OCEANAGOLD
WAIHI OPERATION

Dewatering and Settlement Report 2024

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DEWATERING & SETTLEMENT MONITORING REPORT 2024

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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 2024 to 31 December 2024. Such monitoring and reporting have been completed in accordance with the current Dewatering and Settlement Monitoring Plan that was approved by the Hauraki District Council (HDC) and Waikato Regional Council (WRC) in August 2023.

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). The mine datum is set at 1,000m above sea level.

New settlement triggers were applied during 2020 following approval of the Project Martha consents. These current 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 the potential to be problematic for residential properties or public infrastructure and can be caused by shallow settlement effects. Tilts are typically only potentially problematic if 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.

The current settlement survey results indicate that 95.7% (330/345) of the marks were within the predicted ranges of settlement resulting from mining activities. Fifteen (15) marks triggered further investigation. Five of these triggered settlement marks were located above the Favona mining area.

The remaining ten (10) of the above fifteen (15) triggered marks are located in the wider Waihi area. Generally, no effects were observed at surface near these locations, measured tilts were less than 1 in 1000, and nearby shallow piezometers have not displayed any changes outside of normal seasonal trends.

Six marks in the Favona area have measured tilts greater than 1 in 1000. These marks are situated on farmland that is owned by the company and are located directly above the Favona workings, as such, this ground movement has no material effect on residential property.

Overall, the settlement and dewatering trends are within predicted expectations and no surface effects of concern have been identified to date.

Martha Open Pit

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

Generally, the groundwater level monitoring which has been completed to date indicates that the 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 and limited to within the andesite rock, no undesirable tilts have manifested at the surface. No new trends have developed during 2024.

Analysis of the relevant monitoring 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, or of the upper portions of the young volcanic materials which could lead to undesirable tilt at the surface.

Two property damage complaints attributable to mine dewatering or settlement in response to mine dewatering were reported during 2024. Compliance was achieved with the consent conditions granted for the Martha Extended Project.

Favona

At the Favona Mine the measured piezometer levels indicate continued dewatering of the vein system, with the groundwater level being maintained at approximately 800 mRL mine datum by the end of 2024. Water levels in the country rock surrounding the vein system stand higher and are either not responding or responding slowly to dewatering.

Five Favona marks exceed the settlement predictions set for Project Martha. A settlement trend exists over a 150 m wide area above the underground workings with a maximum total settlement of 390 mm (F18), of which up to 341 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. This 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 (i.e. which occurs the first time a mine is dewatered) is greater than a second cycle (i.e due to subsequent dewatering activities). It is therefore worthy of note that 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 locations are on farmland that is owned by the company and are south of the residential area along Barry Road. All of these locations have been recorded in previous surveying events.

The previous trigger levels which applied to the Favona piezometers have been removed. These have been superseded by the Waihi wide triggers that were introduced as part of the Correnso dewatering consent. The current 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 the Martha Underground dewatering.

Correnso

The Correnso Underground Mine was granted consent and operations began on 20 December 2013.

The Correnso water take permit was activated in July 2017, allowing dewatering to lower the groundwater down to 700 mRL (WRC #124860, Schedule One – General Conditions, Condition 1), beyond the lowest level authorised for the mining of Trio.

New settlement trigger levels for Correnso were applied in 2017 and Project Martha superseded these in 2020. During 2024, 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 WRC consents were required for the activity which is covered by 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 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 2024, the water level was at approximately 636 mRL.

In June 2023, amendments were made to the Dewatering and Settlement Monitoring Plan to specifically address additional monitoring requirements as a result of the proposal to mine the Rex orebody to a higher elevation. This was approved by WRC and HDC in August 2023, and more focused monitoring of groundwater level/pressure along the strike of the Rex orebody began in October 2023. Six additional settlement marks were also installed.

A greater than 2m change in groundwater level was identified in two piezometers during 2024. A 2.75mRL decrease in water level was identified at piezometer P113A (74m deep). This level change occurred at a piezometer tip located in the Andesite and is therefore not considered to be a significant anomaly. A 2.93mRL decrease in water level was identified at piezometer P114 (55m deep) and was believed to be related to a water inflow event associated with unravelling of weak rock mass. The area was treated with resin injection through self-drilling anchors to decrease water inflow and stabilise the area.

1 INTRODUCTION

This report is submitted to meet the requirements of the various consents which are currently held by Oceana Gold New Zealand Limited (OGNZL) that are related to mine-related 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 the relevant 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 (annual monitoring report) report shall, as a minimum, provide the following information:

