OCEANAGOLD
WAIHI OPERATION

Dewatering and Settlement Report 2022

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DEWATERING & SETTLEMENT MONITORING REPORT 2022

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EXECUTIVE SUMMARY

This annual Dewatering and Settlement Monitoring Report is a requirement of the consent conditions for the Martha, Favona, Trio, Correnso and Project Martha mining projects, in Waihi, New Zealand. Compliance monitoring and assessment of groundwater and settlement trends are reported in this document for the period 1 January to 31 December 2022. Such monitoring and reporting has been completed in accordance with the current Dewatering and Settlement Monitoring Plan that was approved by the Hauraki District and Waikato Regional Councils in May 2019.

On 16 July 2017, the Correnso groundwater take permit 124860 was replaced by the Project Martha groundwater take permit 139551. This allows dewatering to a lower level (500 mRL cf. 700 mRL).

New settlement triggers were applied during 2020 following the approval of Project Martha consents. These trigger levels are based on settlement estimates, which trigger a notification to council and review of the area and ongoing settlement trends. Exceeding settlement trigger limits alone does not represent an issue. Settlement can occur with no material effect at the surface. Tilt, which is differential settlement, has potential to be problematic for residential properties or public infrastructure and can be caused by shallow settlement effects. Tilts are only problematic if notably greater than 1 in 1000 and therefore this is the consented tilt trigger level. Shallow settlement effects can be linked to drawdown of the shallow water table and therefore monitoring of the piezometric levels is of importance. Settlement survey results indicated that 96% (385/399) of marks graphed were within the predicted settlement ranges, based on the settlement resulting from mining activities. 14 marks triggered further investigation. Four settlement marks triggered were above the Favona mining area. Six marks have tilts greater than 1 in 1000. These Favona marks are on farmland owned by the company directly above the Favona workings, and have no material affect on residential property. The other ten triggered marks are located in the wider Waihi area. Generally, no effects were observed at surface near these locations, tilts were less than the 1 in 1000, and nearby shallow piezometers have not displayed any changes outside of normal seasonal trends. Settlements around mark BM20 and BM20A have resulted in tilts around 1 in 1000. There is no residential property in this area. Overall, the settlement and dewatering trends are within expectations and no surface effects of concern have been observed.

Martha Open Pit

Dewatering from the Martha Pit was discontinued on 4 May 2015 after a slip in the pit resulted in access and power supply to the dewatering pumps becoming limited. Dewatering from within the Correnso underground mine was initiated on 18 May 2015. The Martha, Trio, Correnso and SUPA groundwater systems are hydraulically linked, and water levels are controlled by Martha Underground dewatering.

Generally, Martha Open Pit and Underground dewatering has negligible effect on the shallow groundwater table, minor effect in the deeper younger volcanic groundwater pressures locally around the pit, and notable depressurisation or dewatering in the deep andesite. As the drawdown effects are primarily deep in the andesite rock there is no undesirable tilts at the surface. No new trends have developed during 2022.

The analysis of data has indicated that most settlement around Martha Pit had developed by the mid to late 1990s, but widespread small magnitude settlement has been ongoing and is likely to be related to dewatering of deeper structures within the andesite rock mass. Groundwater monitoring data does not show any widespread or significant dewatering of alluvium; of the upper portions of the younger volcanic materials which could lead to undesirable tilt at the surface.

No property damage complaints attributable to mine dewatering or settlement in response to mine dewatering were reported during 2022. Compliance was achieved with the consent conditions granted for the Martha Extended Project.

Favona

At the Favona mine, piezometer levels indicate continued dewatering of the vein system, with the water level maintained at approximately 800 mRL mine datum by the end of 2022. Water levels in the country rock surrounding the vein system stand higher and are either not responding or responding slowly to dewatering. During 2019, a separate flow meter to measure dewatering flow from Favona was installed.

Four Favona marks exceed settlement predictions set for Project Martha, the same as in 2020.

A settlement trend exists over a 150 m wide area above the underground workings with a maximum total settlement of 358 mm (F18), of which up to 305 mm can be attributed to Favona mining activity. This is greater than the 80 mm initially predicted by URS (2002 Technical Report) to be due to dewatering. Settlement is attributed to a combination of depressurisation stress (primary consolidation) associated with drawdown in the andesite rock and relaxation of the country rock as mining proceeded. Primary consolidation (the first time a mine is dewatered) is greater than a second cycle (subsequent dewatering activities). The Favona mine is outside of the Martha groundwater system; the Martha system was historically dewatered for a longer period and to greater depth and is currently undergoing a second period of dewatering.

Six tilt gradients attributable to Favona mining activity remain steeper than 1 in 1000; these are on farmland owned by the company and south of the residential area along Barry Road and all, but one, have been recorded in previous surveying events.

The previous trigger levels applied to Favona piezometers have been removed. These have been superseded by the Waihi wide triggers introduced as part of the Correnso dewatering consent. The trigger is a 15m water level change within a month. No Favona piezometer had such an increase or decrease. Compliance with the conditions of the Favona consents and Monitoring Plan was achieved.

Trio

The groundwater levels in this area are assessed to be controlled by Martha Underground dewatering.

Correnso

The Correnso underground mine was granted consent and operations began on 20 December 2013.

Waikato Regional Council consents were granted in 2019 permitting the development of the Martha underground mine (Project Martha) and allowing groundwater levels to be lowered beyond the lowest level allowed for the mining of Trio. The Correnso water take permit was activated in July 2017, allowing dewatering to lower the groundwater down to 700 mRL (124860, Schedule One – General Conditions, Condition 1).

New settlement trigger levels for Correnso were applied in 2017 and Project Martha superseded these in 2020. During 2022, no settlement mark in the Correnso Extensions Project Area (CEPA) displayed dewatering related settlement and no consent related groundwater trigger was activated. Compliance was achieved with the consent conditions granted for the Correnso Project.

SUPA

The Slevin Underground Project Area is essentially an extension of the Correnso mining area. Mining within the SUPA area began 16 January 2017. No new Waikato Regional Council consents were required for the activity which is covered by the existing WRC consent conditions. The HDC dewatering and settlement related conditions are similar to the WRC conditions for Correnso. No new monitoring or reporting is required as the existing networks adequately encompass SUPA.

MDDP

The Martha Drill Drives Project (MDDP) was granted consent on 9 August 2017. Mining in the MDDP began 17 August 2017 and was completed during 2019. The project involved the construction of two underground drill drives from the SUPA area towards Martha Pit. No specific HDC conditions relate to dewatering and settlement, rather it is covered by the existing WRC Correnso consent conditions. No new monitoring or reporting is required as the existing networks adequately encompass MDDP.

Project Martha

Consents for Project Martha were granted on 1 February 2019. Joint HDC and WRC consents were activated on 27 July 2019 when blasting began in the project area. The current Project Martha groundwater take permit (139551) was activated on 1 January 2020 and allows dewatering down to 500 mRL. New dewatering bores were installed during 2020 to progressively lower the water level to enable Project Martha activities. At the end of 2022, the water level was at approximately 676 mRL.

1 INTRODUCTION

This report is submitted to meet the requirements of various consents held by OGNZL related to Dewatering and Settlement. New consents have been issued for different projects as mining has progressed at Waihi with many having conditions and reporting requirements in common. A full list of conditions pertaining to Dewatering and Settlement are included in Appendix A. Consents for Martha, Favona, Trio, Correnso, SUPA, MDDP and Project Martha all require a Dewatering and Settlement Monitoring Plan. Below is a summary of the current common consent requirements:

The report shall, as a minimum, provide the following information:

a) The volume of groundwater abstracted;

b) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;

c) An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of the future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions, this analysis shall be undertaken by a party appropriately experienced and qualified to assess the information;

d) Any contingency actions that may have been taken during the year; and

e) Comment on compliance with [any conditions] of this schedule including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.

f) The report shall be forwarded in a form acceptable to the Councils.

Changes to this year's monitoring report:

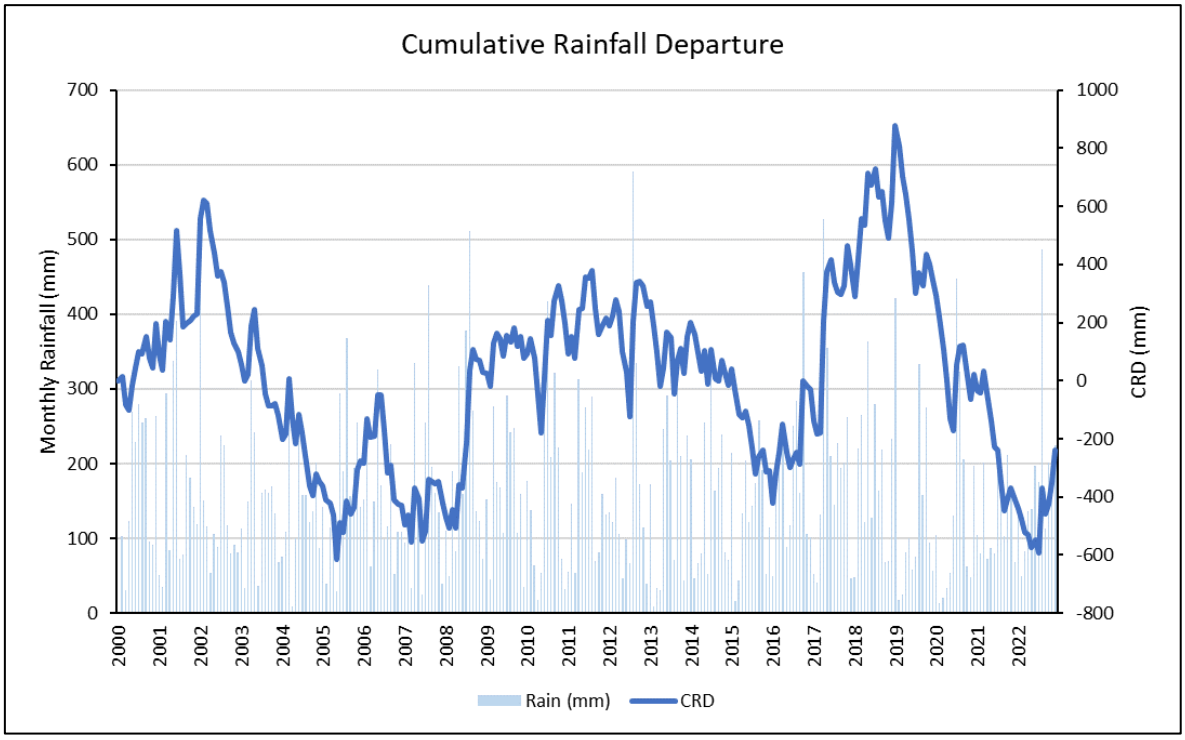
A peer reviewer recommendation from 2022 was to include a section on climatic conditions for the calendar year and historic trends of seasonal or long-term rainfall. Section 2 describes trends in rainfall and includes Figure 1 which displays a cumulative rainfall departure (CRD) plot with rainfall data since 2000, historical rainfall since 1907, and monthly rainfall during 2022.

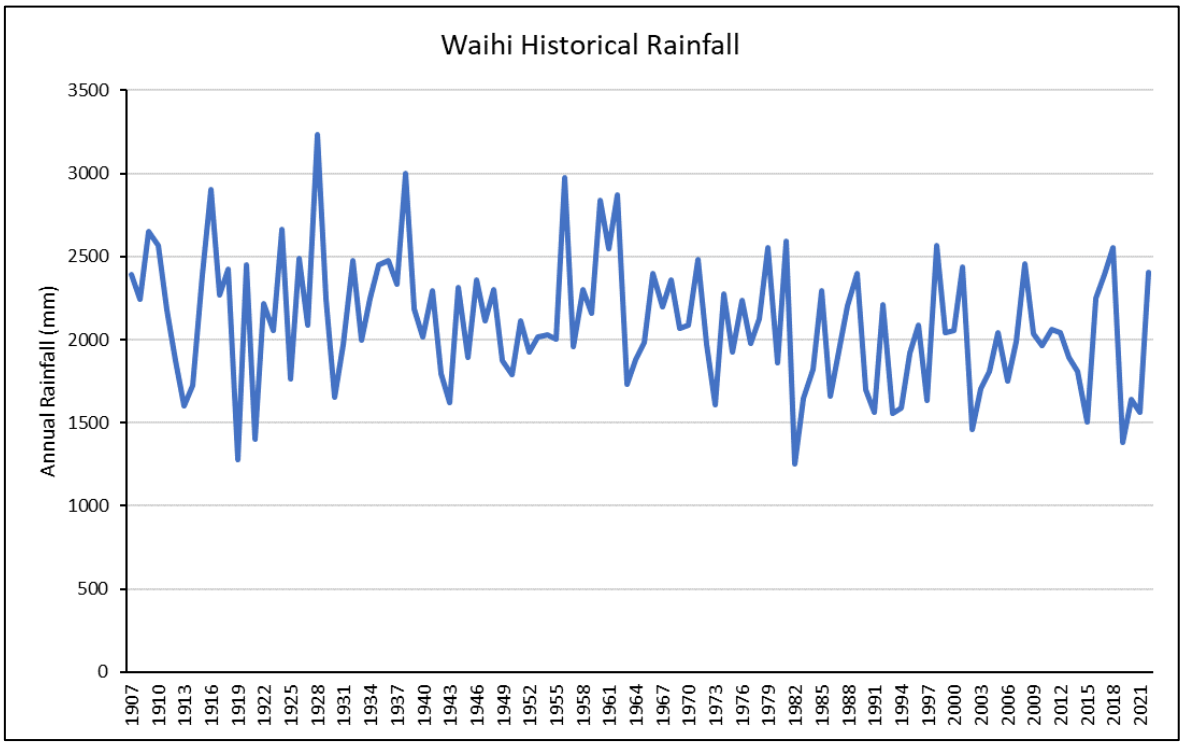
The two new Project Martha vibrating wire piezometers (P122 and P123) have been added to the monitoring network and data collected so far has been included in Figure 20 and Figure 21 (Section 6.3.5).

2 CLIMATE CONDITIONS

Annual and seasonal rainfall trends are displayed in Figure 1. The Cumulative Rainfall Departure (CRD) plot presents monthly long-term trends in rainfall since 2000, with a rising slope since July 2022 indicating above average rainfall in since July 2022. Historical rainfall data for Waihi has been collected since 1907, with annual rainfall ranging from 1249 – 3234 mm.

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. The month with the highest rainfall in 2022 was July (486 mm) followed by December (398 mm) and the driest month was January (49 mm) followed by February (82 mm).





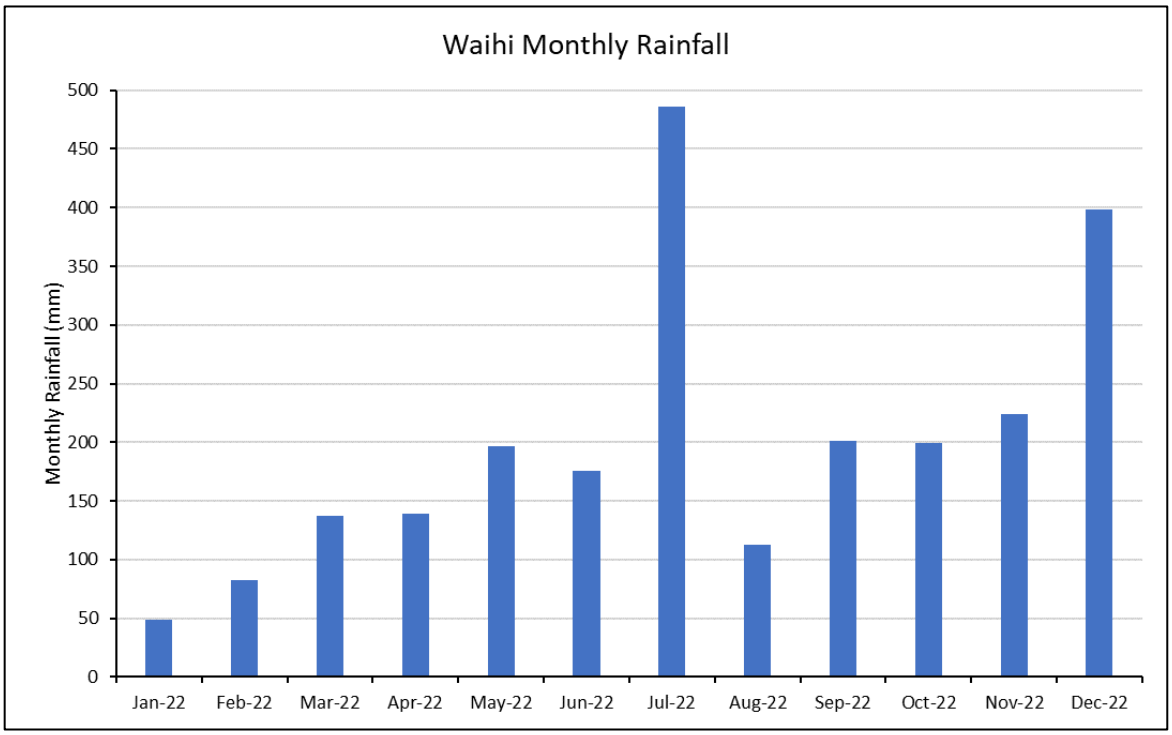


Figure 1. Annual and seasonal rainfall trends. A) CRD plot 2000 – 2022, B) Historical rainfall 1907 – 2022, C) Monthly rainfall 2022.

3 GEOLOGICAL SETTING

The mineralised veins of the Martha, Favona, Trio and Correnso gold deposits in Waihi are developed within Miocene age lava flows, intrusives and volcaniclastics of predominantly andesitic and minor dacitic composition (Figure 2). The andesites extend to depths greater than 600m below the surface and are extensively modified in places by weathering and hydrothermal alteration. The andesites are unconformably overlain by younger, unmineralised rhyolitic ignimbrites under much of the Waihi township. The ignimbrites drape over an eroded andesitic graben and horst landscape resulting in a volcaniclastic package that is highly variable in thickness (0 to >100m). Additionally, the ignimbrites exhibit variable textures, ranging from light weight, soft and pumice-rich horizons that are highly permeable to hard welded ignimbrites that appear less permeable. Paleosols (buried soils) and sedimentary deposits, such as alluvium and boulder alluvium (in places) mark the tops of successive eruption sequences.

There is a discontinuous layer of recent alluvium beneath the Waihi township that is located in areas where old streams and river channels cut into the ignimbrites and andesite units. These alluvial deposits are extensive to the east of Waihi where they are associated with the drainage systems of the Ohinemuri River catchment.

The most common effect of hydrothermal alteration on the andesitic host rocks surrounding the veins is the alteration of primary feldspars to illite and smectite clays and the introduction of pervasive potassic feldspar. Illite and smectite clays generally cause the host rocks to lose their internal strength forming weaker and usually more friable rock. The extent of clay alteration is highly variable and dependant on veining and the host rock type. In Waihi the strongly clay altered zones are usually concentrated within close proximity to the veins or faults (e.g. within the hanging wall of Favona) and within the vein zones themselves (e.g. Martha, Correnso and Trio). Potassic alteration on the other hand generally increases the overall strength of the host rocks which often results in the rocks surrounding the veins being more resistant to weathering and forming bluffs such as the Martha Hill (prior to mining of the Martha Open Pit) and Union Hill in Waihi. Paleo-weathering and hydrothermal alteration appear to have created an extensive low-permeability clay-rich horizon within the upper part of the andesite sequence. This horizon generally separates the andesites, hydrogeologically, from the younger overlying sequence of permeable rhyolitic ignimbrites. Exposure of the altered andesite in the southern wall of the Martha Pit indicates that the weathered clay horizon may extend up to 30m in thickness.

In the vicinity of the Martha vein zone the groundwater is largely concentrated within old underground mine workings, faults and veins where the historical mine workings act as effective conduits allowing inflow of groundwater water from the area surrounding the current Martha Open pit.

Principal veins and faults at both Martha and Favona dip to the south-east while the Correnso vein strikes north-north-west with an easterly dip. The Trio-Union-Amaranth veins are located on a paleotopographic high, informally referred to as the Union Horst that separates the Martha vein system from the Favona-Moonlight vein systems.

There is a hydrogeological connectivity between the Martha vein system and the Trio-Union-Amaranth vein system thought to be facilitated by the connecting Correnso structure. This was demonstrated historically by the rise and fall of ground water levels in the Union Hill shaft in unison with the rise and fall of water levels in the Martha open pit. There is only a very weak hydrogeological connectivity between the Martha system and the Favona system, shown by a lack of mutual response in the measured ground water levels. The zone of separation of the two groundwater systems is not well defined but may be due to a fault boundary, either the No 9 fault or the Favona footwall fault, both of which are north to northeast trending and have a perceived strike extent exceeding 1km.

Groundwater inflow is, predominantly, controlled by infiltration from overlying layers and through outcrops of ignimbrite in the beds of streams and at the ground surface. The rhyolitic ignimbrite sequence is generally considered compressible and to date has accounted for most of the

dewatering induced settlement around the mine site. This is indicated by settlement magnitude generally corresponding to the thickness of the rhyolitic ignimbrite and the magnitude of dewatering in these materials.

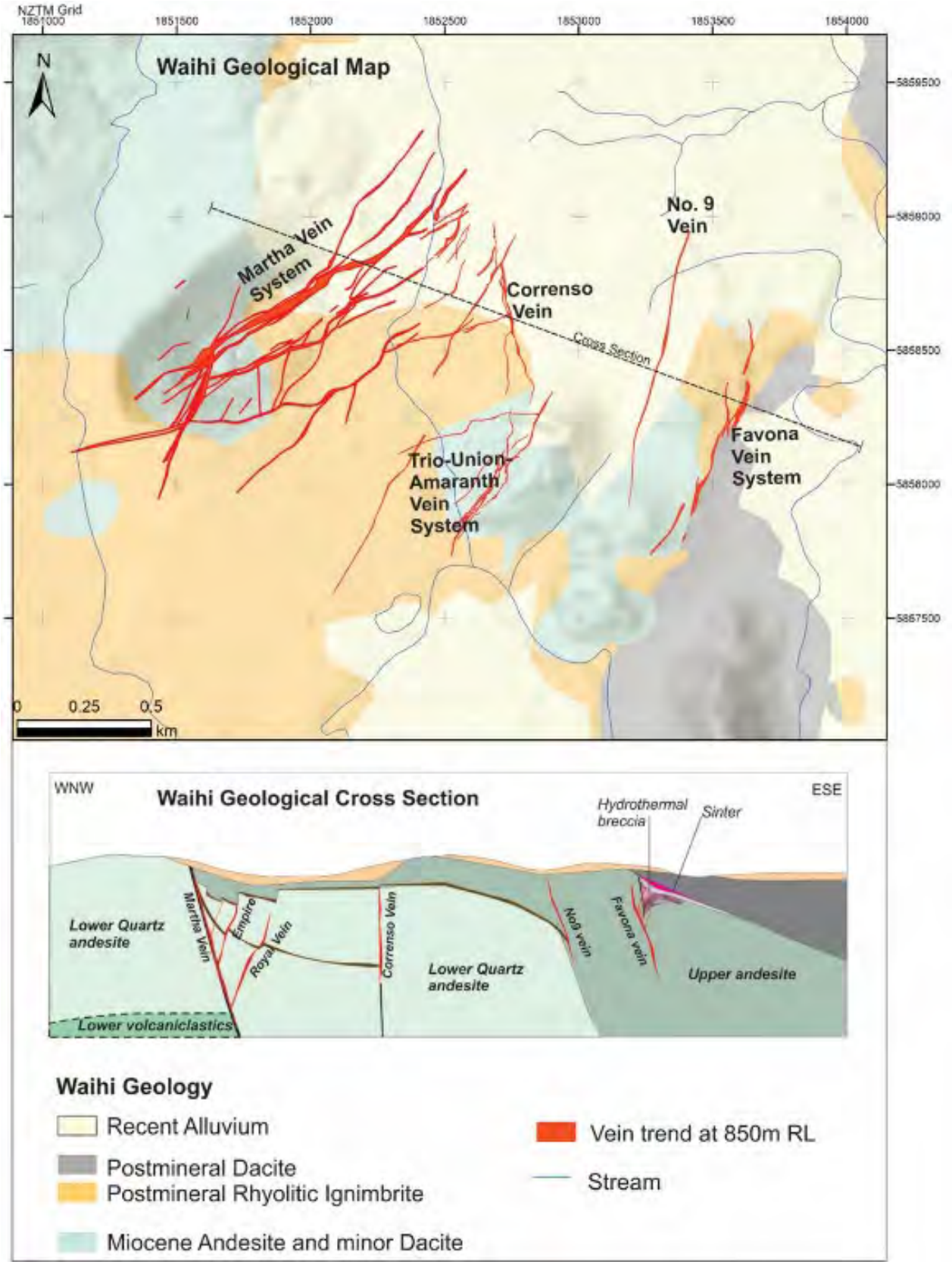


Figure 2. Geological map and cross section of the Waihi area showing the distribution of quartz veining and dominant geological rock units.

4 MINING ACTIVITIES

The main features of the mining activities during 2022 (in relation to dewatering and settlement) are described in the following sections.

4.1 Martha Open Pit

Access to the Martha Pit was restricted during 2022 due to the North Wall slip. No works were undertaken in the pit during 2022. The pit remains in care and maintenance.

4.2 Underground

4.2.1 Development & Production 2022

2022 saw development and production in the Martha mining area (Figure 3 & Figure 5), consisting mainly of declines, accesses, ore drives and stoping. Throughout 2022, a total of 9,281m of development was completed. Approximately 173k tonnes of ore from development and 185k tonnes of ore from production was extracted in 2022.

Limited mining activities were carried out in Correnso in 2022 (Figure 3 & Figure 4), with no blasting after September. Backfilling in line with the land use consents has commenced.

4.2.2 Future Mining Activities

Mining activities for 2023 will focus on ore drives and stoping in Martha in the areas of Rex, Empire West, Edward and Royal East. It is planned to remove approximately 461k tonne of ore and complete approximately 10,000m of development for the year. For a full breakdown of the activities planned refer to the Annual Work Programme (WAI-200-REP-002).

4.2.3 Waste Rock Management

Waste rock is managed by underground stockpiling and backfilling into stopes, and placement on temporary stockpiles on the surface.

On the surface, a short-term stockpile is maintained immediately behind the mill area, enabling easy access for backloading. Larger or longer-term volumes may be stored at the Favona ‘Polishing Pond’ Stockpile (near the water treatment plant polishing pond). Waste rock placement at this stockpile started in early February 2007. The stockpile stopped receiving material in 2011 and was empty until 2020 when it began to store waste rock from the Martha Underground. Previously, the site has been utilised for interim placement of Martha ore. Before undertaking stockpile construction, the Favona Underground Mine Settlement, Dewatering and Water Quality Monitoring Plan was prepared, and approved by Waikato Regional Council (WRC). A separate Favona Water Quality Monitoring Report is prepared mid-year and submitted to WRC.

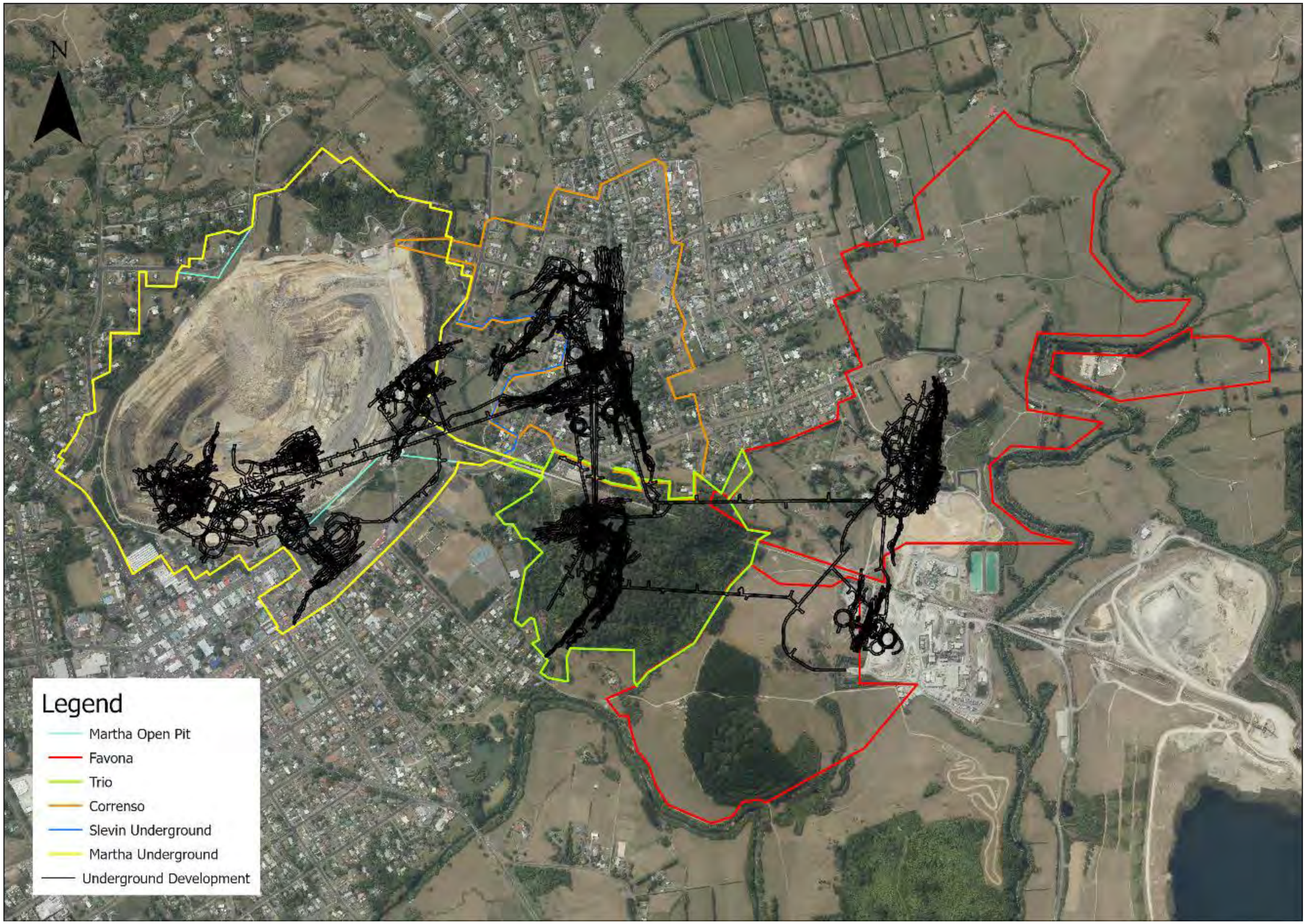


Figure 3. Current workings and boundaries.

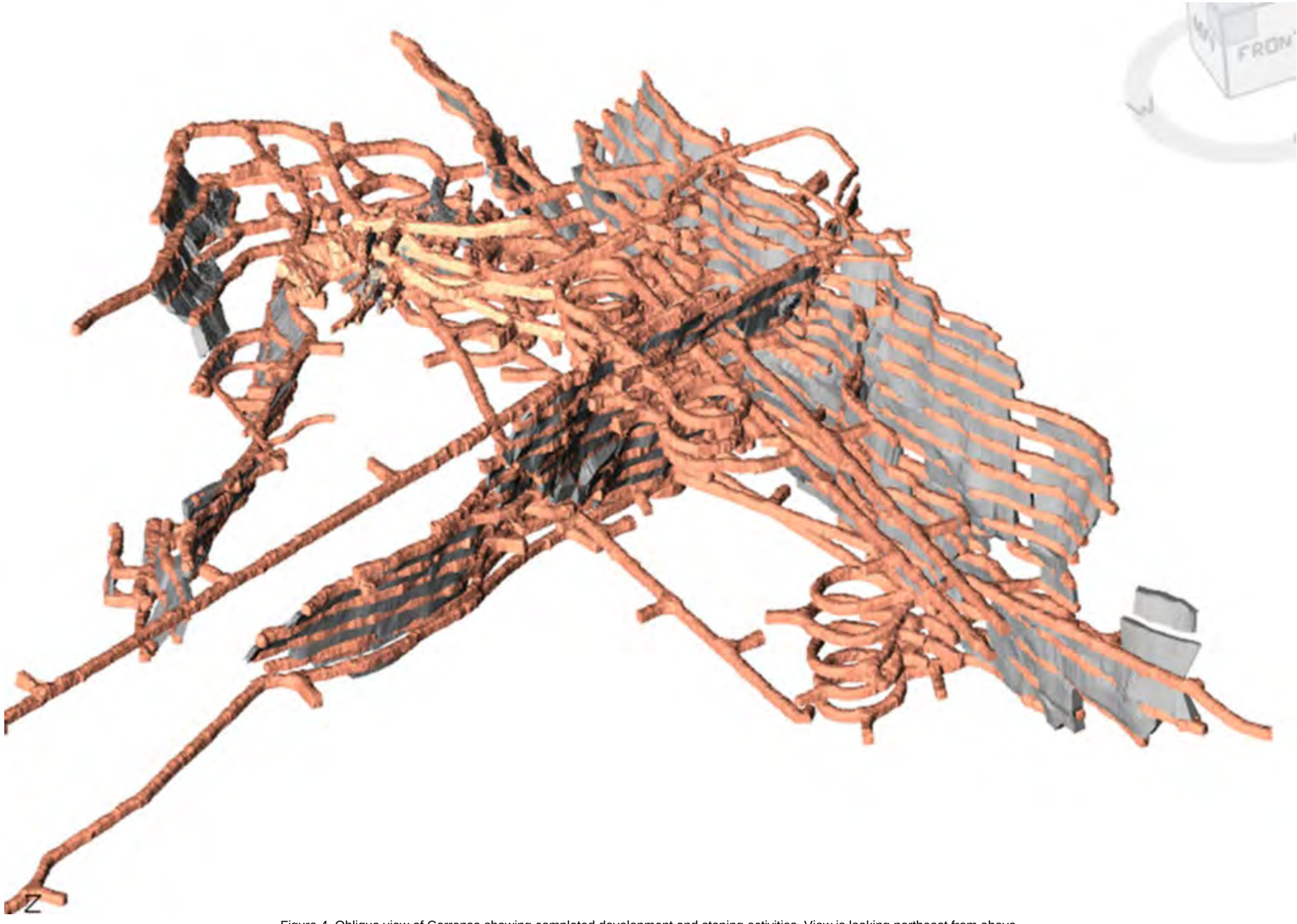


Figure 4. Oblique view of Correnso showing completed development and stoping activities. View is looking northeast from above.

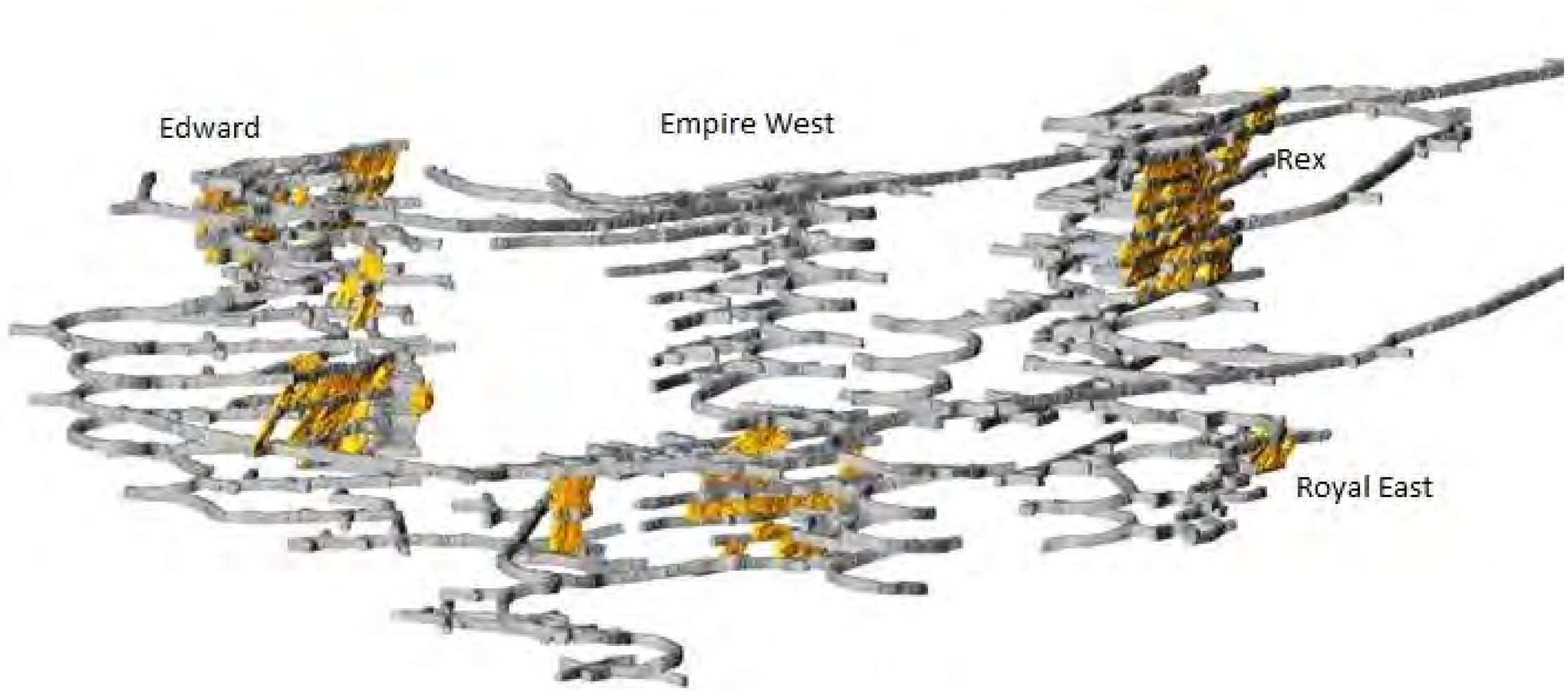


Figure 5. Oblique view of Martha showing completed development and stoping activities. View is looking northeast.

5 DEWATERING

Table 1 shows the annual combined abstraction rate from Martha, Favona, Correnso and Trio. Figure 6 shows groundwater take rates and water levels, and Figure 8 & Figure 9 show the current pump arrangement for underground dewatering.

During 2020, four dewatering pumps were installed in two bores (800 PC1 and 800 PC2) from the 800 mRL level to lower groundwater levels for the Project Martha development. Dewatering to 500 mRL is permitted under the Project Martha consent. Dewatering water from these bores is connected to the existing Correnso dewatering line. Water levels began to be drawn down using these pumps during 2021. At the end of 2022 groundwater levels in PC2 were 676 mRL whereas PC1 was unable to be measured due to a blockage downhole (Figure 7).

Table 1. Martha, Favona, Trio & Correnso Mines annual dewatering volumes and rates.

Year	Total mine take (m^3)	Average pump rate (m^3/day)	Service water pumped under ground (m^3)	Total mine take minus service water (m^3)
2015 (18 May onwards)	1,338,760	5,871	60,727 (23 Sep onwards)	1,278,033
2016	2,911,046	7,954	181,466	2,729,580
2017	3,637,734	9,996	219,198	3,418,536
2018	4,285,048	11,511	262,227	4,022,821
2019	3,153,288	8,639	254,859	2,898,429
2020	2,687,124	7,342	173,290	2,513,834
2021	3,379,568	9,259	182,803	3,196,765
2022	2,537,964	6,953	198,999	2,338,965

At the request of a peer reviewer, a standalone flow meter for the Favona dewatering line was installed in December 2019. Abstraction rates from Favona are shown in Table 2. In 2021, the pump was removed as the area was dry.

Table 2. Favona Mine annual dewatering volumes and rates.

Year	Favona Mine take (m^3)	Average pump rate (m^3/day)
2019	1,637 (first reading 12 December 2019)	125
2020	14,313	39
2021	14,539	39
2022	0	0

Note: for continuity, Favona abstraction volumes are also included in 'Total mine take' numbers reported in Table 1.

5.1 Future Dewatering

The Project Martha dewatering consent allows dewatering to 500 mRL. Underground water levels were drawn to approximately 676 mRL in 2022. This will be progressively lowered during 2023, with

a target pumping rate of 37 L/s at each of the four pumps. Water levels are projected to be lowered to 634 mRL in 2023. Pressure transducers were installed during 2022 with the aim of collecting continuous water level readings. However, installation and setup issues were encountered with the loggers becoming obstructed in the bore holes and the data being unable to be retrieved. Therefore, the water levels in the dewatering bores were measured manually approximately weekly using a water level dip meter. Dewatering will be primarily from the drive and stope face as they mine below the dewatering bore levels.

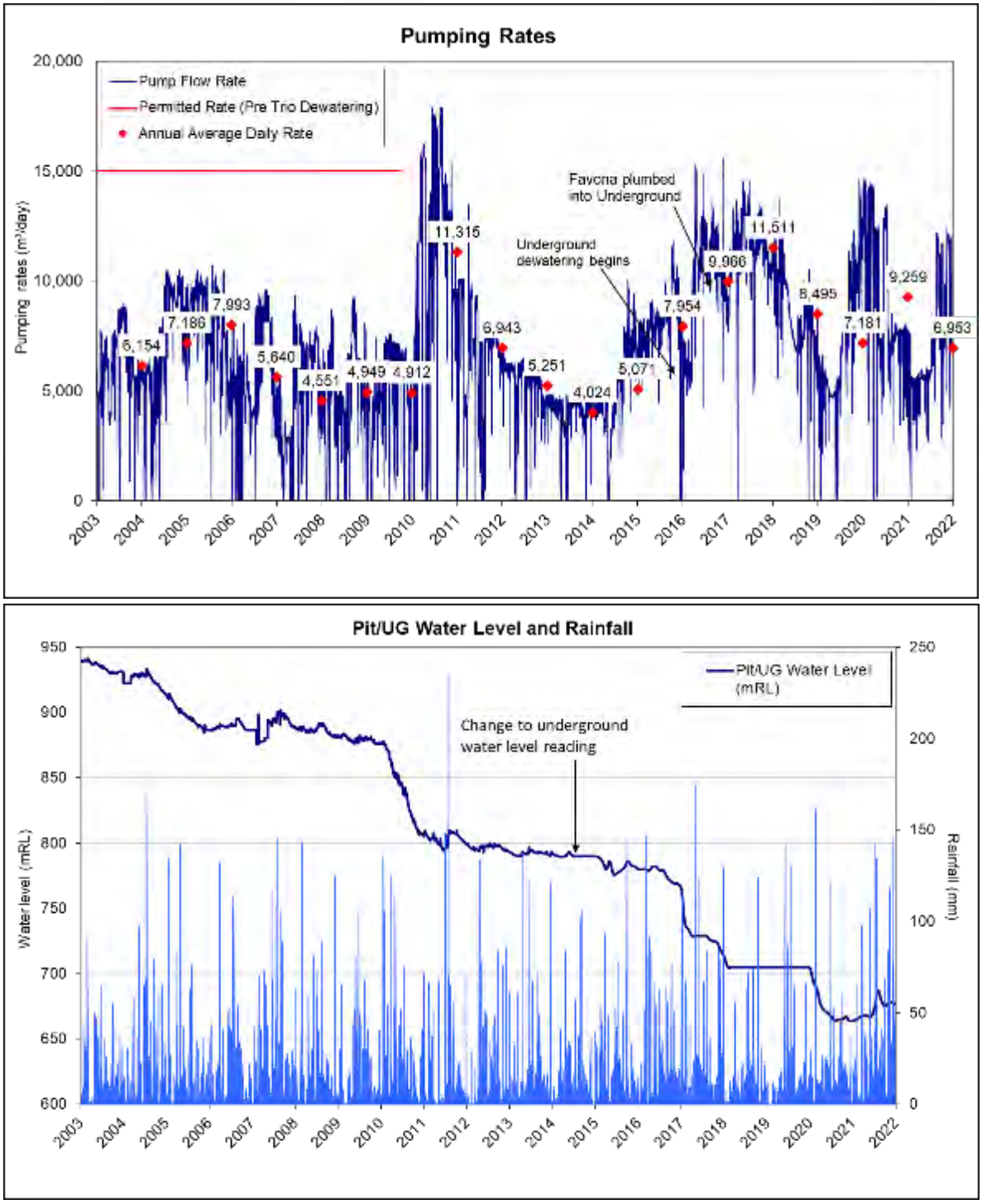
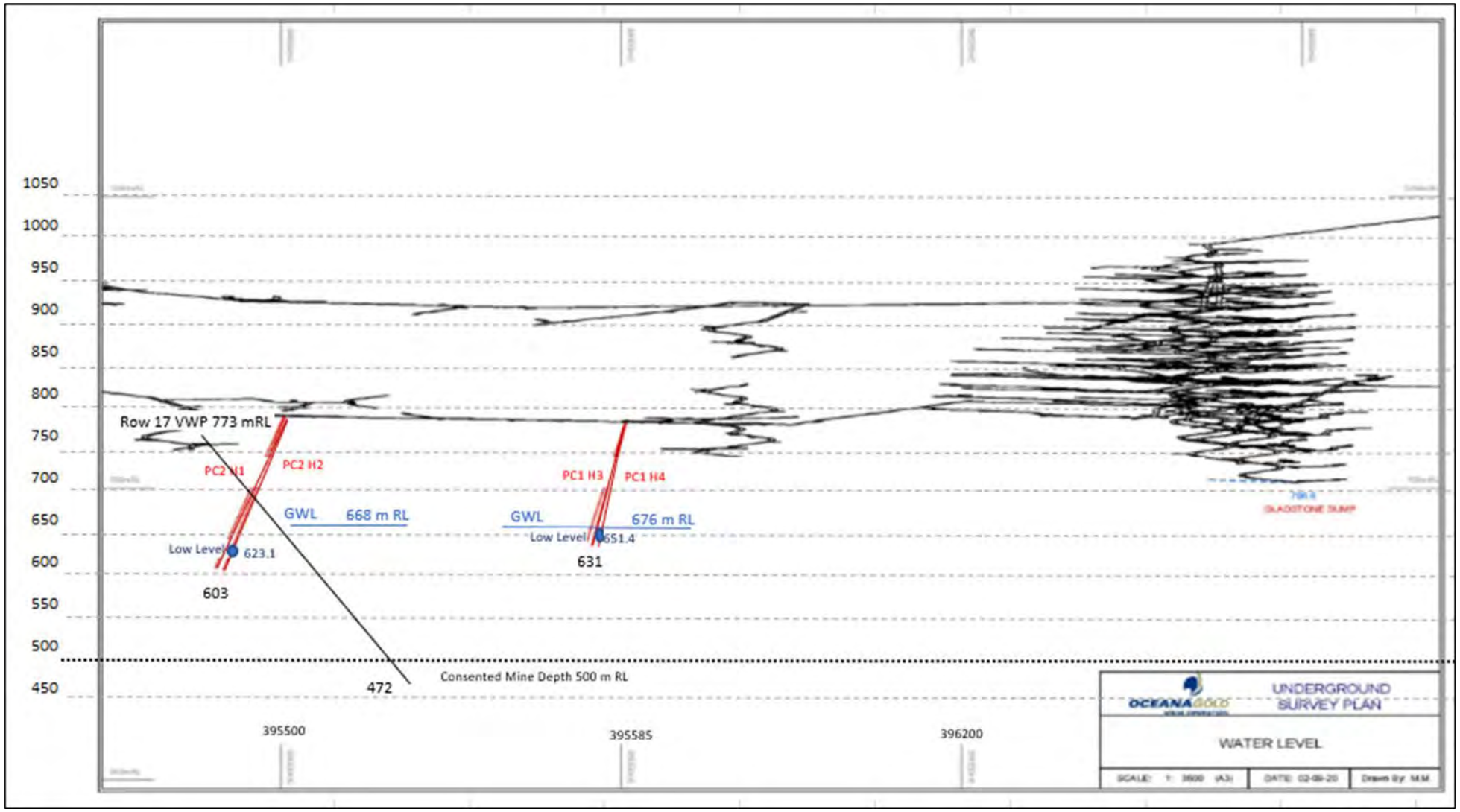


Figure 6. A) Martha Mine/Underground dewatering pumping rates, B) Dewatering water level and rainfall.


1050
1000
950
900
850
800
750
700
650
600
550
500
450
Row 17 VWP 773 mRL
PC2 H1
PC2 H2
PC1 H3
PC1 H4
GWL 668 m RL
GWL 676 m RL
Low Level 623.1
Low Level 651.4
603
631
472
Consented Mine Depth 500 m RL
395500
395585
396200
UNDERGROUND SURVEY PLAN
WATER LEVEL

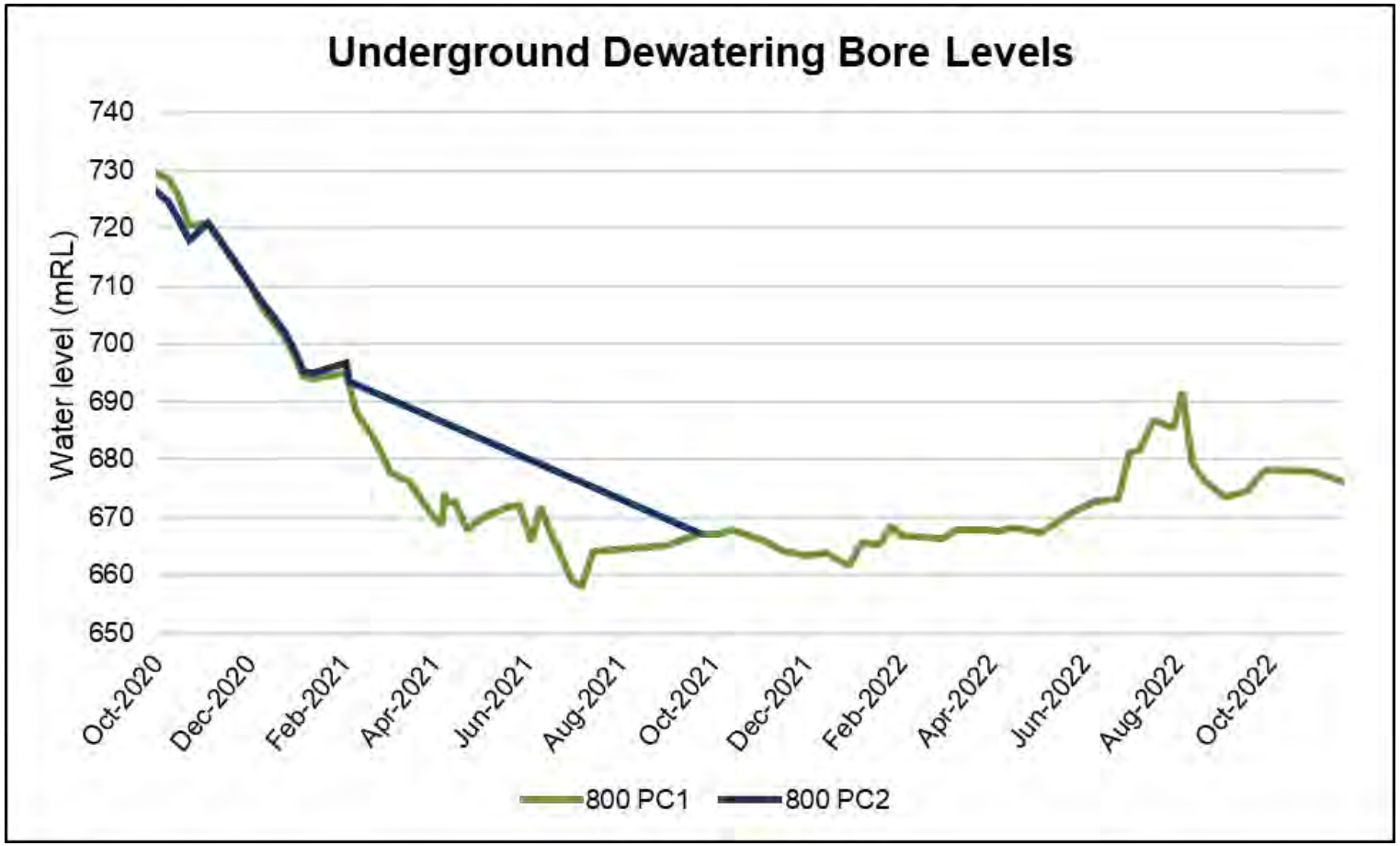


Figure 7. A) Project Martha dewatering bore location, B) Dewatering bore levels

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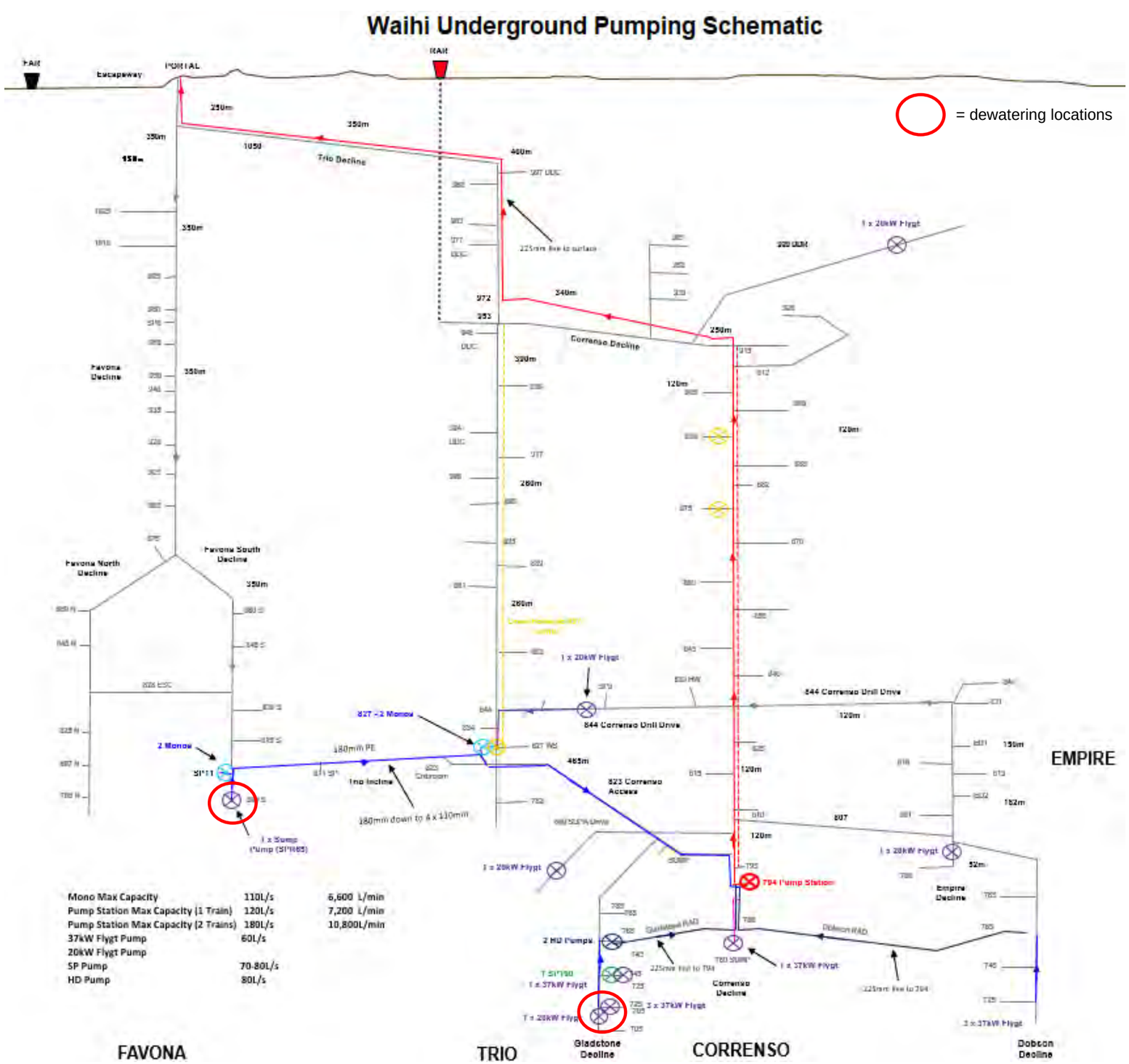

Figure 8. Correnso, Trio and Favona pumping schematic – December 2022.

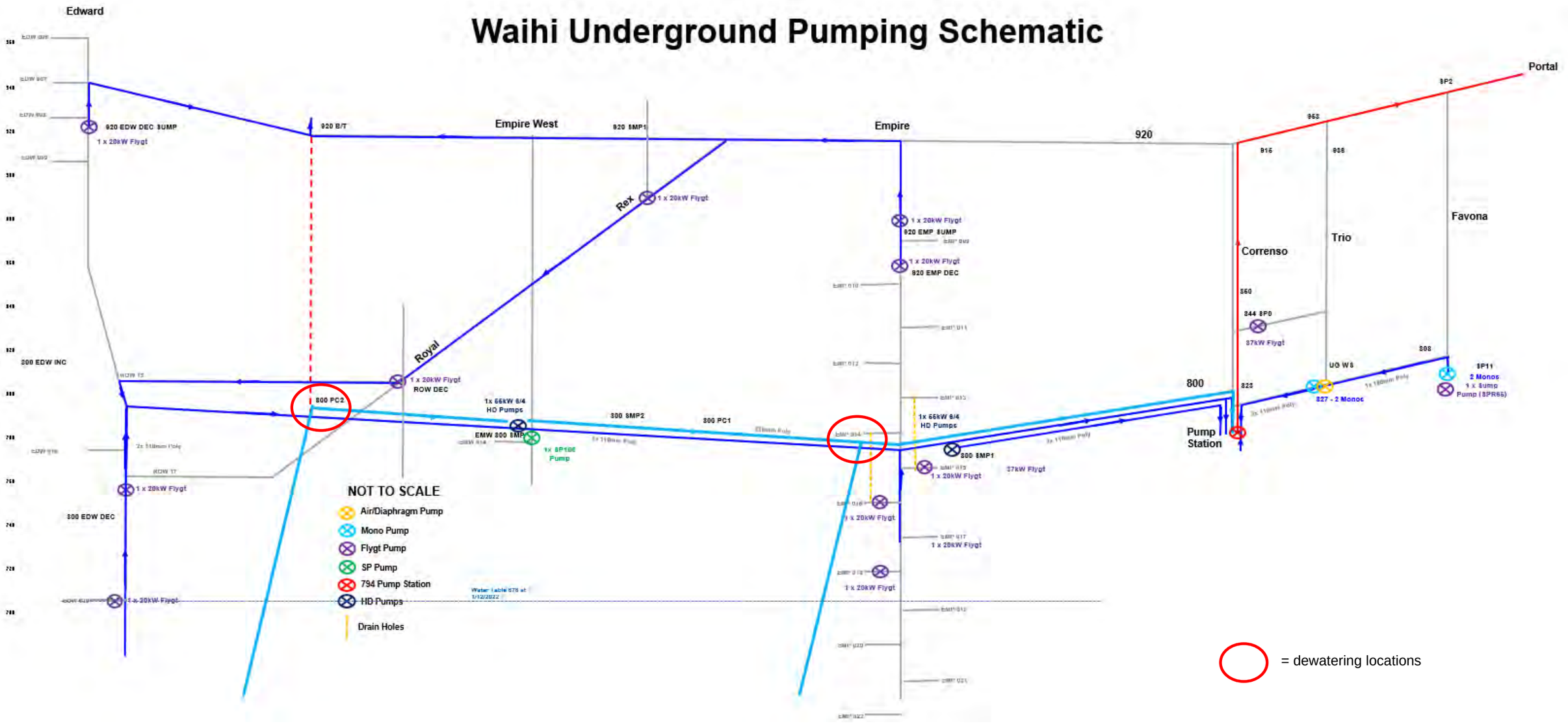

Figure 9. Martha Underground pumping schematic – December 2022.

6 GROUNDWATER MONITORING

This section is provided to meet Conditions 13 a, b and c of the Martha consent, Conditions 2a, 4b, and 4c Schedule 2 of the Favona consent, Conditions 6 (ii) and (iii) of the Trio Development consent (referred to by the Trio Underground Mine Consent 6.1.1), Condition 35 of the Correnso Underground Mine Consent, Condition 29 of the SUPA Consent and Condition 22 of the Project Martha Consent. It includes:

- Data from monitoring undertaken during the previous year including groundwater contour plans (derived from the data) in respect of the piezometer network.
- Identification and interpretation of any environmentally important trends in dewatering behaviour or groundwater profile. Existing trends identified prior to end of 2021 will not be discussed in depth unless there has been a significant change or trigger reached.

6.1 Method

OGNZL has maintained a piezometer network within and around Martha Mine since 1987 and Favona Mine since 2004. Additional Correnso/SUPA piezometers were installed in 2011, 2014 and 2016. P106 was drilled and four vibrating wire piezometers installed in that drill hole during 2017. It is located to the northwest of Martha Pit (Figure 10). Seven Project Martha piezometers were added to the network during 2019, three during 2021 and two were completed during 2022/23 (P122 & P123). The current piezometer network, well depths and average 2022 water depths are shown in Table 3.

Table 3. Piezometer network well depths.

ALLUVIUM					
Well ID	**Depth (mRL)**	**2022 GWL (mRL)**	**Water Depth (m)**	**Type**	**Comment**
P2-4	1101	1108	7	Standpipe	
P8-4	1113	1119	6	Standpipe	
P63-S*	1113	1117	4	Standpipe	
P76-S*	1109	1112	3	Standpipe	
P77-S*	1110	1115	5	Standpipe	
P87-S	1110	1115	5	Standpipe	
P91-1	1113	1120	7	VWP	
P93-1	1105	1116	11	VWP	
P94-1	1114	1115	1	VWP	
P101-1	1102	1109	7	VWP	
P102-1	1108	1114	6	VWP	
WC201-4	1103	1111	8	Standpipe	
WC201-5	1109	1111	2	Standpipe	
GLD004S	1080	1085	5	Standpipe	
YOUNG VOLCANIC					
Well ID	**Depth (mRL)**	**2022 GWL (mRL)**	**Water Depth (m)**	**Type**	
P2-3	1073	1092	19	Standpipe	

P4-2	1047	1088	41	Standpipe	
P7-2	1039	1090	51	Standpipe	
P7-3	1080	1090	10	Standpipe	
P8-3	1092	1116	24	Standpipe	
P27-1	1073	1080	7	Standpipe	
P63-I	1070	1090	20	Standpipe	
P64-I	1086	1101	15	Standpipe	
P76-I	1072	1104	32	Standpipe	
P77-I & P77-I2	1045	1099	54	Standpipe	
P78-I	1051	1105	54	Standpipe	
P79-S	1091	1097	6	Standpipe	
P79-I	1061	1093	32	Standpipe	
P87-I	1070	1111	41	Standpipe	
P90-1	1100	1114	14	VWP	
P90-2	1020	1102	82	VWP	
P91-2	1097	1118	21	VWP	
P91-3	1011	1113	102	VWP	
P92-1	1096	1119	23	VWP	
P92-2	1000	1108	108	VWP	
P93-2	1015	1090	75	VWP	
P94-2	1094	1113	19	VWP	
P94-3	1016	1101	85	VWP	
P95-1	1091	1116	25	VWP	
P95-2	1031	1102	71	VWP	
P100-1	1066	1080	14	VWP	
P100-2	996	1053	57	VWP	
P101-2	1083	1099	16	VWP	
P101-3	1068	1091	23	VWP	
P102-2	1078	1097	19	VWP	
P102-3	1054	1093	39	VWP	
P107	1089	1111	22	Standpipe	
P108	1115	1122	7	Standpipe	
P109	1090	1096	6	Standpipe	
P110	1097	1105	8	Standpipe	
P111-1	1100	1107	7	VWP	
P112-1	1058	1058	0	VWP	Dry
P113	1063	1062	0	Standpipe	Dry
P114	1054	1058	4	Standpipe	
P115	1072	1095	23	Standpipe	
P116	1045	1092	47	Standpipe	

BH6-1	1052	1111	59	Standpipe	
BH7	1078	1097	19	Standpipe	
BH9-1	1073	1096	23	Standpipe	
BH11	1074	1093	19	Standpipe	
BH12	1090	1106	16	Standpipe	
WC202-3	1090	1110	21	Pneumatic	
GLD004I	1065	1087	22	Standpipe	
ANDESITE					
Well ID	**Depth (mRL)**	**2022 GWL (mRL)**	**Water Depth (m)**	**Type**	
P2-2	1034	1045	11	Standpipe	
P7-1	988	1003	15	Standpipe	
P8-1	975	1023	48	Standpipe	
P8-2	1044	1124	80	Standpipe	
P9-1	1036	1118	82	Standpipe	
P69-S	1114	1136	22	Standpipe	
P69-D	1063	1091	28	Standpipe	
P75	979	1068	89	Standpipe	
P76-D	1055	1098	43	Standpipe	
P77-D	1031	1098	67	Standpipe	
P78-D	1052	1073	21	Standpipe	
P79-D	1047	1088	41	Standpipe	
P87-D	1024	1102	78	Standpipe	
P90-3	982	1086	104	VWP	
P91-4	970	1102	132	VWP	
P92-3	965	1101	136	VWP	
P93-4	974	1039	65	VWP	
P94-4	976	992	16	VWP	
P95-3	1000	1060	60	VWP	
P100-3	981	1046	65	VWP	
P100-4	956	989	33	VWP	
P101-4	1036	1038	2	VWP	
P102-4	1026	1032	6	VWP	
P106-1	1100	1100	0	VWP	Dry
P106-2	1060	1060	0	VWP	Dry
P106-3	1010	1008	0	VWP	Dry
P106-4	974	974	0	VWP	Dry
P111-2	1088	1088	0	VWP	Dry
P111-3	1055	1060	5	VWP	
P112-2	1035	1035	0	VWP	Dry

P112-3	997	999	2	VWP	
BH8	1075	1078	3	Standpipe	
WC201-1	1058	1064	6	Pneumatic	
WC201-2	1077	1080	3	Pneumatic	
WC201-3	1096	1100	4	Pneumatic	
WC202-1	1031	1073	42	Pneumatic	
GLD004D	1020	1087	67	Standpipe	

All piezometers are monitored on a monthly basis as required by the consent conditions. The water levels are translated to the mine datum reference level to enable comparison between bores or areas. Vibrating wire piezometers record values at daily intervals with the data downloaded monthly.

6.2 Inspection and Maintenance

The piezometer dip-meter is maintained in good working condition. A calibration of the dip-meter tape against a reference tape is carried out annually by Hydrologic NZ Ltd. The dip-meter tape is replaced if the difference against the reference tape is more than 0.1%. The dip-meter was calibrated in March 2022.

The consent conditions require an inspection of the piezometer installations and appraisal of the piezometer network every two years. In effect, inspections of the piezometer network are undertaken more frequently, with the piezometer monitoring procedure requiring 6-monthly sounding to the bottom of all standpipe piezometers to identify any with excess silt and mud.

