OCEANAGOLD
WAIHI OPERATION

Air Quality Annual Monitoring Report 2022

Document Reference: WAI-200-REP-001

Approvals

OGC Designation	Name	Signature	Date
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Executive Summary

This report provides a review of the air quality monitoring programme carried out by OceanaGold New Zealand Limited (OGNZL) in and around Waihi, and related matters. The report is produced annually to provide a continuing record of the air quality performance of OGNZL. This report covers the 2022 calendar year and is produced in accordance with the Martha, Favona, Trio and Correnso Mines Air Quality Management Plan, 2019.

The information presented mainly relates to OGNZL's routine ambient air monitoring programme, which has been underway since 1982. The 2022 routine monitoring included measurements of total suspended particulate (TSP) and deposited particulate (DP) at 13 sites. There are 6 monitors for TSP and 9 monitors for DP.

Also included in this report are quality assurance measures, the results of any additional air quality monitoring and complaints received, as required by the consent conditions.

The conclusions of the 2022 review are the following:

- No exceedances of the threshold limits or breaches of the trigger levels occurred for TSP or DP during the year.
- OGNZL received two air quality complaints during 2022 (*cf*. three in 2021), however one was not mine related and the other was regarding weed spraying around the pit rim walkway.

1 Introduction

Surface and underground mining operations can generate dust from drilling, blasting, ripping, grading, loading, haulage, tipping, crushing, conveying, and general vehicle movements. Dust can also be generated from exposed areas and stockpiles. Other mining air emissions include combustion gases (carbon monoxide and dioxide, nitrogen oxides and sulphur dioxide), directly from blasting and via exhaust emissions from machinery.

Several Discharge to Air consents (Consent 109741 for the Favona Mine, Consent 121697 for the Trio Mine, and Consent 124859 for the Golden Link Project Area) regulate the site air emissions. The requirement to provide an annual written report is a condition in each of the consents and the condition states:

The consent holder shall provide to the Waikato Regional Council a written annual report each year that addresses at least the following:

(a) A summary of the results of the monitoring required by this consent.
(b) Any environmentally important trends arising from the monitoring programme.
(c) Comments on compliance with all conditions.
(d) Any reasons for non-compliance or difficulties in achieving compliance with the conditions of this resource consent.
(e) Any works that have been undertaken to improve environmental performance or that are proposed to be undertaken in the up-coming year to improve environmental performance in relation to the activities included in this consent.

This report is prepared to satisfy that requirement. In particular, it gives a review of the air quality monitoring programme carried out by OGNZL at Waihi. The review covers the 2022 calendar year with reference to earlier years as appropriate.

This report also covers other air quality activities including other (non-routine) air quality monitoring, quality assurance measures and any complaints received.

2 Air Resource Consent & Air Quality Management Plan

The site's Discharge to Air resource consents authorise OGNZL to discharge contaminants to the air from the surface project area, mine portal, and vent shafts. The consents require OGNZL to develop an Air Quality Management Plan (discussed below) to address air quality objectives, management, and monitoring. It is to be reviewed and updated at least once every two years. This report is in accordance with the 2019 Air Quality Management Plan which was approved by Waikato Regional Council (WRC) in September 2020; the 2019 Plan is the latest approved version.

The Air Quality Management Plan is the guiding document for air quality management at OGNZL, the contents of which are defined in the consent. If there is a conflict or inconsistency

between the conditions of the consent and the provisions of the Air Quality Management Plan, the Discharge to Air resource consent shall prevail.

The Discharge to Air resource consent prescribes various process-type measures to reduce atmospheric emissions and assessments of environmental impacts. The resource consent also sets down the required content of this report.

A requirement of the Air Quality Management Plan is to specify air quality control measures. To meet this requirement OGNZL have adopted the concept of “trigger levels” as being ambient concentrations of air pollutants of concern, rather than ambient air quality guidelines that were more commonly used previously in air quality management. The trigger levels are set at about two-thirds the level of previous limits, and they are recorded in the Air Quality Management Plan.

When the trigger levels are exceeded, OGNZL is required to investigate and report on the reason for the elevated result and identify corrective action(s) to prevent a repeat occurrence where possible. The ambient air “trigger levels” specified in the Air Quality Management Plan are displayed in Table 1.

Table 1. Air Quality Parameters and Trigger Levels

	Total suspended particulate	**Deposited particulate**
Sample period	7-day average	30-day average
Unit of measure	µg/m^3	g/m^2/month
OGNZL trigger level	45	4

3 Routine Monitoring Programme

There are two types of dust measurement included in the routine ambient air monitoring programme: total suspended particulate (TSP) and deposited particulate (DP).

Although not part of the routine weekly/monthly monitoring programme, PM_{10} and silica monitoring has in the past been done biennially. After years of data collection by both OGNZL and WRC (with results within accepted limits), monitoring for PM_{10} and silica has been suspended, with a provision to reinstate a programme if/when considered necessary.

3.1 Monitoring Sites

Details of all 2022 dust monitoring sites are given in Table 2. During the calendar year, there have been a total of 13 sites in use for the routine monitoring programme (Figure 1).

Table 2. Description of 2022 Permanent Monitoring Sites

Site No	Description	Location	Air Monitor Type(s)
6.59	Alexander's, Golden Valley	N of Devt Site	DP
6.60	Torrens, Golden Valley	N of Mill	DP
6.61	Leaches, Grey St	NE of Pit	TSP, DP and Real-time TSP
6.63	Met Station, Barry Rd	SE of Pit	TSP, DP and Real-time TSP
6.64	Courthouse, Haszard Street	S of Pit	TSP
6.65	Moresby Avenue	SW of Pit	TSP
6.66	Waihi College, Rata Street	W of Pit	TSP and DP
6.71	Morrison's Farm, Trig Road	SE of Devt Site	DP
6.72	Ruddock's Farm, Baxter Road	W of Devt Site	DP
6.73	TSF East	E of Devt Site	DP
6.74	Bulltown Road	N of Pit	DP and Real-time TSP
6.78	Cnr Grey & Slevin Streets	E of Pit	TSP