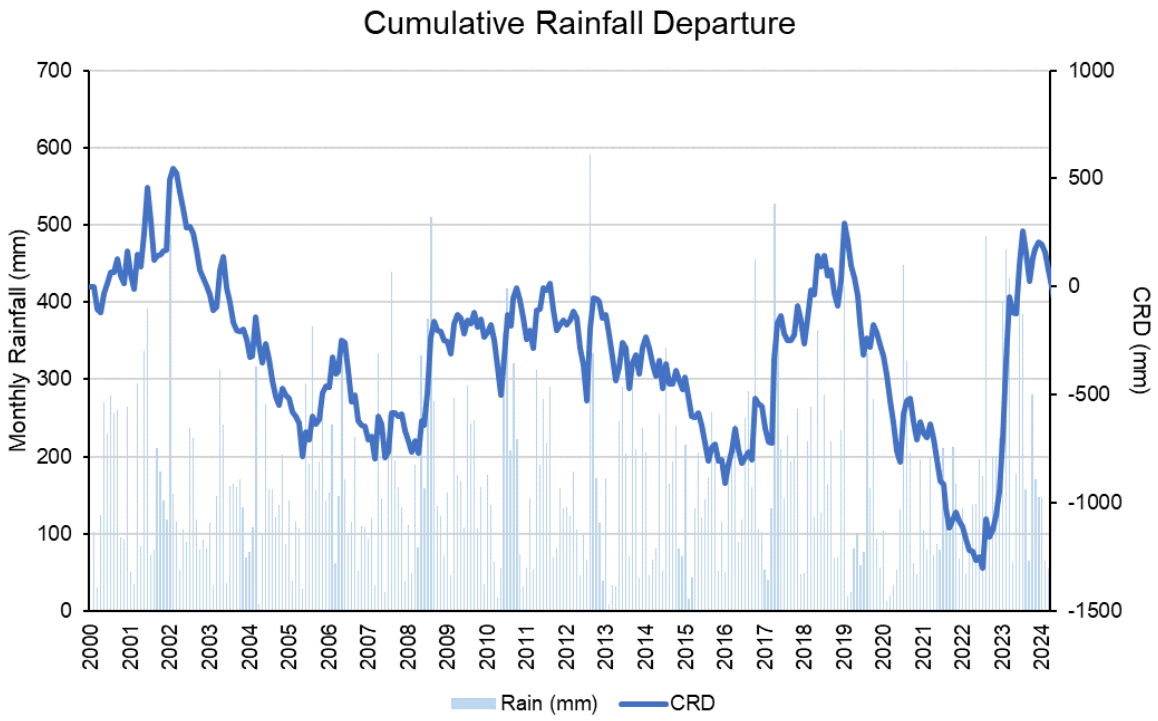
a) The volume of groundwater abstracted;
b) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;
c) An interpretation and analysis of the monitoring data, in particular any change in the groundwater 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;
e) Comment on compliance with relevant resource consent conditions, including any reasons for non-compliance or difficulties in achieving conformance with the conditions.
f) The report shall be forwarded in a form acceptable to the Councils.

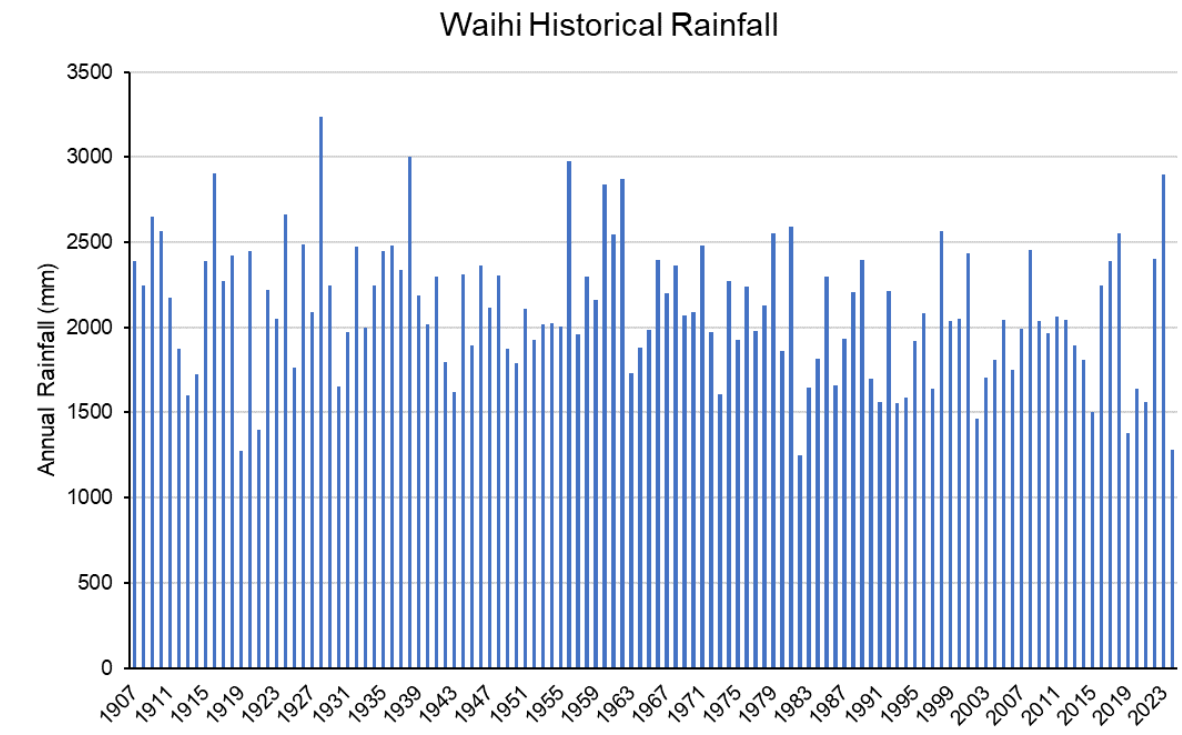
2 CLIMATE CONDITIONS

Historical rainfall data for Waihi has been collected since 1907, with annual measured rainfall ranging between 1249 and 3234 mm per annum.

Annual and seasonal rainfall trends are displayed in Figure 1. Cumulative Rainfall Departure (CRD) is a concept used to evaluate the temporal correlation of rainfall with surface water or groundwater levels. The CRD is calculated by determining the mean of the rainfall for the period in question, subtracting the mean from each data point to determine the departure from the mean, and accumulating the resultant departures. The CRD plot presents monthly long-term trends in rainfall since 2000, with a rising slope since July 2022 influenced predominantly by the cyclonic events in Jan-Feb 2023.

The 2024 annual rainfall (1279 mm) was significantly less than the previous year (2898 mm in 2023), less than 2022 (2403 mm), and 821 mm less than the historical average of 2100 mm. The month with the highest rainfall in 2024 was June (197 mm), followed by May (161 mm) and the driest month was February (55 mm) followed by March (59 mm).





