to prevent contamination of watercourses and to minimise streambed disturbance	No works undertaken during monitoring period	N/A
2. Notification of construction or maintenance work	No maintenance undertaken during monitoring period	N/A
3. Option for Council to review conditions of consent	Option next available June 2023	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		N/A
Overall assessment of administration performance in respect of this consent		N/A
Consent surrendered 03 April 2020		

N/A = not applicable

Table 14 Summary of performance for consent 7043-1

Purpose: To discharge sludge, and some liquid, from two stormwater retention ponds, a filter backwash pond and a settlement pond onto and into land		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option to minimise adverse effect	Inspection and company records	Yes
2. Exercise to be in accordance to submission	Inspection	Yes
3. Specific sludge sources	Inspection	Yes
4. Liquids may be discharged as alternative when stream in low flow	Action not required during period under review	N/A
5. Disposal area specified	Inspection	Yes
6. Minimum distance to and no discharge to surface water	Inspection	Yes
7. Keeping of records	Not requested in period under review	Yes
8. Relocation of soil to approval of Council	Inspection, no soil moved	N/A
9. No adverse effects on any water body	Inspection and biomonitoring	Yes

Purpose: To discharge sludge, and some liquid, from two stormwater retention ponds, a filter backwash pond and a settlement pond onto and into land		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
10. Compliance with soil and groundwater guidelines	Sampling and provision of records	Not assessed this period
11. Advice to District Council on land use	Company records	Yes
12. Option for Council to review conditions of consent	Expiry 2023	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administration performance in respect of this consent		High

N/A = not applicable

Table 15 Summary of performance for consent 4087-2

Purpose: To discharge emissions into the air from the treatment of natural gas, cogeneration, other on-site activities and other related and ancillary activities		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option to prevent or minimise adverse effects	Inspection and records	Yes
2. Emissions maintained to a minimum	Inspection, company records and sampling	Yes
3. Approval for alterations affecting discharge to be gained from Council	Notifications	Yes
4. Three yearly written report to Council	Report received 13 September 2017, next one received 2020	Yes
5. Written report reviewing technological advances	Report provided to Council 1 June 1996	Yes
6. Written report evaluating risk to human health	Report provided to Council 1 June 1996	Yes
7. Annual report on gross emission of carbon dioxide	Change to RMA- no longer required. CO ₂ emission data provided in triennial report	N/A

Purpose: To discharge emissions into the air from the treatment of natural gas, cogeneration, other on-site activities and other related and ancillary activities		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
8. Control of discharges to air of carbon monoxide	Company records of monitoring undertaken in 2004 and 2008 indicated compliance with this condition Additional monitoring undertaken in the 2019-2020 monitoring period	Yes
9. Control of discharges to air of nitrogen dioxide	Company records of monitoring undertaken in 2004 and 2008 indicated compliance with this condition Additional monitoring undertaken in the 2019-2020 monitoring period	Yes
10. Option for Council to review conditions re excess of carbon monoxide or nitrogen dioxide limits	Not exercised	N/A
11. Concentration of benzene not to exceed limits	Not assessed this period as LTS not in operation at present. Other BTEX sources removed Council monitoring 2018-2019 in area indicated 'good' category for benzene in air	Yes
12. Control all other discharges as to not exceed limits	Company records and sampling	Yes
13. Discharge of odour	Inspections did not find offensive or objectionable odour	Yes
14. Depressurisation to avoid dense black smoke	Inspection and Company records	Yes
15. No adverse ecological effect on eco-systems	Inspection and biomonitoring	Yes
16. Notice to review consent conditions	Option next available June 2023	N/A
17. Site contingency plan	Provided	Yes
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administration performance in respect of this consent		High

Table 16 Summary of performance for consent 5090-1

Purpose: To erect, place, use and maintain two above ground pipelines, an electrical ring main and associated structures over beds of various streams between and including the Motumate Stream and an unnamed tributary of the Waiohira Stream for steam and electricity supply purposes		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Structures constructed and maintained according to submission	Inspection	Yes
2. Notification of initial construction and maintenance work	No maintenance undertaken during monitoring period	N/A
3. Option for Council to review conditions of consent	Option next available June 2023	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administration performance in respect of this consent		High

N/A = not applicable

Table 17 Summary of performance for consent 7281-1

Purpose: To remove a weir structure in the Kapuni Stream and undertake works for river bank protection purposes		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Consent to be exercised in accordance with documentation submitted	Weir has previously been removed	N/A
2. Notification prior to commencement and upon completion of works	Notification given 10 April 2008	Yes
3. Adoption of best practicable option to minimise adverse environmental effects	Weir has previously been removed	N/A
4. Minimisation of bed disturbance	Weir has previously been removed	N/A
5. Reasonable steps to minimise sediment effects	Weir has previously been removed	N/A
6. Removal of materials from streambed	Weir has previously been removed	N/A
7. Works prohibited between 10 May and 1 November, without permission	Weir has previously been removed	N/A
8. Use of explosives prohibited	Weir has previously been removed	N/A
9. Lapse of consent if not exercised	Consent was exercised	N/A
10. Option for Council to review conditions of consent	Option next available June 2023	N/A

Purpose: To remove a weir structure in the Kapuni Stream and undertake works for river bank protection purposes		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
Overall assessment of consent compliance and environmental performance in respect of this consent		N/A
Overall assessment of administration performance in respect of this consent		N/A
Consent surrendered 03 April 2020		

N/A = not applicable

Table 18 Summary of performance for consent 7755-1

Purpose: To discharge stormwater from site areas of a natural gas treatment plant where no industrial processes occur (e.g. landscaped areas and roads) into the Kapuni Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option to prevent or minimise adverse effects	Inspection and liaison with consent holder	Yes
2. Limit on stormwater catchment area	Inspection	Yes
3. Controls on effect of discharge in receiving water	Inspection and biological monitoring by Council	Yes
4. Discharge cannot produce visible effects on the surface of Kapuni Stream	Inspection	Yes
5. Maintenance of contingency plan	Receipt and review of plan	Yes
6. Maintenance of stormwater management plan	Receipt and review of plan	Yes
7. Provision for lapse of consent		N/A
8. Option for Council to review consent conditions	Option next available June 2023	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administration performance in respect of this consent		High

N/A = not applicable

Table 19 Evaluation of environmental performance over time

Year	Consent no	High	Good	Improvement req	Poor
2008-2009	1123-2, 1124-2, 1225-3, 4087-1, 5007-1, 5008-1, 5090-1, 5126-1, 5496-1, 7043-1	10			

Year	Consent no	High	Good	Improvement req	Poor
2010-2012	1123-2, 1124-2, 1125-3, 1225-2, 4087-2, 5007-1, 5008-1, 5090-1, 5126-1, 5496-1, 7043-1	11			
2012-2014	1125-3		1		
	1123-2, 1225-2, 4087-2, 5090-1, 5496-1, 7043-1, 7755-1	7			
2015-2016	1123-3, 1125-4, 1225-3, 4087-2, 5090-1, 5496-1, 7043-1, 7755-1	8			
2016-2017	1123-3, 1125-4, 1225-3, 4087-2, 5090-1, 5496-1, 7043-1, 7755-1	8			
2017-2018	1123-3, 1125-4, 1225-3, 4087-2, 5090-1, 7043-1, 7755-1	7			
2018-2019	1123-3, 1125-4, 1225-3, 4087-2, 5090-1, 7043-1, 7755-1	7			
Total		58	1	0	0

During the year, KGTP demonstrated a high level of environmental and high level of administrative performance with the resource consents as defined in Section 1.6.

3.4 Recommendations from the 2018-2019 Annual Report

In the 2018-2019 Annual Report it was recommended:

1. THAT in the first instance, monitoring of consented activities at the Company site in the 2019-2020 year continue at the same level as in 2018-2019.
2. THAT should there be issues with environmental or administrative performance in 2019-2020, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT the option for a review of resource consent in June 2020, as set out in condition 13 of the consent 1125-4 not be exercised, on the grounds that the consent is currently fit for purpose.

Recommendations one and three were implemented, while additional investigation or monitoring as per recommendation two was not required.

3.5 Alterations to monitoring programmes for 2020-2021

In designing and implementing the monitoring programmes for air/water discharges in the region, the Council has taken into account:

- the extent of information already made available through monitoring or other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record of administrative and environmental performances of the consent holder; and

- reporting to the regional community.

The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki exercising resource consents.

It is proposed that for the 2020-2021 monitoring period that the monitoring of consented activities at the Company continue at the same level as 2019-2020

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the sites in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2020-2021.

4 Recommendations

1. THAT in the first instance, monitoring of consented activities at the Kapuni Gas Treatment Plant in the 2020-2021 year continue at the same level as in 2019-2020
2. THAT should there be issues with environmental or administrative performance in 2020-2021, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

Glossary of common terms and abbreviations

The following abbreviations and terms may be used within this report:

Al*	Aluminium.
As*	Arsenic.
AAQG	Ambient Air Quality Guidelines 2002
Biomonitoring	Assessing the health of the environment using aquatic organisms.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 25°C and expressed in $\mu\text{S}/\text{cm}$.
Cu*	Copper.
DRP	Dissolved reactive phosphorus.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
$\text{g}/\text{m}^2/\text{day}$	grams/metre ² /day.
g/m^3	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
Incident register	The Incident Register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
m^2	Square Metres.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
MfE	Ministry for the Environment
NES	National Environmental Standards
NH_4	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH_3	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
NO_3	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
Pb*	Lead.

pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
PM ₁₀ , PM _{2.5} , PM _{1.0}	Relatively fine airborne particles (less than 10 or 2.5 or 1.0 micrometre diameter, respectively).
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	<i>Resource Management Act 1991</i> and including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
UI	Unauthorised Incident.
Zn*	Zinc.

*an abbreviation for a metal or other analytes may be followed by the letters 'As', to denote the amount of metal recoverable in acidic conditions. This is taken as indicating the total amount of metal that might be solubilised under extreme environmental conditions. The abbreviation may alternatively be followed by the letter 'D', denoting the amount of the metal present in dissolved form rather than in particulate or solid form.

For further information on analytical methods, contact a Science Services Manager.

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Appendix I

Resource consents held by the Company

(For a copy of the signed resource consent
please contact the TRC Consents department)

Water abstraction permits

Section 14 of the RMA stipulates that no person may take, use, dam or divert any water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or it falls within some particular categories set out in Section 14. Permits authorising the abstraction of water are issued by the Council under Section 87(d) of the RMA.

Water discharge permits

Section 15(1)(a) of the RMA stipulates that no person may discharge any contaminant into water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or by national regulations. Permits authorising discharges to water are issued by the Council under Section 87(e) of the RMA.

Air discharge permits

Section 15(1)(c) of the RMA stipulates that no person may discharge any contaminant from any industrial or trade premises into air, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Permits authorising discharges to air are issued by the Council under Section 87(e) of the RMA.

Discharges of wastes to land

Sections 15(1)(b) and (d) of the RMA stipulate that no person may discharge any contaminant onto land if it may then enter water, or from any industrial or trade premises onto land under any circumstances, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Permits authorising the discharge of wastes to land are issued by the Council under Section 87(e) of the RMA.

Land use permits

Section 13(1)(a) of the RMA stipulates that no person may in relation to the bed of any lake or river use, erect, reconstruct, place, alter, extend, remove, or demolish any structure or part of any structure in, on, under, or over the bed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Land use permits are issued by the Council under Section 87(a) of the RMA.

Coastal permits

Section 12(1)(b) of the RMA stipulates that no person may erect, reconstruct, place, alter, extend, remove, or demolish any structure that is fixed in, on, under, or over any foreshore or seabed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Coastal permits are issued by the Council under Section 87(c) of the RMA.

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder: Todd Petroleum Mining Company Limited
PO Box 802
New Plymouth 4340

Decision Date 18 June 2012

Commencement Date 18 June 2012

Conditions of Consent

Consent Granted: To discharge process effluent and stormwater to the Kapuni Stream

Expiry Date: 1 June 2035

Review Date(s): June 2023, June 2029

Site Location: Kapuni Gas Treatment Plant, 298 Palmer Road, Kapuni

Grid Reference (NZTM) 1700945E-5629537N

Catchment: Kapuni

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
2. The discharge of stormwater shall be from a catchment area not exceeding 3.37 ha.
3. The discharge shall not raise the temperature of the Kapuni Stream by greater than 2 degrees Celsius, when measured 50 metres downstream of the discharge point and all practicable steps shall be taken by the consent holder to minimise the temperature rise in the Kapuni Stream. Further, the consent holder shall continuously monitor the temperature of the wastewater, and receiving water upstream and downstream of the discharge point.
4. The discharge shall not cause the pH of the Kapuni Stream to be outside the range 6.5 to 9.0 when measured 50 metres downstream of the discharge point. Further, the consent holder shall continuously monitor the pH of the wastewater, and receiving water upstream and downstream of the discharge point.
5. After allowing for reasonable mixing, within a mixing zone extending 50 metres downstream of the discharge point, the discharge shall not produce any visible oil or hydrocarbon films, scums or foams on the surface of the Kapuni Stream.
6. The discharge shall not cause the concentration of un-ionised ammonia in the Kapuni Stream to exceed 0.006 grams per cubic metre when measured 50 metres downstream of the discharge point, unless agreement is given by the holder of consent 0598-3. In any case, the discharge shall not cause the concentration of un-ionised ammonia in the Kapuni Stream to exceed 0.025 grams per cubic metre.
7. The discharge shall not cause the concentration of sodium in the Kapuni Stream to exceed 15 grams per cubic metre when measured 50 metres downstream of the discharge point, unless agreement is given by the holder of consent 0598-3. In any case, the discharge shall not cause the concentration of sodium in the Kapuni Stream to exceed 40 grams per cubic metre.
8. The discharge shall not cause the total vanadium concentration of the Kapuni Stream to exceed 0.08 grams per cubic metre when measured 50 metres downstream of the discharge point.
9. The discharge shall not contain free available chlorine.

Consent 1123-3

10. Prior to the exercise of this consent, the consent holder shall submit an effluent and stormwater management plan for approval by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The management plan shall detail the procedures and processes that will be followed to ensure that the conditions of this consent are met, including but not limited to:
 - i) controlling the effluent and stormwater discharge rate;
 - ii) measuring and recording the discharge;
 - iii) measuring and recording the Kapuni Stream (chemical and biological);
 - iv) calibration of monitoring equipment;
 - v) co-ordination with the holder of consent 0598-3 on discharge of ammonia and sodium;
 - vi) minimisation of free phosphate in the discharge, and how this can be achieved;
 - vii) minimisation of the temperature increase to the receiving environment;
 - viii) contingency events (including discharging in extended low flow events and the use of alternative receiving environments); and
 - ix) reporting on exercise of consent.
11. The consent shall be exercised in accordance with the approved effluent and stormwater management plan required by condition 10. Within one months notice given by the Taranaki Regional Council, the consent holder shall review the management plan and resubmit the plan for approval by the Chief Executive, Taranaki Regional Council.
12. The consent holder shall forward to the Chief Executive, Taranaki Regional Council, details of any programmes of water treatment used at the Gas Treatment Plant, including raw water, boiler water and cooling water. Further, the consent holder shall notify the Chief Executive, Taranaki Regional Council, of any change in water treatment chemical, or increase in maximum concentration of any water treatment chemical, at least one month prior to change of a water treatment programme.
13. The consent holder shall forward to the Chief Executive, Taranaki Regional Council, details of any programmes of chemical cleaning used at the gas treatment plant. Further, the consent holder shall notify the Chief Executive, Taranaki Regional Council, of any change in chemical cleaning agent, or increase in concentration of any chemical cleaning agent used, where the effluent is to be disposed of to the Kapuni Stream, at least one month prior to change of a chemical cleaning programme.
14. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice within three months of notification of proposed changes in water treatment or chemical cleaning programmes under special conditions 12 and 13, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Consent 1123-3

15. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2017, and/or June 2023 and/or June 2029 for the purpose of:
- a. ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time; and/or
 - b. requiring any data collected in accordance with the conditions of this consent to be transmitted directly to the Council's computer system, in a format suitable for providing a 'real time' record over the internet.

Transferred at Stratford on 1 April 2020

For and on behalf of
Taranaki Regional Council



A D McLay
Director - Resource Management

Water Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder: Todd Petroleum Mining Company Limited
PO Box 802
New Plymouth 4340

Decision Date 19 June 2012

Commencement Date 19 June 2012

Conditions of Consent

Consent Granted: To take water from the Kapuni Stream in association with the operation of a gas processing facility

Expiry Date: 1 June 2035

Review Date(s): June 2020, June 2023, June 2029

Site Location: Kapuni Gas Treatment Plant, 298 Palmer Road, Kapuni

Grid Reference (NZTM) 1701464E-5630826N

Catchment: Kapuni

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. The volume of water taken from the Kapuni Stream shall not exceed 3,900 m³ at a rate no greater than:
 - (a) 52 litres/second under normal operating conditions; or
 - (b) 58 litres/second in the event of an emergency shutdown situation, or equipment breakdown/failure; or
 - (c) 58 litres/second in the event that the taking of water under 1(a) or 1(b) cannot occur.
2. Water shall be taken from the South Taranaki District Council intake structure, except at times when water is taken in accordance with special condition 1(c), when water shall be taken from the Kapuni Stream at or about the following locations:
 - (a) (NZTM) 1701160E-5629699N; or
 - (b) (NZTM) 1700943E-5629620N; or
 - (c) (NZTM) 1700952E-5629494N.
3. The taking of water from an alternative location, as specified in special condition 1(c) of this consent, shall only be exercised for up to five days (120 hours) per calendar year, or such longer period as approved by the Chief Executive, Taranaki Regional Council for emergency or other purposes.
4. At all times the consent holder shall adopt the best practicable option as defined in the Resource Management Act 1991, to prevent or minimise any actual or likely adverse effect on the environment associated with the taking of water from the Kapuni Stream, including, but not limited to, the efficient and conservative use of water.
5. Before exercising this consent, the consent holder shall install, and thereafter maintain, a water meter and a datalogger at the point where the water enters the supply line for the Kapuni Gas Treatment Plant (i.e. (NZTM) 1701293E-5629885N). The water meter and datalogger shall be tamper-proof and shall measure and record the rate and volume of water taken to an accuracy of $\pm 5\%$. Records of the date, the time and the rate and volume of water taken at intervals not exceeding 15 minutes, shall be made available to the Chief Executive, Taranaki Regional Council at all reasonable times.

Note: Water meters and dataloggers must be installed, and regularly maintained, in accordance with manufacturer's specifications in order to ensure that they meet the required accuracy. Even with proper maintenance water meters and dataloggers have a limited lifespan.

Consent 1125-4

6. The consent holder shall provide the Chief Executive, Taranaki Regional Council with a document from a suitably qualified person certifying that water measuring and recording equipment required by the conditions of this consent ('the equipment'):
 - (a) has been installed and/or maintained in accordance with the manufacturer's specifications; and/or
 - (b) has been tested and shown to be operating to an accuracy of $\pm 5\%$.

The documentation shall be provided:

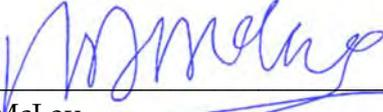
- (i) within 30 days of the installation of a water meter or datalogger;
 - (ii) at other times when reasonable notice is given and the Chief Executive, Taranaki Regional Council has reasonable evidence that the equipment may not be functioning as required by this consent; and
 - (iii) no less frequently than once every five years.
7. If any measuring or recording equipment breaks down, or for any reason is not operational, the consent holder shall advise the Chief Executive, Taranaki Regional Council immediately. Any repairs or maintenance to this equipment must be undertaken by a suitably qualified person.
8. The water meter and datalogger shall be accessible to Taranaki Regional Council officers at all reasonable times for inspection and/or data retrieval.
9. The records of water taken shall:
 - (a) be in a format that, in the opinion of the Chief Executive, Taranaki Regional Council, is suitable for auditing;
 - (b) specifically record the water taken as 'zero' when no water is taken; and
 - (c) for each 12-month period ending on 30 June, be provided to the Chief Executive, Taranaki Regional Council within one month after end of that period.
10. At times when water is taken from an alternative location, as specified in special condition 1(c) of this consent, the consent holder shall advise the Chief Executive, Taranaki Regional Council, within 12 hours of taking water, and within 2 days of ceasing, shall provide details of the length and time the take occurred and the volume and rate of take (cubic metres per day and litres per second).
11. The consent holder shall ensure that the intake is screened to avoid fish entering the intake or being trapped against the screen.
12. The consent holder shall make three annual payments of \$16,667 (plus GST) to the Taranaki Regional Council as a financial contribution for the purpose of providing riparian planting and fencing in the Kapuni Stream catchment. These payments shall be made no later than 1 September each year from 2012 to 2014.

Consent 1125-4

13. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2017 and/or June 2020 and/or June 2023 and/or June 2029 for the purposes of:
- (a) ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time; and/or
 - (b) to require any data collected in accordance with the conditions of this consent to be transmitted directly to the Council's computer system, in a format suitable for providing a 'real time' record over the internet.

Transferred at Stratford on 1 April 2020

For and on behalf of
Taranaki Regional Council



A D McLay
Director - Resource Management

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: Todd Petroleum Mining Company Limited
PO Box 802
New Plymouth 4340

Decision Date 20 June 2012

Commencement Date 20 June 2012

Conditions of Consent

Consent Granted: To discharge domestic sewage, tri-ethylene glycol, methanol and some water treatment chemicals (i.e. phosphate corrosion inhibitors) from an aerated sewage treatment plant onto and into land

Expiry Date: 1 June 2035

Review Date(s): June 2023, June 2029

Site Location: Kapuni Gas Treatment Plant, 298 Palmer Road, Kapuni

Grid Reference (NZTM) 1700726E-5629194N

Catchment: Kapuni

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General condition

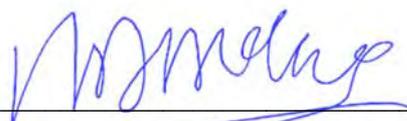
- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
2. There shall be no direct discharge of any contaminant into a surface water body.
3. The discharge shall not exceed 13.5 m³ per day (0.97 litres per second), which shall be spread as evenly as practicable to a disposal area of not less than 1,325 m².
4. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2017 and/or June 2023 and/or June 2029, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 1 April 2020

For and on behalf of
Taranaki Regional Council



A D McLay
Director - Resource Management

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder: Todd Petroleum Mining Company Limited
PO Box 802
New Plymouth 4340

Decision Date 27 January 1997

Commencement Date 27 January 1997

Conditions of Consent

Consent Granted: To discharge emissions into the air from the treatment of natural gas, cogeneration, other on-site activities and other related and ancillary activities

Expiry Date: 1 June 2029

Review Date(s): June 2023

Site Location: Palmer Road, Kapuni

Grid Reference (NZTM) 1700840E-5629660N

Catchment: Kapuni

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- (a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- (b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- (c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - (i) the administration, monitoring and supervision of this consent;
 - (ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
 - (iii) charges authorised by regulations.

Special conditions

- 1) That the consent holder shall at all times adopt the best practicable option to prevent or minimise any actual or likely adverse effects on the environment arising from discharges to air from the site. 'Best practicable option' shall be determined by the Chief Executive, Taranaki Regional Council, taking into account the information supplied by the consent holder under conditions 4, 5 and 6 of this consent, and following review as set out under condition 16 of this consent.
- 2) That the consent holder shall at all times operate, maintain, supervise, monitor and control all processes so that emissions authorised by this consent are maintained at a practicable minimum.
- 3) That prior to undertaking any alterations to the plant, processes or operations which may significantly change the nature or quantity of contaminants discharged to air from the site, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991.
- 4) That the consent holder shall provide to the Chief Executive, Taranaki Regional Council, by 1 June 1999 and every three years thereafter a written report:
 - (a) reviewing any technological advances in the reduction or mitigation of discharges to air from the site, and the costs and benefits of these advances; and
 - (b) detailing an inventory of the discharges to air from the site of such contaminants as the Chief Executive may from time to time specify following consultation with the consent holder; and
 - (c) detailing any measures that have been taken by the consent holder to improve the energy efficiency of the site's activities and processes; and
 - (d) addressing any other issue relevant to the minimisation or mitigation of discharges of contaminants to air from the site that the Chief Executive, Taranaki Regional Council, considers should be included.