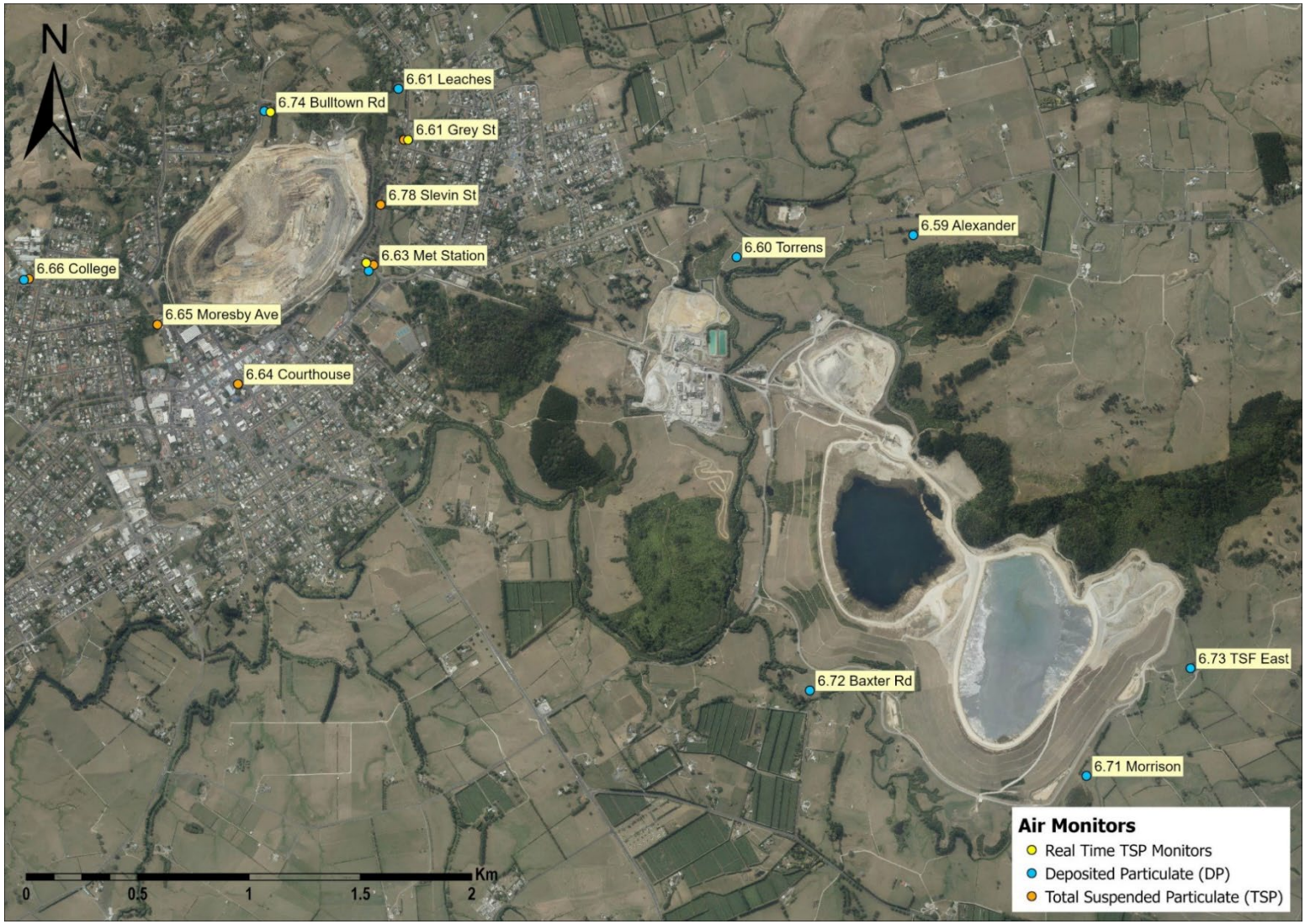


Figure 1. Waihi Dust Monitoring Sites

3.2 Quality Assurance

There are two key aspects of the quality assurance programme – gas meter calibrations and balance calibrations.

- The TSP gas meters at the suspended particulate monitoring sites were replaced with new calibrated units in July 2022.
- OGNZL's Precisa XT220A balance was calibrated on 21 June 2022. The "best accuracy" level was determined for the balance of up to 0.0008g in the 0-40g calibration range. This is considered satisfactory.

3.3 Quality Control

Three TSP samples were affected with damaged filters during 2022. These samples from the 6.65 Moresby Ave monitor were void for the weeks ending 14 October, 21 October, and 23 December 2022.

Five DP samples were contaminated during 2022. The samples from 6.59 Alexander for both the January and February monitoring periods were unable to be filtered due to contamination of the samples with turkey droppings. Subsequently, fencing tape was installed along the top rails of the DP enclosure as a turkey deterrent to prevent contamination of the samples. During the March monitoring period, the sample from 6.71 Morrison was contaminated with algal growth and both samples from 6.59 Alexander and 6.72 Baxter Road were contaminated with fertiliser/lime. These samples were void for the March monitoring period as they were unable to be filtered.

4 Summary of Results

4.1 Total Suspended Particulate

The results of the weekly TSP monitoring for 2022 are given in Figure 2 and Appendix A.