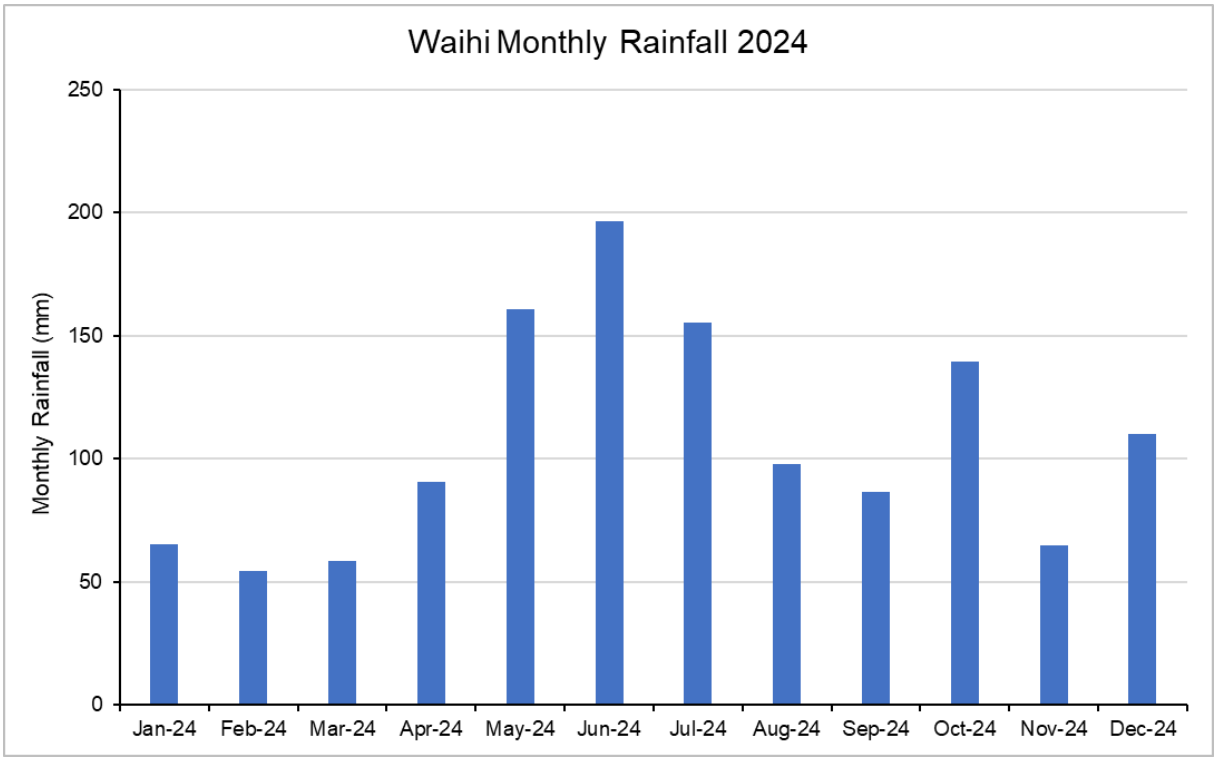


Figure 1. Annual and seasonal rainfall trends. A) CRD plot 2000–2024, B) Historical rainfall 1907–2024, C) Monthly rainfall 2024.

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, hydro-geologically, 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 which is 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 hydro-geological 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 between 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.