Consent 4087-2

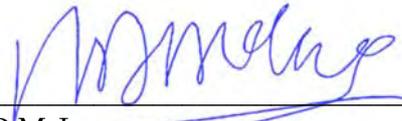
- 5) That in addition to the requirements of condition 4, the consent holder shall provide to the Chief Executive, Taranaki Regional Council, by 1 June 1996 a written report reviewing any technological advances in the reduction or mitigation of discharges of benzene, toluene, ethyl benzene, and xylene, from the glycol towers, and discussing how these might be applicable and/or implemented at the Gas Treatment Plant, and the costs and benefits of these advances.
- 6) That by 1 June 1996 the consent holder shall provide to the Chief Executive, Taranaki Regional Council, a written report evaluating the risk to human health presented by the discharge to air of benzene, toluene, ethyl benzene, and xylene from the site. The report shall be to such detail as is required by the Chief Executive, Taranaki Regional Council.
- 7) That the consent holder shall provide to the Chief Executive, Taranaki Regional Council, on an annual basis the gross emissions of carbon dioxide from the site.
- 8) That the consent holder shall control all discharges to air from the site of carbon monoxide, in order that the maximum concentration of carbon monoxide measured under ambient conditions at or beyond the site boundary arising from discharges to air from the site does not exceed 30 mg/m³ (one-hour average exposure) or 10 mg/m³ (eight-hour average exposure).
- 9) That the consent holder shall control all discharges to air from the site of nitrogen dioxide, in order that the maximum ambient concentration of nitrogen dioxide measured under ambient conditions at or beyond the site boundary arising from discharge to air from the site does not exceed 300 µg/m³ (one-hour average exposure) or 100 µg/m³ (twenty-hour average exposure).
- 10) That should an off-site concentration of carbon monoxide or of nitrogen dioxide in the vicinity of the site be found to exceed a limit established in condition 8 or 9 above, then the Taranaki Regional Council may review any or all of the conditions of this consent pursuant to section 128(1)(a) of the Resource Management Act.
- 11) That the consent holder shall control all discharges of benzene to air from the site, in order that the maximum concentration measured under ambient conditions at or beyond the site boundary arising from discharges to air from the site, shall not exceed 16 µg/m³ (annual average of twenty-four-hour average exposure), nor 3.2 mg/m³ at any time, nor 0.32 mg/m³ (any eight-hour average exposure).
- 12) That the consent holder shall control all discharges to air from the site other than of carbon dioxide, carbon monoxide, nitrogen oxides and benzene, so that the maximum concentration measured under ambient conditions at or beyond the boundary of the site, arising from the exercise of this consent, does not exceed:
 - (a) more than 1/30th of the relevant Occupation Threshold Value (Time Weighted Average); or
 - (b) the Short Term Exposure Limit at any time (Workplace Exposure Standards and Biological Exposure Indices for New Zealand, 1992, Department of Labour).
- 13) That the discharges authorised by this consent shall not give rise to an odour at or beyond the boundary of the site that in the opinion of at least one officer of the Taranaki Regional Council is offensive or obnoxious or objectionable.

Consent 4087-2

- 14) That whenever practicable depressurisation of the plant or sections of the plant shall be so controlled as to avoid dense black smoke from being discharged from any flare.
- 15) That the discharges authorised by this consent shall not give rise to any significant adverse ecological effect on any ecosystems, including but not limited to habitats, plants, animals, microflora and microfauna.
- 16) That pursuant to the provisions of section 128(1)(a) of the Resource Management Act the Council may within six months of receiving a report prepared by the consent holder subject to conditions 4, 5, or 6 of this consent or otherwise by giving notice of review during June 1999 and/or June 2005 and/or June 2011 and/or June 2017 and/or June 2023 serve notice that it intends to review any condition of this resource consent for the purposes of:
 - (a) dealing with any significant adverse effect on the environment arising from the exercise of this consent; or
 - (b) requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment caused by the discharge.
- 17) That the consent holder shall prepare a site contingency plan to the satisfaction of the Chief Executive, Taranaki Regional Council, no later than six months after the granting of this consent. The contingency plan shall be reviewed and if necessary updated to the satisfaction of the Chief Executive, Taranaki Regional Council, annually.

Transferred at Stratford on 1 April 2020

For and on behalf of
Taranaki Regional Council



A D McLay
Director - Resource Management

Land Use Consent
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder: Todd Petroleum Mining Company Limited
PO Box 802
New Plymouth 4340

Decision Date 27 January 1997

Commencement Date 27 January 1997

Conditions of Consent

Consent Granted: To erect place use and maintain two above ground pipelines, an electrical ring main and associated structures over beds of various streams between and including the Motumate Stream and an unnamed tributary of the Waiokura Stream for steam and electricity supply purposes

Expiry Date: 1 June 2032

Review Date(s): June 2023

Site Location: Palmer Road To Manaia Road Kapuni

Grid Reference (NZTM) 1700840E-5629760N

Catchment: Waiokura

Tributary: Motumate

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- (a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- (b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- (c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - (i) the administration, monitoring and supervision of this consent;
 - (ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
 - (iii) charges authorised by regulations.

Special conditions

- 1. That the structures licensed by this consent shall be constructed and maintained in accordance with the documentation submitted in support of application 96/322.
- 2. That the consent holder shall notify the Taranaki Regional Council at least 48 hours prior to, and again upon completion of initial construction works, and again 48 hours prior to and upon completion of any subsequent maintenance works which may result in disturbance of the stream beds and/or discharges to the streams.
- 3. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 1999 and/or June 2005 and/or June 2011 and/or June 2017 and/or June 2023 and/or June 2029, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects of the discharge on the receiving environment arising from the exercise of this consent, which were not foreseen at the time the application was considered and which it was not appropriate to deal with at the time.

Transferred at Stratford on 1 April 2020

For and on behalf of
Taranaki Regional Council



A D McLay
Director - Resource Management

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: Vector Gas Trading Limited
101 Carlton Gore Road
Newmarket
Auckland 1023

Decision Date: 27 January 1997

Commencement Date: 27 January 1997

Conditions of Consent

Consent Granted: To discharge minor amounts earth material and associated stormwater onto land and into various streams between and including the Motumate Stream and an unnamed tributary of the Waiokura Stream associated with the construction of two above ground pipelines, an electrical ring main and associated structures for steam and electricity supply purposes

Expiry Date: 1 June 2032

Review Date(s): June 2017, June 2023, June 2029

Site Location: Palmer Road To Manaia Road, Kapuni

Legal Description: Various

Grid Reference (NZTM) 1700840E-5629760N

Catchment: Waikoura
Motumate

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- (a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- (b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- (c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - (i) the administration, monitoring and supervision of this consent;
 - (ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
 - (iii) charges authorised by regulations.

Special conditions

- 1. That during the exercise of this consent, the consent holder must observe every practicable measure to prevent the discharge or placement of silt and/or organics and/or cement products and/or any other contaminants into the watercourse, and to minimise disturbance of the stream bed.
- 2. That the consent holder shall notify the Taranaki Regional Council at least 48 hours prior to, and again upon completion of, any exercise of this consent.
- 3. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 1999 and/or June 2005 and/or June 2011 and/or June 2017 and/or June 2023 and/or June 2029, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects of the discharge on the receiving environment arising from the exercise of this consent, which were not foreseen at the time the application was considered and which it was not appropriate to deal with at the time.

Transferred at Stratford on 1 September 2015

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder: Todd Petroleum Mining Company Limited
PO Box 802
New Plymouth 4340

Decision Date 25 January 2010

Commencement Date 25 January 2010

Conditions of Consent

Consent Granted: To discharge sludge, and some liquid, from two stormwater retention ponds, a filter backwash pond and a settlement pond onto and into land

Expiry Date: 1 June 2023

Site Location: Kapuni Gas Treatment plant, 298 Palmer Road, Kapuni

Grid Reference (NZTM) 1700973E-5629335N

Catchment: Kapuni

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of applications 4506 and 6313. In the case of any contradiction between the documentation submitted in support of applications 4506 and 6313 and the conditions of this consent, the conditions of this consent shall prevail.
3. The consent holder shall ensure that only sludge generated in the stormwater retention ponds, filter backwash ponds and from settlement of Kapuni Stream water in the northern pond is discharged.
4. During times when the Kapuni Stream is in low flow, or when equipment failure prevents discharge to the stream, the discharge may include liquids [excluding demineralisation wastes] that normally reside in these ponds as an alternative to discharging them to the stream.
5. No disposal shall occur outside the area specified in application 4506.
6. The discharge onto and into land shall occur a minimum of 25 metres from any surface water body or property boundary. Discharge shall be onto and into land and there shall be no discharge of any contaminant to surface water.
7. The consent holder shall keep records of the following:
 - a) Analysis of a representative sample of sludge each time the stormwater ponds and filter backwash pond is de-sludged, and soil quality after each discharge (analysing for arsenic, cadmium, chromium, copper, lead, nickel, mercury and zinc)
 - b) Volumes of material discharged
 - c) Dates and times of discharge events

and shall provide the results to the Chief Executive, Taranaki Regional Council, on request.

Consent 7043-1

8. Any relocation of soil from within the defined disposal area shall only occur if it can be shown to the satisfaction of the Chief Executive, Taranaki Regional Council that the standards, terms, and conditions of Rule 29 of the Regional Freshwater Plan for Taranaki will be complied with.
9. The discharge authorised by this consent shall not give rise to any of the following effects in any water body:
 - a) the production of conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - b) any conspicuous change in the colour or visual clarity;
 - c) any emission of objectionable odour;
 - d) the rendering of fresh water unsuitable for consumption by farm animals;
 - e) any significant adverse effects on aquatic life.
10. At all times, the consent holder shall comply with the guidelines for industrial sites developed by the Australian National Environmental Protection Council (Assessment of Site Contamination) Schedule B(1): Guideline on the Investigation Levels for Soil and Groundwater (1999).
11. The consent holder shall advise the South Taranaki District Council that the disposal area is being used for disposal of contaminated silts at levels and rates expected to result in the soil of that area exceeding agricultural land use guidelines, but not exceeding industrial land use guidelines.
12. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2011 and/or June 2017, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 1 April 2020

For and on behalf of
Taranaki Regional Council



A D McLay
Director - Resource Management

Land Use Consent
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of
Consent Holder: Vector Gas Trading Limited
101 Carlton Gore Road
Newmarket
Auckland 1023

Decision Date: 10 April 2008

Commencement Date: 10 April 2008

Conditions of Consent

Consent Granted: To remove a weir structure in the Kapuni Stream and undertake works for river bank protection purposes

Expiry Date: 1 June 2023

Review Date(s): June 2017

Site Location: Kapuni Gas Treatment Plant, 318 Palmer Road, Kapuni

Legal Description: Pt Lot 1 DP 5227 Lot 1 DP 9987 Blk XVI Kaupokonui SD

Grid Reference (NZTM) 1700900E-5629580N

Catchment: Kapuni

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. The exercise of this consent shall be undertaken substantially in accordance with the documentation submitted in support of application 4950. In the case of any contradiction between the documentation submitted in support of application 4950 and the conditions of this consent, the conditions of this consent shall prevail.
2. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least 48 hours prior to the commencement and upon completion of weir removal and again at least 48 hours prior to and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the river bed or discharges to water. Notification shall include the consent number and a brief description of the activity consented and be emailed to worknotification@trc.govt.nz. Notification by fax or post is acceptable if the consent holder does not have access to email.
3. The consent holder shall adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to avoid or minimise the discharge of sediments or other contaminants into water or onto the riverbed and to avoid or minimise the disturbance of the riverbed and any adverse effects on water quality.
4. The consent holder shall ensure that the area and volume of the riverbed disturbance shall, so far as is practicable, be minimised and any areas which are disturbed shall, so far as is practicable, be reinstated.
5. The consent holder shall take all reasonable steps to:
 - a) minimise the amount of sediment discharged to streams;
 - b) minimise the amount of sediment that becomes suspended in streams; and
 - c) mitigate the effects of any sediment in the stream

Undertaking work in accordance with *Guidelines for Earthworks in the Taranaki Region*, by Taranaki Regional Council, will achieve compliance with this condition.

Consent 7281-1

6. The consent holder shall ensure that all concrete, steel, rubble and any other materials from the demolition is removed from the streambed.
7. Any instream work shall take place only between 1 November and 10 May inclusive, except where this is waived in writing by the Chief Executive, Taranaki Regional Council.
8. The consent holder shall not use explosives in the removal of the structure.
9. This consent shall lapse five years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.
10. That the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2011 and/or June 2017, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which were not foreseen at the time the application was considered and which it was not appropriate to deal with at that time.

Transferred at Stratford on 1 September 2015

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

Certificate of Compliance

**Pursuant to section 139 of the Resource Management Act 1991
a certificate of compliance is hereby issued by the
Taranaki Regional Council**

Name of certificate holder Vector Gas Trading Limited
101 Carlton Gore Road
Newmarket
Auckland 1023

Site location Kapuni Gas Treatment Plant, 298 Palmer Road, Kapuni

Certification The Taranaki Regional Council hereby certifies that as of 29 March 2010:

The placement and use of the following structures in, on, under or over the bed of the Kapuni Stream;

1. LTS pipebridge
2. LTS plant access bridge
3. Water intake structure
4. Flo-Dar and access platform
5. pH meter
6. Gabion baskets
7. Two stormwater discharge pipes
8. Stream bank protection
9. Stock bridge

can lawfully be undertaken without a resource consent.

Relevant Rules

Rule 52 of the Regional Fresh Water Plan applies to all structures listed above excluding a PVC stormwater pipe and Flo-Dar measuring system. That rule has the following conditions:

- *Structure was lawfully established and in use at the date of public notification of this Plan;*
- *Structure must not restrict the passage of fish;*
- *There shall be no significant adverse effects on aquatic life or instream habitat.*

Rule 61 of the Regional Fresh Water Plan applies to the PVC stormwater pipe and Flo-Dar measuring system. That rule has the following conditions:

- *Structures for the conveyance of stormwater shall be no greater than 150 mm in diameter;*
- *Structure shall not cause a navigational hazard;*
- *Structure does not alter the natural course of the river nor reduce channel capacity during flood flows;*
- *There shall be no significant adverse effects on aquatic life or instream habitat;*
- *Structure does not cause significant erosion, scour or deposition;*
- *Disturbance of the bed shall be the minimum necessary to carry out the required works;*
- *No contaminants shall be released to the river or lake bed from equipment being used for the activity, and no refuelling of equipment shall take place on any area of the river or lake bed;*
- *Between 1 May and 31 October there shall be no disturbance of any part of the bed covered by water;*
- *Sediment disturbance will not conspicuously change the visual clarity of water beyond a zone of reasonable mixing;*
- *All construction materials shall be removed from the bed;*
- *Water is only diverted to the extent, and for the period, necessary to carry out the works;*
- *Structure shall not restrict the passage of fish.*

Transferred at Stratford on 1 September 2015

For and on behalf of
Taranaki Regional Council

A D McLay
Director-Resource Management

Discharge Permit
Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder: Todd Petroleum Mining Company Limited
PO Box 802
New Plymouth 4340

Decision Date 20 June 2012

Commencement Date 20 June 2012

Conditions of Consent

Consent Granted: To discharge stormwater from site areas of a natural gas treatment plant where no industrial processes occur (e.g. landscaped areas and roads) into the Kapuni Stream

Expiry Date: 1 June 2035

Review Date(s): June 2023, June 2029

Site Location: Kapuni Gas Treatment Plant, 298 Palmer Road, Kapuni

Grid Reference (NZTM) 1700830E-5629418N

Catchment: Kapuni

*For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document*

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
2. The stormwater discharged shall be from a catchment area not exceeding 9.39 ha.
3. After allowing for reasonable mixing, the discharge shall not, either by itself or in combination with other discharges, give rise to any or all of the following effects in the receiving water:
 - a. the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - b. any conspicuous change in the colour or visual clarity;
 - c. any emission of objectionable odour;
 - d. the rendering of fresh water unsuitable for consumption by farm animals; and
 - e. any significant adverse effects on aquatic life.
4. The consent holder shall maintain a contingency plan (which is incorporated into the contingency plan for the entire site). The contingency plan shall be adhered to in the event of a spill or emergency and shall, to the satisfaction of the Chief Executive, Taranaki Regional Council, detail measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not authorised by this consent and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge.
5. The consent holder shall maintain a stormwater management plan (which is incorporated into the stormwater management plan for the entire site). This plan shall be adhered to at all times and shall, to the satisfaction of the Chief Executive, Taranaki Regional Council document how the site is to be managed in order to minimise the contaminants that become entrained in the stormwater.
6. This consent shall lapse on 30 June 2017, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

Consent 7755-1

7. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2017 and/or June 2023 and/or June 2029, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 1 April 2020

For and on behalf of
Taranaki Regional Council



A D McLay

Director - Resource Management

Certificate of Compliance

**Pursuant to section 139 of the Resource Management Act 1991
a certificate of compliance is hereby issued by the
Taranaki Regional Council**

Name of certificate holder	Vector Gas Trading Limited 101 Carlton Gore Road Newmarket Auckland 1023
Site location	Kapuni Gas Treatment Plant, 298 Palmer Road, Kapuni at or about GR: 1700824E-5629246N [legal description: Lot 1 DP 15254 [Discharge source & site]]
Proposal/Activity	To discharge stormwater from an LPG storage and load-out facility onto and into land in the vicinity of the Kapuni Stream, in accordance with the proposal set out in application 6645.
Certification	<p>The Taranaki Regional Council hereby certifies that:</p> <p>the discharge of stormwater from a LPG storage and load-out facility onto and into land in the vicinity of the Kapuni Stream as outlined in the documentation supplied in support of the application is a permitted activity pursuant to Rule 23 of the Regional Freshwater Plan for Taranaki [2001] at the date of receipt of the application for this certificate, provided that it complies with and continues to comply with the following conditions:</p> <ul style="list-style-type: none">• <i>The discharge shall not originate from any industrial or trade premise where the active area of the site is greater than 0.5 ha, unless there is an interceptor system in place that is designed and managed so that it will keep stormwater from entraining contaminants;</i>

- *The discharge shall not originate from any industrial or trade premise where hazardous substances are used, stored or potentially spilt unless:*
 - (i) *there is an interceptor system in place that is designed and managed so that it will keep stormwater from entraining contaminants; or*
 - (ii) *there is an interceptor system in place that is designed and managed so that it is capable of capturing contaminated stormwater and either diverting it to trade waste or containing it and/or removing or reducing the contaminants such that:*
 - *any spills can be recovered;*
 - *the discharge shall not contain any persistent or bioaccumulative substances;*
 - *the discharge shall not breach any other specified condition of this rule;*

and a spill contingency and interceptor system maintenance plan is maintained and regularly updated for the site;
- *The discharge shall not originate from any industrial or trade premises where the movement of rock, earth or soil material is taking place, unless that movement is being undertaken in connection with site landscaping, or the installation, construction, maintenance or demolition of buildings, structures or equipment;*
- *The discharge shall not be greater than is able to be discharged from a pipe of 900 mm in diameter;*
- *The discharge shall not cause significant erosion, scour or deposition;*
- *Discharge that will, or is liable to enter surface water, shall not exceed the following:*

<i>pH</i>	<i>6.0-9.0</i>
<i>oil and grease</i>	<i>15 gm⁻³</i>
<i>suspended solids</i>	<i>100 gm⁻³</i>
<i>BOD</i>	<i>5 gm⁻³</i>
<i>unionised ammonia</i>	<i>0.025 gm⁻³</i>
<i>free chlorine</i>	<i>0.2 gm⁻³</i>
- *The discharge shall not give rise to any of the following effects in receiving waters after reasonable mixing:*
 - (a) *the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;*
 - (b) *any conspicuous change in the colour or visual clarity;*
 - (c) *any emission of objectionable odour;*
 - (d) *the rendering of fresh water unsuitable for consumption by farm animals;*
 - (e) *any significant adverse effects on aquatic life.*

Any discharge which causes any of the above conditions to be breached is not permitted and may be the subject of enforcement action.

Transferred at Stratford on 1 September 2015

For and on behalf of
Taranaki Regional Council

A D McLay
Director-Resource Management

Appendix II

Triennial report per special condition 4 under
consent 4087



Kapuni Gas Treatment Plant

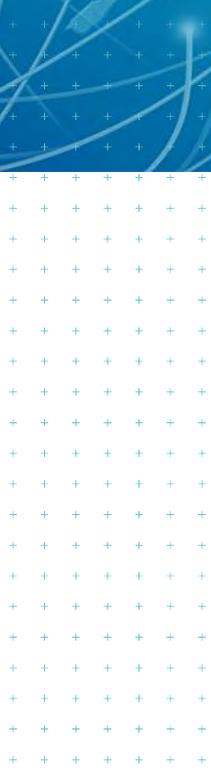
**Report on Special Condition 4 of Air
Discharge Permit 4087 - November
2019 to February 2020**

Prepared for
Todd Petroleum Mining Company Ltd

Prepared by
Tonkin & Taylor Ltd

Date
October 2020

Job Number
1015030



Exceptional thinking together

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Document Control

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1 Introduction

The Kapuni Gas Treatment Plant (KGTP) is owned and operated by Todd Petroleum Mining Company Ltd (TPMC). TPMC holds resource consent (no 4087-2) authorising the discharge of contaminants to air from the treatment of natural gas, cogeneration, and other related activities at the KGTP.

Special Condition 4 of resource consent no 4087-2 requires that TPMC provides a written report to the Taranaki Regional Council (TRC) every three years on discharges to air from the site. The purpose of this monitoring report is to fulfil the requirements of Special Condition 4 for the most recent three year reporting period (September 2017 to August 2020)

Tonkin & Taylor Limited (T+T) has prepared this report for TPMC in accordance with our letter of engagement dated 30 July 2020.

2 Scope of this report

Resource consent no. 4087-2 was granted by the TRC on 7 February 1996.

Special condition 4 of resource consent 4087-2 requires that TPMC provide a written report every three years on the discharges to air from the site, including the following:

- a Reviewing any technological advances in the reduction or mitigation of discharges to air from the site, and the costs and benefits of these advantages.
- b Detailing an inventory of the discharges to air from the site of such contaminants as the General Manager may from time to time specify following consultation with the consent holder.
- c Detailing any measures that have been taken by the consent holder to improve the energy efficiency of the site's activities and processes.
- d Addressing any other issue relevant to the minimisation or mitigation of discharges of contaminants to air from the site that the General Manager, Taranaki Regional Council, considers should be included.

This report is the eighth report produced in accordance with Special Condition 4, with previous reports being prepared in 1999, 2002, 2005, 2009, 2011, 2014 and 2017¹. Accordingly, this report covers the reporting period of September 2017 to August 2020.

3 Condition 4(d): Process description

3.1 Background

The KGTP was built in 1969/70 and processes raw natural gas to produce specification gas for reticulation and a number of other by-products.

Under the present operation, all raw natural gas entering the KGTP comes from the Kapuni Gas Production Station (KGPS), which is also operated by TPMC. Raw Kapuni gas contains approximately 43% carbon dioxide (CO₂) by volume. The KGTP receives approximately 660,000 tonnes of CO₂ annually in its Kapuni gas, with most of this being vented to atmosphere as a result of treatment processes.

¹ Only the 2009 monitoring report was prepared by T+T.

3.2 Historical process change

The KGTP is designed to process high CO₂ content Kapuni gas to a quality suitable for use in general domestic, commercial, and industrial appliances. The process involves the removal of CO₂ from the gas using the Benfield Hot Potassium Carbonate technology. The gas is then dehydrated and chilled to recover natural gas liquids (LPG, natural gasoline) from the gas. The product gas is then compressed, odourised, and distributed via the transmission distribution network as specification gas (compliant with NZS 5442:2008).

The KGTP has undergone several plant expansions and upgrades, which are summarised in Table 3.1.

Table 3.1: Historical expansions, upgrades and changes of ownership of the Kapuni Gas Treatment Plant

Year(s)	Expansion/upgrade
1973	LPG separation and fractionation.
1979-80	Additional CO ₂ removal capacity added to process Maui gas and facilities to recover, purify, and liquefy some of the CO ₂ .
1985	The treatment plant was expanded with the installation of the low temperature separation (LTS) Gas Conditioning Plant that processed the high CO ₂ content Kapuni gas for water and heavy hydrocarbon removal only. The condition gas was supplied to the region's methanol plants so it could be blended with the much lower CO ₂ content Maui gas for more efficient methanol production.
1996-97	TRC issued air discharge permit 4087 on 7 February 1996 to the Natural Gas Corporation of New Zealand Ltd (NGC). In late 1996, NGC sought a change to 4087 to account for the installation of a new cogeneration facility and other ancillary operations associated with the refurbishment of the KGTP. The application was granted by TRC on 27 January 1997.
1997	The KGTP refrigeration systems were upgraded, enabling more natural gas liquids to be removed from the raw gas.
1998	Reliability and efficiencies were further improved with the completion of a \$25 million, 3-year refurbishment of the plant's processes and control systems. The NGC and Todd Energy Kapuni Energy Joint Venture commissioned a 25 MW cogeneration plant within the KGTP complex. The cogeneration plant provides electricity and steam requirements of the KGTP and Fonterra's lactose factory at Kapuni. Excess electricity is sold to the national grid.
2003-04	An upgrade of the gas treatment plant was conducted, involving the recommissioning of one of the plant's three process trains, debottlenecking the dehydration and chilling process, adding a further 100 tonnes of LPG storage, and installing a new reverse osmosis water treatment plant.
May 2005	Methanex reduced its production capacity and as a result the LTS Gas Conditioning Plant was mothballed.
2004-06	NGC was sold to Vector Limited. In July 2006 NGC changed its name to Vector Gas Limited.
Apr 2020	Vector transferred ownership of the KGTP to TPMC. This includes the KGTP and related assets and Vector's 50% interest in the Kapuni Energy Joint Venture.

3.3 Annual emissions of carbon dioxide from the Kapuni gas treatment plant

CO₂ emissions arise from a range of sources within the KGTP site. Most of the CO₂ emissions are from plant and equipment. A notable exception is the cogeneration facility (owned by TPMC), which produces both steam and electricity for the KGTP site and the Fonterra lactose factory. The cogeneration facility also exports electricity to the national grid.