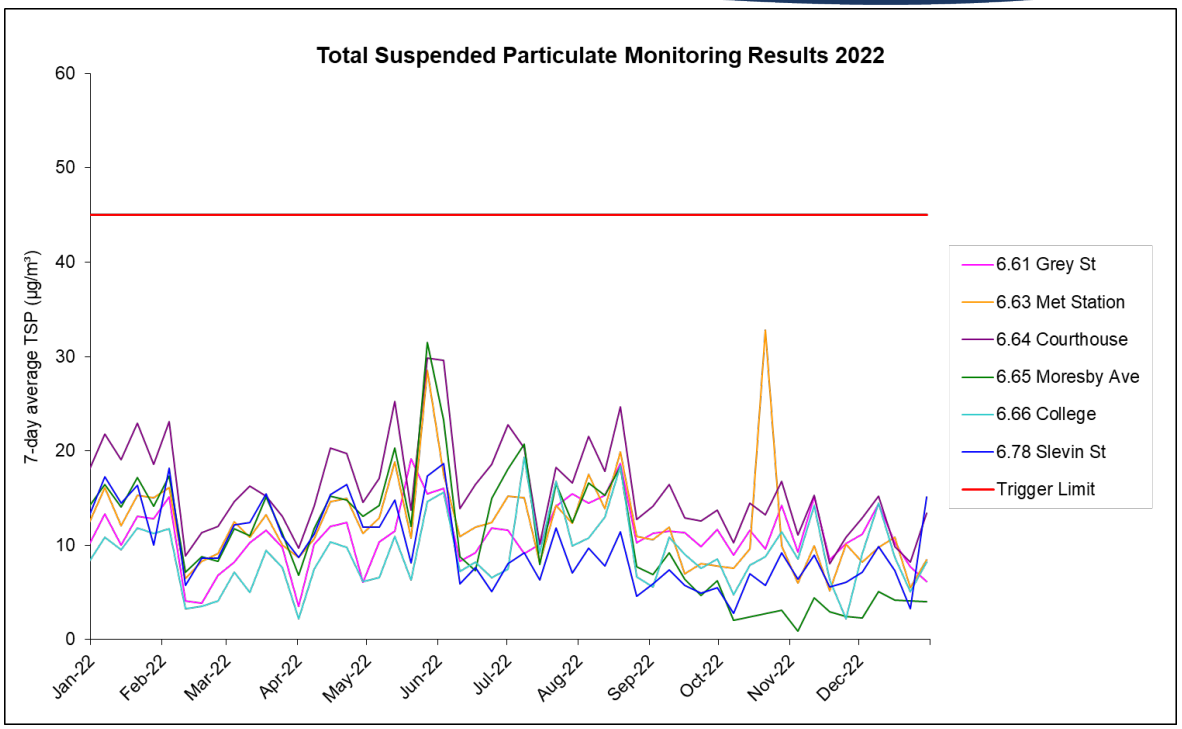


Figure 2. Total Suspended Particulate Results for 2022

No results exceeded the OGNZL TSP trigger limit of 45 µg/m^3, seven-day average during 2022. The highest recording during the year was 32.8 µg/m^3 at the 6.63 Met Station monitor for the week ending 21 October (no other monitor exceeded 30 µg/m^3 during the week concerned). This result may be related to increased exhaust emissions from classic vehicles gathering at the rugby club carpark. The higher TSP concentrations during winter months in 2022 is consistent with previous years' results showing a seasonal trend which is likely due to increased household heating (more fires being lit) when temperatures drop. The average weekly result across all sites was 11.4 µg/m^3 (*c.f.* 13.0 µg/m^3 in 2021).

4.2 Deposited Particulate

The results of the monthly DP monitoring for 2022 are given in Figure 3 and Appendix B.

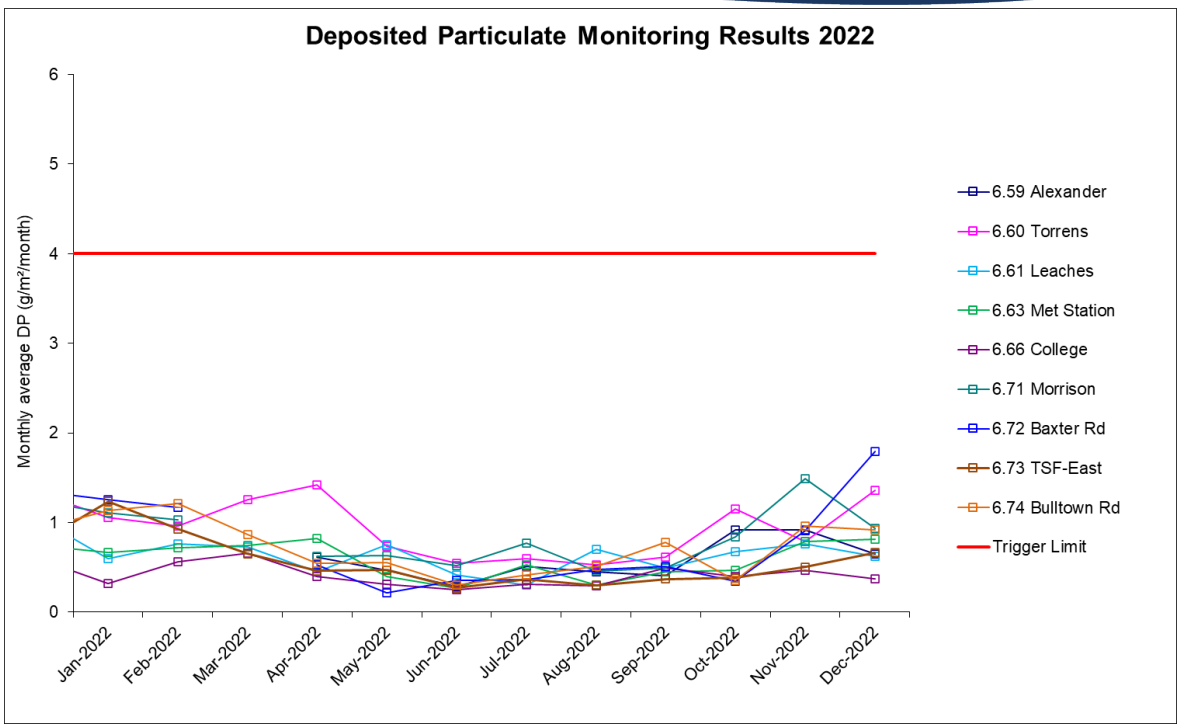


Figure 3. Deposited Particulate Results for 2022

No results exceeded the OGNZL DP trigger limit of 4 g/m^2/month during 2022. The highest recording during the year was 1.8 g/m^2/month at the 6.72 Baxter Rd monitor for the month of December, however no dust generating activities from this area of the mine site occurred during this time. No other site exceeded 1.5 g/m^2/month for the reporting period. The average monthly reading across all sites was 0.7 g/m^2/month (*c.f.* 0.8 g/m^2/month in 2021).

4.3 Trends

The criteria of air quality trigger levels have applied for 24 years, and the dust concentrations are below those trigger levels most of the time. It can be concluded that the air quality in and around Waihi is not deteriorating.

Figure 4 shows the long-term results of the TSP monitoring. The phases of active mining activities do not seem to have been reflected in corresponding changes in TSP levels, indicating that control measures during mining have been effective.