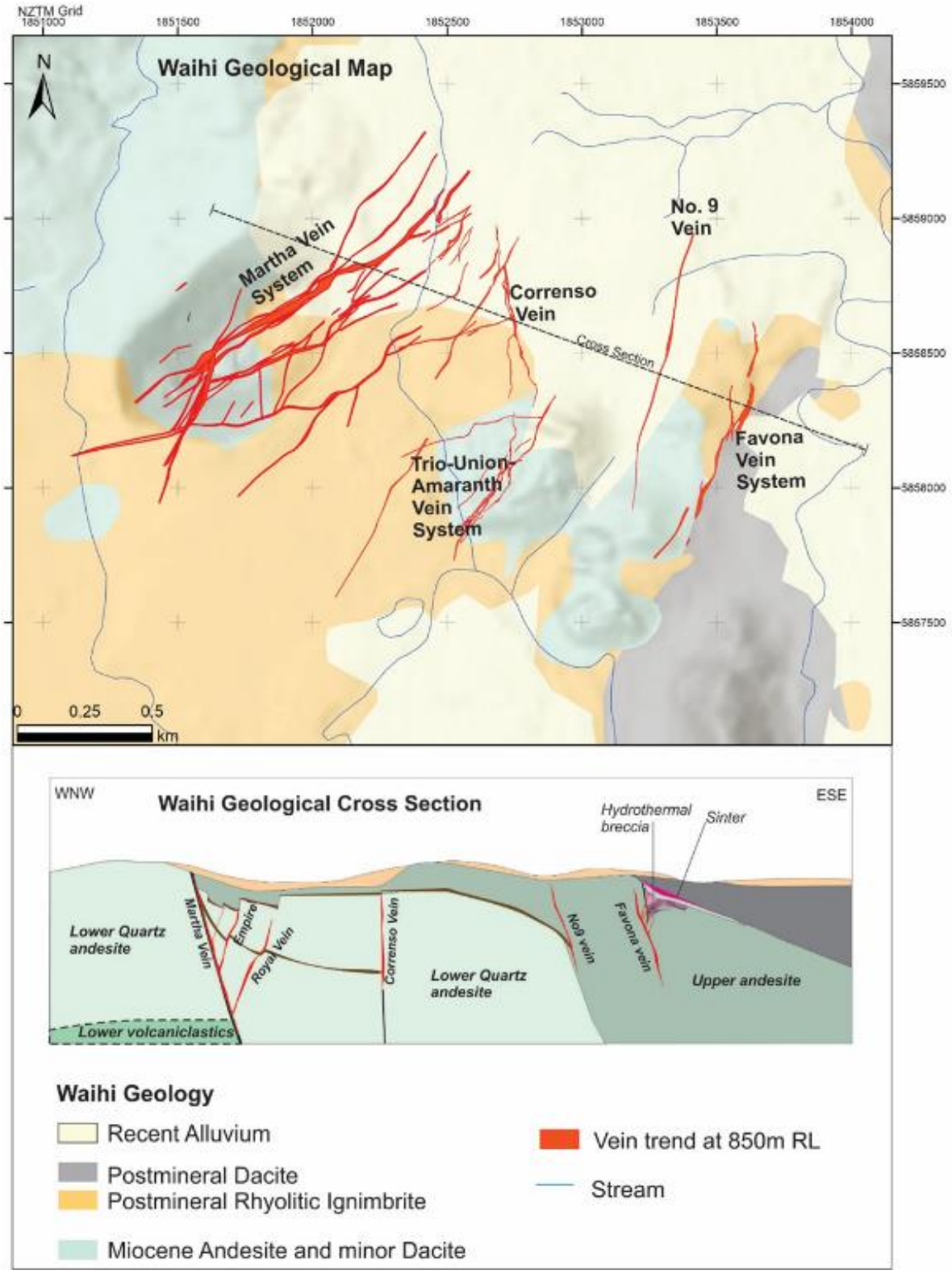


Figure 2. Geological map and cross section of the Waihi area showing the distribution of quartz veining and dominant geological rock units.

4 MINING ACTIVITIES

The main features of the mining activities during 2024 (in relation to dewatering and settlement) are described in the following sections.

4.1 Martha Open Pit

Access from the surface to the Martha Pit remained restricted during 2024 due to the north wall slip. No production works were undertaken in the pit during 2024. The pit remains in care and maintenance. In pit waste rock storage (from Martha Underground) continued.

4.2 Underground

4.2.1 Development & Production 2024

2024 saw development and production in the Martha mining area (Figure 3 & Figure 5), consisting mainly of declines, accesses, ore drives and stoping. Throughout 2024, 8,701m of development was completed. Approximately 181k tonnes of ore from development and 378k tonnes of ore from production was extracted over the period.

Limited mining activities were carried out in Correnso in 2024 (Figure 3 & Figure 4), with development blasting and drive rehabilitation. Backfilling in line with the land use consents continued.

4.2.2 Future Mining Activities

Mining activities for 2025 will focus on ore drives and stoping in Martha in the areas of Rex, Empire West, Empire, Edward and Royal East. It is planned to remove approximately 540k tonnes of ore and complete approximately 10,000m of development for the year. The reader should refer to the Annual Work Programme (WAI-200-REP-002) for a full description of the planned future mining activities.

4.2.3 Waste Rock Management

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

On the surface, a short-term stockpile is maintained immediately behind the mill area, enabling easy access for backloading. Larger or longer-term volumes will be stored at the Favona ‘Polishing Pond’ Stockpile (near the water treatment plant) and within the Martha Open Pit.

Waste rock placement at the Favona ‘Polishing Pond’ 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 also been utilised for interim placement of Martha ore.

Waste rock placement within the Martha Open Pit started in August 2023 and will continue into 2025.

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 will be submitted to WRC at the appropriate time.

4.2.4 Groundwater Inflows

During 2024, there were no anomalous water inflows in the Edward, Empire West and Empire declines which are used for accessing deeper ore bodies for Project Martha. One anomalous water inflow event was recorded in REX associated with unravelling of weak rock mass. P113A and P114 recorded a reduction in ground water levels. The area was treated with resin injection through self-drilling anchors to decrease water inflow and stabilise the area.