CO₂ emissions from the KGTP relate to the Benfield CO₂ removal system, CO₂ recovery plant, pipeline compressors, stabiliser compressor, operation of the boilers and cogeneration, KGTP electricity generation (prior to cogeneration) and flaring.

Food grade CO₂ is produced at the KGTP and is re-sold for food purposes. During the monitoring period around 4-6% of the CO₂ received in the raw gas processed at the site was sold as liquid food grade CO₂. Food grade CO₂, and CO₂ which remains in the treated gas (i.e. not removed by the Benfield process) are not included in the annual CO₂ emissions data for the KGTP as these emissions would occur off-site.

Figure 3.1 shows the KGTP annual CO₂ emission figures for the period 2000-2019. These figures have been presented in the same format as that reported to the Ministry for the Environment (MfE) for input into the New Zealand Greenhouse Gas Inventory, which is categorised emissions as follows:

- CO₂ vented to atmosphere from the Benfield process.
- CO₂ produced by fuel combustion at the KGTP.

Annual CO₂ vented to atmosphere has generally decreased since 2004. The reduction in CO₂ emissions in recent years is generally due to reduced quantities of gas processed by the KGTP compared to previous years.

Additionally, the amount of CO₂ from fuel combustion at the KGTP has reduced since 2008. This is because the site previously used its boilers to raise steam, whereas now all the steam used by the site is produced from the cogeneration facility.

The amount of annual CO₂ released to atmosphere from the site between 2017 and 2019 is similar to the quantities released to atmosphere in 2016.



Figure 3.1: Annual CO₂ emissions from the Kapuni Gas Treatment Plant

3.4 Significant flaring

Flaring is an important safety consideration for the site as it allows flammable material to be safely released into the environment in a non-combustible form in the event of either processing upsets or contingency situations arising at the site. There are no circumstances where TPMC gains a financial advantage from flaring. Any flaring is a financial loss; hence there is a strong drive to minimise any flaring activity.

The largest flaring episodes occur during emergency depressurisation (EDP) tests. This test is carried out to establish that all emergency shutdown and depressurisation valves actuate. This results in only a fraction of the total hydrocarbon inventory being flared. These tests have been carried out on an annual basis since 1997 to achieve the design reliability requirements, and in accordance with international practice.

With the exception of EDP tests, TPMC reports that there have been no flaring events since 2017.

4 Condition 4(c): Process & operational enhancements at the Kapuni Gas Treatment Plant

The annual steam use (in tonnes) per terajoule of gas processed at the KGTP is used as a Key Performance Indicator (KPI) to monitor the efficiency of steam use in the CO₂ removal process.

In previous triannual reports the steam use per unit of CO₂ removed has been presented as a KPI for measuring the efficiency of steam use in the Benfield trains. The KPI of comparing steam use to the amount of gas processed is a better measure of the efficiency of the whole CO₂ removal process, rather than just the Benfield trains.

Figure 4.1 shows the annual steam use per unit of gas processed between 2004 and 2019. The figure generally shows a reduction in the amount of steam used at the site per unit of gas processed since 2004. Since 2010, the annual steam use per unit of gas processed has been at relatively similar levels. This indicates that there has been an overall improvement in the CO₂ removal efficiency at the site. The recent plateau may indicate the site may be approaching a limit on further improvements to efficiency are possible with the current plant.

TPMC reports that there have been no further upgrades to improve energy efficiency at the KGTP in the reporting period.

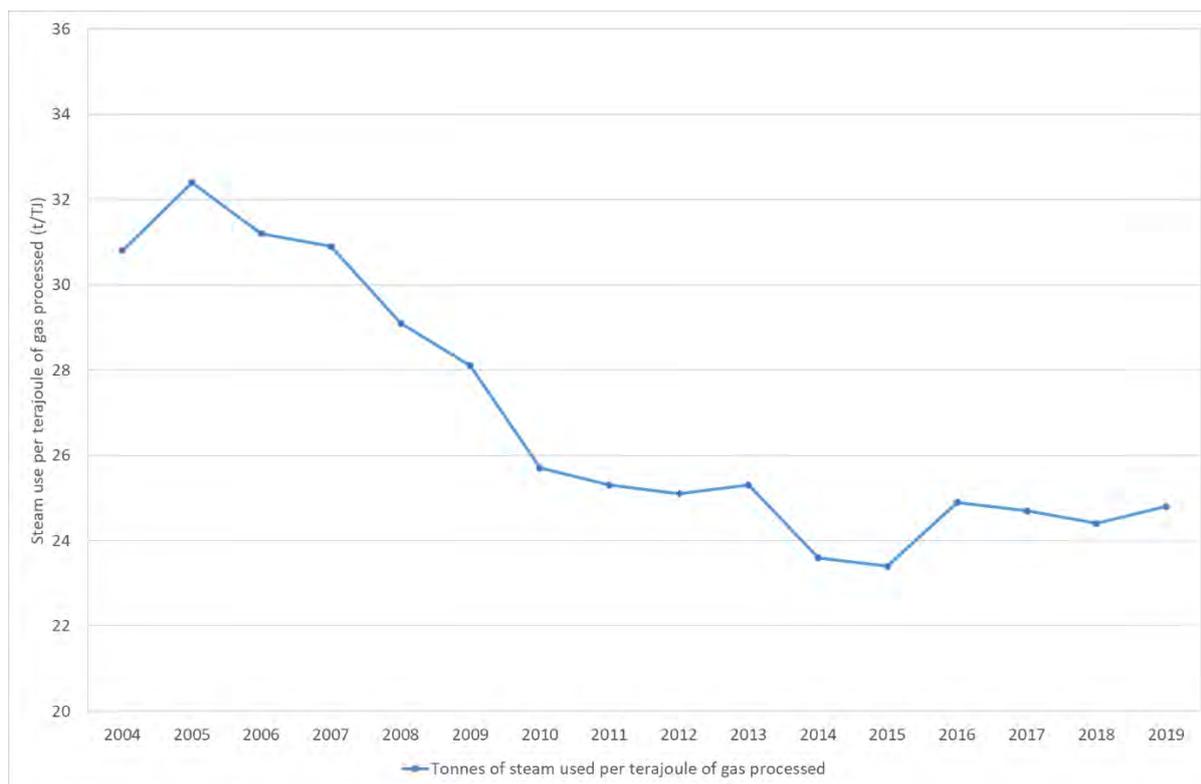


Figure 4.1: Tonnes of steam used per terajoule of gas processed per annum, 2004-2019

5 Condition 4(a): Technology review

TPMC reports that there have been no technological enhancements of the KGTP in the reporting period.

6 Condition 4(b): Ambient air monitoring

6.1 Nitrogen dioxide and carbon monoxide air monitoring study

6.1.1 Monitoring locations

Figure 6.1 shows the location of the air quality monitoring station at the boundary of the KGTP. This location is consistent with monitoring undertaken at the site.

The KGTP is located close to two other industrial activities, which have the potential for nitrogen oxide (NO_x) and carbon monoxide (CO) emissions. The TPMC Kapuni Gas Production Station is immediately adjacent to the north of the KGTP, and the Balance Agri-Nutrients Ammonia Urea plant is located to the west of the site as indicated in Figure 6.1.



Figure 6.1: Monitoring locations for the air monitoring study. The KGTP site boundary is outlined in red, the TPMC Kapuni Gas Production Station site boundary is outlined in orange, and Balance Agri-Nutrients site boundary is outlined in blue.

6.1.2 Monitoring methods

In 2019, Watercare Services Ltd was commissioned to undertake active and passive ambient air quality monitoring at the KGTP by TPMC. Continuous monitoring of CO, nitrogen dioxide (NO₂) and meteorological parameters (wind speed, wind direction & ambient temperature) was carried out at the north-eastern perimeter of the plant. The above parameters were recorded for the period 1 November 2019 to 30 January 2020.

The monitoring shed and sample inlet were sited in accordance with AS/NZ 3580.1.1 – 2016: Ambient Air – Guide for the Siting of Sampling Units. The sampling location is consistent with previous continuous monitoring studies undertaken in 2004 and 2008.

Measurements of CO and NO₂, wind speed, wind direction and temperature were made in accordance with the following standards:

- AS 3580.7.1 – 2011: Determination of carbon monoxide – Direct-reading instrumental method.
- AS 3580.5.1 – 2011: Determination of oxides of nitrogen – Direct-reading instrumental method.
- AS 3580.14 – 2014: Meteorological monitoring for ambient air quality monitoring applications.

With the mothballing of the low temperature separation gas conditioning plant, the BTEX emissions at KGTP have been eliminated. In consultation with TPMC prior to monitoring commencing, Taranaki Regional Council agreed that BTEX monitoring for the 2020 study was unnecessary.

6.1.3 Data validity

The MfE 'Good Practice Guide for Air Quality Monitoring and Data Management'² suggests that it is difficult to reach anything close to 100 % valid data for long-term monitoring. As such, the MfE recommends that data capture should be evaluated against a target data capture rate of 95 %.

Table 6.1 shows the monthly valid data capture during the reporting period. Data capture for NO_x, CO and meteorological parameters were above 95% for the monitoring period and therefore meet the reporting requirements of the MfE.

Table 6.1: Monthly valid data capture

Parameter	Averaging period	Percentage valid data		
		November 2019	December 2019	January 2020
Nitrogen oxides (NO _x , NO and NO ₂)	10-minutes	98 %	98 %	98 %
Carbon monoxide	10-minutes	97 %	98 %	98 %
Wind speed	10-minutes	100 %	100 %	100 %
Wind direction	10-minutes	100 %	100 %	100 %
Air temperature	10-minutes	100 %	100 %	100 %
Relative humidity	10-minutes	100 %	100 %	100 %

6.1.4 Meteorological conditions

Figure 6.2 shows a wind direction and wind speed frequency rose for the monitoring period. During the monitoring period, the predominant wind was from the west-southwest to northwest directions with secondary prevalence of winds from the north and south-southeast.

Figure 6.3 shows a time series of 24-hour average ambient temperature and relative humidity measured at the site. Temperature and humidity were relatively consistent across the monitoring period.

² Ministry for the Environment. *Good Practice Guide for Air Quality Monitoring and Data Management 2009*. April 2009.

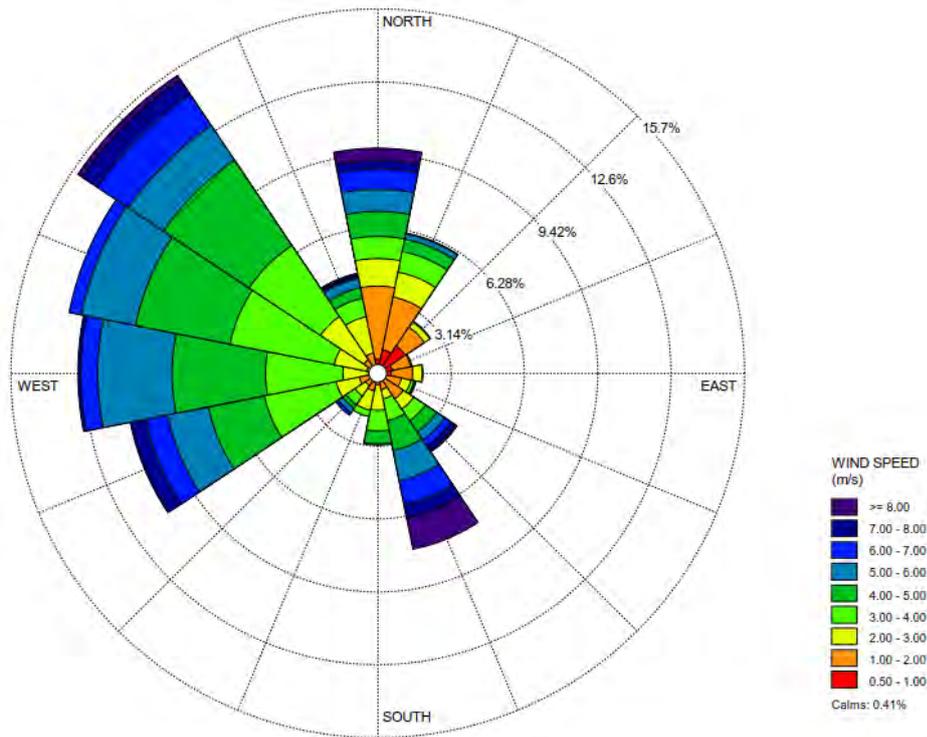


Figure 6.2: Wind direction and wind speed frequency rose, 1-hour averages, blowing-from, November 2019 to January 2020.

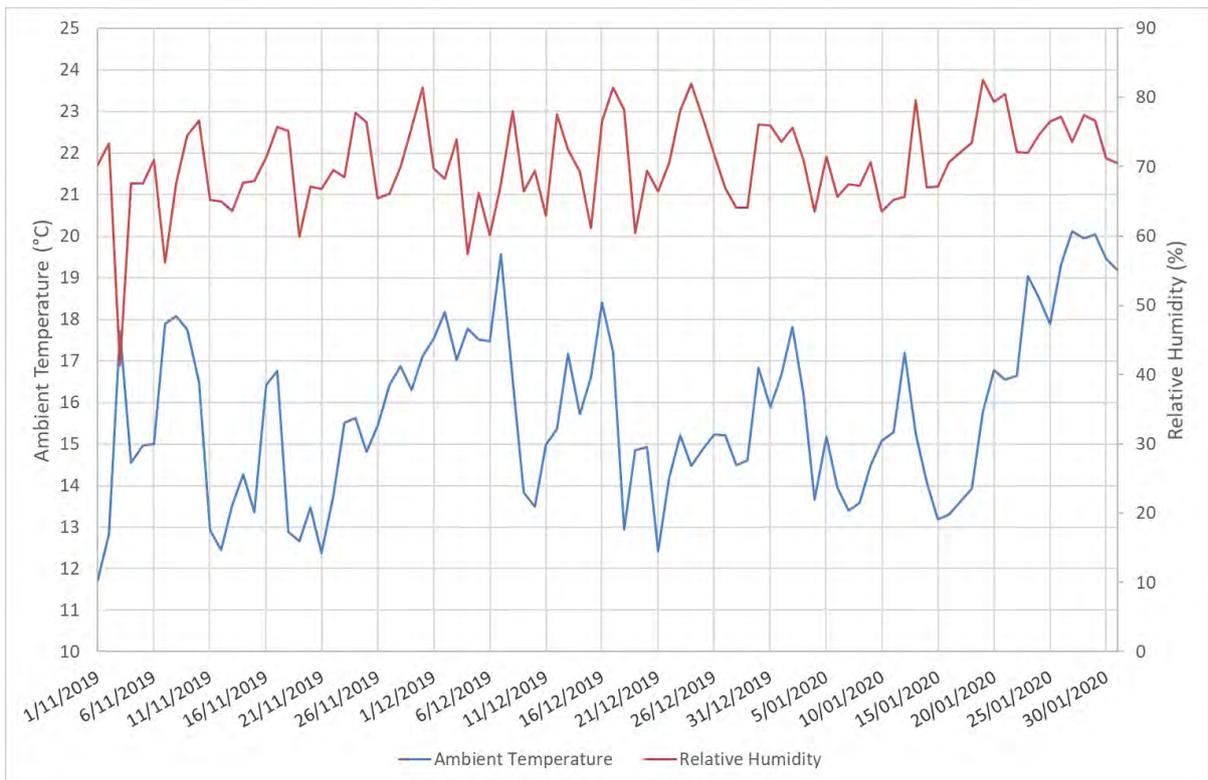


Figure 6.3: 24-hour average ambient temperature and relative humidity time-series, November 2019 to January 2020.

6.1.5 Ambient air quality criteria

Conditions 8 and 9 of resource consent no. 4087-2 sets out limits for maximum concentrations at or beyond the site boundary CO and NO₂ arising from discharges to air from the site.

The Resource Management (National Environmental Standards for Air Quality) Regulations 2004 (NESAQ) specifies standards for certain contaminants, including carbon monoxide and nitrogen dioxide. A key aspect to note is that the NESAQ specifies a 1-hour average concentration limit for nitrogen dioxide of 200 µg/m³ with an allowance for 9 exceedances per year.

Although the NESAQ for nitrogen dioxide is lower than the consent limit, the consent limits in the air discharge consent prevails because the air discharge consent was granted prior to the commencement of the NESAQ³. The consent limits will continue to prevail over the NESAQ until the air discharge consent expires or a review of the air discharge consent conditions is undertaken under Section 128(1)(ba) of the Resource Management Act. The monitoring results have been assessed against the consent limits set out in Table 6.2 below.

Table 6.2: Ambient air quality limits applicable to the Kapuni Gas Treatment Plant

Pollutant	Averaging period	Consent limit (µg/m ³)
Carbon monoxide (CO)	1-hour	30,000
	8-hours	10,000
Nitrogen dioxide (NO ₂)	1-hour	300
	24-hours	100

6.1.6 Nitrogen dioxide results

Table 6.3 summarises the maximum measured concentrations of NO₂ over the monitoring period. The 1-hour average and 24-hour average NO₂ concentrations were below the consented limits of 300 µg/m³ and 100 µg/m³, respectively. Additionally, the maximum measured 1-hour average NO₂ concentration was below the NESAQ standard of 200 µg/m³.

Table 6.3: Maximum ambient nitrogen dioxide concentrations (November 2019 – January 2020)

Pollutant	Averaging period	Air quality criteria (µg/m ³)	Maximum concentration (µg/m ³)		
			November 2019	December 2019	January 2020
Nitrogen dioxide (NO ₂)	1-hour	300	94	99	72
	24-hours	100	53	62	29

The pollution roses in Figure 6.4 show the relationship between NO₂ concentrations and wind direction. Analysis of these wind characteristics show that the highest NO₂ concentrations were measured in winds blowing from the west to northwest directions. Potential sources of NO₂ in the vicinity of the monitoring site in these wind directions are the KGTP (west to northwest of the monitoring site), Ballance Agri-Nutrients (located west to west-northwest of the monitoring site), and the TPMC Kapuni Production Station (located west-northwest to northwest of the monitoring site).

³ Section 43(b)(6a) and (6Aa) provide for discharge permits to prevail of a national environmental standard where those permits were granted before the NES was notified in the *Gazette*. This is applicable to the site's air discharge permit as consent no. 4087-2 was granted in 1996 prior to the NESAQ being notified in the *Gazette* in 2004.

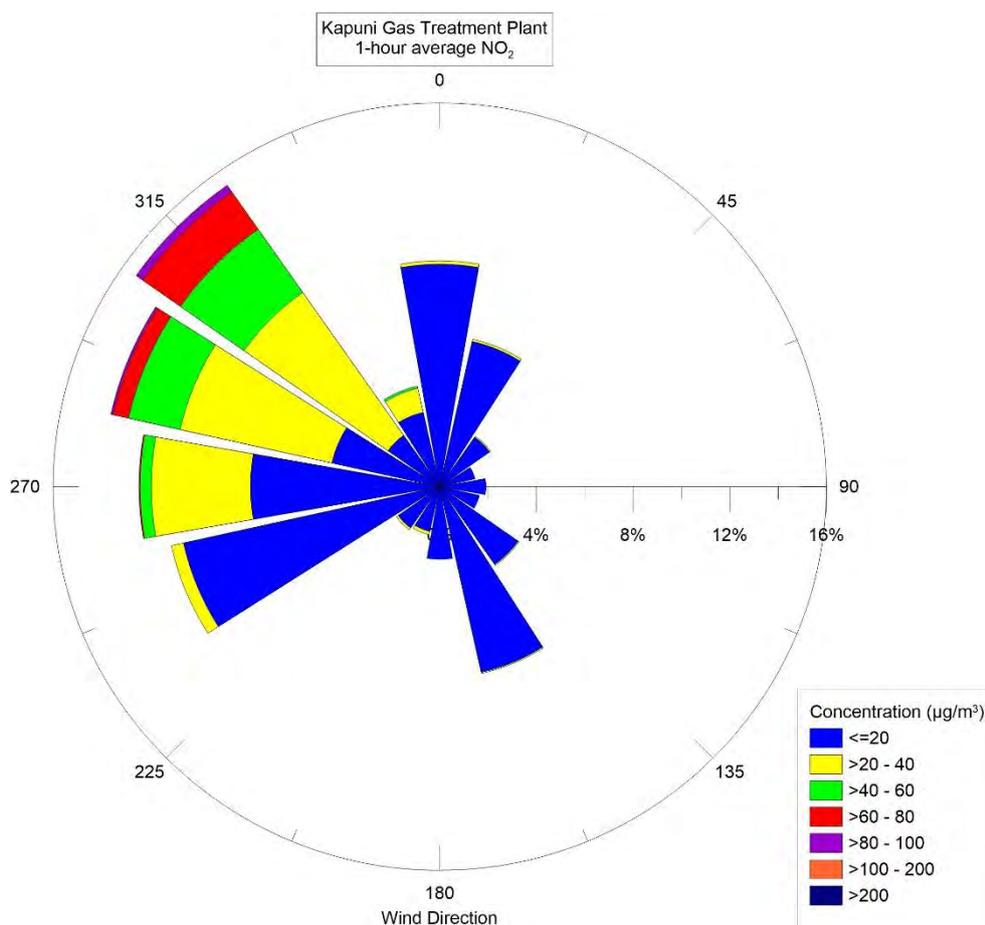


Figure 6.4: 1-hour average nitrogen dioxide pollution rose (1 November 2019 to 31 January 2020)

6.1.7 Carbon monoxide results

Continuous monitoring of CO was carried out at the site boundary for the period 1 November 2019 to 31 January 2020. Table 6.4 summarises the maximum measured concentration of CO over the monitoring period.

Over the monitoring period, 1-hour average and 8-hour average CO concentrations were below the consented limits.

Table 6.4: Maximum measured carbon monoxide concentrations (November 2019 – January 2020)

Pollutant	Averaging period	Air quality criteria ($\mu\text{g}/\text{m}^3$)	Maximum concentration ($\mu\text{g}/\text{m}^3$)		
			November 2019	December 2019	January 2020
Carbon monoxide (CO)	1-hour	30,000	594	1238	1652
	8-hours	10,000	428	894	680

The pollution rose in Figure 6.5 shows the relationship between CO concentrations and wind direction. Analysis of these wind characteristics show that the highest NO₂ concentrations were measured in winds blowing from the west-northwest to northwest directions. Potential sources of CO in the vicinity of the monitoring site in these wind directions are the KGTP (located west-northwest to northwest of the monitoring site), Ballance Agri-Nutrients (located west-northwest of

the monitoring site), and the TPMC Kapuni Production Station (located northwest of the monitoring site).

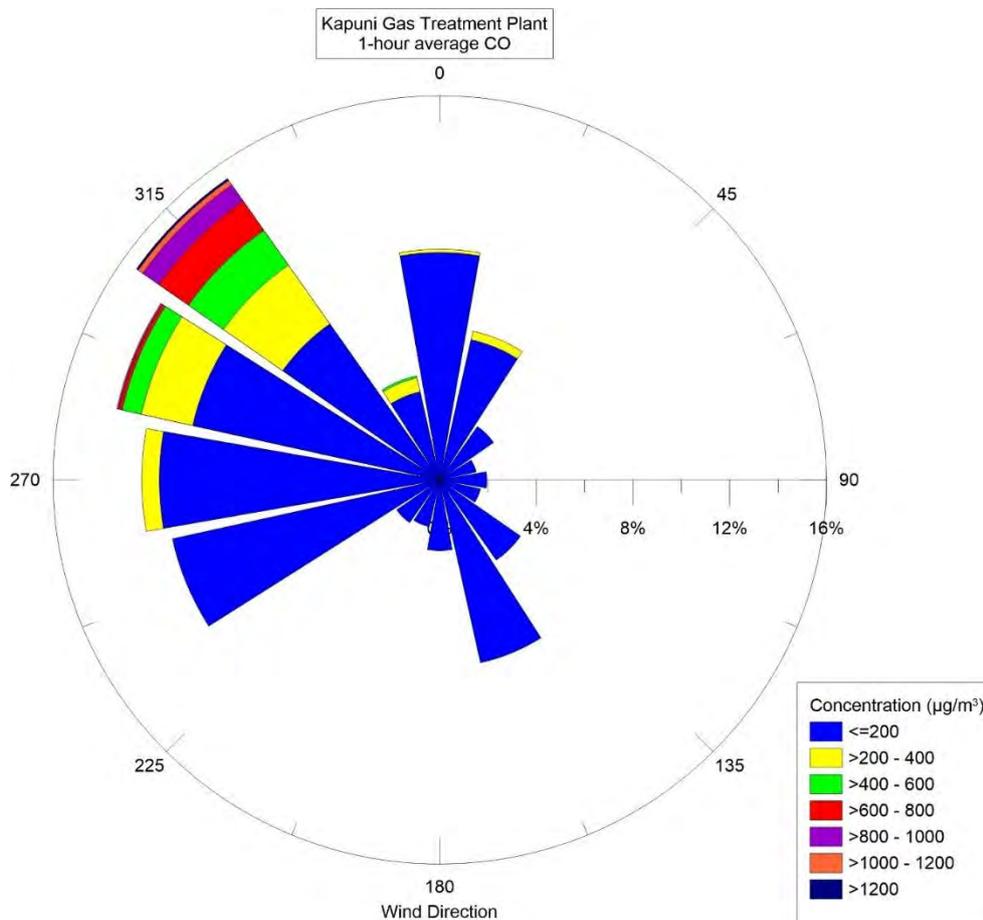


Figure 6.5: 1-hour average carbon monoxide pollution rose (1 November 2019 to 31 January 2020)

6.1.8 Comparison with environmental performance indicators

Environmental Performance Indicators (EPI) can be used to provide an overall picture of air quality with respect to ambient guidelines. The definition of each EPI (air quality category), is shown in Table 6.5 below. The EPIs were set against the NESAQ and MfE Ambient Air Quality Guidelines (AAQG) for NO_2 and CO. We note that the 1-hour NESAQ for NO_2 of $200 \mu\text{g}/\text{m}^3$ used in this comparison is more stringent than the consent limit of $300 \mu\text{g}/\text{m}^3$.