The piezometer designs have screens which allow water inflow into the pipe. Piezometers that are most impacted by sediment are on a flushing schedule, with flushing of silted boreholes occurring in November of 2019. Piezometers P4-1, P4-3, P8-2, P9-2, and P9-3 have showed little change after multiple flushing attempts and are no longer monitored.

6.3 Groundwater Results

The Waihi town piezometer network currently has 52 dipped piezometers and six pneumatic piezometers. An additional 14 data loggers connected to 50 vibrating wire piezometers are also included in monitoring Waihi East, south of the Martha Pit and northwest of the Martha Pit (Figure 10). Groundwater contour plans have been updated for the three principal geological units: alluvium (plus shallow groundwater in weathered younger volcanic materials), younger volcanics (including ignimbrite), and andesite. The groundwater plans are presented in Figure 11, Figure 13 and Figure 16 respectively.

6.3.1 Changes to Monitoring Network 2022

- Two new piezometer locations were added to the network during 2022/23 (P122 & P123, each connected to 4 vibrating wire piezometers).
- An underground vibrating wire piezometer was installed at 773 mRL with a single tip at 472.5 mRL.
- Monitoring well GLD004 has been activated for inclusion in the Waihi piezometer network.
- WC202-2, WC202-4 and WC202-5 have been reactivated as part of groundwater monitoring investigations.
- BH8 is no longer monitored as this borehole collapsed.

6.3.2 Shallow Groundwater

Figure 11 shows the inferred contours for shallow groundwater in alluvium and in weathered younger volcanic materials and shows the water level trends over time. The overall contour pattern and the trend plots demonstrate that the shallow groundwater system remains essentially unaffected by dewatering of the surface and underground mining operations. Shallow groundwater levels are controlled principally by rainfall infiltration, low surface soil permeability and natural and assisted drainage to surface water systems.

Contouring of the area southwest of Martha Mine has been restricted by the loss of access to the wells at sites WC203 and WC206. For the purposes of completing the contour plan it was assumed that groundwater levels in the alluvium at these locations remained the same as in previous years.

Figure 10. Waihi piezometer network 2022.

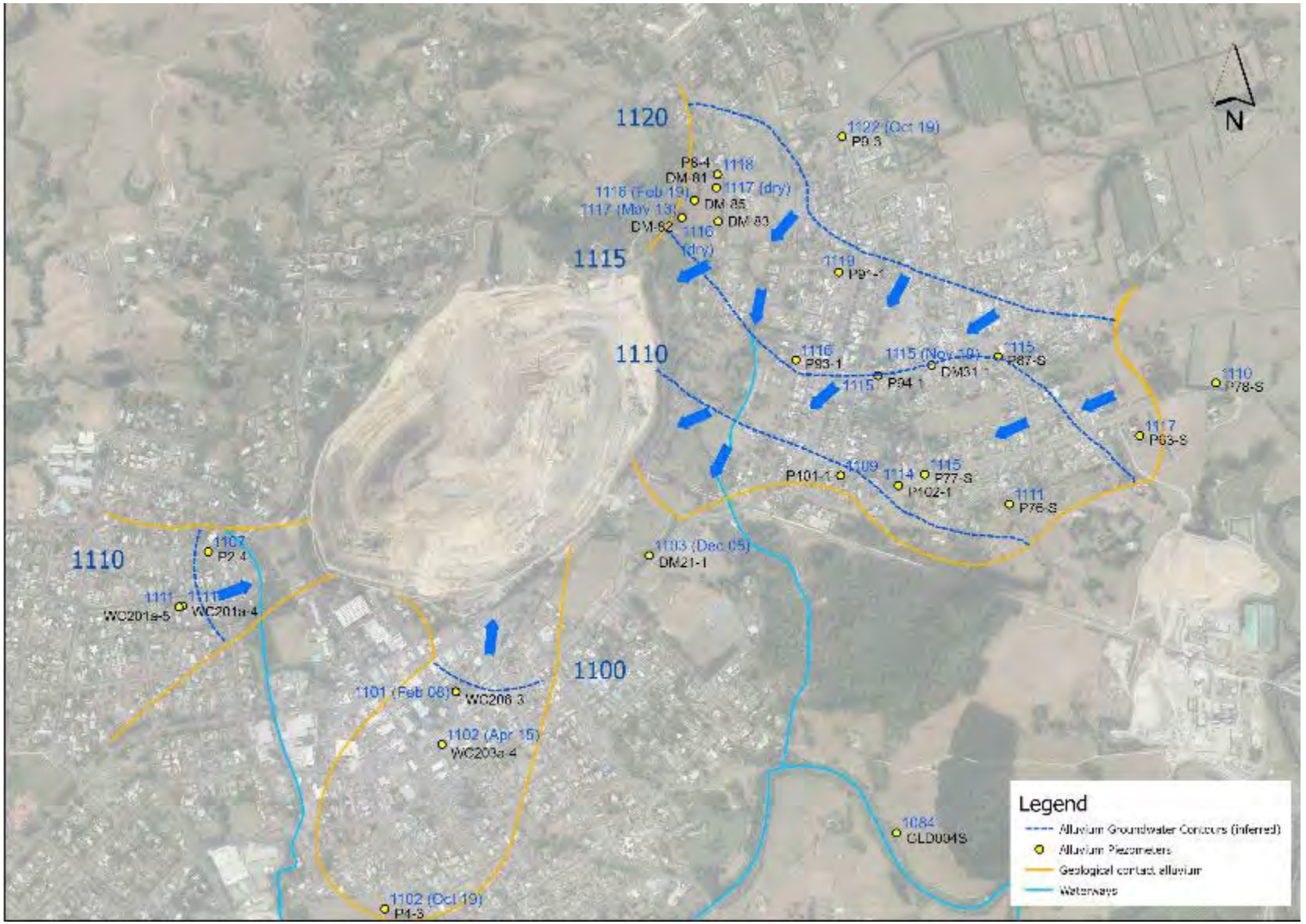

Figure 11. Alluvium water level contours.

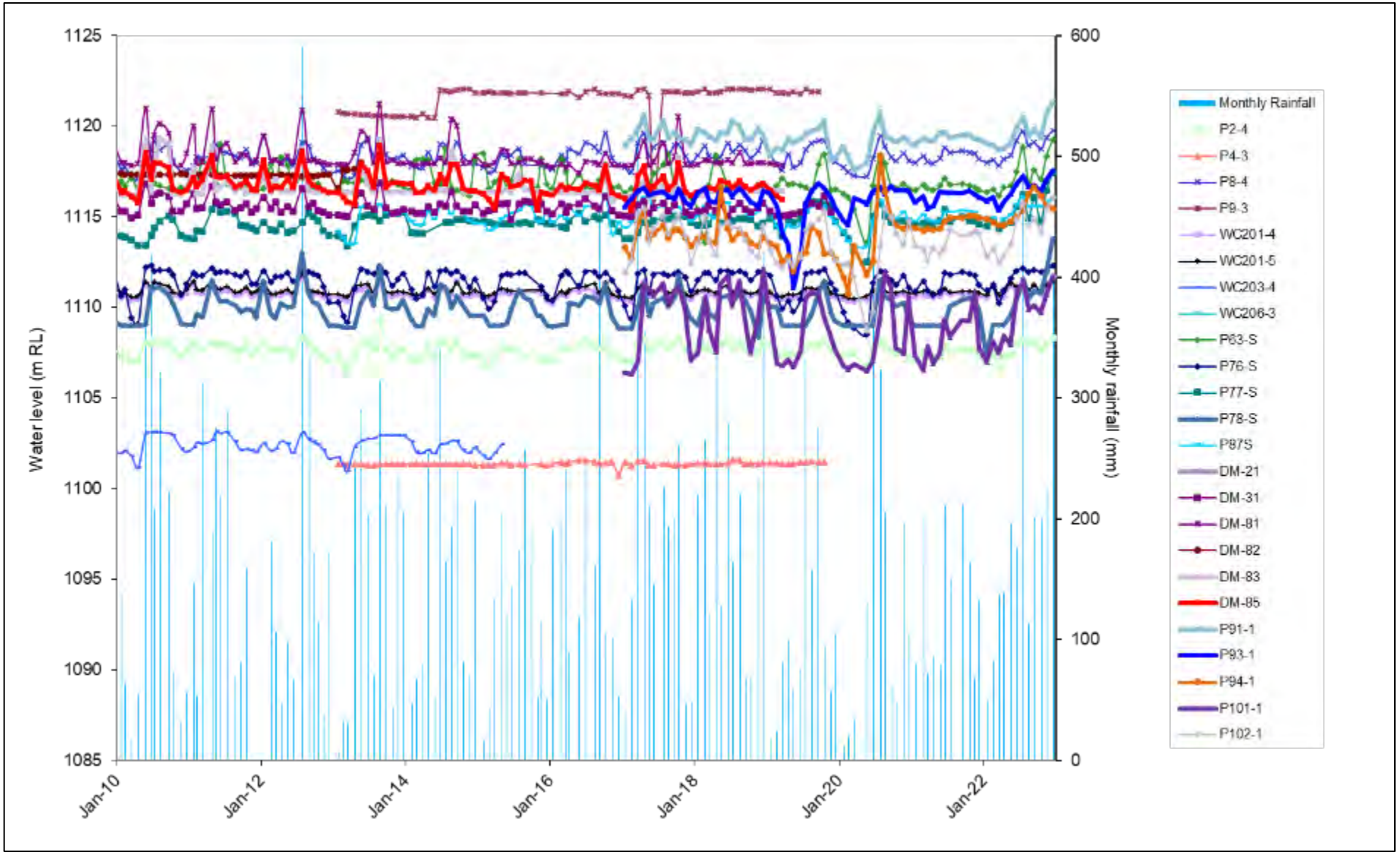

Figure 12. Groundwater level trends – shallow groundwater (alluvium & weathered contact of young volcanics).

6.3.3 Younger Volcanics

Groundwater contours in the deeper portions of the younger volcanic materials below the shallow groundwater system and groundwater level trends are shown on Figure 13, Figure 14 and Figure 15.

The younger volcanic materials infill topographic depressions in the surface of the andesite rock body in which the open pit and underground mines are constructed.

Groundwater level change and the associated consolidation of the varying thickness of these relatively compressible younger volcanic materials is considered to be responsible for much of the settlement and for the settlement patterns around Martha and Favona mines. Noting, that dewatering of the deep andesites is also contributing to general settlements across Waihi.

The dewatering pattern in the younger volcanics around Martha Mine indicates drainage towards the open pit. The limited groundwater discharge at the contact of the younger volcanic materials with the underlying andesite in the pit (see Figure 13 & Figure 14) suggests drainage is affected by features other than the contact (which defines a paleovalley in the andesite). The most likely additional drain point is a substantial block cave evident in the pit wall. This block cave, referred to as the Milking Cow, was active during historical (pre-1950's) underground operations and resulted in substantial settlement of the ground surface, down-folding of fill and younger volcanic strata, and close fracturing of the welded ignimbrite layers.

Prior to the start of dewatering at Martha Mine, groundwater levels in all rock units were similar. With the onset of mine dewatering, water levels in the veins and historic workings were drawn down. Groundwater levels in the various rock units below the shallow aquifer showed increasing vertical separation until the mid to late 1990's. Thereafter, the water levels (other than in the veins and workings) stabilised and have remained stable since. This pattern is demonstrated in the monitoring wells at site P2, with piezometer P2-1 following the vein water levels until the water level dropped below the piezometer tip. P2-2 measures the upper andesite water levels, P2-3, the younger volcanic rock water levels and P2-4 the alluvium (shallow aquifer) water levels.

The development of the settlement pattern has shown a similar behaviour with an initial higher rate of settlement followed by a much-reduced rate of settlement once groundwater levels in the upper rock layers stabilised. These patterns are discussed in the following sections.

BH11 and BH12 have been included in the young volcanics hydrograph. These were historically listed as andesite piezometers. The piezometer network was reviewed by GWS Limited as part of a wider assessment of the Waihi piezometer network. The findings of the GWS review resulted in the installation of two new Martha vibrating wire (VW) piezometers, P122 and P123.

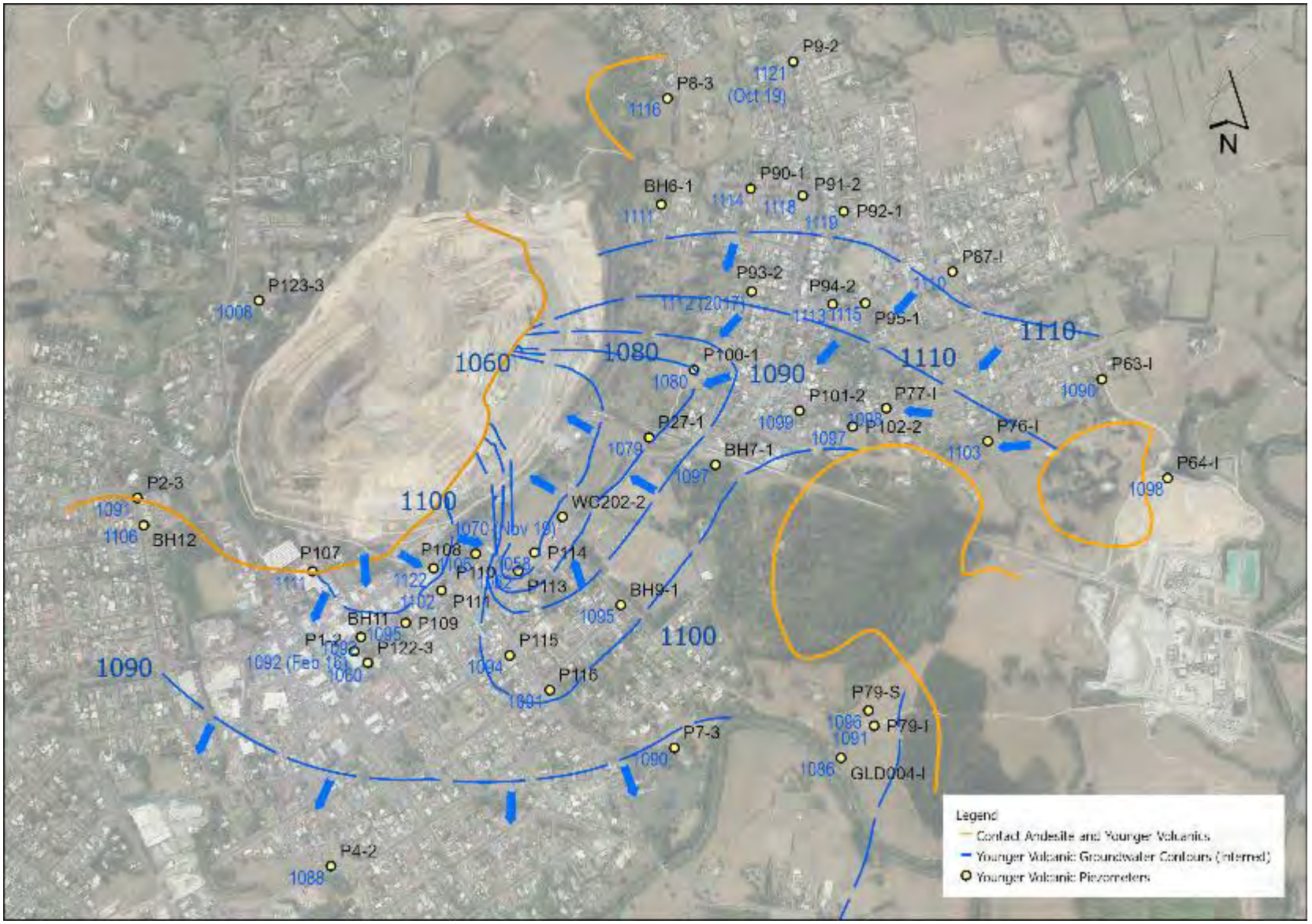

Figure 13. Deeper younger volcanic water level contours.

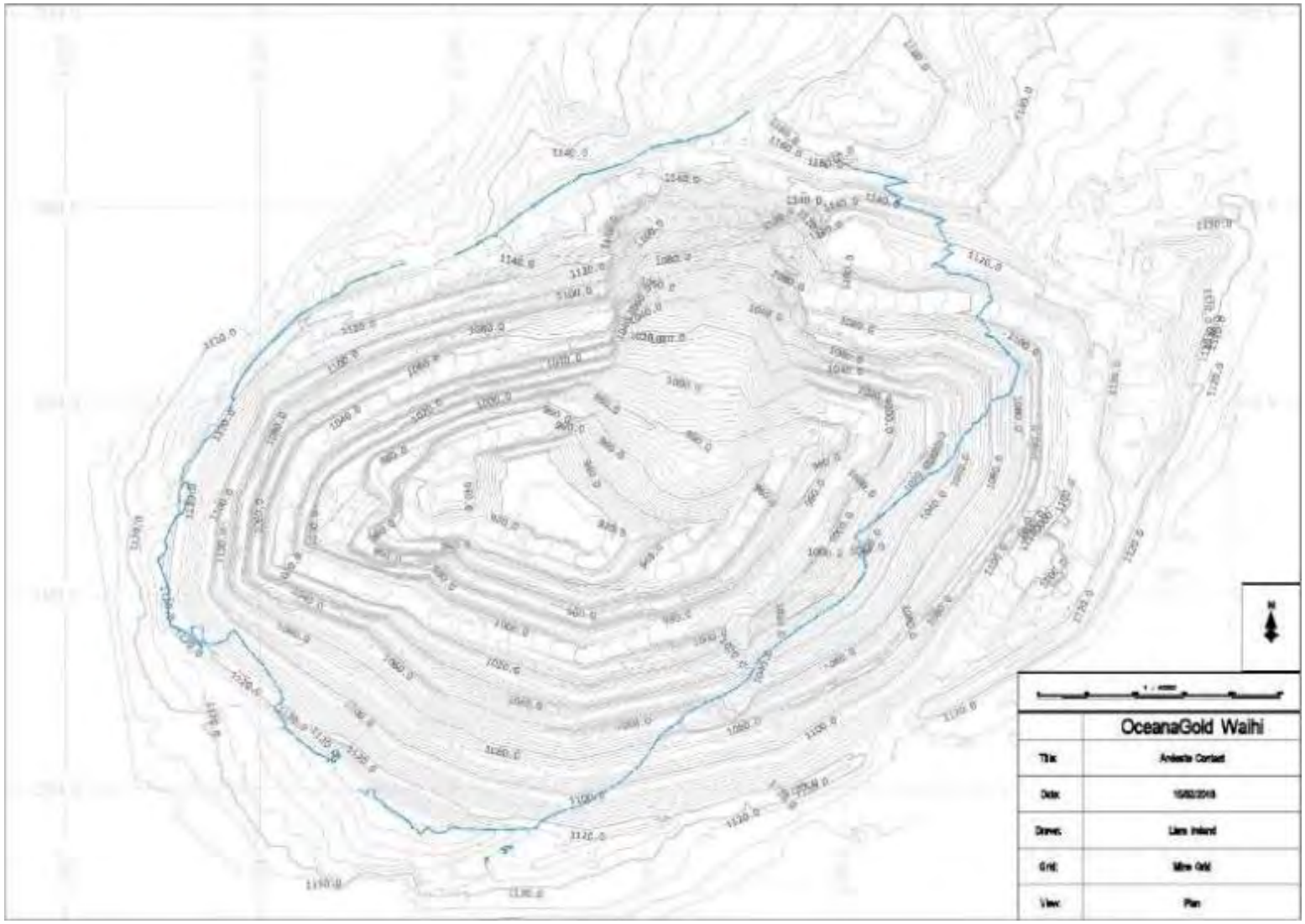

Figure 14. Groundwater level trends – deeper younger volcanic materials (blue line indicates contact of the younger volcanics with the underlying andesite where seepage at the base of the younger volcanics would occur).

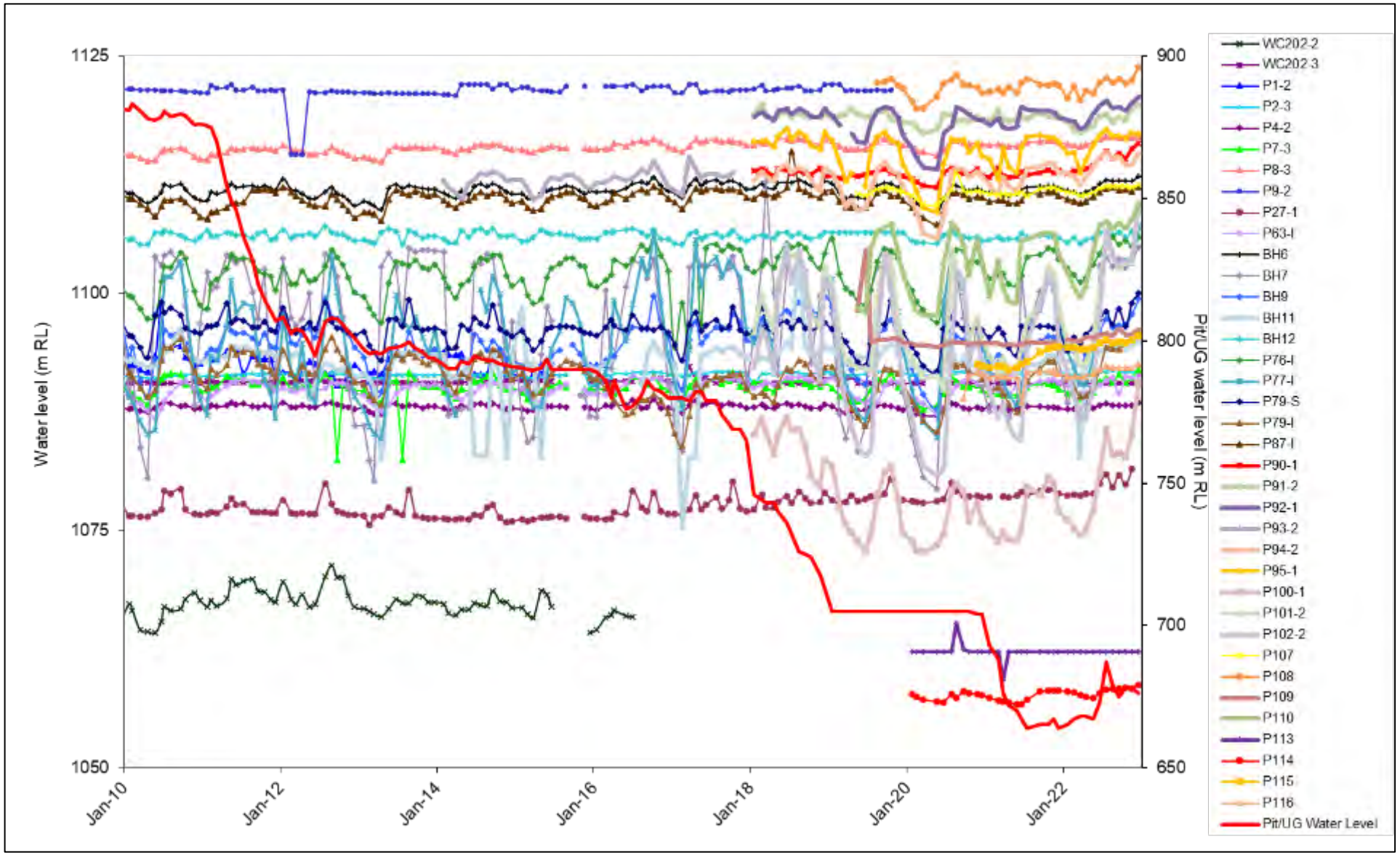

Figure 15. Groundwater level trends – deeper younger volcanics near underlying andesite contact.

6.3.4 Andesite

Andesite rock forms the local basement rock body for the area and hosts the mineralisation which was being mined at Martha Pit and is mined in the Underground.

Figure 16 shows the scope of the dewatering effects in the andesite rock body as a result of dewatering. Data from the Waihi East vibrating wire piezometer units have been included. Figure 17 provides the water level trends in the andesite rock body. While groundwater level data is available for the vein systems and the shallower andesite rock, no monitoring data is available for intermediate depths within the andesite rock mass outside of development areas. Hence, groundwater levels between the vein and the shallow rock mass have been interpolated.

Groundwater levels in the andesite vein systems have responded rapidly and substantially to mine dewatering along the strike of the Martha vein system, along the strike of the Trio vein system beneath Union Hill, and also along the strike of the Favona/Moonlight vein systems (Figure 16). An area of dewatering, indicated between Martha Mine and Trio/Correnso vein systems, suggests a relatively close linkage. Outside of these structures, the dewatering effect in the andesite rock is attenuated or absent. This is illustrated by the different responses shown on Figure 17.

The Martha Mine dewatering effect continues to be abruptly attenuated to the north of the mine and also to the west of the mine. This is considered to be the result of faulting which truncates the veining. A lobe of dewatering extends to the southwest of Martha Mine and this is considered to be due to the drainage effect along the north-south Edward lode structure. Dewatering is shown to reduce eastwards along the Martha system but may extend further at depth as the host rocks are more deeply buried in that direction and no deep monitoring wells are available for confirmation.

Figure 16 also indicates the dewatering centralised on the Favona system with the restriction of connection between Favona and the Union systems. The geological model in Section 3 indicates an up-thrown block (Union Horst, Figure 16) between the Union and Favona systems. This structural hiatus is likely to account for the restricted groundwater interconnection between the Martha-Union and Favona systems.

The chart displaying andesite water level trends (Figure 17) was congested so the vibrating wire and Favona piezometers have been excluded. These are presented in Figure 18 to Figure 34.

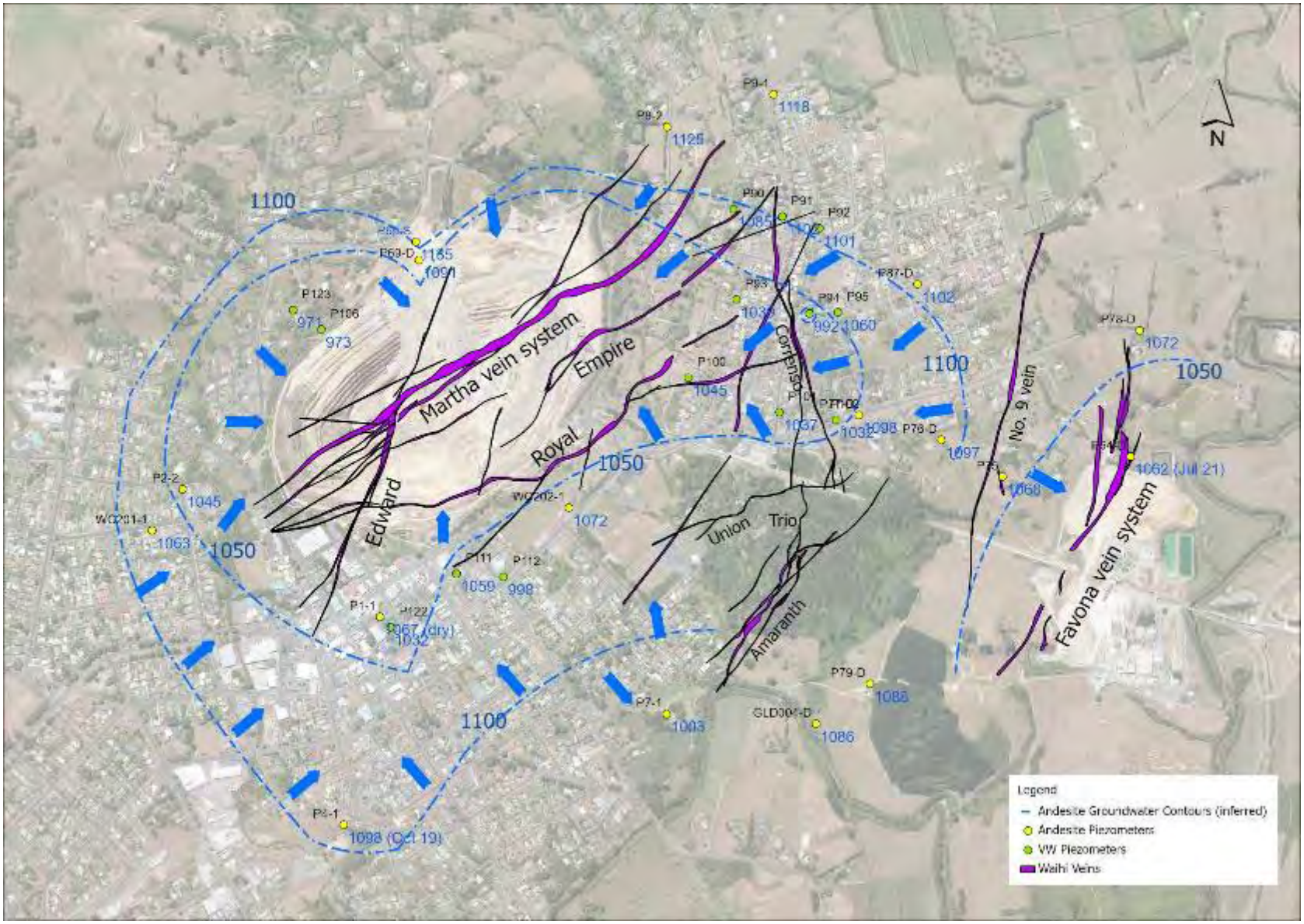

Figure 16. Upper andesite water level contours.

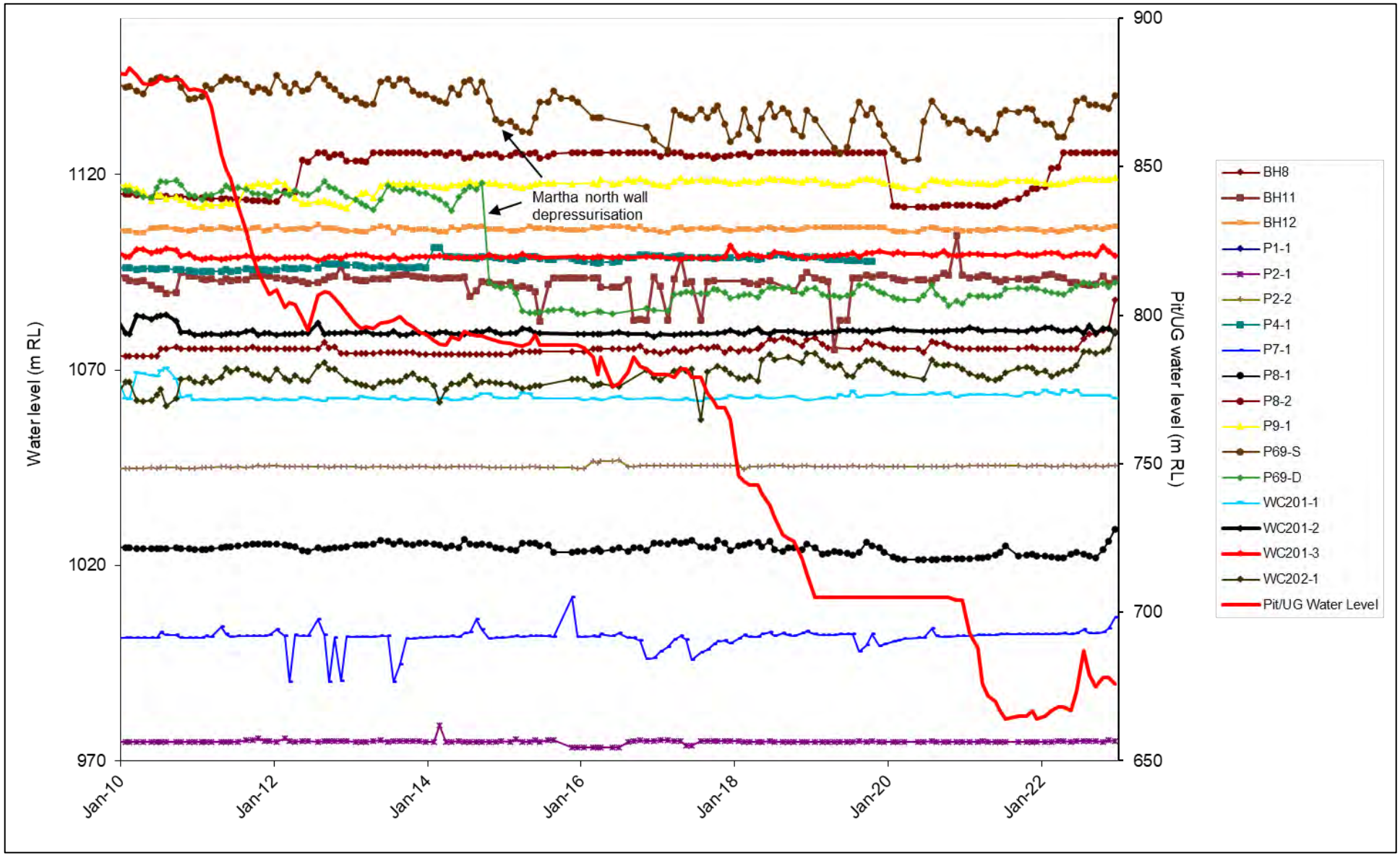

Figure 17. Andesite water level trends (excl. VW piezometers).

6.3.5 Martha Groundwater Assessment

Martha groundwater remained stable during the reporting period following expected trends with an increase in piezometric levels in response to heavy rainfall in the second half of 2022 (See Figures 12, 15 and 17). No triggers were breached; many piezometers showed increases towards the end of the monitoring period likely due to the above average rainfall experienced. GWS Ltd have analysed the data and provided a summary in Appendix F.

Two new Project Martha piezometers were installed in 2022/23. Locations and tip depths were advised by GWS and discussed with the hydrogeologic peer reviewer. Tip depths and RL's are shown in Table 4. Water levels are currently indicative as the piezometers have been recently installed, however it seems some tips at depth show little water pressure, indicating dry conditions.

Table 4. Project Martha piezometer depths.

Piezometer	Target material	Tip depth (m)	Tip (mRL)	Water level (mRL)
P122-1	Upper young volcanics	20	1092	1100
P122-2	Base younger volcanics	52	1060	1060
P122-3	Upper Andesite	80	1032	1032
P122-4	Lower Andesite	180	932	934
P123-1	Upper Andesite	80	1044	1113
P123-2	Lower Andesite	120	1004	1007
P123-3	Lower Andesite	160	964	972
P123-4	Lower Andesite	200	924	926

Project Martha piezometers P107 to P110 and P113 to P116 are standpipes installed at varying ground elevations. Figure 15 shows water levels have remained relatively stable. P113 has remained dry since installation.

Vibrating wire piezometer P111 (Figure 18) was installed with three tips, one in the young volcanics and two in the andesite layer. The younger volcanic piezometer is measuring some water pressure at 1107mRL. The upper andesite piezometer appears to be dry with levels recorded below the tip level (1087mRL cf. 1088mRL), indicating this area may be previously affected by dewatering. The lower andesite piezometer is measuring around 4m of water pressure above the tip, at 1059mRL.

P112 is also a vibrating wire piezometer installed with three tips, one in the young volcanics and two in the andesite layer. The younger volcanic piezometer is measuring around 1 m of water pressure above the tip at 1059mRL, while both the andesite piezometers have been dry (1035mRL & 998mRL) since installation in July 2020 (Figure 19).

P122 (VWP) was installed in January 2023 with four tips, one in the young volcanics and three in the andesite layer. Water levels appear to have stabilised with the upper young volcanic piezometer tip measuring around 8m of water pressure at 1100mRL and the lower andesite piezometer tip measuring around 2m of water pressure at 934mRL. The other two piezometers appear to be dry at 1060mRL and 1032mRL (Figure 20).

P123 (VWP) was installed in December 2022 with all four tips in the andesite layer and these seem to have now stabilised. The 80m tip is measuring around 69m of water pressure above the tip at 1113mRL, the 120m tip is measuring around 3m of water pressure at 1007mRL, the 160m tip is

measuring around 8m of water pressure at 972mRL, and the 200m tip is measuring around 2m of water pressure at 926mRL (Figure 21).

A peer review recommendation was to identify lithology zones on the vibrating wire hydrographs.The key to the zone shading is shown in Table 5.

Table 5. Lithology shading.

Lithology	
Alluvium	
Young Volcanics	
Andesite	

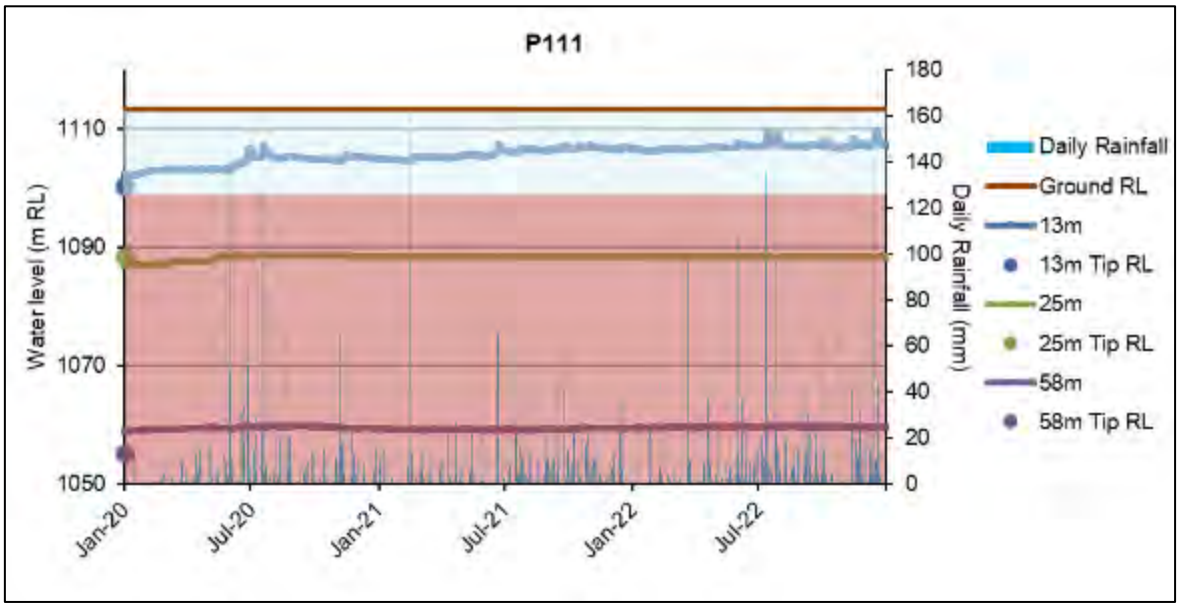

Figure 18. P111 vibrating wire piezometer.

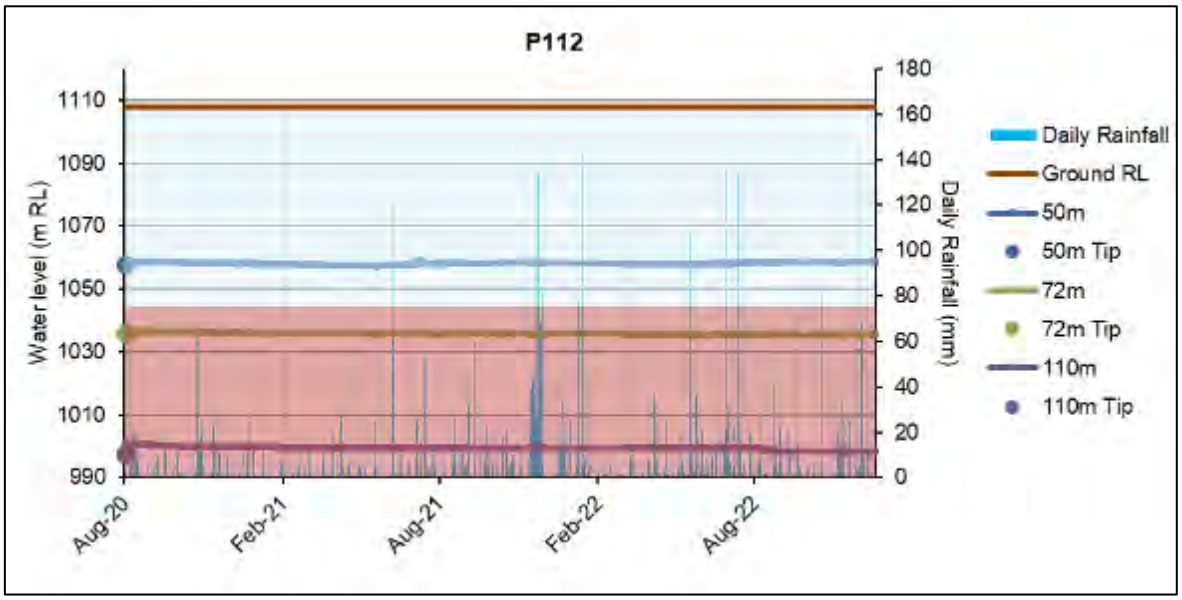

Figure 19. P112 vibrating wire piezometer.

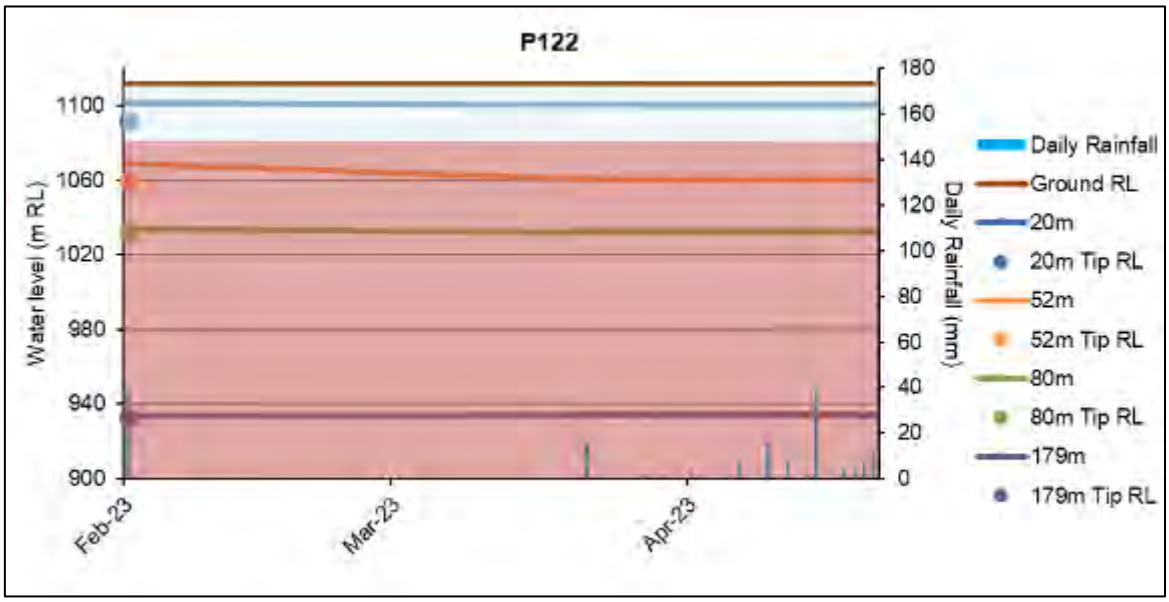

Figure 20. P122 vibrating wire piezometer.

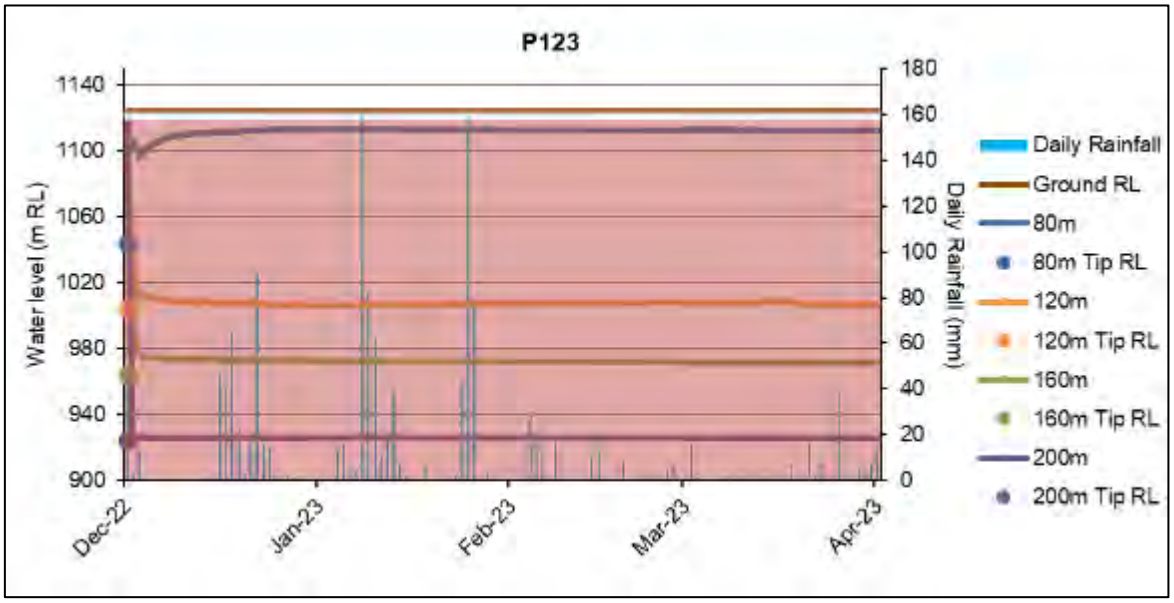

Figure 21. P123 vibrating wire piezometer.

Underground piezometer Row 17

In July 2022 a piezometer was installed in an existing exploration drill hole (Figure 22). The drill hole collar is in the Edward decline at 773 mRL. The hole length is around 350m, however vertically it is 300.5 m. The piezo tip is at 472.5 mRL and terminates approximately under the Empire west orebody and in set in deep Martha andesite. Piezometer readings show the December 2022 water level at 668 mRL (Figure 23). This is similar to the water level measured in PC1 borehole at 676 mRL.

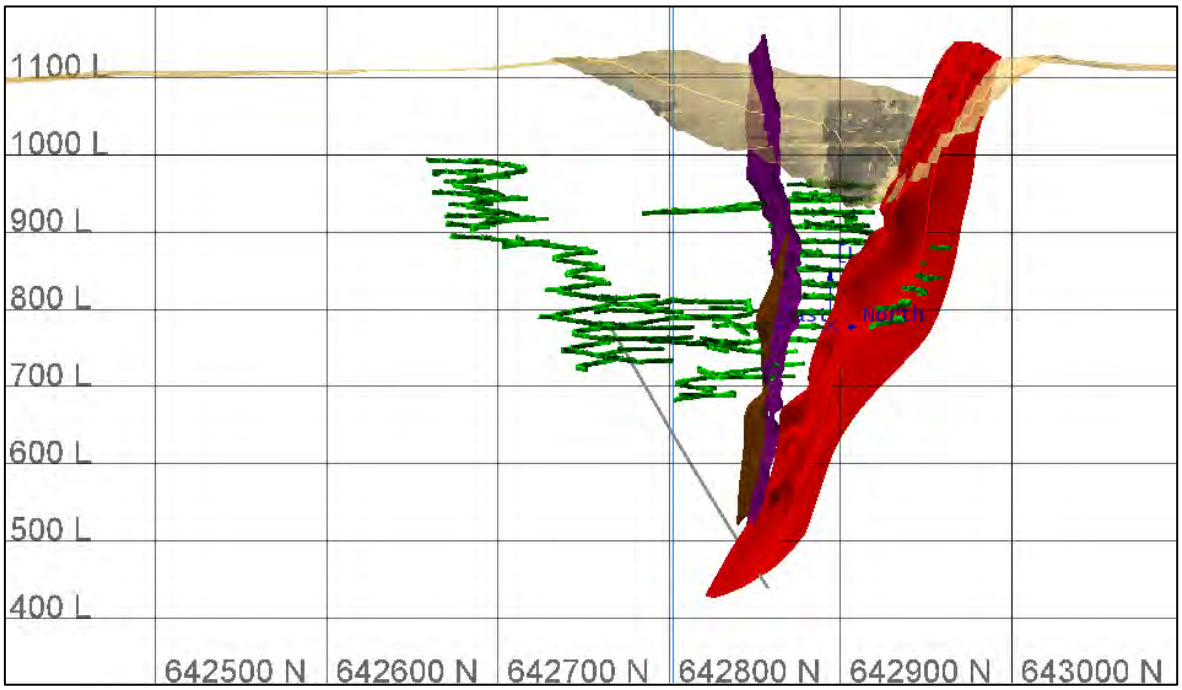

Figure 22: Underground piezometer cross section

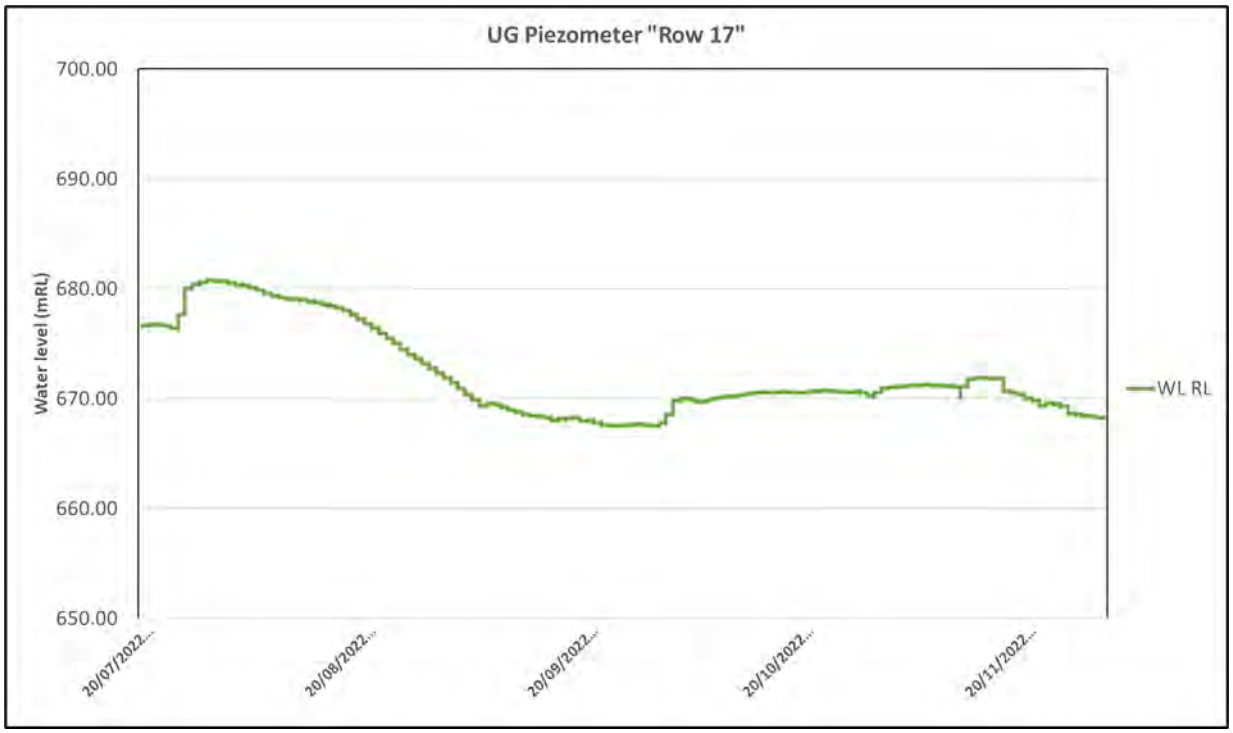

Figure 23: Underground piezometer water level

6.3.6 Favona Groundwater Assessment

Favona groundwater congregates at the 800 level and this is the assumed groundwater level in the Favona mine. However, mine development links Favona to Trio and Correnso, both part of the Martha groundwater system. Figure 24 shows how most Favona wells are influenced seasonally and not by Martha/Underground dewatering. The majority of piezometers have shown an increasing trend towards the end of 2022. P79-D has recovered to typical levels held prior to its depressurisation in 2016. A peer review request was made to include a chart with selected Favona andesite piezometer

with rainfall included (Figure 25). A slight delayed response to rainfall and drier periods can be noted in four piezometers, with P87-D less responsive.

No well had a 15m decrease during the reporting period.

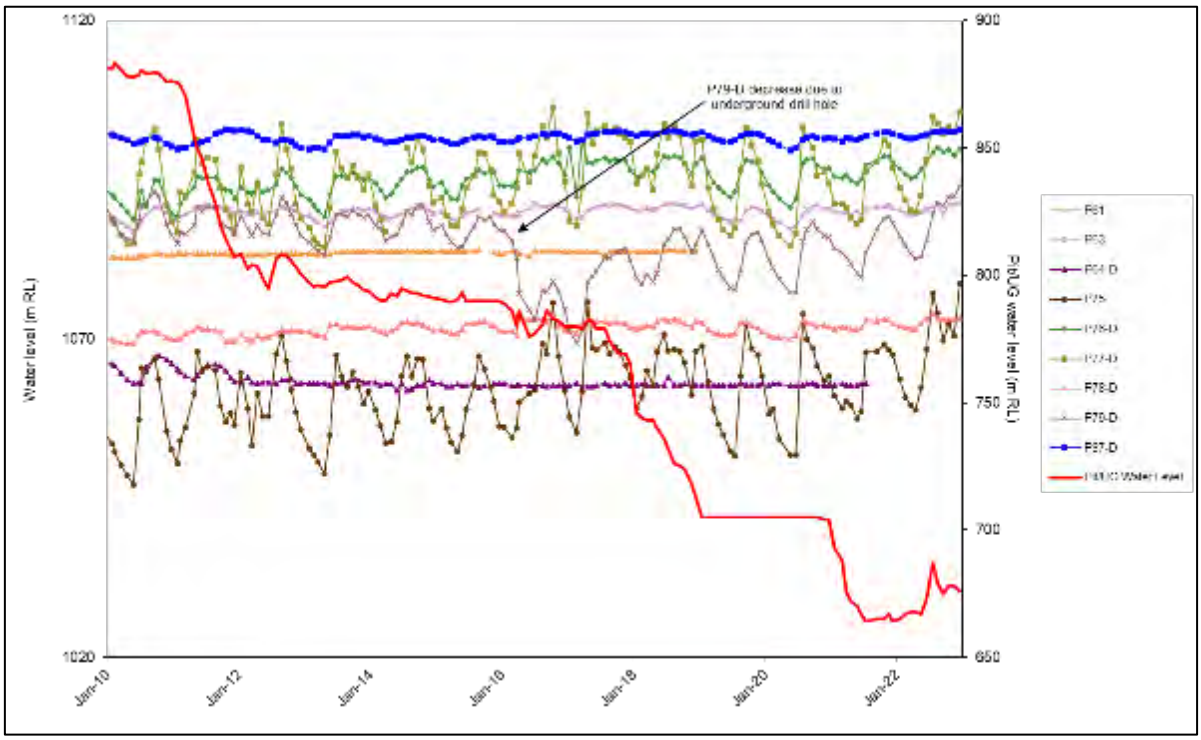

Figure 24. Favona andesite water level trends.

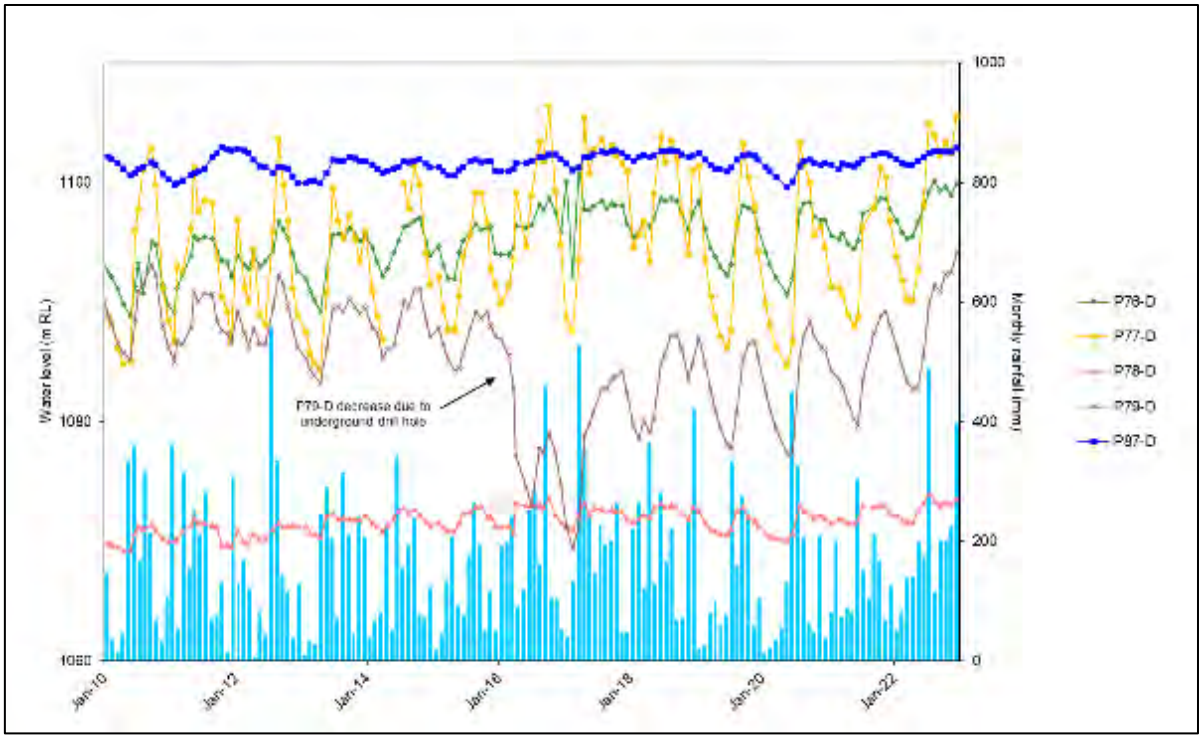

Figure 25. Selected Favona andesite piezometers with rainfall.

6.3.7 Waihi East – CEPA

Six vibrating wire piezometers were installed between July – September 2011. They are located east of the Martha Pit to provide improved groundwater information in an area with few existing wells and in the vicinity of the Correnso Project. Two additional vibrating wire piezometer boreholes and 39 additional settlement markers were installed in early 2014. One further borehole was installed in 2016 for monitoring related to the Daybreak/SUPA orebody.

The piezometers were located across and perpendicular to the Correnso vein system in three lines (P90, P91 and P92 forming one line, P93, P94 and P95 a second line and P100, P101 and P102 the third). Separation distance between the northern and southern lines is some 500m. The piezometers were constructed to intercept the shallow aquifer, younger volcanics, and andesite rock (Table 6).

Table 6. Geological units and depths of P90-P95, P100-P102 piezometers.

Bore	**Shallow**	**Younger Volcanics**		**Andesite**	
		Upper	**Basal Zone**		
P90	-	20.0m	100.0m	137.0m	
P91	9.3m	25.5m	111.3m	151.3m	
P92	-	23.3m	121.3m	156.3m	
P93	12.3m	26.0m	100.0m	143.0m	
P94	6.0m	25.0m	104.0m	144.0m	
P95	-	35.0m	90.0m	120.0m	
P100	-	50.0m	120.0m	135.0m	160.0m
P101	12.8m	32.0m	47.0m	78.0m	
P102	8.0m	38.0m	62.0m	90.0m	

Figure 26 to Figure 34 present the records from the piezometers expressing water level as mRL. The charts also display the depth of the piezometer tips, lithology shading and daily rainfall. Separation between the shallow and deeper piezometers is evident in the records. The nine groundwater monitoring boreholes have indicated stable water levels in Waihi East. Exceptions are discussed below.

Note: In the following plots the gaps in the data are usually due to either brief logger malfunction issues or flat batteries in the unit. The exception to this is the data gaps in P90-2 which are due to the cable being severed by drainage works associated with nearby residential construction. This cable will be repaired once the residential construction has finished.

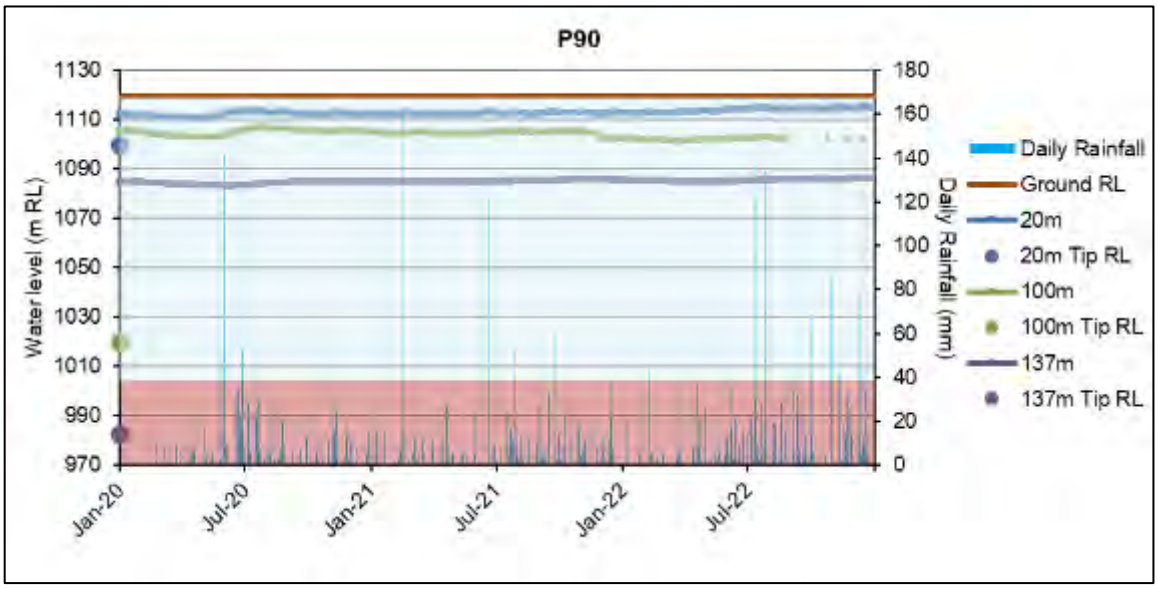

Figure 26. P90 vibrating wire piezometer.

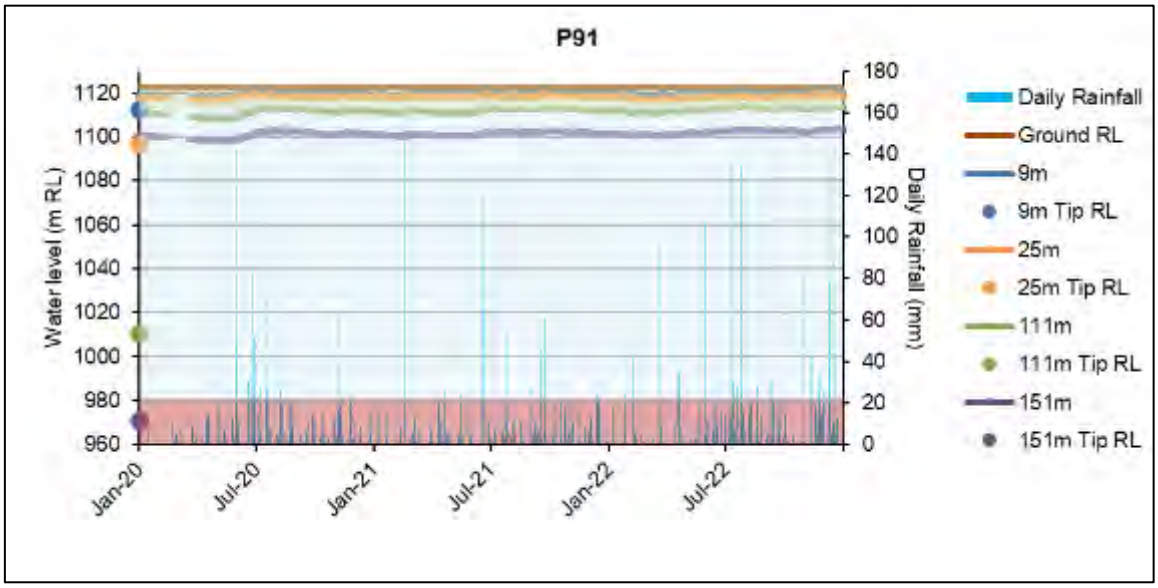

Figure 27. P91 vibrating wire piezometer.

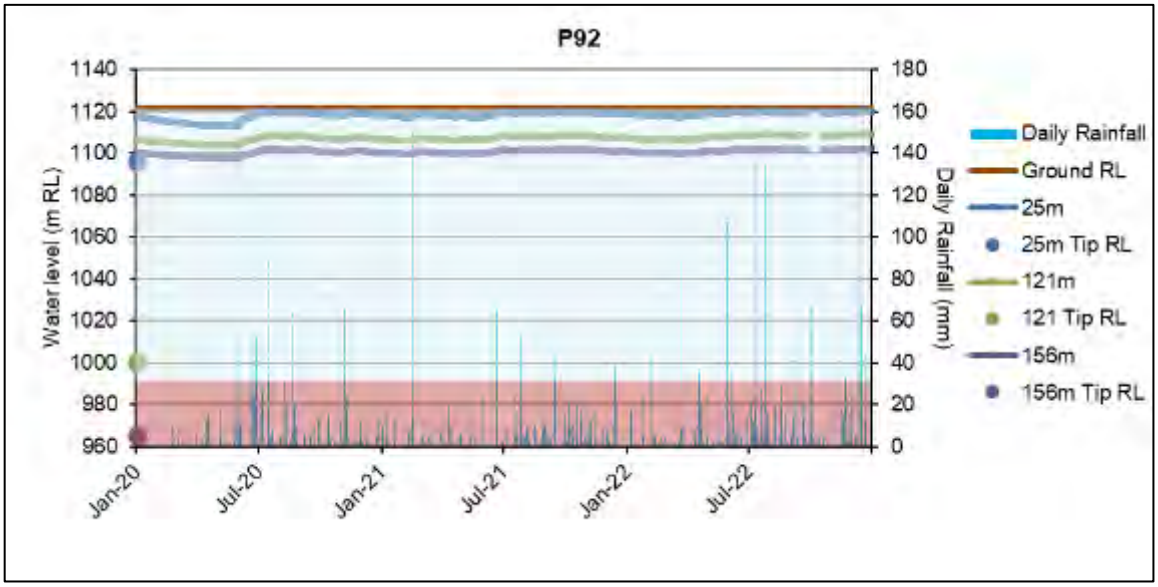

Figure 28. P92 vibrating wire piezometer.