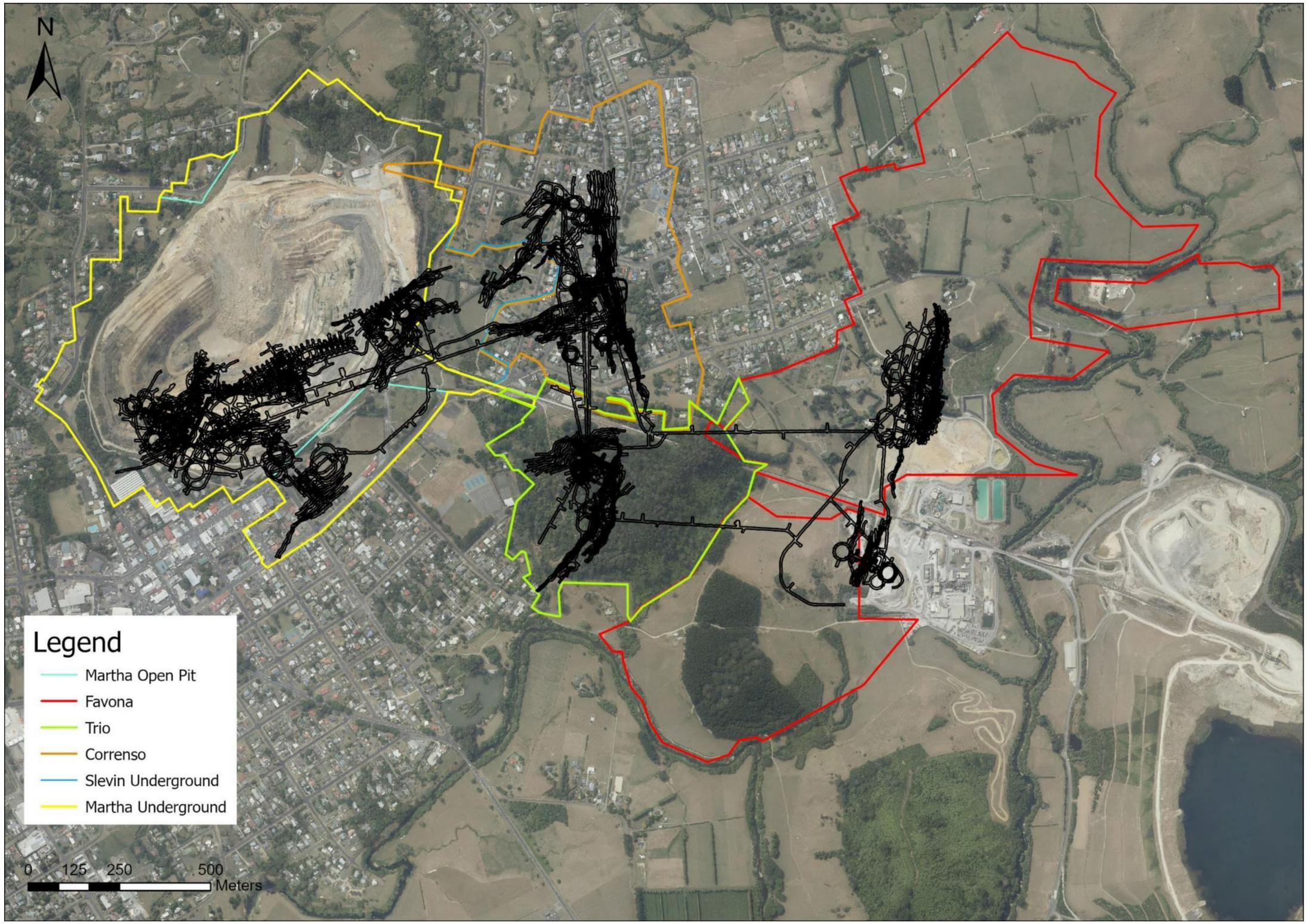


Figure 3. Current workings and boundaries.

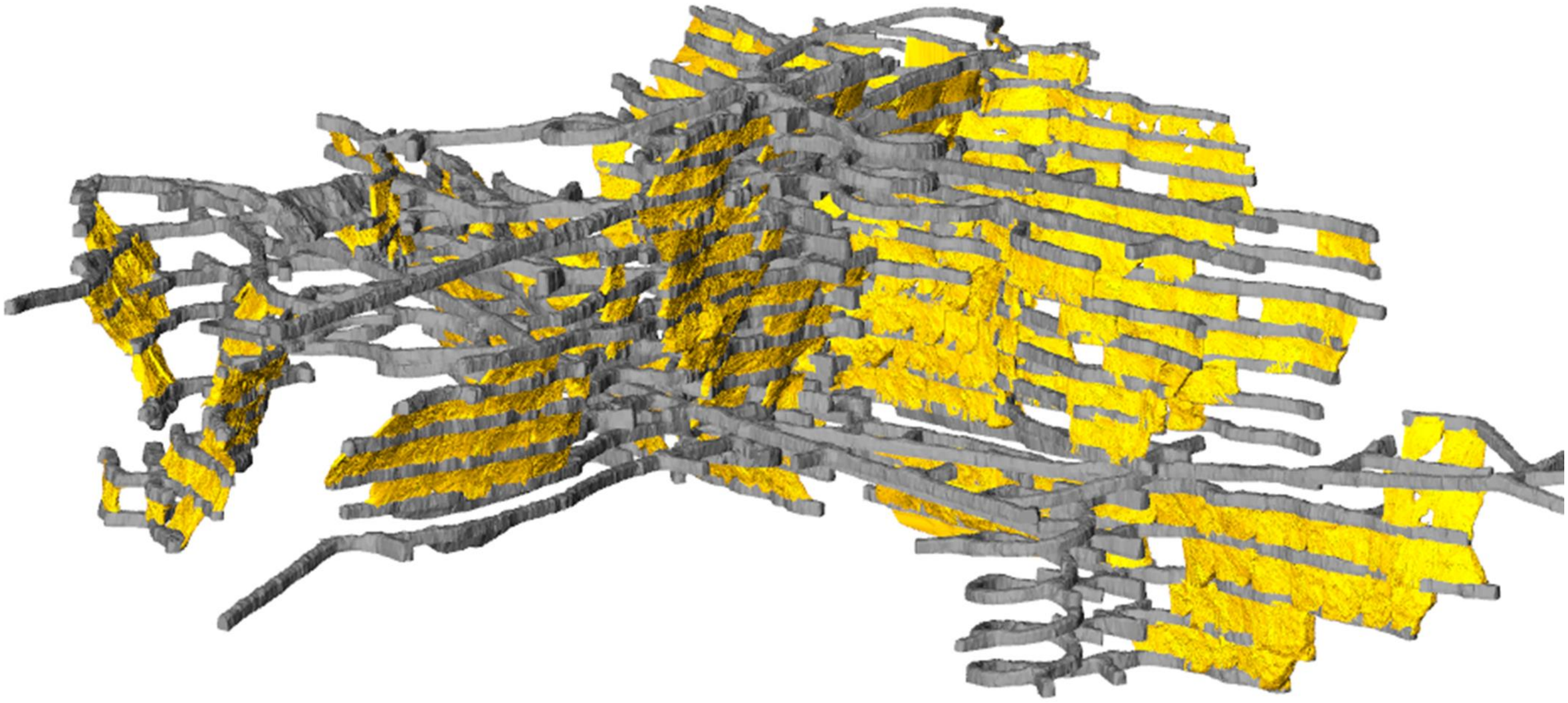


Figure 4 Oblique view of Correnso showing completed development (grey) and stoping (yellow) activities. View is looking northeast from above.