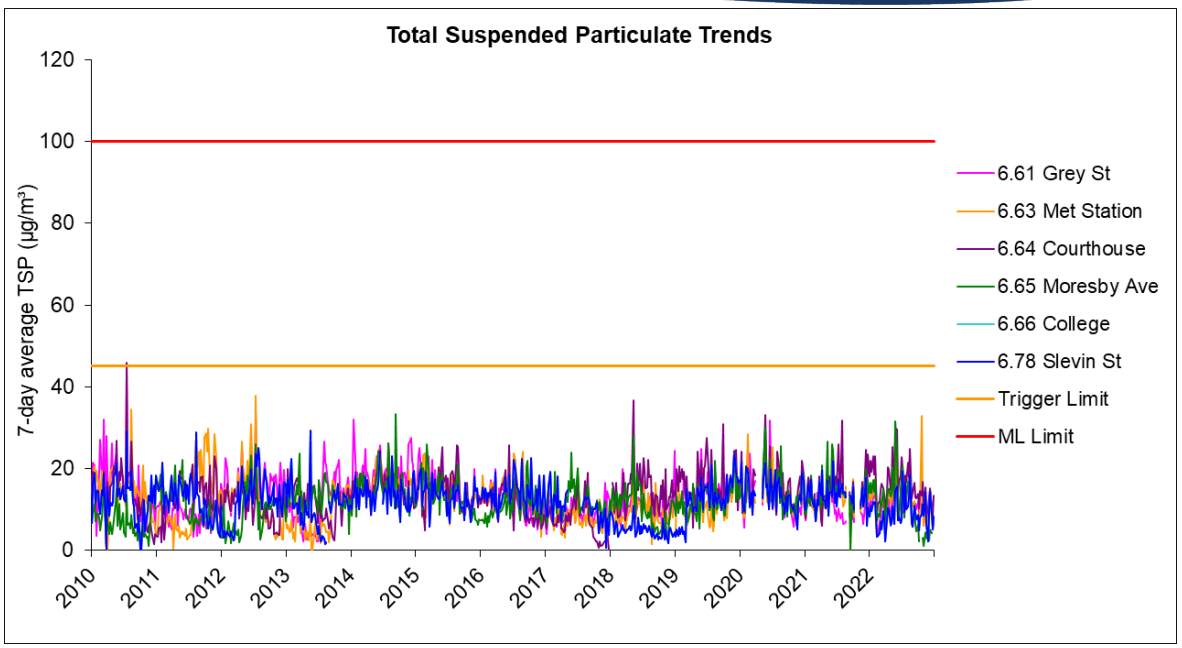


Figure 4. Total Suspended Particulate Trends from 2010 to 2022

Figure 5 shows the long-term DP results from the Waihi monitors. The 2022 results show a stable trend and compare well with results from the previous years.

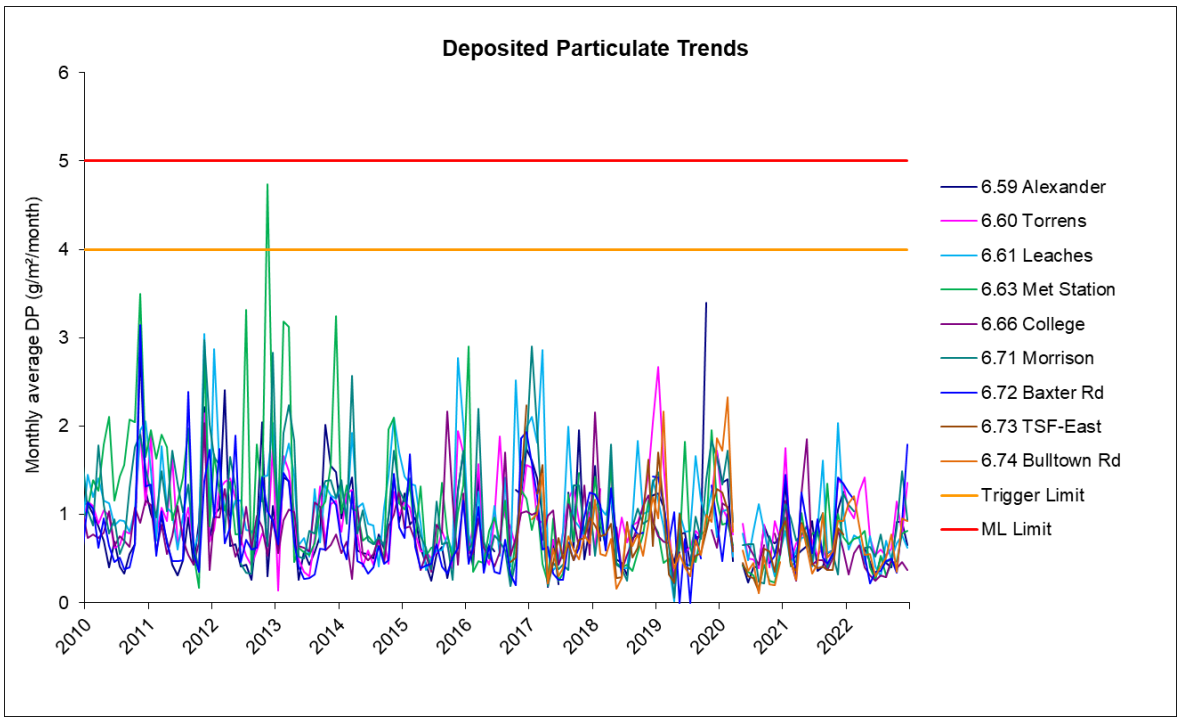


Figure 5. Deposited Particulate Trends from 2010 to 2022

4.4 Discretionary Deposited Particulate Monitoring

No discretionary deposited particulate monitoring was undertaken in 2022.

5 Compliance with Consent Conditions

5.1 General Operations 2022

Mining activities in 2022 remained as normal for most of the site's operations. Ore stockpiling continued as normal, with more ore processed in 2022 compared to 2021. Overall, the site's operations experienced lower levels of activity compared with previous years. The Favona waste stockpile continues to be utilised to store waste rock from the Martha Underground since early 2020 (after being empty for 8 years). At the Development Site, earthworks were undertaken to raise the crest of TSF1A by 1.2 m in early 2022. The Martha Pit remains in abeyance.

5.2 Complaints

Complaints about dust, smoke and blasting odour coming from the site's operations are matters of concern to OGNZL. No complaints were received in relation to the above parameters; however, two complaints in relation to air quality were received in 2022.

The first related to weed spraying around the pit rim walkway. The resident was informed of the weed spraying prior to the work being carried out, the area was signposted, and a notification of the activity was put up on Facebook. However, they were concerned with roundup being used and felt as though OGNZL should use an organic alternative. The resident agreed to write an email explaining their concerns so that it could be passed onto management, however no response was received.