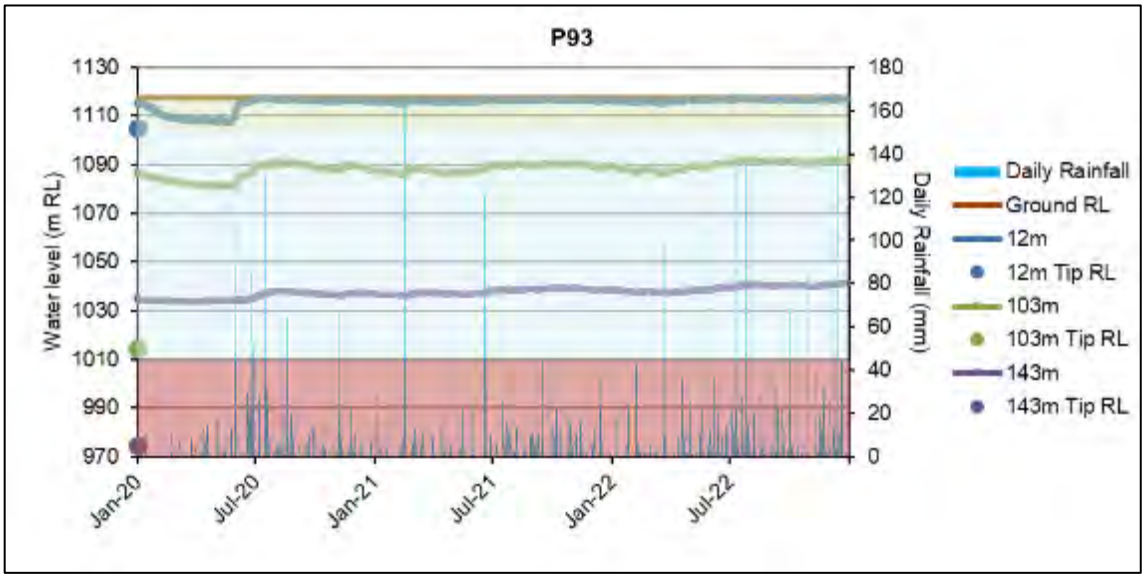

Figure 29. P93 vibrating wire piezometer.

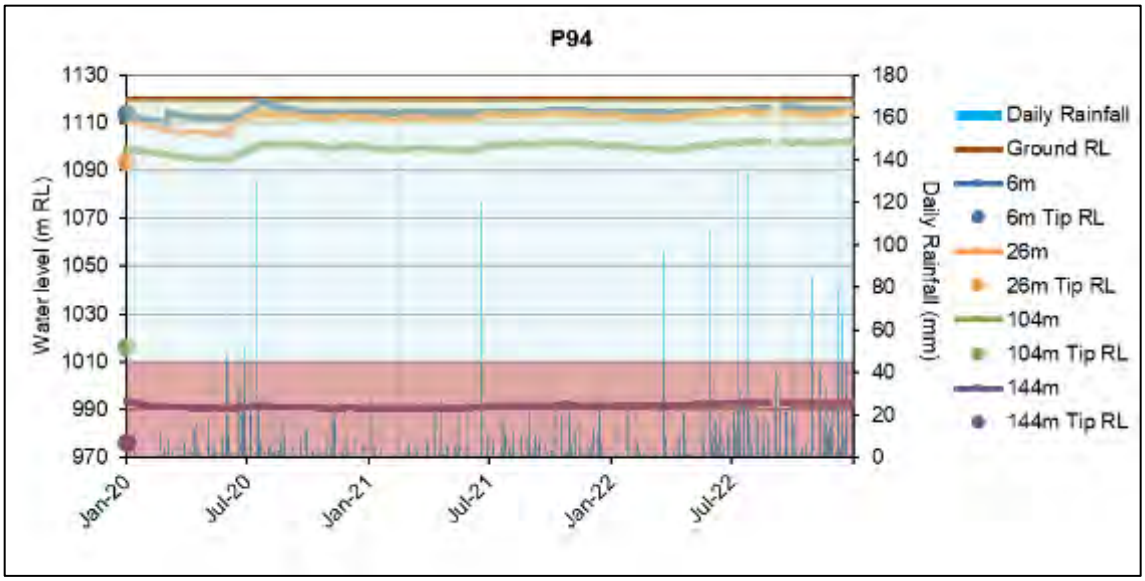

Figure 30. P94 vibrating wire piezometer.

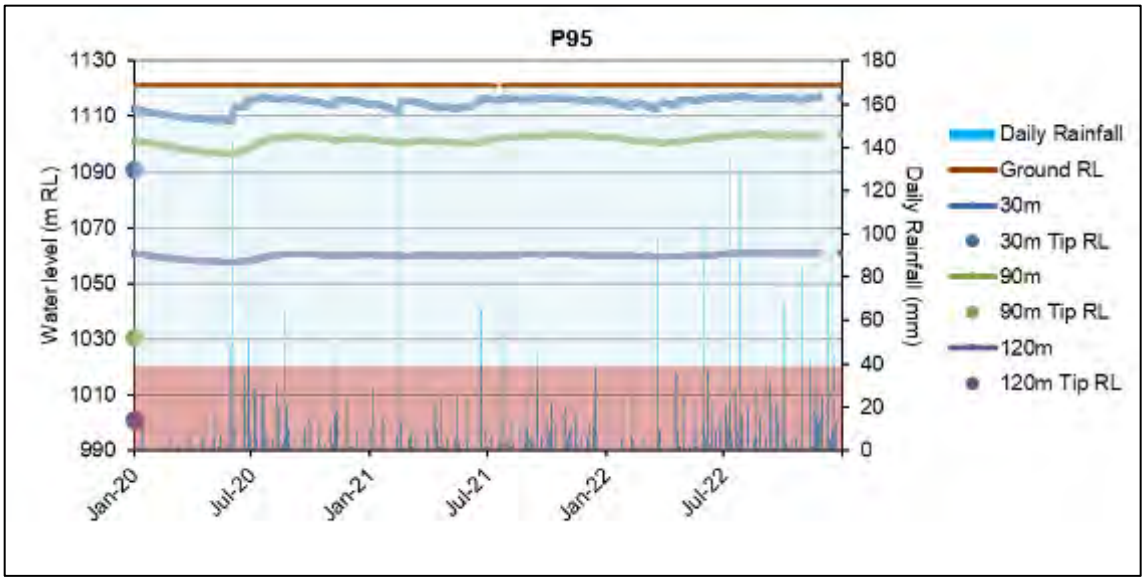

Figure 31. P95 vibrating wire piezometer.

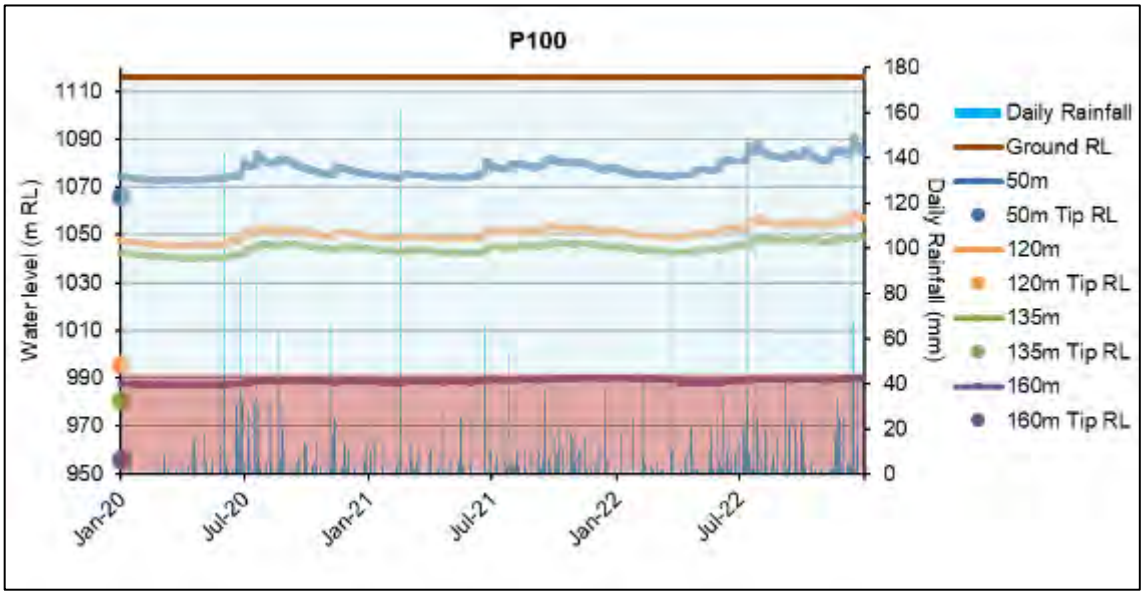

Figure 32. P100 vibrating wire piezometer.

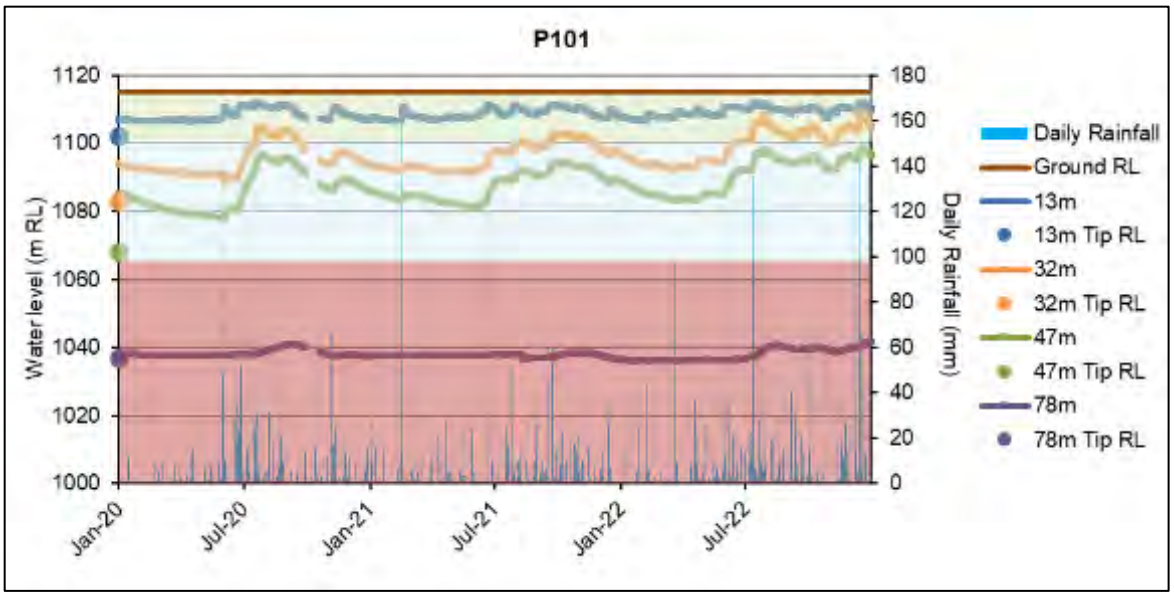

Figure 33. P101 vibrating wire piezometer.

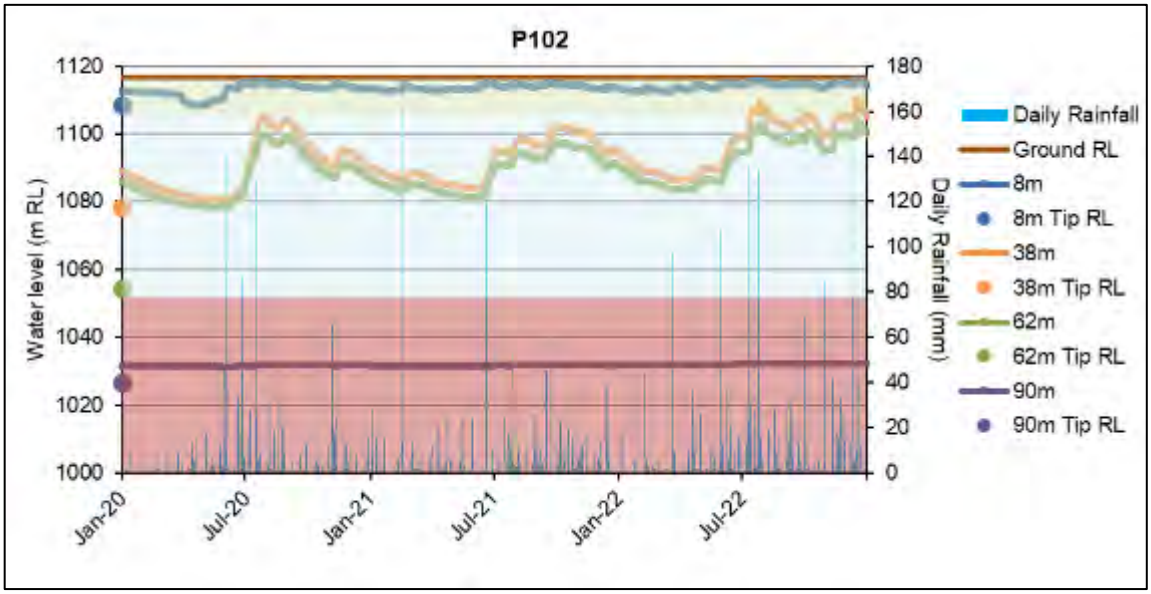

Figure 34. P102 vibrating wire piezometer.

Piezometric levels in the younger volcanics have continued to show some influence from rainfall. This is particularly evident at P100, P101 and P102. This ongoing fluctuation does not appear to have any significant effect on ground surface settlement.

During 2018 and 2019, P94-4 (the 975 mRL piezometer) showed a drop in pressure which is believed to be a result of nearby mining causing relaxation in the country rock surrounding the piezometer tip. The pressure has stabilised through 2021 and 2022 with water levels remaining at around 990 mRL. The shallower piezometers at this location have not displayed any unusual drop in pressure and there have been no anomalous trends identified in nearby settlement markers (BM24, MATAURA1, 24F).

P101-4, an andesite piezometer, appears to have little water pressure (Figure 33). The tip is at ~1042 mRL and at the end of the 2022 monitoring period (during 2021) the water pressures gradually fell from 1037.71 to 1036.59 mRL. This pressure is now gradually increasing with the current measurement being 1041.61 mRL. The three piezometers above show no such gradual decline and are reactive to wet and dry periods. OGNZL will continue to monitor P101 monthly and note any other significant trends in 2023.

6.3.8 Private Wells

The private wells are bores which are mainly used for water supply. They show seasonal fluctuations in groundwater levels and these levels can also be influenced by landowners using the bore. The Wharry Rd, Whangamata Rd and Mataura Rd bores can no longer be accessed. Two such access restrictions were due to health and safety concerns and the other due to the landowner not allowing OGNZL access. There is no previous indication of any influence in the bores from mine dewatering (Figure 35).

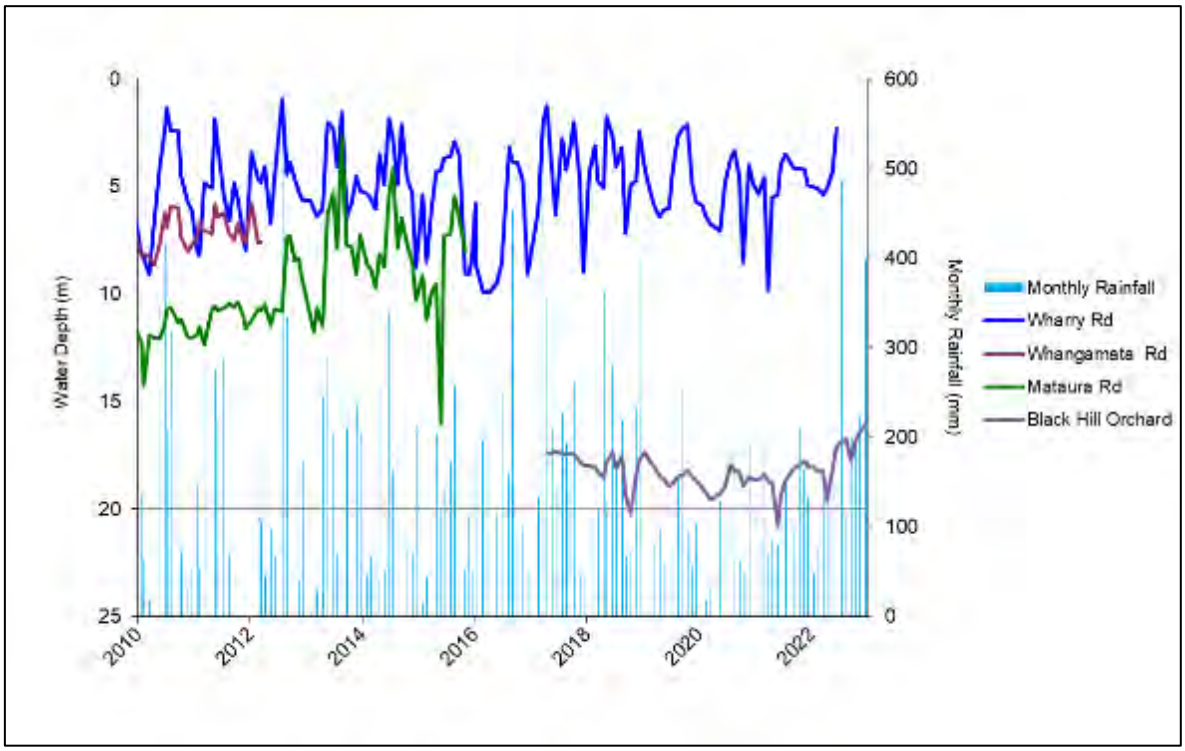

Figure 35. Private bore water levels.

7 SETTLEMENT MONITORING

Condition 13b of the Extended Martha Mine consent requires the identification of any environmentally important trends in settlement behaviour. Condition 13d of the same consent requires that a comparison of the settlement survey data with that predicted for the consent.

A reassessment for the settlement prediction was conducted for the Trio Development Project (Engineering Geology, June 2010). This review assessed the effect of pumping from the Martha pit to draw down the groundwater level progressively to 755mRL, which would also dewater the connected Trio system.

Another reassessment was conducted for the Correnso Underground project (Engineering Geology, 2012). The report recommended new trigger levels for settlement based on additional depressurisation of the andesite layer.

Further reassessment was undertaken for Project Martha with dewatering to below 700 mRL authorised. New triggers were applied during the 2020 reporting period (Table 7).

A review of the settlement marker network was undertaken during 2019 by GWS Ltd. This resulted in the removal of erroneous and high-density settlement markers for settlement plotting and trigger assessments.

Seven settlements zones were defined around the Martha Mine pit in 1999, extending to the outskirts of Waihi. The zones were established based on the first ten years (pre-extension) of settlement history having regard to the then current knowledge of the thickness and composition of compressible materials (such as ash-soils, alluvium, sediments, and unconsolidated younger volcanic deposits) and the expected effect from Martha Mine dewatering. Table 7 provides the most recent update of the Settlement Zone trigger levels, approved in 2019 and applied following the commencement of Project Martha in 2020, to reflect the changed mining and dewatering conditions. Figure 35 shows the predicted settlement zones. These have also been updated with the commencement of Project Martha.

Table 7 - Summary of Predicted Settlement Zone and Project Martha Trigger Levels

Zone	New Trigger Levels (mm) Project Martha (2020)
Settlement Zone 1	55
Settlement Zone 2	65
Settlement Zone 3	95
Settlement Zone 4	160
Settlement Zone 5	260
Settlement Zone 6	340
Settlement Zone 7	540

The settlement measured is an accumulation of all causes of settlement. Generally, this is considered to be the result of mine dewatering, but close to the mines and (in the case of Favona) overlying the mine areas, additional settlement may be the result of primary consolidation settlement (as opposed to reconsolidation settlement which is the process in the Martha groundwater system where historic dewatering resulted in groundwater levels dropping to lower elevations for a longer time period than is proposed for current mining activity). Nevertheless, it is the total settlement that is discussed in this report as settlement due to dewatering alone cannot be separated from other causes.

Comment is provided in relation to the predicted settlements given in Table 7 and these comments are expanded on where monitoring data show exceedance of the trigger values.

7.1 Method

The initial settlement survey network was established in 1980 during the exploration phase of the project and has been regularly monitored since December 1987. Over the course of the project, settlement survey marks have been added, removed or replaced, as required, to extend the network or to compensate for damaged sites.

Figure 38 shows the location of settlement marks monitored by OGNZL up to the end of 2022. Also, included on Figure 38 are the defined subsidence hazard zones related to historical underground mine stopes and shafts (IGNS, 2002). Figure 39 provides the settlement monitoring marks across the Favona Mine and shows the locations of the Favona Mine workings in relation to the marks. Figure 40 provides the marks identified as triggered during the November 2022 survey.

Settlement monitoring was undertaken in May/June and November/December 2022 across the settlement network surrounding Waihi Township (refer Appendix C) and also along the Favona network which is an extension of the Martha mine survey network. Appendix B presents the two summary settlement monitoring reports. For simplicity this report refers to surveys as May and November 2022.

The raw data provided by the surveyors has been graphed and where changes in the record are apparent as a result of mark relocation or replacement, corrections have been applied using graphical projection so that total settlement over the life of mining can be assessed for each location. The correction process applied was as follows:

- Updating the time-history graph for all data from settlement markers with data up to 1/11/2022.
- Where changes in the time-history graph identified a datum change, a correction was arrived at by projecting the initial data visually on the graph to the time of the new datum and a correction calculated. A smooth settlement curve resulting after the correction was applied and similarity of curve shape to those of adjacent marks was taken as indicating an acceptable correction.
- Where marks were installed in May 1999, the previously determined settlement for that location from 1988 to 1999 was applied as a correction.
- Where marks were installed or changed other than in May 1999, the previously assessed settlement at the location as of May 1999 was used with a best fit trend line of settlement in time to correct the values to be consistent with the May 1999 value.
- For Favona marks, settlement values as at 1/12/2005 were assessed for each location and used to correct the new marks to account for settlement from 1988 to 2005.
- The corrected data has then been used to generate:
  - Settlement-time trend graphs for each zone.
  - Plans of total settlement.
  - Contours of total settlement.
  - Calculation of tilt.
  - Settlement-time trend graphs of specific areas.
- Where Favona development has affected settlement, a projection of the pre-Favona mine settlement trend has been made as a means to estimate the current Martha Mine settlement and this settlement value has been subtracted from the total measured settlement to provide an estimate of the settlement due to the Favona Mine development.

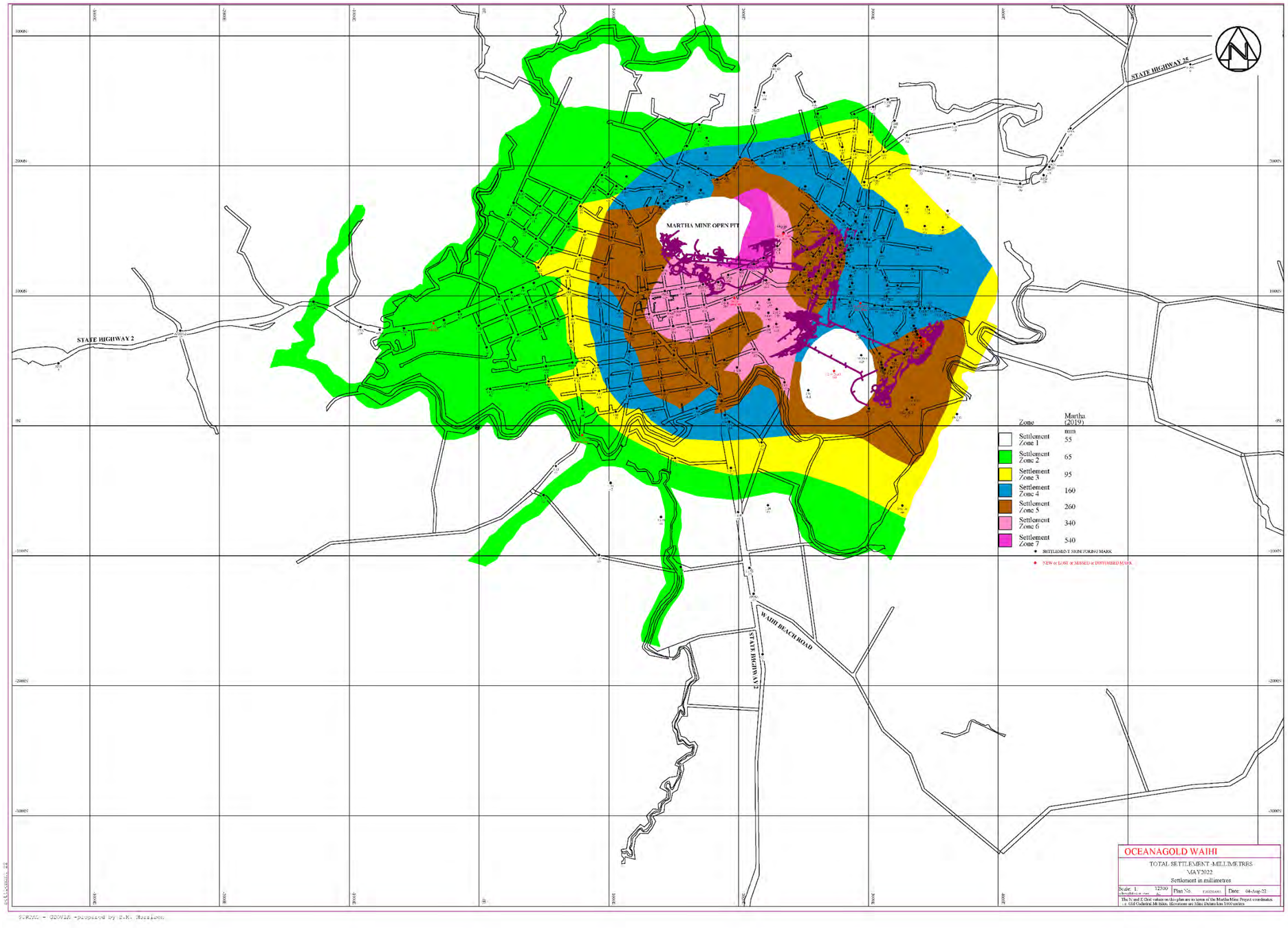

Figure 36 Total Settlement Zones May 2022

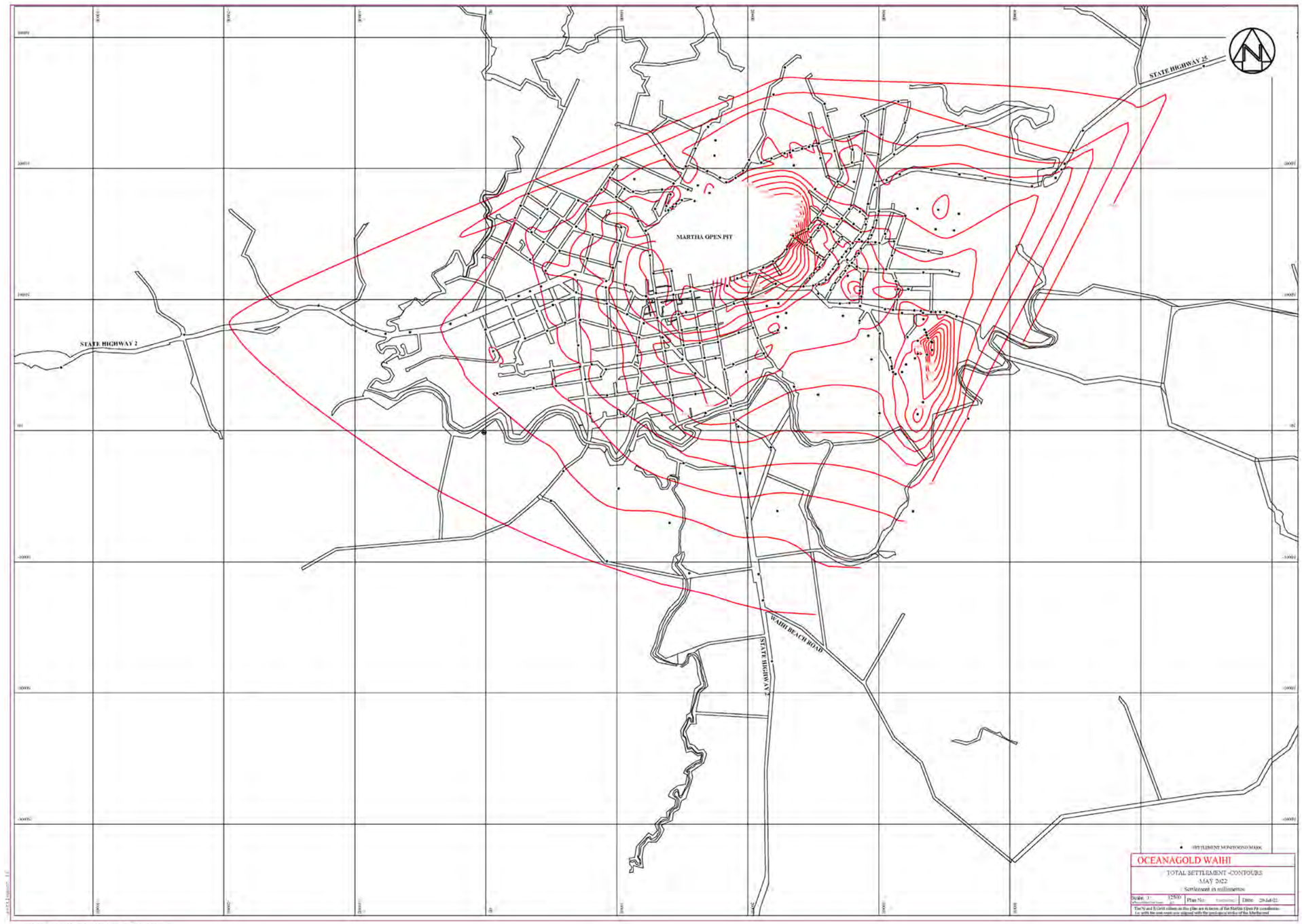

Figure 37: Total Settlement Contours May 2022

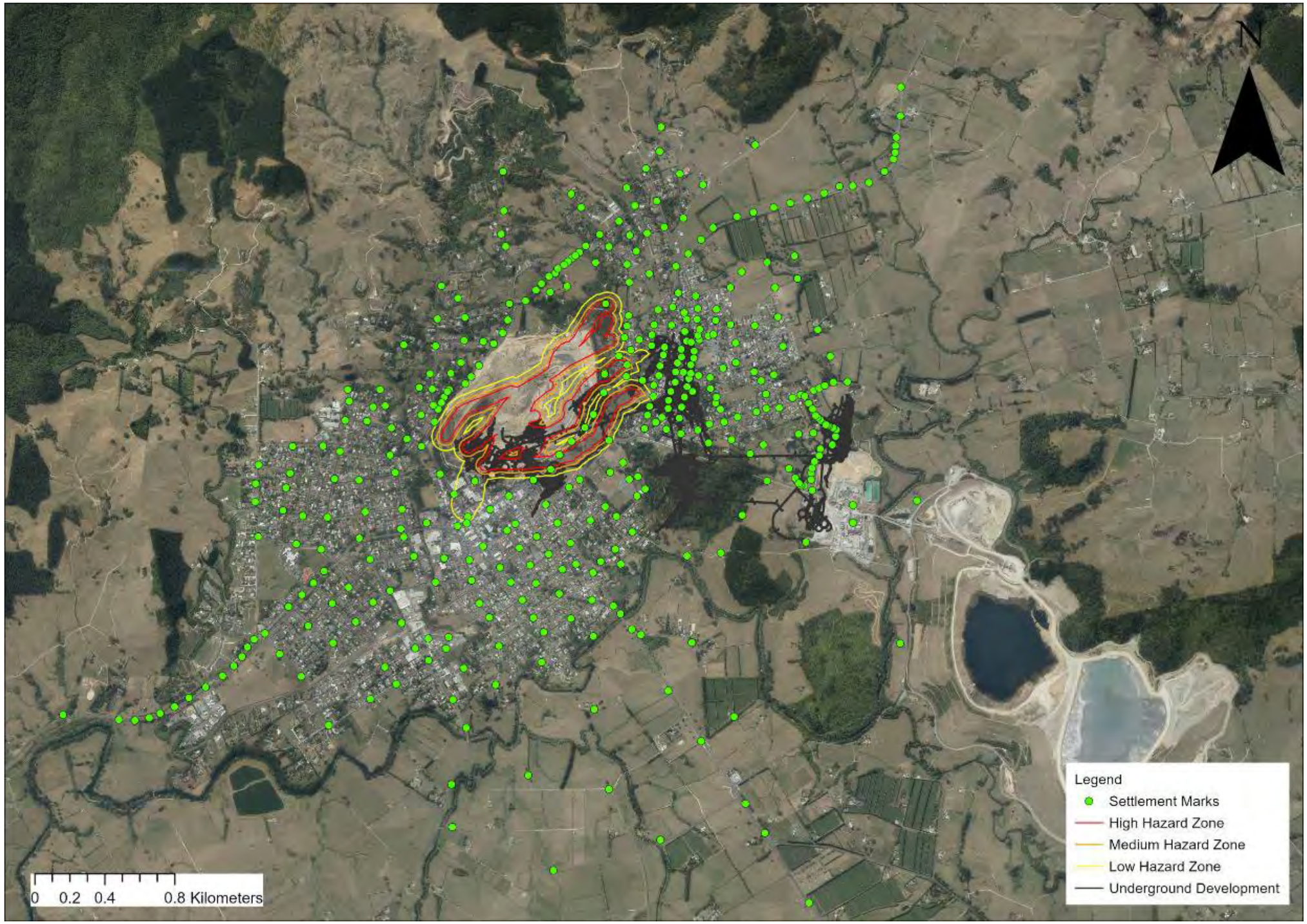

Figure 38: Settlement Marker Location Plan & Hazard Zones

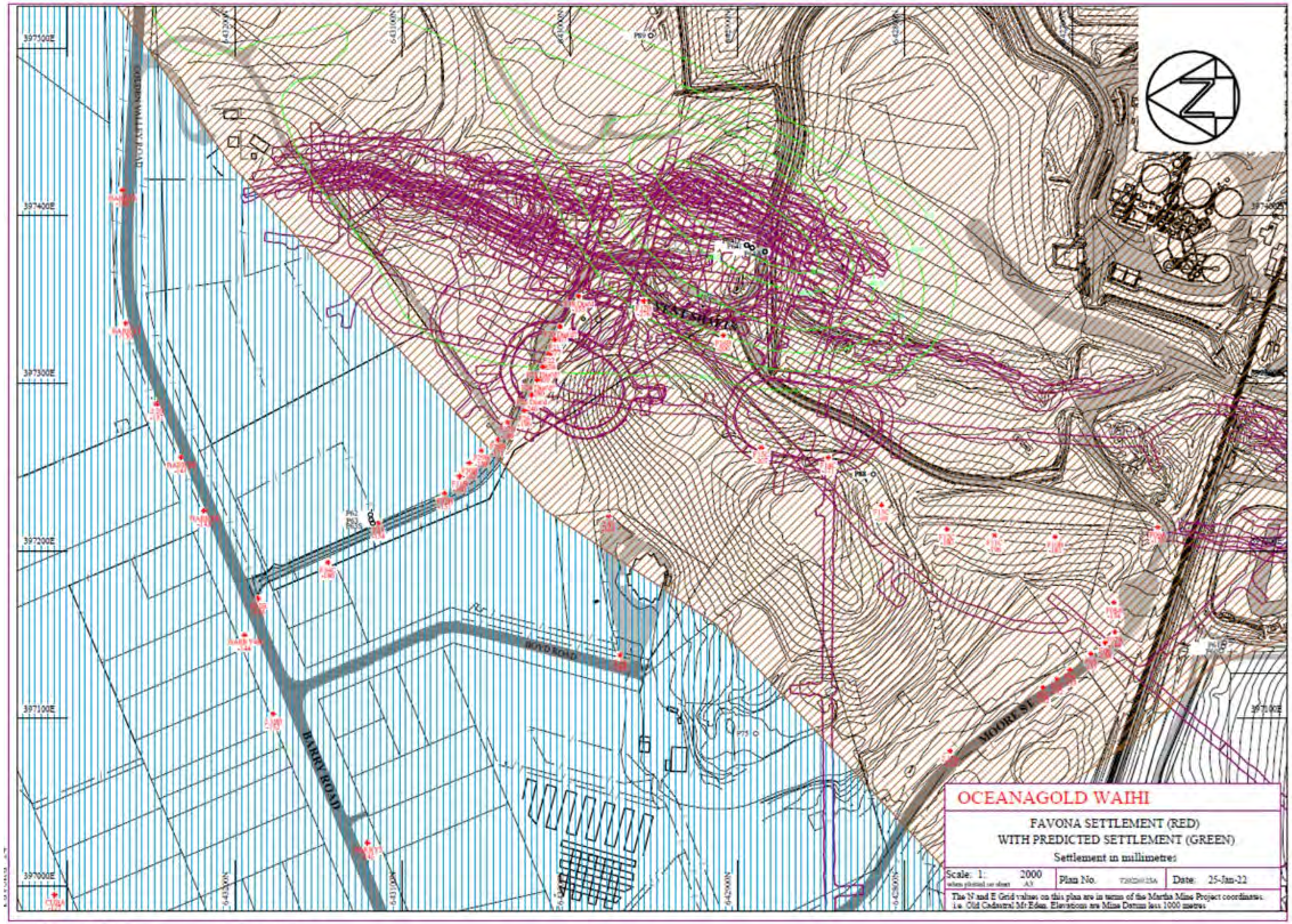

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Figure 39: Favona Settlement Nov 2022

Figure 40: Triggered settlement marks Nov 2022

7.2 Results

Appendix C presents plans showing settlement marks, settlement values and settlement contours.

Time-history plots of settlement survey data for each zone are presented in Appendix D. The plots also depict the zone settlement predictions (for the Martha Extended Project, Trio Development, Correnso Project and Project Martha) shown as horizontal lines on each set of graphs.

The projected trends and the maximum settlements are provided on the graphs in Appendix D. Key trends are described below.

96% (385/399) of the marks did not exceed the settlement trigger levels; 14 marks were triggered. This number is similar to 2021. Figure 40 displays the ten settlement marks from the November 2022 survey outside the influence of the Favona Underground that exceeded the trigger limits. The other four marks that exceeded the trigger limits are located above the Favona Underground.

In the previous reporting period, some points in the time-history plots of settlement in Appendix D for May 2021 showed greater settlement compared to the general trends. This was due to a larger than normal survey mis-close associated with the change to a new survey staff in May 2021. This was generally most notable to the north and east extents of the survey. The reason for this larger than normal mis-close was able to be identified and corrected for the November 2021 survey. The May 2021 survey data was reprocessed to remove the May 2021 mis-close. The November 2022 results follow the general settlement trends prior to the May 2022 survey.

A summary of the number of settlement survey marks that have been triggered within each of the settlement zones is presented below in Table 8. Further discussion regarding each of the triggered survey marks is provided in the following sections.

Table 8 Number of Survey Marks Triggered in Each Settlement Zone

Zone	Triggered marks
1	4
2	1
3	3
4	1
5	0
6	1
7	0
Favona	4
Total	**14**

7.2.1 ZONE 1 – Trigger 55mm

The Zone 1 time-history plot (Appendix D) shows three groupings, one showing a small but steady ongoing settlement after about 1999), another with little settlement until November 2015 and then a small ongoing settlement and another group with no settlement evident. To show these observations the marks for Zone 1 were re-plotted as groups namely:

- Zone 1 along Waihi Whangamata Road has had a small steady ongoing settlement since 1999 which has reached between 15 and 40 mm (Figure 41)
- Zone 1 south of Waihi has had a small steady ongoing settlement since 1999 which has reached between 15 and 50 mm (Figure 42)

- Zone 1 west of Waihi has had a very small amount of settlement (less than 12 mm) up to 2015 following which the settlement rate increased to a small steady ongoing settlement which has reached between 10 to 20 mm (Figure 43)
- Zone 1 north of Waihi which has had no measurable settlement (Figure 44)

This grouping shows that the marks in Zone 1 with a slow ongoing settlement trend are located along Waihi to Whangamata Road to the east of Waihi and to the south of Waihi. A steady increase in settlement rate from about 1999 is also be observed in most marks in Zones 2 to 6, suggesting that there is a small and widespread effect occurring at depth. Two of the three settlement marks in Zone 1 to the west show little settlement until 2015 and then a small steady on-going settlement showing the widespread effects at depth have reached these markers (Figure 44).

These observations suggest the following:

- The widespread 10 to 50 mm settlement observed from about 1999 at many Zone 1 marks and also the increasing settlement in Zones 2 to 6 marks is a response to the ongoing dewatering of the deeper structures in the andesite rock body (fracture depressurisation) as a result of mine dewatering. This is a broad effect and has negligible influence on differential tilt between marks.

The stable water levels in the wells monitoring the deeper younger volcanic materials and the upper andesite layers (Figure 15) indicate that the observed settlement behaviour is not related to on-going consolidation of these materials at these locations as no on-going dewatering is evident at these locations.

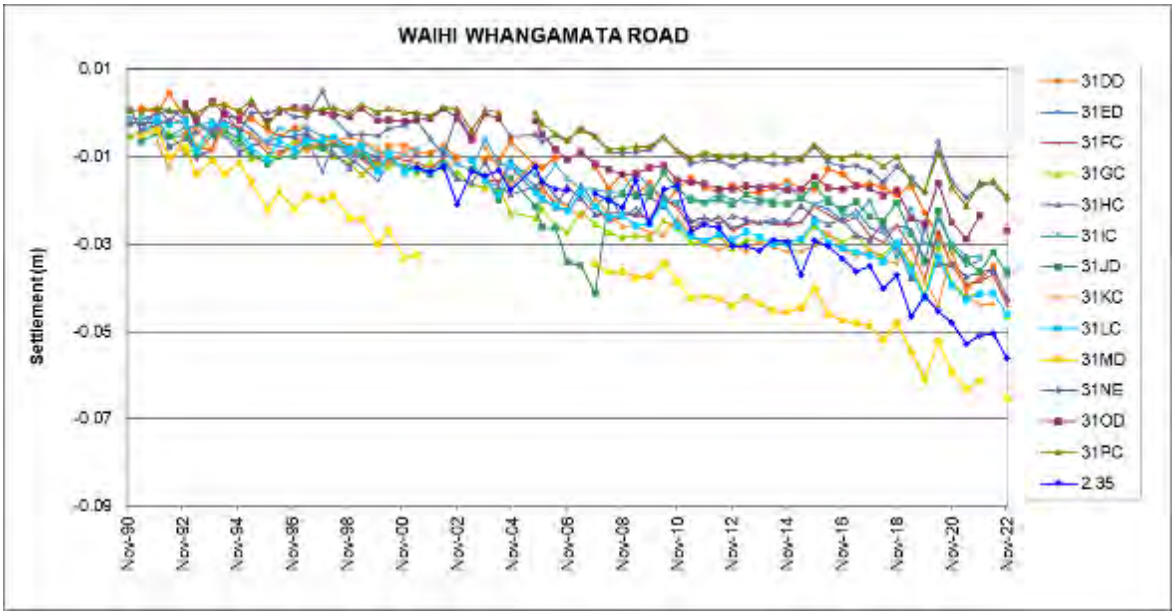


Figure 41: Zone 1 Waihi to Whangamata Road

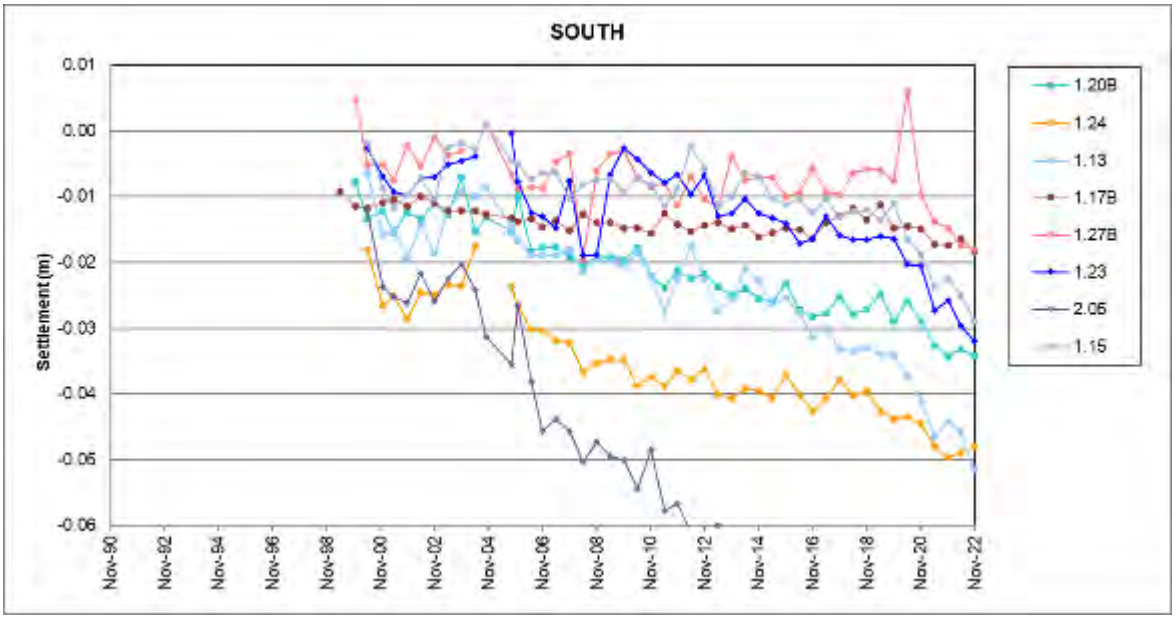


Figure 42: Zone 1 Waihi South

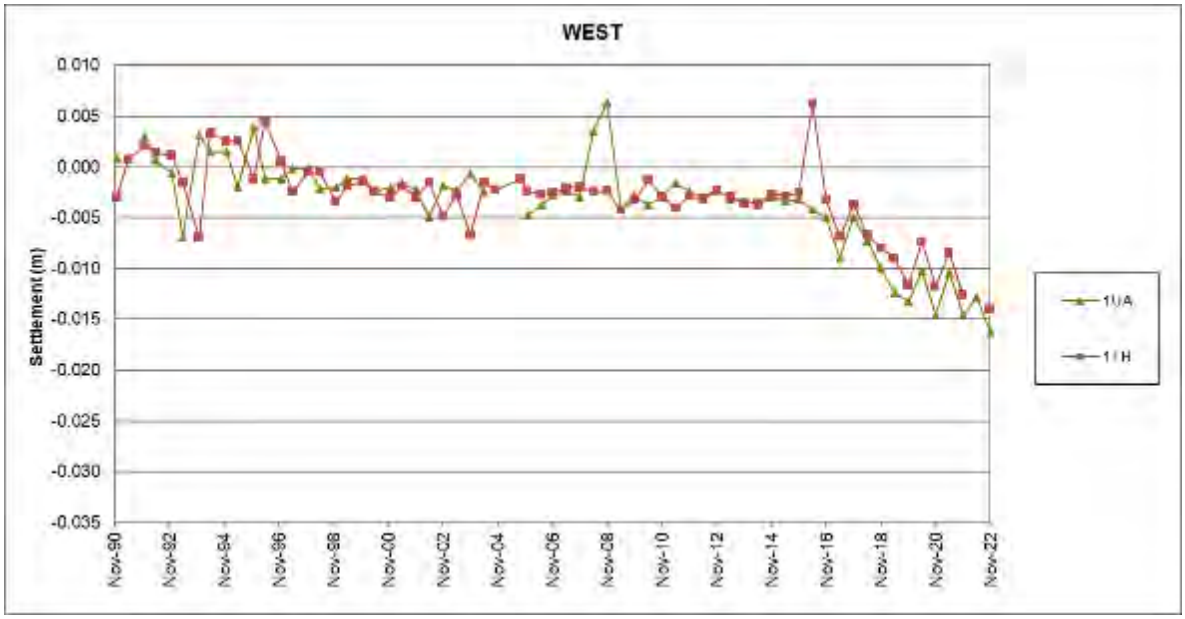


Figure 43: Zone 1 West of Waihi

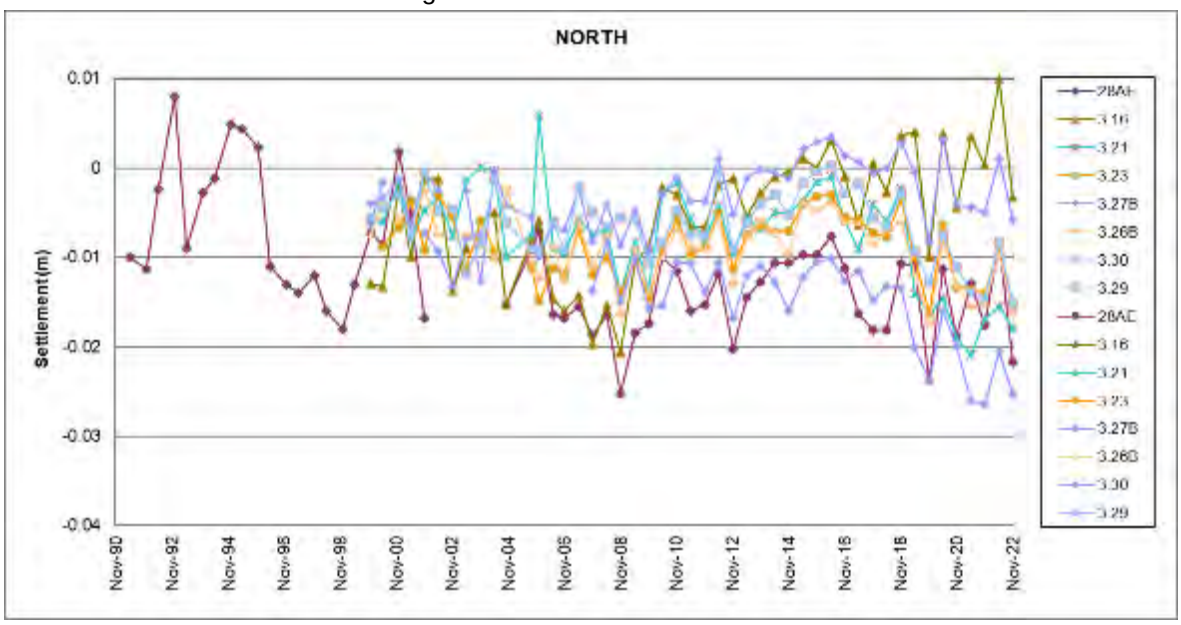


Figure 44: Zone 1 North of Waihi

Results exceeding the trigger levels shown on the Zone 1 time – history plot are discussed below.

Four marks in Zone 1 showed settlement greater than the trigger levels: 31MD, 2.05, 2.35, and 2.44

Mark 31MD is located along the Waihi to Whangamata Road and showed a period of greater settlement than nearby marks during the early 1990s. More recent recorded ongoing settlement is similar to nearby marks. This mark may be influenced by its proximity to the banks of the Ohinemuri River (Figure 40).

Mark 2.05 is near Winner Hill and was included in Zone 1 because it was an andesite outcrop. Dewatering of the andesite was originally thought to contribute less to settlements. Like other marks to the south of Waihi Mark 2.05 indicates ongoing settlement after 2003 due to deeper and more extensive dewatering of the andesite. Mark 2.05 is more representative of Zone 4 settlements.

Mark 2.35 is south of the Waihi to Whangamata Road and close to the Settlement Zone 3 boundary. The data suggests an acceleration of settlement after September 2005, however neighbouring marks

in Zone 3 have similar settlement values indicative of a general trend in this area. This mark is northeast of Correnso and not in close proximity to underground mine activities.

Mark 2.44 has been investigated in the past and the cause has been attributed to some localised surficial slope movement. This mark is listed as disturbed by the surveyor.

7.2.2 ZONE 2 – Trigger 65mm

This settlement zone encompasses the western outskirts of Waihi township and some marks to the north and south of Waihi. The time-history plot for Settlement Zone 2 (Appendix D) shows all but one of the Zone 2 marks to be tracking less than the settlement trigger level. As with Zone 1 most of the marks have small settlements. Total settlements to date are generally between 10 to 65 mm with settlements of between 10 to 40 mm since 1999. Movements exceeding trigger levels are discussed below.

On review, the settlement in Zone 2 which is occurring at Mark 1.04, Mark 1.02D, and Mark 1.03D has continued steadily and at an increased rate compared to other marks in Zone 2. This is assessed to be associated with ongoing dewatering for the Martha Underground (MUG) and likely shows the effect of the deep dewatering in the andesite. Piezometer P4, in the southern area of Waihi, indicates the overlying younger volcanics have not been dewatered. The settlements are relatively small, result in negligible tilt and are therefore not of concern at this point in time. Mark 1.12 will continue to be reviewed with subsequent monitoring surveys undertaken when over the trigger level of 65mm.

Mark 1.04 is located in the southern region of Waihi, near the Ohinemuri river. This mark has been triggered previously. The settlement at this mark is assessed to be unrelated to mining activities due to its distance from mining works. It should be further noted that this mark is located near the river and likely upon alluvial soils which are often susceptible to moisture related shrink and swell.

7.2.3 ZONE 3 – Trigger 95mm

This zone includes areas to the east, south and west of Waihi town.

Review of the time-history plot for Zone 3 shows, as with Zones 1 and 2, most marks display ongoing steady settlement. The measured total settlements are relatively small and generally between 20 and 90 mm with settlements since 1999 typically being between 10 and 50 mm. Tilts between adjacent marks are well within acceptable limits.

One mark (2CE) has moved more than the settlement trigger level for the zone. Mark 2CE is located to the west of Waihi township and has showed an increased rate of settlement compared to nearby marks between 1991 and 1995. Thereafter, it has settled at a similar rate to nearby marks. This settlement pattern is similar to point 2BC in Zone 5. This increase settlement rate in the early 1990's is associated with dewatering/depressurisation effects due to the development of Martha Pit. Steady ongoing settlements similar to the surrounding points indicates settlement associated with dewatering of the deeper andesite. This mark will continue to be reviewed however settlements are explainable and tilts are small, so not of concern.

Mark 1.07 is located in the southern region of Waihi. This mark has triggered in the past, and the observed settlement is not thought to be associated with mine dewatering. As with Mark 1.04 (in Zone 2) roadworks have occurred in this area and the mark is located near the Ohinemuri River where shrink/swell susceptible alluvial soils are likely to be present.

Mark 14DB is located near to Mark 1.07. This mark has also triggered in the past and the observed settlement is not thought to be related to mine dewatering. Roadworks have occurred in this area and the mark is located near the Ohinemuri River where shrink/swell susceptible alluvial soils are likely to be present.

7.2.4 ZONE 4 – Trigger 160mm

The Zone 4 time-history plots (Appendix D) show relatively steady ongoing settlement since 1995 in response to mine dewatering. The measured total settlements are relatively small and are generally between 20 and 140 mm. Settlements since 1999 are generally between 10 and 80 mm. Tilts between adjacent marks are well within acceptable limits.

One mark, 23C, exceeded the predicted maximum settlement for this zone in November 2022. This mark showed a sharp increase in settlement in the May 2020 survey. The settlement in the subsequent November 2020 survey was similar to nearby marks. This mark is located near a drain and may have been affected by the dry summer and autumn during 2019/2020 or was influenced by recent drainage works nearby. No visual evidence of settlement effects on surrounding land have been identified to date and nearby piezometers have not shown any unusual changes.

7.2.5 ZONE 5 – Trigger 260mm

The data for the Zone 5 marks is provided on the relevant time-history plot in Appendix D. These marks show a steady increase in settlement with time and total settlements are generally between 30 and 150 mm. Settlements since 1999 are generally between 15 and 85 mm. No marks in Zone 5, outside of the area over Favona Underground, exceeded the predicted maximum settlement for the zone.

7.2.6 ZONE 6 – Trigger 340mm

The settlement in this zone is shown on the relevant Zone 6 time-history plot in Appendix D. This settlement zone extends through the centre of the Waihi commercial area. The relevant settlement marks show steady ongoing settlement with time and total settlements are generally between 70 and 280 mm. Settlements since 1999 are generally between 50 and 190 mm. One mark in this zone exceeded the maximum predicted settlement for the zone. This mark (mark BM20) has been noted as disturbed by the surveyor (Appendix B), however the settlement has been accumulated at a relatively constant rate. The larger settlements at BM20 (compared to the rest of Zone 6) are likely due to the local ground conditions and there is no private property in this area. This point will continue to be monitored and reviewed.

7.2.7 ZONE 7 – Trigger 540mm

The settlements which have been measured within Zone 7 are all less than the predicted maximum. (Zone 7 time-history plot, Appendix D). Total settlements are about 300 mm. Settlements measured since 1999 are about 160 mm. Ongoing settlements are relatively constant and match the ongoing dewatering at depth within the andesite. No new settlement trends are indicated by the latest monitoring results.

7.3 Favona Settlement

The measured settlement in the vicinity of the Favona Mine has a component of settlement due to Martha Mine dewatering as well as a component of settlement related to Favona Mine dewatering.

A separation of the measured total settlement into Martha and Favona settlement components has been undertaken by projecting the settlement evident before the commencement of the Favona Mine and accepting these projected settlements as Martha settlements. The difference between the projected (Martha) settlement and total measured settlement has been taken as the Favona component of settlement. Table 9 sets out the total settlement, the settlement attributed to Martha dewatering and the settlement attributed to Favona Mine dewatering as assessed for the Favona Mine settlement markers.

Table 9 - Separation of Settlement – Favona Marks (Nov 2022)

Mark	Measured Total Settlement. (mm)	Estimated Martha Settlement. (mm)	Estimated Favona Settlement. (mm)
F02	109	50	59
F04	113	44	69
F05	110	46	64
F06	114	40	74
F08A	126	44	82
F10B	134	44	90
F12C	136	39	97
F14C	134	60	74
F15C	176	55	121
F16B	166	55	111
F17B	284	55	229
F18	358	49	309
F20	304	44	260
F21	274	43	231
F22	254	42	212
F24	218	42	176
F26	188	45	143
F28B	161	49	112
F30B	151	52	99
F32B	124	49	75
F33	115	52	63
F34C	112	58	54
F35B	107	61	46

The largest measured settlement at Favona Mine occurs where the markers overlie mine workings (marks F16B to F26). The maximum predicted settlement over the workings from dewatering was assessed as 80 mm for earlier projects, with mine dewatering related settlement not extending into the urbanised area. The actual total settlement and the extent of settlement exceeded the predictions for the dewatering settlement. The difference between the predictions and measured settlement was assessed to reflect depressurisation and consolidation of the andesite rock body, which was not considered in the initial settlement predictions. Andesite rock was considered to be a stiff material with negligible consolidation characteristics, but the long-term settlement observed in response to Martha Mine dewatering (in Zones 1 to 6, discussed above) suggests that some minor consolidation of the deeper andesite rock is occurring, possibly as a response to fracture depressurisation. In addition, some further relaxation of the rock mass towards the mine workings may be occurring, and this may be providing further volume reduction of the andesite rock mass in the vicinity of the mine.

Another potential influence is that the Favona andesite has been undergoing primary consolidation, as current water level monitoring data suggests that the Favona system was not dewatered to the same extent as the Martha groundwater system during historical mining in the early 1900's. Consolidation predictions for Favona were made based on Martha's "reconsolidation" dewatering data. The amount of primary consolidation is greater for the first time of dewatering compared to the second or subsequent times of dewatering. This is because the first cycle of dewatering results in pre-consolidation and an increase in the stiffness of the ground, and subsequent recovery of the groundwater levels does not result in full rebound of the ground surface to its original levels.

Settlement predictions for Project Martha have been updated for the zone encompassing Favona marks to reflect the effects outlined above. Four Favona marks exceeded the maximum predicted

settlement in the November 2021 survey: F17B, F18, F20 and F21. All are located above underground workings, on company owned land. Marks F18 and F20 are noted by the surveyor as being disturbed (Figure 39, Appendix B).

7.4 Trio Underground

The only anomalous result in the vicinity of Trio Underground has been apparent settlement at mark 2.44 (located on a farm track between Union and Black Hill) with pronounced acceleration since the May 2010 survey. This was investigated and determined to be related to a shallow, likely pre-existing surficial landslide. It is now noted by the surveyor as being disturbed. The mark will continue to be monitored on a biennial basis as per other survey marks but will not be included in any settlement profiling.

7.5 Summary

The analysis of the data to the end of 2022 continues to indicate that current slow settlements associated with Martha Mine are likely to be related to dewatering of the deeper structures within the andesite rock mass. Groundwater monitoring data does not show any widespread or significant ongoing dewatering of alluvium, younger volcanic materials or the upper layers of the andesite rock body.

Settlement triggers include modification to Martha Mine Extended pit associated with the cutback projects; the extended duration of dewatering at Martha Mine; assumptions made in the Favona settlement predictions (fracture depressurisation, secondary rather than primary consolidation); and localised natural, induced and historic effects.

The area around Martha Mine of greatest settlement is adjacent to the eastern pit wall where the weaker younger volcanic rocks are thickest and dewatering of this geological unit is greatest. This is also an area that has historic underground workings that have not been backfilled.

The main area of settlement at Favona overlies the underground workings. Such area comprises Company owned farmland. Outside the Favona workings area the measured ground surface settlement is notably lower. The conditions giving rise to settlement at Favona differ from those in the Martha Groundwater System as the latter has been dewatered to a greater extent for a longer time than the current dewatering while the former has not been previously dewatered. While settlement has exceeded initial estimates at Favona, those estimates were based on Martha settlement data which was responding to reconsolidation rather than primary consolidation.

In relation to Trio, Correnso and SUPA mines, these areas are located in the dewatered Martha Groundwater System and settlement (as described in this document) has already been developing in response to Martha Mine dewatering. Also, as these are linked to the Martha system, settlement will be based on additional consolidation and did not include settlement due to dewatering of the andesites.

8 TILT

As noted earlier, a full assessment and review of the Waihi settlement marker network and database was undertaken by GWS Limited in 2019. This review resulted in the removal of erroneous and high-density settlement marks and an updated settlement database with revised settlement marker corrections where appropriate. Marks proposed for removal have been included in tilt calculations until their removal is approved by Hauraki District and Waikato Regional Councils. Revised settlement marker corrections have been applied in this reporting period.

Assessments have been grouped into five areas: Favona, Martha (including the North Wall), Correnso, Correnso South and SUPA. There is some crossover of marks between Mining Permit boundaries. The assessment of tilt between adjacent settlement marks is summarised in Table 9.