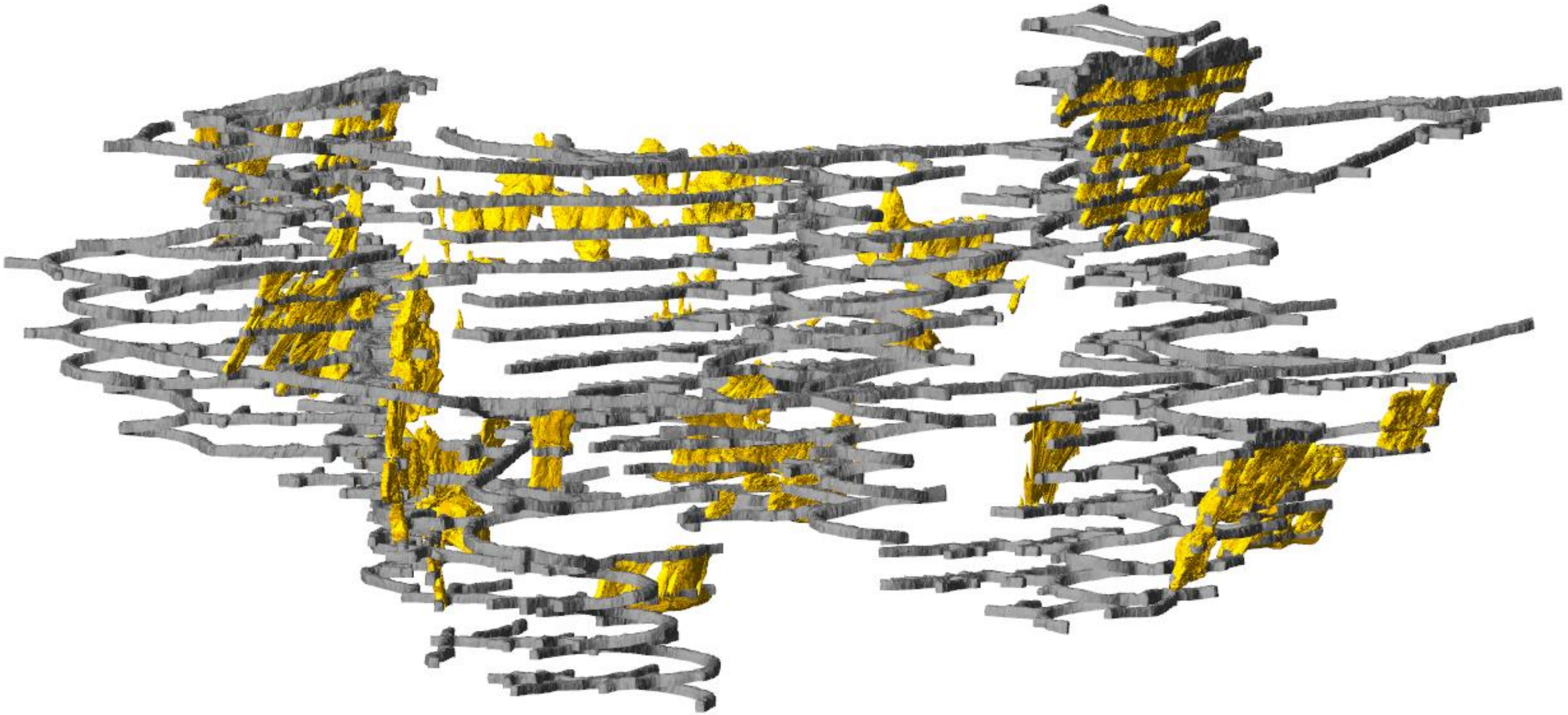


Figure 5. Oblique view of Martha Underground showing completed development (grey) and stoping (yellow) activities. View looking northeast.

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 the groundwater levels for the Project Martha development. Dewatering to 500 mRL is permitted under the Project Martha consent. 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 2024, groundwater levels were drawn to 636 mRL (Figure 7).

The mine datum is set at 1,000 m above sea level, which makes the Waihi township ground surface level around 1,120 mRL.

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 underground (m^3)	Total mine take minus service water (m^3)
2015 (18/05 onwards)	1,338,760	5,871	60,727 (23/09 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
2023	4,045,764	11,084	229,295	3,816,469
2024	2,721,100	7,435	227,393	2,493,707

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

During December 2019, at the request of a peer reviewer, a standalone flow meter was installed for the Favona dewatering line. In 2021, the pump was removed as the area was dry.

5.1 Future Dewatering

The Project Martha dewatering consent allows dewatering to 500 mRL. Underground water levels were drawn to approximately 636 mRL in 2024. This will be progressively lowered during 2025, with a target pumping rate of 35 – 140 L/s, depending on rainfall and operational requirements. Water levels are projected to be lowered to approximately 600 mRL in 2025. Dewatering will be primarily from the drive and stope face as they mine below the dewatering bore levels. Ground water inflow into planned mine development will be pumped from the active mining front to the primary pump system.