Table 6.5: Environmental Performance Indicators

Category	Measured value	Concentration ($\mu\text{g}/\text{m}^3$)			
		NO_2 - 1-hour average	NO_2 - 24-hour average	CO - 1-hour average	CO - 8-hour average
Action	Exceeds the guideline value.	>200	>100	>30,000	>10,000
Alert	Between 66% and 100% of the guideline value.	>132 and ≤ 200	>66 and ≤ 100	>19,800 and $\leq 30,000$	6,600> and $\leq 10,000$
Acceptable	Between 33% and 66 % of the guideline value.	>66 and ≤ 132	>33 and ≤ 66	>9,900 and $\leq 19,800$	3,300> and $\leq 6,600$

Category	Measured value	Concentration ($\mu\text{g}/\text{m}^3$)			
		NO ₂ - 1-hour average	NO ₂ - 24-hour average	CO - 1-hour average	CO - 8-hour average
Good	Between 10% and 33% of the guideline value.	>20 and \leq 66	>10 and \leq 33	>3,000 and \leq 9,900	>1,000 and \leq 3,300
Excellent	Less than 10% of the guideline value.	\leq 20	\leq 10	\leq 3,000	\leq 1,000

Figure 6.6 shows a histogram of the monitoring results presented in EPI categories for NO₂ and CO measured at the boundary ambient monitoring site. Measured 1-hour average and 24-hour average NO₂ concentrations were within the “excellent” to “acceptable” categories for the monitoring period of November 2019 to January 2020. All measured 1-hour and 8-hour average CO concentrations were in the “excellent” category for the monitoring period.

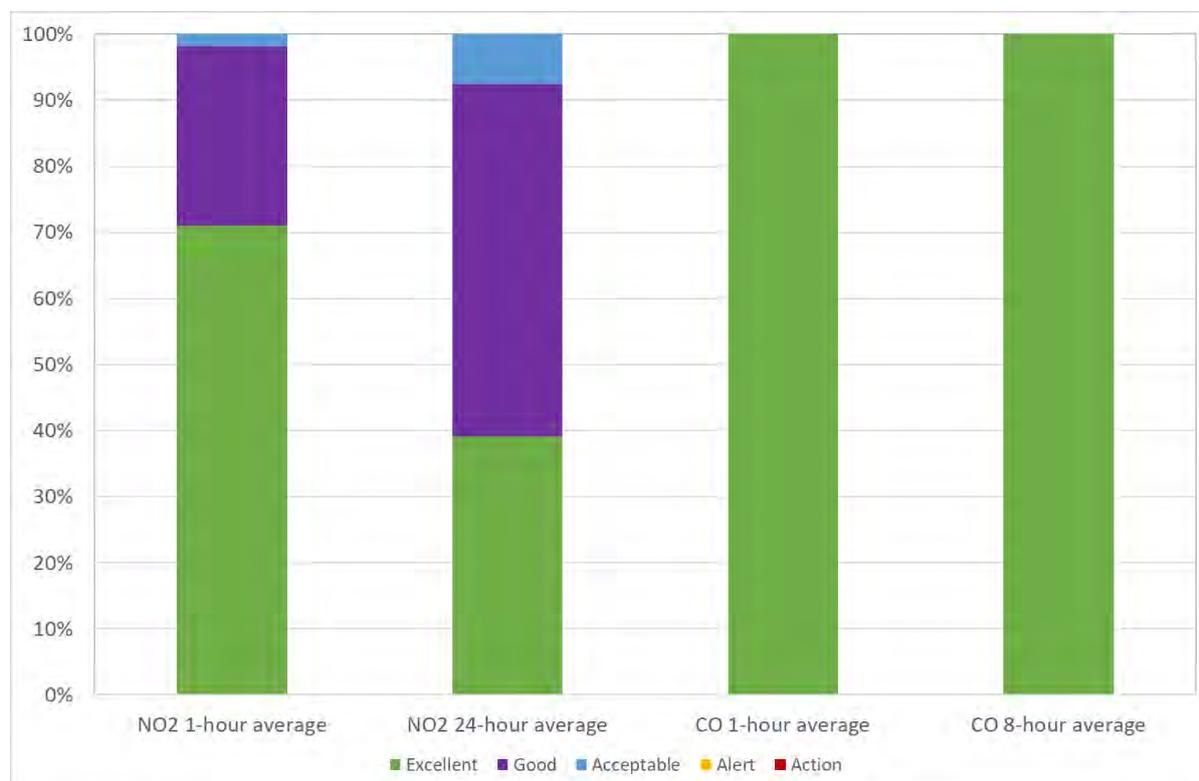


Figure 6.6: Comparison of monitored concentrations of NO₂ and CO to EPI categories, November 2019 to January 2020

6.2 Trace metal deposition monitoring

Trace metal deposition monitoring around the KGTP was undertaken as part of the air monitoring study. Dust deposition gauges were deployed by TPMC staff at three locations at the KGTP, which were located immediately south and east of the main processing area (refer to Figure 6.7). The dust deposition gauges were collected at 1-month intervals for the months of November 2019, December 2019 and January 2020. The dust deposition samples were analysed for a suite of metals by Watercare Services Ltd.



Figure 6.7: Metal deposition monitoring locations.

There are no ambient air criteria for deposited metals. Therefore, metal deposition rates have been compared to monitoring undertaken in previous years. Deposition rates at the three monitoring locations have historically been highest for potassium, vanadium and zinc. Graphical summaries of the potassium, vanadium and zinc deposition rates between 2008 and 2020 are presented in Figure 6.8 to Figure 6.10. The deposition rates of these metals have generally decreased since 2008, and deposition rates were similar during the reporting period (2017 to 2020).

The laboratory transcripts of dust deposition analysis carried out in November 2019, December 2019 and January 2020 are provided in Appendix A.

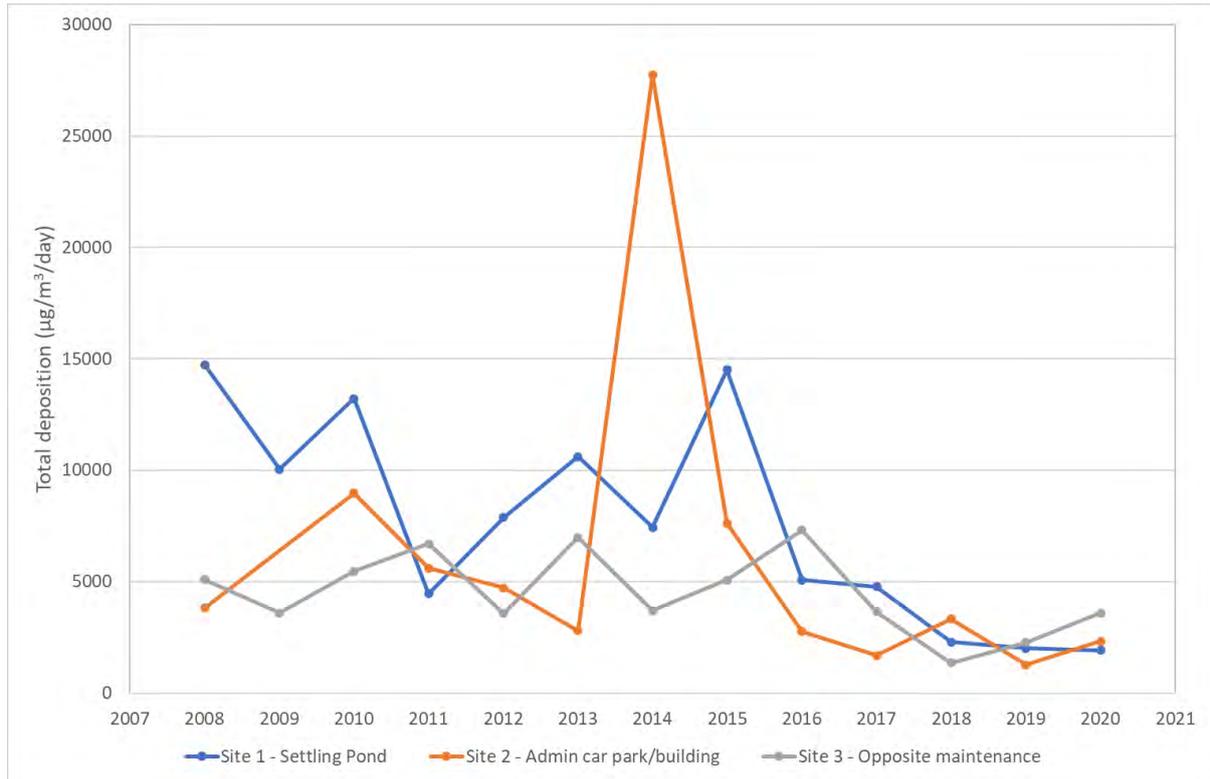


Figure 6.8: Total potassium deposition rates, 2008 - 2020

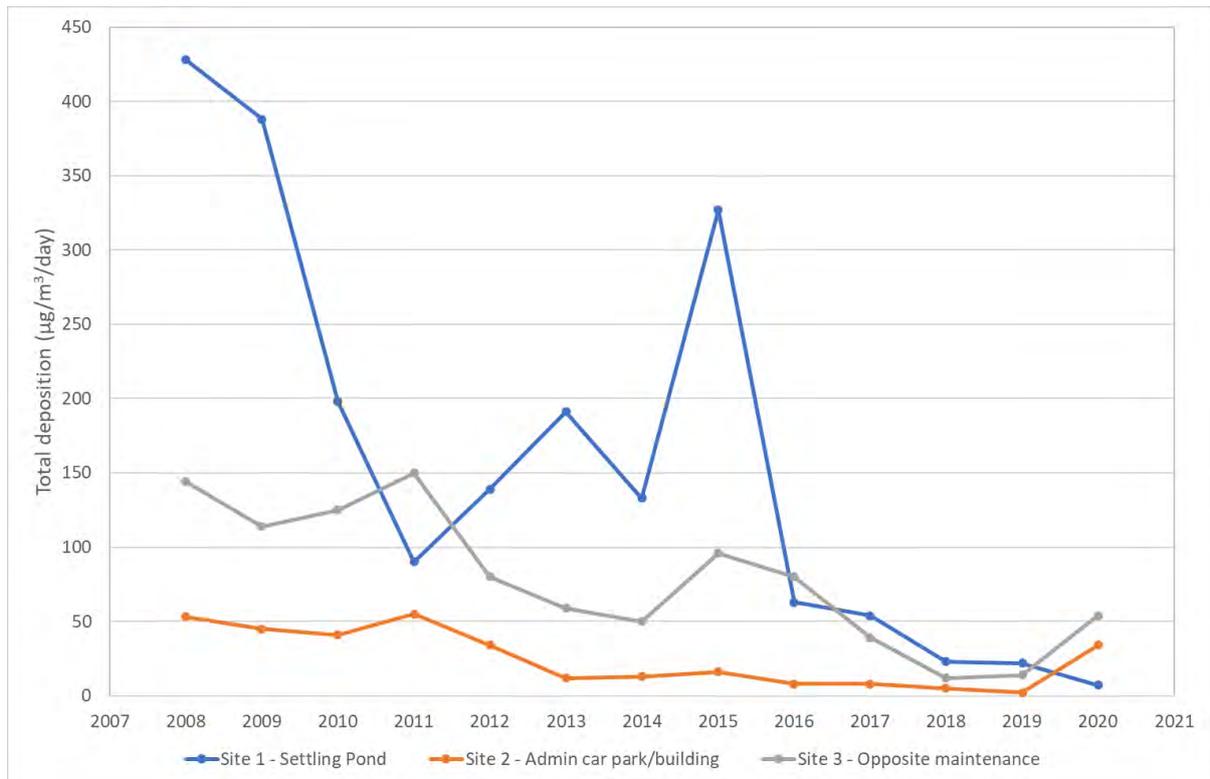


Figure 6.9: Total vanadium deposition rates, 2008 - 2020

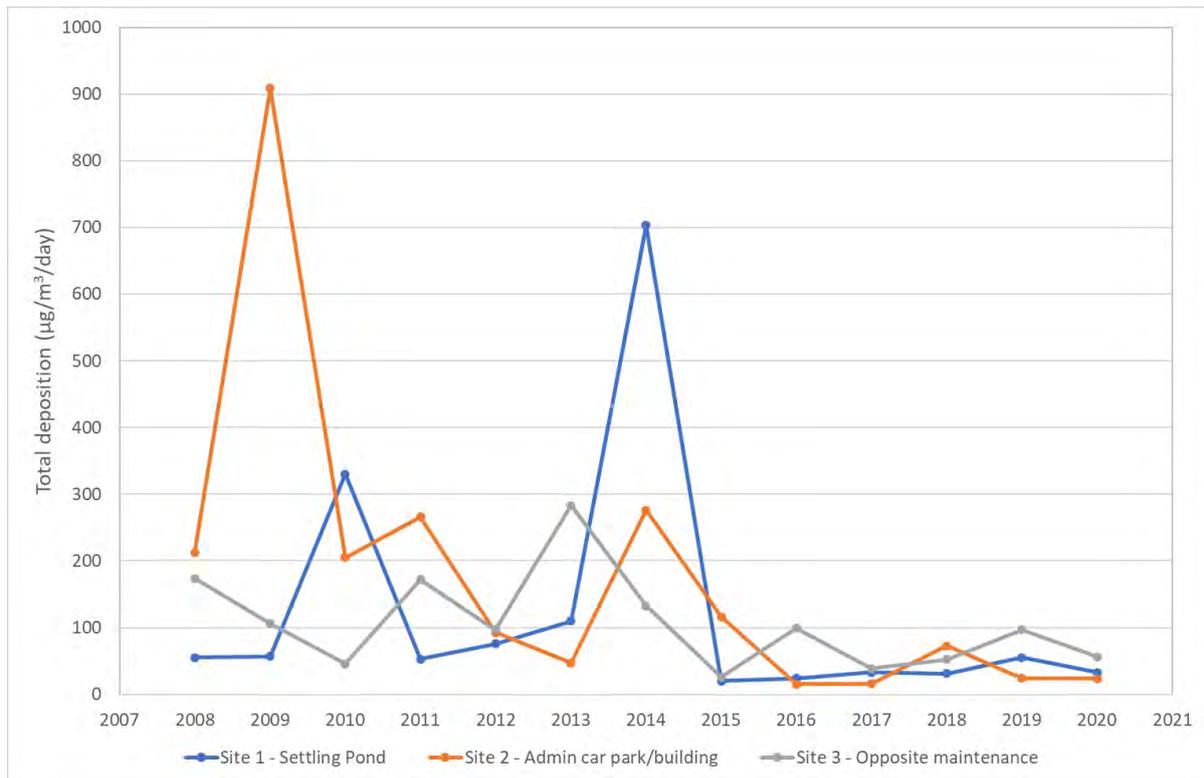


Figure 6.10: Total zinc deposition rates, 2008 - 2020

7 Conclusion

The triannual reporting required by Special Condition 4 of resource consent no. 4087-2 for the period September 2017 to August 2020 has been summarised in this report, with the following conclusions made:

- Vector transferred ownership of the KGTP to TPMC on 1 April 2020. This includes the KGTP and related assets and Vector's 50% interest in the Kapuni Energy Joint Venture.
- Annual CO₂ emissions to atmosphere from the KGTP have reduced between 2004 and 2019. Annual CO₂ emissions to atmosphere between 2017 and 2019 were consistent with previously reported emissions from 2016. The reduction in CO₂ emissions in recent years reflects reduced quantities of gas processed by the plant compared to previous years.
- The steam use per unit of gas processed at the site removed has decreased since 2004. This indicates a general improvement in the efficiency of CO₂ removal at the site over time. Since 2010, the annual steam use per unit of gas processed has been at relatively similar levels. The recent plateau may indicate the site is approaching a limit on further improvements to efficiency are possible with the current plant.
- TPMC reports that there have been no technological enhancements or further upgrades to improve energy efficiency at the KGTP in the reporting period.
- Ambient NO₂ and CO monitoring was undertaken between November 2019 and January 2020:
 - Data capture for nitrogen oxides, carbon monoxide and meteorological parameters were above 95% for the monitoring period.
 - There were no exceedances of the consented limits or the NESAQ for NO₂ and CO during the monitoring period.

- Measured 1-hour average and 24-hour average NO₂ concentrations were in the “excellent” to “acceptable” categories during the monitoring period.
- All measured 1-hour and 8-hour average CO concentrations were in the “excellent” category during the monitoring period.
- Metal deposition monitoring has been undertaken at the site between November 2019 and January 2020.
 - There are no ambient air criteria for deposited metals. Therefore, metal deposition rates have been compared to monitoring undertaken in previous years.
 - Deposition rates at the three monitoring locations have historically been highest for potassium, vanadium and zinc. The deposition rates of these metals have decreased since 2008, and deposition rates were similar during the reporting period (2017 to 2020).

8 Applicability

This report has been prepared for the exclusive use of our client Todd Petroleum Mining Company Ltd, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that this report will be used by Taranaki Regional Council in undertaking its regulatory functions in connection with air discharge permit.

Tonkin & Taylor Ltd

Report prepared by:



Dylan Vernal

Environmental Scientist

Authorised for Tonkin & Taylor Ltd by:



Glen Nicholson

Project Director

Report technically reviewed by: Richard Chilton – Senior Air Quality Scientist

DV

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Appendix A: Metal deposition laboratory transcripts

Certificate of Analysis

Laboratory Reference: 191205-111

Attention: Vilani Abeyratne	Final Report: 355084-1	Replaces Report 355084-0
Client: WATERCARE SERVICES LTD	Report Issue Date: 25-Feb-2020	
Address: 52 Aintree Avenue, Mangere, 2022	Received Date: 05-Dec-2019	
Client Reference: Vector Kapuni	Quote Reference : 10615	
Purchase Order: LA-000590		

Note:
 All dust gauges were dry. 500 mL water was added to each dust gauge for analysis. 100mL was used for metals analysis. The remainder was used for suspended solids testing (all dust gauges were then rinsed with 100 mL water to get all dust out, used entire remaining aliquots - 500mL - for Suspended Solids).
 Total Beryllium included in Amended Certificate of Analysis

Sample Details

	WATERS	WATERS	WATERS
Lab Sample ID:	191205-111-1	191205-111-2	191205-111-3
Client Sample ID:	31/10/19 - 02/12/19	31/10/19 - 02/12/19	31/10/19 - 02/12/19
Sample Date/Time	02/12/2019 13:45	02/12/2019 13:50	02/12/2019 13:55
Description:	Admin	Workshop	Ponds

General Testing

	WATERS	WATERS	WATERS
Total Suspended Solids mg/L	170	50	70
Volume (at room temp c. 20 °C) mL	0 *	0 *	0 *

Metals

Dissolved Metals by ICP-MS—Trace

	WATERS	WATERS	WATERS
Antimony (Dissolved) mg/L	<0.001	<0.001	<0.001
Arsenic (Dissolved) mg/L	0.00035	<0.0001	<0.0001
Beryllium (Dissolved) mg/L	<0.00005	<0.00005	<0.00005
Cadmium (Dissolved) mg/L	0.00041	0.000056	<0.00005
Chromium (Dissolved) mg/L	<0.0005	<0.0005	<0.0005
Cobalt (Dissolved) mg/L	0.00019	<0.00003	<0.00003
Copper (Dissolved) mg/L	0.0098	0.0014	0.0012
Iron (Dissolved) mg/L	0.012	<0.002	<0.002
Lead (Dissolved) mg/L	0.00015	<0.0001	<0.0001
Mercury (Dissolved) mg/L	<0.00005	<0.00005	<0.00005
Molybdenum (Dissolved) mg/L	0.00051	<0.0003	0.0033
Nickel (Dissolved) mg/L	0.0011	0.00013	0.00014
Potassium (Dissolved) mg/L	7.8	1.0	0.39
Selenium (Dissolved) mg/L	<0.0005	<0.0005	<0.0005
Vanadium (Dissolved) mg/L	0.006	0.034	0.0051
Zinc (Dissolved) mg/L	0.014	0.012	0.016

Total Metals by ICP-MS—Trace (Default Digest)

	WATERS	WATERS	WATERS
Antimony (Total) mg/L	<0.001	<0.001	<0.001
Arsenic (Total) mg/L	0.001	0.00018	<0.0001
Beryllium (Total) mg/L	0.000053	<0.00005	<0.00005
Cadmium (Total) mg/L	0.002	0.0001	<0.00005
Chromium (Total) mg/L	0.0032	<0.0005	<0.0005
Cobalt (Total) mg/L	0.00076	0.000064	0.000074
Copper (Total) mg/L	0.04	0.0029	0.0025
Iron (Total) mg/L	1.3	0.13	0.16
Lead (Total) mg/L	0.0041	0.0011	0.00037
Mercury (Total) mg/L	0.000072	<0.00005	<0.00005
Molybdenum (Total) mg/L	0.0011	<0.0003	0.0036
Nickel (Total) mg/L	0.0034	0.00028	0.00037
Potassium (Total) mg/L	8.9	1.1	0.48
Selenium (Total) mg/L	<0.0005	<0.0005	<0.0005



Sample Details (continued)	WATERS	WATERS	WATERS
Lab Sample ID:	191205-111-1	191205-111-2	191205-111-3
Client Sample ID:	31/10/19 - 02/12/19	31/10/19 - 02/12/19	31/10/19 - 02/12/19
Sample Date/Time:	02/12/2019 13:45	02/12/2019 13:50	02/12/2019 13:55
Description:	Admin	Workshop	Ponds

Metals

Total Metals by ICP-MS—Trace (Default Digest)

Vanadium (Total)	mg/L	0.019	0.038	0.007
Zinc (Total)	mg/L	0.14	0.03	0.03

Results marked with * are not accredited to International Accreditation New Zealand

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods

The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Volume (at room temp c. 20 °C) by Volumetry	Not Applicable	mL	All	Auckland

Metals

Dissolved Metals by ICP-MS—Trace

Antimony (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Arsenic (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Beryllium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Cadmium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Chromium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.0005 mg/L	All	Auckland
Cobalt (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00003 mg/L	All	Auckland
Copper (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.0002 mg/L	All	Auckland
Iron (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.002 mg/L	All	Auckland
Lead (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Mercury (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Molybdenum (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.0003 mg/L	All	Auckland
Nickel (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Potassium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.05 mg/L	All	Auckland
Selenium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.0005 mg/L	All	Auckland
Vanadium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Zinc (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland

Total Metals by ICP-MS—Trace (Default Digest)

Antimony (Total)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Arsenic (Total)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Beryllium (Total)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Cadmium (Total)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Chromium (Total)	APHA (online edition) 3125 B by ICPMS	0.0005 mg/L	All	Auckland
Cobalt (Total)	APHA (online edition) 3125 B by ICPMS	0.00003 mg/L	All	Auckland
Copper (Total)	APHA (online edition) 3125 B by ICPMS	0.0002 mg/L	All	Auckland
Iron (Total)	APHA (online edition) 3125 B by ICPMS	0.002 mg/L	All	Auckland
Lead (Total)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Mercury (Total)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Molybdenum (Total)	APHA (online edition) 3125 B by ICPMS	0.0003 mg/L	All	Auckland
Nickel (Total)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Potassium (Total)	APHA (online edition) 3125 B by ICPMS	0.05 mg/L	All	Auckland
Selenium (Total)	APHA (online edition) 3125 B by ICPMS	0.0005 mg/L	All	Auckland
Vanadium (Total)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Zinc (Total)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland

Preparations

0.45 µm Filtration for Dissolved Metals	APHA (online edition) 3010B (modified)	All	Auckland
Digest for Total Metals in Liquids	In House (4:1 Nitric:Hydrochloric Acid, 95°C 2 hours)	All	Auckland

*The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher.
For more information please contact the Operations Manager.*

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

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F: (03) 214 4041

Certificate of Analysis

Laboratory Reference:200110-133

Attention:	Vilani Abeyratne	Final Report:	350563-0
Client:	WATERCARE SERVICES LTD	Report Issue Date:	21-Jan-2020
Address:	52 Aintree Avenue, Mangere, 2022	Received Date:	10-Jan-2020
Client Reference:	Vector Kapuni	Quote Reference :	10615
Purchase Order:	LA-000590		