Table 10: Tilt Calculations - November 2022 Survey

Mark	x	y	Distance (m)	Nov 2022 (m)	Abs	Δh (m)	Tilt (1:X)
Favona							
F02	3097.60	490.00		-0.1086	0.1086		
F06	3107.08	445.21	45.78	-0.1149	0.1149	0.0063	7230
F10B	3176.88	446.75	69.82	-0.1347	0.1347	0.0198	3526
F12C	3207.32	503.82	64.69	-0.1361	0.1361	0.0014	46502
F14C	3275.29	551.31	82.91	-0.1349	0.1349	0.0012	71101
F15C	3297.17	585.32	40.44	-0.1761	0.1761	0.0412	981
F16B	3367.38	578.70	70.52	-0.1661	0.1661	0.0100	7037
F17B	3405.48	613.91	51.88	-0.2847	0.2847	0.1186	437
F18	3423.83	648.30	38.98	-0.3585	0.3585	0.0737	528
F21	3405.99	672.00	29.66	-0.2743	0.2743	0.0842	352
F24	3388.13	690.85	25.97	-0.2187	0.2187	0.0555	468
F32B	3348.78	769.1	87.59	-0.1240	0.1240	0.0948	924
F34C	3339.49	849.57	81.00	-0.1124	0.1124	0.0115	7015
F35B	3336.68	896.06	46.58	-0.1073	0.1073	0.0051	9133
Martha							
20BB	2533.26	1622.29		-0.1230	0.1230		
20AC	2461.04	1536.91	111.83	-0.1243	0.1243	0.0014	81543
BM20A	2345.50	1484.90	126.71	-0.2456	0.2456	0.1212	1045
20D	2482.07	1473.48	137.05	-0.1443	0.1443	0.1012	1354
19CB	2296.71	1381.40	206.97	-0.2887	0.2887	0.1444	1433
19BB	2191.56	1292.02	138.00	-0.3013	0.3013	0.0126	10957
BM19B	2117.17	1244.36	88.35	-0.3006	0.3006	0.0008	115836
17CB	2014.23	1201.01	111.70	-0.3030	0.3030	0.0024	46420
17BB	1919.52	1160.79	102.90	-0.2230	0.2230	0.0800	1287
17AB	1841.32	1104.80	96.18	-0.1938	0.1938	0.0292	3293
2.04B	1893.21	968.34	145.99	-0.1764	0.1764	0.0174	8387
34BE	1732.56	931.60	164.80	-0.1426	0.1426	0.0338	4878
BM17A	1724.44	1088.92	207.42	-0.1044	0.1044	0.0382	5426
10BC	1560.13	1062.92	216.74	-0.1338	0.1338	0.0294	7366

10AB	1430.61	1037.00	298.38	-0.1382	0.1382	0.0044	68094
BM16	1418.09	1218.03	210.32	-0.1309	0.1309	0.0073	28711
10DC	1279.04	1198.33	221.36	-0.1458	0.1458	0.0149	14851
16BC	1252.81	1336.47	203.34	-0.1405	0.1405	0.0053	38642
BM9B	1220.25	1523.29	330.23	-0.0831	0.0831	0.0574	5756

North Wall

27AB	2009.08	2064.33		-0.0127	0.0127		
26Q	1963.00	1982.71	93.73	-0.0354	0.0354	0.0226	4139
26PB	1834.84	1893.11	156.38	-0.0526	0.0526	0.0172	9086
26OB	1706.93	1812.27	151.31	-0.0048	0.0048	0.0478	3169
26NC	1641.16	1772.40	228.22	-0.0453	0.0453	0.0405	5638
26MB	1593.46	1750.66	122.11	-0.0473	0.0473	0.0136	8972
26JB	1495.71	1756.55	93.74	-0.0404	0.0404	0.0032	29526
BM26	1542.45	1837.81	100.98	-0.0372	0.0372	0.0101	10009
3.09	1618.51	1870.17	217.54	-0.0337	0.0337	0.0289	7524

Correnso

25E	2472.35	1162.01		-0.1584	0.1584		N/A
25B	2497.67	1105.83	61.62	-0.1321	0.1321	0.0263	2340
25I	2537.20	1045.04	72.51	-0.1225	0.1225	0.0096	7545
24H	2630.70	1072.28	97.39	-0.1216	0.1216	0.0009	110320
24B	2667.67	1126.40	65.54	-0.1276	0.1276	0.0060	11006
24G	2705.96	1170.46	58.38	-0.1376	0.1376	0.0100	5826
24L	2761.67	1181.33	56.76	-0.1340	0.1340	0.0036	15847
24AC	2743.58	1218.90	41.70	-0.1376	0.1376	0.0036	11612
24F	2772.80	1257.27	48.23	-0.1323	0.1323	0.0053	9057
BM24	2794.55	1279.36	31.00	-0.1232	0.1232	0.0091	3413
24E	2758.43	1303.23	43.29	-0.1286	0.1286	0.0054	7982
24DC	2718.29	1323.13	44.80	-0.1219	0.1219	0.0067	6676
24I	2692.57	1269.71	59.29	-0.1294	0.1294	0.0075	7868
25H	2648.48	1232.96	57.40	-0.1378	0.1378	0.0083	6881
25CB	2615.91	1190.50	53.51	-0.1376	0.1376	0.0002	289758
25G	2594.60	1149.42	46.29	-0.1384	0.1384	0.0008	60073
25F	2542.53	1116.24	61.74	-0.1393	0.1393	0.0010	64471

25B	2497.67	1105.83	46.05	-0.1321	0.1321	0.0072	6379
BM25	2424.91	1100.25	72.97	-0.1470	0.1470	0.0149	4899
25E	2472.35	1162.01	77.88	-0.1584	0.1584	0.0114	6808
25A	2505.13	1203.77	53.09	-0.1577	0.1577	0.0008	68538
25D	2547.05	1248.02	60.95	-0.1589	0.1589	0.0013	47468
21DC	2573.96	1304.15	62.25	-0.1462	0.1462	0.0127	4903
21N	2623.25	1342.44	62.41	-0.1322	0.1322	0.0141	4442
21C	2651.57	1389.82	55.20	-0.1214	0.1214	0.0108	5102
21M	2694.90	1439.65	66.03	-0.1071	0.1071	0.0143	4625
21BC	2719.27	1477.80	45.27	-0.0942	0.0942	0.0129	3512
21EB	2799.95	1429.09	94.24	-0.0961	0.0961	0.0019	50682
24K	2783.89	1387.72	44.38	-0.1130	0.1130	0.0169	2623
24J	2749.39	1365.76	40.89	-0.1077	0.1077	0.0053	7736
24DC	2718.29	1323.13	52.77	-0.1219	0.1219	0.0142	3717
22F	2815.91	1325.41	97.65	-0.1269	0.1269	0.0050	19652
22C	2846.39	1352.54	40.80	-0.1431	0.1431	0.0163	2507
22GB	2862.88	1387.97	39.08	-0.1165	0.1165	0.0267	1465
22BC	2916.75	1435.77	72.02	-0.1020	0.1020	0.0145	4963
22I	2918.98	1461.37	25.69	-0.0950	0.0950	0.0070	3684
22H	2869.25	1441.80	53.44	-0.0897	0.0897	0.0053	10073
21P	2849.17	1456.90	25.13	-0.0865	0.0865	0.0032	7976
21FB	2861.65	1512.21	56.70	-0.0691	0.0691	0.0174	3253
21Q	2899.60	1571.32	70.24	-0.0697	0.0697	0.0006	120674
21GC	2901.12	1614.05	42.76	-0.0727	0.0727	0.0030	14303
22KB	2981.80	1603.49	81.37	-0.0619	0.0619	0.0108	7531
2.29B	2953.39	1548.17	62.19	-0.0909	0.0909	0.0291	2139
22J	2944.47	1489.76	59.09	-0.0807	0.0807	0.0102	5798
22I	2918.98	1461.37	38.16	-0.0923	0.0923	0.0115	3307
22H	2869.25	1441.80	53.44	-0.0897	0.0897	0.0026	20512
21EB	2799.95	1429.09	70.46	-0.0961	0.0961	0.0064	11015
21BC	2719.27	1477.80	94.24	-0.0942	0.0942	0.0019	50682
BM21	2654.80	1515.40	74.63	-0.1027	0.1027	0.0085	8754
20F	2605.79	1575.98	77.92	-0.1120	0.1120	0.0093	8366
20E	2535.65	1542.67	77.65	-0.1661	0.1661	0.0540	1437
21C	2651.57	1389.82	191.83	-0.1214	0.1214	0.0447	4289

Correnso South

23F	2700.77	968.79		-0.1116	0.1116		
2.13	2725.42	874.95	97.03	-0.0681	0.0681	0.0435	2229
23E	2774.82	972.51	74.15	-0.1156	0.1156	0.0040	18309
2.14A	2853.28	838.67	132.91	-0.0760	0.0760	0.0080	16648
23B	2856.49	949.79	84.77	-0.1194	0.1194	0.0038	22542
BANK1	2866.21	1023.25	74.10	-0.1041	0.1041	0.0153	4853
23C	2856.14	1068.01	45.88	-0.1759	0.1759	0.0718	639
2.25	2874.51	1097.26	34.54	-0.1203	0.1203	0.0556	621
23D	2861.42	1154.89	59.09	-0.1231	0.1231	0.0028	20979
2.24	2885.91	1215.47	65.35	-0.1326	0.1326	0.0095	6889
MATAURA1	2831.84	1250.81	64.60	-0.1211	0.1211	0.0115	5638
BM24	2794.55	1279.36	46.96	-0.1232	0.1232	0.0020	22964

SUPA

Mark	**x**	**y**	**Distance (m)**	**November 2022 (m)**	Abs	**Δh (m)**	**Tilt (1:X)**
BM25	2424.91	1100.25		-0.1470	0.1470		
34H	2233.59	970.56	231.14	-0.1235	0.1235	0.0235	9828
2.10	2143.92	950.39	91.91	-0.0597	0.0597	0.0637	1442
34C	1967.74	983.20	179.21	-0.2113	0.2113	0.1516	1182
34GC	2211.33	1119.52	279.14	-0.2085	0.2085	0.0028	97984
19BB	2191.56	1292.02	173.63	-0.3013	0.3013	0.0928	1870
19CB	2296.71	1381.40	138.00	-0.2887	0.2887	0.0126	10957
21O	2527.37	1356.34	232.01	-0.1470	0.1470	0.1417	1637
20C	2450.61	1413.86	95.92	-0.1618	0.1618	0.0148	6487
20D	2482.07	1473.48	67.41	-0.1443	0.1443	0.0175	3861
BM20A	2345.50	1484.90	137.05	-0.2456	0.2456	0.1012	1354

Above mine workings

Tilt greater than 1:1000

8.1 Favona

The locations surveyed in 2022 with tilt values between adjacent marks steeper than the 1:1000 criterion are highlighted in Table 10 above. The locations of the marks in relation to the Favona mine workings are shown in Figure 45 and Figure 46 below.

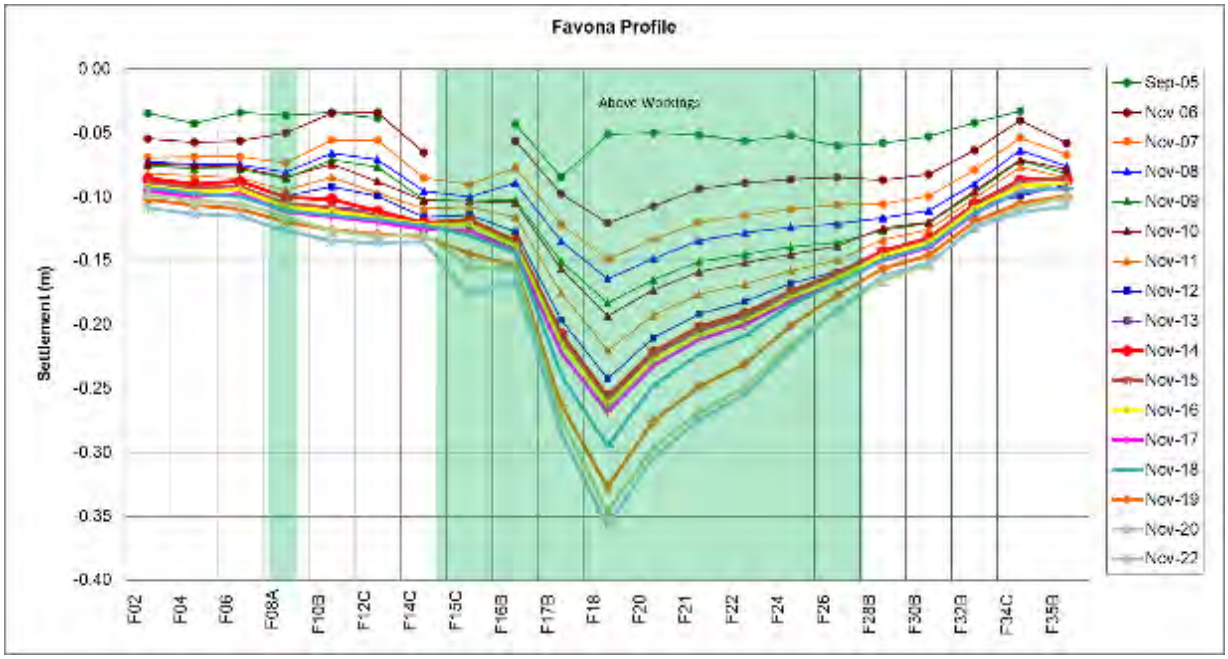


Figure 45: Favona Settlement Profile

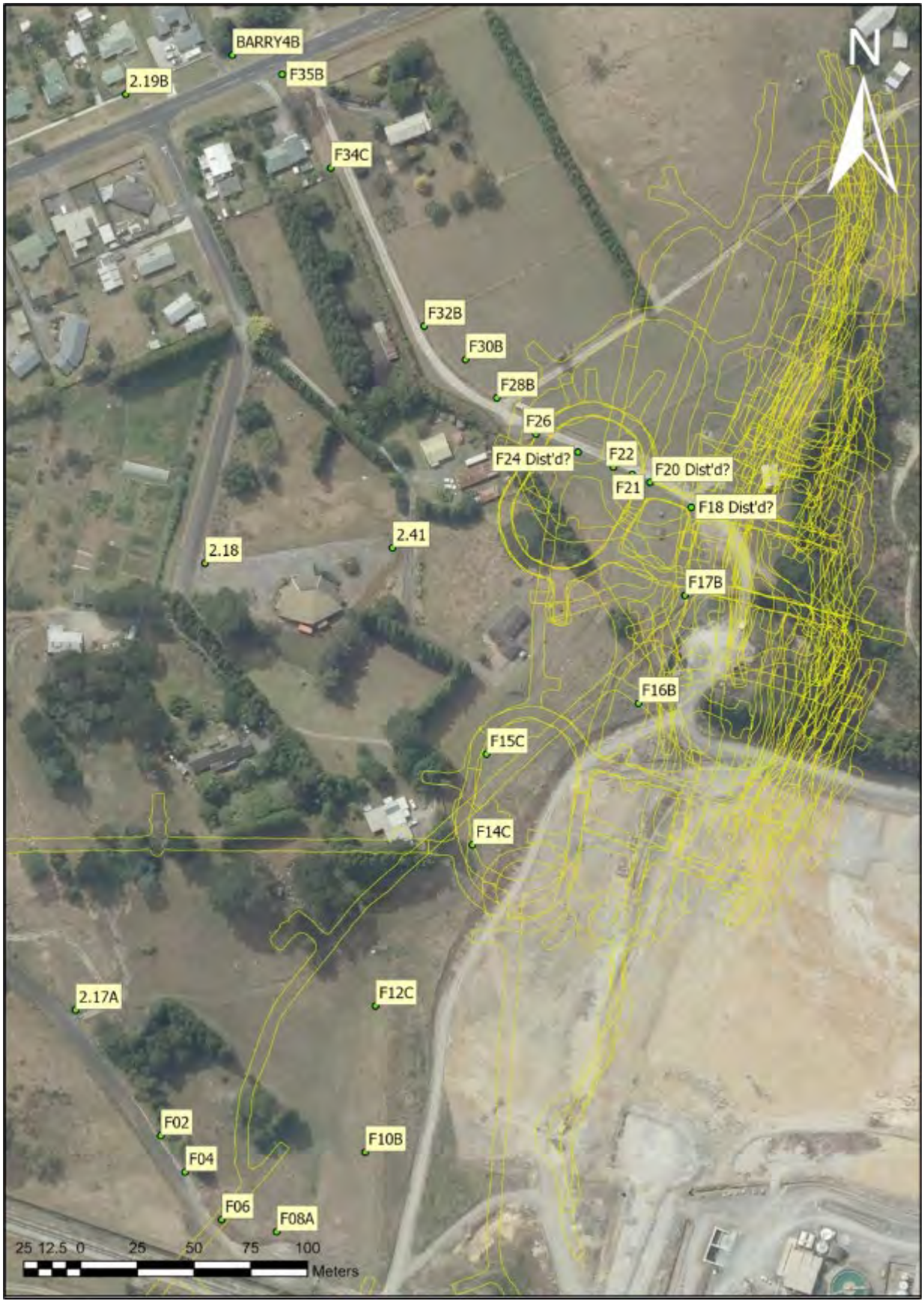


Figure 46: Favona Settlement marks and workings

Discussion

Favona Tilt

This area comprises farmland that is owned by the company. The footprint of this area is over 100m south of any non-company residences.

The tilt in this area has changed little since 2005, with small increases in tilt as the dewatered underground workings adjust compared to the adjacent land.

Tilt values greater than 1:1000 was previously assessed at six locations (F14C/F15C, F16B/F17B, F17B/F18, F18/F21, F21/F24 and F24/26). These are all located over or near underground workings.

The monitoring results for the survey marks above the Favona workings indicate no new tilt measurements in excess of 1:1000 since the May 2022 survey.

All Favona marks showed more settlement than the May 2022 survey, continuing the trend of slow settlement over time at this location.

Monitoring will continue, and this will determine any anomalous results that need to be addressed.

Note 1: The Favona tilt is calculated from the total settlement at each mark, without separation of any Martha effect. While the calculated tilt may not precisely reflect the tilt due to Favona alone, the discrepancy is considered to be minor.

Note 2: Not all Favona settlement markers are included in tilt calculations due to some being too close to one another. The minimum distance between marks included in tilt calculation is 25m.

8.2 Martha/North Wall Tilt

No tilt calculations greater than 1:1000 have been identified in the Martha/North Wall area during the November 2022 survey.

Although no tilts have been identified in Slevin Park, the area is swampy, historically infilled with poor material and has a previous history of slumping/subsidence. Therefore, close monitoring of this area will continue. We understand that HDC is also undertaking regular monitoring of this area.

From November 2022 additional Martha marks have been added to the tilt calculations to extend this analysis in line with the mine expansion in this area.

8.3 Correnso

Two tilt calculations greater than 1:1000 were identified in the Correnso South area during the May 2020 survey and remain in the November 2022 survey. The tilts are between marks 23C/2.25 and 23C/BANK1. Both tilts are due to a sharp increase in the measured settlement at mark 23C during the May 2020 survey. The rate of settlement recorded at 23C in subsequent survey events has been similar to nearby marks. The mark is noted by the surveyor as being near a watercourse. The mark may have been influenced by improved drainage nearby or may have been disturbed.

8.4 SUPA

No tilts greater than the 1:1000 trigger have been identified to date in the SUPA area.

Figure 47: Correnso Tilts and Underground Workings

8.5 Historic comparisons

The latest measurements at all survey marks are compared with their three previous survey readings to assess any trends (Table 11). It should be noted that tilt assessments vary depending on the separation distance of the markers. If marks have little tilt, large numbers can sometimes be generated. Additionally, marks can be reviewed which can result in revised corrections. This will modify tilt calculations.

Historic comparisons for Favona marks have not been included prior to the May 2021 reporting period due to the large number of Favona marks which were removed from tilt calculations following the November 2020 survey event, as agreed by Hauraki District and Waikato Regional Councils.

Table 11: Comparison of Tilt Calculations – May 2021 to November 2022

Mark	Tilt (1:X) May 21	Tilt (1:X) Nov 21	Tilt (1:X) May 22	Tilt (1:X) Nov 22
Favona				
F02	N/A	N/A	N/A	N/A
F06	8032	6510	7346	7230
F10B	3595	3232	3324	3526

F12C	11757	22374	21626	46502
F14C	207249	24632	22016	71101
F15C	1268	1117	988	981
F16B	8104	15596	8791	7037
F17B	444	441	440	437
F18	512	528	530	528
F21	381	370	368	352
F24	440	479	474	468
F32B	941	937	936	924
F34C	5745	6838	9156	7015
F35B	5250	5416	5293	9133

Martha

20BB	N/A	N/A	N/A	N/A
20AC	22366	28886	30459	81543
BM20A	1115	1087	1074	1045
20D	1543	1499	1496	1354
19CB	1581	1548	1547	1433
19BB	10534	10702	10619	10957
BM19B	552197	372363	1408494	115836
17CB	47329	38434	25938	46420
17BB	1278	1251	1251	1287
17AB	3546	3398	2923	3293
2.04B	*	*	*	8387
34BE	*	*	*	4878
BM17A	1352	1302	1315	1319
10BC	*	*	*	7366
10AB	*	*	*	68094
BM16	*	*	*	28711
10DC	*	*	*	14851
16BC	*	*	*	38642
BM9B	*	*	*	5756

* Fields added in November 2022 analysis due to mine expansion.

North Wall

27AB	N/A	N/A	N/A	N/A
26Q	3927	3948	3931	4139
26PB	10784	9529	8830	9086
26OB	3434	3285	3912	3169
26NC	6472	5810	5705	5638
26MB	6822	9174	9314	8972
26JB	7102	20949	17122	29526
BM26	5232	9447	10422	10009
3.09	11847	7935	10197	7524

Correnso

25E	N/A	N/A	N/A	N/A
25B	2515	2619	2305	2340
25I	4074	5890	9919	7545
24H	24348	8266	119177	110320
24B	19277	17453	24684	11006
24G	5780	5602	6131	5826
24L	6524	31210	33754	15847
24AC	9065	17440	18201	11612
24F	6184	7874	7747	9057
BM24	3195	3413	3137	3413
24E	7338	7564	7434	7982
24DC	9143	401372	4387	6676
24I	118573	4583	4619	7868
25H	3827	17175	14561	6881
25CB	89187	632001	3491021	289758
25G	77139	60071	31475	60073
25F	34298	27346	31537	64471
25B	10012	11751	7651	6379
BM25	5446	5531	4710	4899
25E	7016	7532	6929	6808

25A	26544	25590	26886	68538
25D	43536	44038	158714	47468
21DC	7074	5713	5661	4903
21N	2517	1796	5699	4442
21C	13464	7583	3224	5102
21M	7025	5335	4828	4625
21BC	2830	3061	3283	3512
21EB	34905	39943	53565	50682
24K	2635	2753	2623	2623
24J	3543	1657	23863	7736
24DC	2852	1571	7762	3717
22F	43018	104892	14642	19652
22C	2454	2322	2507	2507
22GB	1420	1438	1438	1465
22BC	5192	5177	4998	4963
22I	64234	15351	4528	3684
22H	3685	4769	7120	10073
21P	2264	8819	33472	7976
21FB	2148	3110	2762	3253
21Q	63855	47393	89814	120674
21GC	17104	15899	16513	14303
22KB	7505	8002	8662	7531
2.29B	2506	2630	2325	2139
22J	4769	4892	5242	5798
22I	1758	2092	2364	3307
22H	3685	4769	7120	20512
21EB	5504	5730	11015	11015
21BC	34905	39943	53565	50682
BM21	10512	9660	9073	8754
20F	9189	8645	6540	8366
20E	1396	1342	1434	1437
21C	4189	4045	4097	4289

23F	N/A	N/A	N/A	N/A
2.13	9703	11250	1102	2229
23E	14685	21492	17445	18309
2.14A	19837	14253	37875	16648
23B	17122	54321	22670	22542
BANK1	6798	5122	4984	4853
23C	736	738	691	639
2.25	603	632	625	621
23D	7986	10711	17816	20979
2.24	24203	19298	8847	6889
MATAURA1	4581	5227	5738	5638
BM24	33546	21893	17108	22964

SUPA

BM25	N/A	N/A	N/A	N/A
34H	1543	11841	11210	9828
2.10	2944	5800	13938	1442
34C	4484	6228	1946	1182
34GC	1793	3002	61201	97984
19BB	10534	1933	1926	1870
19CB	1919	10702	10619	10957
21O	4370	1724	1729	1637
20C	254246	4049	4032	6487
20D	5930	2962	3056	3861
BM20A	12101	1499	1499	1354

Above Mine Workings

Tilt Greater than 1:1000

No anomalous trends were identified. Some marks have shown an overall trend of increasing tilt; however, none are currently of concern.

9 COMPLAINTS

The company maintains a complaints database in accordance with consent condition 13f. There were no complaints received during 2022 in relation to dewatering or settlement.

A number of other property damage complaints or enquiries were made during the year, generally in relation to impacts of blast vibration, but also included perceived concerns of settlement. As a result, some of the properties were inspected to determine likely sources. No evidence was found of land deformation as a consequence of mining activities.

10 CONTINGENCY ACTIONS AND FUTURE IMPACTS

No consent or management plan settlement trigger has been activated.

11 UNDERGROUND WATER QUALITY

Underground dewatering water is sampled at the Water Treatment Plant. This is a combination of underground water from Favona, Trio, Correnso, SUPA, Martha mines and treated service water, but gives a general indication of underground water quality. Additionally, Environmental staff endeavour to collect quarterly water samples from four locations underground.

The only mine backfilled and considered near its final closure state is the Favona underground mine. Separate sampling of Correnso and Favona underground water from sumps at the lowest accessible points in each mine began during 2018. Sampling from the two Martha Underground bores, PC1 and PC2, began in 2021.

During the reporting period, results from the composite underground dewatering had stable pH and EC values averaging 6.5 units and 276 mS/m respectively. Sulphate values averaged 1796 g/m^3. Iron averaged 7.9 g/m^3 and manganese 17.2 g/m^3. Other metal concentrations were low (Figure 48; Appendix E).

Underground sites were sampled eight times in 2022. These included:

- 705 level Correnso x0 - dry
- 800 level Favona x2
- 800 level PC1 bore x3
- 800 level PC2 bore x3

Some sites were not able to be sampled due to dry sumps, the bore not running, or access issues. The composite underground mine water was sampled monthly throughout the period.

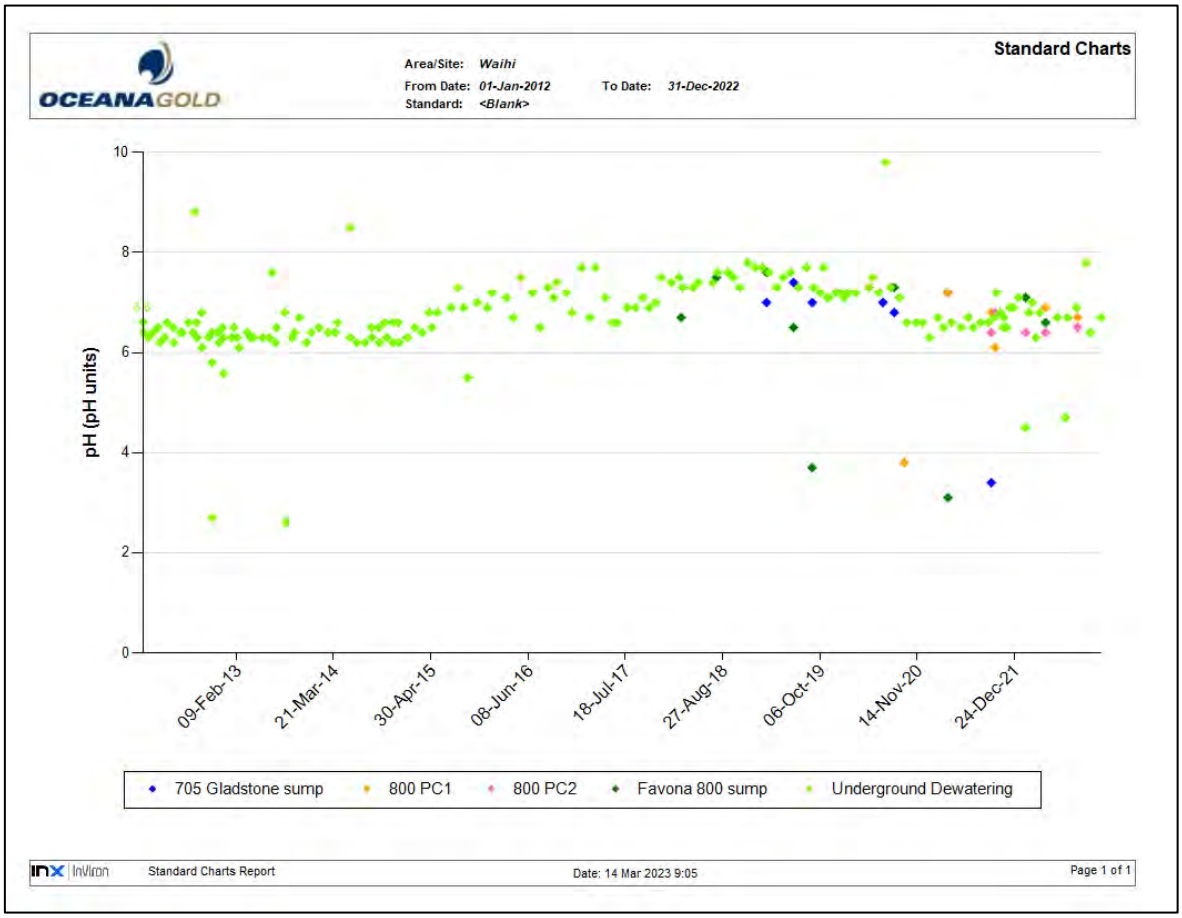
From the sites listed above, the single Favona sample had the highest EC and sulphate (328 mS/m and 2300 g/m^3) (Figure 48). All other samples returned similar results. The eight samples recorded averages of:

- EC : 286 mS/m
- Sulphate: 1884 g/m^3
- pH: 6.3.

Figures 43 to 46 show Piper Diagrams for the various types of underground water. All water types have a similar make up of cation and anions. UG dewatering and Correnso and at times Favona are calcium sulphate waters and PC01 and at times Favona, are calcium magnesium sulphate waters.

While elevated levels of some metals are noted, all underground water is currently pumped to the Water Treatment Plant.

Figure 53 displays a Piper diagram for treated water. Treated water is used a service water underground, as discussed in Section 4. Treated water quality is extremely consistent as it needs to comply with strict water quality parameters prior to river discharge. In 2022 service water made up 7% of the dewatering volume total and is unlikely to have any effect on groundwater quality. Water quality results are provided in Appendix E.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6
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2
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21-Mar-14
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08-Jun-16
18-Jul-17
27-Aug-18
06-Oct-19
14-Nov-20
24-Dec-21
705 Gladstone sump
800 PC1
800 PC2
Favona 800 sump
Underground Dewatering
InVironStandard Charts Report
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Page 1 of 1

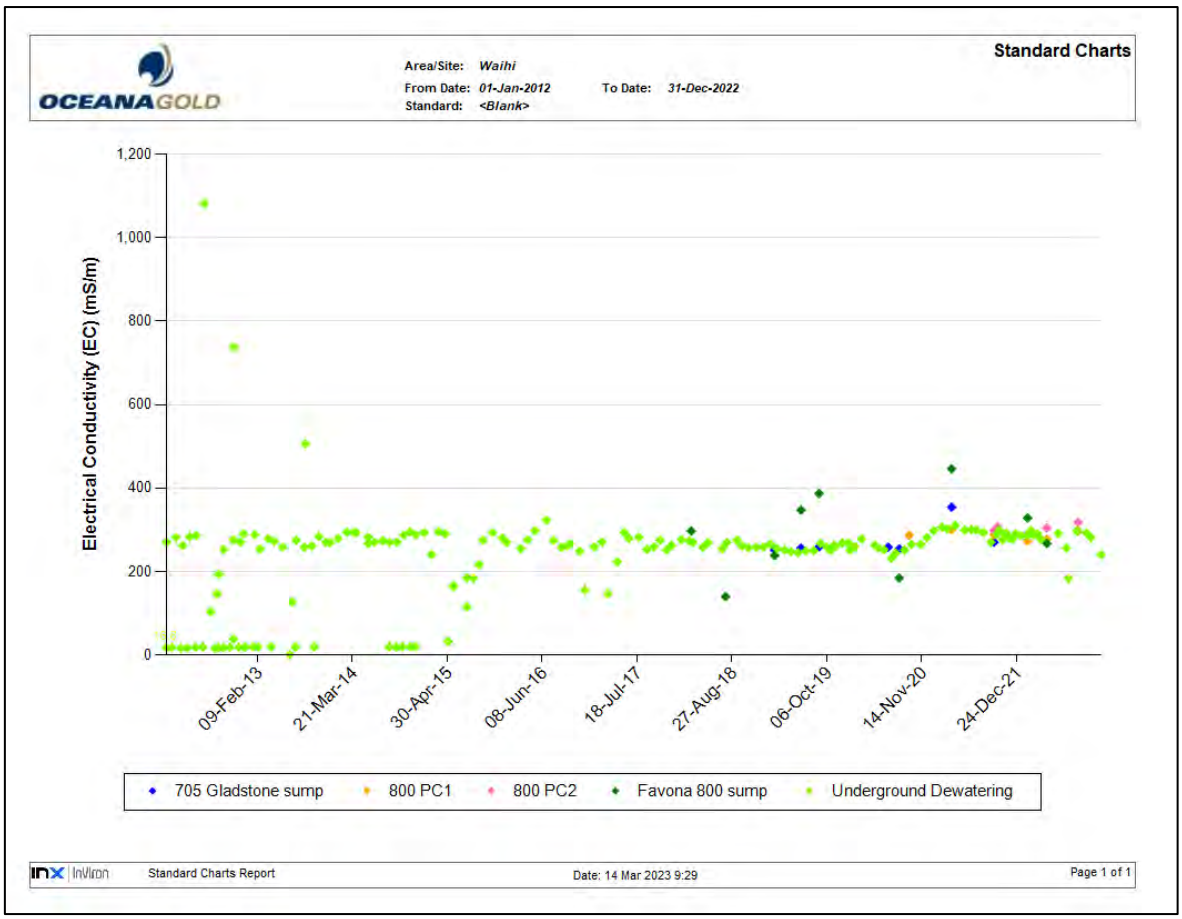
Standard Charts
Area/Site: Waihi
From Date: 01-Jan-2012
To Date: 31-Dec-2022
Standard: <Blank>
Electrical Conductivity (EC) (mS/m)
1,200
1,000
800
600
400
200
0
09-Feb-13
21-Mar-14
30-Apr-15
08-Jun-16
18-Jul-17
27-Aug-18
06-Oct-19
14-Nov-20
24-Dec-21
705 Gladstone sump
800 PC1
800 PC2
Favona 800 sump
Underground Dewatering
InVironStandard Charts Report
Date: 14 Mar 2023 9:29
Page 1 of 1

Figure 48: Underground sample sites – Summaries of Key Chemistry

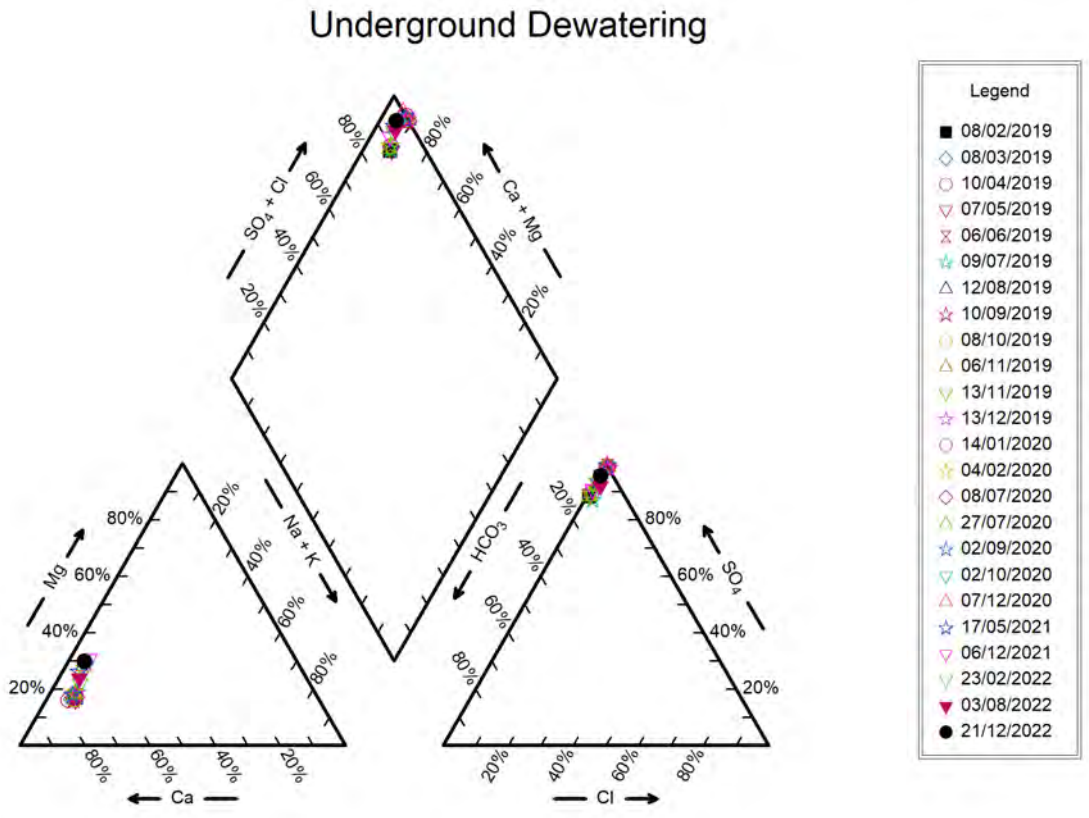

Figure 49: Underground Dewatering Piper Diagram

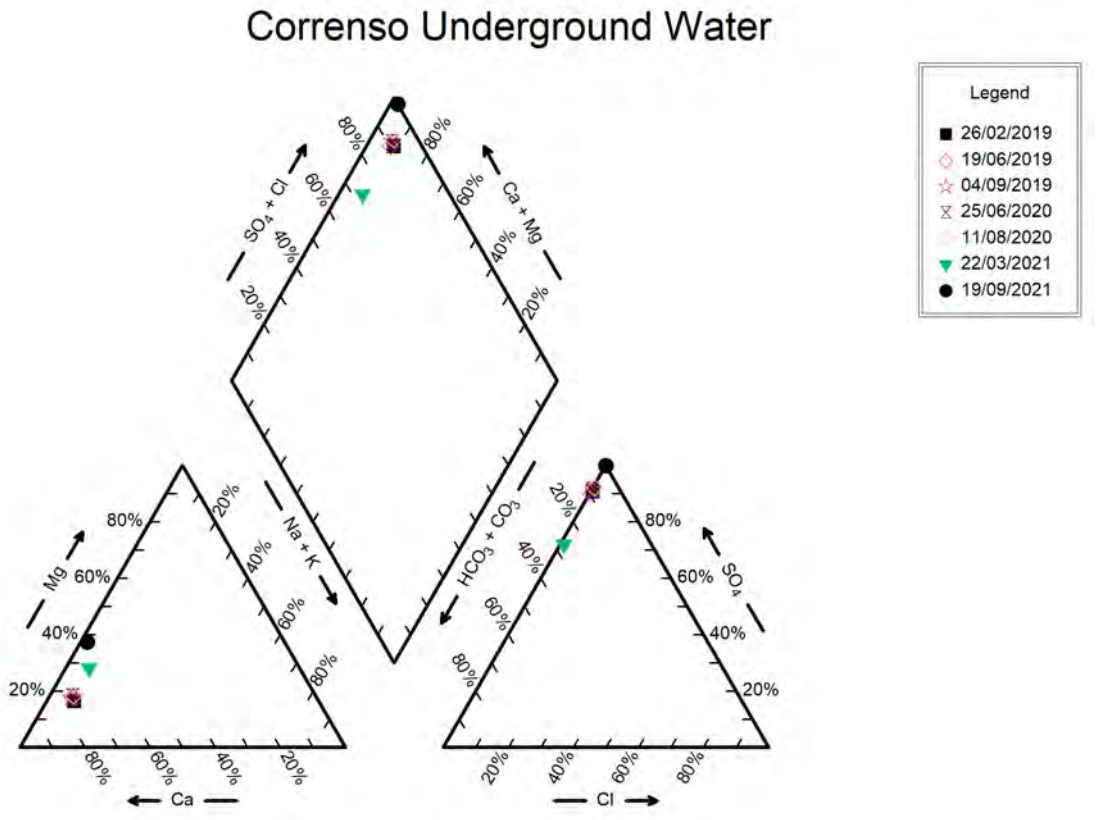

Figure 50: Correnso Underground Piper Trilinear Diagram

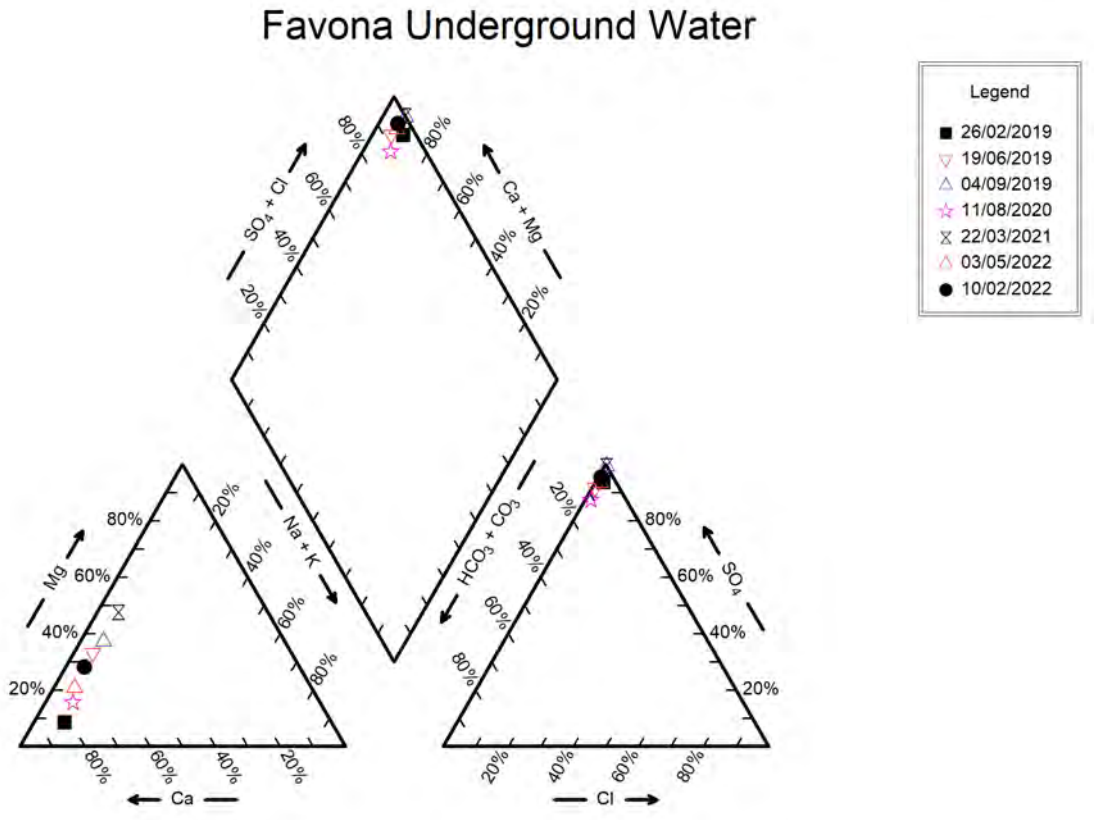

Figure 51: Favona Underground Piper Trilinear Diagram

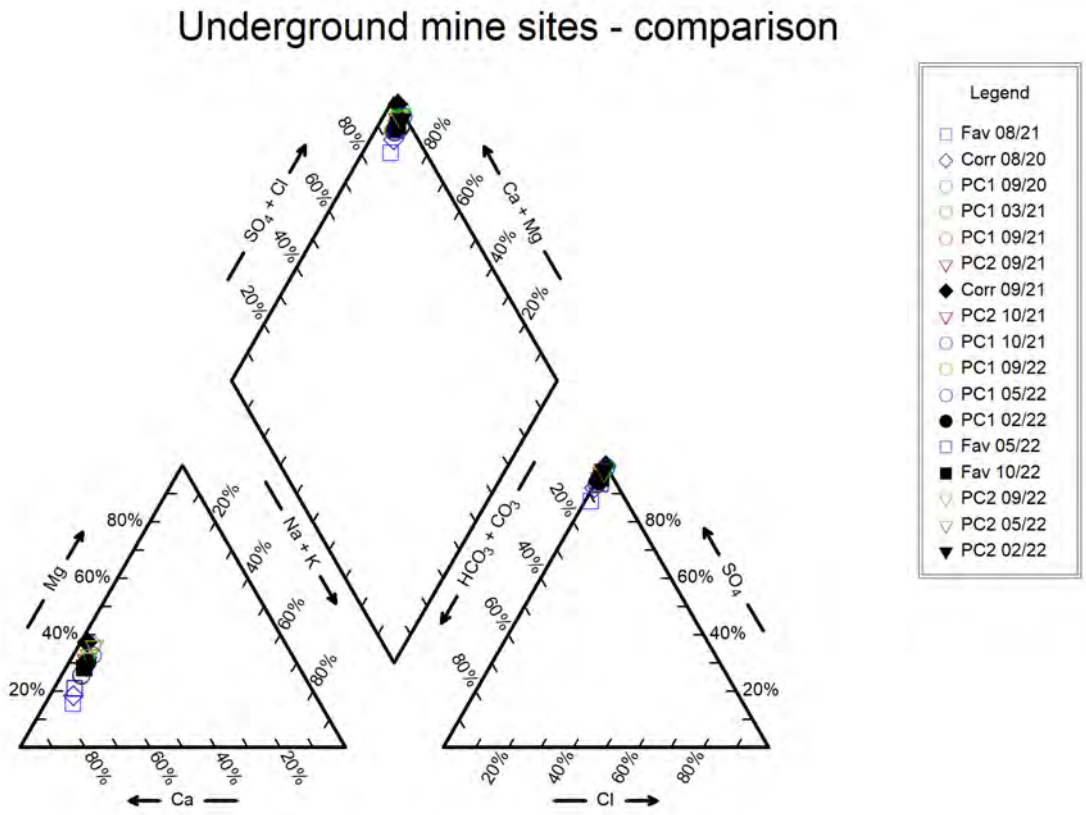

Figure 52: Underground Comparison Water Piper Trilinear Diagram

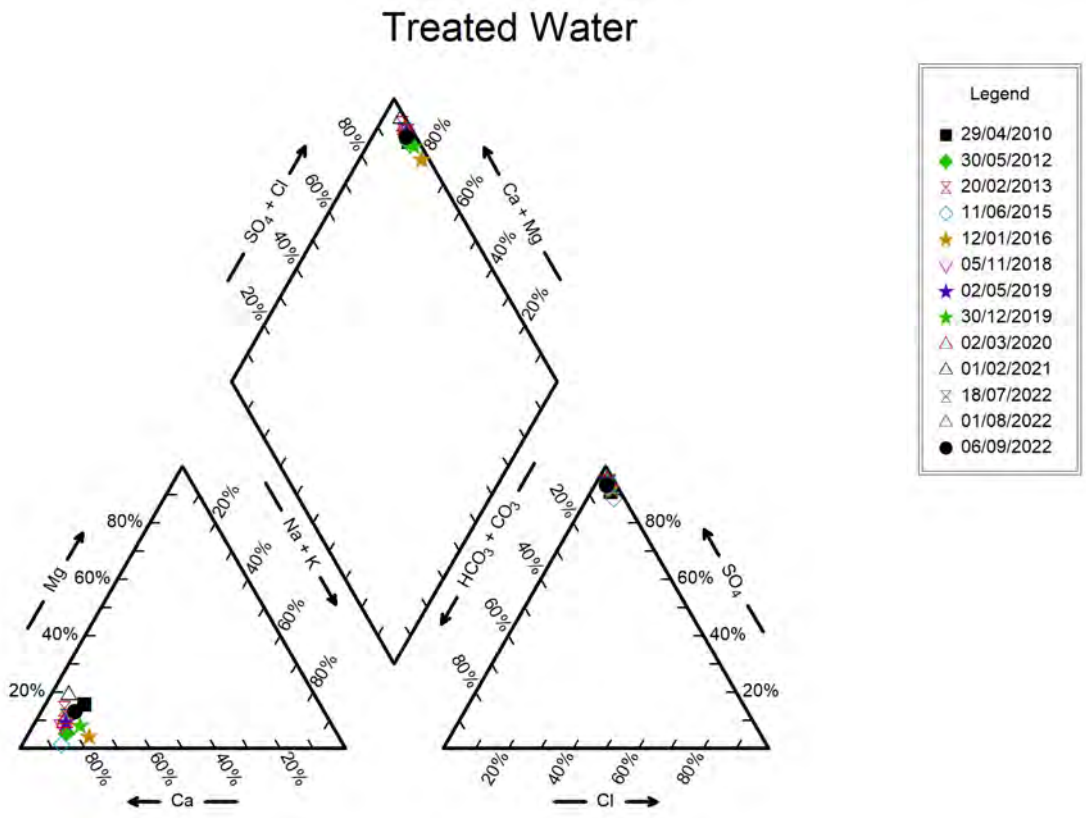

Figure 53: Treated Water Piper Trilinear Diagram

12 FUTURE DEWATERING PREDICTIONS

At peer review 2021 it was raised that future dewatering predictions should be included in this report. As a result of this recommendation OGNZL commissioned GWS Ltd to assess the pumped groundwater volume predictions (Appendix G).

The key dewatering dates are currently expected to be as follows:

- 23/12/2023 dewater below 634 mRL
- 26/04/2025 dewater to 527 mRL
- 01/11/2027 dewater to 500 mRL

GWS Ltd assessed that an increased pumped water volume will be required to dewater and lower the deep groundwater level in the MUG area to 500 mRL. It was estimated that the pumped groundwater volume would need to increase from approximately 4,800 m^3/d to approximately 7,000 m^3/d to achieve this level of drawdown. It was further estimated that a pumped groundwater volume of around 6,000 m^3/d would be required to hold the groundwater level at this target elevation.

The above estimates were validated by comparing to historic mine pumping rates.

13 IMPROVEMENT ACTIVITIES

Works that have been undertaken at the site during 2022 to improve environmental monitoring performance include:

- Review of the Martha piezometer network to assess effectiveness.
- Installation of two new piezometers in the Project Martha area and upgraded to telemetry monitoring.
- Installation of a VW piezometer in the underground Martha mine to ~500 mRL.
- Remodel of MUG Dewatering rate work scope approved.

Proposed improvement activities to be undertaken in 2023 include:

- Develop a groundwater quality baseline monitoring program.
- Further review of the Martha piezometer network to assess effectiveness.
- Predict dewatering impacts post closure.

14 PEER REVIEW RECOMMENDATIONS 2022

This section summarises the peer review recommendations from the previous annual reporting period and how they have been or are going to be addressed in this report (Table 12).

Table 12: 2022 Peer review recommendations and actions

Recommendation	Action
8.2 The Peer Reviewer recommended that the basal tip of proposed P122 located near the Rex orebody be 50 m (see memorandum in Attachment A) or deeper and needs further evaluating for actual depth below dry workings.	Section 6.3.5 P122-4 drilled to 180m bgl.
8.4 The Peer Reviewer strongly recommends the inclusion of deeper piezometric data to be included on these conceptual hydrogeological sections progressively as data becomes available. This includes piezometric/groundwater levels from underground monitoring infrastructure (piezometers/dewatering bores) within the Andesite used to assess underground dewatering, collected by the geotechnical department.	Limited data. To be potentially included in 2023 report Section 6.3.5 interprets new underground piezometer data
8.6 The Peer Reviewer recommends providing a section after the “Introduction” in the report on climatic conditions for last year and historic trends of seasonal or long-term rainfall.	Section 2
8.6 The Peer Reviewer recommends a plot showing annual/seasonal rainfall totals and possibly a Cumulative Rainfall Departure (CRD) plot	Section 2
8.7 The Peer Reviewer recommend the water level plan should show water level at the end of the reporting period, i.e. December 2021 and also at the end of last reporting period, i.e. December 2020, so that the change in dewatering level can be appreciated.	Section 5.1
8.8 Although not part of consent conditions, the Peer Reviewer recommends either the simple analytical model is recalibrated or preferably a numerical groundwater model is developed to provide more reliable predictions of drawdown rates and pumping rates. Piezometric data from Waihi monitoring network and also collected from underground investigations (installation of VWPs), pumping dewatering levels and actual pumping rates will assist in calibration process. The numerical groundwater model also can be used for predictions of groundwater recovery, levels and flows at closure for the Rehabilitation and Closure Planning. The Peer Reviewer understands that there is a groundwater component in numerical geotechnical modelling conducted recently for the OGNZ Geotechnical Group. This should be reviewed to determine the relevance to the D&S reporting.	Appendix G MUG Dewatering Predictions
8.8 Although not part of consent conditions, the Peer Reviewer suggests this proposed water level investigation is outlined in the Dewatering and Settlement annual reporting as planned future works.	Section 12

This water level data from the pumping bores and piezometer(s) is recommended to be included on Figure 5 "Dewatering water level and rainfall" and plotted on the hydrogeological conceptual sections providing an understanding of depressurisation of the deep andesite from mining activities, and response to high rainfall recharge events.	To be included 2023 report
8.11 The Peer Reviewer recommends the inclusion of a time-series hydrograph of the Favona piezometers in this section	Section 6.3.6 Figure 21
8.12 The Peer Reviewer recommends a table be included with the depth of bore and inferred screened geological formation. Also, the Peer Reviewer recommends rainfall data (and/or CRD) by included on the plot in Figure 29 so that seasonal or long-term trends in water levels can be shown	Section 6.3.8 Bore depths and screens unknown. Figure 31 rainfall included
8.12 The Peer Reviewer requests the reasons why private bores can no longer be monitored be stated in the DW&S report.	Section 6.3.8
8.14 The DW&S report requires the following to meet consent conditions: - Discussion of the chemistry of shallow and deep aquifers from monitoring data collection. - Prediction of future impacts including post closure effects based on monitoring data and contingency/remedial activities.	GWS Ltd commissioned to select wells GWS Ltd commissioned

15 RESOURCE CONSENT EVALUATION

Comments on compliance with all conditions of the Martha, Favona, Trio, Correnso and Project Martha consents including any reasons for non-compliance or difficulties in achieving conformance with the consent conditions are summarised in Table 13. The Correnso/Golden Link take 124860 has been superseded by Project Martha Water Permit 139551.

Table 13 – Favona, Trio, Correnso, SUPA, Project Martha Consent Condition Compliance Assessment

Description	Consent (Condition)	Compliance	Comment
Favona Dewatering and Settlement Plan	**109742 - 109746**		
Favona groundwater take	109742 (3)	Full	Favona discharge plumbed into main dewatering line, new meter installed on Favona line.
Divert and discharge ground and surface water (farm run-off and intercepted groundwater) from around the (Favona) project area.	109743	Full	Non-mine run-off has been diverted to natural drainage.
Discharge waste rock and ore onto land in temporary surface stockpiles and to discharge seepage from the temporary stockpiles into ground.	109744	Full	Stockpile area design & construction. Water quality monitoring in manholes and shallow bores (the subject of a separate report – *Favona Water Quality Monitoring Annual Report.*
Discharge waste rock into land underground in the project area as backfill and to allow degraded quality groundwater to discharge from the flooded workings in the project area into the surrounding ground post closure.	109745	Full	Favona back-filling completed. Dewatering being maintained
Discharge treated mine water from the Martha Mine Water Treatment Plant to ground in association with flooding the underground mine on completion of the project.	109746	Full	Favona Water Quality Monitoring Annual Report
	109742 – 109746 Schedule 2		
Water Management Plan	(1)		Under separate negotiation
Prior to exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Settlement, Dewatering and Water Quality Monitoring Plan	(2)	Full	Dewatering and Settlement Monitoring Plan, April 2019
The monitoring regime shall be designed to assess the effects of:		Full	Defined in this document.

a) mine dewatering on the regional groundwater system, b) mine dewatering on settlement; c) leachate from stockpiles containing potentially acid forming material on shallow groundwater quality, and d) the discharge of degraded-quality water from the backfilled and flooded workings on groundwater quality.			c) Reported annually in Favona Water Quality Monitoring Report. d) Combined dewatering sample taken monthly
Final details of the monitoring locations are to be agreed with the Council. The Plan shall also provide trigger limits that will initiate the implementation of contingency mitigation and/or monitoring measures and shall detail any linkages with the Martha pit operation.		Full	Section 5 Stockpile water quality bores agreed in Nov 2006
The exercise of this consent shall be in accordance with the Plan as approved by the Council. The Plan shall be reviewed, and updated as necessary, by the consent holder at least once every two years. Any updated Plan shall be promptly forwarded to the Council for approval and following approval the updated Plan shall be implemented in place of the previous version.		Full	Consent activated following approval of Plan. Combined plan, approved by WRC, May 2023
In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Settlement, Dewatering and Water Quality Monitoring Plan, then the conditions of this consent shall prevail.		Full	No inconsistency identified
In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations, or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Council in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then:	(3)	Full	Section 7 Correspondence in Tilt Reports
a) explain the cause of the non-conformance,			Section 7
b) agree with the Council on the appropriate settlement contingency measures to be implemented as described,			Propose ongoing monitoring
c) implement settlement contingency measures as appropriate,			Not considered necessary as on company owned farmland
d) advise the Council on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.			Propose ongoing monitoring
The report shall include at least the following information:	(4)		
a) volume of groundwater abstracted		Full	Section 4
b) data from monitoring undertaken during the previous year including groundwater contour plans		Full	Section 5
c) an interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure		Full	Section 5 & 9

effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions.			
This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information.		Full	GWS Ltd & OGNZL staff
d) any contingency actions that may have been taken during the year.		Full	Section 9
e) comment on compliance with all conditions of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of this consent.		Full	This section
Trio Dewatering and Settlement Plan - General conditions	**121416 - 121418, 121446 & 121447**		
Prior to exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Settlement, Dewatering and Water Quality Monitoring Plan	Schedule 1 (5)	Full	Combined plan Approved by WRC May 2023
The monitoring regime shall be designed to assess the effects of: i) dewatering on the regional groundwater system, ii) dewatering on settlement; iii) the discharge of degraded-quality water from the backfilled and flooded workings on groundwater quality.		Full	Defined in plan iii) No significant flooded workings as yet.
Final details of the monitoring locations are to be agreed with the Council. The Plan shall also provide trigger limits that will initiate the implementation of contingency mitigation and/or monitoring measures and shall detail any linkages with the Martha pit operation.		Full	Defined in approved Plan
The exercise of this consent shall be in accordance with the Plan as approved by the Council. The Plan shall be reviewed, and updated as necessary, by the consent holder. Any updated Plan shall be promptly forwarded to the Council for written approval and following approval, the updated Plan shall be implemented in place of the previous version.		Full	Consent activated following approval of Plan Jul 2014
In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Settlement, Dewatering and Water Quality Monitoring Plan, then the conditions of this consent shall prevail.		Full	No inconsistency identified
Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information:	Schedule 1 (6)		
i) volume of groundwater abstracted		Full	Section 4
ii) data from monitoring undertaken during the previous year including groundwater contour plans		Full	Section 5
iii) an interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over		Full	Section 5 & 9

the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions.			
This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information.		Full	GWS Ltd & OGNZL staff
iv) any contingency actions that may have been taken during the year.		Full	Section 9
v) comment on compliance with all conditions of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of this consent.		Full	This section
Monitoring - Tilt:	Schedule 1 (7)		
In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations, installed in accordance with the Settlement, Dewatering and Water Quality Monitoring Plan required pursuant to condition 2 above, or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Council in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then:		Full	Section 7
i) explain the cause of the non-conformance,			Section 9
ii) agree with the Councils on the appropriate settlement contingency measures to be implemented,			Propose ongoing monitoring
iii) implement settlement contingency measures as appropriate,			Not considered necessary
iv) advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.			Propose ongoing monitoring
The consent holder shall provide to the Council an annual Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information:			
a) The volume of groundwater abstracted;		Full	Section 4
b) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;		Full	Section 5
c) An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on		Full	Annual Report reviewed by GWS Ltd and Engineering Geology

actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information;			
d) Any contingency actions that may have been taken during the year; and		Full	Section 9
e) Comment on compliance with Conditions 27 to 34 of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.		Full	This section.
The report shall be forwarded in a form acceptable to the Council.			
Advice note:			
The Dewatering and Settlement Monitoring Report shall be consistent with the Dewatering and Settlement Monitoring Report prepared as a condition of the ground dewatering consent (RC 124860) granted by the Waikato Regional Council.			
Golden Link Project Area Groundwater Take – General conditions	**124860**		
Monitoring - Abstraction Volume 4.The consent holder shall monitor the volume of water abstracted on a weekly basis and shall report this to the Waikato Regional Council on a quarterly basis. **Dewatering and Settlement Monitoring Plan** 5. Prior to the exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Dewatering and Settlement Monitoring Plan. The purpose of this Plan is to monitor and assess the effects of the activities on land settlement and the groundwater hydraulic regime, and also to detail the contingency measures that will be actioned should groundwater or surface settlement triggers be exceeded. The Plan shall, as a minimum, provide an overall description of the groundwater and settlement monitoring system and the measures to be adopted, including contingency measures, to meet the objectives of the groundwater and settlement management system, as proposed in the consent application. The monitoring regime shall be designed to assess the effects of: (i) dewatering on the regional groundwater system; and (ii) dewatering on settlement; and (iii) the discharge of degraded quality water from the backfilled and flooded workings on groundwater quality. Monitoring locations are to provide appropriate resolution of surface tilt relative to the scale of surface infrastructure and final details are to be agreed with the		Full Full Full Full	Section 4 Latest plan April 2019 Defined in plan iii) No significant flooded workings as yet. Defined in plan

Councils. The Plan shall also provide trigger limits that will initiate the implementation of contingency mitigation and/or monitoring measures and shall detail any linkages with the Martha pit operation.			
The exercise of this consent shall be in accordance with the Plan as approved by the Council. The Plan shall be reviewed and updated as necessary by the consent holder. Such updated Plans shall relate to the Correnso Mine or to any new mine within Area L. Any updated Plan shall be promptly forwarded to the Council for written approval and following approval, the updated Plan shall be implemented in place of the previous version.		Full	Plan May 2023
In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Dewatering and Settlement Monitoring Plan, then the conditions of this consent shall prevail.			
Dewatering and Settlement Monitoring Report 6.The consent holder shall provide to the Councils an annual Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information: (i) The volume of groundwater abstracted; (ii) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network; (iii) An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information; (iv) Any contingency actions that may have been taken during the year; and (v) Comment on compliance with condition 5 of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent. The report shall be forwarded in a form acceptable to the Councils.		Full Full Full Full Full	Section 4 Section 5 Section 5 & 9 Section 9 Section 12
Monitoring - Tilt 7. In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations installed in accordance with the Dewatering and Settlement Monitoring Plan required pursuant to condition 5 of this consent, and such tilt is caused by the de-watering and/or there is a significant variance from the predicted settlement rates, the consent holder shall		Full	Section 7

notify the Councils in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then engage in a process with the Councils: (i) explain the cause of the non-conformance, (ii) Propose appropriate settlement contingency measures for discussion with Councils and agree with the Councils on the appropriate settlement contingency measures and the timing for their implementation as described, (iii) implement agreed settlement contingency measures as appropriate within the agreed time limit, (iv) advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.			Section 9 Propose ongoing monitoring Not considered necessary Propose ongoing monitoring
Monitoring – Water Quality 8.The consent holder shall monitor throughout the period of operation, the chemistry of the groundwater, pit run-off and pit discharge water abstracted from the open pit. The monitoring data is to be used to correlate these inflows with pit lake water quality predictions, and to provide a database for input into the closure plans. The sampling parameters and frequencies shall be described in the Martha Extended Project dewatering consent (unless agreed otherwise with the Waikato Regional Council) with the results forwarded to the Waikato Regional Council on an annual basis. **Other Water Users** 9.If, in the opinion of the Waikato Regional Council, the exercise of this consent adversely affects stock, domestic or other water supplies, then the consent holder shall, at its own cost, be responsible for providing to the owner of those water supplies an alternative equivalent water supply, to the satisfaction of Waikato Regional Council. The consent holder shall be responsible for making an alternative water supply available within 12 hours of being directed to do so by the Waikato Regional Council.		Partial Full	Pit sampling limited, dewatering sampled monthly. Favona and Correnso Underground WQ measured separately. Underground dewatering from Project Martha bores commenced.
Project Martha – Common Conditions	**202.2018.00000857.001**		
Dewatering and Settlement Monitoring Plan 14. The objectives of the groundwater and settlement management system shall be to ensure that dewatering operations do not give rise to surface instability and differential settlement beyond that authorised by this consent. 15. Two months prior to dewatering below 700 m RL (mine datum), the consent holder shall prepare, and submit to the Councils for their certification, a Dewatering and Settlement Monitoring Plan. The purpose of the Dewatering and Settlement Monitoring Plan is to monitor		Full	Dewatering and Settlement Monitoring Plan approved May 2023 (Conditions 14-18)

and assess the effects of the activities on land settlement and the groundwater hydraulic regime, and also to detail the contingency measures that will be actioned should groundwater or surface settlement triggers be exceeded. 16 The Plan shall, as a minimum, provide an overall description of the groundwater and settlement monitoring system and the measures to be adopted, including contingency measures, to meet the objectives of the groundwater and settlement management system set out in Condition 14 of this schedule. The monitoring regime shall be designed to assess the effects of: a. Dewatering on the regional groundwater system; and b. Dewatering on settlement. 17. Monitoring locations are to provide appropriate resolution of mine inflows and pumping, groundwater levels (both for shallow and deep aquifers) and ground surface tilt relative to the scale of surface infrastructure, throughout the area within the maximum extent of the groundwater cone of depression and particularly in the areas above and adjacent to the mining activities provided for in this consent. Final details are to be agreed with the Councils, but are to include additional piezometers and extensometers located along the line of upper level workings in the Rex Orebody. The Dewatering and Settlement Monitoring Plan shall also provide groundwater and settlement trigger limits that will initiate the implementation of contingency mitigation and / or monitoring measures and shall detail any linkages with the operation of the Martha Pit and Martha Underground Mine. 18. The exercise of this consent shall be in accordance with the Dewatering and Settlement Monitoring Plan as certified by the Councils. The Dewatering and Settlement Monitoring Plan shall be reviewed and updated as necessary by the consent holder. Any updated Dewatering and Settlement Monitoring Plan shall be promptly forwarded to the Councils for certification, and following this process, the updated plan shall be implemented in place of the previous version. 19. In the event that a tilt greater than 1 in 1,000 occurs between any two network monitoring locations installed in accordance with the Dewatering and Settlement Monitoring Plan required pursuant to Condition 15 of this schedule, or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Councils in writing within 20 working days of receiving the results of the monitoring. The consent holder shall then: a. Explain the cause of the non-conformance; b. Propose appropriate settlement contingency measures to the Councils and the timing of implementation thereof by the consent holder; c. Implement settlement contingency measures as appropriate within the agreed time limit; and		Full	Notification of tilts greater than 1:1000 provided in Tilt Report No non-conformances

d. Advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation. 20. The consent holder shall as a matter of urgency, advise the Councils of any significant anomalies identified by the regular reading of groundwater levels in the piezometer network. Such advice is to include an explanation of the anomalous results and actions proposed to address any issues identified. This report is to be provided to the Councils within 10 working days of the anomalous results being identified. A "significant anomaly" is defined as a drop in groundwater level greater than the seasonal variation in piezometers within the alluvium and younger volcanic rocks and a drop of 15 m or more in the recordings from piezometers tapping the upper 50 m of Andesite over a one month period. **Dewatering and Settlement Monitoring Report** 22. The consent holder shall provide to the Councils (within one month of an agreed anniversary date) an annual Dewatering and Settlement Monitoring Report. The report shall, as a minimum, provide the following information: a. The volume of groundwater abstracted; b. The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network; c. An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of the future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions, this analysis shall be undertaken by a party appropriately experienced and qualified to assess the information; d. Any contingency actions that may have been taken during the year; and e. Comment on compliance with Conditions 14 to 21 of this schedule including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent. f. The report shall be forwarded in a form acceptable to the Councils.		Full Full Full Full Full Full	 Section 4 Sections 5, 6 and 9 Section 9 This section
Project Martha Groundwater take permit **Dewatering Level** 1. The exercise of this consent shall not result in groundwater lowering to a level below 500mRL. **MONITORING**	**139551**	Full	Groundwater level not lowered below 500 mRL.

2. Upon commencement of this consent, the consent holder shall monitor the volume of water abstracted on a weekly basis and shall report this to the Waikato Regional Council.		Full	Abstraction volumes reported to Council via Hyquest,
3. Upon the first exercise of this consent the consent holder must telemeter – via a telemetry system developed after liaison with the Waikato Regional Council to ensure that the telemetry system is compatible with the Waikato Regional Council telemetry system standards and data protocols – continuous 15 minute values of: gross take volume (in units of cubic metres). The data must be reported once daily to the Waikato Regional Council via the telemetry system. There must be 96 values, respectively, per daily report. When no water is being taken the data must specify the gross take volume and calculated net take volume as zero.		Full	As above.
4. The consent holder shall monitor the chemistry of the water abstracted under this consent. Prior to the commencement of this consent the sampling parameters and frequencies shall be agreed with the Waikato Regional Council, with the results forwarded to the Waikato Regional Council on an annual basis. The consent holder may change the sampling parameters and frequencies with the agreement of the Waikato Regional Council.		Full	Appendix E
OTHER WATER USERS			
5. If, in the opinion of the Waikato Regional Council, the exercise of this consent adversely affects any existing stock, domestic or other water supplies, then the consent holder shall, at its own cost, be responsible for providing to the owner of those water supplies an alternative equivalent water supply, to the satisfaction of Waikato Regional Council. The consent holder shall be responsible for making an alternative water supply available within 12 hours of being directed to do so by the Council.		N/A	
MONITORING OF THE SHALLOW AND DEEP AQUIFERS		Full	Provided to Waikato Regional Council in June 2019
6. The consent holder shall upon commencement of this consent and at five yearly intervals thereafter, provide a report to the Waikato Regional Council commenting on the effect the groundwater take and dewatering activity is having on the deep and shallow aquifers under the Martha Pit and immediate surrounds. The report shall as a minimum, provide the following information: (a) The nature of the geology under the Martha Pit and immediate surrounds; (b) Comment on the existing groundwater chemistry for the deep and shallow aquifers; (c) Comment on the groundwater levels in the deep and shallow aquifers; and (d) Provide details of any wetland areas and any other known aquatic ecological values			

that are dependent on the surface contribution of shallow and deep groundwater outflows. Taking into account all of this information (and any other relevant data) the consent holder shall provide comment on the effects the dewatering activity is having on the shallow and deep aquifers under the Martha Pit and immediate surrounds.			

16 CONCLUSIONS

Monitoring of dewatering, groundwater, settlement, tilt, and water quality in and around the Martha, Favona, Trio, Correnso, SUPA and Project Martha operations was undertaken during 2022 in accordance with the consent conditions and the approved monitoring plan.

By the end of 2022 the groundwater levels underground had been lowered to approximately 676 mRL.