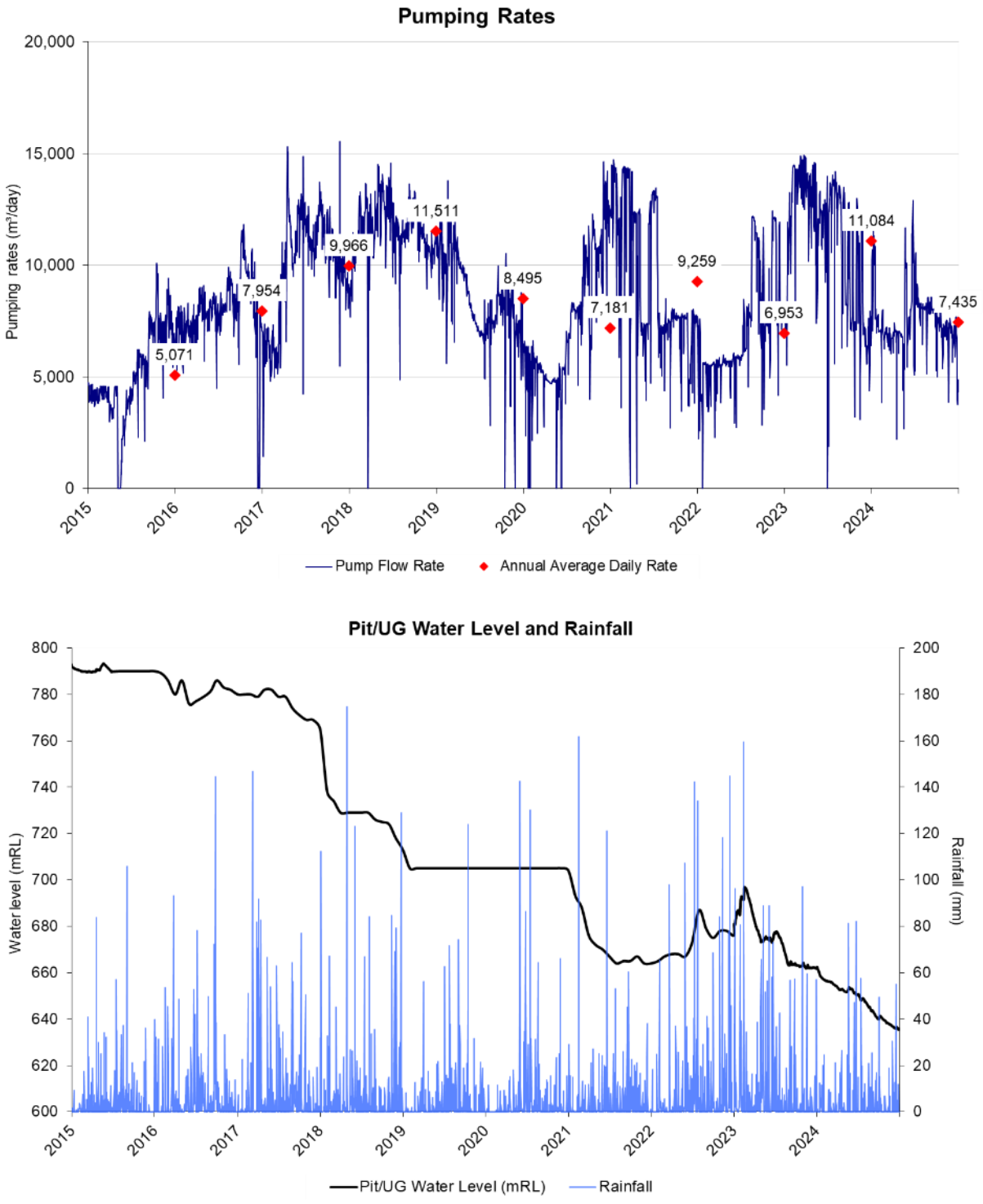
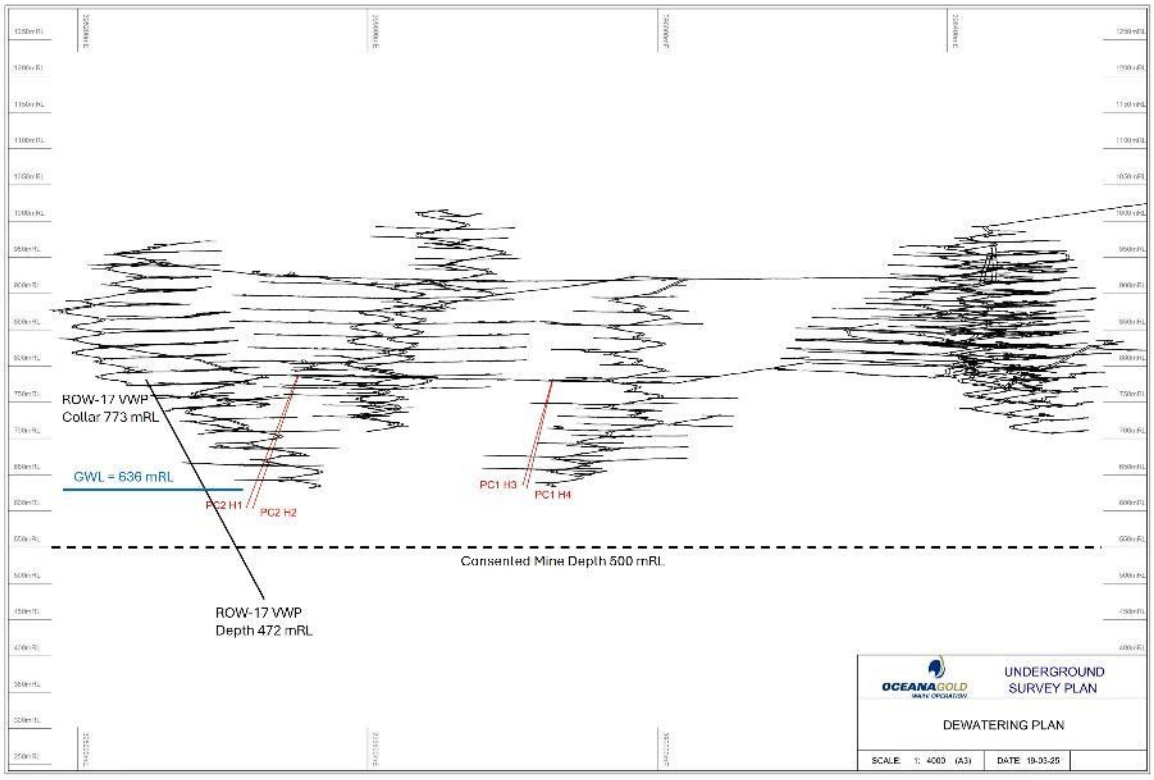


Figure 6. A) Underground dewatering pumping rates, B) Dewatering water level and rainfall.