Sample Details

	WATERS	WATERS	WATERS
Lab Sample ID:	200110-133-1	200110-133-2	200110-133-3
Client Sample ID:	02/12/19 - 03/01/20	02/12/19 - 03/01/20	02/12/19 - 03/01/20
Sample Date/Time	03/01/2020 01:45	03/01/2020 01:55	03/01/2020 01:50
Description:	Admin	Workshop	Ponds

General Testing

	mg/L			
Total Suspended Solids	78	29	50	
Volume (at room temp c. 20 °C)	3 *	3 *	4 *	

Metals

Dissolved Metals by ICP-MS—Trace

	mg/L			
Antimony (Dissolved)	<0.001	<0.001	<0.001	
Arsenic (Dissolved)	0.00014	0.00015	0.00039	
Beryllium (Dissolved)	<0.00005	<0.00005	<0.00005	
Cadmium (Dissolved)	0.00011	0.0004	0.0002	
Chromium (Dissolved)	<0.0005	<0.0005	<0.0005	
Cobalt (Dissolved)	0.000038	<0.00003	0.000068	
Copper (Dissolved)	<0.0002	0.00031	0.00089	
Iron (Dissolved)	<0.002	<0.002	0.009	
Lead (Dissolved)	<0.0001	<0.0001	0.00042	
Mercury (Dissolved)	<0.00005	<0.00005	<0.00005	
Molybdenum (Dissolved)	<0.0003	<0.0003	0.0032	
Nickel (Dissolved)	<0.0001	0.00012	<0.0001	
Potassium (Dissolved)	0.38	2.4	0.99	
Selenium (Dissolved)	<0.0005	<0.0005	<0.0005	
Vanadium (Dissolved)	<0.001	0.033	0.0083	
Zinc (Dissolved)	0.0097	0.033	0.15	

Total Metals by ICP-MS—Trace (Default Digest)

	mg/L			
Antimony (Total)	<0.001	<0.001	<0.001	
Arsenic (Total)	0.00021	0.00023	0.00049	
Beryllium (Total)	<0.00005	<0.00005	<0.00005	
Cadmium (Total)	0.0007	0.00059	0.00022	
Chromium (Total)	<0.0005	<0.0005	<0.0005	
Cobalt (Total)	0.000084	0.000031	0.000077	
Copper (Total)	0.002	0.00092	0.0013	
Iron (Total)	0.045	0.034	0.026	
Lead (Total)	0.00015	0.00027	0.0012	
Mercury (Total)	<0.00005	<0.00005	<0.00005	
Molybdenum (Total)	<0.0003	<0.0003	0.0033	
Nickel (Total)	0.00016	0.00032	0.0002	
Potassium (Total)	0.58	3.1	1.2	
Selenium (Total)	<0.0005	<0.0005	<0.0005	
Vanadium (Total)	<0.001	0.038	0.0095	
Zinc (Total)	0.024	0.044	0.18	

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Reference Methods

The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Volume (at room temp c. 20 °C) by Volumetry	Not Applicable	mL	All	Auckland
Metals				
Dissolved Metals by ICP-MS—Trace				
Antimony (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Arsenic (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Beryllium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Cadmium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Chromium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.0005 mg/L	All	Auckland
Cobalt (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00003 mg/L	All	Auckland
Copper (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.0002 mg/L	All	Auckland
Iron (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.002 mg/L	All	Auckland
Lead (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Mercury (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Molybdenum (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.0003 mg/L	All	Auckland
Nickel (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Potassium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.05 mg/L	All	Auckland
Selenium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.0005 mg/L	All	Auckland
Vanadium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Zinc (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Total Metals by ICP-MS—Trace (Default Digest)				
Antimony (Total)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Arsenic (Total)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Beryllium (Total)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Cadmium (Total)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Chromium (Total)	APHA (online edition) 3125 B by ICPMS	0.0005 mg/L	All	Auckland
Cobalt (Total)	APHA (online edition) 3125 B by ICPMS	0.00003 mg/L	All	Auckland
Copper (Total)	APHA (online edition) 3125 B by ICPMS	0.0002 mg/L	All	Auckland
Iron (Total)	APHA (online edition) 3125 B by ICPMS	0.002 mg/L	All	Auckland
Lead (Total)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Mercury (Total)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Molybdenum (Total)	APHA (online edition) 3125 B by ICPMS	0.0003 mg/L	All	Auckland
Nickel (Total)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Potassium (Total)	APHA (online edition) 3125 B by ICPMS	0.05 mg/L	All	Auckland
Selenium (Total)	APHA (online edition) 3125 B by ICPMS	0.0005 mg/L	All	Auckland
Vanadium (Total)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Zinc (Total)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Preparations				
0.45 µm Filtration for Dissolved Metals	APHA (online edition) 3010B (modified)		All	Auckland
Digest for Total Metals in Liquids	In House (4:1 Nitric:Hydrochloric Acid, 95°C 2 hours)		All	Auckland
<i>The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher. For more information please contact the Operations Manager.</i>				

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

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Certificate of Analysis

Laboratory Reference:200214-181

Attention:	Kath Mcleod	Final Report:	355766-0	Replaces Report	355092-1
Client:	WATERCARE SERVICES LTD	Report Issue Date:	03-Mar-2020		
Address:	52 Aintree Avenue, Mangere, 2022	Received Date:	14-Feb-2020		
Client Reference:	Vector Kapuni	Quote Reference :	10615		
Purchase Order:	LA-000590				

Amended report: Original report failed to generate.

Sample Details

	WATERS	WATERS	WATERS
Lab Sample ID:	200214-181-1	200214-181-4	200214-181-5
Client Sample ID:			
Sample Date/Time	04/02/2020 15:35	04/02/2020 15:50	04/02/2020 15:40
Description:	Admin	Workshop	Ponds

General Testing

	mg/L			
Total Suspended Solids	59	47	57	
Volume (at room temp c. 20 °C)	500 *	500 *	500 *	

Metals

Dissolved Metals by ICP-MS—Trace

	mg/L			
Antimony (Dissolved)	<0.001	<0.001	<0.001	
Arsenic (Dissolved)	<0.0001	0.00029	0.00024	
Beryllium (Dissolved)	<0.00005	<0.00005	<0.00005	
Cadmium (Dissolved)	0.00051	0.00025	0.000067	
Chromium (Dissolved)	<0.0005	<0.0005	<0.0005	
Cobalt (Dissolved)	0.000078	0.000091	0.000099	
Copper (Dissolved)	0.0023	0.0043	0.0058	
Iron (Dissolved)	0.0037	0.0094	0.014	
Lead (Dissolved)	<0.0001	0.00026	0.00055	
Mercury (Dissolved)	<0.00005	<0.00005	<0.00005	
Molybdenum (Dissolved)	<0.0003	0.00071	0.011	
Nickel (Dissolved)	0.00029	0.00048	0.00094	
Potassium (Dissolved)	1.8	6.5	16	
Selenium (Dissolved)	<0.0005	<0.0005	<0.0005	
Vanadium (Dissolved)	0.018	0.1	0.24	
Zinc (Dissolved)	0.013	0.027	0.038	

Total Metals by ICP-MS—Trace (Default Digest)

	mg/L			
Antimony (Total)	<0.001	<0.001	<0.001	
Arsenic (Total)	0.00029	0.00069	0.00055	
Beryllium (Total)	<0.00005	<0.00005	<0.00005	
Cadmium (Total)	0.00085	0.00061	0.00013	
Chromium (Total)	0.00052	0.00083	0.0017	
Cobalt (Total)	0.00018	0.00031	0.00035	
Copper (Total)	0.0045	0.0076	0.0092	
Iron (Total)	0.32	0.45	0.69	
Lead (Total)	0.0015	0.0088	0.0086	
Mercury (Total)	0.000052	<0.00005	0.00046	
Molybdenum (Total)	<0.0003	0.00084	0.012	
Nickel (Total)	0.00052	0.0019	0.0038	
Potassium (Total)	2.1	9.8	20	
Selenium (Total)	<0.0005	<0.0005	<0.0005	
Vanadium (Total)	0.023	0.13	0.31	
Zinc (Total)	0.033	0.069	0.13	

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Reference Methods

The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Volume (at room temp c. 20 °C) by Volumetry	Not Applicable	mL	All	Auckland
Metals				
Dissolved Metals by ICP-MS—Trace				
Antimony (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Arsenic (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Beryllium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Cadmium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Chromium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.0005 mg/L	All	Auckland
Cobalt (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00003 mg/L	All	Auckland
Copper (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.0002 mg/L	All	Auckland
Iron (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.002 mg/L	All	Auckland
Lead (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Mercury (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Molybdenum (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.0003 mg/L	All	Auckland
Nickel (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Potassium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.05 mg/L	All	Auckland
Selenium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.0005 mg/L	All	Auckland
Vanadium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Zinc (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Total Metals by ICP-MS—Trace (Default Digest)				
Antimony (Total)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Arsenic (Total)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Beryllium (Total)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Cadmium (Total)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Chromium (Total)	APHA (online edition) 3125 B by ICPMS	0.0005 mg/L	All	Auckland
Cobalt (Total)	APHA (online edition) 3125 B by ICPMS	0.00003 mg/L	All	Auckland
Copper (Total)	APHA (online edition) 3125 B by ICPMS	0.0002 mg/L	All	Auckland
Iron (Total)	APHA (online edition) 3125 B by ICPMS	0.002 mg/L	All	Auckland
Lead (Total)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Mercury (Total)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Molybdenum (Total)	APHA (online edition) 3125 B by ICPMS	0.0003 mg/L	All	Auckland
Nickel (Total)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Potassium (Total)	APHA (online edition) 3125 B by ICPMS	0.05 mg/L	All	Auckland
Selenium (Total)	APHA (online edition) 3125 B by ICPMS	0.0005 mg/L	All	Auckland
Vanadium (Total)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Zinc (Total)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Preparations				
0.45 µm Filtration for Dissolved Metals	APHA (online edition) 3010B (modified)		All	Auckland
Digest for Total Metals in Liquids	In House (4:1 Nitric:Hydrochloric Acid, 95°C 2 hours)		All	Auckland
<p><i>The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher. For more information please contact the Operations Manager.</i></p>				

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

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Certificate of Analysis

Laboratory Reference:200130-211

Attention:	Kath Mcleod	Final Report:	355335-0
Client:	WATERCARE SERVICES LTD	Report Issue Date:	26-Feb-2020
Address:	52 Aintree Avenue, Mangere, 2022	Received Date:	30-Jan-2020
Client Reference:	Vector Kapuni	Quote Reference :	10615
Purchase Order:	LA-000590		

Sample Details

WATERS

Lab Sample ID:	200130-211-1
Client Sample ID:	
Sample Date/Time	30/01/2020
Description:	Blank - Preservative

General Testing

Volume (at room temp c. 20 °C)	mL	1000 *
--------------------------------	----	--------

Metals

Dissolved Metals by ICP-MS—Trace

Antimony (Dissolved)	mg/L	<0.002
Arsenic (Dissolved)	mg/L	<0.0002
Beryllium (Dissolved)	mg/L	<0.00005
Cadmium (Dissolved)	mg/L	<0.0001
Chromium (Dissolved)	mg/L	<0.001
Cobalt (Dissolved)	mg/L	<0.00006
Copper (Dissolved)	mg/L	<0.0004
Iron (Dissolved)	mg/L	<0.004
Lead (Dissolved)	mg/L	<0.0002
Mercury (Dissolved)	mg/L	<0.0001
Molybdenum (Dissolved)	mg/L	<0.0006
Nickel (Dissolved)	mg/L	<0.0002
Potassium (Dissolved)	mg/L	<0.1
Selenium (Dissolved)	mg/L	<0.001
Vanadium (Dissolved)	mg/L	<0.002
Zinc (Dissolved)	mg/L	<0.002

Total Metals by ICP-MS—Trace (Default Digest)

Antimony (Total)	mg/L	0.0012
Arsenic (Total)	mg/L	0.00013
Beryllium (Total)	mg/L	<0.0001
Cadmium (Total)	mg/L	<0.00005
Chromium (Total)	mg/L	<0.0005
Cobalt (Total)	mg/L	<0.00003
Copper (Total)	mg/L	<0.0002
Iron (Total)	mg/L	<0.002
Lead (Total)	mg/L	<0.0001
Mercury (Total)	mg/L	<0.0001
Molybdenum (Total)	mg/L	<0.0003
Nickel (Total)	mg/L	<0.0001
Potassium (Total)	mg/L	<0.05
Selenium (Total)	mg/L	<0.001
Vanadium (Total)	mg/L	<0.001
Zinc (Total)	mg/L	<0.001

Results marked with * are not accredited to International Accreditation New Zealand

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods

The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Volume (at room temp c. 20 °C) by Volumetry	Not Applicable	mL	All	Auckland
Metals				
Dissolved Metals by ICP-MS—Trace				
Antimony (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Arsenic (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Beryllium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Cadmium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Chromium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.0005 mg/L	All	Auckland
Cobalt (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00003 mg/L	All	Auckland
Copper (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.0002 mg/L	All	Auckland
Iron (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.002 mg/L	All	Auckland
Lead (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Mercury (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00005 mg/L	All	Auckland
Molybdenum (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.0003 mg/L	All	Auckland
Nickel (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.00010 mg/L	All	Auckland
Potassium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.05 mg/L	All	Auckland
Selenium (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.0005 mg/L	All	Auckland
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Zinc (Dissolved)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Total Metals by ICP-MS—Trace (Default Digest)				
Antimony (Total)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
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Vanadium (Total)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Zinc (Total)	APHA (online edition) 3125 B by ICPMS	0.001 mg/L	All	Auckland
Preparations				
0.45 µm Filtration for Dissolved Metals	APHA (online edition) 3010B (modified)		All	Auckland
Digest for Total Metals in Liquids	In House (4:1 Nitric:Hydrochloric Acid, 95°C 2 hours)		All	Auckland
<p><i>The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher. For more information please contact the Operations Manager.</i></p>				

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

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Appendix III

Ambient air quality monitoring November 2019 –
January 2020

Vector, Kapuni

Ambient Air Quality Monitoring
Summary Report
November 2019 to January 2020

Prepared for
Vector, Kapuni

By

Watercare
Laboratory Services

IANZ
ACCREDITED LABORATORY

Tests indicated as
not accredited are outside
the scope of the
laboratory's accreditation

Air Quality Department

Ambient Air Quality Monitoring
November 2019 to January 2020

A report for:

Vector, Kapuni
298 Palmer Road
Kapuni
New Zealand

14 April 2020

Prepared by:

Watercare Services Limited
Laboratory Services – Air Quality Department
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Watercare report number: AQ-2020-042

Watercare reference: 19-58678

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Summary

This report contains ambient air quality results for Vector Limited, Kapuni in Taranaki. The parameters were monitored from November 2019 to January 2020. The pollutants monitored for this report were:

- Carbon Monoxide (CO)
- Nitrogen Oxides (NO and NO₂)
- Meteorological parameters (Ambient Temperature, Relative Humidity, Wind Speed and Wind Direction,

The monitoring was conducted by Watercare, on behalf of Vector, Kapuni. This monitoring was undertaken to compare the results with previously conducted ambient air quality monitoring projects.

Ambient air quality monitoring at Vector, Kapuni for the period of November 2019 to January 2020 showed:

- Carbon Monoxide (CO)
 - The CO maximum 1-hour average concentration was 1.7 mg/m³ (27/01/2020 08:00).
 - The CO maximum 8-hour average concentration was 0.9 mg/m³ (07/01/2020 05:00).
 - Valid data for CO monitored was 98%.
 - On average CO concentrations were higher during December 2019.
 - Very slightly elevated CO hourly concentrations occurred from 20:00 to 10:00.
 - There were higher (>1.0 mg/m) CO hourly concentrations from the west-northwest and northwest.
 - CO environmental performance indicators were all in the excellent category.
- Nitrogen Oxides (NO and NO₂)
 - The NO₂ maximum 1-hour average concentration was 98.6 µg/m³ (05/12/2019 16:00).
 - The NO₂ maximum 24-hour average concentration was 98.6 ppb (21/01/2020 09:00).
 - Valid data for NO₂ monitored was 98%.
 - On average NO₂ concentrations for September and October were similar and higher than November.
 - Elevated (>10 ppb) NO₂ hourly concentrations occurred from 22:00 to 09:00 except for 03:00 (during automatic calibrations).
 - There were higher (>100 ppb) NO₂ hourly concentrations from the west-northwest and northwest.
 - NO₂ environmental performance indicators were in the acceptable to excellent categories.
- Meteorological parameters
 - Valid data for ambient temperature and relative humidity was 100%.
 - Valid data for wind speed and wind direction was 100%.
 - The predominant wind direction was from the northwest.

1 Introduction

Vector Limited, Kapuni commissioned Watercare to conduct continuous monitoring of carbon monoxide (CO), oxides of nitrogen (NO and NO₂) and meteorological parameters at the Vector, Kapuni in Taranaki. The monitoring was carried out to examine ambient air quality east of the plant operations.

For the reporting period from November 2019 to January 2020, the gaseous instruments have been adjusted for span and zero instrument drift using the results from automatic and manual calibrations. All data in this report have been validated. Quality assurance checks have been carried out to ensure that invalid and calibration data are not reported.

This report presents:

- a summary of ambient air quality guidelines and standards
- an overview of the relevant guideline and standards
- monitoring site descriptions
- an overview of the methods used to monitor parameters
- site performance
- comparison to the relevant ambient air quality guidelines and standards
- data summary and statistics
- analyser instrument history

2 Ambient Air Quality Guidelines and Standards

The measurements of air quality made at vector, Kapuni can be compared with various air quality guidelines or standards. The Ministry for the Environment (MfE) National Environmental Standards (NES) for air quality superseded the Ambient Air Quality Guidelines (AAQG) 2002 in some areas. These limits are listed in Table 1.

Table 1: AAQG (2002) and NES

Contaminant	Averaging Period	MfE AAQG	MfE NES
Carbon Monoxide (CO)	1-hour	30 mg/m ³	No standard
	8-hour	10 mg/m ³	10mg/m ³ with 1 exceedence per year
Nitrogen Dioxide (NO ₂)	1-hour	200 µg/m ³	200µg/m ³ with 9 exceedences per year
	24-hour	100 µg/m ³	No standard

3 New Zealand Environmental Performance Indicators

In order to provide guidance on when improvement should be required, the MfE has provided Environmental Performance Indicators (EPI) for air quality, as set out in Table 2. These indicators can act as both indicators of poor air quality and goals which policy can work towards achieving.

Table 2: Environmental Performance Indicators for Air Quality

Category	Maximum Measured Value	Comment
Action	Exceeds guideline	Completely unacceptable by national and international standards
Alert	Between 66% and 100% of the guideline	Warning level, which can lead to guidelines being exceeded if trends are not curbed
Acceptable	Between 33% and 66% of the guideline	A broad category, where maximum values might be of concern in some sensitive locations, but are generally at a level which does not warrant dramatic action
Good	Between 10% and 33% of the guideline	Peak measurements in this range are unlikely to affect air quality
Excellent	Less than 10% of the guideline	Of little concern. If maximum values are less than a tenth of the guideline, average values are likely to be much less

4 Site Description

Vector, Kapuni	
Site Address	298 Palmer Road, Kapuni, Taranaki
Site ID	AQGLTAR001
Site Class	Industrial
Site Coordinates (NZTM)	E1701101 N5629536
<p style="text-align: center;">Description</p> <p>Kapuni is approximately 50 kilometres south of New Plymouth. Vector is located north east of the small Kaponga township. The local topography is flat farmland with Mount Taranaki to the north. Neighbouring industrial sites include Shell Todd Oil Services which lies adjacent to the plant in the north and Ballance Agri-Nutrients to the west (across the road).</p> <p>The ambient air quality monitoring station (Figure 1) was located 10 m from the eastern boundary of Vector, Kapuni, 330 m east of Palmer Road and 60m south of the Kapuni Stream. The site was commissioned on 31 October 2019 and decommissioned on the 27 February 2020. Valid data commenced 01 November 2019 and ended 27 February 2020. The equipment was owned and operated by Watercare Services Ltd on behalf of Vector, Kapuni.</p> <p>The shed and sample inlet were sited in accordance with AS/NZ 3580.1.1 - 2016 Ambient Air – Guide for the Siting of Sampling Units. The ambient air quality monitoring station location was selected by Vector, Kapuni. Previous continuous ambient monitoring with Watercare were undertaken at this location in 2004 and 2008.</p>	
Pollutants (at 3m)	CO and NO _x
Weather Parameters (at 6m)	Wind, Ambient Temperature and Relative Humidity
<p style="text-align: center;">Site Location</p> 	



Figure 1: Map of the Air Quality Monitoring Site

5 Methods

5.1 Quality Assurance

All monitoring services undertaken by Watercare were in accordance with the MfE 'Good Practice Guide for Air Quality Monitoring and Data Management' (GPG) 2009. Watercare is accredited by International Accreditation New Zealand (IANZ) for the following relevant methods:

- AS 3580.7.1 – 2011: Determination of carbon monoxide – Direct-reading instrumental method.
- AS 3580.5.1 – 2011: Determination of oxides of nitrogen – Direct-reading instrumental method.

All pollutant results in this summary report have been validated and calculated to standard temperature (0°C) and pressure (1 atm). The instruments continuously measure the parameters allowing data to be analysed and reported from 10-minute data points to a variety of average periods, including 1-hour, 24-hour and one year. All data are stored as time ending averages and at New Zealand Standard Time (NZST). Watercare provided the following monitoring services:

- Instrument operation, calibration and maintenance:
This included monthly visits and the use of automatic alternate day calibration systems for all continuous gas monitors. This ensured that the requirements of the relevant Australian Standards for weekly calibration of continuous analysers were met.
- Data logging, daily polling, checking, validation, peer review and reporting:
This encompassed the entire data quality assurance process ensuring that the final data set reported is correct and valid data capture is achieved. Data was logged onsite and download at regular intervals during the day via a wireless router to **Watercare's data management and reporting software**. Subsequently, the data is checked, validated and reported in line with the GPG.

5.2 Carbon Monoxide

Measurements were made in accordance with AS 3580.7.1 – 2011 using an API model T300. The instrument was an infrared absorption gas analyser which continuously measures carbon monoxide. The CO analysers operated with a full-scale measurement range of 0 – 50 ppm. The estimated relative expanded uncertainty of measurement at **the 95% confidence interval** for CO was 11.3% of the reading.

5.3 Nitrogen Oxides

Measurements were made in accordance with AS 3580.5.1 – 2011 using an API model 200E. The instrument was a chemiluminescence gas analyser which continuously measures nitrogen oxides. The NO₂ analysers operated with a full-scale measurement range of 0 - 1000 ppb. The estimated relative expanded uncertainty of measurement at **the 95% confidence interval for NO₂** was 10.7% of the reading.

5.4 Meteorological Parameters

Measurements were made with reference to AS 3580.14 – 2014: **Meteorological monitoring for ambient air quality monitoring applications and Watercare's quality system**. Watercare is not accredited for method AS 3580.14 – 2014. Ambient temperature, relative humidity, wind speed and wind direction were measured using a Vaisala model WXT520.

6 Results

This section provides the site performance and an overview of the results for CO, NO₂ and meteorological parameters.

6.1 Site Performance

The MfE GPG 2009 suggests that it is difficult to reach anything close to 100% valid data for long-term monitoring. As such site performance has been evaluated against a target of 95%. The per cent of valid data is defined as the per cent of valid data following quality assurance adjustments. Table 2 describes overall site performance

Table 3: Site Performance – November 2019 to January 2020

Parameter	Averaging period	Valid data (%)	Site notes
CO	10-min	98%	-
NO ₂	10-min	98%	-
Ambient Temperature	10 min	100	-
Relative Humidity	10 min	100	-
Wind Speed	10 min	100	-
Wind Direction	10 min	100	-

6.2 Carbon Monoxide (CO)

Table 4 presents a statistical summary of validated CO 1-hour and 8-hour averages that have been calculated from 10-minute averages. There were no exceedences of the ambient air quality standard or guidelines listed in Table 1. The results of CO measured from November 2019 to January 2020 are shown graphically in Figure 2 to Figure 6.