In the Martha area the greatest recent change in measured groundwater level occurred at WC-202-1. At this location a decline in the groundwater level of approximately 11m was observed over a nine-month period. Monitoring continued into 2023 and the groundwater levels at WC-202-1 have rebounded by approximately 8m.

At Favona the underground water level was maintained at around 800 mRL. As observed in previous years this dewatering has maintained a steep but localised depression of the groundwater (contour pattern) along the NE-SW trending vein structure. Water levels in the younger volcanic materials and overlying alluvium have not responded to the significant dewatering of the underlying vein-hosted andesite. Minor or no response has been seen in wells monitoring the upper layers of the andesite rock body. Response is only evident in deeper wells constructed in the andesite rock mass that intercept structures connected to the vein systems.

The drop in pressure within the P94 / 975 mRL piezometer which was previously observed in 2018 and 2019 has discontinued and now appears stable. Shallower piezometers at this location have not shown any corresponding drop in pressure. The depressurisation effect at the 975mRL level is expected to reverse once mining and groundwater pumping is discontinued the area. Monitoring of all other piezometers in the Waihi East network show levels consistent with baseline data recorded in 2011.

Settlement monitoring, to assess any effects from groundwater changes, was conducted in May/June and November/December 2022. Settlement survey results indicated that 96% (385/399) of marks graphed were within the predicted settlement ranges, based on the newly implemented Project Martha predicted settlement. Of the greater-than-predicted settlements, four were above or near the Favona Underground mine. The other ten exceedances are generally associated with sites that are considered to be affected by unstable ground or soil creep due to proximity to stream banks or drains. At all these locations no visible effects were noted nearby, and shallow piezometers have not shown any abnormal changes.

A general settlement rate across town of 10 to 65 mm over the period from 1999 to present has been measured by the monitoring network and this is considered to be a response to ongoing dewatering of structures within the deeper andesite within the Martha groundwater system. No widespread ongoing dewatering effects were observed in the younger volcanic or upper andesite rock that would give rise to such widespread settlement.

Settlement continues to be observed in marks near and overlying the Favona Mine, although the total amount is similar to previous years. The deep monitoring wells connected to the Favona vein system are the only wells showing dewatering changes consistent with this settlement, indicating the settlement is likely to be a response to dewatering of the deeper structures of the Favona vein system and/or to changes in the rock mass volume associated with mining at Favona. Tilt is also apparent between marks near and overlying the Favona Mine which is occurring on farmland owned by OGNZL (and therefore is not expected to be an issue).

Some elevated trace metal results were noted from underground water sampling during the period; however, this is expected, and all underground water is currently collected and treated.

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Appendix A Relevant Consent Conditions

Extract from conditions of Waikato Regional Council Resource Consents 109742 to 109746, pertaining to Dewatering and Settlement:

SCHEDULE TWO – GENERAL CONDITIONS

The granting of consents (109742 to 109746 inclusive) is subject to the following conditions, which shall apply to each individual consent.

Water Management Plan

1. Prior to exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Water Management Plan describing the water management system to be applied across the project area, with emphasis on management of stormwater including water storage options, decline and mine dewatering, and stockpile runoff.

   The consent holder shall exercise this consent in accordance with the approved Water Management Plan.

Settlement, Dewatering and Water Quality Monitoring Plan

2. Prior to exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Settlement, Dewatering & Water Quality Monitoring Plan. The purpose of this Plan is to monitor and assess the effects of the activities on land settlement, the groundwater hydraulic regime and on water quality, and also to detail the contingency measures that will be actioned should groundwater or surface settlement triggers be exceeded.

   The Plan shall, as a minimum, provide an overall description of the groundwater and settlement monitoring system and the measures to be adopted, including contingency measures, to meet the objectives of the groundwater and settlement management system, as proposed in the consent application. The monitoring regime shall be designed to assess the effects of:

   a) mine dewatering on the regional groundwater system,
   b) mine dewatering on settlement;
   c) leachate from stockpiles containing potentially acid forming material on shallow groundwater quality, and
   d) the discharge of degraded-quality water from the backfilled and flooded workings on groundwater quality.

   Final details of the monitoring locations are to be agreed with the Council. The Plan shall also provide trigger limits that will initiate the implementation of contingency mitigation and/or monitoring measures and shall detail any linkages with the Martha pit operation.

   The Plan shall be consistent with the recommendations included in the reports to the Council entitled;

   - *"Proposed Favona Underground Mine – Review of Groundwater Assessment" dated October 2003 and prepared by Pattle Delamore Partners; and*
   - *"Technical Review of Water Quality and Geochemistry Issues - Favona Underground Project", dated October 2003 and prepared by GEOKEM.*

   The exercise of this consent shall be in accordance with the Plan as approved by the Council. The Plan shall be reviewed, and updated as necessary, by the consent holder at least once every two years. Any updated Plan shall be promptly forwarded to the Council for approval and following approval the updated Plan shall be implemented in place of the previous version.

In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Settlement, Dewatering & Water Quality Monitoring Plan, then the conditions of this consent shall prevail.

3. In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations, installed in accordance with the Settlement, Dewatering & Water Quality Monitoring Plan required pursuant to condition 2 above, or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Council in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then:

   a) explain the cause of the non-conformance,
   b) agree with the Council on the appropriate settlement contingency measures to be implemented as described,
   c) implement settlement contingency measures as appropriate,
   d) advise the Council on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

Settlement, Dewatering & Water Quality Monitoring Report

4. The consent holder shall provide to the Council (with a copy provided to the Hauraki District Council) an annual Settlement, Dewatering & Water Quality Monitoring Report. The report shall include at least the following information:

   a) the volume of groundwater abstracted,
   b) the data from monitoring undertaken during the previous year including groundwater contour plans (derived from the data) in respect of the piezometer network,
   c) an interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information,
   d) any contingency actions that may have been taken during the year,
   e) comment on compliance with all conditions of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of this consent.

   The report shall be forwarded in a format acceptable to the Council.

Extract from conditions of Hauraki District Council Resource Consent 97/98-105, pertaining to Dewatering and Settlement:

3.30 Settlement

a) The consent holder shall prepare a Dewatering and Settlement Monitoring Plan. The purpose of this Plan is to monitor and assess the effects of dewatering on land settlement and the effects of the mining activities on the subsurface hydraulic regime. The Dewatering and Settlement Monitoring Plan shall address at least the following:

i) An overall description of the groundwater and settlement monitoring system and the measures to be adopted to meet the objectives of the groundwater and settlement monitoring system.

ii) Details of the piezometer network proposed to monitor the effects of pit dewatering on the aquifers under Waihi township.

Any monitoring bores additional to the existing piezometer network shall be installed and operational prior to the exercising of this consent.

iii) Details of the settlement monitoring network proposed to monitor the extended zone which has been, or is likely to be, affected by settlement caused by mine dewatering.

Any settlement monitoring network locations additional to the existing monitoring locations shall be installed and operational prior to exercising this consent.

iv) Details of the survey of facilities in the Waihi township considered by the consent holder to be potentially "at risk" of damage from ground settlement caused by mine dewatering. The survey to be completed shall include collection of information about the facility's location, the nature of construction materials, the nature of sensitive equipment that might be potentially "at risk", and the sensitivity of this equipment to ground settlement caused by mine dewatering and/or tilt.

This survey shall be completed prior to exercise of the Waikato Regional Council consent number 971286.

v) A settlement contingency plan to include mitigation measures to be implemented in the event that ground settlement caused by mine dewatering induces a tilt that exceeds 1 in 1000 between any two network monitoring locations spaced no less than 25 metres apart. The settlement contingency plan shall particularly address those facilities identified by the consent holder as being potentially "at risk" of damage from ground settlement caused by mine dewatering.

vi) A dewatering contingency plan that describes the steps the consent holder shall implement in the event that dewatering results in adverse impacts on affected aquifer systems and associated groundwater supplies used for domestic, stock or other purposes.

In detailing the monitoring programmes the consent holder shall provide information on the monitoring methods proposed, the parameters to be monitored, and the calibration and maintenance of monitoring equipment.

In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Dewatering and Settlement Monitoring Plan, then the conditions of Waikato Regional Council consent number 971286 shall prevail.

b) The Dewatering and Settlement Monitoring Plan shall be submitted to Hauraki District Council for approval at least one month prior to the exercise of this consent. The Hauraki District Council shall consult with the Waikato Regional Council prior to approving the Dewatering and Settlement Monitoring Plan. The consent holder shall review and update (as necessary) the Plan and shall provide promptly such updated Plan to the Hauraki District Council annually for approval.

c) If in the opinion of Hauraki District Council the dewatering adversely affects land or facilities, then the consent holder shall at its own cost be responsible for reinstating the facilities to an equivalent standard to the reasonable satisfaction of Council.

d) The consent holder shall measure and record the daily volume of water abstracted from the pit.

e) The consent holder shall undertake monthly water level monitoring of the piezometer network in accordance with the Dewatering and Settlement Monitoring Plan.

f) The consent holder shall monitor ground settlement at a minimum of six monthly intervals in accordance with the Dewatering and Settlement Monitoring Plan.

g) In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations spaced no less than 25 metres apart, and such tilt is caused by mine dewatering, or there is a significant variance from the predicted settlement rates described in the evidence of Dr Semple (Table 5, Figure 8 dated 13 November 1997 as presented to the Joint Hearing Committee – attached hereto as Appendix C), the consent holder shall notify the Hauraki District Council and the Waikato Regional Council, in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then:

- explain the cause of the non-conformance,
- agree with the Hauraki District Council and Waikato Regional Council on the appropriate settlement contingency measures to be implemented as described,
- implement settlement contingency measures as appropriate,
- advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

h) The consent holder shall provide to the Hauraki District Council and the Waikato Regional Council an annual dewatering and settlement monitoring report. The report shall include at least the following information:

- The data from monitoring undertaken during the previous year including ground water contour plans (derived from the data) in respect of the piezometer network.
- Identification of any environmentally important trends in settlement and dewatering behaviour.
- Interpretation and analysis of any change in ground water profile over the previous year, any contingency actions that may have been taken during the year, predictions of future impacts on other bore users that may arise as a result of any trends that have been identified, and what contingency actions, if any, the consent holder proposes to take in response to those predictions.
- A comparison of the settlement survey data with that predicted in Table 5 and Figure 8 (dated 13 November 1997) by Dr Semple of Woodward Clyde (NZ) Ltd as provided in evidence to the Joint Hearing Committee.
- Comment on compliance with this condition.
- A summary and analysis of complaints relevant to this condition.
- Any reasons for non-compliance or difficulties in achieving conformance with this condition.
- Any works that have been undertaken to improve environmental performance or that are proposed to be undertaken in the forthcoming year to improve environmental performance in relation to activities permitted by this condition.

The report shall be forwarded in a format acceptable to the Hauraki District Council.

(Note: This condition is complementary to Waikato Regional Council consent number 971286).

Extract from conditions of Hauraki District Council Resource Consent RC-15735, as pertaining to Dewatering and Settlement:

Dewatering and Settlement Monitoring Plan

14. Within 2 months of the exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Dewatering and Settlement Monitoring Plan. The purpose of this Plan is to monitor and assess the effects of the activities on land settlement and the groundwater hydraulic regime, and also to detail the contingency measures that will be actioned should groundwater or surface settlement triggers be exceeded.

    The Plan shall, as a minimum, provide an overall description of the groundwater and settlement monitoring system and the measures to be adopted, including contingency measures, to meet the objectives of the groundwater and settlement management system, as proposed in the consent application. The monitoring regime shall be designed to assess the effects of:

    (i) dewatering on the regional groundwater system; and
    (ii) dewatering on settlement.

    Final details of the monitoring locations are to be agreed with the Council. The Plan shall also provide trigger limits that will initiate the implementation of contingency mitigation and/or monitoring measures and shall detail any linkages with the Martha pit operation.

    The exercise of this consent shall be in accordance with the Plan as approved by the Council. The Plan shall be reviewed and updated as necessary by the consent holder. Any updated Plan shall be promptly forwarded to the Council for written approval and following approval, the updated Plan shall be implemented in place of the previous version.

    In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Dewatering and Settlement Monitoring Plan, then the conditions of this consent shall prevail.

Dewatering and Settlement Monitoring Report

15. The consent holder shall provide to the Council an annual Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information:
    (i) The volume of groundwater abstracted;
    (ii) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;
    (iii) An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information;
    (iv) Any contingency actions that may have been taken during the year; and
    (v) Comment on compliance with condition 14 of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.

The report shall be forwarded in a form acceptable to the Council.

Monitoring – Tilt

16. In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations installed in accordance with the De-watering and Settlement Monitoring Plan required pursuant to condition 14 of this consent, or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Hauraki District and Waikato Regional Councils in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then:

(i) Explain the cause of the non-conformance,
(ii) Agree with the Councils on the appropriate settlement contingency measures to be implemented as described,
(iii) Implement settlement contingency measures as appropriate,
(iv) Advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

Extract from conditions of Waikato Regional Council Resource Consents 121416, 121417, 121418, 121446, and 121447, pertaining to Dewatering and Settlement:

SCHEDULE ONE – GENERAL CONDITIONS

Resource Consents **121416, 121417, 121418, 121446, and 121447** are subject to the following general conditions, which are applicable to all consents.

Dewatering and Settlement Monitoring Plan

5 Prior to exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Dewatering and Settlement Monitoring Plan. The purpose of this Plan is to monitor and assess the effects of the activities on land settlement and the groundwater hydraulic regime, and also to detail the contingency measures that will be actioned should groundwater or surface settlement triggers be exceeded.

The Plan shall, as a minimum, provide an overall description of the groundwater and settlement monitoring system and the measures to be adopted, including contingency measures, to meet the objectives of the groundwater and settlement management system, as proposed in the consent application. The monitoring regime shall be designed to assess the effects of:

(i) dewatering on the regional groundwater system; and
(ii) dewatering on settlement, and
(iii) the discharge of degraded quality water from the backfilled and flooded workings on groundwater quality.

Final details of the monitoring locations are to be agreed with the Council. The Plan shall also provide trigger limits that will initiate the implementation of contingency mitigation and/or monitoring measures and shall detail any linkages with the Martha pit operation.

The exercise of this consent shall be in accordance with the Plan as approved by the Council. The Plan shall be reviewed and updated as necessary by the consent holder. Any updated Plan shall be promptly forwarded to the Council for written approval and following approval, the updated Plan shall be implemented in place of the previous version.

In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Dewatering and Settlement Monitoring Plan, then the conditions of this consent shall prevail.

Dewatering and Settlement Monitoring Report

6. The consent holder shall provide to the Councils an annual Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information:

(i) The volume of groundwater abstracted;
(ii) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;
(iii) An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis

shall be undertaken by a party appropriately experienced and qualified to assess the information;

(iv) Any contingency actions that may have been taken during the year; and

(v) Comment on compliance with condition 5 of this schedule including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.

The report shall be forwarded in a form acceptable to the Council.

Monitoring – Tilt

7. In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations installed in accordance with the De-watering and Settlement Monitoring Plan required pursuant to condition 5 of this schedule, and such tilt is caused by the de-watering and/or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Councils in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then engage in a process with the Councils:

(i) explain the cause of the non-conformance,

(ii) agree with the Councils on the appropriate settlement contingency measures to be implemented as described,

(iii) implement settlement contingency measures as appropriate,

(iv) advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

Extract from conditions of Mining Licence 32 2388, pertaining to Dewatering and Settlement:

Dewatering

11. (a) The licensee shall prepare a Dewatering and Settlement Monitoring Plan. The purpose of this Plan is to monitor and assess the effects of dewatering associated with the extended project on land settlement and the effects of the mining activities on the subsurface hydraulic regime. The Dewatering and Settlement Monitoring Plan shall address at least the following:

(i) An overall description of the groundwater and settlement monitoring system and the measures to be adopted to meet the objectives of the groundwater and settlement monitoring system.

(ii) Details of the piezometer network proposed to monitor the effects of pit dewatering on the aquifers under Waihi township.

Any monitoring bores additional to the existing piezometer network shall be installed and operational prior to the commencement of the extended project.

(iii) Details of the settlement monitoring network proposed to monitor the extended zone which has been, or is likely to be, affected by settlement caused by mine dewatering.

Any settlement monitoring network locations additional to the existing monitoring locations shall be installed and operational prior to the commencement of the extended project.

(iv) Details of the survey of facilities in the Waihi township considered by the licensee to be potentially "at risk" of damage from ground settlement caused by mine dewatering. The survey to be completed shall include collection of information about the facility's location, the nature of construction materials, the nature of sensitive equipment that might be potentially "at risk", and the sensitivity of this equipment to ground settlement caused by mine dewatering and/or tilt.

This survey shall be completed prior to the commencement of the extended project.

(v) A settlement contingency plan to include mitigation measures to be implemented in the event that ground settlement caused by mine dewatering induces a tilt that exceeds 1 in 1000 between any two network monitoring locations spaced no less than 25 metres apart. The settlement contingency plan shall particularly address those facilities identified by the licensee as being potentially "at risk" of damage from ground settlement caused by mine dewatering.

(vi) A dewatering contingency plan that describes the steps the licensee shall implement in the event that dewatering results in adverse impacts on affected aquifer systems and associated groundwater supplies used for domestic, stock or other purposes.

In detailing the monitoring programmes the licensee shall provide information on the monitoring methods proposed, the parameters to be monitored, and the calibration and maintenance of monitoring equipment.

In the event of any conflict or inconsistency between these conditions and the provisions of the Dewatering and Settlement Monitoring Plan, these conditions shall prevail.

(b) The Dewatering and Settlement Monitoring Plan shall be submitted to the Minister for approval at least one month prior to the commencement of the extended project. The licensee shall review and update (as necessary) the Plan and shall provide promptly such updated Plan to the Minister annually for approval.

(c) If in the opinion of the Minister the dewatering adversely affects land or facilities, then the licensee shall at its own cost be responsible for reinstating the facilities to an equivalent standard to the reasonable satisfaction of the Minister.

(d) The licensee shall measure and record the daily volume of water abstracted from the pit.

(e) The licensee shall undertake monthly water level monitoring of the piezometer network in accordance with the Dewatering and Settlement Monitoring Plan.

(f) The licensee shall monitor ground settlement at a minimum of six monthly intervals in accordance with the Dewatering and Settlement Monitoring Plan.

(g) In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations spaced no less than 25 metres apart, and such tilt is caused by mine dewatering, or there is a significant variance from the predicted settlement rates described in the evidence of Dr Semple (Table 5, Figure 8 dated 13 November) the licensee shall notify the Minister, in writing, within 20 working days of receiving the results of the monitoring. The licensee shall then:

- Explain the cause of the non-conformance;
- Agree with the Minister on the appropriate settlement contingency measures to be implemented as described;
- Implement settlement contingency measures as appropriate;
- Advise the Minister on the steps the licensee proposes to take in order to prevent any further occurrence of the situation.

(h) The licensee shall provide to the Minister an annual dewatering and settlement monitoring report. The report shall include at least the following information:

- The data from monitoring undertaken during the previous year including ground water contour plans (derived from the data) in respect of the piezometer network;
- Identification of any environmentally important trends in settlement and dewatering behaviour;
- Interpretation and analysis of any change in groundwater profile over the previous year, any contingency actions that may have been taken during the year, predictions of future impacts on other bore users that may arise as a result of any trends that have been identified, and what contingency actions, if any, the licensee proposes to take in response to those predictions;
- A comparison of the settlement survey data with that predicted in Table 5 and Figure 8 (dated 13 November 1997 by Dr Semple of Woodward Clyde (NZ) Ltd);
- Comment on compliance with this condition;
- A summary and analysis of complaints relevant to this condition;

- Any reasons for non-compliance or difficulties in achieving conformance with this condition;
- Any works that have been undertaken to improve environmental performance or that are proposed to be undertaken in the forthcoming year to improve environmental performance in relation to activities permitted by this condition;
- The report shall be forwarded in a format acceptable to the Minister.

Extract from conditions of Hauraki District Council Resource Consent 202.2012 (Correnso), as pertaining to Dewatering and Settlement:

Dewatering and Settlement Monitoring Plan

27 The objectives of the groundwater and settlement management system shall be to ensure that dewatering operations do not give rise to surface instability and differential settlement beyond that authorised by this consent.

28 Within 2 months of the exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Dewatering and Settlement Monitoring Plan. The purpose of this Plan is to monitor and assess the effects of the activities on land settlement and the groundwater hydraulic regime, and also to detail the contingency measures that will be actioned should groundwater or surface settlement triggers be exceeded.

29 The Plan shall, as a minimum, provide an overall description of the groundwater and settlement monitoring system and the measures to be adopted, including contingency measures, to meet the objectives of the groundwater and settlement management system set out in Condition 27. The monitoring regime shall be designed to assess the effects of:

a) Dewatering on the regional groundwater system; and

b) Dewatering on settlement.

30 Monitoring locations are to provide appropriate resolution of groundwater levels and surface tilt relative to the scale of surface infrastructure, particularly in the areas above and adjacent to the mining activities provided for in this consent. Final details are to be agreed with the Council. The Plan shall also provide settlement trigger limits that will initiate the implementation of contingency mitigation and/or monitoring measures and shall detail any linkages with the Martha pit operation.

31 The exercise of this consent shall be in accordance with the Plan as approved by the Council. The Plan shall be reviewed and updated as necessary by the consent holder. Any updated Plan shall be promptly forwarded to the Council for written approval and following approval, the updated Plan shall be implemented in place of the previous version.

32 In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations installed in accordance with the Dewatering and Settlement Monitoring Plan required pursuant to Condition 28 of this consent, or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Hauraki District and Waikato Regional Councils in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then:

a) Explain the cause of the non-conformance;

b) Propose appropriate settlement contingency measures to the Councils and the timing of implementation thereof by the consent holder;

c) Implement settlement contingency measures as appropriate within the agreed time limit;

d) Advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

33 The consent holder shall as a matter of urgency, advise the Council of any significant anomalies identified by the regular (monthly) reading of groundwater levels in the piezometer network. Such advice is to include an explanation of the anomalous results and actions proposed to address any issues identified. This report is to be provided to the Council within 10 working days of the anomalous results being identified.

A “significant anomaly” is defined as 15m or more offset occurring in piezometer recordings over a 1 month period.

34 In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Dewatering and Settlement Monitoring Plan, then the conditions of this consent shall prevail.

Advice notes:

1. The Dewatering and Settlement Monitoring Plan shall be consistent with the Dewatering and Settlement Monitoring Plan prepared as a condition of the ground dewatering consent (RC 124860) granted by the Waikato Regional Council.
2. The monitoring undertaken in terms of the Dewatering and Settlement Monitoring Plan may need to be continued for a period beyond the term of this consent depending on recharge of the groundwater following cessation of underground mining activities and the filling of the Martha Pit.

Dewatering and Settlement Monitoring Report

35 The consent holder shall provide to the Council an annual Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information:

a) The volume of groundwater abstracted;

b) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;

c) An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information;

d) Any contingency actions that may have been taken during the year; and

e) Comment on compliance with Conditions 27 to 34 of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.

The report shall be forwarded in a form acceptable to the Council.

Advice note:

The Dewatering and Settlement Monitoring Report shall be consistent with the Dewatering and Settlement Monitoring Report prepared as a condition of the ground dewatering consent (RC 124860) granted by the Waikato Regional Council.

Extract from conditions of Waikato Regional Council Resource Consent 124860, pertaining to Dewatering and Settlement:

Monitoring - Abstraction Volume

4. The consent holder shall monitor the volume of water abstracted on a weekly basis and shall report this to the Waikato Regional Council on a quarterly basis.

Dewatering and Settlement Monitoring Plan

5. Prior to the exercise of this consent, the consent holder shall prepare, and submit to the Council for its written approval, a Dewatering and Settlement Monitoring Plan. The purpose of this Plan is to monitor and assess the effects of the activities on land settlement and the groundwater hydraulic regime, and also to detail the contingency measures that will be actioned should groundwater or surface settlement triggers be exceeded.

   The Plan shall, as a minimum, provide an overall description of the groundwater and settlement monitoring system and the measures to be adopted, including contingency measures, to meet the objectives of the groundwater and settlement management system, as proposed in the consent application. The monitoring regime shall be designed to assess the effects of:

   (i) dewatering on the regional groundwater system; and
   (ii) dewatering on settlement; and
   (iii) the discharge of degraded quality water from the backfilled and flooded workings on groundwater quality.

   Monitoring locations are to provide appropriate resolution of surface tilt relative to the scale of surface infrastructure and final details are to be agreed with the Councils. The Plan shall also provide trigger limits that will initiate the implementation of contingency mitigation and/or monitoring measures and shall detail any linkages with the Martha pit operation.

   The exercise of this consent shall be in accordance with the Plan as approved by the Council. The Plan shall be reviewed and updated as necessary by the consent holder. Such updated Plans shall relate to the Correnso Mine or to any new mine within Area L. Any updated Plan shall be promptly forwarded to the Council for written approval and following approval, the updated Plan shall be implemented in place of the previous version.

   In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Dewatering and Settlement Monitoring Plan, then the conditions of this consent shall prevail.

Dewatering and Settlement Monitoring Report

6. The consent holder shall provide to the Councils an annual Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information:
   (i) The volume of groundwater abstracted;
   (ii) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;
   (iii) An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions. This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information;
   (iv) Any contingency actions that may have been taken during the year; and
   (v) Comment on compliance with condition 5 of this consent including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.

   The report shall be forwarded in a form acceptable to the Councils.

Monitoring - Tilt

7. In the event that a tilt greater than 1 in 1000 occurs between any two network monitoring locations installed in accordance with the Dewatering and Settlement Monitoring Plan required pursuant to condition 5 of this consent, and such tilt is caused by the de-watering and/or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Councils in writing, within 20 working days of receiving the results of the monitoring. The consent holder shall then engage in a process with the Councils:
   (i) explain the cause of the non-conformance,
   (ii) Propose appropriate settlement contingency measures for discussion with Councils and agree with the Councils on the appropriate settlement contingency measures and the timing for their implementation as described,
   (iii) implement agreed settlement contingency measures as appropriate within the agreed time limit,
   (iv) advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

Monitoring – Water Quality

8. The consent holder shall monitor throughout the period of operation, the chemistry of the groundwater, pit run-off and pit discharge water abstracted from the open pit. The monitoring data is to be used to correlate these inflows with pit lake water quality predictions, and to provide a database for input into the closure plans. The sampling parameters and frequencies shall be described in the Martha Extended Project dewatering consent (unless agreed otherwise with the Waikato Regional Council) with the results forwarded to the Waikato Regional Council on an annual basis.

Other Water Users

9. If, in the opinion of the Waikato Regional Council, the exercise of this consent adversely affects stock, domestic or other water supplies, then the consent holder shall, at its own cost, be responsible for providing to the owner of those water supplies an alternative equivalent water supply, to the satisfaction of Waikato Regional Council. The consent holder shall be responsible for making an alternative water supply available within 12 hours of being directed to do so by the Waikato Regional Council.

Extract from conditions of Waikato Regional Council Resource Consent 124861, pertaining to Dewatering and Settlement:

Groundwater Monitoring

5. Piezometers shall be installed at sites to be approved by the Waikato Regional Council for the purpose of monitoring changes in groundwater arising from the exercise of this consent. The groundwater monitoring system shall be detailed in the dewatering and Settlement Monitoring Plan, prepared pursuant to condition 5 of consent number 124860.

Extract from common conditions of Hauraki District Council and Waikato Regional Council Resource Consent for Project Martha (202.2018), as pertaining to Dewatering and Settlement:

Dewatering and Settlement Monitoring Plan

11 The objectives of the groundwater and settlement management system shall be to ensure that dewatering operations do not give rise to surface instability and differential settlement beyond that authorised by this consent.

12 Two months prior to dewatering below 700 m RL (mine datum), the consent holder shall prepare, and submit to the Councils for their certification, a Dewatering and Settlement Monitoring Plan. The purpose of the Dewatering and Settlement Monitoring Plan is to monitor and assess the effects of the activities on land settlement and the groundwater hydraulic regime, and also to detail the contingency measures that will be actioned should groundwater or surface settlement triggers be exceeded.

13 The Plan shall, as a minimum, provide an overall description of the groundwater and settlement monitoring system and the measures to be adopted, including contingency measures, to meet the objectives of the groundwater and settlement management system set out in Condition 14 of this schedule. The monitoring regime shall be designed to assess the effects of:

a. Dewatering on the regional groundwater system; and

b. Dewatering on settlement.

14 Monitoring locations are to provide appropriate resolution of mine inflows and pumping, groundwater levels (both for shallow and deep aquifers) and ground surface tilt relative to the scale of surface infrastructure, throughout the area within the maximum extent of the groundwater cone of depression and particularly in the areas above and adjacent to the mining activities provided for in this consent. Final details are to be agreed with the Councils, but are to include additional piezometers and extensometers located along the line of upper level workings in the Rex Orebody. The Dewatering and Settlement Monitoring Plan shall also provide groundwater and settlement trigger limits that will initiate the implementation of contingency mitigation and / or monitoring measures and shall detail any linkages with the operation of the Martha Pit and Martha Underground Mine.

15 The exercise of this consent shall be in accordance with the Dewatering and Settlement Monitoring Plan as certified by the Councils. The Dewatering and Settlement Monitoring Plan shall be reviewed and updated as necessary by the consent holder. Any updated Dewatering and Settlement Monitoring Plan shall be promptly forwarded to the Councils for certification, and following this process, the updated plan shall be implemented in place of the previous version.

16 In the event that a tilt greater than 1 in 1,000 occurs between any two network monitoring locations installed in accordance with the Dewatering and Settlement Monitoring Plan required pursuant to Condition 15 of this schedule, or there is a significant variance from the predicted settlement rates, the consent holder shall notify the Councils in writing within 20 working days of receiving the results of the monitoring. The consent holder shall then:

a. Explain the cause of the non-conformance;

17.1.1

b. Propose appropriate settlement contingency measures to the Councils and the timing of implementation thereof by the consent holder;

17.1.2

c. Implement settlement contingency measures as appropriate within the agreed time limit; and

17.1.3

d. Advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.

17 The consent holder shall as a matter of urgency, advise the Councils of any significant anomalies identified by the regular reading of groundwater levels in the piezometer network. Such advice is to include an explanation of the anomalous results and actions proposed to address any issues identified. This report is to be provided to the Councils within 10 working days of the anomalous results being identified.

A “significant anomaly” is defined as a drop in groundwater level greater than the seasonal variation in piezometers within the alluvium and younger volcanic rocks and a drop of 15 m or more in the recordings from piezometers tapping the upper 50 m of Andesite over a one month period.

18 In the event of any conflict or inconsistency between the conditions of this consent and the provisions of the Dewatering and Settlement Monitoring Plan, then the conditions of this consent shall prevail.

Advice Note:
The monitoring undertaken in terms of the Dewatering and Settlement Monitoring Plan may need to be continued for a period beyond the term of this consent depending on recharge of the groundwater following cessation of underground mining activities and filling of the Martha Pit.

Dewatering and Settlement Monitoring Report

19 The consent holder shall provide to the Councils (within one month of an agreed anniversary date) an annual Dewatering and Settlement Monitoring Report. The report shall, as a minimum, provide the following information:

g) The volume of groundwater abstracted;

17.1.4

h) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;

17.1.5

i) An interpretation and analysis of the monitoring data, in particular any change in the groundwater profile over the previous year, predictions of the future impacts that may arise as a result of any trends that have been identified including review of the predicted post closure effects based on actual monitoring data, and what contingency actions, if any, the consent holder proposes to take in response to those predictions, this analysis shall be undertaken by a party appropriately experienced and qualified to assess the information;

17.1.6

j) Any contingency actions that may have been taken during the year; and

17.1.7

k) Comment on compliance with Conditions 14 to 21 of this schedule including any reasons for non-compliance or difficulties in achieving conformance with the conditions of consent.

17.1.8

l) The report shall be forwarded in a form acceptable to the Councils.

Appendix B Surveyor Reports

MEMORANDUM

TO: **MARK BURROUGHS**

FROM: **BRUCE MORRISON**

DATE: **18TH JULY 2022**

SUBJECT: **GROUND SETTLEMENT MONITORING –MAY 2022**

Introduction

This report outlines the results from the May 2022 Ground Settlement Monitoring Survey.

Field Method

The settlement monitoring marks were levelled during May and June 2022 for OceanaGold by myself utilising an experienced *Kauri Gold* assistant under my supervision.

Equipment used for this May 2022 event was the LEICA DNA03 electronic digital level (SN330350) paired with the **new** LEICA 3 section 4.05 metre fibreglass bar coded GKNL4F staff. To minimise 'windage', the staff was used in 2 section 'mode'. The level was serviced and check calibrated by the supplier in March 2022. A field calibration check was carried out by myself before commencing this event and the check result was satisfactory.

A summary of the above framework 'misclosures' for the last thirty events is tabulated below.

Event	West –East misclose (mm)	North –South misclose (mm)
	AP2 > 34BE > AP1	34BE > AP6
May 2007	+2.4	+6.4
Nov 2007	+2.7	+3.1
May 2008	+13.2	+4.0
Nov 2008	-8.1	+7.3
May2009	+8.8	+3.7
Nov 2009	-5.8	+2.0
May 2010	-8.1	+4.3
Nov 2010	-0.6	+6.4
May 2011	+2.0	+2.7

Nov 2011	+6.9	+6.5
May 2012	+4.1	+6.7
Nov 2012	+23.3	+5.3
May 2013	+2.7	+9.5
Nov 2013	-0.9	+4.5
May 2014	-1.1	+11.5
Nov 2014	-2.6	+7.0
May 2015	+1.6	+6.3
Nov 2015	-8.0	+10.3
May 2016	+9.2	+12.2
	AP20 No 2 >AP2 > 34BE > AP1	34BE > AP6
Nov 2016	+14.2	+3.6
	AP19 >AP2 > 34BE > AP1	34BE > AP6
May 2017	+1.0	+0.4
Nov 2017	-10.2	-0.5
May 2018	+6.4	+4.0
Nov 2018	-11.1	+3.6
	AP19 >AP2 > 34BE > AP1>BUH5	34BE > AP6
May 2019	See page 2	See page 2
	AP19 >AP2 > 34BE > AP1>BUH5	34BE > AP6
May 2019	-7.9	-6.9
	AP19 >AP2 > 34BE > AP1>BUH5	34BE > AP24A> 34BE
Nov 2019	+0.3	-1.3
	AP19 >AP2 > 34BE > AP1>BUH5	34BE > AP24A> C1
May 2020	-5.5	-1.7
Nov 2020	-3.2	-2.5
May2021	-38.7	-9.2
Nov 2021	-0.8	+1.7
May2022	+10.6	+2.3

Extending Levelling

This levelling event included LINZ benchmarks AP2, AP20 No 2, AP19, (to the west of Waihi), AP1 and BUH5 (to the east of Waihi). AP24 a.k.a control mark AP6 (south of Waihi) and AP25 have been lost to road works. AP24A and C1 have been established as a replacement for the lost AP6 control mark in this vicinity. AP2 and AP20 No 2 have now been 'unfixed' and AP19 is the fixed benchmark west of

Waihi. The 'fixed' elevation value for AP19 was deduced from LINZ data comparing the relative levels of AP19, AP2, AP20 No2, and AP24 dating back to the year 1990. East of Waihi, AP1 is now 'unfixed, and there has never been any LINZ data for this mark although AP1 appears to be constructed to the same specifications as AP19 and AP26. The R.L. for the 'new' fixed eastern control mark (BUH5) was the mean value from two close values (relative to AP19) levelled in May 2021 and Nov 2021.

Photographs

The order of levelling of the monitoring points has now been fixed. This has been achieved by photographing all of the settlement points and placing them in 22 albums –generally in the order the points are to be levelled. This will achieve repeatable error distribution and should therefore give better results. I believe **all** the marks now have accurate GPS fixes. In the future, this should make the task of locating these marks easier if the marks are covered over by re-seal etc, or quickly confirm if the marks have definitely been 'lost' to street maintenance etc.

I recommend continuing these 'maintenance' details before or during the next levelling event.

Adjustments

Disturbed marks BM20 and 2.44 are excluded from the settlement contouring- as are marks F18, F20, F23, F24, and F25. . All the above marks are excluded from the settlement contouring.

Mark 2.11C has a 'previous history' deduced as has mark 2.28B. Marks 34C, 1.12, and BARRY2 have been lost. New marks 34BC, 1.12B, and BARRY2B have been established. These new marks are excluded from the settlement contouring as they await 'previous history' deduction.

Results

One A1 plan is attached -colour coded by seven zones as identified in the 'Settlement and Groundwater Monitoring Plan. The original Zone boundaries and 'trigger' settlement values have been modified to match *Engineering Geology Ltd* Drawing No. 8332-Fig 16.

This plan "Total Settlement Contours" (T2022-----) identifies all marks (in black) that have been used to produce the contours for the plan. The plan shows total movement (in millimetres) at the monitoring mark itself. Missed, 'lost', or disturbed marks are shown in red and these marks are not used for contouring. New marks are also shown in red and generally not used for settlement contouring until the next levelling event.

This plan also displays settlement contours in 20mm intervals. The Settlement and Groundwater Monitoring Plan identifies gradients steeper than 1:1000 to be cause for concern. BM20 has been a large mover in the past and has been identified in past surveys as being placed on shrinking material. There are no buildings in this area anymore. I understand (from Mark Halloran) BM20A was placed near BM20 with a 'foot' bedded in firm ground. Significant differential settlement (1:120) is now occurring between BM20A and BM20 –sufficient to decide to omit BM20 from the settlement 'contour' calculation.

These contours represent the total negative (–ve) movement (or settlement) around Waihi since monitoring began.

The closest contours (omitting disturbed marks) are between marks 20AC and BM20A. The distance between these marks using GPS measurements, calculates at 126.706 metres, and show 0.1831 metres of relative vertical movement to give a gradient of 1:692. The distance between marks BM20A and 20D using GPS measurements, calculates at 137.047 metres, and shows 0.1595 metres of relative vertical movement to give

a gradient of 1:859. The distance between marks 20C and BM20A, when checked by GPS measurements, calculates at 126.865 metres, and show 0.1264 metres of relative vertical movement to give a gradient of 1:1004.

Some cracks are visible in the sealed pavements in this area of closest contours.

Table 1 (pages 4-12) lists all the marks used for this settlement levelling event with the marks sorted first by Zone and then by settlement value. Marks that record 'exceedences' in terms of zone predictions (for Martha (2019) are highlighted with colour and have comments attached. All marks that 'exceeded' in Table 1 were analysed further and field inspections were conducted where required.

The comments included below attempt to explain the probable reason for 'excess' movement. The comments are *Dist'd* for BM20 in Zone 6. In Zone 4, the comment is '*Nr watercourse'* for 23C. The swampy(?) ground may have de-watered during the autumn drought. For Zone 3, 2CE is near Zone 5. For Zone 2, 3.14 is near Zone 4. For Zone 1, 2.44 is *Dist'd,* 2.05 is near Zone 5, 2.35, 31DD and 31FC.are near Zone 3, and 31KC, 31LC, 31MD, and 31NE are near the Ohinemuri River bridge.31HC is near Zone3. 31GC is near Zone 3.

The 'Favona' marks were installed for monitoring the effects of dewatering in the original underground mine area. The underlying original 'Martha' zone was Zone 3 and but the Favona marks were never given zone exceedence parameters in terms of the original Martha zones. The Favona marks all report significant settlement. Note marks F18, F20, F23, F24, F25 are tentatively labelled as 'Dist'd' and not used for contouring the settlement.

The five extra 'Favona' settlement marks are again shown on the plan. These are FP1, BLOCK-S, BLOCK-N, TRIG 22, and TRIG 24. The settlements for these marks have generally been deduced relative to original reduced levels measured around the year 1987 –although FP1 (at the Favona portal) was established about the year 2000. Favona mark F07 is disturbed but has been relabelled as F07A. A 'previous history' has been calculated for F07A so this mark can be used for settlement contouring. The underlying zone for the Favona marks is now Zone 5 Martha (2019).

I understand that Time-History plots for all survey marks grouped by zone will be produced by other persons in accordance with the "Settlement and Groundwater Monitoring Plan 31 July 2005"

Bruce Morrison

Registered Professional Surveyor

Table 1. Total Movement

	SURVEY		TOTAL	SETTLEMENT

Zone	station i.d.	DATE	X	Y	Z	May-22	Comments
Zone7	BM19B	1/05/2022	2117.17	1244.355	35.5314	-0.3346	
Zone7	19BB	1/05/2022	2191.56	1292.022	35.527	-0.3308	
Zone7	17CB	1/05/2022	2014.23	1201.01	35.4606	-0.3098	
Zone6	BM20	1/05/2022	2342.50	1476.25	35.5774	-0.4034	Dist'd
Zone6	BM20A	1/05/2022	2345.50	1484.901	35.7502	-0.327	
Zone6	19CB	1/05/2022	2296.71	1381.4	34.9185	-0.3114	
Zone6	17BB	1/05/2022	1919.52	1160.787	37.355	-0.2741	
Zone6	17AB	1/05/2022	1841.32	1104.802	36.8791	-0.2362	
Zone6	34GC	1/05/2022	2211.33	1119.517	32.1272	-0.2246	
Zone6	2.04B	1/05/2022	1893.21	968.34	29.0845	-0.2063	
Zone6	34H	1/05/2022	2233.59	970.561	32.1501	-0.197	
Zone6	18EE	1/05/2022	1750.73	809.328	23.4266	-0.1948	
Zone6	18C	1/05/2022	1494.95	767.193	27.4607	-0.1942	
Zone6	18IB	1/05/2022	1611.19	784.79	25.8243	-0.1911	
Zone6	34AD	1/05/2022	1470.88	886.92	29.7577	-0.1891	
Zone6	2.10	1/05/2022	2143.92	950.387	30.2808	-0.1881	
Zone6	34BE	1/05/2022	1732.56	931.603	28.3274	-0.1793	
Zone6	BM34	1/05/2022	1528.38	903.297	30.3138	-0.1693	
Zone6	34FC	1/05/2022	2120.79	587.93	19.0392	-0.1668	
Zone6	10BC	1/05/2022	1560.13	1062.92	38.1032	-0.1644	
Zone6	11AC	1/05/2022	1308.26	859.512	29.3337	-0.1632	
Zone6	18AB	1/05/2022	1632.39	667.73	22.1366	-0.1548	
Zone6	10AB	1/05/2022	1430.61	1036.998	34.9995	-0.1535	
Zone6	BM17A	1/05/2022	1724.44	1088.919	40.0353	-0.1529	
Zone6	2.08B	1/05/2022	2289.75	782.64	24.5339	-0.1525	
Zone6	2.11C	1/05/2022	2292.35	896.99	26.6152	-0.1485	
Zone6	1.28B	1/05/2022	1987.03	447.71	12.0975	-0.1474	

Zone6	2.09C	1/05/2022	2228.35	868.63	28.6421	-0.1418
Zone6	34I	1/05/2022	2229.55	765.53	28.464	-0.1342
Zone6	2.06	1/05/2022	2351.95	334.473	11.2795	-0.1222
Zone6	34CB	1/05/2022	1967.74	983..202	30.0332	new mark
Zone5	20C	1/05/2022	2450.61	1413.86	36.3068	-0.2006
Zone5	21DC	1/05/2022	2573.96	1304.152	37.7523	-0.1874
Zone5	20E	1/05/2022	2535.65	1542.672	37.0758	-0.185
Zone5	25D	1/05/2022	2547.05	1248.02	36.8566	-0.1842
Zone5	25A	1/05/2022	2505.13	1203.768	35.9297	-0.1801
Zone5	A10B	1/05/2022	1298.62	1049.614	30.6877	-0.1791
Zone5	21O	1/05/2022	2527.37	1356.342	35.9975	-0.1783
Zone5	25E	1/05/2022	2472.35	1162.013	34.7655	-0.178
Zone5	BM25	1/05/2022	2424.91	1100.25	33.4726	-0.1755
Zone5	16BC	1/05/2022	1252.81	1336.473	39.4527	-0.1748
Zone5	21N	1/05/2022	2623.25	1342.435	38.2815	-0.1675
Zone5	20D	1/05/2022	2482.07	1473.478	36.5499	-0.1675
Zone5	10DC	1/05/2022	1279.04	1198.326	35.3001	-0.165
Zone5	25G	1/05/2022	2594.60	1149.415	37.58	-0.1645
Zone5	25CB	1/05/2022	2615.91	1190.496	38.2879	-0.1634
Zone5	25H	1/05/2022	2648.48	1232.956	38.9123	-0.1634
Zone5	24L	1/05/2022	2761.67	1181.326	39.3149	-0.1633
Zone5	25F	1/05/2022	2542.53	1116.24	35.9906	-0.1623
Zone5	24I	1/05/2022	2692.57	1269.713	39.2768	-0.1607
Zone5	2.41	1/05/2022	3296.32	685.398	46.2559	-0.1605
Zone5	25B	1/05/2022	2497.67	1105.83	34.8192	-0.1578
Zone5	10CB	1/05/2022	1222.46	1025.855	29.7746	-0.1575
Zone5	12CE	1/05/2022	1499.92	543.077	20.9798	-0.1556
Zone5	24AC	1/05/2022	2743.58	1218.9	40.0799	-0.1555
Zone5	18F	1/05/2022	1752.28	551.03	17.3264	-0.1547

Zone5	BM16	1/05/2022	1418.09	1218.03	46.4401	-0.1543
Zone5	2.03	1/05/2022	1930.08	745.943	22.5894	-0.154
Zone5	24F	1/05/2022	2772.80	1257.274	40.12	-0.1537
Zone5	24E	1/05/2022	2758.43	1303.234	40.3545	-0.1536
Zone5	13AC	1/05/2022	1751.98	327.376	18.5921	-0.1528
Zone5	24G	1/05/2022	2705.96	1170.464	39.7902	-0.1526
Zone5	25I	1/05/2022	2537.20	1045.036	34.6802	-0.1525
Zone5	BM24	1/05/2022	2794.55	1279.36	40.3908	-0.1523
Zone5	22F	1/05/2022	2815.91	1325.407	40.2256	-0.1519
Zone5	BM12	1/05/2022	1370.27	607.735	23.9548	-0.1519
Zone5	34EB	1/05/2022	2073.93	705.952	24.636	-0.1516
Zone5	24B	1/05/2022	2667.67	1126.399	39.3698	-0.1515
Zone5	21C	1/05/2022	2651.57	1389.816	38.4612	-0.151
Zone5	18G	1/05/2022	1669.05	554.602	18.4724	-0.1504
Zone5	24DC	1/05/2022	2718.29	1323.127	39.6305	-0.1503
Zone5	18B	1/05/2022	1510.36	650.578	23.5577	-0.1493
Zone5	24H	1/05/2022	2630.70	1072.279	36.1449	-0.1489
Zone5	1.28A	1/05/2022	1888.26	505.887	13.2089	-0.1466
Zone5	24K	1/05/2022	2783.89	1387.719	40.6116	-0.1463
Zone5	34D	1/05/2022	2038.90	783.431	25.3406	-0.1455
Zone5	20AC	1/05/2022	2461.04	1536.905	37.0152	-0.1439
Zone5	21EB	1/05/2022	2799.95	1429.09	41.6297	-0.1439
Zone5	BM18	1/05/2022	1771.96	674.53	19.4267	-0.1437
Zone5	2A	1/05/2022	1069.03	1111.858	23.8001	-0.1427
Zone5	24J	1/05/2022	2749.39	1365.756	40.2294	-0.1417
Zone5	12DC	1/05/2022	1596.95	435.491	19.9646	-0.1409
Zone5	13BC	1/05/2022	1850.36	246.59	13.7201	-0.1409
Zone5	18HC	1/05/2022	1821.52	466.47	14.8881	-0.1398
Zone5	12AC	1/05/2022	1388.32	488.888	19.0463	-0.1388
Zone5	15A	1/05/2022	1204.79	818.863	28.7713	-0.1374

Zone5	20BB	1/05/2022	2533.26	1622.291	37.8739	-0.1372
Zone5	21M	1/05/2022	2694.90	1439.648	39.1804	-0.1351
Zone5	20F	1/05/2022	2605.79	1575.98	37.5672	-0.1344
Zone5	15BC	1/05/2022	1169.90	708.855	26.333	-0.1319
Zone5	AP22A	1/05/2022	1868.44	188.565	12.4078	-0.1312
Zone5	11BB	1/05/2022	1348.57	710.573	26.929	-0.1299
Zone5	1.10A	1/05/2022	1599.70	278.938	16.634	-0.1295
Zone5	BM21	1/05/2022	2654.80	1515.397	39.4246	-0.1288
Zone5	12BC	1/05/2022	1405.27	368.295	14.9191	-0.1286
Zone5	BM13	1/05/2022	1426.61	269.34	13.5771	-0.1280
Zone5	4DB	1/05/2022	1033.26	1550.66	32.25	-0.1278
Zone5	21BC	1/05/2022	2719.27	1477.799	41.2675	-0.1274
Zone5	21K	1/05/2022	2681.11	1572.207	39.9991	-0.1262
Zone5	4B	1/05/2022	1021.54	1448.63	31.2524	-0.1220
Zone5	2.17A	1/05/2022	3085.76	555.866	36.9084	-0.1211
Zone5	2BC	1/11/2021	970.20	1241.898	30.3855	-0.1205
Zone5	30C	1/05/2022	2573.54	1675.395	38.442	-0.1119
Zone5	BM9B	1/05/2022	1220.25	1523.285	34.7521	-0.1053
Zone5	7CB	1/05/2022	1161.74	1597.63	30.6124	-0.1034
Zone5	AP3	1/05/2022	918.94	1140.59	26.0687	-0.1016
Zone5	26F	1/05/2022	1392.77	1680.26	43.8599	-0.0800
Zone5	26R	1/05/2022	1905.59	1927.17	71.3567	-0.0785
Zone5	26Q	1/05/2022	1963.00	1982.711	73.6727	-0.0784
Zone5	26PB	1/05/2022	1834.84	1893.106	67.9443	-0.0783
Zone4	23C	1/05/2022	2856.14	1068.014	37.5462	-0.2199
Zone4	23AB	1/05/2022	3145.42	1078.73	37.1891	-0.1827
Zone4	2.24	1/05/2022	2885.91	1215.469	41.2754	-0.1716
Zone4	22C	1/05/2022	2846.39	1352.544	40.308	-0.1713

Zone4	23D	1/05/2022	2861.42	1154.885	38.8537	-0.1632
Zone4	BANK1	1/05/2022	2866.21	1023.248	37.7929	-0.1614
Zone4	2.25	1/05/2022	2874.51	1097.261	37.9749	-0.1603
Zone4	MATAURA1	1/05/2022	2831.84	1250.806	41.0606	-0.1592
Zone4	23E	1/05/2022	2774.82	972.514	37.703	-0.1585
Zone4	23B	1/05/2022	2856.49	949.794	38.7431	-0.157
Zone4	23F	1/05/2022	2700.77	968.793	36.6413	-0.1563
Zone4	22GB	1/05/2022	2862.88	1387.968	40.8384	-0.1558
Zone4	2.13	1/05/2022	2725.42	874.951	47.2017	-0.1542
Zone4	2.14A	1/05/2022	2853.28	838.669	41.3137	-0.1539
Zone4	2.19B	1/05/2022	3270.21	916.063	38.5593	-0.1496
Zone4	BARRY1	1/05/2022	3047.74	926.576	38.1155	-0.1493
Zone4	MORTON	1/05/2022	2975.42	1231.913	40.7125	-0.1472
Zone4	BARRY3	1/05/2022	3176.85	895.991	37.6882	-0.1424
Zone4	BARRY4B	1/05/2022	3320.16	912.693	38.8889	-0.1417
Zone4	2.18	1/05/2022	3218.04	712.756	44.5453	-0.1414
Zone4	22BC	1/05/2022	2916.75	1435.773	42.101	-0.1408
Zone4	BARRY5	1/05/2022	3397.59	904.647	40.9921	-0.1403
Zone4	BARRY6	1/05/2022	3432.52	904.356	42.4774	-0.1399
Zone4	22E	1/05/2022	3055.20	1231.504	40.7849	-0.1386
Zone4	22H	1/05/2022	2869.25	1441.796	41.6187	-0.1381
Zone4	STAFORD	1/05/2022	3139.86	998.179	37.3165	-0.1377
Zone4	1.11B	1/05/2022	1675.83	133.622	9.0255	-0.1375
Zone4	2.20	1/05/2022	3467.69	904.56	43.785	-0.1361
Zone4	BM23	1/05/2022	3107.42	921.05	38.0911	-0.1360
Zone4	2.23	1/05/2022	3560.02	1212.795	36.6378	-0.1347
Zone4	2HB	1/05/2022	1078.24	886.849	24.3907	-0.1346
Zone4	21P	1/05/2022	2849.17	1456.9	41.8489	-0.1344
Zone4	22M	1/05/2022	2973.44	1434.656	41.672	-0.134
Zone4	22I	1/05/2022	2918.98	1461.367	41.9153	-0.1339
Zone4	2.16	1/05/2022	3007.62	739.64	33.5961	-0.1317
Zone4	2.15	1/05/2022	2918.94	723.52	38.3665	-0.1304

Zone4	BARRY7	1/05/2022	3518.87	901.897	43.6134	-0.1279
Zone4	22L	1/05/2022	3047.70	1499.876	40.994	-0.1277
Zone4	22A	1/05/2022	3003.28	1429.771	41.645	-0.1277
Zone4	GW	1/05/2022	3128.83	1140.936	38.5426	-0.1268
Zone4	AP100	1/05/2022	1893.80	81.27	11.7818	-0.1260
Zone4	22J	1/05/2022	2944.47	1489.763	42.4238	-0.1259
Zone4	CUBA	1/05/2022	3224.32	1079.177	35.8274	-0.1258
Zone4	BARRY8	1/05/2022	3592.28	871.451	37.9365	-0.1252
Zone4	2.22	1/05/2022	3339.13	1206.603	40.3536	-0.1242
Zone4	22D	1/05/2022	3100.02	1335.441	41.4523	-0.1238
Zone4	1.05	1/05/2022	1176.96	473.454	21.8186	-0.1208
Zone4	21FB	1/05/2022	2861.65	1512.211	42.65	-0.1203
Zone4	BM2	1/05/2022	915.74	1091.799	24.8308	-0.1197
Zone4	2.29B	1/05/2022	2953.39	1548.172	42.5882	-0.1186
Zone4	21L	1/05/2022	2806.79	1575.074	43.086	-0.1178
Zone4	21AC	1/05/2022	2716.64	1617.767	39.6913	-0.1177
Zone4	BM22	1/05/2022	3115.79	1442.95	40.6204	-0.1138
Zone4	1.26	1/05/2022	1926.81	30.053	15.0933	-0.1135
Zone4	2.27	1/05/2022	3379.40	1371.481	37.7579	-0.1127
Zone4	27KB	1/05/2022	2320.23	2120.206	63.3337	-0.1119
Zone4	15C	1/05/2022	1156.82	571.08	24.21	-0.1116
Zone4	26BE	1/05/2022	1408.78	1800.553	38.8154	-0.1107
Zone4	2GB	1/05/2022	922.38	967.66	22.6763	-0.1092
Zone4	21Q	1/05/2022	2899.60	1571.317	43.1286	-0.1086
Zone4	1.06	1/05/2022	1159.34	302.262	17.2233	-0.1078
Zone4	22KB	1/05/2022	2981.80	1603.49	42.8504	-0.1063
Zone4	30BB	1/05/2022	2604.86	1726.50	41.549	-0.1059
Zone4	21I	1/05/2022	2854.70	1668.793	41.645	-0.1048
Zone4	21J	1/05/2022	2773.44	1688.923	39.9631	-0.1036
Zone4	26CE	1/05/2022	1377.77	1711.891	40.6001	-0.1035

Zone4	21GC	1/05/2022	2901.12	1614.054	43.4451	-0.1017
Zone4	SM822	1/05/2022	2512.91	1841.132	41.4587	-0.0994
Zone4	2.31B	1/05/2022	3201.23	1637.29	42.0944	-0.0989
Zone4	1.09B	1/05/2022	1344.14	117.48	9.9268	-0.0983
Zone4	27N	1/05/2022	2179.57	2075.99	71.9144	-0.0962
Zone4	2.30B	1/05/2022	3000.35	1672.941	43.172	-0.0956
Zone4	BM15	1/05/2022	976.94	783.004	20.5212	-0.0953
Zone4	27E	1/05/2022	2494.09	2171.62	50.3441	-0.0941
Zone4	4.08	1/05/2022	2350.64	2022.324	73.2139	-0.0932
Zone4	21HC	1/05/2022	2916.84	1728.842	42.8833	-0.0927
Zone4	7BB	1/05/2022	1105.69	1689.902	35.9401	-0.0872
Zone4	4.05	1/05/2022	2809.68	1897.68	40.6185	-0.0829
Zone4	27H	1/05/2022	2413.27	2149.757	57.0283	-0.0822
Zone4	4.07	1/05/2022	2554.47	2079.237	45.0513	-0.0818
Zone4	27J	1/05/2022	2344.14	2136.14	62.1344	-0.0815
Zone4	3.01	1/05/2022	1291.95	1690.334	37.2989	-0.0806
Zone4	3.04B	1/05/2022	1123.76	1821.498	39.2847	-0.0802
Zone4	26AE	1/05/2022	1432.47	1883.48	37.5526	-0.0802
Zone4	BM30	1/05/2022	2715.36	1996.207	44.0868	-0.0768
Zone4	26H	1/05/2022	1452.90	1729.593	49.9634	-0.0754
Zone4	26G	1/05/2022	1425.06	1706.748	47	-0.0748
Zone4	26JB	1/05/2022	1495.71	1756.55	53.7287	-0.0737
Zone4	27F	1/05/2022	2466.48	2164.026	52.3215	-0.0734
Zone4	26MB	1/05/2022	1593.46	1750.66	58.9705	-0.0726
Zone4	3.11A	1/05/2022	1786.17	1929.216	62.1499	-0.0722
Zone4	30AB	1/05/2022	2685.64	1898.443	46.2365	-0.0721
Zone4	3.02	1/05/2022	1344.87	1837.735	34.9453	-0.0719
Zone4	3.09	1/05/2022	1618.51	1870.174	51.921	-0.071
Zone4	27DC	1/05/2022	2541.24	2190.709	48.1901	-0.0694
Zone4	27AB	1/05/2022	2009.08	2064.334	73.4824	-0.0682

Zone4	3.10A	1/05/2022	1689.03	1978.29	53.4373	-0.0671
Zone4	27L	1/05/2022	2280.24	2115.405	65.8409	-0.067
Zone4	27O	1/05/2022	2101.57	2042.821	75.025	-0.0655
Zone4	BM26	1/05/2022	1542.45	1837.805	45.4247	-0.0614
Zone4	3.13	1/05/2022	1744.89	2097.492	53.7644	-0.0602
Zone4	26OB	1/05/2022	1706.93	1812.27	67.1824	-0.0524
Zone4	3.6A	1/05/2022	1526.28	2015.74	38.9213	-0.0443
Zone4	BARRY2B	1/05/2022	2937.67	943.59	38.5538	new mark
Zone3	2CE	1/05/2022	774.75	1313.19	34.6109	-0.1150
Zone3	2.34	1/05/2022	3452.45	1683.502	37.7071	-0.1062
Zone3	14DB	1/05/2022	876.99	411.215	15.1516	-0.1022
Zone3	2.36	1/05/2022	3433.14	1534.879	35.9202	-0.095
Zone3	1.25	1/05/2022	2175.94	-129.105	20.0545	-0.0915
Zone3	2.40B	1/05/2022	3572.85	1526.452	33.1489	-0.0912
Zone3	2.33	1/05/2022	3294.51	1691.952	40.3026	-0.0903
Zone3	4.02	1/05/2022	2797.90	2143.571	45.7594	-0.0897
Zone3	A33C	1/05/2022	456.03	1219.226	35.851	-0.0889
Zone3	1.07	1/05/2022	924.43	267.487	12.4973	-0.0863
Zone3	4.03B	1/05/2022	2794.90	2044.783	43.7955	-0.0854
Zone3	4A	1/05/2022	815.01	1494.154	40.6873	-0.0851
Zone3	31BC	1/05/2022	3159.33	1954.86	45.4974	-0.0851
Zone3	4EC	1/05/2022	782.01	1687.78	41.1247	-0.0850
Zone3	BM31	1/05/2022	2967.04	1873.475	43.2806	-0.0849
Zone3	2FC	1/05/2022	720.33	843.055	23.9232	-0.0833
Zone3	15DB	1/05/2022	917.56	466.148	15.5971	-0.0829
Zone3	2DA	1/05/2022	682.15	1189.58	35.8057	-0.0829
Zone3	14EA	1/05/2022	808.56	504.723	17.0881	-0.0807
Zone3	14CB	1/05/2022	759.10	389.766	18.8155	-0.0803
Zone3	4.01C	1/05/2022	2891.78	2113.146	47.298	-0.0801
Zone3	4.04	1/05/2022	2662.60	2131.765	45.9155	-0.0797

Zone3	14BC	1/05/2022	535.45	340.672	20.9076	-0.0779
Zone3	31AC	1/05/2022	3059.04	1910.629	44.0652	-0.0773
Zone3	1.08	1/05/2022	1052.91	107.171	16.5219	-0.0769
Zone3	1.21A	1/05/2022	1939.94	-325.504	19.6529	-0.0768
Zone3	29DB	1/05/2022	2996.63	2106.66	47.8035	-0.0754
Zone3	2EB	1/05/2022	689.02	1054.62	29.2594	-0.0726
Zone3	1.22	1/05/2022	1510.00	-249.93	15.8612	-0.0716
Zone3	14FB	1/05/2022	705.60	649.144	20.1487	-0.0707
Zone3	3.25	1/05/2022	3116.90	2107.06	49.81	-0.0671
Zone3	29AC	1/05/2022	2641.62	2218.071	48.515	-0.0609
Zone3	29CE	1/05/2022	2891.84	2285.59	51.569	-0.0606
Zone3	3.24	1/05/2022	3017.29	2258.712	51.9305	-0.0557
Zone3	29B	1/05/2022	2772.84	2242.217	50.0005	-0.0462
Zone2	1.12B	1/05/2022	794.14	-73.01	11.0434	new mark
Zone2	3.14	1/05/2022	1752.75	2214.323	48.7539	-0.0727
Zone2	7AC	1/05/2022	994.54	1781.823	43.52	-0.0719
Zone2	1K	1/05/2022	511.74	957.174	29.5972	-0.0718
Zone2	3.03	1/05/2022	1134.46	1917.24	39.3452	-0.0697
Zone2	33F	1/05/2022	347.95	1511.68	42.0397	-0.0688
Zone2	BM4	1/05/2022	689.21	1555.55	42.2726	-0.0681
Zone2	4FB	1/05/2022	562.51	1370.97	39.3663	-0.0668
Zone2	BM7	1/05/2022	1057.32	1843.069	44.1115	-0.0649
Zone2	3.12	1/05/2022	1599.68	2152.411	40.263	-0.0648
Zone2	33E	1/05/2022	437.71	1437.52	40.9845	-0.0618
Zone2	1.04	1/05/2022	795.98	129.359	12.7981	-0.0608
Zone2	1JB	1/05/2022	604.79	822.761	26.4095	-0.0607
Zone2	6A	1/05/2022	946.43	1928.115	47.5073	-0.0607
Zone2	1C	1/05/2022	421.48	1098.886	34.7888	-0.0598

Zone2	33A	1/05/2022	338.15	1303.89	36.7195	-0.0591
Zone2	3.07	1/05/2022	1362.08	2096.818	48.0416	-0.0576
Zone2	1I	1/05/2022	468.34	761.228	27.2719	-0.0571
Zone2	BM14	1/05/2022	718.16	485.955	19.8315	-0.0561
Zone2	1B	1/05/2022	337.50	1062.935	34.0014	-0.0558
Zone2	BM6	1/05/2022	881.86	1837.081	46.2295	-0.0541
Zone2	33DB	1/05/2022	265.40	1714.72	46.3645	-0.0539
Zone2	14AC	1/05/2022	515.17	457.62	24.0214	-0.0517
Zone2	5C	1/05/2022	705.43	1754.71	45.1658	-0.0512
Zone2	33GA	1/05/2022	415.95	1621.64	45.3494	-0.0511
Zone2	1FB	1/05/2022	210.46	850.779	29.8282	-0.0493
Zone2	1EB	1/05/2022	388.60	912.09	30.4301	-0.0488
Zone2	1HC	1/05/2022	299.70	702.80	27.0423	-0.0486
Zone2	3.22A	1/05/2022	2891.15	2398.65	56.6562	-0.0485
Zone2	BM29	1/05/2022	2608.80	2400.76	55.9601	-0.0483
Zone2	3.15	1/05/2022	1696.24	2315.821	39.1	-0.048
Zone2	3.05	1/05/2022	966.29	1990.77	47.1859	-0.0465
Zone2	1O	1/05/2022	-271.35	814.183	22.7116	-0.0461
Zone2	1A	1/05/2022	249.92	1026.38	33.3305	-0.0452
Zone2	1GB	1/05/2022	-2.87	769.742	29.291	-0.0437
Zone2	1ME	1/05/2022	-155.40	879.89	26.1006	-0.0426
Zone2	1.03B	1/05/2022	365.55	323.37	19.3832	-0.042
Zone2	5AC	1/05/2022	470.30	1688.454	47.036	-0.0418
Zone2	1.02D	1/05/2022	85.42	283.30	18.6565	-0.0415
Zone2	BM5	1/05/2022	325.93	1806.47	47.804	-0.0414
Zone2	BM1	1/05/2022	152.75	994.87	32.7733	-0.0413

Zone2	33B	1/05/2022	156.88	1430.804	34.4127	-0.0403	
Zone2	1.01	1/05/2022	56.47	604.075	25.4477	-0.0392	
Zone2	33C	1/05/2022	222.53	1621.241	44.4096	-0.0385	
Zone2	1RA	1/05/2022	-579.06	750.36	16.7337	-0.0341	
Zone2	1.14	1/05/2022	496.74	-535.095	8.4384	-0.0312	
Zone2	AP2	1/05/2022	-1276.40	954.13	5.7698	-0.0262	
Zone2	1.16	1/05/2022	1552.97	-1086.27	18.3537	-0.0243	
Zone2	1PA	1/05/2022	-351.51	787.24	missed	1	
Zone1	2.44	1/05/2022	2734.64	421.025	27.2406	-0.5881	Dist'd
Zone1	2.05	1/05/2022	2535.68	272.682	20.7637	-0.1164	
Zone1	31NE	1/05/2022	4349.43	1927.421	33.3291	-0.0995	
Zone1	31LC	1/05/2022	4168.53	1862.11	32.072	-0.0956	
Zone1	31FC	1/05/2022	3614.22	1954.15	43.4068	-0.0953	
Zone1	2.35	1/05/2022	3609.80	1652.681	34.092	-0.0937	
Zone1	31HC	1/05/2022	3810.83	1924.65	40.3102	-0.0853	
Zone1	31JD	1/05/2022	4005.65	1911.423	35.5372	-0.0833	
Zone1	31DD	1/05/2022	3400.43	1989.83	46.6771	-0.0828	
Zone1	28AE	1/05/2022	2128.26	2448.76	85.905	-0.0713	
Zone1	31PC	1/05/2022	4393.52	1991.66	37.7119	-0.0708	
Zone1	31QC	1/05/2022	4417.71	2035.37	39.6099	-0.0658	
Zone1	3.21	1/05/2022	2585.77	2493.375	64.9214	-0.0548	
Zone1	3.30	1/05/2022	3296.29	2235.94	50.3708	-0.0519	
Zone1	1.20B	1/05/2022	1995.49	-664.093	22.0247	-0.0478	
Zone1	1.23	1/05/2022	1013.01	-440.769	13.2616	-0.047	
Zone1	1.24	1/05/2022	2225.16	-613.23	16.6868	-0.0468	

Zone1	3.16	1/05/2022	2195.60	2563.08	95.6003	-0.0462	
Zone1	3.26B	1/05/2022	3200.09	2347.92	55.4089	-0.0456	
Zone1	3.23	1/05/2022	3035.80	2453.65	59.6151	-0.0425	
Zone1	3.29	1/05/2022	3662.64	2323.533	44.9105	-0.04	
Zone1	AP1A	1/05/2022	4557.10	2288.33	42.4606	-0.0394	
Zone1	3.27B	1/05/2022	3148.37	2510.53	60.2723	-0.0393	
Zone1	1.13	1/05/2022	591.36	-310.797	7.0534	-0.0391	
Zone1	AP2A	1/05/2022	-766.18	738.506	12.3123	-0.0374	
Zone1	AP1	1/05/2022	4486.29	2137.008	41.3575	-0.035	
Zone1	1.27B	1/05/2022	1401.56	-701.57	15.3262	-0.0349	
Zone1	1UA	1/05/2022	-914.75	759.054	8.7266	-0.028	
Zone 1	AP24A	1/05/2022	2114.57	-1292.93	28.0482	-0.027	
Zone1	1.15	1/05/2022	923.35	-995.413	14.3451	-0.0269	
Zone1	1.17B	1/05/2022	2082.20	-1093.92	25.5769	-0.0267	
Zone1	AP20No2	1/05/2022	-2303.63	731.69	20.1887	-0.0165	
Zone1	BM28/2	1/05/2022	2282.46	2770.68	101.879	-0.0067	
Zone1	AP19	1/05/2022	-3242.58	480.68	-6.5213	0	control
Zone1	BUH5	1/05/2022	5480.15	2780.65	52.7029	0.0000	control
Zone1	C1	1/05/2022	2183.23	-1759.33	32.8139	0	control
Favona	F18	1/05/2022	3423.83	648.3	39.9796	-0.3518	Dist'd
Favona	F20	1/05/2022	3411.70	665.722	40.9012	-0.3029	Dist'd
Favona	F24	1/05/2022	3388.13	690.846	40.6128	-0.2751	Dist'd
Favona	F17B	1/05/2022	3405.48	613.91	43.9666	-0.2729	
Favona	F21	1/05/2022	3405.99	671.998	40.7406	-0.2727	
Favona	F22	1/05/2022	3399.79	678.39	40.683	-0.2534	
Favona	F15C	1/05/2022	3297.17	585.319	57.3088	-0.2077	
Favona	BLOCK-S	1/05/2022	3295.82	124.324	24.8154	-0.1966	

Favona	F16B	1/05/2022	3367.38	578.70	46.3697	-0.1963
Favona	F26	1/05/2022	3374.47	705.541	40.5762	-0.1897
Favona	BLOCK-N	1/05/2022	3336.45	215.694	24.2836	-0.1794
Favona	F34C	1/05/2022	3339.49	849.569	40.1622	-0.1783
Favona	F10B	1/05/2022	3176.88	446.75	49.252	-0.1761
Favona	F12C	1/05/2022	3207.32	503.824	53.477	-0.1758
Favona	F14C	1/05/2022	3275.29	551.31	60.6417	-0.1661
Favona	F28B	1/05/2022	3365.21	727.17	40.4956	-0.1641
Favona	F30B	1/05/2022	3359.36	748.26	40.6813	-0.1562
Favona	F08A	1/05/2022	3126.97	430.49	42.7275	-0.15
Favona	F32B	1/05/2022	3348.78	769.10	40.8461	-0.1459
Favona	F35B	1/05/2022	3336.68	896.063	39.7528	-0.1444
Favona	F06	1/05/2022	3107.08	445.21	40.4834	-0.1344
Favona	F04	1/05/2022	3100.96	470.88	38.7032	-0.1317
Favona	F02	1/05/2022	3097.60	490	38.1818	-0.1289
Favona	ITXCIVB	1/05/2022	2943.85	542.17	32.5941	-0.1286
Favona	FP1	1/05/2022	3004.15	131.25	45.3969	-0.1121
Favona	TRIG 24	1/05/2022	3260.76	-615.678	25.6664	-0.0636
Favona	TRIG 22	1/05/2022	3681.97	89.358	26.134	-0.056

MEMORANDUM

TO: **MARK BURROUGHS**

FROM: **BRUCE MORRISON**

DATE: **8TH FEBRUARY 2023**

SUBJECT: **GROUND SETTLEMENT MONITORING –NOVEMBER 2022**

Introduction

This report outlines the results from the November 2022 Ground Settlement Monitoring Survey.