The second complaint was from a resident experiencing a lot of dust at their property. They were informed that dust monitoring around the pit area was still being carried out and there had been no exceedances of dust levels. Additionally, no dust generating activities occurred in the pit during this time. To follow up, OGNZL supplied the 2022 dust monitoring data to the resident.

Details of any complaints or concerns received by OGNZL are recorded in a complaints/concerns register, along with information about any follow-up action. The register covers complaints on all operational matters, not just air quality, and has been in use since 1987. The number of complaints received about air quality each year are recorded in the register and listed in Table 3.

Table 3. Air Quality Complaints[1] Recorded in the Company's Register

Year	Number		Year	Number
1987	15		2005	2
1988	6		2006	3
1989	0		2007	8
1990	0		2008	7
1991	2		2009	5
1992	4		2010	6
1993	5		2011	26
1994	6		2012	11
1995	1		2013	10
1996	0		2014	5
1997	0		2015	7
1998	1		2016	4
1999	5		2017	5
2000	10		2018	2
2001	2		2019	0
2002	10		2020	1
2003	5		2021	3
2004	18		2022	2

5.3 Mitigation

The dry periods require OGNZL to be proactive with mitigating any dust emissions occurring from operating areas. Actions taken to mitigate dust emissions, particularly during drier periods, include the use of the sprinklers and watering roads in high activity areas. Speed restrictions on unsealed roads also reduce dust generation.

The 2022 annual rainfall (2403 mm) was significantly more than the previous year (1560 mm in 2021) and more than the historical average of 2100 mm (Figure 6). Therefore, actions required to mitigate dust emissions throughout the year were minimal.

[1] Not all complaints were deemed to be mine-related.

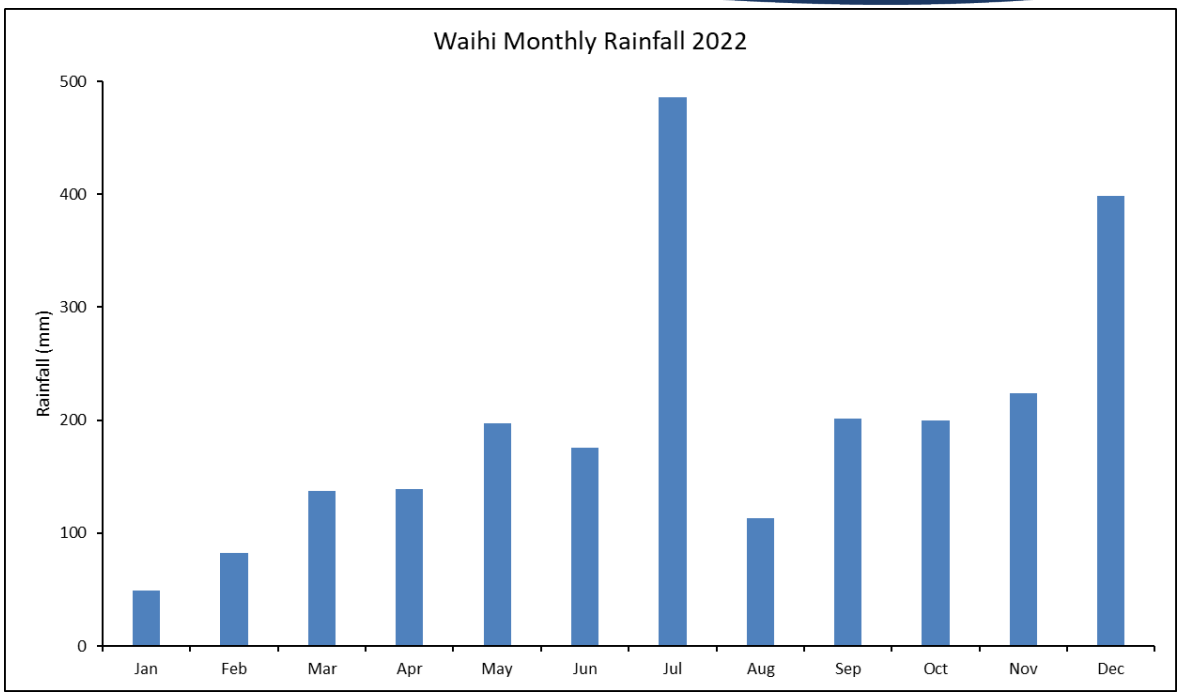


Figure 6**. Waihi Monthly Rainfall 2022**

Wind speed and direction followed typical seasonal patterns in 2022, with predominantly northeast and southwest winds. There were mostly light winds in late summer to early autumn, while the strongest winds occurred in July and November (westerlies). The 2022 monthly wind roses for Waihi are displayed in Appendix C and compare well with data from the previous year.

5.4 Hydro-seeding, Tarsealing and Rehabilitation

Hydro-seeding and pasture establishment is normally carried out in response to new earthworks (e.g. pit cutbacks, TSF crest raising). No new hydro-seeding or pasture planting was undertaken during the year.

In 2022, the Development Site Perimeter Road was re-sheeted, and minor tarseal repairs occurred on the access road and around the mill; no significant new areas were sealed.

6 Other Monitoring

6.1 PM_{10} and Silica Monitoring

PM_{10} and silica community monitoring was not conducted in 2022. Along with the suspension of production mining in the open pit, it has been agreed with WRC that PM_{10} and silica monitoring can be suspended until such time that it is considered necessary.

6.2 Real-time TSP Monitoring

Three 'real-time' TSP monitors around the open pit were installed in 2021 to provide prompt feedback on TSP levels, ensuring that future earthworks in the open pit will have an established real-time system ready in advance. The monitors are located at 6.61 Grey St, 6.63 Met Station, and 6.74 Bulltown Rd (Figure 1) and can also analyse for specific dust fractions (PM_{10}, $PM_{2.5}$, using special cyclones), should the need arise in the future.

The real-time TSP monitoring results for 2022 are given in Figure 7; currently there are no set trigger limits. The Bulltown Rd monitor (6.74) wasn't operational until October 2022.