Table 4: CO Statistics and Exceedences – November 2019 to January 2020

CO (mg/m ³)	Maximum	Minimum	Average	Exceedence(s)
<i>November 2019</i>				
CO 1-hour	0.6	0.0	0.1	None
CO 8-hour	0.4	0.0	0.1	None
<i>December 2019</i>				
CO 1-hour	1.2	0.0	0.2	None
CO 8-hour	0.9	0.0	0.2	None
<i>January 2020</i>				
CO 1-hour	1.7	0.0	0.1	None
CO 8-hour	0.7	0.0	0.1	None
<i>November 2019 to January 2020</i>				
CO 1-hour	1.7 27/01/2020 08:00	0.0 06/12/2019 05:00	0.1	None
CO 8-hour	0.9 05/12/2019	0.0 24/12/2019	0.1	None

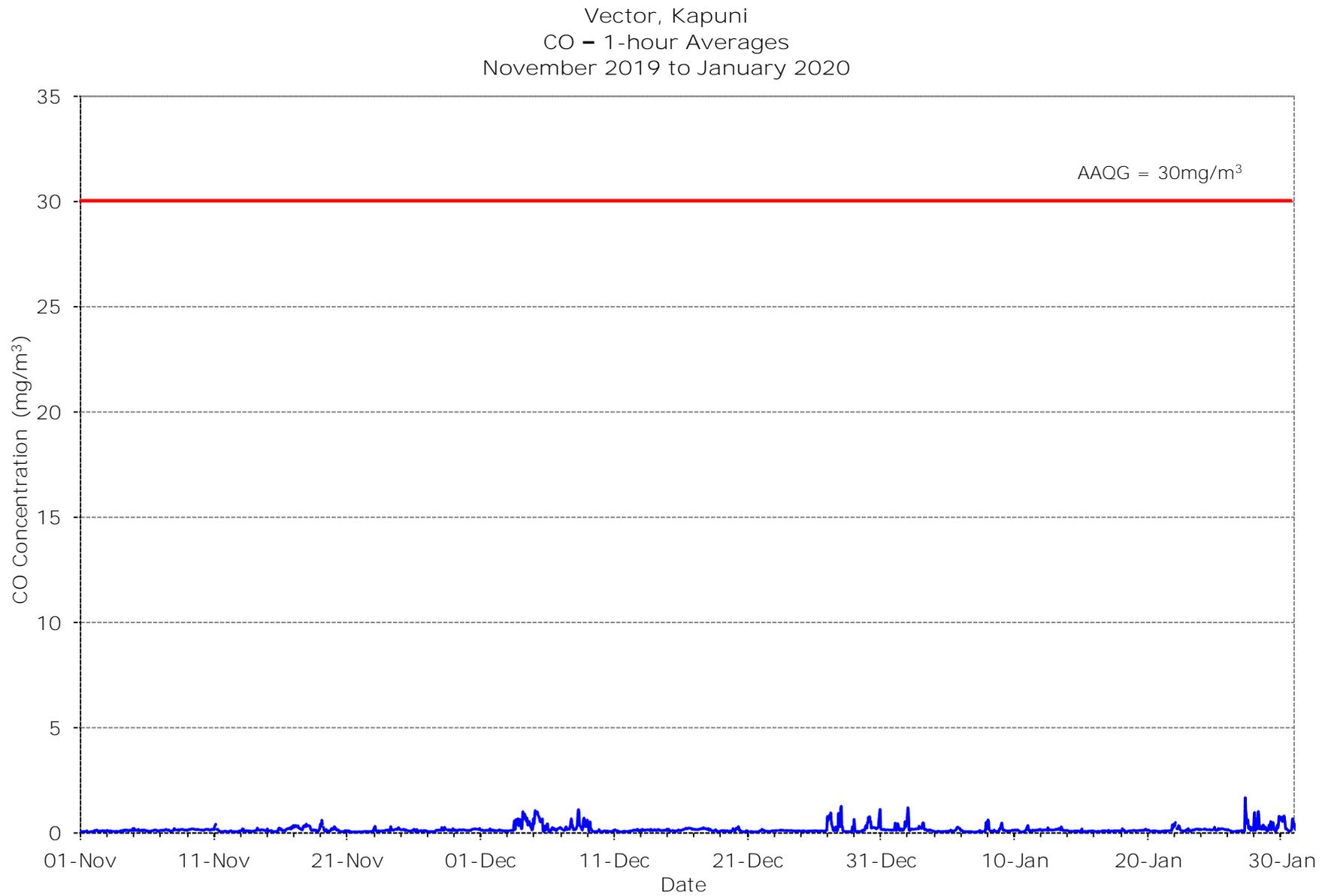


Figure 2: Vector, Kapuni: CO (1-hour averages)

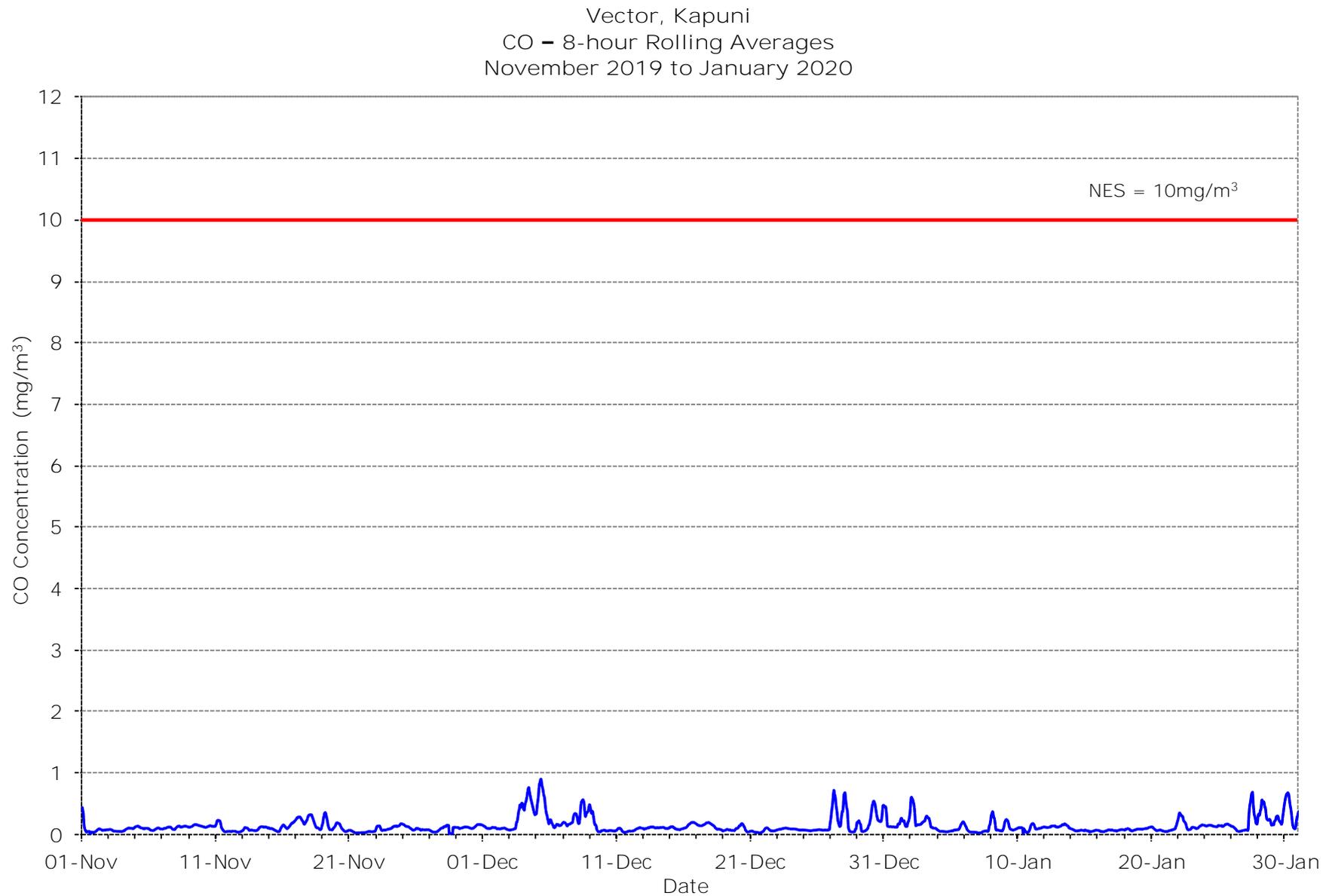


Figure 3: Vector, Kapuni: CO (8-hour rolling averages)

Vector, Kapuni
CO Pollution Rose – 1-hour Averages
November 2019 to January 2020

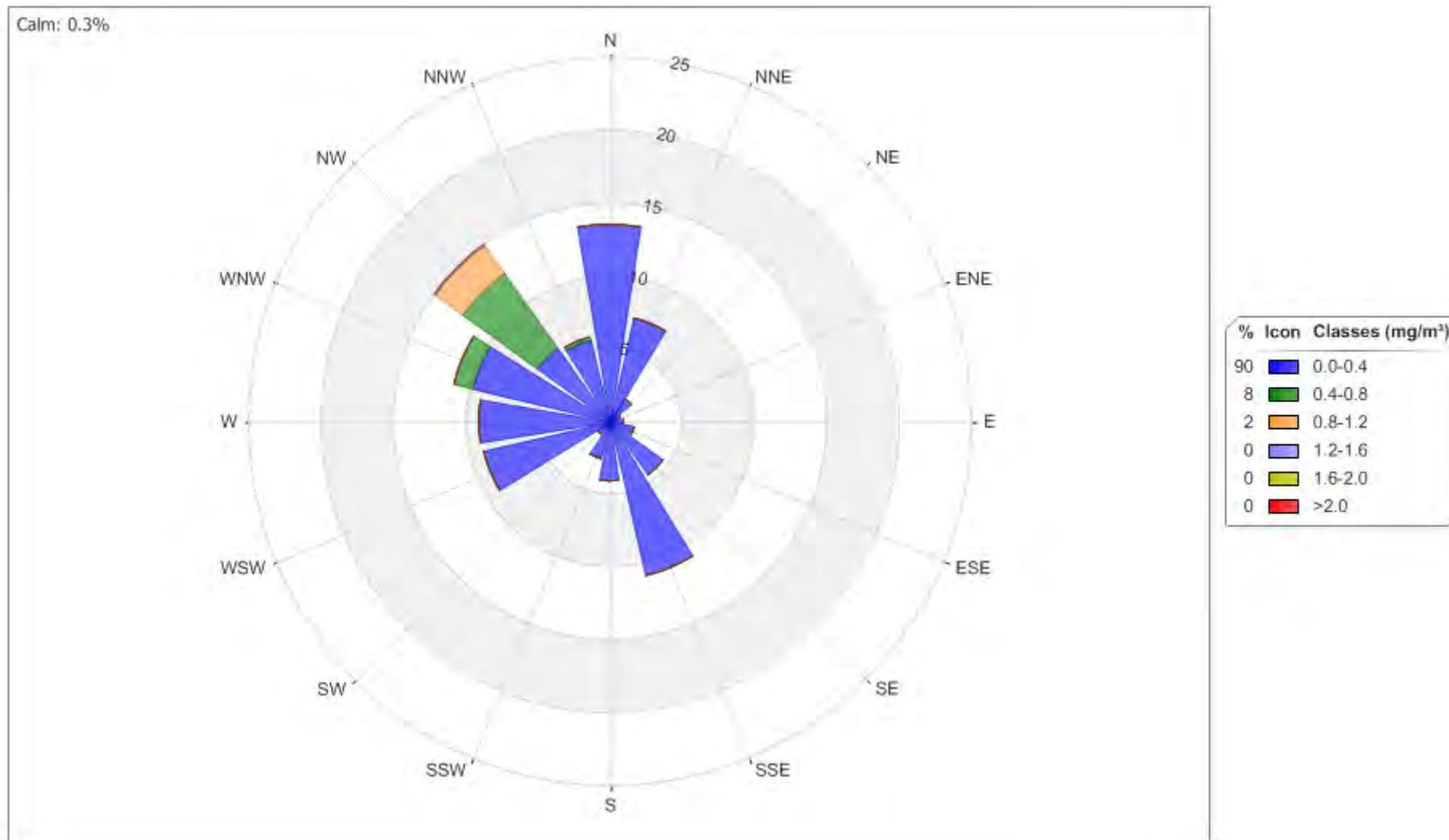


Figure 4: Vector, Kapuni: CO Pollution Rose (1-hour averages)

Vector, Kapuni
CO Diurnal Variation – 1-hour Averages
November 2019 to January 2020

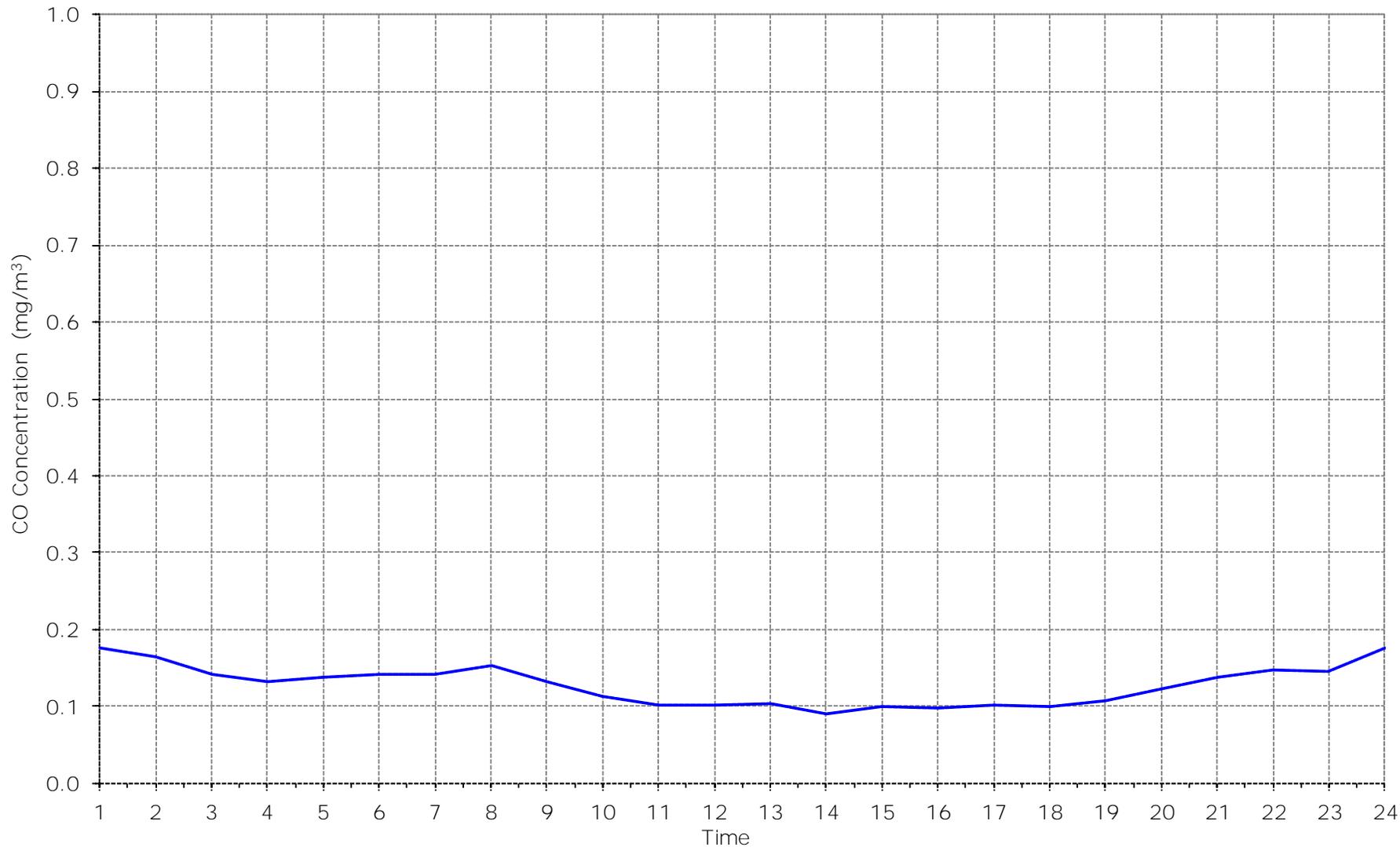


Figure 5: Vector, Kapuni: CO Diurnal Variation (1-hour averages)

Vector, Kapuni
CO Distribution of EPI Categories
November 2019 to January 2020

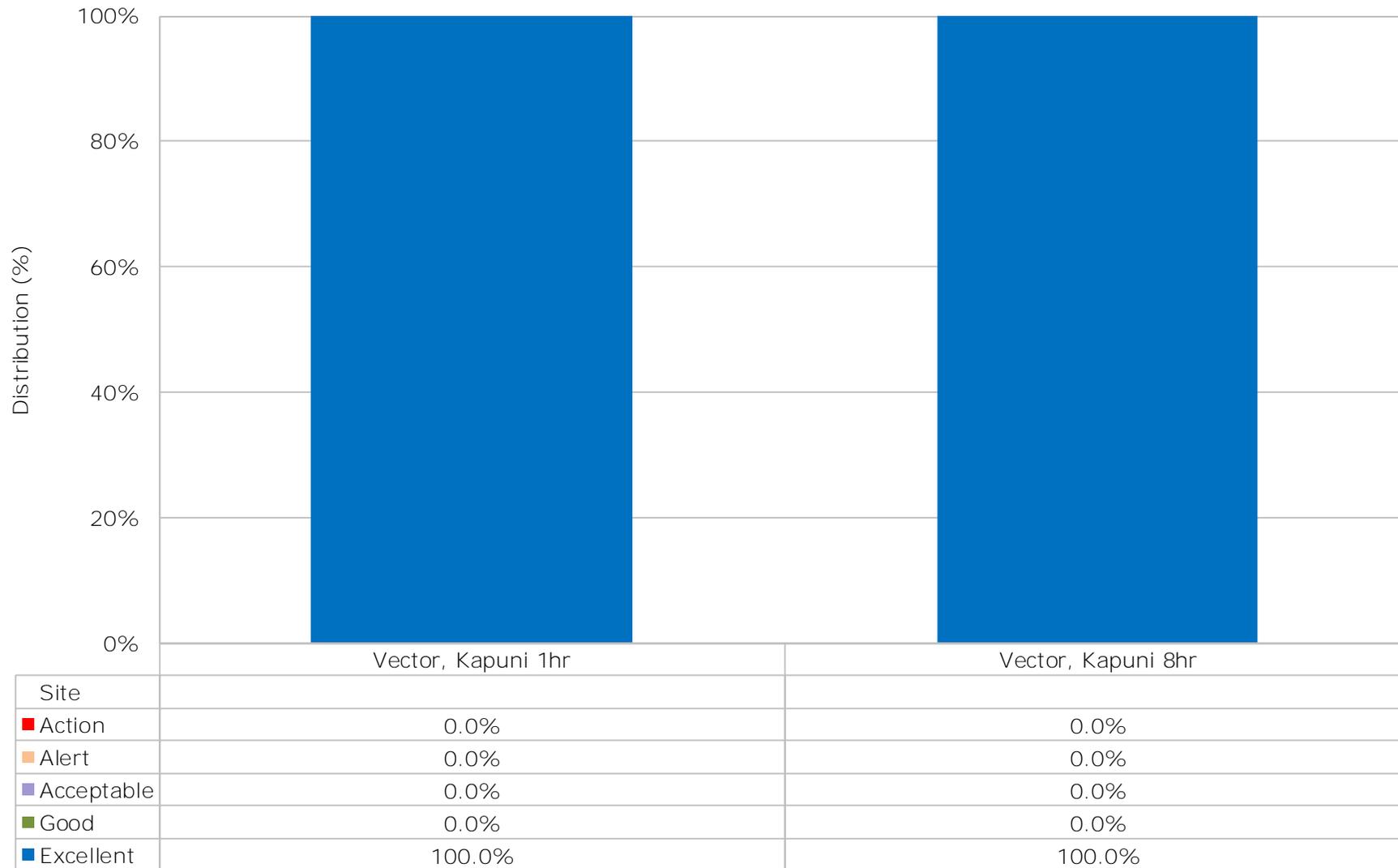


Figure 6: Vector, Kapuni: CO Comparison of EPI Categories (1-hour and 8-hour averages)

6.3 Nitrogen Dioxide (NO₂)

Table 5 presents a statistical summary of validated NO₂ 1-hour and 24-hour averages that have been calculated from 10-minute averages. There were no exceedences of the ambient air quality standard or guidelines listed in Table 1. The results of NO₂ measured from November 2019 to January 2020 are shown graphically in Figure 7 to Figure 12.

Table 5: NO₂ Statistics and Exceedences – November 2019 to January 2020

NO ₂ (µg/m ³)	Maximum	Minimum	Average	Exceedence(s)
<i>November 2019</i>				
NO ₂ 1-hour	93.5	0.4	15.9	None
NO ₂ 24-hour	52.7	2.2	15.9	None
<i>December 2019</i>				
NO ₂ 1-hour	98.6	0.4	14.7	None
NO ₂ 24-hour	61.6	1.4	14.1	None
<i>January 2020</i>				
NO ₂ 1-hour	71.6	0.3	15.0	None
NO ₂ 24-hour	29.2	3.1	14.8	None
<i>November 2019 to January 2020</i>				
NO ₂ 1-hour	98.6 05/12/2019 16:00	0.3 19/01/2020 13:00	15.2	None
NO ₂ 24-hour	61.6 05/12/2019	2.7 24/12/2019	15.2	None

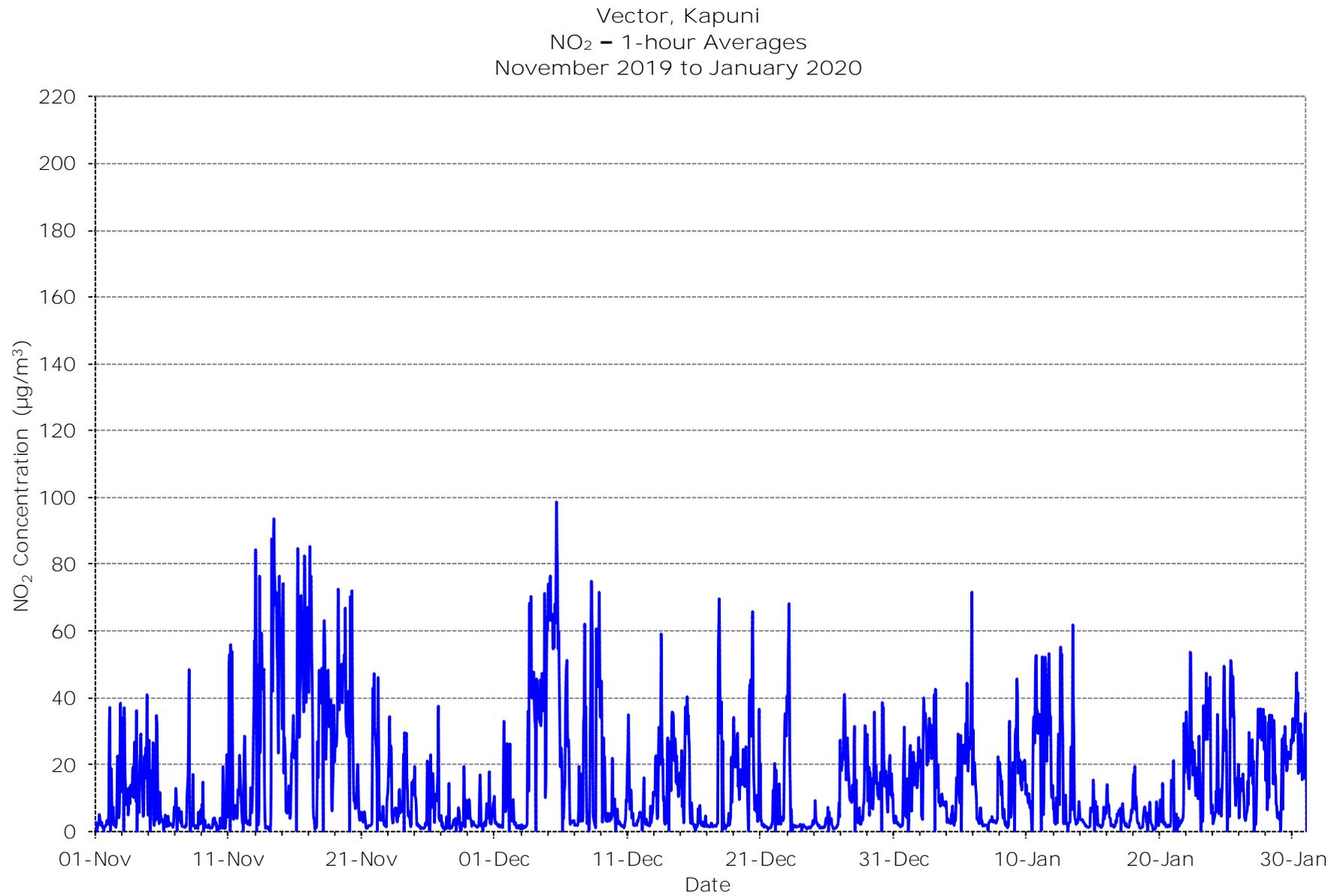


Figure 7: Vector, Kapuni: NO₂ (1-hour averages)