Field Method

The settlement monitoring marks were levelled during November 2022, December 2022, and January 2023 for OceanaGold by myself utilising two inexperienced *Kauri Gold* assistants under my supervision.

Equipment used for this 'November 2022' event was the LEICA DNA03 electronic digital level (SN330350) paired with the **new** LEICA 3 section 4.05 metre fibreglass bar coded GKNL4F staff. To minimise 'windage', the staff was used in 2 section 'mode'. The level was serviced and check calibrated by the supplier in March 2022. A field calibration check was carried out by myself before commencing this event and the check result was satisfactory.

A summary of the above framework 'misclosures' for the last thirty-two events is tabulated below.

Event	West –East misclose (mm)	North –South misclose (mm)
	AP2 > 34BE > AP1	34BE > AP6
May 2007	+2.4	+6.4
Nov 2007	+2.7	+3.1
May 2008	+13.2	+4.0
Nov 2008	-8.1	+7.3
May2009	+8.8	+3.7
Nov 2009	-5.8	+2.0
May 2010	-8.1	+4.3
Nov 2010	-0.6	+6.4
May 2011	+2.0	+2.7
Nov 2011	+6.9	+6.5
May 2012	+4.1	+6.7

Nov 2012	+23.3	+5.3
May 2013	+2.7	+9.5
Nov 2013	-0.9	+4.5
May 2014	-1.1	+11.5
Nov 2014	-2.6	+7.0
May 2015	+1.6	+6.3
Nov 2015	-8.0	+10.3
May 2016	+9.2	+12.2
	AP20 No 2 >AP2 > 34BE > AP1	34BE > AP6
Nov 2016	+14.2	+3.6
	AP19 >AP2 > 34BE > AP1	34BE > AP6
May 2017	+1.0	+0.4
Nov 2017	-10.2	-0.5
May 2018	+6.4	+4.0
Nov 2018	-11.1	+3.6
	AP19 >AP2 > 34BE > AP1>BUH5	34BE > AP6
May 2019	See page 2	See page 2
	AP19 >AP2 > 34BE > AP1>BUH5	34BE > AP6
May 2019	-7.9	-6.9
	AP19 >AP2 > 34BE > AP1>BUH5	34BE > AP24A> 34BE
Nov 2019	+0.3	-1.3
	AP19 >AP2 > 34BE > AP1>BUH5	34BE > AP24A> C1
May 2020	-5.5	-1.7
Nov 2020	-3.2	-2.5
May2021	-38.7	-9.2
Nov 2021	-0.8	+1.7
May2022	+10.6	+2.3
Nov2022	+30.7	+9.7

Extending Levelling

This levelling event included LINZ benchmarks AP2, AP20 No 2, AP19, (to the west of Waihi), AP1 and BUH5 (to the east of Waihi). AP24 a.k.a control mark AP6 (south of Waihi) and AP25 have been lost to road works. AP24A and C1 have been established as a replacement for the lost AP6 control mark in this vicinity. AP2 and AP20 No 2 have now been 'unfixed' and AP19 is the fixed benchmark west of Waihi. The 'fixed' elevation value for AP19 was deduced from LINZ data comparing the relative levels of AP19, AP2, AP20 No2, and AP24 dating back to the year 1990. East of Waihi, AP1 is now 'unfixed,

and there has never been any LINZ data for this mark although AP1 appears to be constructed to the same specifications as AP19 and AP26. The R.L. for the 'new' fixed eastern control mark (BUH5) was the mean value from two close values (relative to AP19) levelled in May 2021 and Nov 2021.

Photographs

The order of levelling of the monitoring points has now been fixed. This has been achieved by photographing all of the settlement points and placing them in 22 albums –generally in the order the points are to be levelled. This will achieve repeatable error distribution and should therefore give better results. I believe **all** the marks now have accurate GPS fixes. In the future, this should make the task of locating these marks easier if the marks are covered over by re-seal etc, or quickly confirm if the marks have definitely been 'lost' to street maintenance etc.

I recommend continuing these 'maintenance' details before or during the next levelling event.

Adjustments

Disturbed marks BM20 and 2.44 are excluded from the settlement contouring- as are marks F18, F20, and F24. All the above marks are excluded from the settlement contouring.

Mark 1.10A has been lost to site development as has mark 3.24. New Marks 34BC, 1.12B, and BARRY2B have had a 'previous history' deduced for settlement purposes.

Results

Two A1 plans are attached -one (T20230216A) is colour coded by seven zones as identified in the 'Settlement and Groundwater Monitoring Plan. The original Zone boundaries and 'trigger' settlement values have been modified to match *Engineering Geology Ltd* Drawing No. 8332-Fig 16.

This A1 plan "Total Settlement Contours" (T20230216A) shows the contours (in 20 millimetre intervals) deduced from the settlement marks. The locations of these settlement marks are shown with black 'stars'.

The second A1 plan "Total Settlement Values" (T20230216B) shows the location, station I.D., and total settlement value in millimetres for each mark.

The Settlement and Groundwater Monitoring Plan identifies gradients steeper than 1:1000 to be cause for concern. BM20 has been a large mover in the past and has been identified in past surveys as being placed on shrinking material. There are no buildings in this area anymore. I understand (from Mark Halloran) BM20A was placed near BM20 with a 'foot' bedded in firm ground. Significant differential settlement (1:121) is now occurring between BM20A and BM20 –sufficient to decide to omit BM20 from the settlement 'contour' calculation.

These contours represent the total negative (–ve) movement (or settlement) around Waihi since monitoring began.

The closest contours (omitting disturbed marks) are between marks 20AC and BM20A. The distance between these marks using GPS measurements, calculates at 126.706 metres, and show 0.1850 metres of relative vertical movement to give a gradient of 1:684. The distance between marks BM20A and 20D using GPS measurements, calculates at 137.047 metres, and shows 0.1689 metres of relative vertical movement to give a gradient of 1:811. The distance between marks 20C and BM20A, when checked by GPS measurements, calculates at 126.865 metres, and show 0.1423 metres of relative vertical movement to give a gradient of 1:891.

Some cracks are visible in the sealed pavements in this area of closest contours.

Table 1 (pages 3 -11) lists all the marks used for this settlement levelling event with the marks sorted first by Zone and then by settlement value. Marks that record 'exceedences' in terms of zone predictions (for Martha (2019) are highlighted with colour and have comments attached. All marks that 'exceeded' in Table 1 were analysed further and field inspections were conducted where required.

The comments included below attempt to explain the probable reason for 'excess' movement. The comments are *Dist'd* for BM20 in Zone 6. For Zone4, 4 of the 5 marks are near Zone 5. For Zone 3, 12 of the 13 marks are located near Zone 4 or Zone 5. For Zone 2, 20 of the 21 marks are located near Zone 3 or Zone 4. For Zone 1, 2.44 is *Dist'd,* 13 of 15 other marks are located near Zone 2 or Zone 3.

The 'Favona' marks were installed for monitoring the effects of dewatering in the original underground mine area. The underlying original 'Martha' zone was Zone 3 and but the Favona marks were never given zone exceedence parameters in terms of the original Martha zones. The Favona marks all report significant settlement. Note marks F18, F20, and F24 are tentatively labelled as 'Dist'd' and not used for contouring the settlement.

The five extra 'Favona' settlement marks are again shown on the plan. These are FP1, BLOCK-S, BLOCK-N, TRIG 22, and TRIG 24. The settlements for these marks have generally been deduced relative to original reduced levels measured around the year 1987 –although FP1 (at the Favona portal) was established about the year 2000. The underlying zone for the Favona marks is now Zone 5 Martha (2019).

I understand that Time-History plots for all survey marks grouped by zone will be produced by other persons in accordance with the "Settlement and Groundwater Monitoring Plan 31 July 2005"

Bruce Morrison

Registered Professional Surveyor

Table 1. Total Movement

	Zone	station i.d.	SURVEY DATE	X	Y	TOTAL Z	SETTLEMENT Nov-22	Comments
1	Zone7	BM19B	1/11/2022	2117.17	1244.355	35.5269	-0.3405	
1	Zone7	19BB	1/11/2022	2191.56	1292.022	35.5218	-0.3371	
1	Zone7	17CB	1/11/2022	2014.23	1201.01	35.458	-0.3188	

3	Zone6	BM20	1/11/2022	2342.50	1476.25	35.5722	-0.4081	Dist'd
1	Zone6	BM20A	1/11/2022	2345.50	1484.90	35.7456	-0.3327	
1	Zone6	19CB	1/11/2022	2296.71	1381.4	34.9129	-0.3182	
1	Zone6	17BB	1/11/2022	1919.52	1160.787	37.3501	-0.2828	
1	Zone6	17AB	1/11/2022	1841.32	1104.802	36.8705	-0.2494	
1	Zone6	34GC	1/11/2022	2211.33	1119.517	32.1247	-0.2285	
1	Zone6	2.04B	1/11/2022	1893.21	968.34	29.0811	-0.2107	
1	Zone6	18C	1/11/2022	1494.95	767.193	27.4574	-0.1975	
1	Zone6	34H	1/11/2022	2233.59	970.56	32.1523	-0.1965	
1	Zone6	18IB	1/11/2022	1611.19	784.79	25.8216	-0.195	
1	Zone6	18EE	1/11/2022	1750.73	809.328	23.4275	-0.1939	
1	Zone6	2.10	1/11/2022	2143.92	950.387	30.2805	-0.1928	
1	Zone6	34AD	1/11/2022	1470.88	886.92	29.7565	-0.192	
1	Zone6	34BE	1/11/2022	1732.56	931.60	28.3257	-0.1821	
1	Zone6	10BC	1/11/2022	1560.13	1062.92	38.0946	-0.1779	
1	Zone6	34CB	1/11/2022	1967.74	983.20	30.0324	-0.1733	
1	Zone6	34FC	1/11/2022	2120.79	587.931	19.0346	-0.1731	
1	Zone6	BM34	1/11/2022	1528.38	903.30	30.3124	-0.1727	
1	Zone6	10AB	1/11/2022	1430.61	1036.998	34.9895	-0.1716	
1	Zone6	11AC	1/11/2022	1308.26	859.512	29.3283	-0.1712	
1	Zone6	BM17A	1/11/2022	1724.44	1088.919	40.0264	-0.1655	
1	Zone6	18AB	1/11/2022	1632.39	667.73	22.1342	-0.1594	
1	Zone6	2.11C	1/11/2022	2292.35	896.99	26.6118	-0.1583	
1	Zone6	2.08B	1/11/2022	2289.75	782.64	24.5335	-0.1563	
1	Zone6	2.09C	1/11/2022	2228.35	868.63	28.6389	-0.15	
1	Zone6	1.28B	1/11/2022	1987.03	447.706	12.0956	-0.1498	
1	Zone6	34I	1/11/2022	2229.55	765.534	28.4601	-0.1435	
1	Zone6	2.06	1/11/2022	2351.95	334.473	11.2788	-0.1239	
1	Zone5	A10B	1/11/2022	1298.62	1049.614	30.6777	-0.1975	
1	Zone5	20C	1/11/2022	2450.61	1413.86	36.3177	-0.1904	
1	Zone5	21DC	1/11/2022	2573.96	1304.152	37.751	-0.1894	
1	Zone5	20E	1/11/2022	2535.65	1542.672	37.0734	-0.1893	
1	Zone5	25D	1/11/2022	2547.05	1248.02	36.8536	-0.1878	

1	Zone5	16BC	1/11/2022	1252.81	1336.473	39.4439	-0.1859
1	Zone5	25A	1/11/2022	2505.13	1203.77	35.9276	-0.1818
1	Zone5	25E	1/11/2022	2472.35	1162.013	34.7646	-0.1786
1	Zone5	21O	1/11/2022	2527.37	1356.342	35.9994	-0.1772
1	Zone5	BM25	1/11/2022	2424.91	1100.25	33.4719	-0.1768
1	Zone5	BM16	1/11/2022	1418.09	1218.03	46.4274	-0.1762
1	Zone5	10DC	1/11/2022	1279.04	1198.33	35.2905	-0.1761
1	Zone5	21N	1/11/2022	2623.25	1342.435	38.2787	-0.1721
1	Zone5	25H	1/11/2022	2648.48	1232.956	38.9079	-0.1691
1	Zone5	25CB	1/11/2022	2615.91	1190.496	38.2837	-0.1688
1	Zone5	10CB	1/11/2022	1222.46	1025.855	29.7678	-0.1685
1	Zone5	2.41	1/11/2022	3296.32	685.398	46.2506	-0.1685
1	Zone5	25G	1/11/2022	2594.60	1149.415	37.5765	-0.1685
1	Zone5	25F	1/11/2022	2542.53	1116.24	35.9881	-0.1656
1	Zone5	20D	1/11/2022	2482.07	1473.478	36.5549	-0.1638
1	Zone5	25B	1/11/2022	2497.67	1105.828	34.8179	-0.162
1	Zone5	34EB	1/11/2022	2073.93	705.95	24.6319	-0.1601
1	Zone5	12CE	1/11/2022	1499.92	543.077	20.9774	-0.1598
1	Zone5	2.03	1/11/2022	1930.08	745.94	22.5876	-0.1586
1	Zone5	BM12	1/11/2022	1370.27	607.735	23.9513	-0.1578
1	Zone5	24DC	1/11/2022	2718.29	1323.127	39.6252	-0.1574
1	Zone5	21C	1/11/2022	2651.57	1389.816	38.4567	-0.1568
1	Zone5	18F	1/11/2022	1752.28	551.027	17.3255	-0.1564
1	Zone5	13AC	1/11/2022	1751.98	327.376	18.591	-0.1562
1	Zone5	18B	1/11/2022	1510.36	650.578	23.5549	-0.1546
1	Zone5	2A	1/11/2022	1069.03	1111.858	23.7931	-0.1543
1	Zone5	24L	1/11/2022	2761.67	1181.326	39.3157	-0.1533
1	Zone5	18G	1/11/2022	1669.05	554.602	18.4711	-0.1527
1	Zone5	24K	1/11/2022	2783.89	1387.719	40.6067	-0.1526
1	Zone5	34D	1/11/2022	2038.90	783.431	25.3381	-0.1522
1	Zone5	21EB	1/11/2022	2799.95	1429.087	41.6248	-0.151
1	Zone5	22F	1/11/2022	2815.91	1325.407	40.222	-0.1497
1	Zone5	25I	1/11/2022	2537.20	1045.036	34.6812	-0.1494

1	Zone5	24J	1/11/2022	2749.39	1365.756	40.2245	-0.1487
1	Zone5	1.28A	1/11/2022	1888.26	505.887	13.2077	-0.1485
1	Zone5	20AC	1/11/2022	2461.04	1536.905	37.0139	-0.1477
1	Zone5	15A	1/11/2022	1204.79	818.86	28.7651	-0.1472
1	Zone5	24E	1/11/2022	2758.43	1303.234	40.3527	-0.1471
1	Zone5	24AC	1/11/2022	2743.58	1218.90	40.0794	-0.1469
1	Zone5	BM18	1/11/2022	1771.96	674.53	19.4258	-0.1468
1	Zone5	4DB	1/11/2022	1033.26	1550.66	32.2339	-0.1468
1	Zone5	BM24	1/11/2022	2794.55	1279.361	40.3886	-0.1463
1	Zone5	24F	1/11/2022	2772.80	1257.274	40.1186	-0.1461
1	Zone5	12DC	1/11/2022	1596.95	435.491	19.9615	-0.1449
1	Zone5	12AC	1/11/2022	1388.32	488.888	19.0429	-0.1439
1	Zone5	13BC	1/11/2022	1850.36	246.587	13.7195	-0.1434
1	Zone5	20BB	1/11/2022	2533.26	1622.29	37.8703	-0.1431
1	Zone5	15BC	1/11/2022	1169.90	708.86	26.3263	-0.1418
1	Zone5	18HC	1/11/2022	1821.52	466.47	14.8869	-0.1417
1	Zone5	21M	1/11/2022	2694.90	1439.648	39.1765	-0.1416
1	Zone5	24G	1/11/2022	2705.96	1170.464	39.7891	-0.141
1	Zone5	4B	1/11/2022	1021.54	1448.629	31.2374	-0.1393
1	Zone5	24B	1/11/2022	2667.67	1126.399	39.3692	-0.1385
1	Zone5	11BB	1/11/2022	1348.57	710.573	26.9237	-0.1381
1	Zone5	2BC	1/11/2022	970.20	1241.90	30.3699	-0.1380
1	Zone5	20F	1/11/2022	2605.79	1575.98	37.5647	-0.1351
1	Zone5	BM21	1/11/2022	2654.80	1515.397	39.4195	-0.135
1	Zone5	AP22A	1/11/2022	1868.44	188.565	12.407	-0.1349
1	Zone5	12BC	1/11/2022	1405.27	368.295	14.9152	-0.1338
1	Zone5	21BC	1/11/2022	2719.27	1477.799	41.2627	-0.1338
1	Zone5	BM13	1/11/2022	1426.61	269.34	13.5725	-0.1333
1	Zone5	21K	1/11/2022	2681.11	1572.207	39.9934	-0.1326
1	Zone5	24H	1/11/2022	2630.70	1072.279	36.1476	-0.1315
1	Zone5	2.17A	1/11/2022	3085.76	555.866	36.9019	-0.1311
1	Zone5	BM9B	1/11/2022	1220.25	1523.285	34.7414	-0.1204
1	Zone5	30C	1/11/2022	2573.54	1675.395	38.438	-0.119

1	Zone5	7CB	1/11/2022	1161.74	1597.63	30.6018	-0.1186	
1	Zone5	AP3	1/11/2022	918.94	1140.585	26.062	-0.1133	
1	Zone5	26Q	1/11/2022	1963.00	1982.71	73.6618	-0.0987	
1	Zone5	26R	1/11/2022	1905.59	1927.165	71.3461	-0.0976	
1	Zone5	26PB	1/11/2022	1834.84	1893.106	67.9339	-0.0968	
1	Zone5	26F	1/11/2022	1392.77	1680.261	43.8483	-0.0963	
3	Zone5	1.10A	1/11/2022	1599.70	278.938	lost	Lost	
1	Zone4	23C	1/11/2022	2856.14	1068.014	37.5444	-0.2164	Nr Zone 5
1	Zone4	23AB	1/11/2022	3145.42	1078.73	37.1879	-0.1836	?
1	Zone4	22C	1/11/2022	2846.39	1352.544	40.3044	-0.1704	Nr Zone 5
1	Zone4	2.24	1/11/2022	2885.91	1215.469	41.2723	-0.1682	Nr zone 5
1	Zone4	23D	1/11/2022	2861.42	1154.885	38.8527	-0.1617	Nr Zone 5
1	Zone4	2.25	1/11/2022	2874.51	1097.261	37.9734	-0.1571	
1	Zone4	BANK1	1/11/2022	2866.21	1023.248	37.7965	-0.1567	
1	Zone4	22GB	1/11/2022	2862.88	1387.968	40.8343	-0.1554	
1	Zone4	2.19B	1/11/2022	3270.21	916.063	38.5557	-0.1553	
1	Zone4	MATAURA1	1/11/2022	2831.84	1250.806	41.0577	-0.1545	
1	Zone4	2.14A	1/11/2022	2853.28	838.669	41.313	-0.1525	
1	Zone4	BARRY1	1/11/2022	3047.74	926.576	38.1137	-0.1525	
1	Zone4	23B	1/11/2022	2856.49	949.794	38.7463	-0.1523	
1	Zone4	MORTON	1/11/2022	2975.42	1231.913	40.7068	-0.1513	
1	Zone4	BARRY4B	1/11/2022	3320.16	912.693	38.8851	-0.1477	
1	Zone4	BARRY3	1/11/2022	3176.85	895.991	37.6857	-0.1477	
1	Zone4	2.18	1/11/2022	3218.04	712.756	44.5429	-0.1472	
1	Zone4	22E	1/11/2022	3055.20	1231.504	40.7796	-0.1465	
1	Zone4	BARRY5	1/11/2022	3397.59	904.647	40.9882	-0.1463	
1	Zone4	2.23	1/11/2022	3560.02	1212.795	36.6318	-0.1452	
1	Zone4	BARRY6	1/11/2022	3432.52	904.356	42.4737	-0.1451	
1	Zone4	2HB	1/11/2022	1078.24	886.849	24.3849	-0.1446	
1	Zone4	2.20	1/11/2022	3467.69	904.56	43.7795	-0.1428	
1	Zone4	BM23	1/11/2022	3107.42	921.049	38.088	-0.1414	
1	Zone4	23E	1/11/2022	2774.82	972.514	37.7137	-0.141	
1	Zone4	22BC	1/11/2022	2916.75	1435.77	42.097	-0.1408	

1	Zone4	22M	1/11/2022	2973.44	1434.656	41.6655	-0.14
1	Zone4	22H	1/11/2022	2869.25	1441.796	41.6138	-0.1393
1	Zone4	BARRY2B	1/11/2022	2937.67	943.59	38.5558	-0.1389
1	Zone4	STAFORD	1/11/2022	3139.86	998.179	37.3156	-0.1388
1	Zone4	2.22	1/11/2022	3339.13	1206.603	40.3457	-0.1381
1	Zone4	1.11B	1/11/2022	1675.83	133.62	9.0255	-0.1380
1	Zone4	21P	1/11/2022	2849.17	1456.9	41.8464	-0.1368
1	Zone4	22I	1/11/2022	2918.98	1461.367	41.9126	-0.1366
1	Zone4	BARRY7	1/11/2022	3518.87	901.897	43.6075	-0.1355
1	Zone4	2.16	1/11/2022	3007.62	739.64	33.5932	-0.1353
1	Zone4	2.15	1/11/2022	2918.94	723.52	38.3631	-0.1349
1	Zone4	22L	1/11/2022	3047.70	1499.876	40.9881	-0.1348
1	Zone4	GW	1/11/2022	3128.83	1140.936	38.5379	-0.1342
1	Zone4	22A	1/11/2022	3003.28	1429.771	41.6385	-0.1335
1	Zone4	22D	1/11/2022	3100.02	1335.441	41.4467	-0.133
1	Zone4	2.13	1/11/2022	2725.42	874.951	47.2119	-0.1307
1	Zone4	BM2	1/11/2022	915.74	1091.799	24.8243	-0.13
1	Zone4	AP100	1/11/2022	1893.80	81.27	11.7812	-0.1291
1	Zone4	CUBA	1/11/2022	3224.32	1079.177	35.8249	-0.1291
1	Zone4	BARRY8	1/11/2022	3592.28	871.451	37.9339	-0.129
1	Zone4	1.05	1/11/2022	1176.96	473.454	21.812	-0.1287
1	Zone4	22J	1/11/2022	2944.47	1489.763	42.4192	-0.1284
1	Zone4	21FB	1/11/2022	2861.65	1512.211	42.6444	-0.1281
1	Zone4	27KB	1/11/2022	2320.23	2120.206	63.326	-0.127
1	Zone4	26BE	1/11/2022	1408.78	1800.553	38.8046	-0.1268
1	Zone4	21AC	1/11/2022	2716.64	1617.767	39.6854	-0.1246
1	Zone4	21L	1/11/2022	2806.79	1575.074	43.0798	-0.1243
1	Zone4	BM22	1/11/2022	3115.79	1442.95	40.6141	-0.1232
1	Zone4	23F	1/11/2022	2700.77	968.793	36.6603	-0.1228
1	Zone4	2.29B	1/11/2022	2953.39	1548.172	42.5846	-0.1209
1	Zone4	26CE	1/11/2022	1377.77	1711.891	40.5883	-0.1205
1	Zone4	2.27	1/11/2022	3379.40	1371.481	37.7522	-0.1205
1	Zone4	15C	1/11/2022	1156.82	571.077	24.2036	-0.1194
1	Zone4	2GB	1/11/2022	922.38	967.661	22.6705	-0.1185

1	Zone4	1.26	1/11/2022	1926.81	30.05	15.0925	-0.1170
1	Zone4	21Q	1/11/2022	2899.60	1571.317	43.1232	-0.1169
1	Zone4	1.06	1/11/2022	1159.34	302.26	17.2163	-0.1149
1	Zone4	27N	1/11/2022	2179.57	2075.985	71.9052	-0.1144
1	Zone4	22KB	1/11/2022	2981.80	1603.49	42.8457	-0.1132
1	Zone4	30BB	1/11/2022	2604.86	1726.496	41.5454	-0.1124
1	Zone4	21I	1/11/2022	2854.70	1668.793	41.6396	-0.112
1	Zone4	21GC	1/11/2022	2901.12	1614.054	43.4393	-0.1105
1	Zone4	21J	1/11/2022	2773.44	1688.923	39.9576	-0.1101
1	Zone4	4.08	1/11/2022	2350.64	2022.324	73.2063	-0.1089
1	Zone4	SM822	1/11/2022	2512.91	1841.132	41.4531	-0.1085
1	Zone4	27E	1/11/2022	2494.09	2171.622	50.3385	-0.1073
1	Zone4	2.31B	1/11/2022	3201.23	1637.289	42.0887	-0.1065
1	Zone4	BM15	1/11/2022	976.94	783.004	20.5139	-0.1055
1	Zone4	2.30B	1/11/2022	3000.35	1672.94	43.1666	-0.1032
1	Zone4	7BB	1/11/2022	1105.69	1689.90	35.9298	-0.1023
1	Zone4	1.09B	1/11/2022	1344.14	117.48	9.9248	-0.1015
1	Zone4	21HC	1/11/2022	2916.84	1728.842	42.878	-0.1006
1	Zone4	3.01	1/11/2022	1291.95	1690.334	37.287	-0.0976
1	Zone4	27J	1/11/2022	2344.14	2136.138	62.127	-0.0974
1	Zone4	4.07	1/11/2022	2554.47	2079.237	45.0446	-0.0973
1	Zone4	27H	1/11/2022	2413.27	2149.757	57.0221	-0.0969
1	Zone4	3.04B	1/11/2022	1123.76	1821.498	39.2743	-0.0939
1	Zone4	26AE	1/11/2022	1432.47	1883.479	37.5442	-0.0937
1	Zone4	27I	1/11/2022	2385.10	2141.94	59.5229	-0.0921
1	Zone4	3.11A	1/11/2022	1786.17	1929.216	62.1397	-0.0904
1	Zone4	26H	1/11/2022	1452.90	1729.593	49.954	-0.0901
1	Zone4	27AB	1/11/2022	2009.08	2064.334	73.4703	-0.0898
1	Zone4	26MB	1/11/2022	1593.46	1750.663	58.9611	-0.089
1	Zone4	27F	1/11/2022	2466.48	2164.026	52.3154	-0.0877
1	Zone4	4.05	1/11/2022	2809.68	1897.68	40.616	-0.0876
1	Zone4	3.02	1/11/2022	1344.87	1837.735	34.9356	-0.087
1	Zone4	3.09	1/11/2022	1618.51	1870.174	51.9121	-0.0867
1	Zone4	26JB	1/11/2022	1495.71	1756.55	53.722	-0.0854
1	Zone4	BM30	1/11/2022	2715.36	1996.207	44.0816	-0.0854

1	Zone4	3.10A	1/11/2022	1689.03	1978.29	53.4275	-0.0837	
1	Zone4	27L	1/11/2022	2280.24	2115.405	65.8336	-0.0824	
1	Zone4	27O	1/11/2022	2101.57	2042.821	75.017	-0.0813	
1	Zone4	30AB	1/11/2022	2685.64	1898.443	46.2317	-0.0805	
1	Zone4	3.13	1/11/2022	1744.89	2097.492	53.7542	-0.0795	
1	Zone4	27DC	1/11/2022	2541.24	2190.709	48.1844	-0.0783	
1	Zone4	BM26	1/11/2022	1542.45	1837.805	45.4157	-0.0764	
1	Zone4	26OB	1/11/2022	1706.93	1812.27	67.1741	-0.0684	
1	Zone4	1.12B	1/11/2022	794.14	-73.011	11.0368	-0.0679	
1	Zone4	3.6A	1/11/2022	1526.28	2015.739	38.912	-0.0586	
1	Zone3	2CE	1/11/2022	774.75	1313.191	34.6024	-0.1258	Nr Zone 5
1	Zone3	2.34	1/11/2022	3452.45	1683.502	37.7024	-0.1106	Nr Zone 4
1	Zone3	14DB	1/11/2022	876.99	411.215	15.1448	-0.109	Nr Zone 4
1	Zone3	A33C	1/11/2022	456.03	1219.226	35.8432	-0.0996	Nr 2CE above
1	Zone3	2.36	1/11/2022	3433.14	1534.879	35.9166	-0.0992	Nr Zone 4
1	Zone3	2.33	1/11/2022	3294.51	1691.952	40.2962	-0.0989	Nr Zone 4
1	Zone3	4EC	1/11/2022	782.01	1687.78	41.1148	-0.098	Nr Zone 4
1	Zone3	1.25	1/11/2022	2175.94	-129.105	20.0521	-0.0974	Nr Zone 4
1	Zone3	2.40B	1/11/2022	3572.85	1526.452	33.1444	-0.0973	Nr Zone 4
1	Zone3	4A	1/11/2022	815.01	1494.154	40.6796	-0.0964	Nr Zone 5
1	Zone3	4.02	1/11/2022	2797.90	2143.571	45.756	-0.0963	Nr Zone 4
1	Zone3	1.07	1/11/2022	924.43	267.487	12.4888	-0.0954	Nr Zone 4
1	Zone3	31BC	1/11/2022	3159.33	1954.857	45.4903	-0.0951	Nr Zone 4
1	Zone3	BM31	1/11/2022	2967.04	1873.475	43.2741	-0.0947	
1	Zone3	2FC	1/11/2022	720.33	843.055	23.9148	-0.0945	
1	Zone3	15DB	1/11/2022	917.56	466.148	15.5893	-0.0915	
1	Zone3	2DA	1/11/2022	682.15	1189.579	35.7992	-0.0909	
1	Zone3	14EA	1/11/2022	808.56	504.723	17.0799	-0.0899	
1	Zone3	4.03B	1/11/2022	2794.90	2044.783	43.7937	-0.0899	
1	Zone3	4.01C	1/11/2022	2891.78	2113.15	47.2917	-0.0898	
1	Zone3	31AC	1/11/2022	3059.04	1910.63	44.0575	-0.0886	
1	Zone3	4.04	1/11/2022	2662.60	2131.765	45.9107	-0.0871	
1	Zone3	14CB	1/11/2022	759.10	389.77	18.8089	-0.0868	
1	Zone3	29DB	1/11/2022	2996.63	2106.66	47.7967	-0.0864	
1	Zone3	2EB	1/11/2022	689.02	1054.621	29.251	-0.0848	

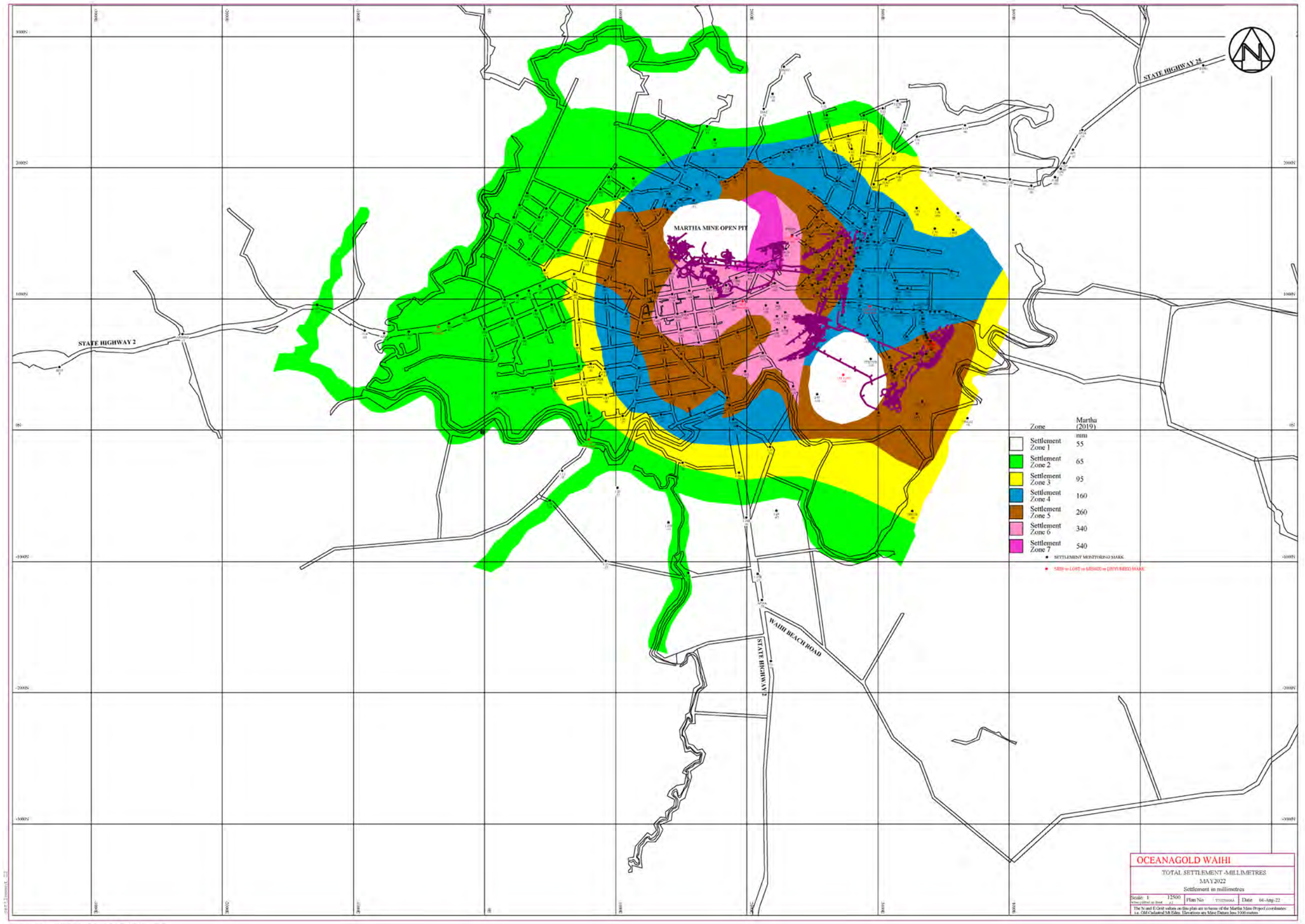
1	Zone3	14BC	1/11/2022	535.45	340.672	20.9013	-0.0845	
1	Zone3	1.08	1/11/2022	1052.91	107.171	16.5138	-0.0838	
1	Zone3	14FB	1/11/2022	705.60	649.144	20.14	-0.0806	
1	Zone3	1.21A	1/11/2022	1939.94	-325.504	19.6515	-0.0801	
1	Zone3	3.25	1/11/2022	3116.90	2107.06	49.8032	-0.0780	
1	Zone3	1.22	1/11/2022	1510.00	-249.93	15.8584	-0.0748	
1	Zone3	29CE	1/11/2022	2891.84	2285.59	51.5625	-0.0712	
1	Zone3	29AC	1/11/2022	2641.62	2218.071	48.5098	-0.0695	
1	Zone3	29B	1/11/2022	2772.84	2242.217	49.9944	-0.0555	
3	Zone3	3.24	1/11/2022	3017.29	2258.712	lost	lost	
1	Zone2	3.14	1/11/2022	1752.75	2214.323	48.745	-0.0875	Nr Zone 4
1	Zone2	1K	1/11/2022	511.74	957.174	29.5855	-0.0872	Nr Zone 3
1	Zone2	7AC	1/11/2022	994.54	1781.82	43.5101	-0.0859	Nr Zone 3
1	Zone2	3.03	1/11/2022	1134.46	1917.237	39.3347	-0.0843	Nr Zone 4
1	Zone2	3.12	1/11/2022	1599.68	2152.41	40.2543	-0.0790	Nr Zone 4
1	Zone2	BM4	1/11/2022	689.21	1555.55	42.2648	-0.0787	Nr Zone 3
1	Zone2	BM7	1/11/2022	1057.32	1843.07	44.1014	-0.0787	Nr Zone 4
1	Zone2	3.07	1/11/2022	1362.08	2096.818	48.032	-0.0741	Nr Zone 4
1	Zone2	1JB	1/11/2022	604.79	822.761	26.3987	-0.0741	Nr Zone 3
1	Zone2	33F	1/11/2022	347.95	1511.68	42.0341	-0.0738	Nr 4FB below
1	Zone2	4FB	1/11/2022	562.51	1370.97	39.3598	-0.0735	Nr Zone 3
1	Zone2	6A	1/11/2022	946.43	1928.115	47.4978	-0.0733	Nr Zone 4
1	Zone2	33A	1/11/2022	338.15	1303.89	36.7114	-0.0717	Nr Zone 3
1	Zone2	1C	1/11/2022	421.48	1098.89	34.7807	-0.0713	Nr Zone 3
1	Zone2	33E	1/11/2022	437.71	1437.524	40.9774	-0.0697	Nr 4FB above
1	Zone2	1I	1/11/2022	468.34	761.228	27.2619	-0.0685	Nr Zone 3
1	Zone2	1.04	1/11/2022	795.98	129.359	12.7901	-0.0684	Nr Zone 3
1	Zone2	BM6	1/11/2022	881.86	1837.081	46.2196	-0.0682	Nr Zone 3
1	Zone2	33DB	1/11/2022	265.40	1714.719	46.3555	-0.0672	?
1	Zone2	BM14	1/11/2022	718.16	485.955	19.8236	-0.0659	Nr Zone 3
1	Zone2	1B	1/11/2022	337.50	1062.935	33.9944	-0.0653	Nr Zone 3
1	Zone2	5C	1/11/2022	705.43	1754.71	45.1558	-0.0647	
1	Zone2	3.15	1/11/2022	1696.24	2315.821	39.091	-0.0616	
1	Zone2	3.22A	1/11/2022	2891.15	2398.649	56.649	-0.0608	
1	Zone2	14AC	1/11/2022	515.17	457.622	24.0134	-0.0606	

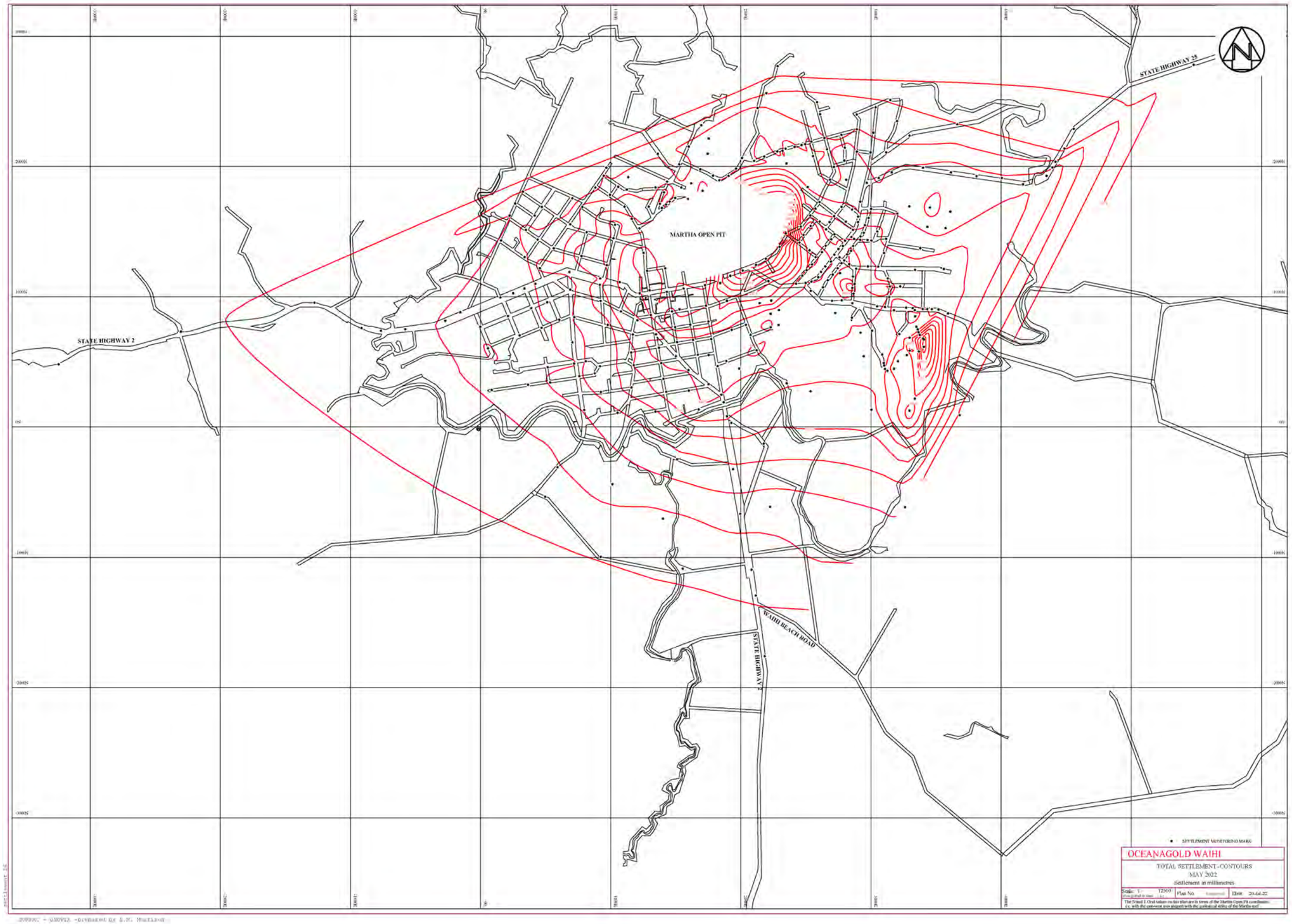
1	Zone2	33GA	1/11/2022	415.95	1621.64	45.3413	-0.0604	
1	Zone2	BM29	1/11/2022	2608.80	2400.756	55.9534	-0.0596	
1	Zone2	1EB	1/11/2022	388.60	912.09	30.4208	-0.0593	
1	Zone2	1FB	1/11/2022	210.46	850.779	29.8203	-0.0591	
1	Zone2	1HC	1/11/2022	299.70	702.8	27.0356	-0.0554	
1	Zone2	5AC	1/11/2022	470.30	1688.454	47.0266	-0.0544	
1	Zone2	1A	1/11/2022	249.92	1026.38	33.324	-0.0541	
1	Zone2	1O	1/11/2022	-271.35	814.183	22.7058	-0.0539	
1	Zone2	33B	1/11/2022	156.88	1430.80	34.404	-0.0531	
1	Zone2	BM5	1/11/2022	325.93	1806.47	47.7954	-0.0527	
1	Zone2	33C	1/11/2022	222.53	1621.241	44.4011	-0.052	
1	Zone2	1GB	1/11/2022	-2.87	769.74	29.2841	-0.0515	
1	Zone2	BM1	1/11/2022	152.75	994.869	32.7672	-0.05	
1	Zone2	1.03B	1/11/2022	365.55	323.37	19.3768	-0.0498	
1	Zone2	3.05	1/11/2022	966.29	1990.77	47.181	-0.0497	
1	Zone2	1.02D	1/11/2022	85.42	283.3	18.65	-0.0497	
1	Zone2	1ME	1/11/2022	-155.40	879.887	26.0952	-0.0492	
1	Zone2	1.01	1/11/2022	56.47	604.075	25.4405	-0.0471	
1	Zone2	1RA	1/11/2022	-579.06	750.356	16.729	-0.0403	
1	Zone2	1.14	1/11/2022	496.74	-535.10	8.4339	-0.0333	
1	Zone2	AP2	1/11/2022	-1276.40	954.13	5.7666	-0.0312	
1	Zone2	1.16	1/11/2022	1552.97	-1086.27	18.3528	-0.0233	
3	Zone1	2.44	1/11/2022	2734.64	421.025	27.2491	-0.579	Dist'd
1	Zone1	2.05	1/11/2022	2535.68	272.68	20.7629	-0.1181	Nr Zone 3
1	Zone1	31FC	1/11/2022	3614.22	1954.151	43.3996	-0.1042	Nr Zone 3
1	Zone1	31NE	1/11/2022	4349.43	1927.421	33.3254	-0.1039	?
1	Zone1	31LC	1/11/2022	4168.53	1862.106	32.0673	-0.1006	Nr Zone 3
1	Zone1	2.35	1/11/2022	3609.80	1652.681	34.0866	-0.0995	Nr Zone 3
1	Zone1	28AE	1/11/2022	2128.26	2448.76	85.8917	-0.0938	Nr Zone 2
1	Zone1	31DD	1/11/2022	3400.43	1989.83	46.6695	-0.0932	Nr Zone 3
1	Zone1	31JD	1/11/2022	4005.65	1911.423	35.5324	-0.0925	Nr Zone 3
1	Zone1	31HC	1/11/2022	3810.83	1924.654	40.3037	-0.0924	Nr Zone 3
1	Zone1	31PC	1/11/2022	4393.52	1991.662	37.7082	-0.0751	?
1	Zone1	31QC	1/11/2022	4417.71	2035.374	39.6072	-0.0707	?

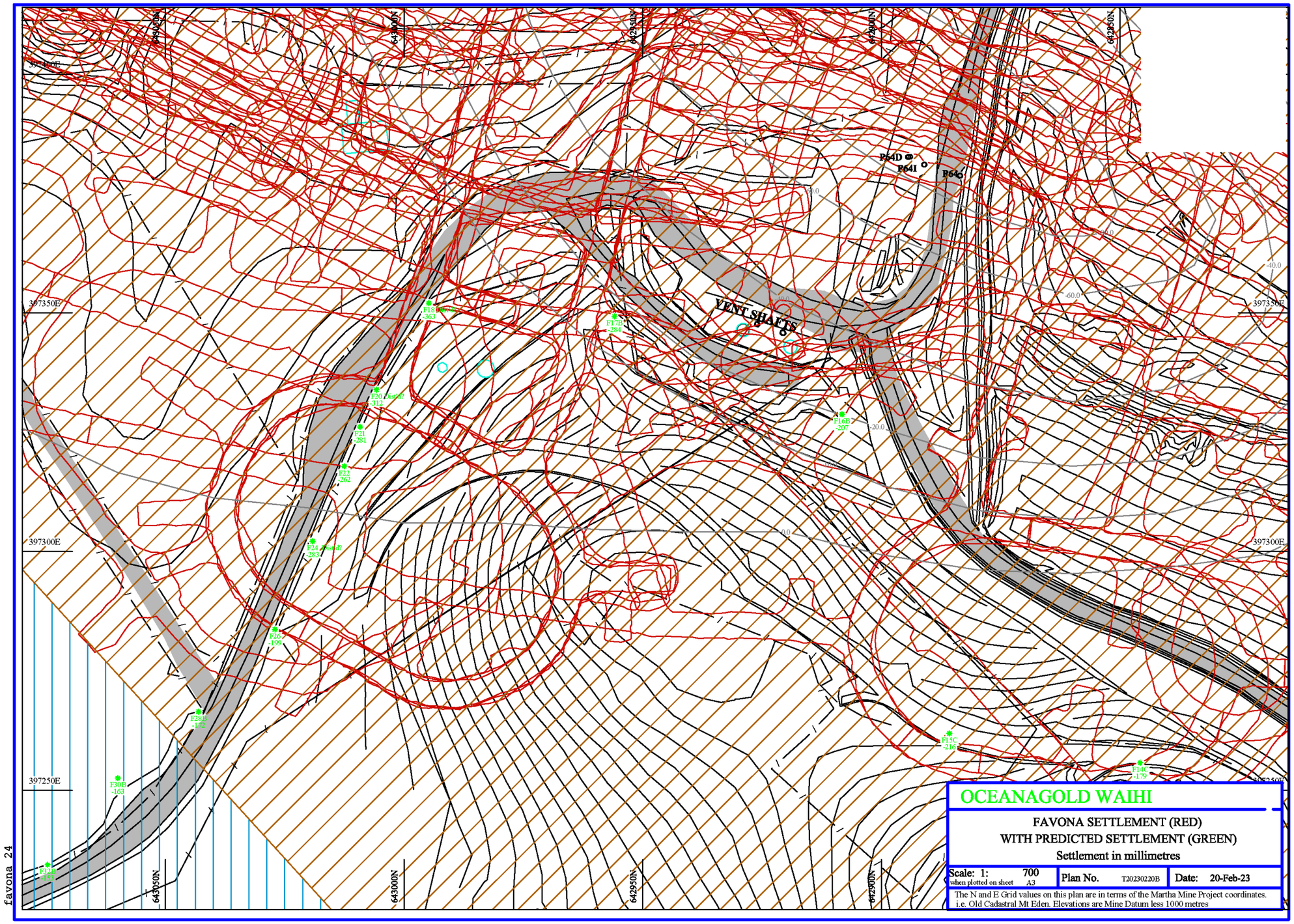
1	Zone1	3.16	1/11/2022	2195.60	2563.077	95.5871	-0.0689	Nr 28AE above
1	Zone1	3.30	1/11/2022	3296.29	2235.94	50.3661	-0.0624	Nr Zone 2
1	Zone1	3.21	1/11/2022	2585.77	2493.375	64.919	-0.0586	Nr Zone 2
1	Zone1	3.26B	1/11/2022	3200.09	2347.92	55.4023	-0.0578	Nr Zone 2
1	Zone1	3.23	1/11/2022	3035.80	2453.651	59.6085	-0.0545	
1	Zone1	3.29	1/11/2022	3662.64	2323.53	44.9036	-0.0532	
1	Zone1	3.27B	1/11/2022	3148.37	2510.53	60.2654	-0.0523	
1	Zone1	1.20B	1/11/2022	1995.49	-664.093	22.0237	-0.0499	
1	Zone1	1.24	1/11/2022	2225.16	-613.23	16.6878	-0.0465	
1	Zone1	1.23	1/11/2022	1013.01	-440.77	13.2592	-0.0456	
1	Zone1	AP2A	1/11/2022	-766.18	738.506	12.3083	-0.0433	
1	Zone1	1.13	1/11/2022	591.36	-310.797	7.0477	-0.0433	
1	Zone1	AP1A	1/11/2022	4557.10	2288.33	42.4602	-0.0378	
1	Zone1	AP1	1/11/2022	4486.29	2137.01	41.3565	-0.0357	
1	Zone1	1UA	1/11/2022	-914.75	759.054	8.7232	-0.0332	
1	Zone1	1.27B	1/11/2022	1401.56	-701.57	15.3255	-0.0329	
1	Zone1	1.17B	1/11/2022	2082.20	-1093.92	25.5749	-0.0297	
1	Zone1	1.15	1/11/2022	923.35	-995.413	14.3413	-0.0281	
1	Zone1	AP20No2	1/11/2022	-2303.63	731.69	20.1846	-0.0245	
1	Zone1	BM28/2	1/11/2022	2282.46	2770.684	101.8901	-0.0033	
1	Zone1	AP19	1/11/2022	-3242.58	480.68	-6.5213	0.0000	control
1	Zone1	BUH5	1/11/2022	5480.15	2780.649	52.7029	0	control
1	Zone1	C1	1/11/2022	2183.23	-1759.33	32.8139	0.0000	control
1	Zone 1	AP24A	1/11/2022	2114.57	-1292.93	28.0474	-0.0277	
3	Favona	F18	1/11/2022	3423.83	648.3	39.9719	-0.363	Dist'd?
3	Favona	F20	1/11/2022	3411.70	665.722	40.8965	-0.3116	Dist'd?
1	Favona	F17B	1/11/2022	3405.48	613.912	43.9591	-0.2836	
3	Favona	F24	1/11/2022	3388.13	690.846	40.6094	-0.2831	Dist'd?
1	Favona	F21	1/11/2022	3405.99	671.998	40.7365	-0.2808	
1	Favona	F22	1/11/2022	3399.79	678.393	40.6792	-0.2619	
1	Favona	F15C	1/11/2022	3297.17	585.319	57.3004	-0.2156	
1	Favona	BLOCK-S	1/11/2022	3295.82	124.324	24.7998	-0.2133	
1	Favona	F16B	1/11/2022	3367.38	578.696	46.3628	-0.2067	
1	Favona	F26	1/11/2022	3374.47	705.541	40.5736	-0.1987	

1	Favona	BLOCK-N	1/11/2022	3336.45	215.694	24.2673	-0.1968
1	Favona	F10B	1/11/2022	3176.88	446.75	49.2444	-0.1881
1	Favona	F12C	1/11/2022	3207.32	503.824	53.471	-0.1861
1	Favona	F34C	1/11/2022	3339.49	849.569	40.1627	-0.1795
1	Favona	F14C	1/11/2022	3275.29	551.312	60.6331	-0.1794
1	Favona	F28B	1/11/2022	3365.21	727.17	40.4948	-0.1722
1	Favona	F08A	1/11/2022	3126.97	430.49	42.7178	-0.1637
1	Favona	F30B	1/11/2022	3359.36	748.26	40.6799	-0.1633
1	Favona	F32B	1/11/2022	3348.78	769.103	40.8439	-0.1528
1	Favona	F35B	1/11/2022	3336.68	896.063	39.7496	-0.1495
1	Favona	F06	1/11/2022	3107.08	445.21	40.4746	-0.147
1	Favona	F04	1/11/2022	3100.96	470.88	38.6951	-0.1426
1	Favona	F02	1/11/2022	3097.60	490	38.1731	-0.1406
1	Favona	ITXCIVB	1/11/2022	2943.85	542.17	32.5884	-0.1386
1	Favona	FP1	1/11/2022	3004.15	131.25	45.3886	-0.1236
1	Favona	TRIG 24	1/11/2022	3260.76	-615.678	25.6556	-0.0729
1	Favona	TRIG 22	1/11/2022	3681.97	89.358	26.1205	-0.0694

Appendix C Plans of Settlement Marks & Contours

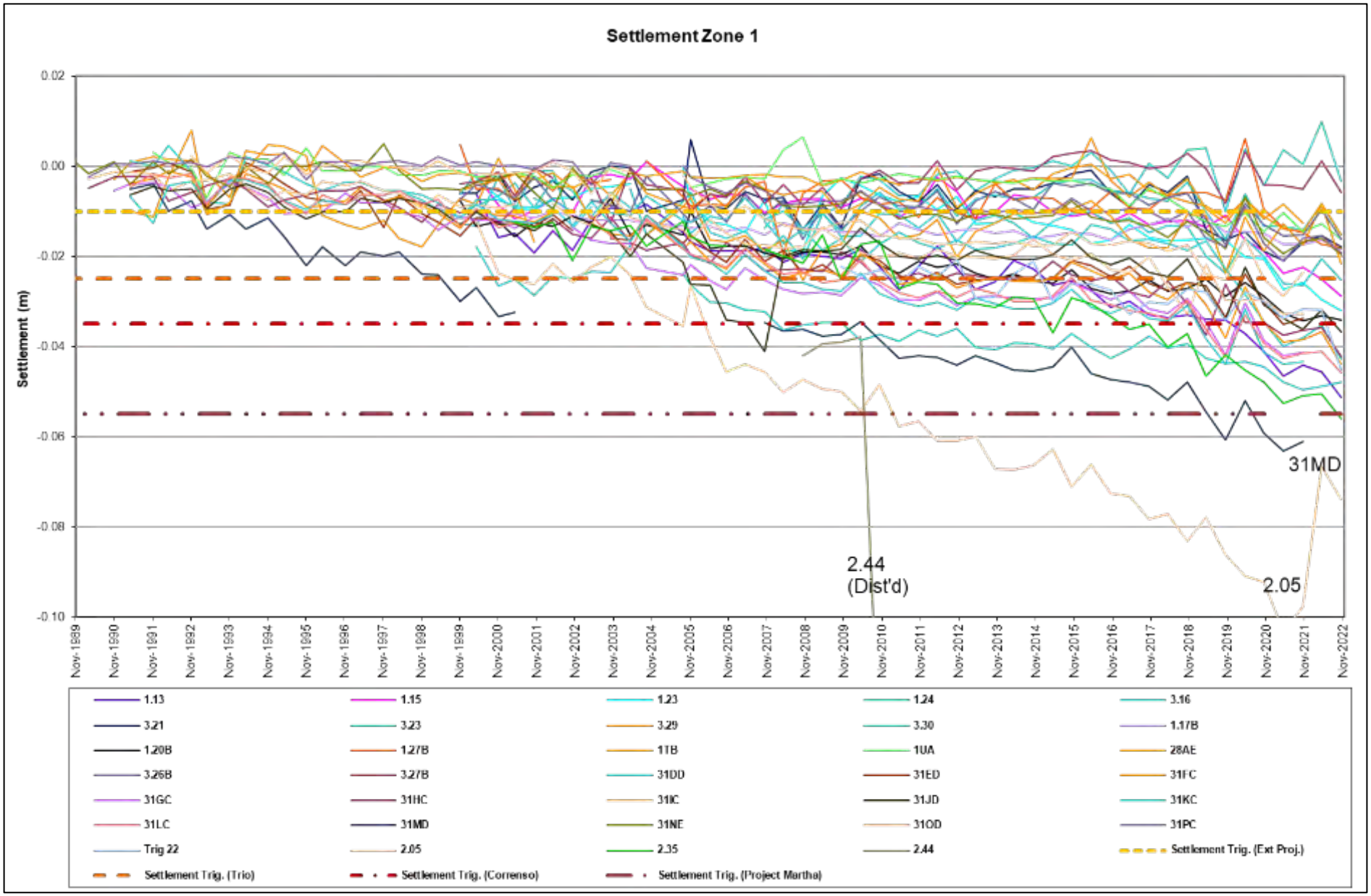

STATE HIGHWAY 35
MARTHA MINE OPEN PIT
STATE HIGHWAY 2
STATE HIGHWAY 2
WAIHI BEACH ROAD
Zone
Martha (2019) mm
Settlement Zone 1 55
Settlement Zone 2 65
Settlement Zone 3 95
Settlement Zone 4 160
Settlement Zone 5 260
Settlement Zone 6 340
Settlement Zone 7 540
SETTLEMENT MONITORING MARK
OCEANAGOLD WAIHI
TOTAL SETTLEMENT -MILLIMETRES
MAY2022
Settlement in millimetres
Scale: 1 12500
Plan No
Date 04-May-22
SURFAC - GEOVIA -prepared by E.N. Morrison


STATE HIGHWAY 25
MARTHA OPEN PIT
STATE HIGHWAY 2
WAIHI BEACH ROAD
STATE HIGHWAY 2
SETTLEMENT MONITORING MARK
OCEANAGOLD WAIHI
TOTAL SETTLEMENT - CONTOURS
MAY 2022
Settlement in millimetres
Scale: 1 : 12500
Plan No.
Date: 20-Jul-22