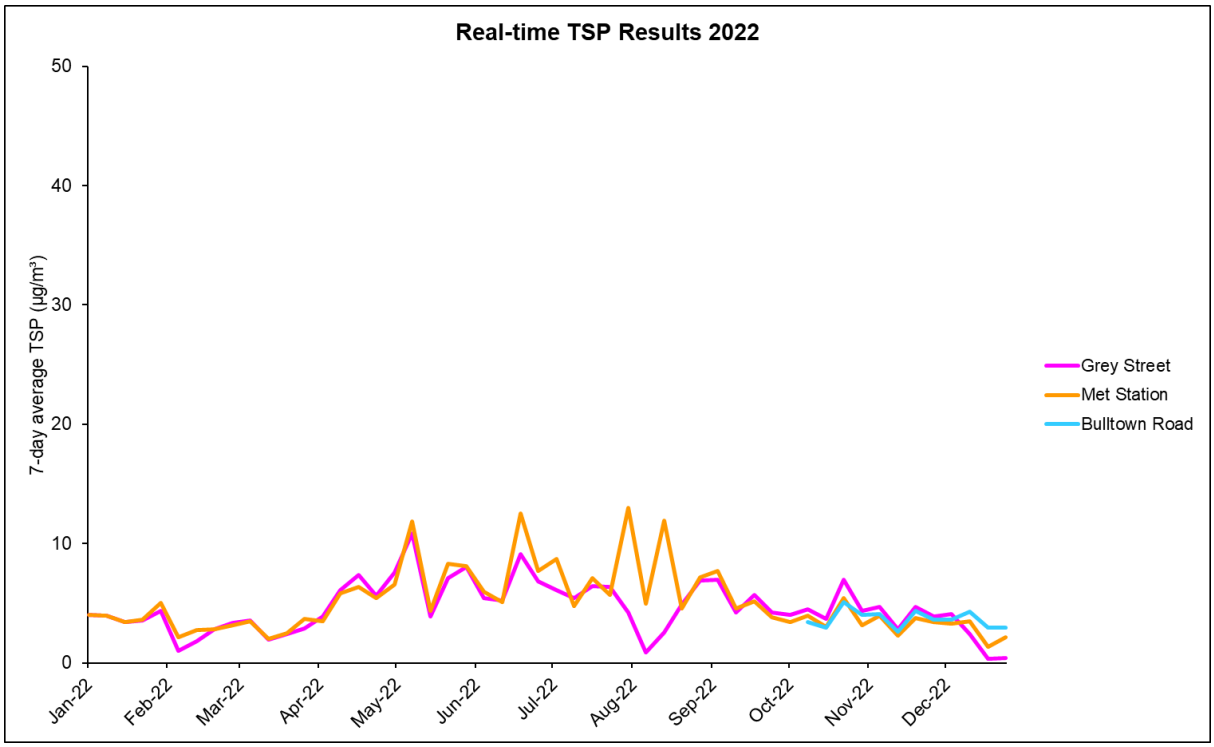


Figure 7. Real-time TSP Results for 2022

7 Future Monitoring

7.1 Deposited, Total Suspended Particulates

Ongoing operational activities followed by rehabilitation activities at Waihi will require dust control activities to be maintained and monitored for some time. At present, there is no consideration for altering the current DP and TSP programmes.

7.2 PM_{10} and Silica

OGNZL had been undertaking biennial monitoring for PM_{10} and silica and WRC also conducted a continuous monitoring programme for PM_{10} from 2008 – 2011. Data has indicated that the mine is complying with standards and that Waihi is regarded as a 'complying airshed.' In consultation with WRC, it was agreed that PM_{10} and silica monitoring can be suspended until such time that it is considered necessary. Future decisions will be based on any trends from the ongoing air quality monitoring programmes, as well as the implications of future mining activity.

Appendix A. Total Suspended Particulate Monitoring Results 2022 (µg/m³)

AIR QUALITY
TOTAL SUSPENDED PARTICULATE (TSP) RESULTS

	Above trigger limit (45)
	Near trigger limit (40-45)

All Measurements in µg/m^3

Period Ending Date	6.61 Grey St	6.63 Met Station	6.64 Courthouse	6.65 Moresby Ave	6.66 College	6.78 Slevin St
7-Jan-22	13.3	16.1	21.8	16.5	10.9	17.3
14-Jan-22	10.0	12.1	19.1	14.1	9.5	14.4
21-Jan-22	13.1	15.3	22.9	17.2	11.9	16.3
28-Jan-22	12.8	15.0	18.6	14.1	11.3	10.0
4-Feb-22	15.2	16.1	23.1	17.3	11.7	18.1
11-Feb-22	4.1	6.5	8.9	7.2	3.3	5.7
18-Feb-22	3.9	8.3	11.3	8.8	3.6	8.6
25-Feb-22	6.8	9.1	12.0	8.3	4.1	8.6
4-Mar-22	8.2	12.5	14.6	11.8	7.2	12.1
11-Mar-22	10.2	10.9	16.3	11.0	5.0	12.4
18-Mar-22	11.6	13.3	15.2	15.1	9.5	15.4
25-Mar-22	9.8	10.0	13.1	11.2	7.7	10.9
1-Apr-22	3.6	8.7	9.7	6.8	2.2	8.7
8-Apr-22	10.1	10.6	14.1	11.8	7.5	11.2
15-Apr-22	12.0	14.6	20.3	15.2	10.4	15.4
22-Apr-22	12.4	14.9	19.7	14.8	9.8	16.5
29-Apr-22	6.0	11.2	14.6	13.1	6.1	11.9
6-May-22	10.3	12.9	17.1	14.2	6.6	11.9
13-May-22	11.5	18.9	25.3	20.3	10.9	14.8
20-May-22	19.2	10.8	13.7	12.0	6.3	8.1
27-May-22	15.4	28.5	29.9	31.5	14.6	17.3
3-Jun-22	16.0	17.5	29.6	23.3	15.6	18.6
10-Jun-22	8.3	10.9	13.9	8.8	7.2	5.9
17-Jun-22	9.2	11.9	16.4	7.3	8.2	7.6
24-Jun-22	11.8	12.4	18.5	15.0	6.6	5.1
1-Jul-22	11.6	15.2	22.8	18.1	7.5	8.0
8-Jul-22	9.1	15.1	20.3	20.7	19.3	9.2
15-Jul-22	10.1	8.1	10.1	8.0	9.2	6.3
22-Jul-22	14.1	14.2	18.2	16.5	16.8	11.8
29-Jul-22	15.5	12.3	16.6	12.4	9.9	7.0
5-Aug-22	14.5	17.5	21.5	16.6	10.8	9.7
12-Aug-22	15.3	13.9	17.8	15.3	13.0	7.8
19-Aug-22	18.6	19.9	24.7	18.3	18.4	11.4
26-Aug-22	10.3	10.9	12.8	7.7	6.6	4.6
2-Sep-22	11.2	10.6	14.1	6.9	5.6	5.9
9-Sep-22	11.5	11.9	16.4	9.2	10.8	7.4
16-Sep-22	11.3	7.0	12.9	6.4	9.0	5.8
23-Sep-22	9.9	8.0	12.6	4.6	7.5	5.0
30-Sep-22	11.7	7.8	13.7	6.2	8.6	5.5
7-Oct-22	9.0	7.5	10.3	2.0	4.8	2.8
14-Oct-22	11.6	9.7	14.4	F	7.9	7.0
21-Oct-22	9.6	32.8	13.3	F	8.8	5.7
28-Oct-22	14.2	10.0	16.8	3.1	11.4	9.2
4-Nov-22	9.3	6.0	11.1	0.9	8.5	6.4
11-Nov-22	15.1	10.0	15.2	4.4	14.2	8.9
18-Nov-22	8.4	5.2	8.0	2.9	6.3	5.6
25-Nov-22	10.1	10.1	10.8	2.5	2.2	6.1
2-Dec-22	11.2	8.2	12.9	2.3	9.1	7.1
9-Dec-22	14.4	9.8	15.2	5.1	14.5	9.9
16-Dec-22	10.3	10.8	9.9	4.2	8.7	7.3
23-Dec-22	7.7	5.5	8.2	F	5.1	3.3
30-Dec-22	6.2	8.4	13.4	4.1	8.2	15.1