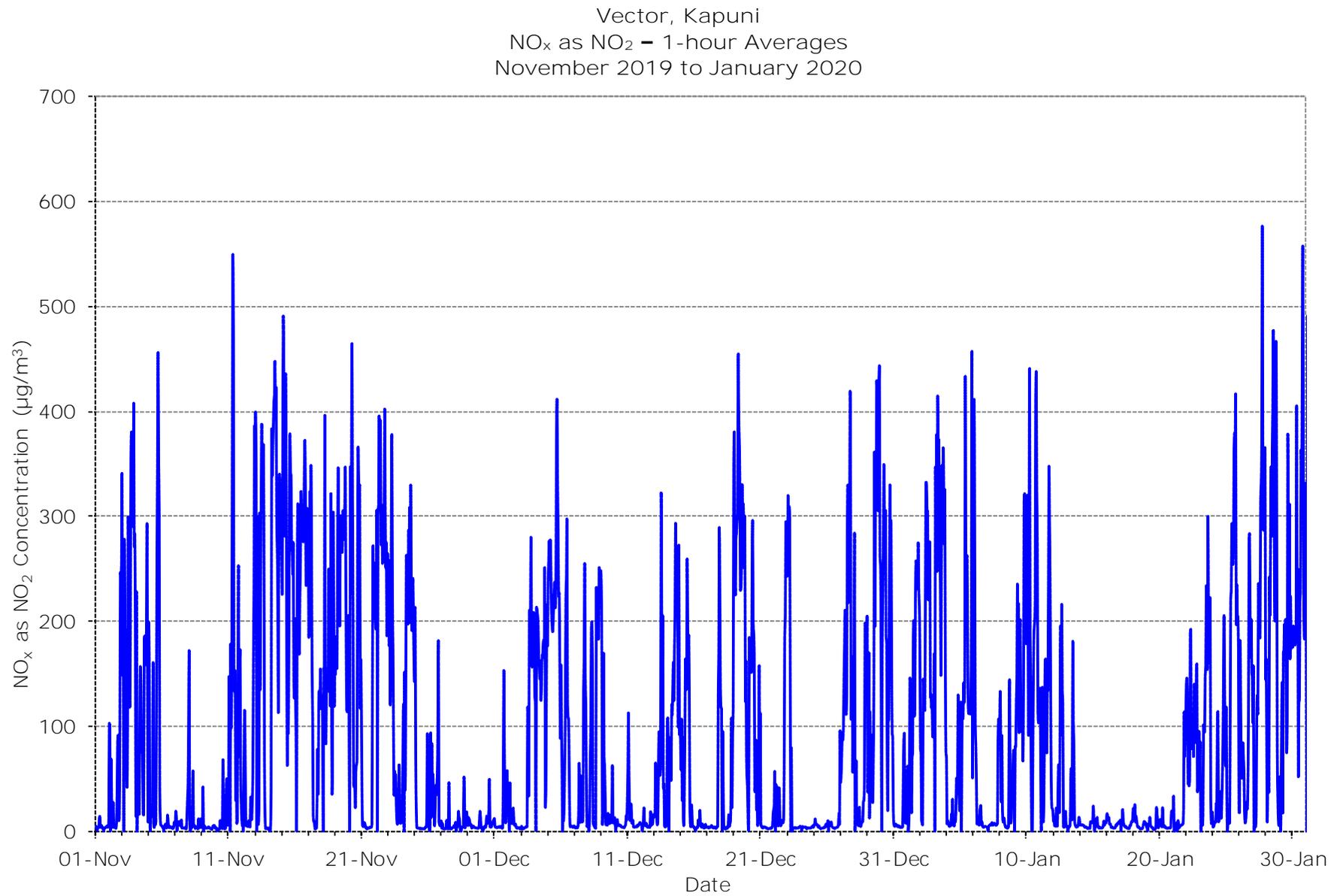


Figure 8: Vector, Kapuni: NO_x as NO₂ (1-hour averages)

Vector, Kapuni
NO₂ - 24-hour Averages
November 2019 to January 2020

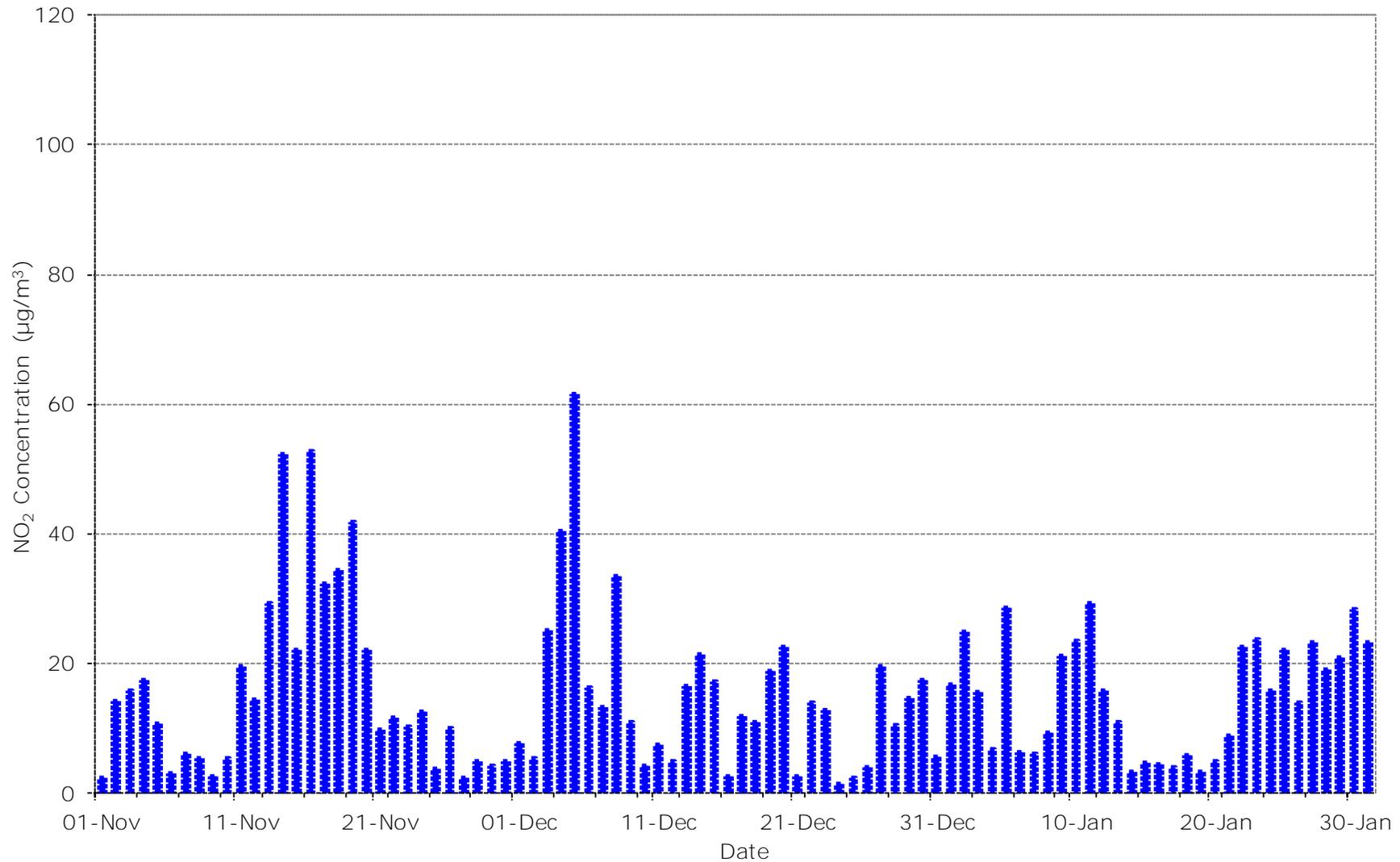


Figure 9: Vector, Kapuni: NO₂ (24-hour averages)

Vector, Kapuni
 NO₂ Pollution Rose - 1-hour Averages
 November 2019 to January 2020

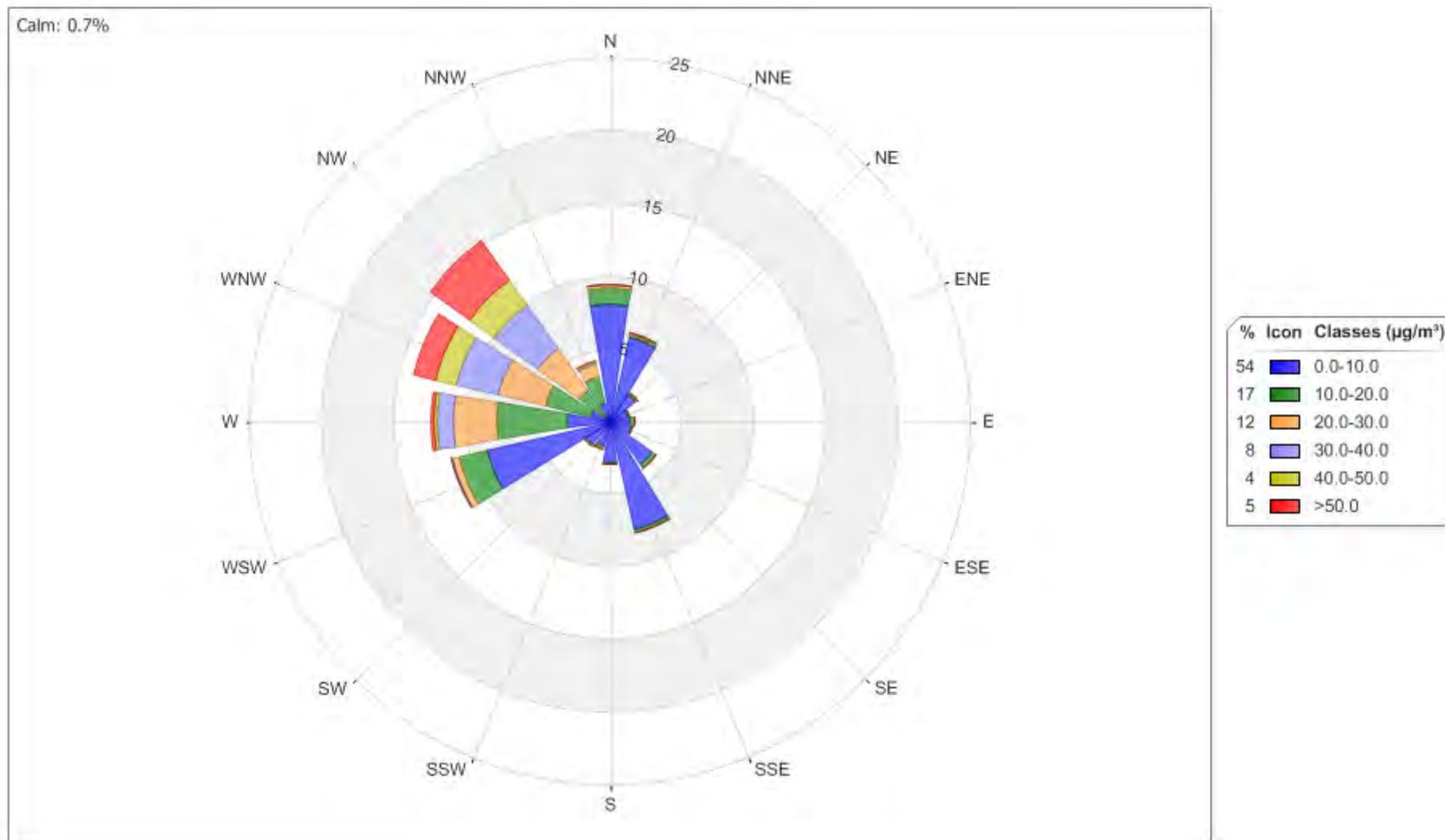


Figure 10: Vector, Kapuni: NO₂ Pollution Rose (1-hour averages)

Vector, Kapuni
NO₂ Diurnal Variation – 1-hour Averages
November 2019 to January 2020

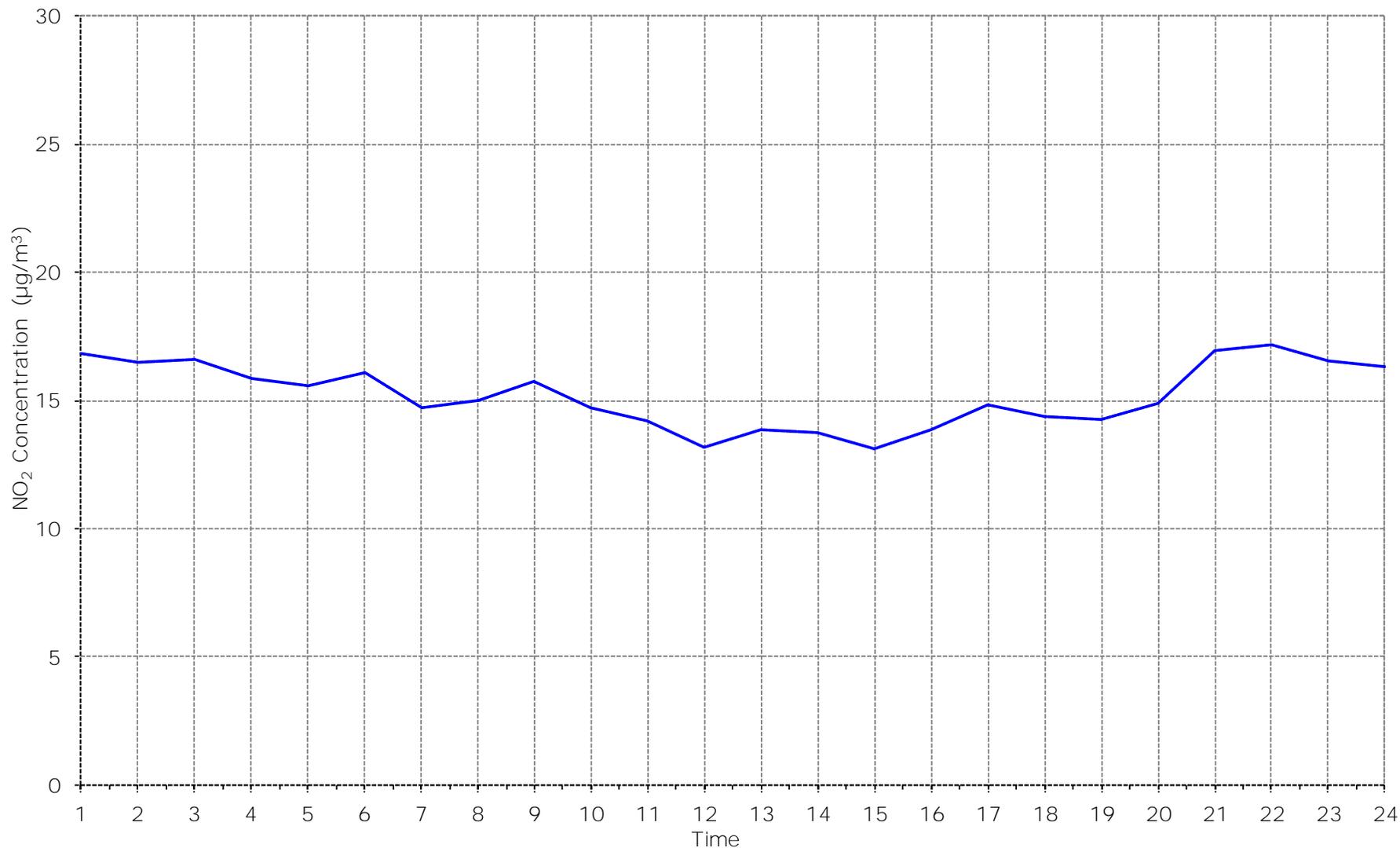


Figure 11: Vector, Kapuni: NO₂ Diurnal Variation (1-hour averages)

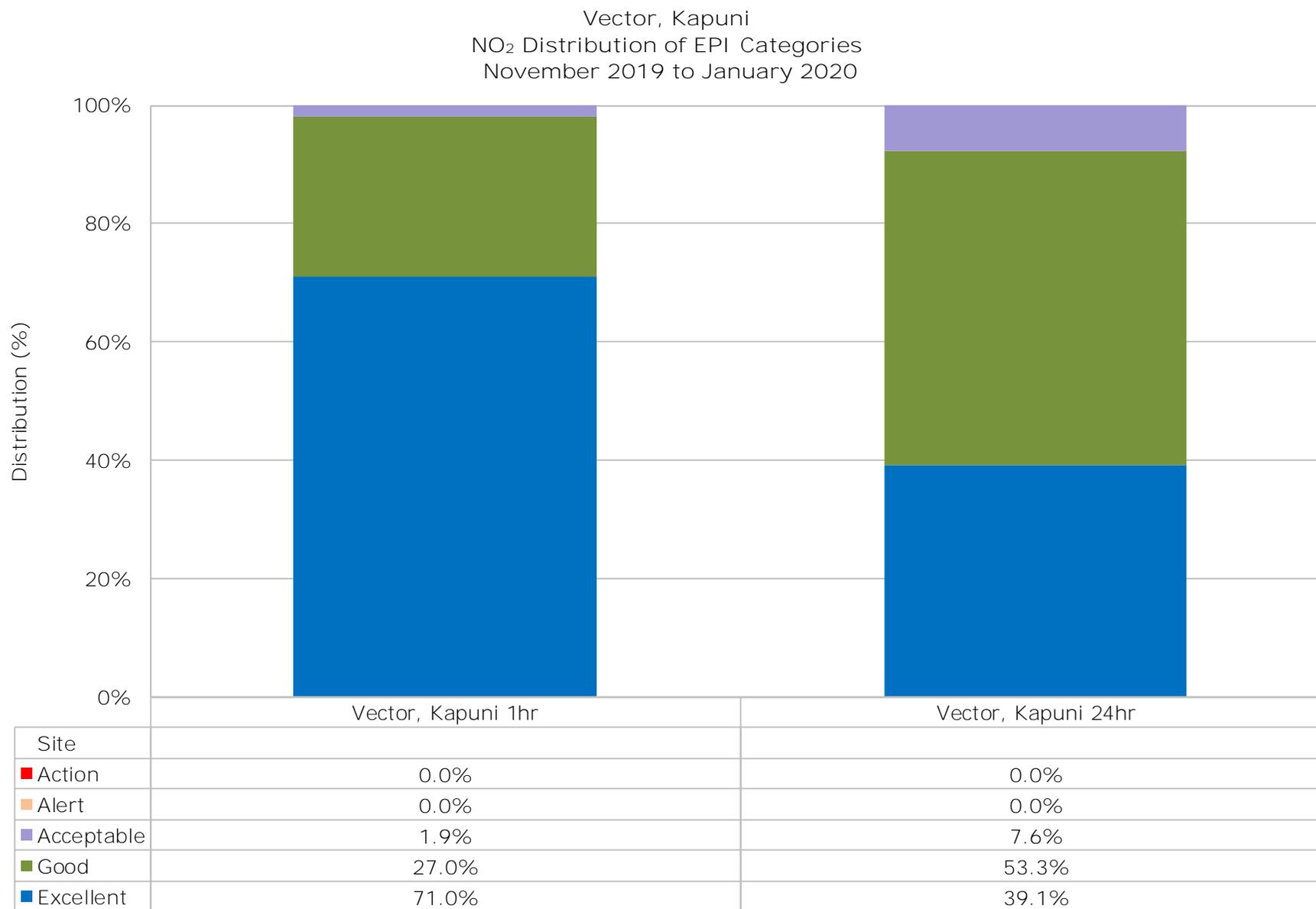


Figure 12: Vector, Kapuni: NO₂ Comparison of EPI Categories (1-hour and 24-hour averages)

6.4 Meteorological Parameters

6.4.1 Ambient Temperature and Relative Humidity

Table 6 presents a statistical summary of validated ambient temperature 1-hour and 24-hour averages that have been calculated from 10-minute averages. The results of ambient temperature measured from November 2019 to January 2020 are shown graphically in Figure 13 to Figure 15.

Table 7 presents a statistical summary of validated relative humidity 1-hour and 24-hour averages that have been calculated from 10-minute averages. The results of relative humidity measured from November 2019 to January 2020 are shown graphically in Figure 13.

Table 6: Ambient Temperature Statistics – November 2019 to January 2020

Ambient Temperature (°C)	1-hour average	24-hour average
Maximum	24.1 27/01/2020 14:00	20.1 27/01/2020
Average	15.7	15.7
Minimum	6.8 26/11/2019 03:00	11.7 1/11/2019

Table 7: Relative Humidity Statistics – November 2019 to January 2020

Relative Humidity (%)	1-hour average	24-hour average
Maximum	90.8 30/11/2019 07:00	82.6 19/01/2020
Average	70.4	70.4
Minimum	22.7 03/11/2019 22:00	41.4 3/11/2019

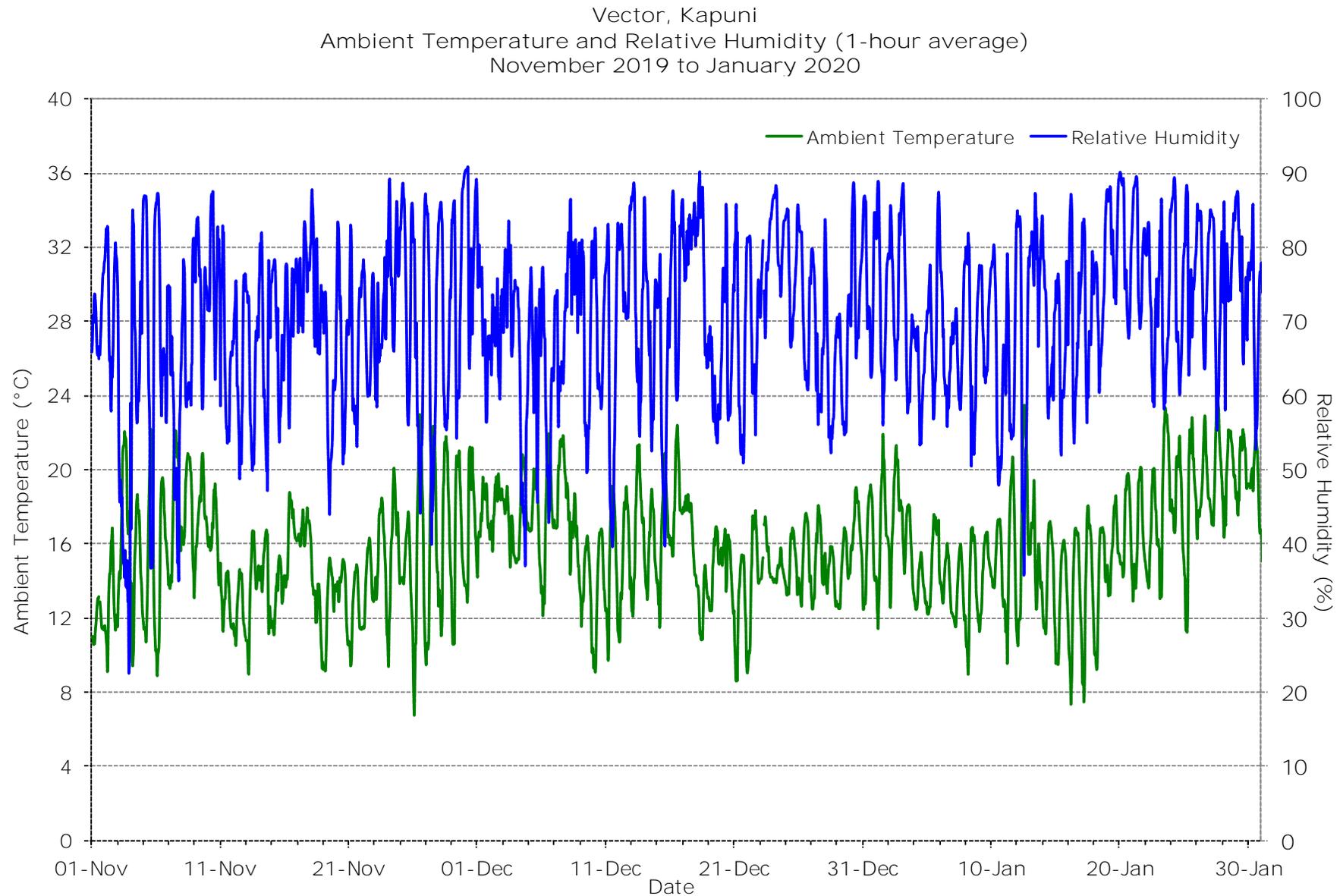


Figure 13: Vector, Kapuni: Ambient Temperature and Relative Humidity (1-hour averages)