SURPAC - GEOVIA -prepared by B.M. Morrison

Appendix D Trend Plots of Settlement Zones


Settlement Zone 1
Settlement (m)
0.02
0.00
-0.02
-0.04
-0.06
-0.08
-0.10
Nov-1989
Nov-1990
Nov-1991
Nov-1992
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Nov-1995
Nov-1996
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Nov-2013
Nov-2014
Nov-2015
Nov-2016
Nov-2017
Nov-2018
Nov-2019
Nov-2020
Nov-2021
Nov-2022
31MD
2.44
(Dist'd)
2.05
1.13
1.15
1.23
1.24
3.16
3.21
3.23
3.29
3.30
1.17B
1.20B
1.27B
1TB
1UA
28AE
3.26B
3.27B
31DD
31ED
31FC
31GC
31HC
31IC
31JD
31KC
31LC
31MD
31NE
31OD
31PC
Trig 22
2.05
2.35
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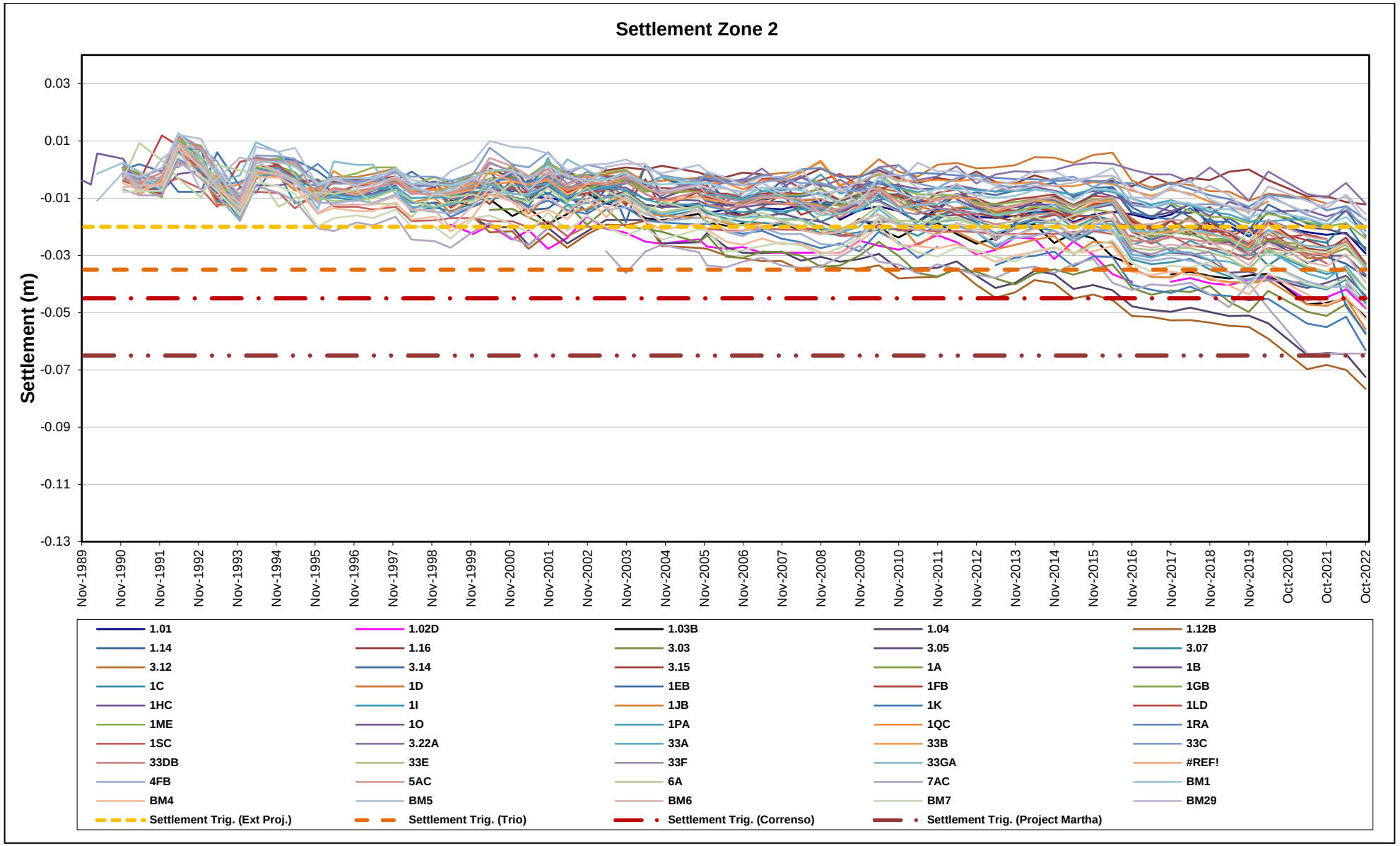
Settlement Trig. (Trio)
Settlement Trig. (Correnso)
Settlement Trig. (Project Martha)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0.01
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-0.05
-0.07
-0.09
-0.11
-0.13
Nov-1989
Nov-1990
Nov-1991
Nov-1992
Nov-1993
Nov-1994
Nov-1995
Nov-1996
Nov-1997
Nov-1998
Nov-1999
Nov-2000
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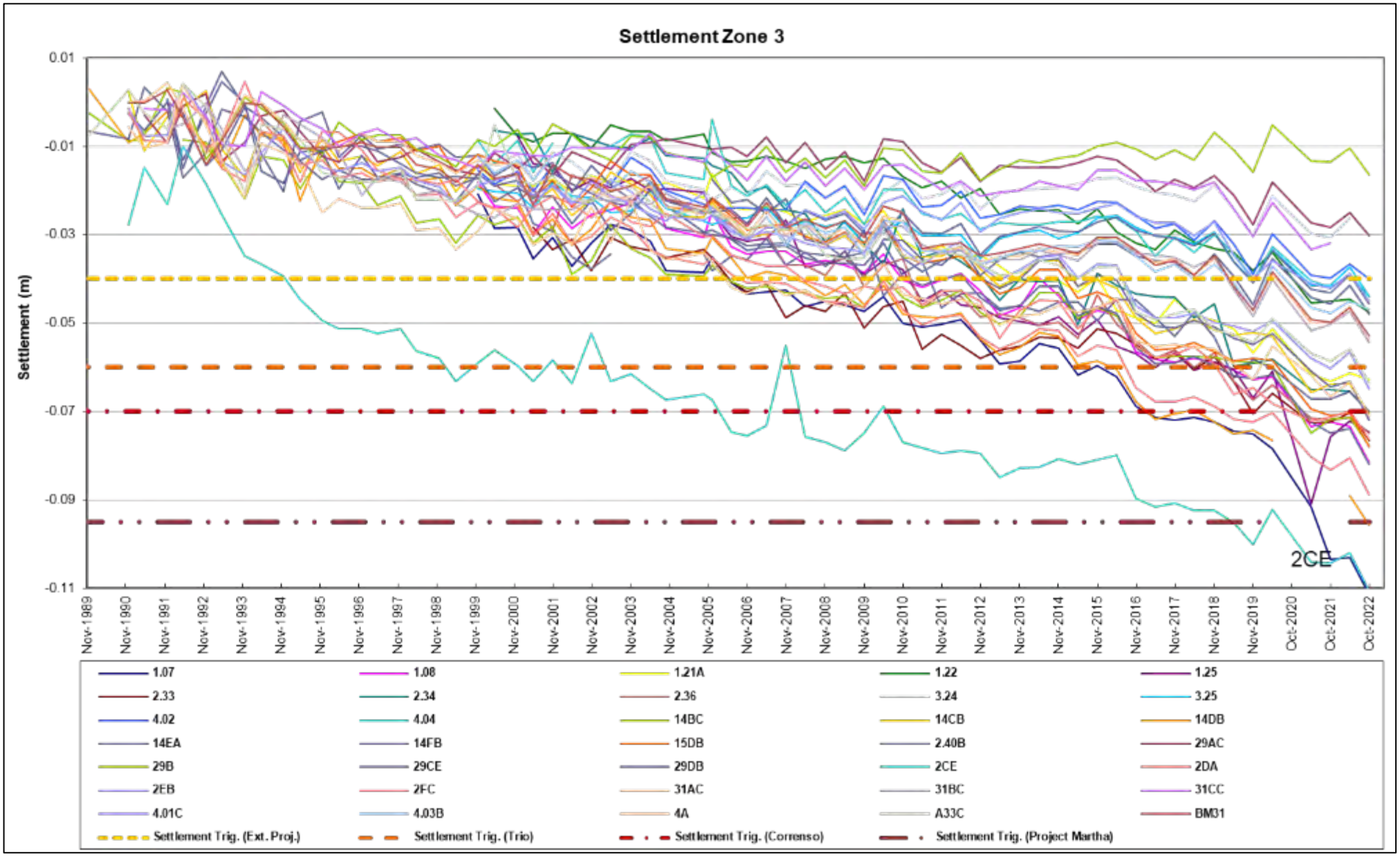
Nov-2012
Nov-2013
Nov-2014
Nov-2015
Nov-2016
Nov-2017
Nov-2018
Nov-2019
Oct-2020
Oct-2021
Oct-2022
1.01
1.02D
1.03B
1.04
1.12B
1.14
1.16
3.03
3.05
3.07
3.12
3.14
3.15
1A
1B
1C
1D
1EB
1FB
1GB
1HC
1I
1JB
1K
1LD
1ME
1O
1PA
1QC
1RA
1SC
3.22A
33A
33B
33C
33DB
33E
33F
33GA
#REF!
4FB
5AC
6A
7AC
BM1
BM4
BM5
BM6
BM7
BM29
Settlement Trig. (Ext Proj.)
Settlement Trig. (Trio)
Settlement Trig. (Correnso)
Settlement Trig. (Project Martha)


Settlement Zone 3
Settlement (m)
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-0.01
-0.03
-0.05
-0.07
-0.09
-0.11
2CE
Nov-1989
Nov-1990
Nov-1991
Nov-1992
Nov-1993
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Nov-2015
Nov-2016
Nov-2017
Nov-2018
Nov-2019
Oct-2020
Oct-2021
Oct-2022
1.07
1.08
1.21A
1.22
1.25
2.33
2.34
2.36
3.24
3.25
4.02
4.04
14BC
14CB
14DB
14EA
14FB
15DB
2.40B
29AC
29B
29CE
29DB
2CE
2DA
2EB
2FC
31AC
31BC
31CC
4.01C
4.03B
4A
A33C
BM31
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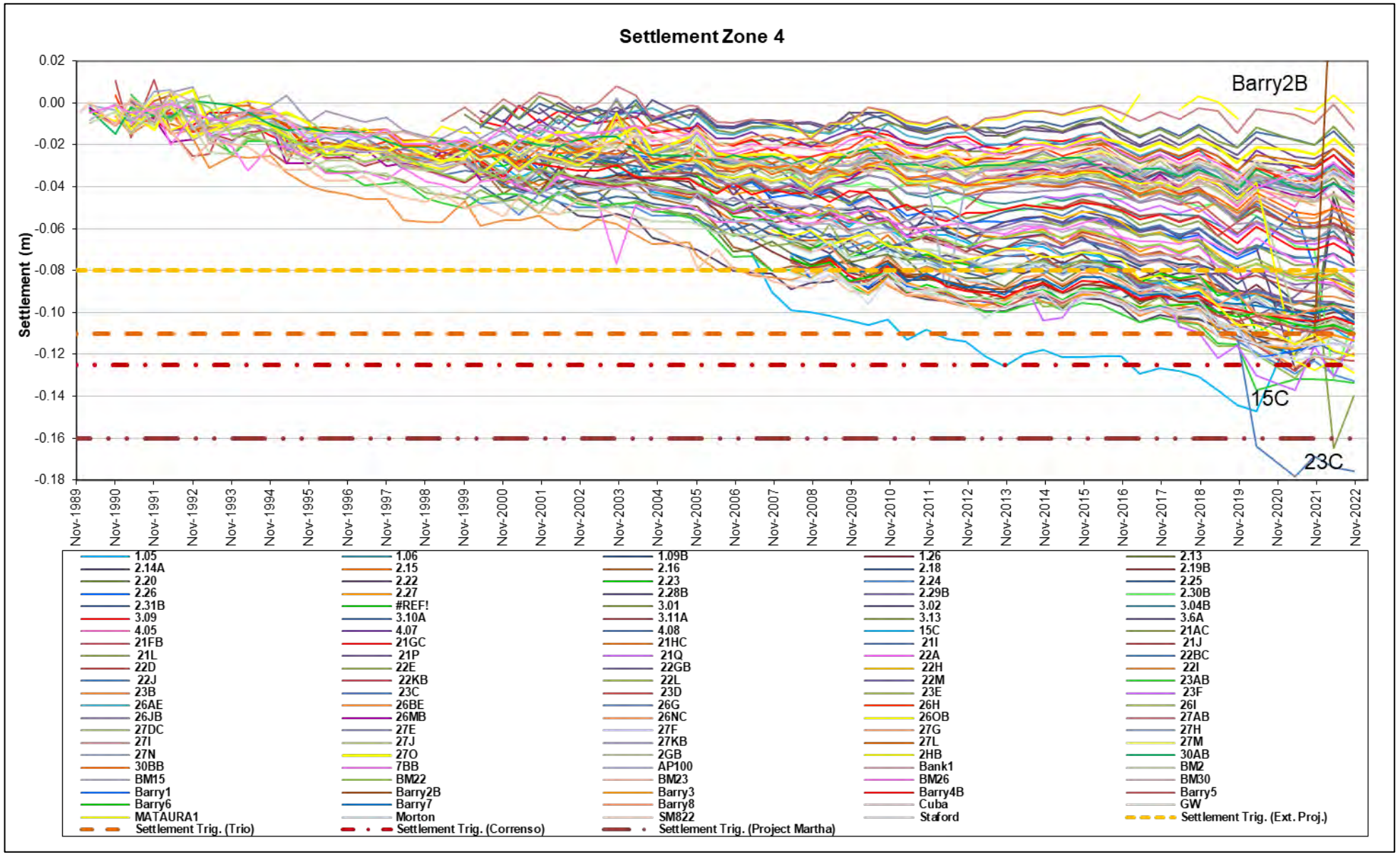
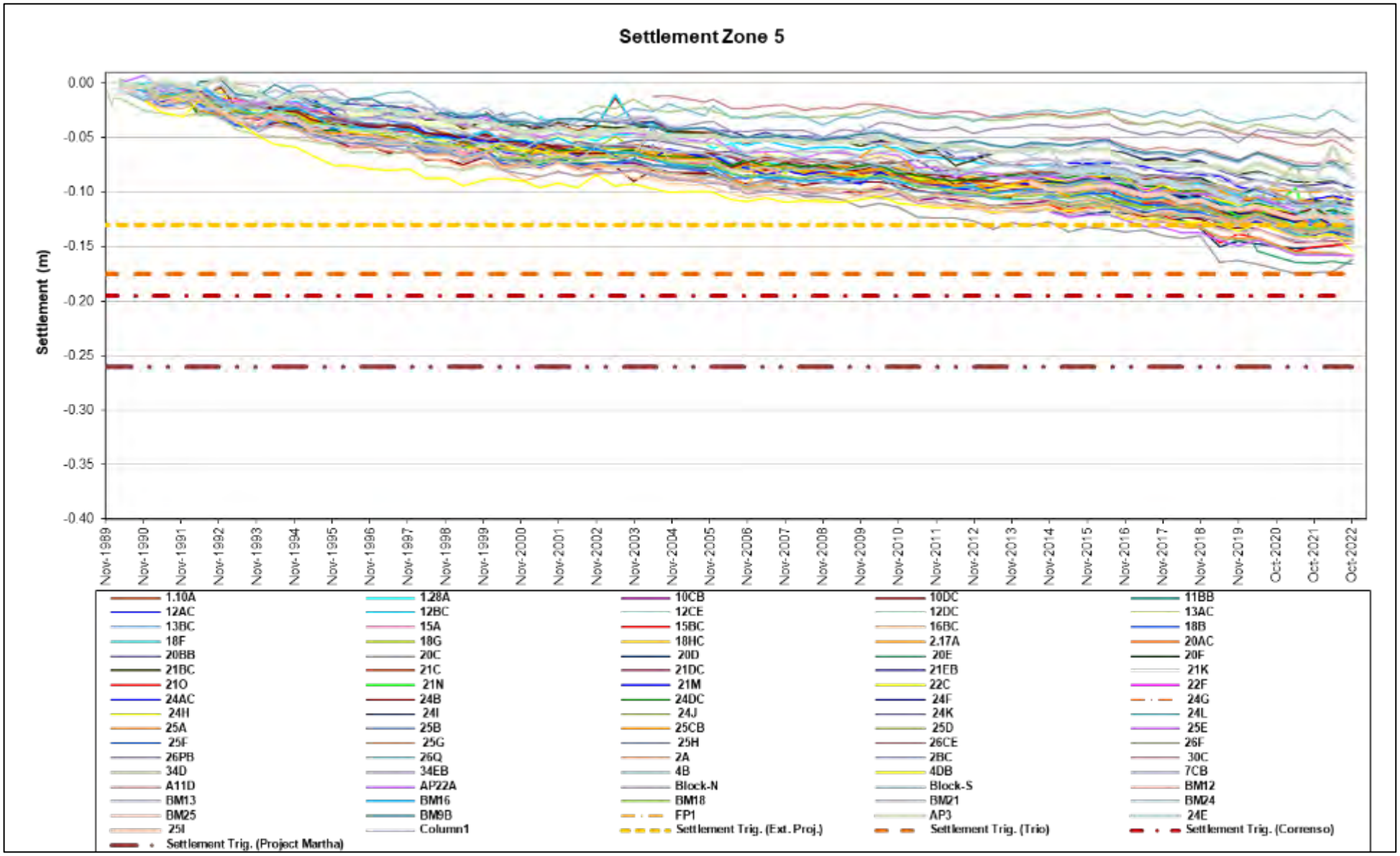
Settlement Trig. (Trio)
Settlement Trig. (Correnso)
Settlement Trig. (Project Martha)



NB: Barry2B not yet corrected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-0.30
-0.35
-0.40
Nov-1989
Nov-1990
Nov-1991
Nov-1992
Nov-1993
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Nov-1996
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Nov-1999
Nov-2000
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Nov-2012
Nov-2013
Nov-2014
Nov-2015
Nov-2016
Nov-2017
Nov-2018
Nov-2019
Oct-2020
Oct-2021
Oct-2022
1.10A
1.28A
10CB
10DC
11BB
12AC
12BC
12CE
12DC
13AC
13BC
15A
15BC
16BC
18B
18F
18G
18HC
2.17A
20AC
20BB
20C
20D
20E
20F
21BC
21C
21DC
21EB
21K
21O
21N
21M
22C
22F
24AC
24B
24DC
24F
24G
24H
24I
24J
24K
24L
25A
25B
25CB
25D
25E
25F
25G
25H
26CE
26F
26PB
26Q
2A
2BC
30C
34D
34EB
4B
4DB
7CB
A11D
AP22A
Block-N
Block-S
BM12
BM13
BM16
BM18
BM21
BM24
BM25
BM9B
FP1
AP3
24E
25I
Column1
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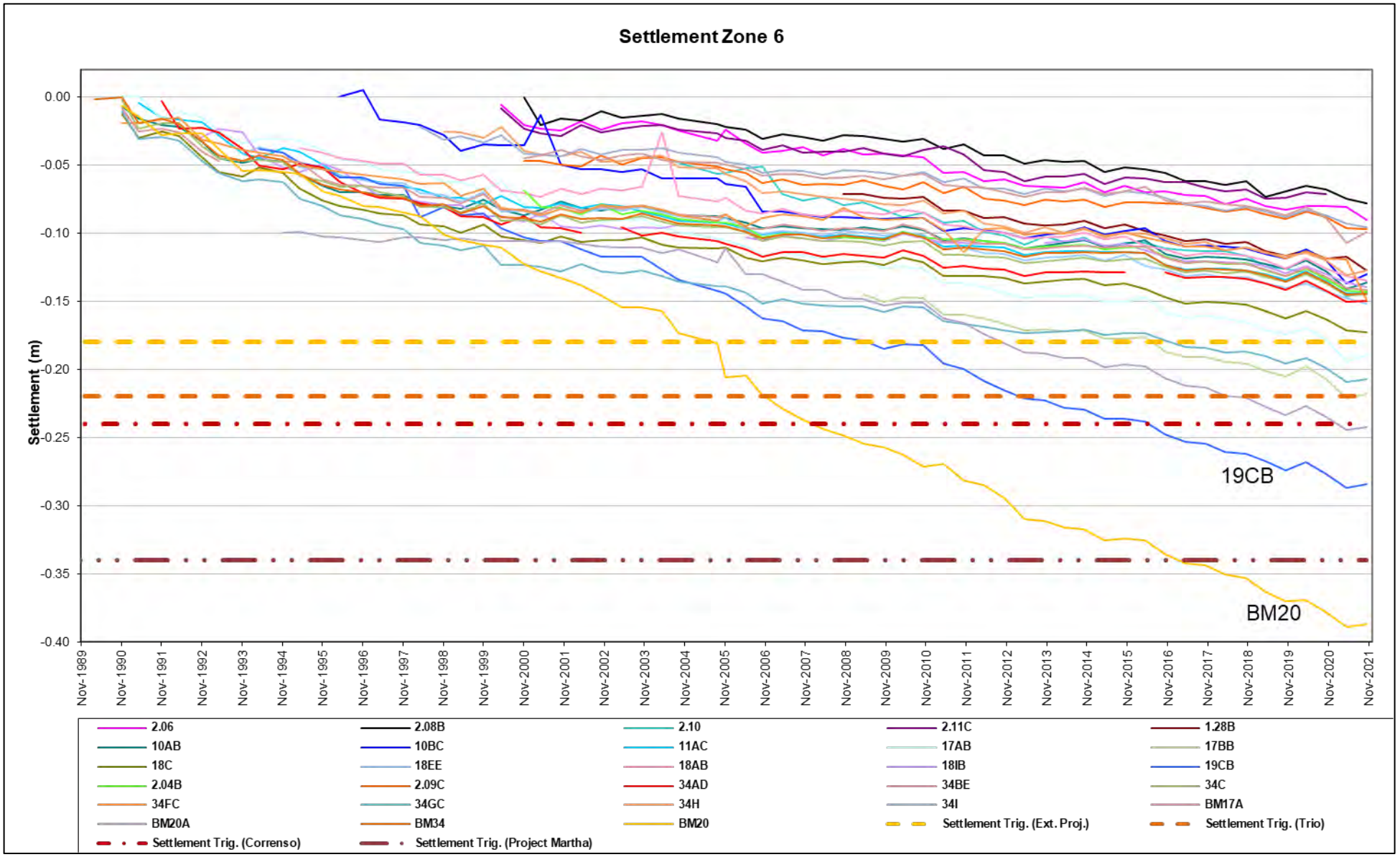
Settlement Trig. (Trio)
Settlement Trig. (Correnso)
Settlement Trig. (Project Martha)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-0.30
-0.35
-0.40
Nov-1989
Nov-1990
Nov-1991
Nov-1992
Nov-1993
Nov-1994
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Nov-1996
Nov-1997
Nov-1998
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Nov-2000
Nov-2001
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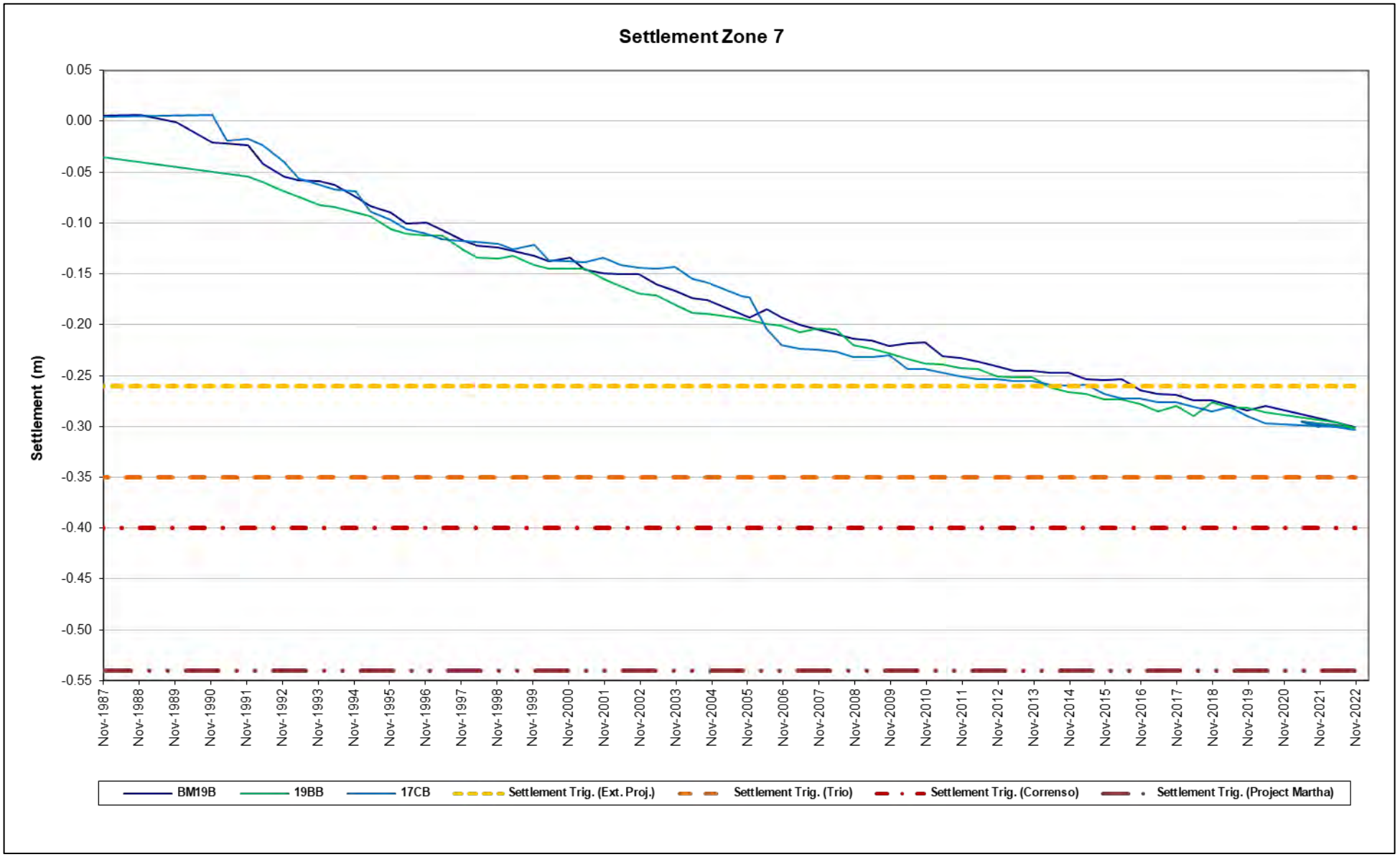
Nov-2008
Nov-2009
Nov-2010
Nov-2011
Nov-2012
Nov-2013
Nov-2014
Nov-2015
Nov-2016
Nov-2017
Nov-2018
Nov-2019
Nov-2020
Nov-2021
19CB
BM20
2.06
2.08B
2.10
2.11C
1.28B
10AB
10BC
11AC
17AB
17BB
18C
18EE
18AB
18IB
19CB
2.04B
2.09C
34AD
34BE
34C
34FC
34GC
34H
34I
BM17A
BM20A
BM34
BM20
Settlement Trig. (Ext. Proj.)
Settlement Trig. (Trio)
Settlement Trig. (Correnso)
Settlement Trig. (Project Martha)


Settlement Zone 7
Settlement (m)
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0.00
-0.05
-0.10
-0.15
-0.20
-0.25
-0.30
-0.35
-0.40
-0.45
-0.50
-0.55
Nov-1987
Nov-1988
Nov-1989
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Nov-1996
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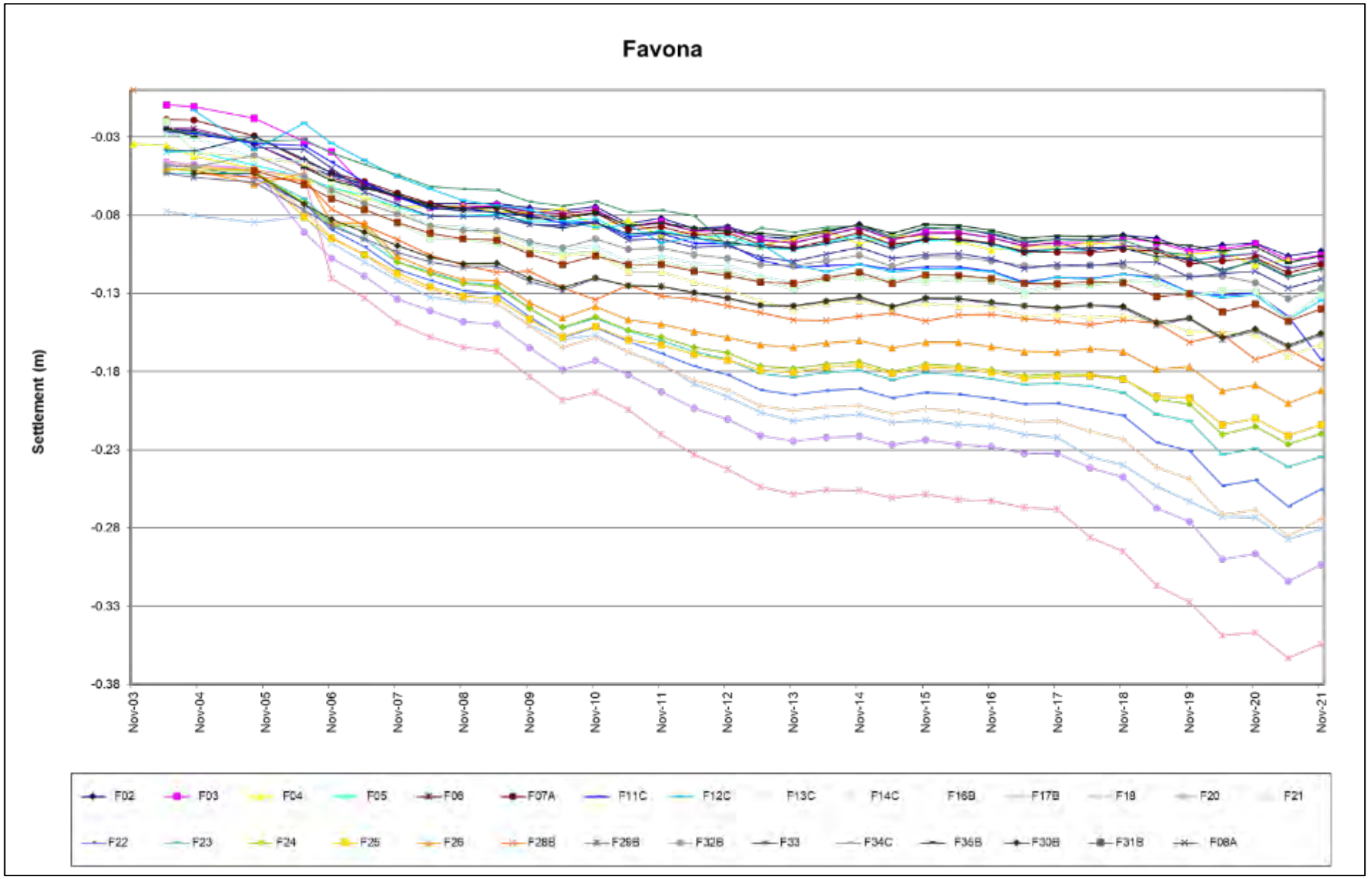
Nov-2010
Nov-2011
Nov-2012
Nov-2013
Nov-2014
Nov-2015
Nov-2016
Nov-2017
Nov-2018
Nov-2019
Nov-2020
Nov-2021
Nov-2022
BM19B
19BB
17CB
Settlement Trig. (Ext. Proj.)
Settlement Trig. (Trio)
Settlement Trig. (Correnso)
Settlement Trig. (Project Martha)


Favona
Settlement (m)
-0.03
-0.08
-0.13
-0.18
-0.23
-0.28
-0.33
-0.38
Nov-03
Nov-04
Nov-05
Nov-06
Nov-07
Nov-08
Nov-09
Nov-10
Nov-11
Nov-12
Nov-13
Nov-14
Nov-15
Nov-16
Nov-17
Nov-18
Nov-19
Nov-20
Nov-21
F02
F03
F04
F05
F06
F07A
F11C
F12C
F13C
F14C
F16B
F17B
F19
F20
F21
F22
F23
F24
F25
F26
F28B
F29B
F32B
F33
F34C
F35B
F30B
F31B
F08A

Appendix E Pit/Underground & Pit Wall Runoff – Water Quality 2022

Pit / Underground Dewatering Water Quality

Treated Water Quality

Date	Data Point	FLS Comments	FLS pH	FLS EC (mS/m	FLS Temp	Acidity (pH 3.	Alk-Bicarb	Alk-T	AlS	SbS	AsS	COD	Bicarb	Cr6col	CdS	CaSO	Cl	CrS	CoS
7/04/2022	Underground Dewatering		6.47	304.2	26.5	1	195	195	0.014	0.0023	0.0016	10	240	0.01	0.0029	570	13	0.0005	0.027
21/06/2022	Underground Dewatering		6.39	280.4	24.2	1	102	102	0.03	0.0013	0.0014	22	124	0.01	0.006	510	13	0.0005	0.063
25/07/2022	Underground Dewatering	air locks in tap disrup	4.63	272.7	20	1	3.9	3.9	9.9	0.0009	0.0035	23	4.8	0.01	0.025	410	12	0.0032	0.192
3/08/2022	Underground Dewatering		6.56	180.1	17.5	1	62	62	0.027	0.0031	0.0012	8	75	0.01	0.0046	300	20	0.0005	0.059
8/09/2022	Underground Dewatering	air lock in tap	6.61	298.2	25.2	1	330	330	0.022	0.0041	0.0027	46	400	0.01	0.0043	490	14	0.0005	0.037
19/10/2022	Underground Dewatering	airlock in tap	7.71	302	25.2	1	370	380	0.032	0.0033	0.0025	32	460	0.01	0.00108	530	15	0.0024	0.0192
6/11/2022	Underground Dewatering		6.12	291.5	25.7	1	92	92	0.097	0.001	0.002	6	112	0.01	0.0035	520	10	0.001	0.041
21/12/2022	Underground Dewatering	air locks in pipe, some	5.94	252.7	24.6	1	65	65	0.1	0.0025	0.0019	18	79	0.01	0.0107	440	9	0.0005	0.069
10/01/2023	Underground Dewatering		5.93	237.8	23.1	1	44	44	0.068	0.0019	0.0011	50	54	0.01	0.0065	420	9	0.0005	0.112
20/02/2023	Underground Dewatering		4.89	236.8	24.9	1	3.3	3.3	3.8	0.0012	0.002	15	4	0.01	0.021	370	9	0.0014	0.138

Date	Data Point	CuS	EC (mS/m)	CNTOT	Hard	FeA	PbS	MgSO	MnS	HgA	NiS	NO3-N	NOxN	NO2-N	NH3	NH4N	pH	KSO	SeS	FeT
7/04/2022	Underground Dewatering	0.0015	277	0.02	1960	10	0.00021	129	13.1	8.00E-05	0.053	1.53	1.62	0.1	0.0004	0.26	6.8	11.2	0.001	71
21/06/2022	Underground Dewatering	0.0162	291	0.02	1820	4.9	0.00087	131	16.7	8.00E-05	0.155	0.98	1	0.1	6.70E-05	0.066	6.7	10.6	0.001	34
25/07/2022	Underground Dewatering	0.21	256	0.02	1490	13.4	0.031	114	17.6	8.00E-05	0.42	3.3	3.5	0.2	1.00E-05	0.95	4.7	8.8	0.002	38
3/08/2022	Underground Dewatering	0.0098	184.4	0.02	990	0.12	0.00048	62	6.6	8.00E-05	0.125	7.9	8.4	0.45	0.00157	1.29	6.7	10	0.0019	0.6
8/09/2022	Underground Dewatering	0.0063	297	0.02	1710	9.3	0.00046	116	12.1	8.00E-05	0.087	6.4	7.3	0.9	0.0036	2	6.9	13	0.0014	54
19/10/2022	Underground Dewatering	0.0019	292	0.02	1770	10.7	0.0001	110	10.1	8.00E-05	0.05	3.5	4.1	0.61	0.0169	1.15	7.8	11.1	0.002	45
6/11/2022	Underground Dewatering	0.0112	281	0.02	1840	3.8	0.0012	134	12.8	8.00E-05	0.092	0.52	0.53	0.1	3.20E-05	0.05	6.4	10.3	0.002	6.4
21/12/2022	Underground Dewatering	0.057	240	0.02	1610	2.7	0.0199	122	13.8	8.00E-05	0.197	4.9	5.4	0.47	0.0023	1.87	6.7	10.8	0.0018	11.9
10/01/2023	Underground Dewatering	0.0148	218	0.02	1430	14.9	0.00163	94	11.5	8.00E-05	0.28	2.3	2.5	0.22	0.00026	0.67	6.2	7.8	0.0012	117
20/02/2023	Underground Dewatering	0.196	222	0.02	1340	7.7	0.078	102	12.4	8.00E-05	0.32	4.4	4.6	0.22	2.70E-05	1.52	4.9	9.9	0.002	30

Date	Data Point	PTO	AgS	NaSO	AuS	DRP	SO4	SeT	Sum Anion	Sum Cation	HgT	TKN	TSS	CNWAD	ZnS	SI
7/04/2022	Underground Dewatering	1.48	0.0001	51	0.0006	0.004	1820	0.0026	42	42	0.00045	0.71	2100	0.02	1.26	36
21/06/2022	Underground Dewatering	0.117	0.0001	47	0.0006	0.04	1800	0.0021	40	39	0.0002	0.45	198	0.02	2.9	41
25/07/2022	Underground Dewatering	0.37	0.0001	34	0.0006	0.004	1730	0.003	37	34	0.00031	1.97	1100	0.02	11.5	42
3/08/2022	Underground Dewatering	0.007	0.0001	27	0.0005	0.004	960	0.002	22	22	8.00E-05	1.39	12	0.02	1.6	26
8/09/2022	Underground Dewatering	1.01	0.0001	45	0.0006	0.004	1850	0.0026	46	37	0.00037	4.6	7500	0.02	1.91	34
19/10/2022	Underground Dewatering	0.85	0.0001	47	0.0006	0.005	1700	0.0026	44	38	0.00029	1.29	2000	0.02	0.138	40
6/11/2022	Underground Dewatering	0.043	0.0002	45	0.0006	0.004	1860	0.0011	41	40	8.00E-05	0.72	133	0.02	1.7	39
21/12/2022	Underground Dewatering	0.187	0.0001	33	0.0006	0.004	1550	0.0022	34	35	0.00013	2.4	2200	0.02	4.3	38
10/01/2023	Underground Dewatering	0.187	0.0001	22	0.0006	0.004	1430	0.0032	31	30	0.0021	0.96	3600	0.02	2.8	37
20/02/2023	Underground Dewatering	0.164	0.0002	27	0.0006	0.004	1400	0.011	30	29	0.00027	1.73	980	0.02	9.5	41

Date	Data Point	FLS Comments	FLS EC (mS/m)	FLS pH	FLS Temp	Alk-Bicarb	Alk-T	SbA	SbS	AsA	AsS	Bicarb	CdA	CdS	CaSO	Carb	Cl	Cr6col	CoA	CoS	CuA	CuS	CNTOT	EC (mS/m)
4/04/2022	Treated Water Discharge		290	8.64	25.5			0.0148	0.0156															
11/04/2022	Treated Water Discharge	algae on surface reforming rain event coming	300.2	8.73	22.5			0.0143		0.0015			5.00E-05		590			0.01			0.0083			287
19/04/2022	Treated Water Discharge		249.4	8.85	20.3			0.011	0.0108															
26/04/2022	Treated Water Discharge		266.9	8.76	20.8			0.0133	0.0127															
2/05/2022	Treated Water Discharge		247.6	8.95	20.8			0.0104		0.001			5.00E-05		480			0.01			0.0067			238
10/05/2022	Treated Water Discharge		295.6	8.66	21.3			0.0119	0.013															
17/05/2022	Treated Water Discharge		269.3	8.82	21			0.0115	0.0113															
23/05/2022	Treated Water Discharge		274.3	8.73	18			0.0107	0.0115															
1/06/2022	Treated Water Discharge	pond clear no algae	220.7	8.8	19.4			0.0124	0.0134															
7/06/2022	Treated Water Discharge	acid soluble cobalt test as well	240.2	8.76	18.1			0.0091		0.001			5.00E-05		380			0.01	0.012		0.0076			220
13/06/2022	Treated Water Discharge		213.2	8.83	16.8			0.0124	0.0131															
20/06/2022	Treated Water Discharge		234.2	8.69	17.9			0.0061	0.0061															
27/06/2022	Treated Water Discharge		234.9	8.78	17.6			0.0073	0.0073															
5/07/2022	Treated Water Discharge		250.2	8.77	17.4			0.0098	0.0093															
11/07/2022	Treated Water Discharge	first pond overflowing into second	197.6	8.85	16.4			0.0052	0.0053															
18/07/2022	Treated Water Discharge		200	9.24	15.9	29	31		0.0054		0.001	35		5.00E-05	400	1	39	0.01		0.0068		0.033	0.011	216
25/07/2022	Treated Water Discharge	first pond overflow pipes spilling into 2nd pond	218.2	8.54	15.3			0.0077	0.0081															
1/08/2022	Treated Water Discharge	Erroneous lab EC result deleted from database (199,000)	205.9	8.9		27	30		0.0064		0.001	33		5.00E-05	400	1.2	33	0.01		0.0069		0.027	0.012	
9/08/2022	Treated Water Discharge		199.5	9.06	17.5			0.0056	0.0053															
15/08/2022	Treated Water Discharge		205	9.14	17.3			0.0049	0.005															
22/08/2022	Treated Water Discharge		246	8.85	21.1			0.0075	0.0077															
29/08/2022	Treated Water Discharge		257.4	8.97	20.3			0.0095	0.0094															
6/09/2022	Treated Water Discharge		218.1	8.75	17.4	39	40		0.0079		0.001	47		5.00E-05	400	1	36	0.01		0.0104		0.0152	0.012	218
12/09/2022	Treated Water Discharge		219.4	9.11	20.1			0.0067	0.0068															
19/09/2022	Treated Water Discharge		232.7	9.08	19.2			0.0113	0.0117															
26/09/2022	Treated Water Discharge		269.6	8.99	20.1			0.002	0.002															
3/10/2022	Treated Water Discharge		179	9.09	19.6			0.0082		0.001			5.00E-05		330			0.01			0.008			180.9
10/10/2022	Treated Water Discharge		247.4	9.04	20			0.0078	0.0078															
17/10/2022	Treated Water Discharge		240.5	9.11	20.8			0.0157	0.0172															
24/10/2022	Treated Water Discharge		281.7	8.97	22.5			0.0027	0.0025															
2/11/2022	Treated Water Discharge	Lab pH value corrected from 7.5 to 8.5	218	9.06	22.8			0.0013		0.001			5.00E-05		420			0.01			0.0008			217
7/11/2022	Treated Water Discharge	Lab pH value corrected from 7.7 to 8.8	282.4	9.12	22.6			0.0015	0.0015															
14/11/2022	Treated Water Discharge		223.7	9.08	22.9			0.0061	0.0064															
21/11/2022	Treated Water Discharge		234.2	9.02	23			0.0049	0.005															
27/11/2022	Treated Water Discharge		244.3	9.14	22			0.009	0.0087															
7/12/2022	Treated Water Discharge		246.2	9	21.6			0.0126		0.001			5.00E-05		440			0.01			0.0171			235
12/12/2022	Treated Water Discharge		244.6	9.03	23.8			0.009	0.0088															
19/12/2022	Treated Water Discharge	first signs of possible algal bloom to start	181.7	8.96	22.8			0.007	0.0065															
28/12/2022	Treated Water Discharge		230.6	9.27	26.1			0.0128	0.0132															
4/01/2023	Treated Water Discharge		281	9.19	22.7			0.0087	0.0091															
9/01/2023	Treated Water Discharge		192.7	8.82	23.2			0.0064		0.001			5.00E-05		350			0.01			0.0045			171.1
16/01/2023	Treated Water Discharge		233.7	9.01	23.8			0.0034	0.0034															
22/01/2023	Treated Water Discharge		262	8.97	25.2			0.0037	0.0037															
31/01/2023	Treated Water Discharge		125.7	8.97	21.1			0.0016	0.0016															
8/02/2023	Treated Water Discharge		216.6	9.01	23.9			0.004		0.002			0.0001		400			0.01			0.0121			205
13/02/2023	Treated Water Discharge		207.8	8.94	19.8			0.004	0.0036															
20/02/2023	Treated Water Discharge		205.9	8.98	23.3			0.0046	0.0045															
27/02/2023	Treated Water Discharge		183	8.75	21.8			0.004	0.004															
6/03/2023	Treated Water Discharge		224	8.87	22.7			0.0048		0.002			0.0001		430			0.01			0.0109			209
12/03/2023	Treated Water Discharge		237.2	8.97	22.7			0.0053	0.0056															
20/03/2023	Treated Water Discharge		250.5	8.82	23.3			0.0062	0.005															
27/03/2023	Treated Water Discharge		244.8	8.84	23.4			0.0063	0.0066															

Date	Data Point	NH3	Hard	FeA	FeS	PbA	PbS	MgSO	MnA	MnS	HgA	HgS	NiA	NiS	NO3-N	NOxN	NO2-N	NH4N	pH	PTO	KSO	DRP	SeA	SeS	SI	AgA	AgS	NaSO	SO4	Sum Anion
4/04/2022	Treated Water Discharge																		8.1				0.0119	0.0121						
11/04/2022	Treated Water Discharge	0.053	1750	0.02		0.0001		64	0.0118		8.00E-05		0.0006					1.37	8.2	0.009		0.004	0.0122			0.0001			1860	
19/04/2022	Treated Water Discharge																		8.7				0.009	0.0089						
26/04/2022	Treated Water Discharge																		8.5				0.0111	0.0109						
2/05/2022	Treated Water Discharge	0.076	1400	0.02		0.0001		51	0.0111		8.00E-05		0.0007					1.3	8.4	0.007		0.004	0.0077			0.00011			1400	
10/05/2022	Treated Water Discharge																		8.6				0.0095	0.0101						
17/05/2022	Treated Water Discharge																		8.6				0.0076	0.0079						
23/05/2022	Treated Water Discharge																		8.7				0.0071	0.0071						
1/06/2022	Treated Water Discharge																		8.6				0.0084	0.0086						
7/06/2022	Treated Water Discharge	0.26	1150	0.02		0.0001		47	0.024		8.00E-05		0.0021					2	8.8	0.007		0.004	0.0059			0.00011			1190	
13/06/2022	Treated Water Discharge																		8.7				0.0075	0.0076						
20/06/2022	Treated Water Discharge																		8.7				0.0037	0.0039						
27/06/2022	Treated Water Discharge																		8.4				0.0053	0.0054						
5/07/2022	Treated Water Discharge																		8.8				0.0096	0.0093						
11/07/2022	Treated Water Discharge																		8.8				0.0051	0.0048						
18/07/2022	Treated Water Discharge		1140		0.02		0.00017	34		0.0101	8.00E-05	8.00E-05		0.0022	32	33	0.67	2.3	8.7	0.009	12.8	0.004		0.0057	6.7		0.0002	43	1080	27
25/07/2022	Treated Water Discharge																		8.7				0.0086	0.0089						
1/08/2022	Treated Water Discharge		1130		0.02		0.0001	31		0.0113	8.00E-05	8.00E-05		0.0018	15.9	16.6	0.69	2.4	8.9	0.005	13.1	0.005		0.0071	7		0.00087	43	1100	26
9/08/2022	Treated Water Discharge																		8.3				0.0069	0.0063						
15/08/2022	Treated Water Discharge																		8.4				0.008	0.0085						
22/08/2022	Treated Water Discharge																		8.9				0.0079	0.0081						
29/08/2022	Treated Water Discharge																		8.8				0.0097	0.0099						
6/09/2022	Treated Water Discharge		1160		0.02		0.0001	41		0.0142	8.00E-05	8.00E-05		0.0019	8.9	9.5	0.68	2.9	8.4	0.004	13.9	0.004		0.0089	7.7		0.00041	55	1170	27
12/09/2022	Treated Water Discharge																		9.1				0.0071	0.0068						
19/09/2022	Treated Water Discharge																		8.6				0.013	0.0136						
26/09/2022	Treated Water Discharge																		8.9				0.0014	0.0014						
3/10/2022	Treated Water Discharge	0.139	960	0.02		0.0001		30	0.0066		8.00E-05		0.0011		19.2	19.8	0.54	1.82	8.6	0.007		0.004	0.0118			0.001			910	
10/10/2022	Treated Water Discharge														15.8	16.5	0.62		9.1				0.0091	0.0094						
17/10/2022	Treated Water Discharge																		8.9				0.0167	0.0166						
24/10/2022	Treated Water Discharge																		8.5				0.0017	0.0016						
2/11/2022	Treated Water Discharge	0.0036	1270	0.02		0.0001		55	0.0085		8.00E-05		0.0005		19	19.2	0.19	0.48	8.5	0.004		0.004	0.0011			0.0001			1200	
7/11/2022	Treated Water Discharge																		8.8				0.001	0.001						
14/11/2022	Treated Water Discharge																		8.5				0.005	0.0058						
21/11/2022	Treated Water Discharge																		9.1				0.0038	0.0039						
27/11/2022	Treated Water Discharge																		9.1				0.0081	0.0075						
7/12/2022	Treated Water Discharge	0.37	1330	0.02		0.00058		57	0.0083		8.00E-05		0.0024		9.8	10.9	1.04	2.3	8.9	0.012		0.004	0.0119			0.00013			1340	
12/12/2022	Treated Water Discharge																		8.8				0.0077	0.0079						
19/12/2022	Treated Water Discharge																		8.7				0.0056	0.0059						
28/12/2022	Treated Water Discharge																		9				0.0104	0.0099						
4/01/2023	Treated Water Discharge																		8.9				0.006	0.007						
9/01/2023	Treated Water Discharge	0.093	980	0.03		0.0001		23	0.0067		8.00E-05		0.0018		22	22	0.64	1.33	8.5	0.013		0.004	0.0057			0.0003			860	
16/01/2023	Treated Water Discharge																		9.2				0.0023	0.0024						
22/01/2023	Treated Water Discharge																		8.7				0.0031	0.0031						
31/01/2023	Treated Water Discharge																		8.7				0.0011	0.0011						
8/02/2023	Treated Water Discharge	0.3	1220	0.04		0.0002		55	0.03		8.00E-05		0.0019		15.5	16	0.51	1.1	9.2	0.002		0.004	0.0033			0.0002			1180	
13/02/2023	Treated Water Discharge																		8.8				0.02	0.003						
20/02/2023	Treated Water Discharge																		9.2				0.003	0.003						
27/02/2023	Treated Water Discharge																		9.2				0.003	0.003						
6/03/2023	Treated Water Discharge	0.37	1290	0.04		0.0002		55	0.026		8.00E-05		0.0018		5.5	6.2	0.7	1.26	9.2	0.006		0.004	0.004			0.0002			1240	
12/03/2023	Treated Water Discharge																		8.6				0.004	0.004						
20/03/2023	Treated Water Discharge																		9				0.005	0.02						
27/03/2023	Treated Water Discharge																		9				0.005	0.005						

Date	Data Point	Sum Cation	TKN	TSS	CNWAD	ZnA	ZnS
4/04/2022	Treated Water Discharge			3			
11/04/2022	Treated Water Discharge			3	0.02	0.0014	
19/04/2022	Treated Water Discharge			3			
26/04/2022	Treated Water Discharge			3			
2/05/2022	Treated Water Discharge			3	0.02	0.0012	
10/05/2022	Treated Water Discharge			3			
17/05/2022	Treated Water Discharge			3			
23/05/2022	Treated Water Discharge			3			
1/06/2022	Treated Water Discharge			3			
7/06/2022	Treated Water Discharge			3	0.02	0.0019	
13/06/2022	Treated Water Discharge			3			
20/06/2022	Treated Water Discharge			3			
27/06/2022	Treated Water Discharge			3			
5/07/2022	Treated Water Discharge			3			
11/07/2022	Treated Water Discharge			4			
18/07/2022	Treated Water Discharge	25	4	4	0.006		0.0017
25/07/2022	Treated Water Discharge			3			
1/08/2022	Treated Water Discharge	25	4.4	4	0.006		0.0031
9/08/2022	Treated Water Discharge			3			
15/08/2022	Treated Water Discharge			3			
22/08/2022	Treated Water Discharge			3			
29/08/2022	Treated Water Discharge			5			
6/09/2022	Treated Water Discharge	26	5.2	3	0.01		0.0013
12/09/2022	Treated Water Discharge			3			
19/09/2022	Treated Water Discharge			3			
26/09/2022	Treated Water Discharge			3			
3/10/2022	Treated Water Discharge			3	0.02	0.001	
10/10/2022	Treated Water Discharge			3			
17/10/2022	Treated Water Discharge			3			
24/10/2022	Treated Water Discharge			3			
2/11/2022	Treated Water Discharge			3	0.02	0.0014	
7/11/2022	Treated Water Discharge			3			
14/11/2022	Treated Water Discharge			3			
21/11/2022	Treated Water Discharge			3			
27/11/2022	Treated Water Discharge			3			
7/12/2022	Treated Water Discharge			3	0.02	0.0011	
12/12/2022	Treated Water Discharge			3			
19/12/2022	Treated Water Discharge			3			
28/12/2022	Treated Water Discharge			3			
4/01/2023	Treated Water Discharge			3			
9/01/2023	Treated Water Discharge			3	0.02	0.0013	
16/01/2023	Treated Water Discharge			3			
22/01/2023	Treated Water Discharge			3			
31/01/2023	Treated Water Discharge			5			
8/02/2023	Treated Water Discharge			3	0.02	0.012	
13/02/2023	Treated Water Discharge			3			
20/02/2023	Treated Water Discharge			3			
27/02/2023	Treated Water Discharge			3			
6/03/2023	Treated Water Discharge			3	0.02	0.008	
12/03/2023	Treated Water Discharge			3			
20/03/2023	Treated Water Discharge			3			
27/03/2023	Treated Water Discharge			3			

Pit Wall Runoff Water Quality

No pit wall sampling was undertaken in 2022.

Appendix F REX OREBODY INVESTIGATION

TECHNICAL MEMO

GWS Limited

28th March 2023

To: Mark Burroughs

From: Chris Simpson

Subject: Rex Orebody - Groundwater Monitoring and Special Investigations

1. Background

The consent conditions for the Martha Underground mine (MUG) dewatering permit require monitoring of groundwater levels / pressures around the vein systems, in the host rock and in the overlying young volcanic deposits. This is undertaken through measurements from a network of piezometers (stand pipes, vibrating wire and pneumatic piezometers). Where significant changes occur in the monitoring records that might indicate a sudden change in conditions has occurred (i.e. water level or pressure drop), there is a requirement to investigate and report the findings of those investigations back to the Regional Council.

This technical memo provides a review of groundwater conditions in the area of the Rex Orebody as recent monitoring has shown some deviation from historical trends that suggest dewatering has occurred in response to underground mining.

2. Hydrogeological Setting

The Rex Orebody is a north-east trending vein system that is located behind the Martha Pit southern wall. The Rex vein system parallels the other main vein systems that are already dewatered (Martha, Empire and Welcome Lodes) and intercepts the Royal Lode in the east (refer Figure 1). The Royal Lode is dewatered via interception with the Edward lode which is actively dewatered by current mining operation. All of these vein systems are hosted by andesite rocks. In the area surrounding the Rex vein system, post mineralisation ignimbrite volcanics overlie the andesite with the distributing being controlled by the paleo topography prior to deposition.

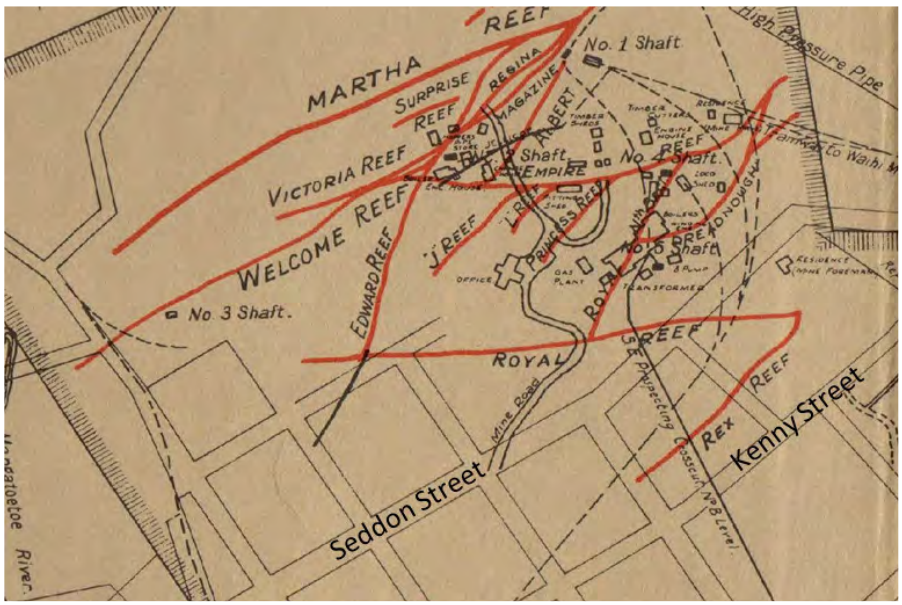


Figure 1 Location of Martha Vein Systems (after McAra, 1988)

Level 1/320 Ti Rakau Dr
East Tamaki
Auckland 2013

Phone: 09 576 0093
Email: GWS@xtra.co.nz
Web Page: www.gwsconsulting.co.nz

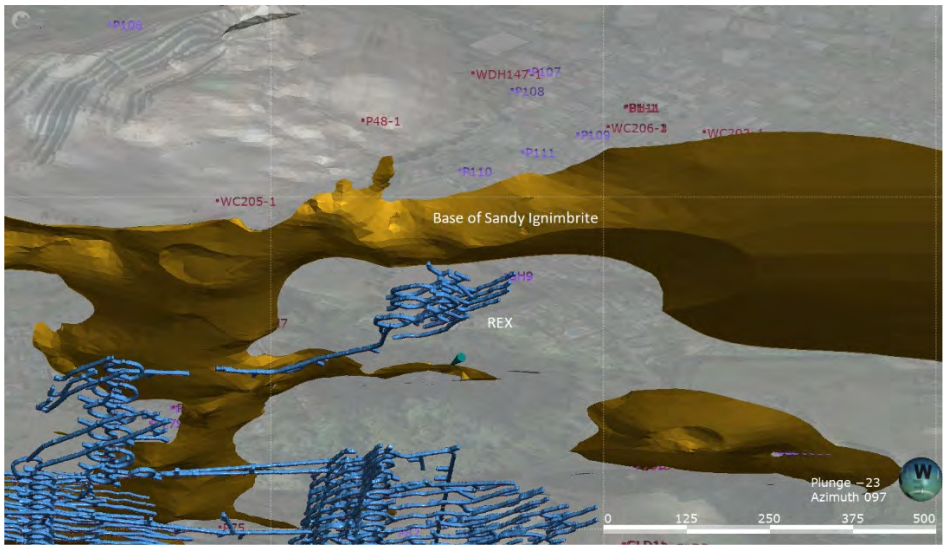


Figure 2 Sandy Ignimbrite Distribution (Viewing Up from Beneath)

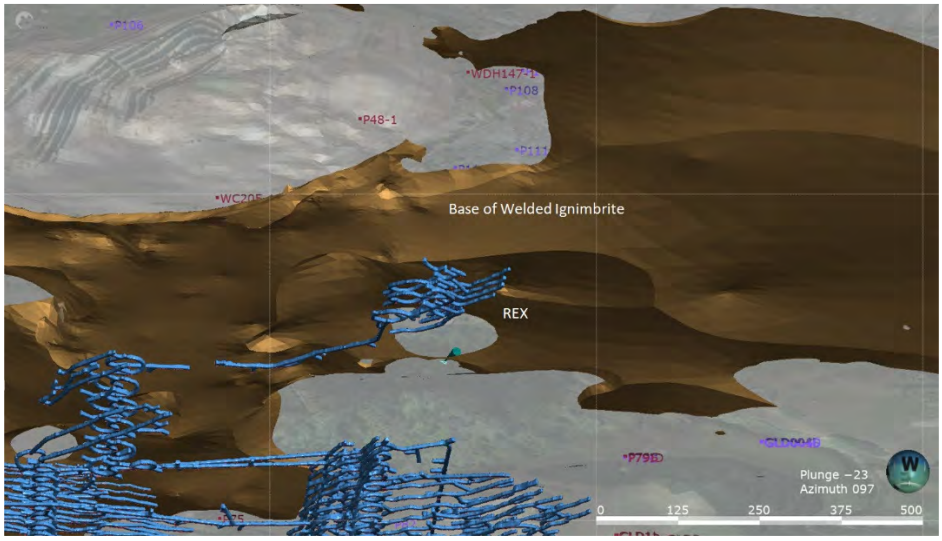


Figure 3 Welded Ignimbrite Distribution (Viewing Up from Beneath)

The sequence of young volcanic deposits consists of a fairly channelised sandy ignimbrite, overlain by a laterally extensive sheet of welded ignimbrite. Deposited on top of the welded ignimbrite is a layer of ash/regolith of variable thickness with some lake deposits present locally. This is illustrated in Figures 2 and 3.

Two separate groundwater systems exist as a function of the geologic units present; one in the andesite rockmass and one in the younger volcanics. In the vicinity of the Rex Orebody, both groundwater systems are interpreted to be draining back into the Martha Pit as shown in Figures 4 and 5. Experience has shown that the groundwater in the Young Volcanics is in a perched system that remains generally unaffected by the drainage in the underlying andesite rocks. This is due to the presence of low permeability layers that separate the systems.

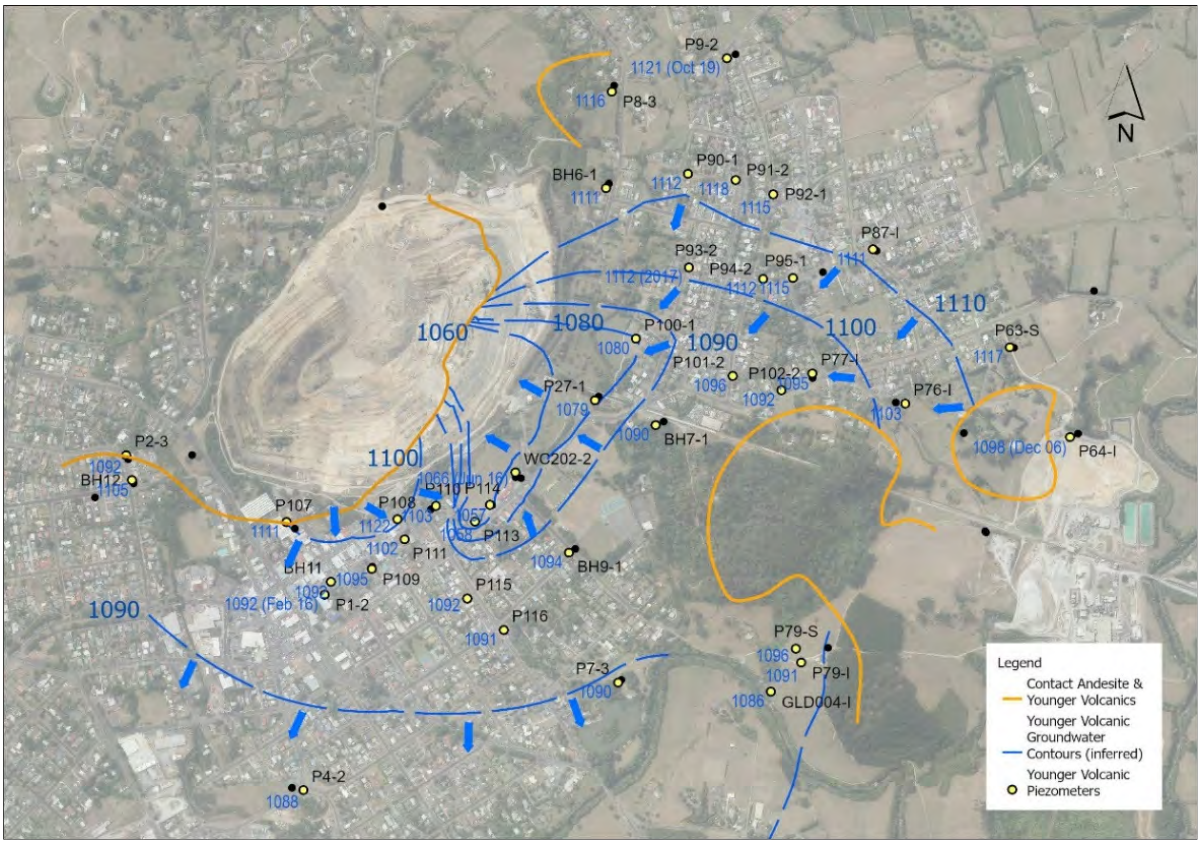


Figure 4 Young Volcanics Interpreted Piezometric Surface

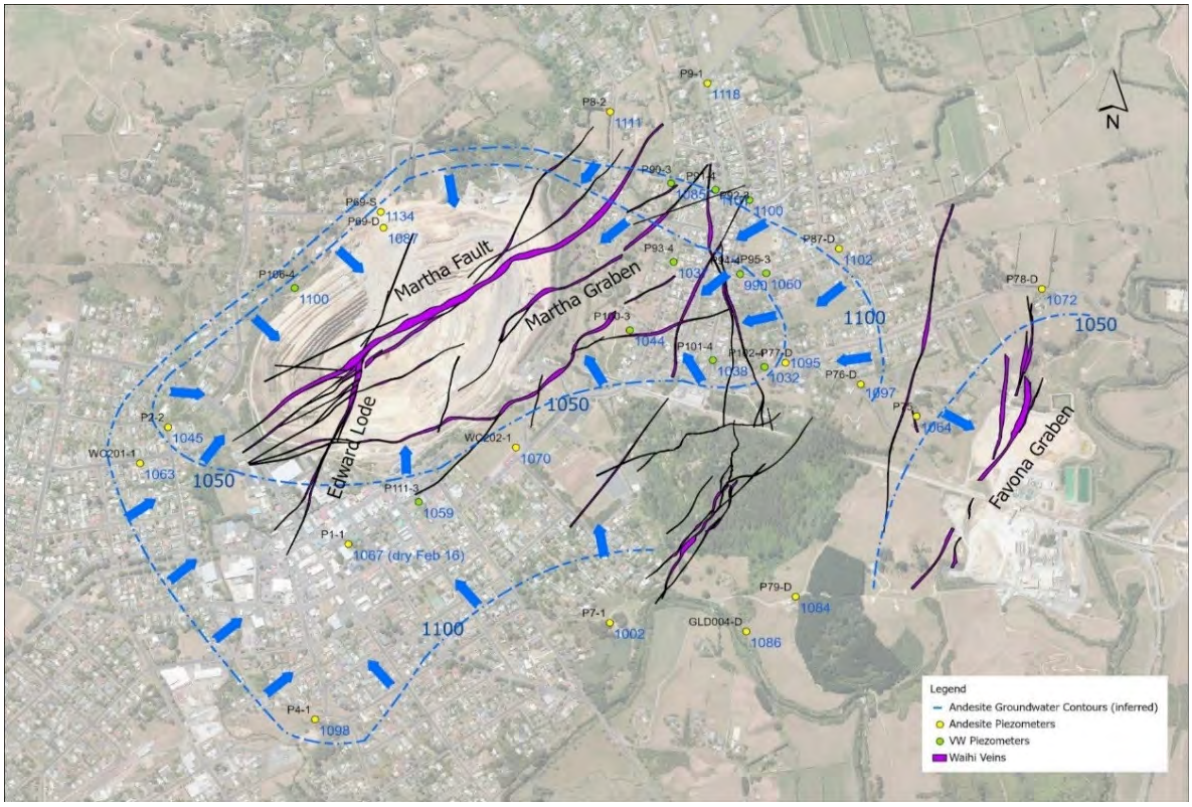


Figure 5 Andesite Piezometric Surface

3. Groundwater Monitoring Results

Groundwater monitoring is undertaken throughout Waihi and is required through conditions of consent associated with the mine dewatering permit. Monitoring in the vicinity of the Rex Orebody is undertaken at several locations as shown on Figure 6. These wells are of different depths and construction and each one is discussed individually below. The monitoring records for the piezometers are included in Attachment A of this letter report.

Figure 6 Groundwater Monitoring Well Locations near the Rex Orebody

P110

This monitoring location consists of a 17 m deep standpipe piezometer within the young volcanics with the water levels measured monthly by manual dipping. The monitoring data indicates a permanent water table exists and the groundwater level varies in response to seasonal influences by some 5-6 m. Drainage effects from the dewatered andesite rockmass have not propagated into the overlying aquifer.

P111

This monitoring location is along strike of the Rex vein system and consists of a nest of three vibrating wire piezometers. The tips are positioned; in the young volcanics (13 m depth), upper andesite (25m depth) and lower andesite (60 m depth). The groundwater pressures are automatically logged on a daily frequency. In summary, the monitoring indicates there is partial saturation in the andesite having been affected by dewatering. The groundwater system in the young volcanics is perched and demonstrates some 2.5 m of seasonal fluctuation. Drainage effects from the dewatered andesite rockmass have not propagated into the overlying aquifer.