CODE	DEFINITION
F	Filter damaged

Appendix B. Deposited Particulate Monitoring Results 2022 (g/m²/month)

AIR QUALITY
DEPOSITED PARTICULATE (DP) RESULTS

All measurements in g/m²/month

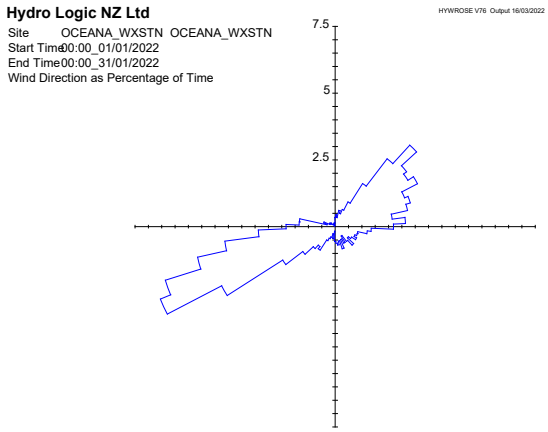
4 g/m²/month	Above trigger limit
>3 g/m²/month	Near trigger limit

YEAR		6.59 Alexander	6.60 Torrens	6.61 Leaches	6.63 Met Station	6.66 College	6.71 Morrison	6.72 Baxter Rd	6.73 TSF East	6.74 Bulltown Rd
2022	Jan-22	O	1.1	0.6	0.7	0.3	1.1	1.3	1.2	1.1
	Feb-22	O	1.0	0.8	0.7	0.6	1.0	1.2	0.9	1.2
	Mar-22	FL	1.3	0.7	0.7	0.7	O	FL	0.7	0.9
	Apr-22	0.6	1.4	0.4	0.8	0.4	0.6	0.5	0.5	0.5
	May-22	0.5	0.7	0.8	0.4	0.3	0.6	0.2	0.5	0.6
	Jun-22	0.3	0.5	0.4	0.3	0.2	0.5	0.4	0.3	0.3
	Jul-22	0.5	0.6	0.3	0.5	0.3	0.8	0.4	0.4	0.4
	Aug-22	0.5	0.5	0.7	0.3	0.3	0.5	0.5	0.3	0.5
	Sep-22	0.4	0.6	0.5	0.4	0.5	0.5	0.5	0.4	0.8
	Oct-22	0.9	1.2	0.7	0.5	0.4	0.8	0.3	0.4	0.4
	Nov-22	0.9	0.8	0.8	0.8	0.5	1.5	0.9	0.5	1.0
	Dec-22	0.7	1.4	0.6	0.8	0.4	0.9	1.8	0.7	0.9

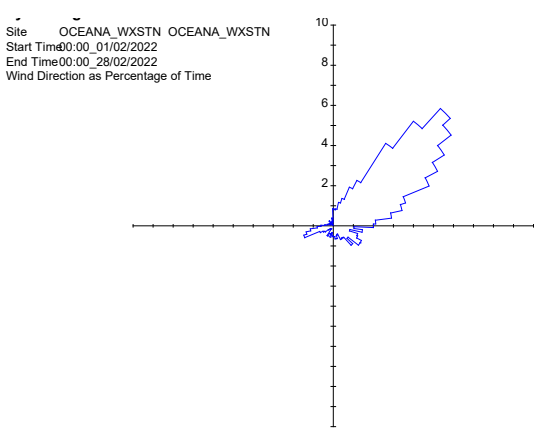
CODE	DEFINITION
FL	Fertiliser / Lime in sample
O	Organics, unable to filter

Appendix C. 2022 Monthly Wind Roses, Waihi

Jan 22



Feb 22



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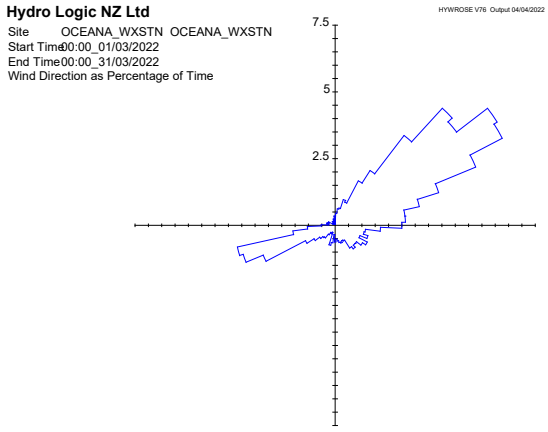
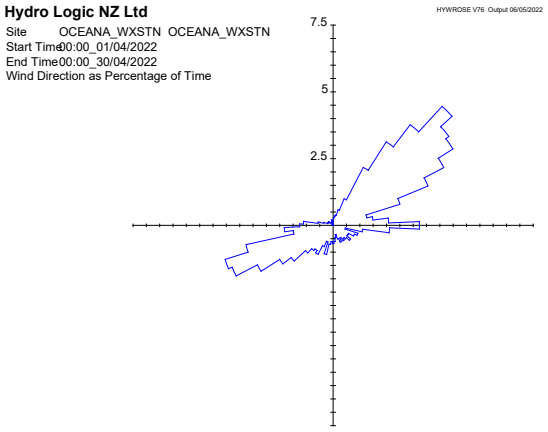