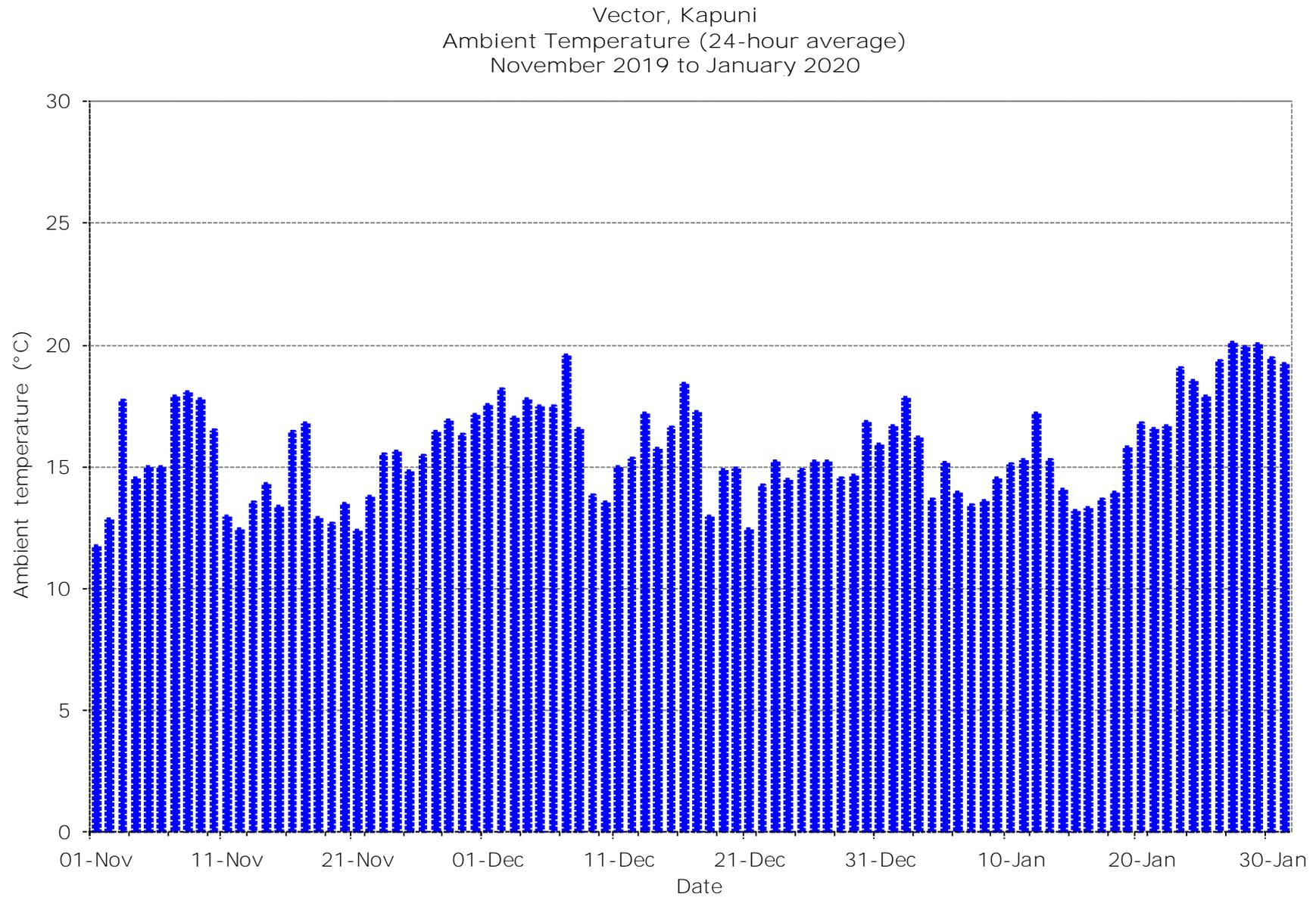


Figure 14: Vector, Kapuni: Ambient Temperature (24-hour averages)

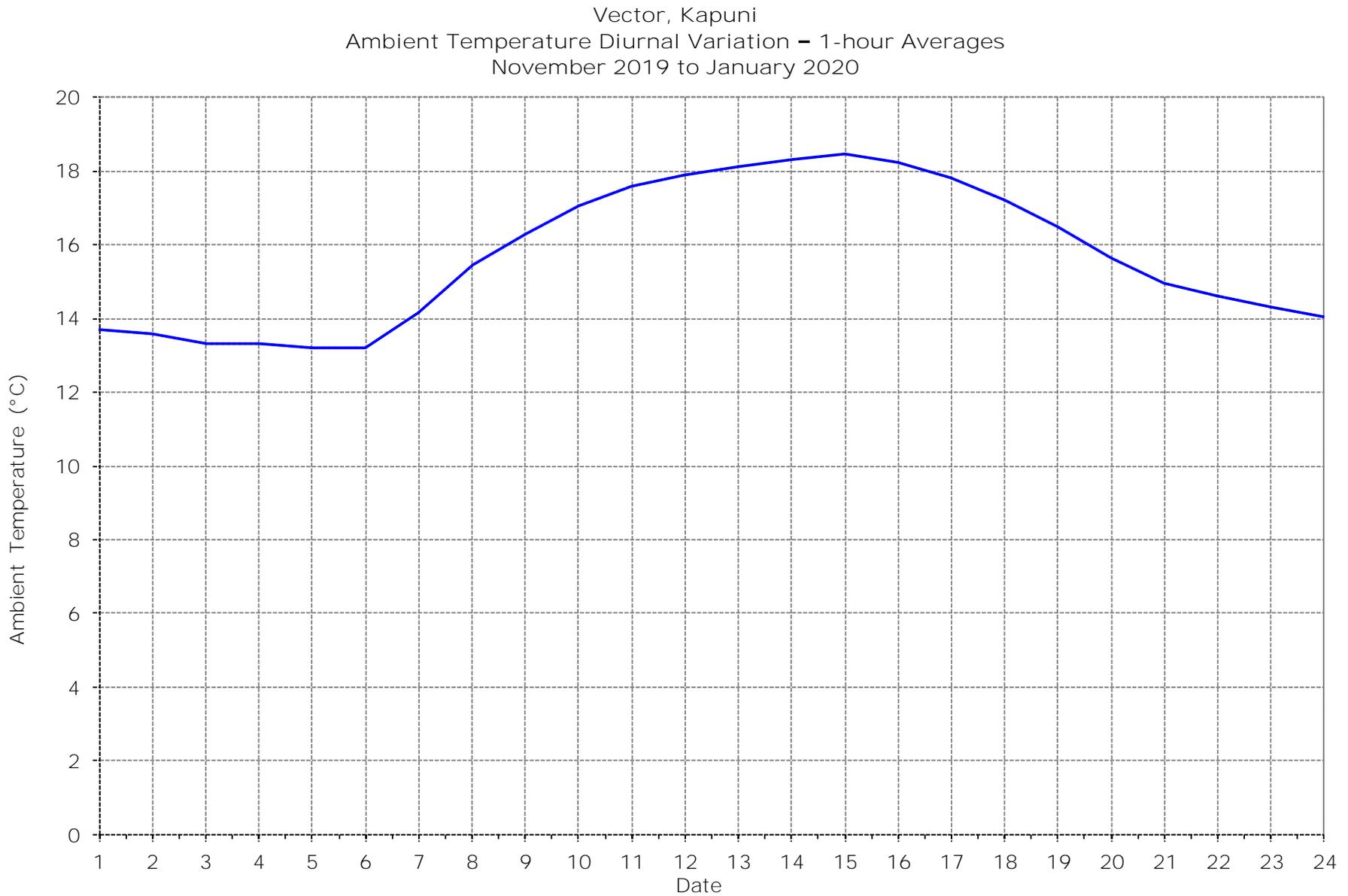


Figure 15: Vector, Kapuni: Ambient Temperature Diurnal Variation (1-hour averages)

6.4.2 Wind Speed and Direction

Table 8 presents a statistical summary of validated wind speed and wind direction 1-hour and 24-hour averages that have been calculated from 10-minute averages. Calm phases occurred when the wind speed was less than 0.5 m/s. These results from November 2019 to January 2020 are shown graphically in Figure 16 to Figure 19.

Table 9 shows the proportion of wind strengths at each wind direction. Strong winds, greater than 10 m/s, were observed from the north and south-southeast. The predominant wind direction was from the northwest.

Table 8: Wind Statistics – November 2019 to January 2020

Wind	1-hour average
Maximum Wind Speed (m/s)	11.8 03/12/2019 08:00
Average Wind Speed (m/s)	3.7
Main Wind Direction(s)	NW
Wind Calm (%)	0.6

Table 9: Wind Speed and Wind Direction summary (1-hour average)

Wind Direction	Wind speed time (hours)						Total (hours)	% of total
	0.5 – 2.0m/s	2.0 – 4.0m/s	4.0 – 6.0m/s	6.0 – 8.0m/s	8.0 – 10.0m/s	>10.0m/s		
N	83	46	47	23	5	7	211	9.6
NNE	76	45	16	2	0	0	139	6.3
NE	51	6	0	0	0	0	57	2.6
ENE	32	1	0	0	0	0	33	1.5
E	34	6	0	0	0	0	40	1.8
ESE	24	12	2	0	0	0	38	1.7
SE	29	26	21	12	2	0	90	4.1
SSE	16	32	58	36	22	7	171	7.8
S	10	44	10	0	0	0	64	2.9
SSW	17	27	0	0	0	0	44	2.0
SW	15	22	7	3	0	0	47	2.1
WSW	18	99	95	35	1	0	249	11.3
W	4	106	146	16	0	0	272	12.3
WNW	14	133	143	12	0	0	302	13.7
NW	17	134	130	52	5	0	338	15.3
NNW	21	53	20	2	2	0	98	4.4
All	461	793	696	193	37	14	2194	99
Calm	14						14	0.6

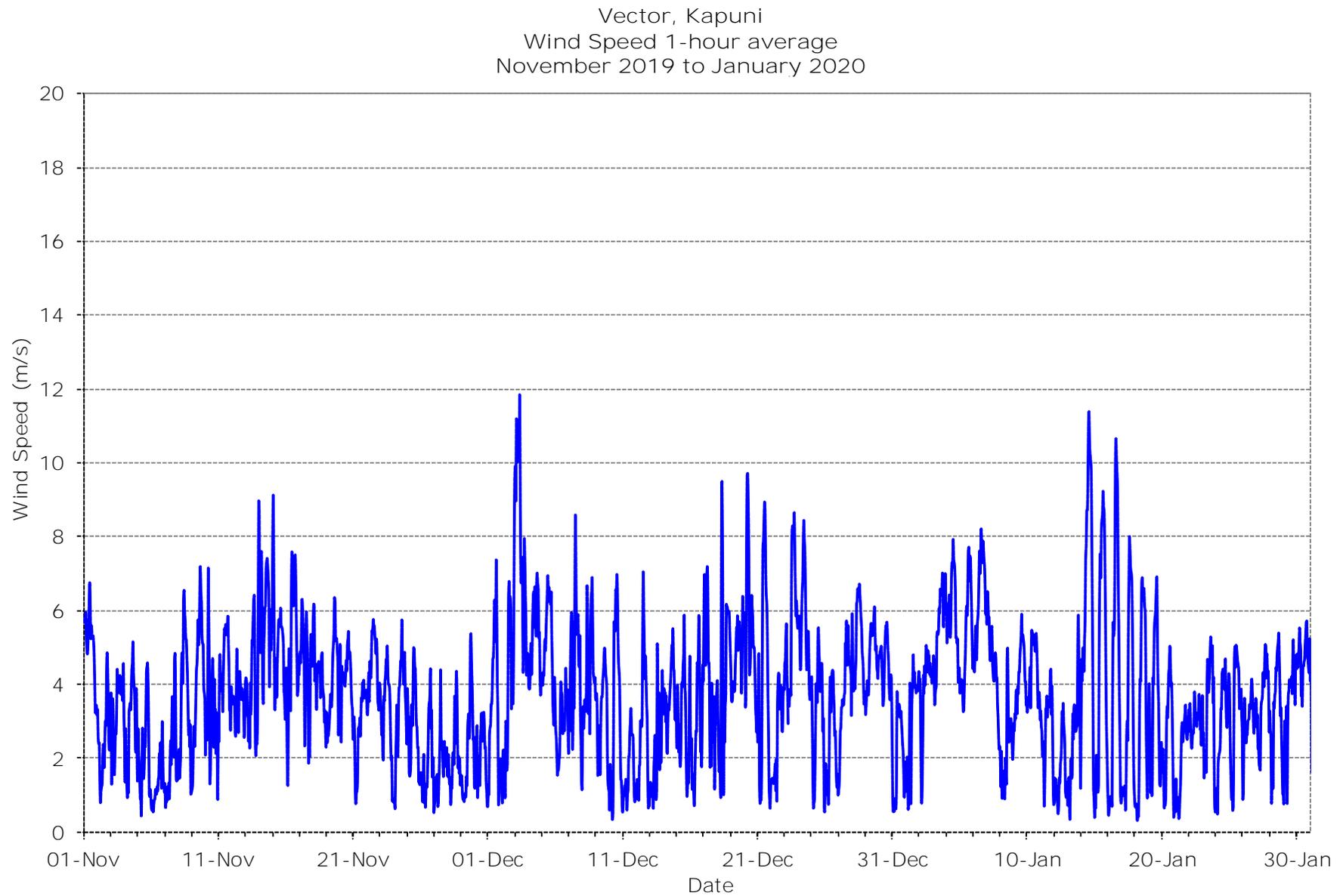


Figure 16: Vector, Kapuni: Wind Speed (1-hour averages)

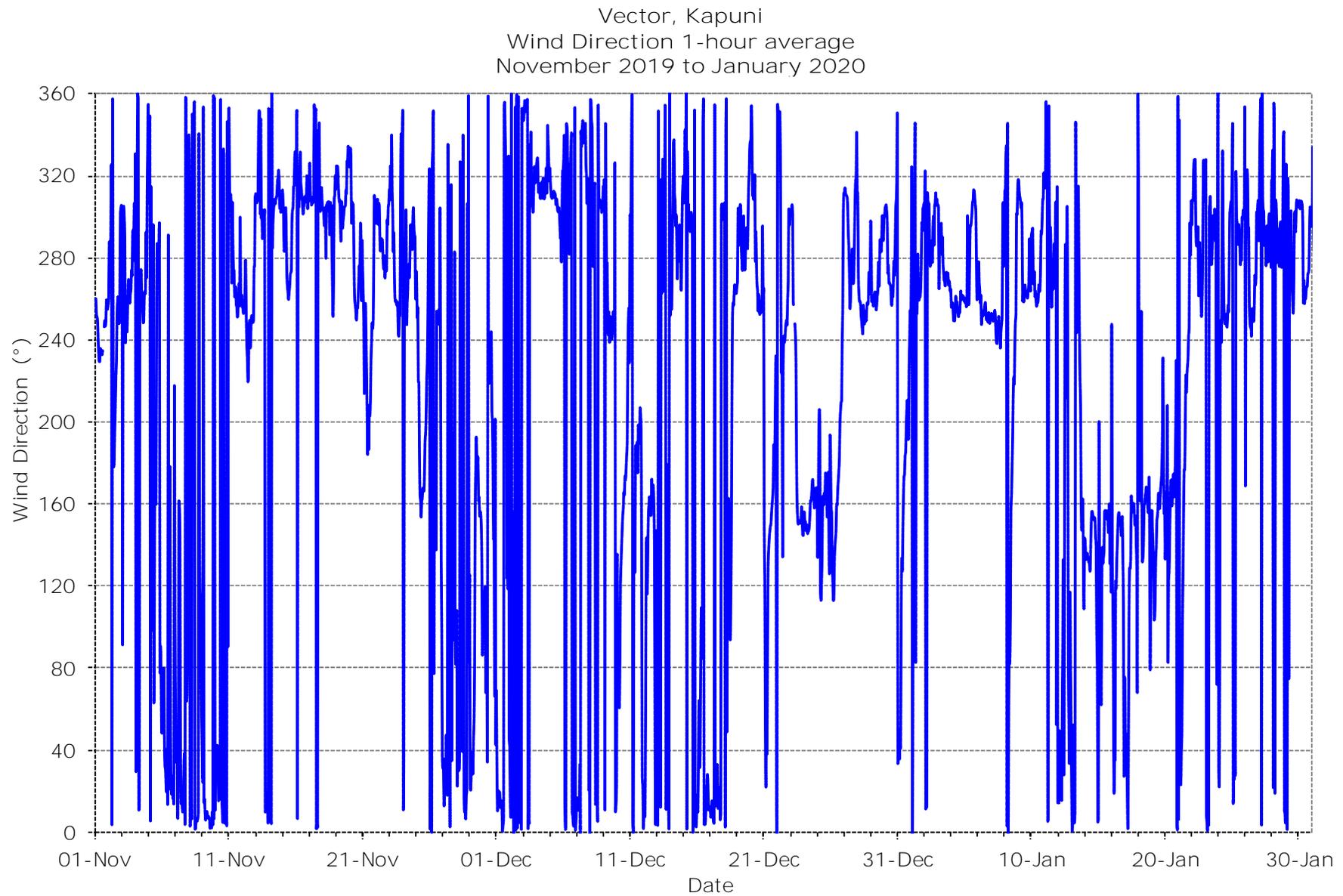


Figure 17: Vector, Kapuni: Wind Direction (1-hour averages)

Vector, Kapuni Wind Rose 1-hour average November 2019 to January 2020

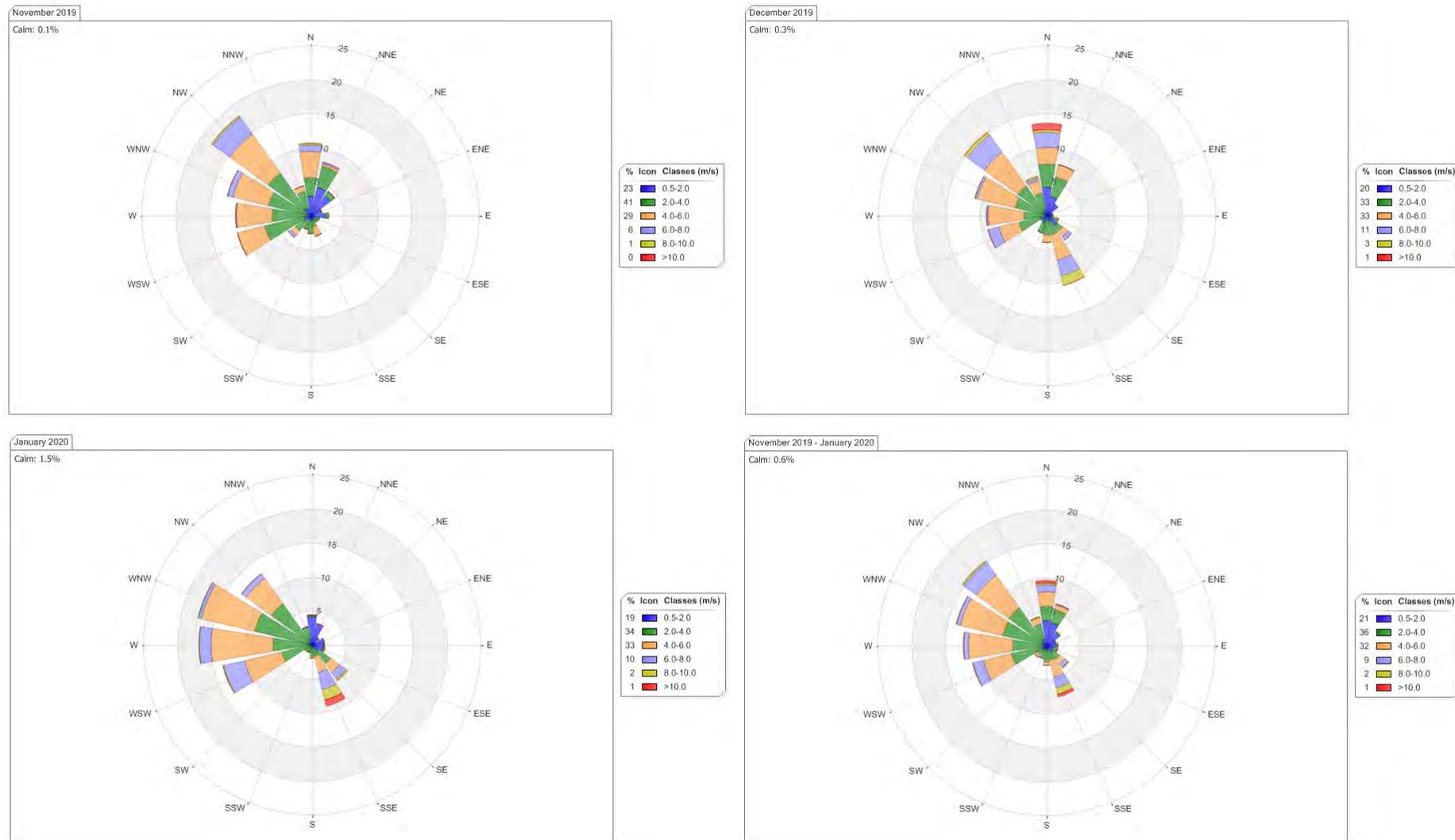


Figure 18: Vector, Kapuni: Wind Roses (1-hour averages)

Vector, Kapuni
Wind Speed Diurnal Variation - 1-hour Averages
November 2019 to January 2020

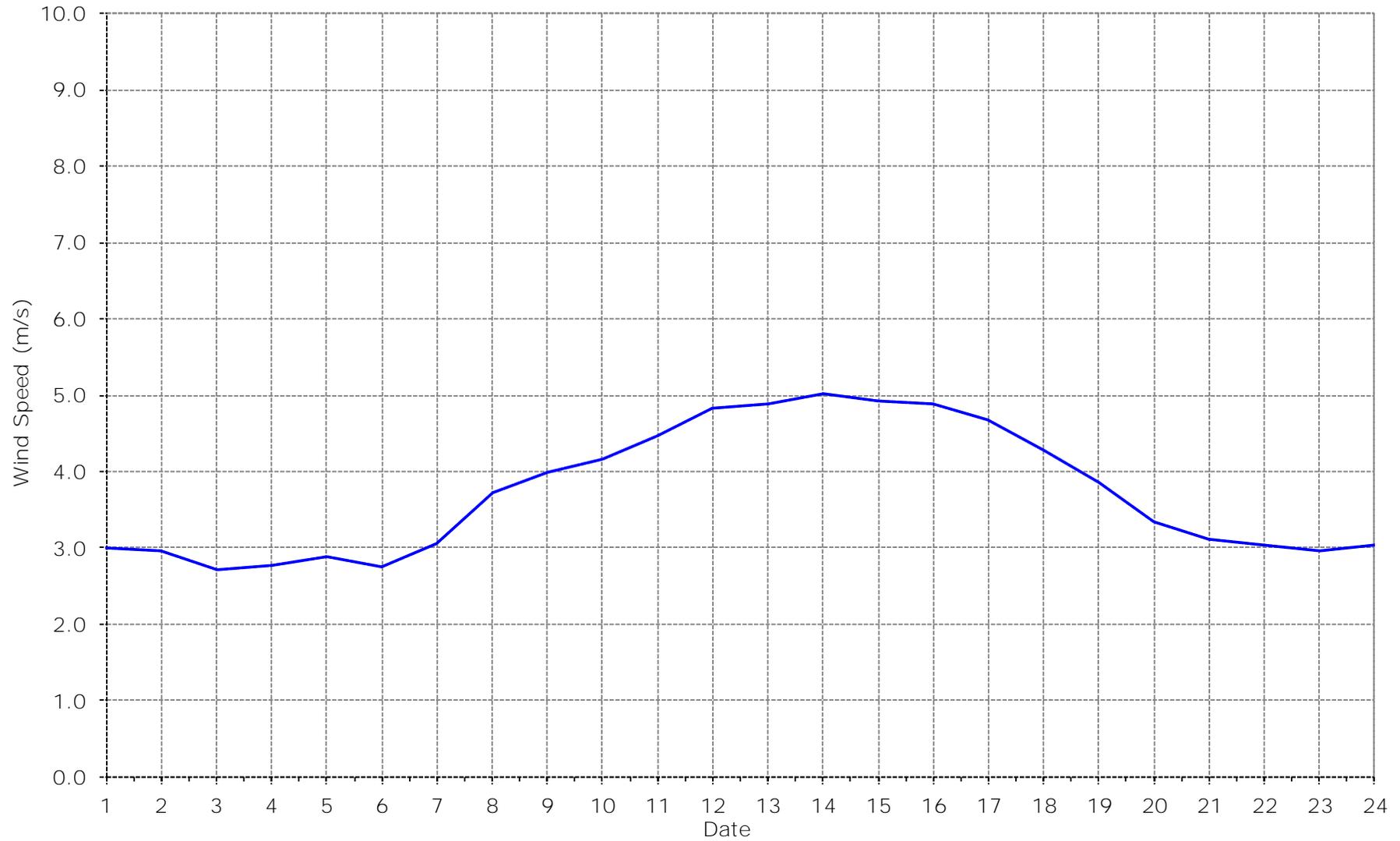


Figure 19: Vector, Kapuni: Wind Speed Diurnal Variation (1-hour averages)

7 Instrument History

Vector, Kapuni

Instrument	Date	Unit ID	Make and Model	Planned Maintenance	Service Information	Technician
<i>Gas Analyser – Carbon Monoxide</i>						
	31/10/2019	10087358	API T300	Six-Monthly Maintenance	Commissioned	B Kaushal
	28/11/2019	10087358	API T300	Monthly Maintenance	Recalibration	H MdAli
	23/12/2019	10087358	API T300	Monthly Maintenance	Recalibration	H MdAli
	10/01/2020	10087358	API T300	Monthly Maintenance	Audit Calibration	B Kaushal
	27/02/2020	10087358	API T300	Monthly Maintenance	Decommissioned	B Kaushal
<i>Gas Analyser – Nitrogen Oxides</i>						
	31/10/2019	10028345	API 200E	Six-Monthly Maintenance	Commissioned	B Kaushal
	28/11/2019	10028345	API 200E	Monthly Maintenance	Recalibration	H MdAli
	23/12/2019	10028345	API 200E	Monthly Maintenance	Recalibration	H MdAli
	10/01/2020	10028345	API 200E	Monthly Maintenance	Recalibration	B Kaushal
	27/02/2020	10028345	API 200E	Monthly Maintenance	Decommissioned	B Kaushal
<i>Meteorological Sensor</i>						
	31/10/2019	10080278	WTX520	Six-Monthly Maintenance	Commissioned	B Kaushal
	27/02/2020	10080278	WTX520	Monthly Maintenance	Decommissioned	B Kaushal
<i>Air Quality Location</i>						
	31/10/2019	T001	Vector, Kapuni	Annual Maintenance	Commissioned	B Kaushal
	27/02/2020	T001	Vector, Kapuni	Monthly Maintenance	Decommissioned	B Kaushal

8 References

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