P112

This monitoring location is along strike of the Rex vein system and consists of a nest of three vibrating wire piezometers. The tips are positioned; deep in the young volcanics (50 m depth), upper andesite (72m depth) and lower andesite (110 m depth). The groundwater pressures are automatically logged on a daily frequency. In summary, the monitoring indicates there is partial saturation in the andesite having been affected by dewatering. The groundwater system in the

young volcanics is perched and shows some 2.0 m of seasonal fluctuation. Drainage effects from the dewatered andesite rockmass have not, therefore, propagated into the overlying aquifer.

P113
This monitoring location consists of a 47 m deep standpipe piezometer within the deeper young volcanics with the water levels measured monthly by manual dipping. This monitoring well shows a limited water depth is present (<1.2 m) with minimal variation over time. The monitoring data suggests the lower younger volcanics are affected by dewatering of the andesite.

P114
This monitoring location consists of a 60 m deep standpipe piezometer within the deeper young volcanics with the water levels measured monthly by manual dipping. This monitoring well shows between 8 and 10 m water depth is present with seasonal variation over time observed. The monitoring data suggests the lower younger volcanics have limited effect from dewatering of the andesite with a permanent water table present.

BH8
This monitoring well has recorded erroneous measurements since 2009 and it is thought that the borehole has collapsed. It has not been used in this assessment.

WC202
This monitoring location is along strike of the Rex vein system and consists of a nest of three pneumatic piezometers in the deep monitoring well and two standpipe piezometers in the shallow monitoring well. The pneumatic piezo tips (1-3) are positioned; in the young volcanics (20 m depth), upper andesite (62m depth) and lower andesite (79 m depth). The groundwater pressures are automatically logged on a daily frequency. The standpipe piezometer screens (4-5) are located at 4 m and 12 m depth in the young volcanics. The monitoring data indicate the entire sequence of younger volcanics is largely dewatered above the andesite. Groundwater pressures have been present in the lowest piezo tip within the andesite and recent data has shown an increase in groundwater levels at that location.

4. Observations Underground

A site visit to the mine underground operations to view the Rex Orebody exposure from beneath was undertaken on 20/2/2023. The purpose of the site visit was to observe groundwater inflows at various locations. In summary, there is no groundwater ingress through the stope in the north-east part of the orebody in the vicinity of WC202. Between P112, P113 and P114, there is groundwater seepage through the Rex Vein and the inflow rate has remained constant during mining. These inflows are interpreted to be seepage from water contained within the basal sandy ignimbrite unit through the Rex vein “exposure”. This is illustrated in Figures 7 and 8 below.

5. Settlement Survey

Ground settlement monitoring is frequently undertaken in the area as a requirement of the MUG dewatering consent. Based on the latest survey results (November 2022) no settlement data from the area suggests any increased movement as a result of the existing underground dewatering i.e. no marks breached their respective settlement zone triggers (all Zones 6 or 7). Further, no tilt has been identified that might indicate potential differential settlement has taken place.

Figure 7 **Distribution of the Sandy Ignimbrite within the Paleo valley**

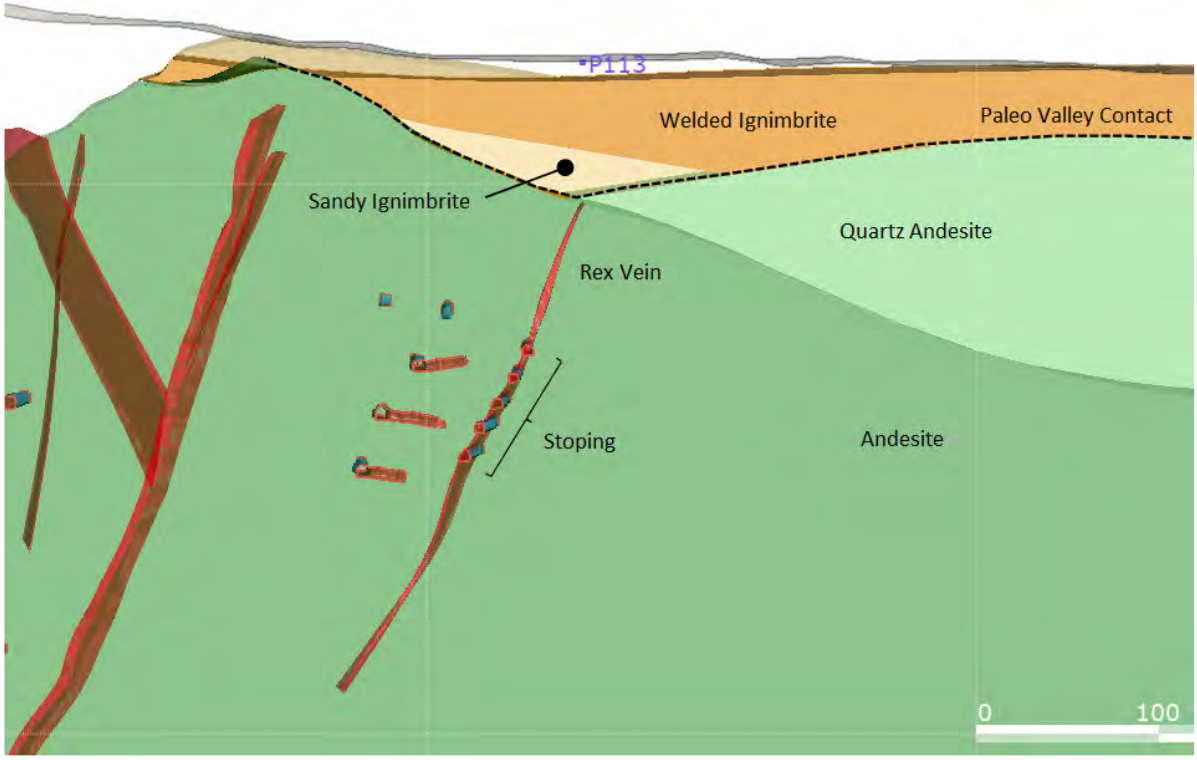


Figure 8 **Section through P113 Showing the Paleo Valley in Relation to the Rex Vein**

6. Summary and Discussion

Review of the groundwater monitoring data from around the Rex Orebody has indicated the following groundwater conditions exist.

- The andesite rocks that host the Rex Vein are dewatered.
- In the deep younger volcanics water remains present locally in association with the sandy ignimbrite.
- A water table remains present at most locations in the upper ash/Regolith/volcanics sequence (top 20 m) that is perched on the welded ignimbrite.

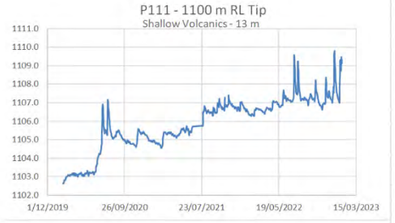
This review has shown that recent changes in some piezometers is the ongoing response to dewatering of the rockmass as a result underground mine operations. However, dewatering of the water table at the surface is generally noted not to occur as a result of mine underdrainage. Deep dewatering has not, therefore, resulted in near surface effects nor ground settlement beyond that expected beyond the consented envelope.

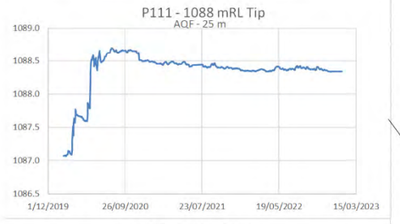
ATTACHMENTS

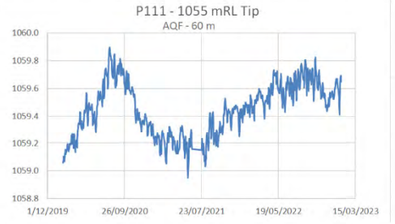
Attachment A Groundwater Monitoring Records

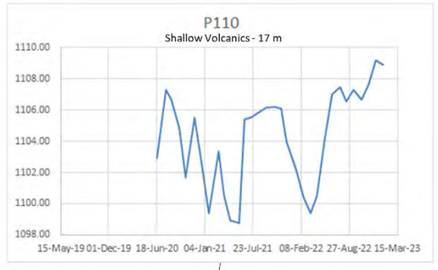
Attachment A

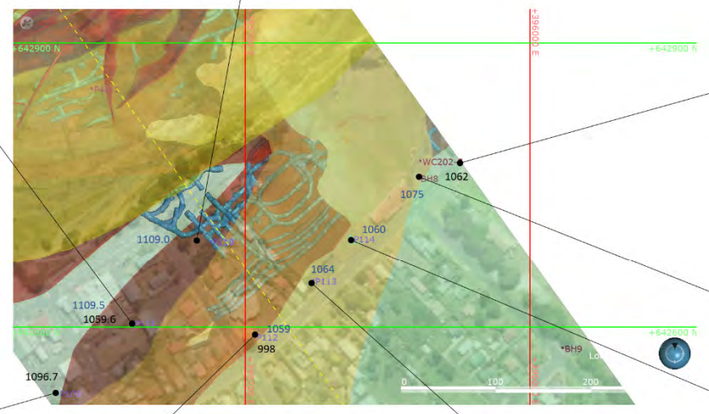
Monitoring Well Records

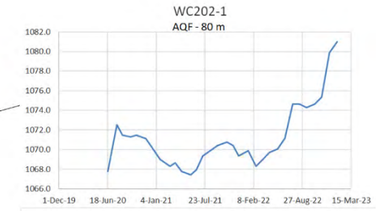

P111 - 1100 m RL Tip
Shallow Volcanics - 13 m
1111.0
1110.0
1109.0
1108.0
1107.0
1106.0
1105.0
1104.0
1103.0
1102.0
1/12/2019
26/09/2020
23/07/2021
19/05/2022
15/03/2023

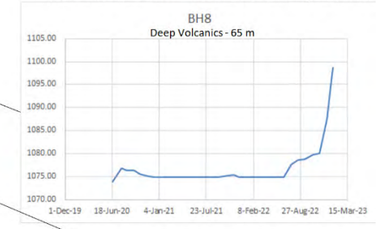

P111 - 1088 mRL Tip
AQF - 25 m
1089.0
1088.5
1088.0
1087.5
1087.0
1086.5
1/12/2019
26/09/2020
23/07/2021
19/05/2022
15/03/2023


P111 - 1055 mRL Tip
AQF - 60 m
1060.0
1059.8
1059.6
1059.4
1059.2
1059.0
1058.8
1/12/2019
26/09/2020
23/07/2021
19/05/2022
15/03/2023


P110
Shallow Volcanics - 17 m
1110.00
1108.00
1106.00
1104.00
1102.00
1100.00
1098.00
15-May-19 01-Dec-19 18-Jun-20 04-Jan-21 23-Jul-21 08-Feb-22 27-Aug-22 15-Mar-23


+642900 N
+642900 N
+642900 N
*WC202
BH8
1062
1075
1060
1109.0
1064
1109.5
1059.6
1059
998
1096.7
*BH9
0
100
200


WC202-1
AQF - 80 m
1082.0
1080.0
1078.0
1076.0
1074.0
1072.0
1070.0
1068.0
1066.0
1-Dec-19
18-Jun-20
4-Jan-21
23-Jul-21
8-Feb-22
27-Aug-22
15-Mar-23

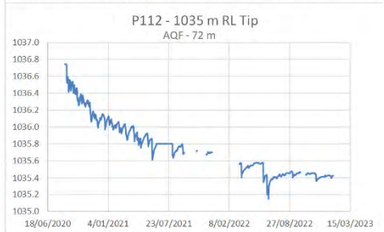

BH8
Deep Volcanics - 65 m
1105.00
1100.00
1095.00
1090.00
1085.00
1080.00
1075.00
1070.00
1-Dec-19
18-Jun-20
4-Jan-21
23-Jul-21
8-Feb-22
27-Aug-22
15-Mar-23

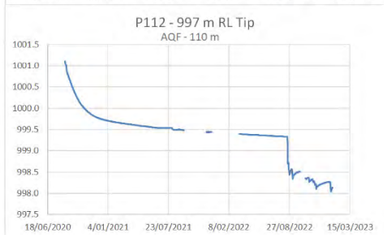

P109
AQF - 58 m
1097.00
1096.50
1096.00
1095.50
1095.00
1094.50
15-May-19 01-Dec-19 18-Jun-20 04-Jan-21 23-Jul-21 08-Feb-22 27-Aug-22 15-Mar-23

P112 - 1057 m RL Tip
Deep Volcanics - 50 m
1059.5
1059.0
1058.5
1058.0
1057.5
1057.0
18/06/2020
4/01/2021
23/07/2021
8/02/2022
27/08/2022
15/03/2023

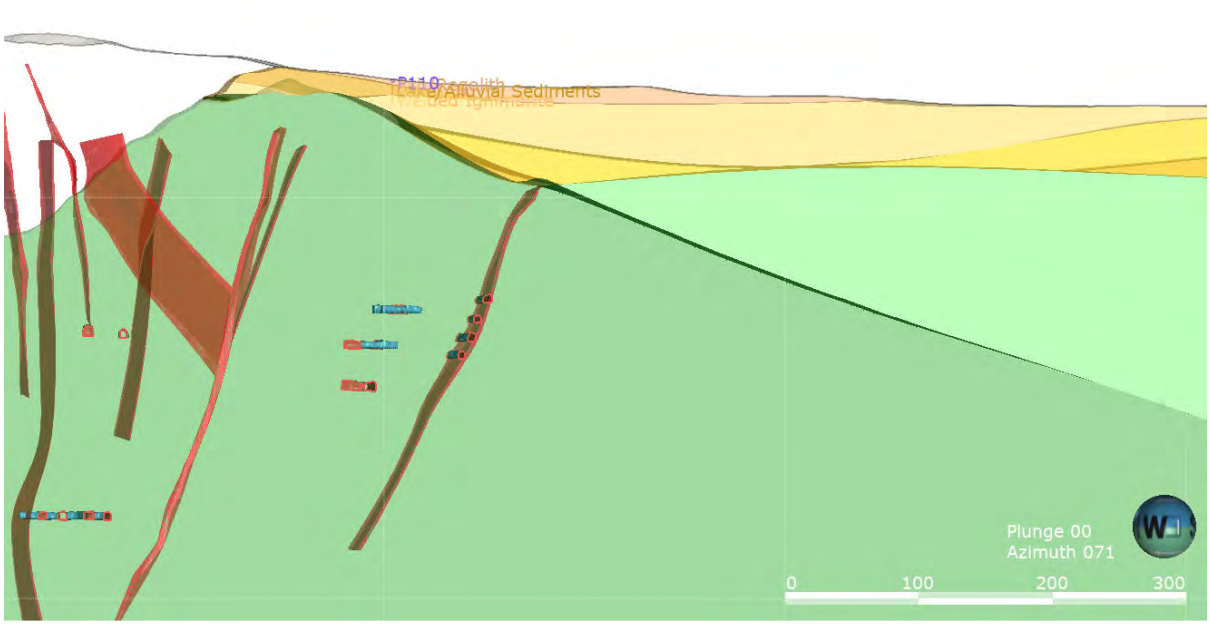
P113
Deep Volcanics - 47 m
1064.45
1064.40
1064.35
1064.30
1064.25
1064.20
1064.15
1064.10
15-May-19 01-Dec-19 18-Jun-20 04-Jan-21 23-Jul-21 08-Feb-22 27-Aug-22 15-Mar-23

P114
Deep Volcanics - 60 m
1060.50
1060.00
1059.50
1059.00
1058.50
1058.00
1057.50
15-May-19 01-Dec-19 18-Jun-20 04-Jan-21 23-Jul-21 08-Feb-22 27-Aug-22 15-Mar-2

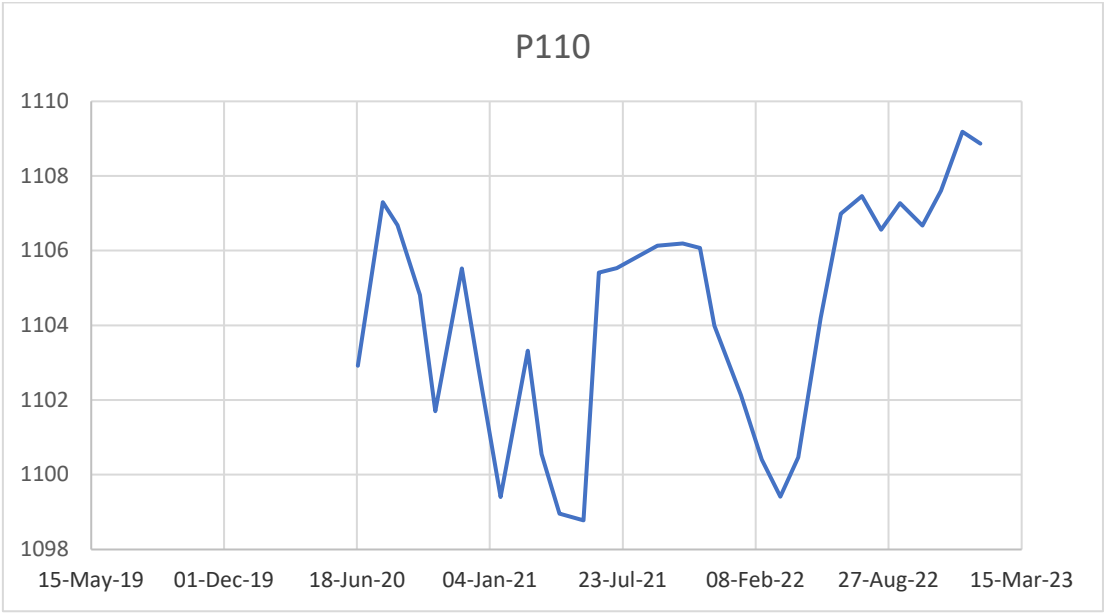

P112 - 1035 m RL Tip
AQF - 72 m
1037.0
1036.8
1036.6
1036.4
1036.2
1036.0
1035.8
1035.6
1035.4
1035.2
1035.0
18/06/2020
4/01/2021
23/07/2021
8/02/2022
27/08/2022
15/03/2023


P112 - 997 m RL Tip
AQF - 110 m
1001.5
1001.0
1000.5
1000.0
999.5
999.0
998.5
998.0
997.5
18/06/2020
4/01/2021
23/07/2021
8/02/2022
27/08/2022
15/03/2023

P110

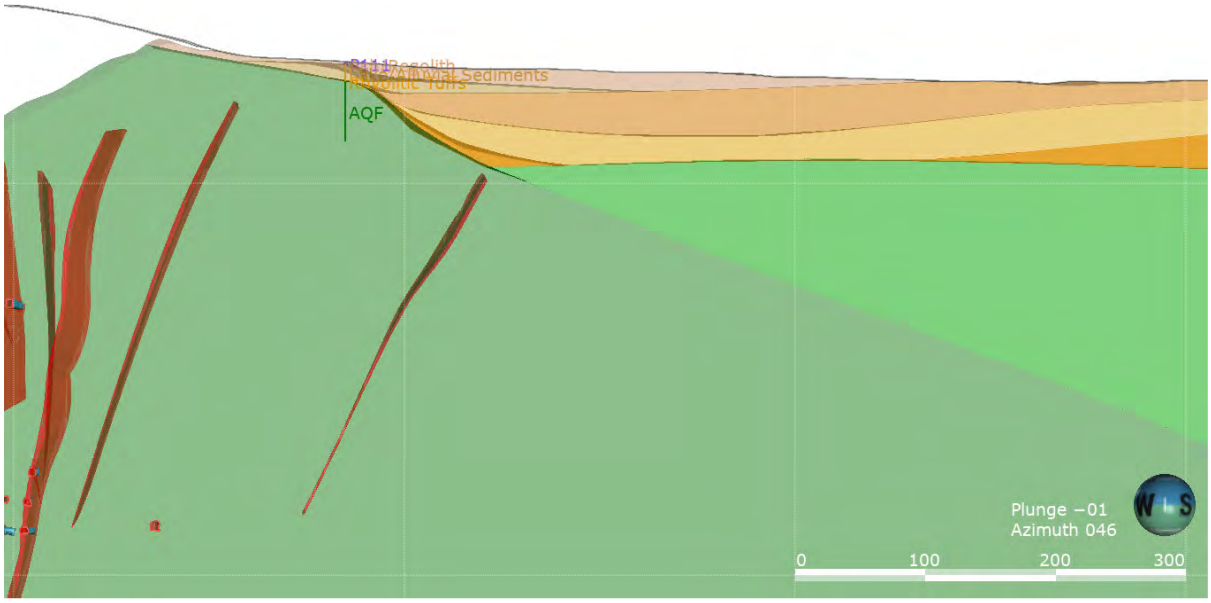


P110 Location (NW-SE Section)

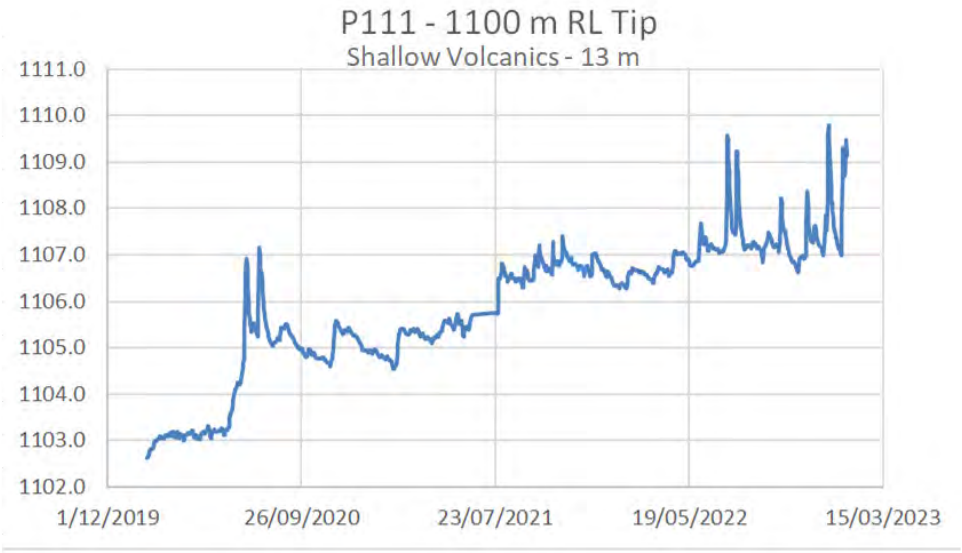


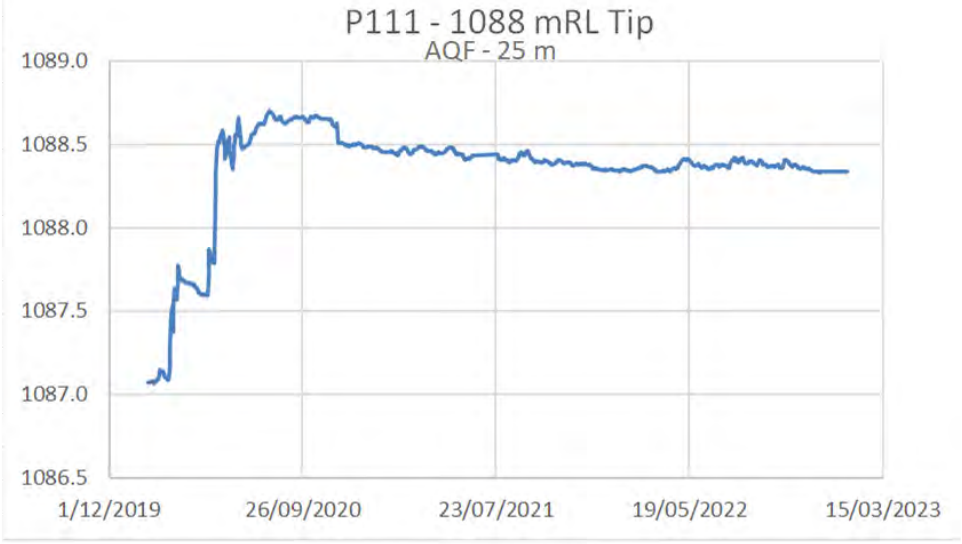
P110 Groundwater Monitoring Record

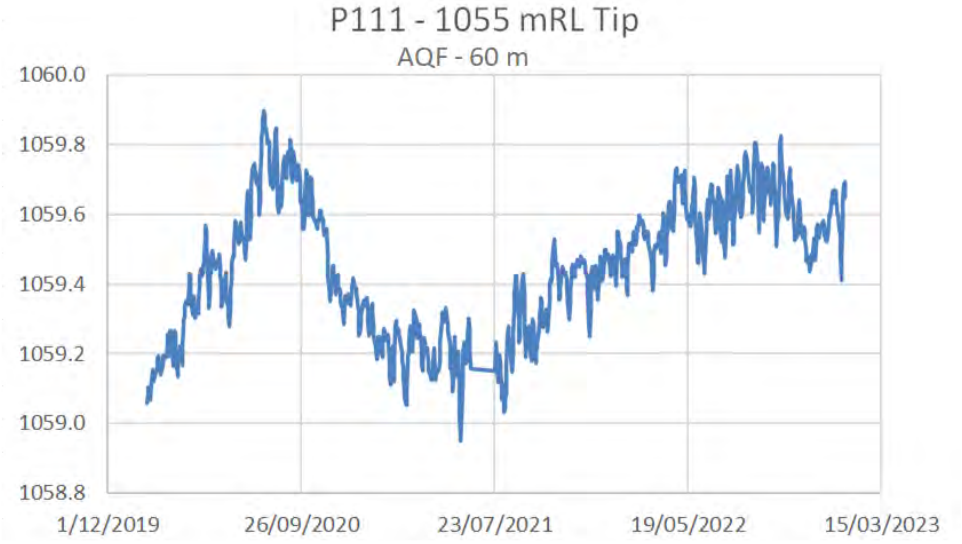
P111



P111 Location (NW-SE Section)

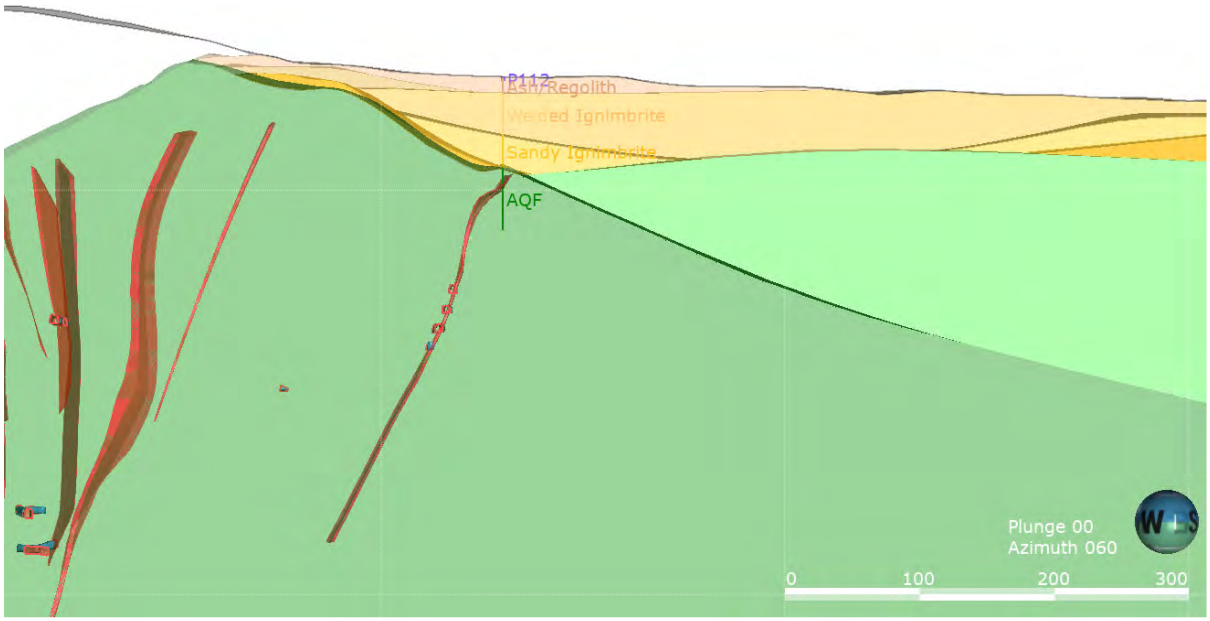




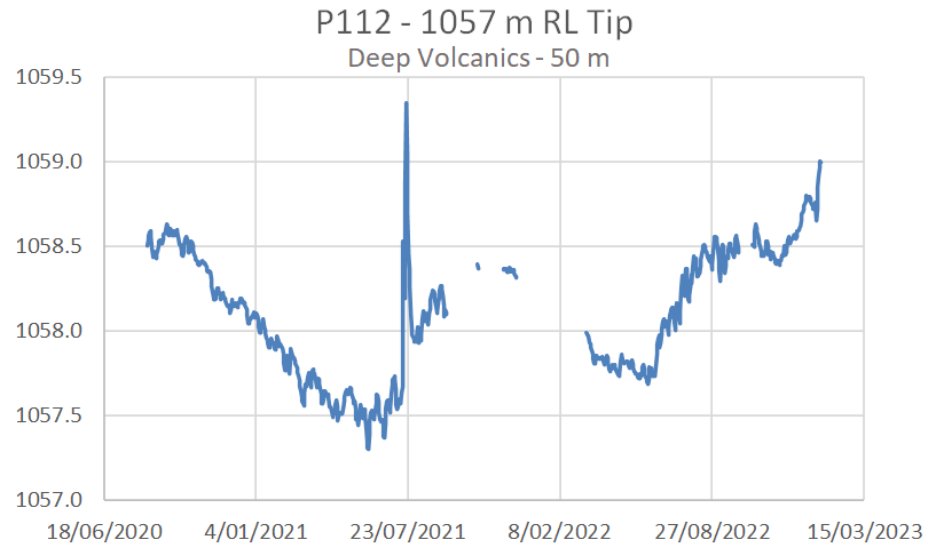


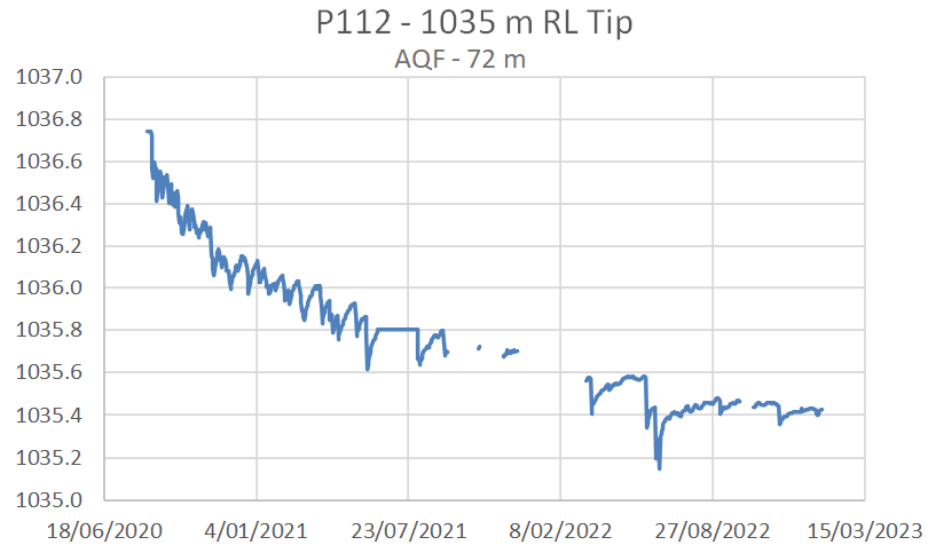
P111 Groundwater Monitoring Records

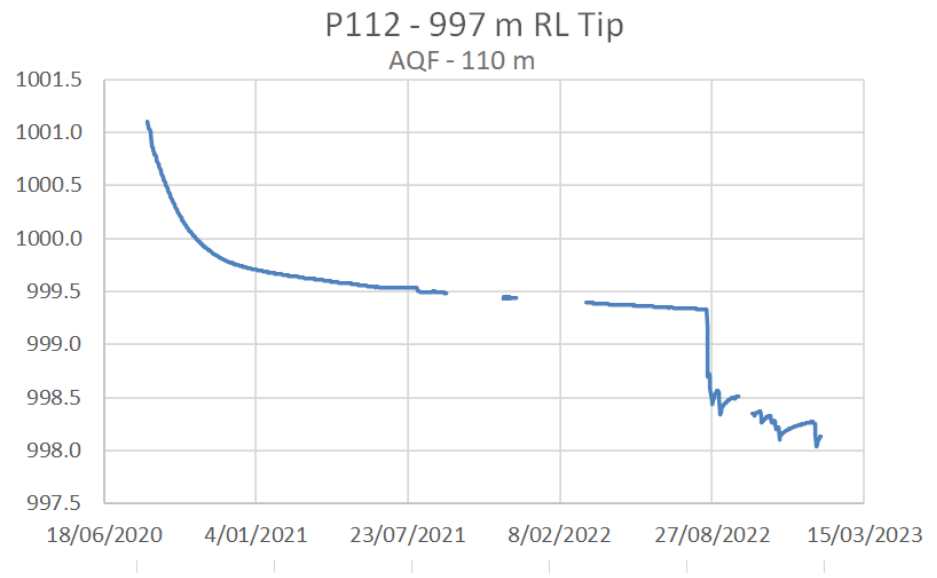
P112



P112 Location (NW-SE Section)

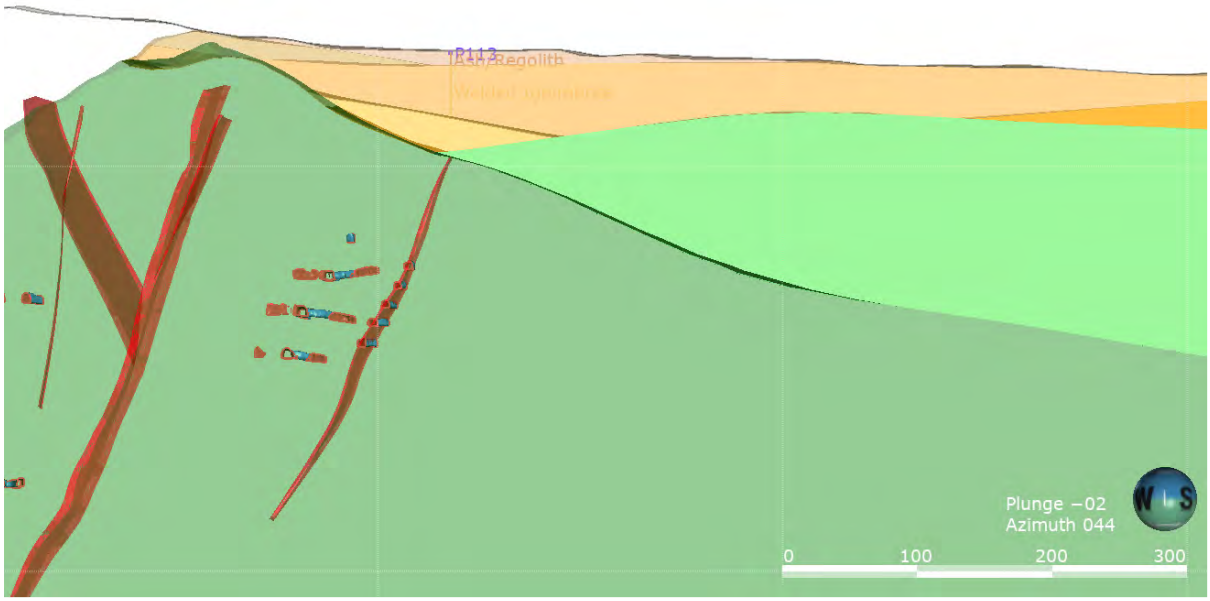




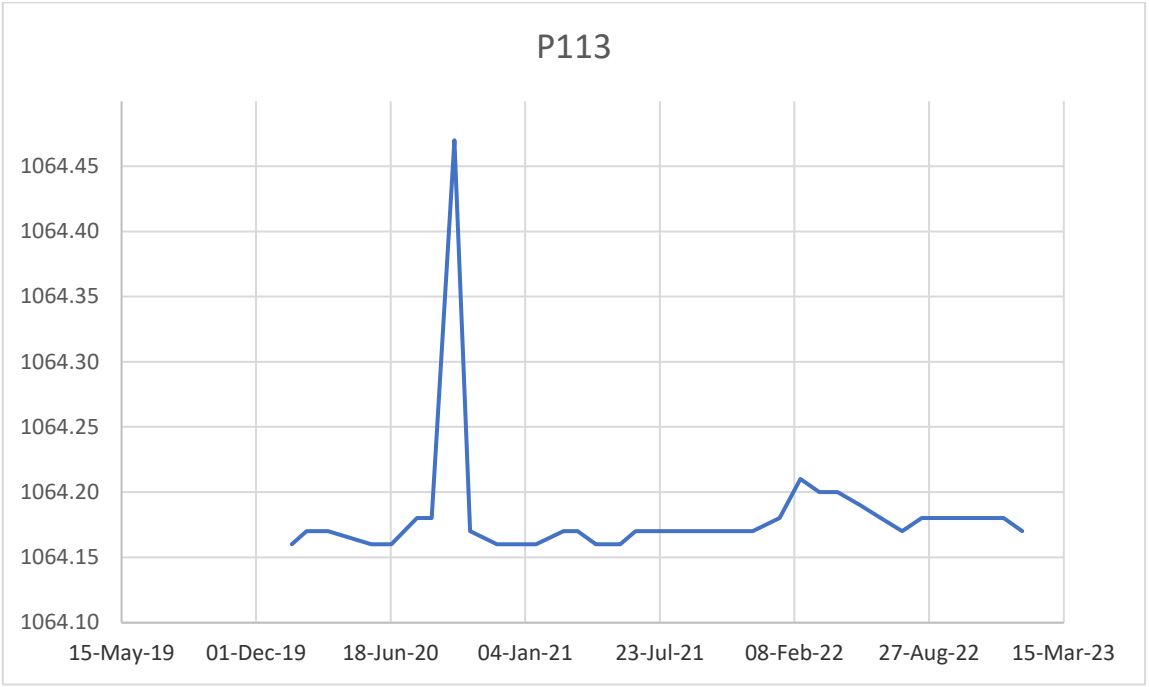


P112 Groundwater Monitoring Records

P113

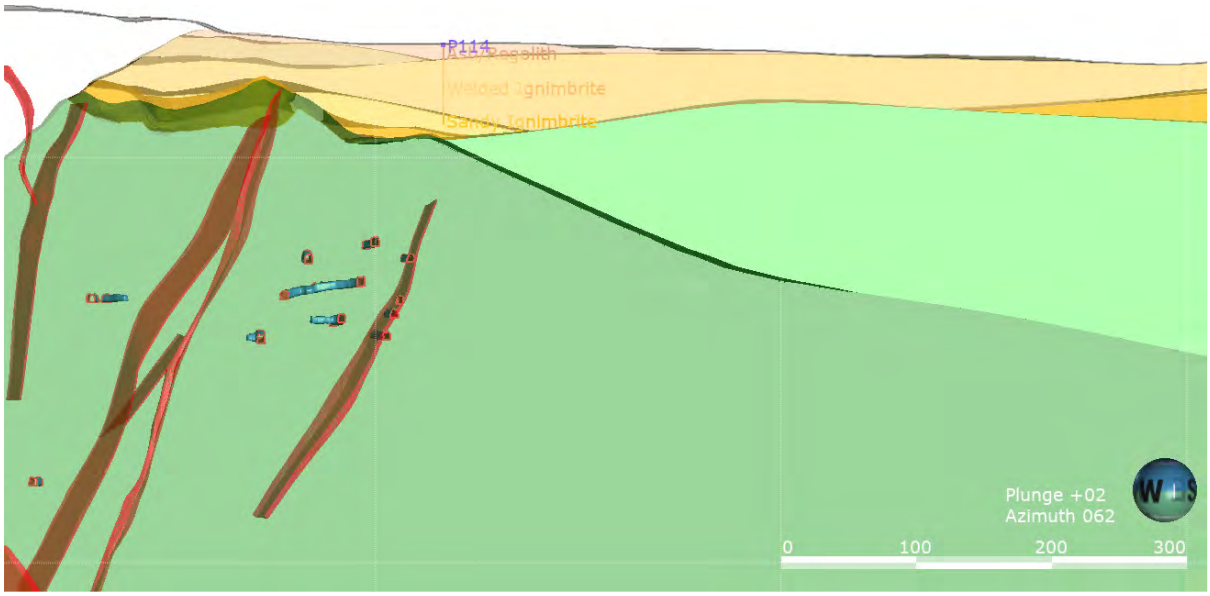


P113 Location (NW-SE Section)

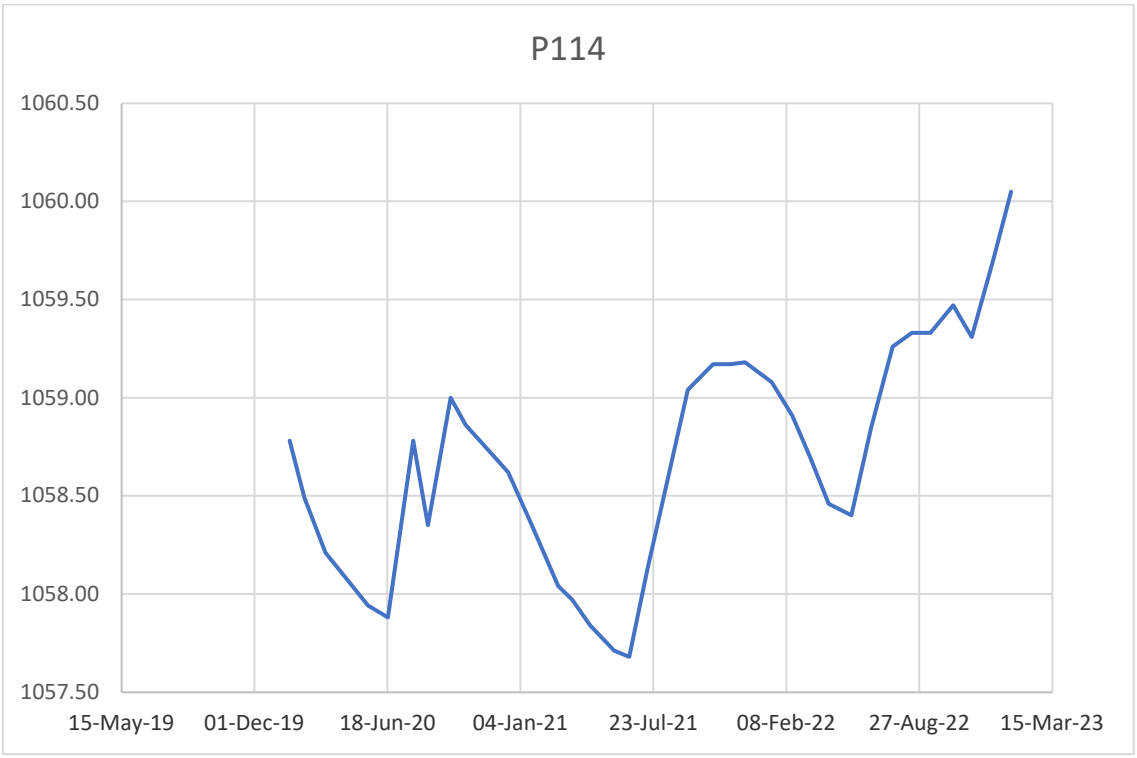


P113 Groundwater Monitoring Record

P114

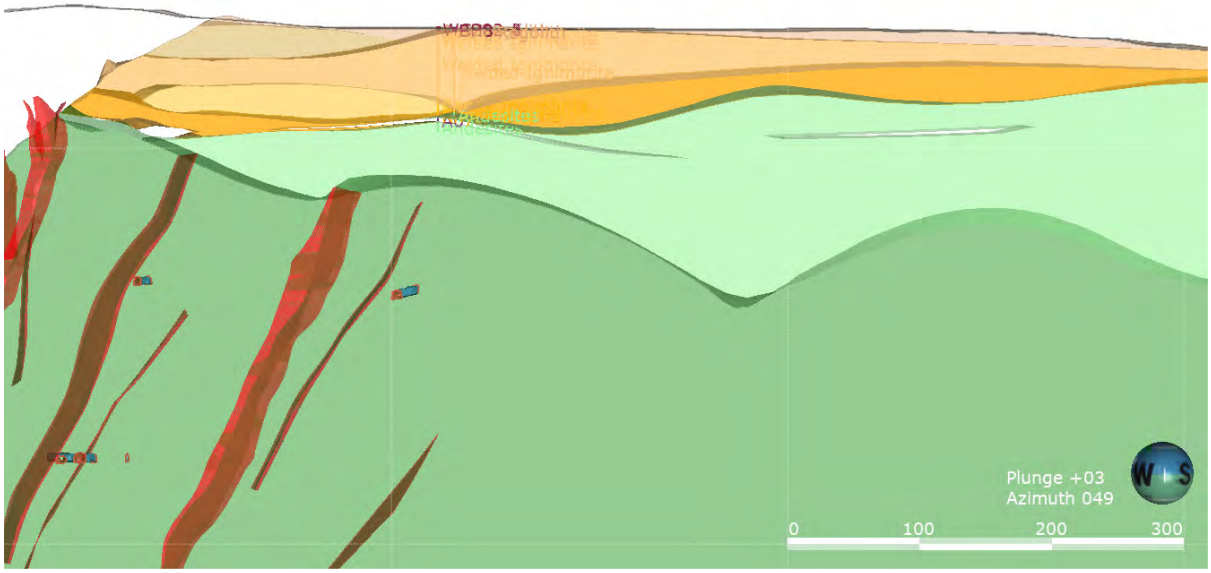


P114 Location (NW-SE Section)

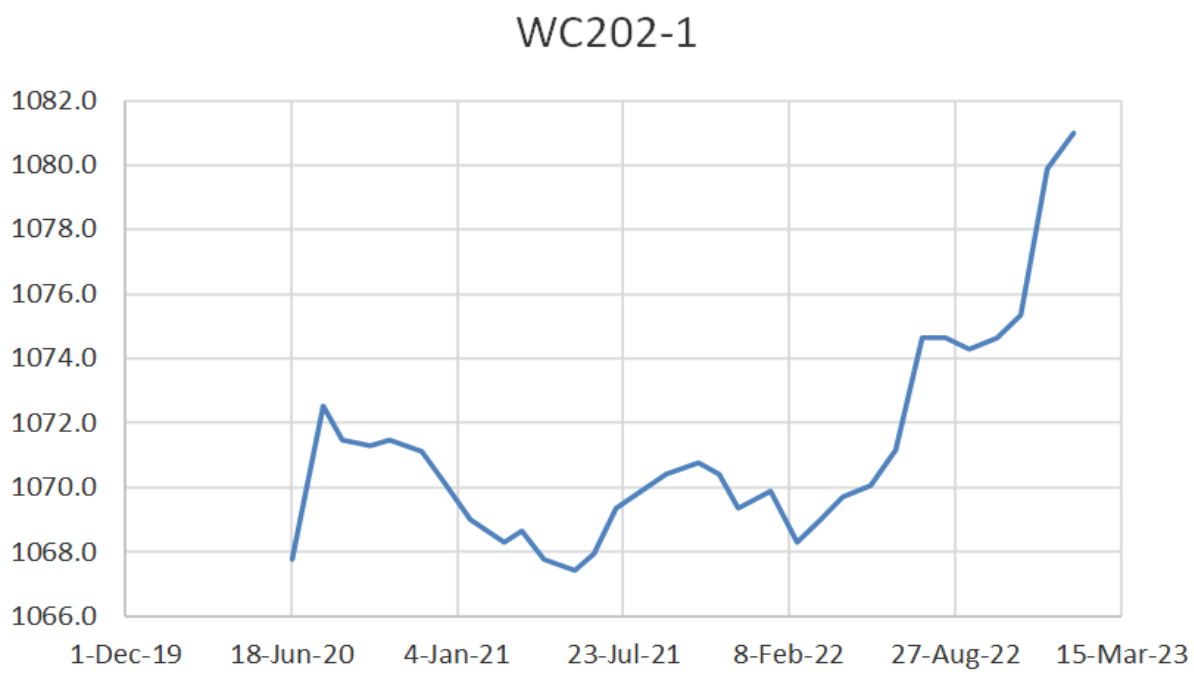


P114 Groundwater Monitoring Record

BH8 & WC202



BH8 & WC202 Locations (NW-SE Section)



WC202-1 Groundwater Monitoring Record

Appendix G MUG DEWATERING PREDICTIONS

TECHNICAL MEMO

GWS Limited

27th March 2023

To: Mark Burroughs

From: Chris Simpson

Subject: Revised MUG Dewatering Predictions

1. Background

As part of the consenting process for the Martha Underground mine (MUG) there were predictions provided as to what the rate of groundwater level drawdown would be in response to underground mine development and dewatering. Those predictions assumed that mine dewatering would be done at the development faces via sump pumping. In 2019 a decision was made to construct deep dewatering wells in order to advance dewatering ahead of the mine face. Two bores were constructed (PC1 & PC2), each consisting of 2 x 3 m diameter holes with submersible pumps installed that have a combined pumping capacity of 6,900 m^3/d. This memo provides updated predictions for lowering of the groundwater level assuming a continuation of advance dewatering using wells.

2. Existing Mine Dewatering

A summary of the mine dewatering for the MUG project was undertaken by GWS (2023)[1] and the following provides a description of the mine dewatering. There are 4 components to the water balance:

- Initial water removed from storage (vein system, andesite and structures). This is long term dewatering needing to be achieved to enable mine development and has a time frame of years.
- Ongoing groundwater inflow from the rockmass (andesite and structures). This is long term dewatering needing to be achieved to enable mine development and has a time frame of years.
- Water replaced into storage following rainfall via permeable structures (veins and faults). This creates water that continues to flow for some weeks after rainfall.

The dewatering records for PC1 and PC2 reflect the sum of these components of the water balance. In addition to the mine dewatering, there is:

- Surface water runoff infiltrating the pit and entering the underground directly through conduits (remnant workings, open veins). These inflows occur within days during and after rainfall and can flood the underground workings.

This component of the water balance is included in the records for sump pumping and can contribute an additional 2,000 to 6,000 m^3/d depending on the intensity of rainfall. This water is essentially rainfall and as such is not included in the predictions for mine dewatering, but is included in the overall water balance model for the site. Attachment A includes a break down of the MUG inflow components as well as the overall mine water balance including Favona and other sources.

[1] GWS, 2023: MUG Dewatering Review 20/2/2023

3. Proposed Mine Dewatering

The following provides our prediction of groundwater inflows likely to be encountered during mining of the Martha Underground vein systems. This method of assessment assumes dewatering is undertaken at the same rate of advance as the underground mine development. Key dates for the dewatering requirements were set out by OGL as follows:

- Dewater below 634 mRL by 23/12/2023
- Dewater to 527 mRL by 26/4/2025
- Dewater to 500 mRL by 1/11/2027

Figure 1 Indicates the proposed dewatering rates and these have been calculated and provided below.

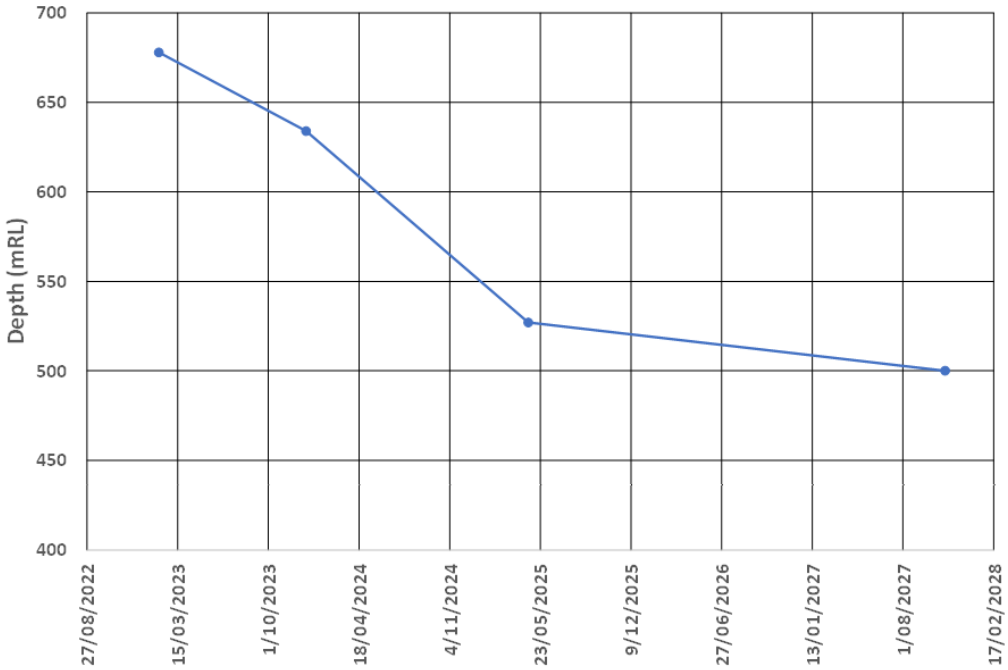


Figure 1 Proposed MUG Development Elevation over Time

Table 1 Proposed MUG Development Rate

Dates	1/02/2023	23/12/2023	26/04/2025	2/11/2027
Days		325	490	920
Months		10.7	16.1	30.2
(mRL)	678	634	527	500
Difference (m)		44	107	27
Rate (m/mth)		4.1	6.6	0.9
Rate (m/d)		0.135	0.218	0.029

Method

The methodology to calculate the pumping rates required to meet the dewatering schedule has been projected from recent pumping rates and water level data. These data were provided and discussed in GWS (2023). Sections of data were analysed determine the volume pumped and the water level change over a given time period. From these were calculated: m3/m, m/d and m3/d. These then were used to calculate the pumping rates to obtain the required dewatering. From the data discussed in GWS (2023) a period of dewater between 6/1/2021 and21/4/2021 resulted in a water level drop of 29 m. The calculation (Table 2) provides the average pumping rate over that period.

Table 2 Observed Average Pumping Rate

m3	m	d
588493	29.1	105.00
m3/m	m/d	m3/d
20,225	0.277	5,605
Start	701.471	m
End	672.373	m
Change	29.098	m
Volume	588493	m3
Start	6/01/2021	
End	21/04/2021	
Days	105	days
Pumping Rate	5,605	m3/d

From the 21/4/2021 to the end of that record when water level stabilised, some 11,715,851 m^3 been was pumped over 571 days averaging 3,005 m^3/d.

Results

Results for the three dewatering rate stages shown are on Table 3.

Table 3 Calculated Dewatering Rates

Stage A		
Start	687.00	m
End	634	m
Change	53	m
Volume	1,071,899	m3
Start	1/02/2023	
End	23/12/2023	
Days	325	days
Storage	3,298	m3/d

Stage B		
Start	634.00	m
End	527	m
Change	107	m
Volume	2,164,023	m3
Start	23/12/2023	
End	26/04/2025	
Days	490	days
Storage	4,416	m3/d

Stage C		
Start	527.00	m
End	500	m
Change	27	m
Volume	546,062	m3
Start	6/04/2025	
End	2/11/2027	
Days	940	days
Storage	581	m3/d

These values have been adopted as being the volume of water that needs to be removed from storage + groundwater inflow + rainfall replaced storage, in order to maintain a steady level at the stage elevation. Based on the period of observations available at this time, around a further 1,800 m^3/d dewatering is required in addition to the steady state dewatering volumes in order to advance the dewatering depth. This is shown on Figure 2.

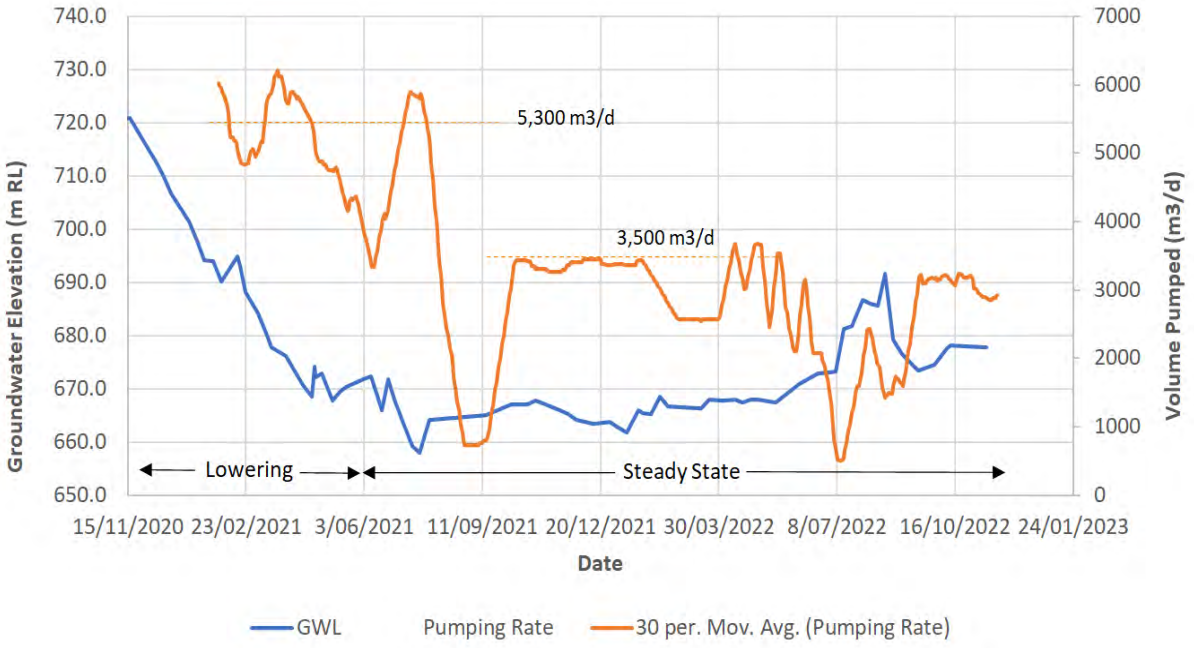


Figure 2 Observed MUG Dewatering Response (PC1&PC2)

Figure 3 show the total dewatering volumes expected based on the proposed mine development. In summary, the inflow volumes are expected to be 4,800 m^3/d initially, increasing to 7,800 m^3/d at the lowest elevation. While not shown on Figure 3, the dewatering volumes would reduce to some 6,000 m^3/d at the lowest mine elevation to hold groundwater at that level, rather than advancing the lowering further.

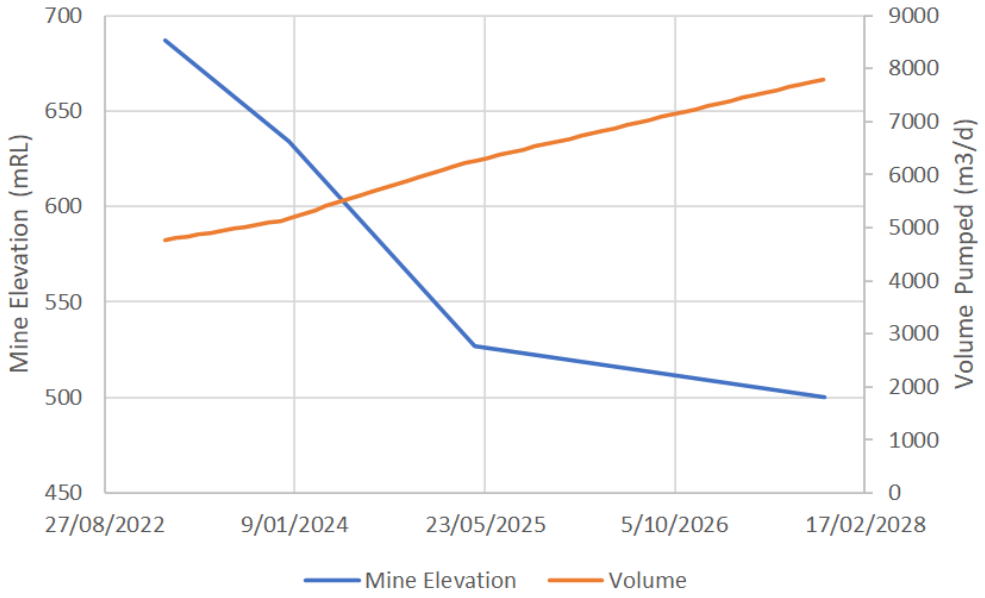


Figure 3 Predicted Groundwater Inflow Volumes

The average pumping rates calculated are considered to include storage recharged by rainfall, but heavy periods of rainfall would likely further reduce the rate of dewatering for a period or would need extra pumping for a period to maintain the dewatering rate.

Validation from Historical Data

Table 4 provides the historical mine pumping data which are annual averaged values that do not include the effects of rainfall infiltration via the pit.

Table 4 Historic Dewatering Rates

Elevation Start	Elevation Finish	Diference	Martha Pumping		
mRL	mRL	m/yr	m3/yr	m3/d	m/d
673	667	6	2,135,252	5,850	0.0164
667	659	8	1,812,005	4,964	0.0219
659	649	10	1,734,207	4,751	0.0274
649	638	11	1,876,655	5,142	0.0301
638	609	29	1,798,856	4,928	0.0795
609	581	28	2,342,348	6,417	0.0767
581	554	27	1,268,148	3,474	0.0740
554	540	14	1,721,423	4,716	0.0384
540	500	40	2,161,184	5,921	0.1096
			1,872,231	5,129	0.0527

While the historical pumping rate is similar to that calculated from the current data, the current data is showing more rapid dewatering overall. This may reflect the dewatering methodology or a change in the volume within the historic mine between natural ground and the post-mining condition.

Limitations

The predicted groundwater inflow values have been undertaken adopting a methodology that relies on observational data. The method differs to that previously adopted for consenting the Martha Underground mine that was largely theoretical and assumed face dewatering only. Ultimately, the volumes of groundwater pumped from the underground mine will relate to the rate of advancement of dewatering. Hence changes to the method of dewatering will result in departures from the predictions made here.

ATTACHMENT A – Water Balance Figures

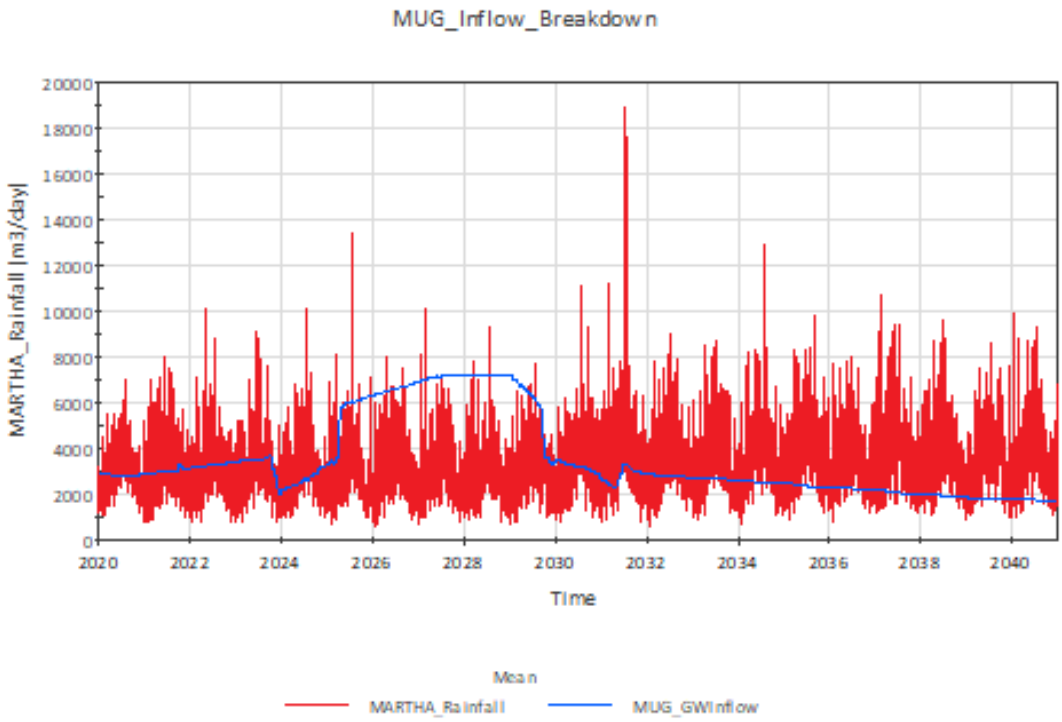


Figure A1 Breakdown of Martha Underground Water Volumes (Provided by GHD)

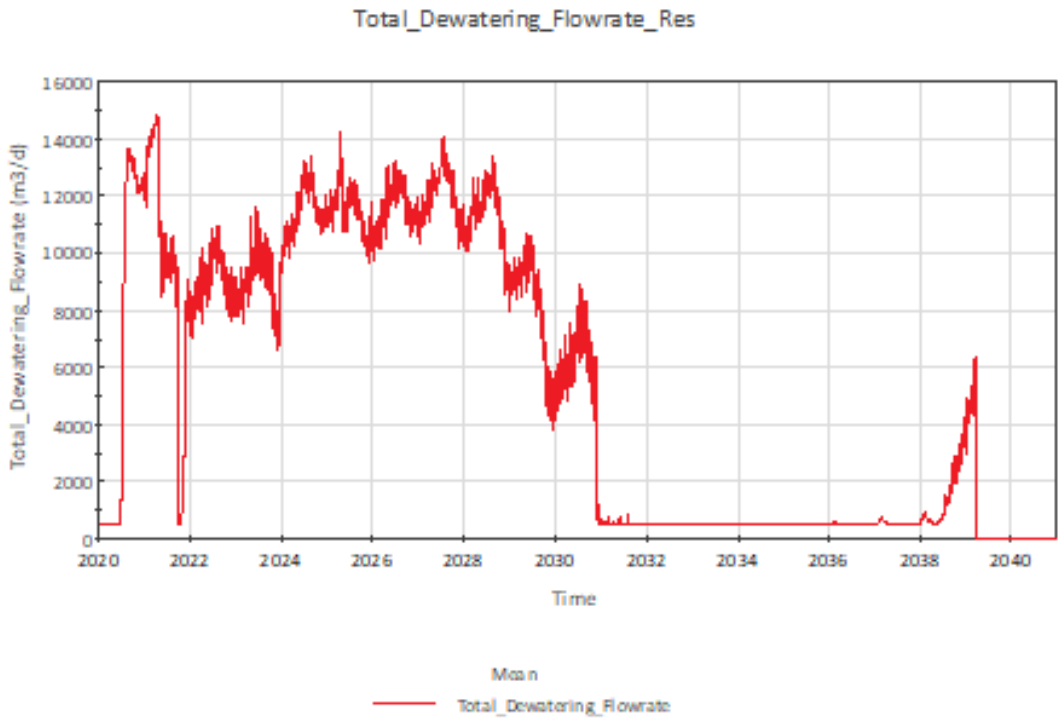


Figure A2 Total Mine Water Volumes Reporting to the WWTP (Provided by GHD)