Apr 22



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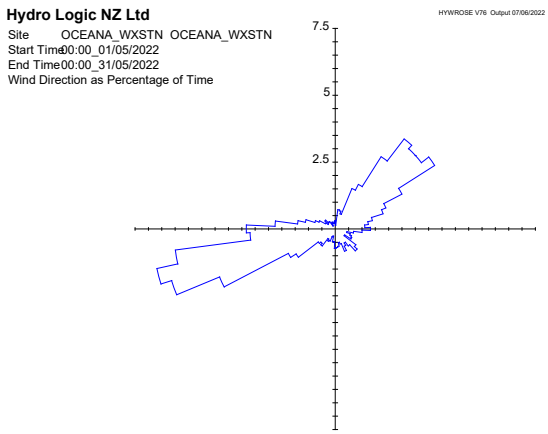
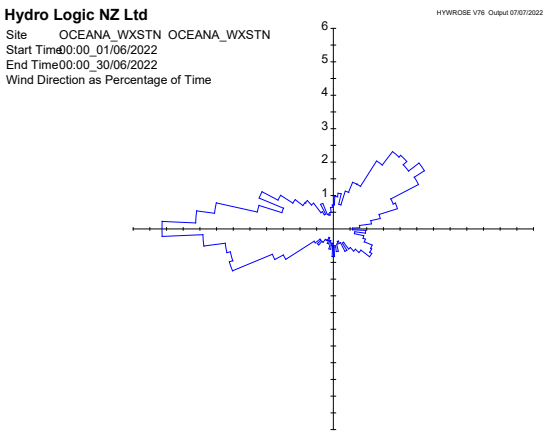
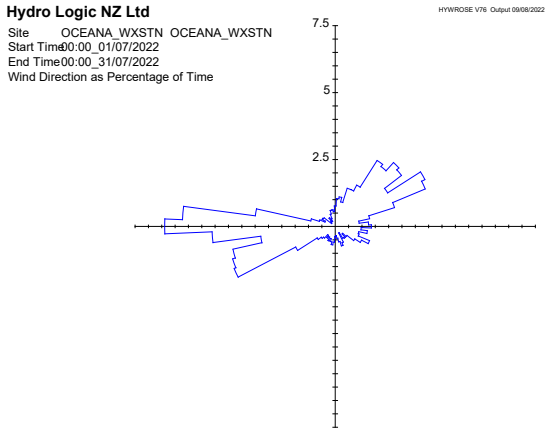


Jun 22



Jul 22



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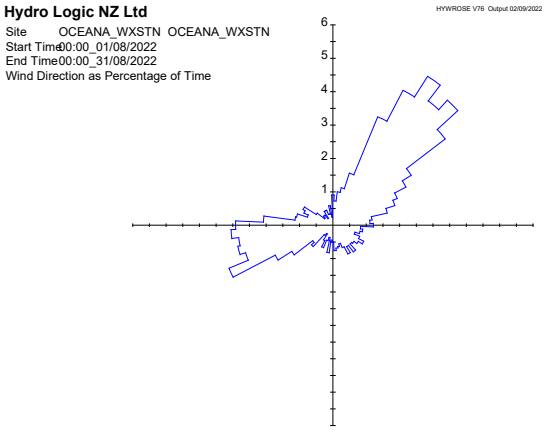

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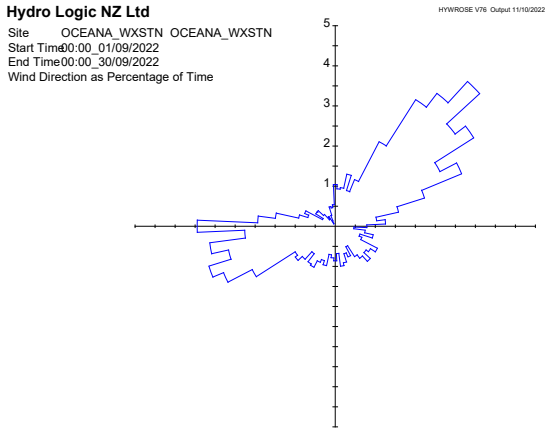

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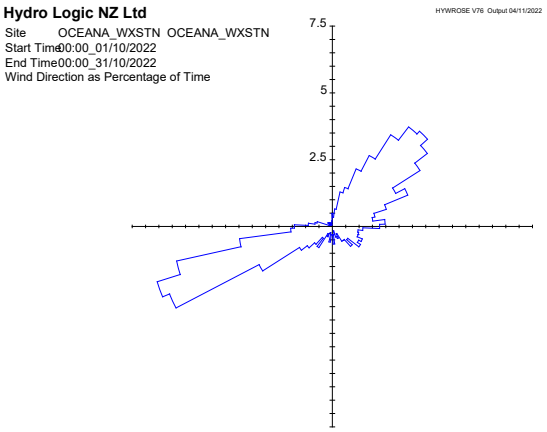

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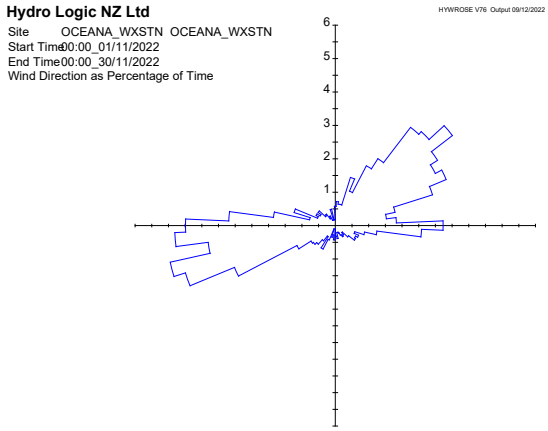

Dec 22