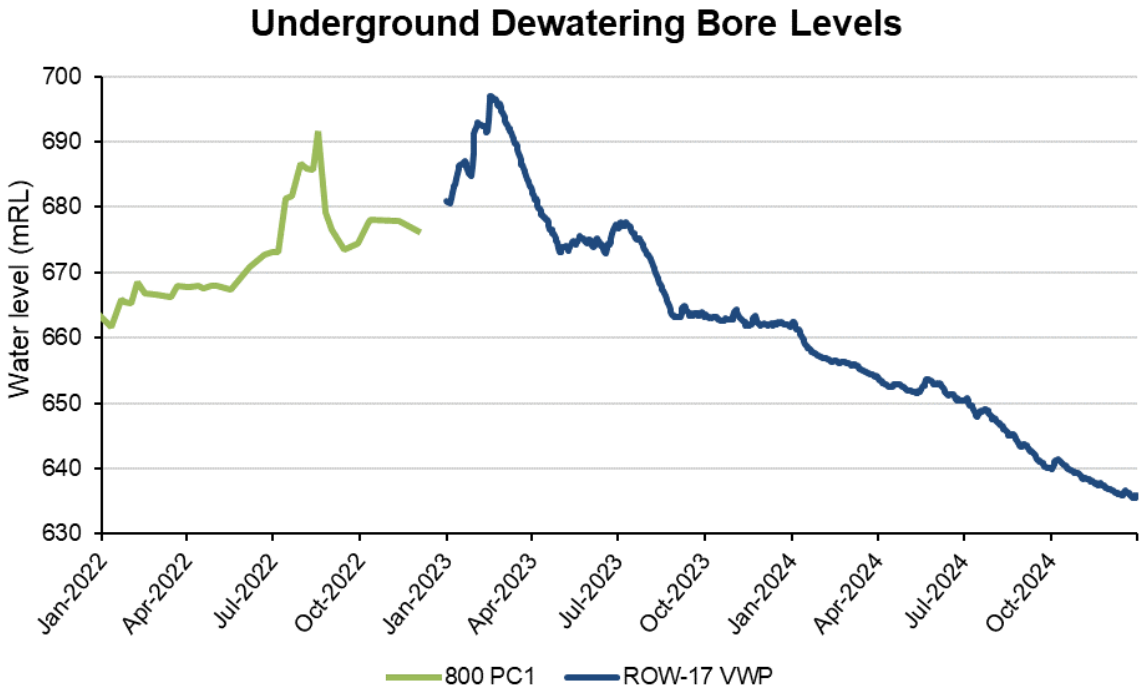


Figure 7. A) Project Martha dewatering bore locations, B) Underground dewatering bore levels.

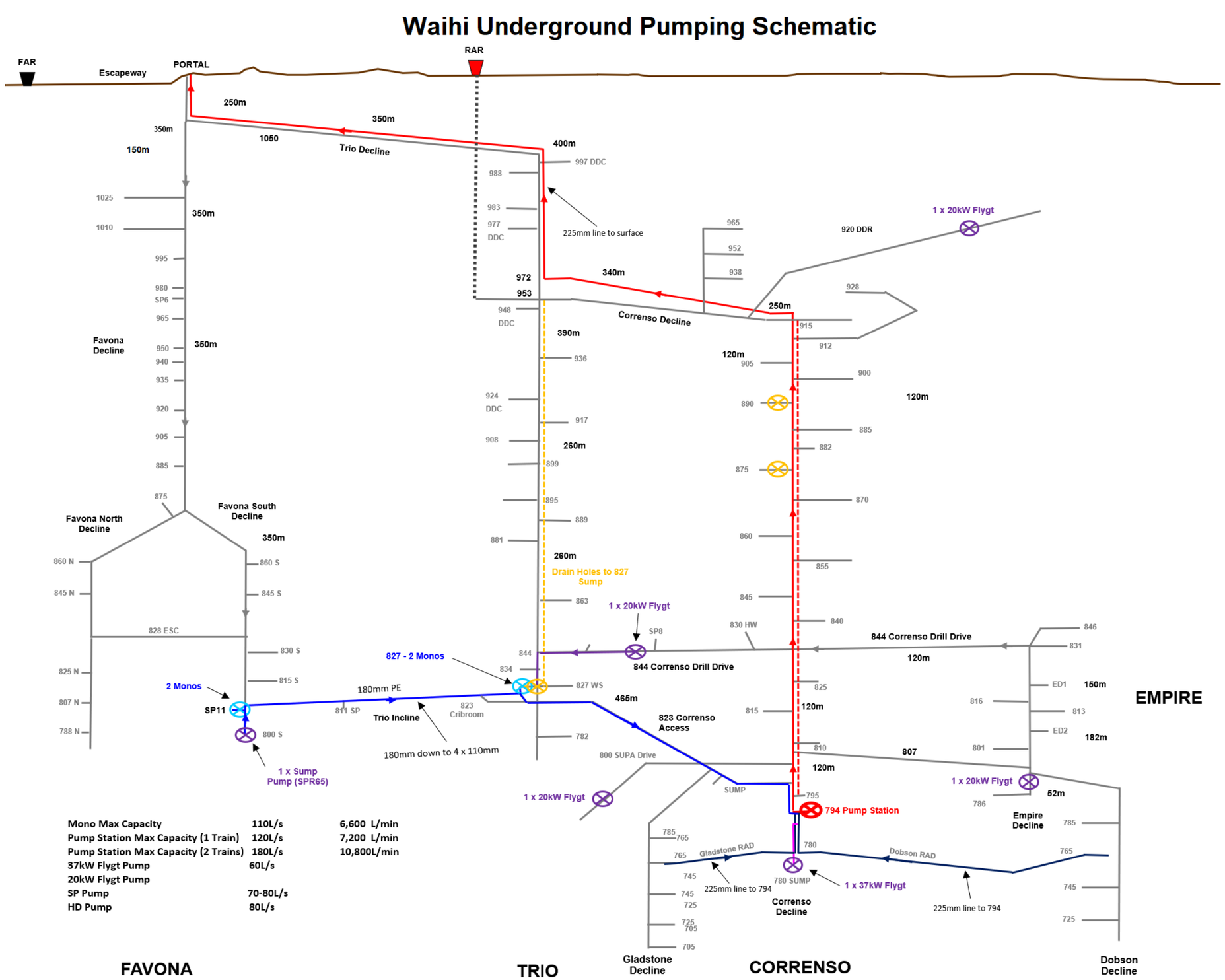


Figure 8. Corrensо, Trio and Favona pumping schematic 2024.

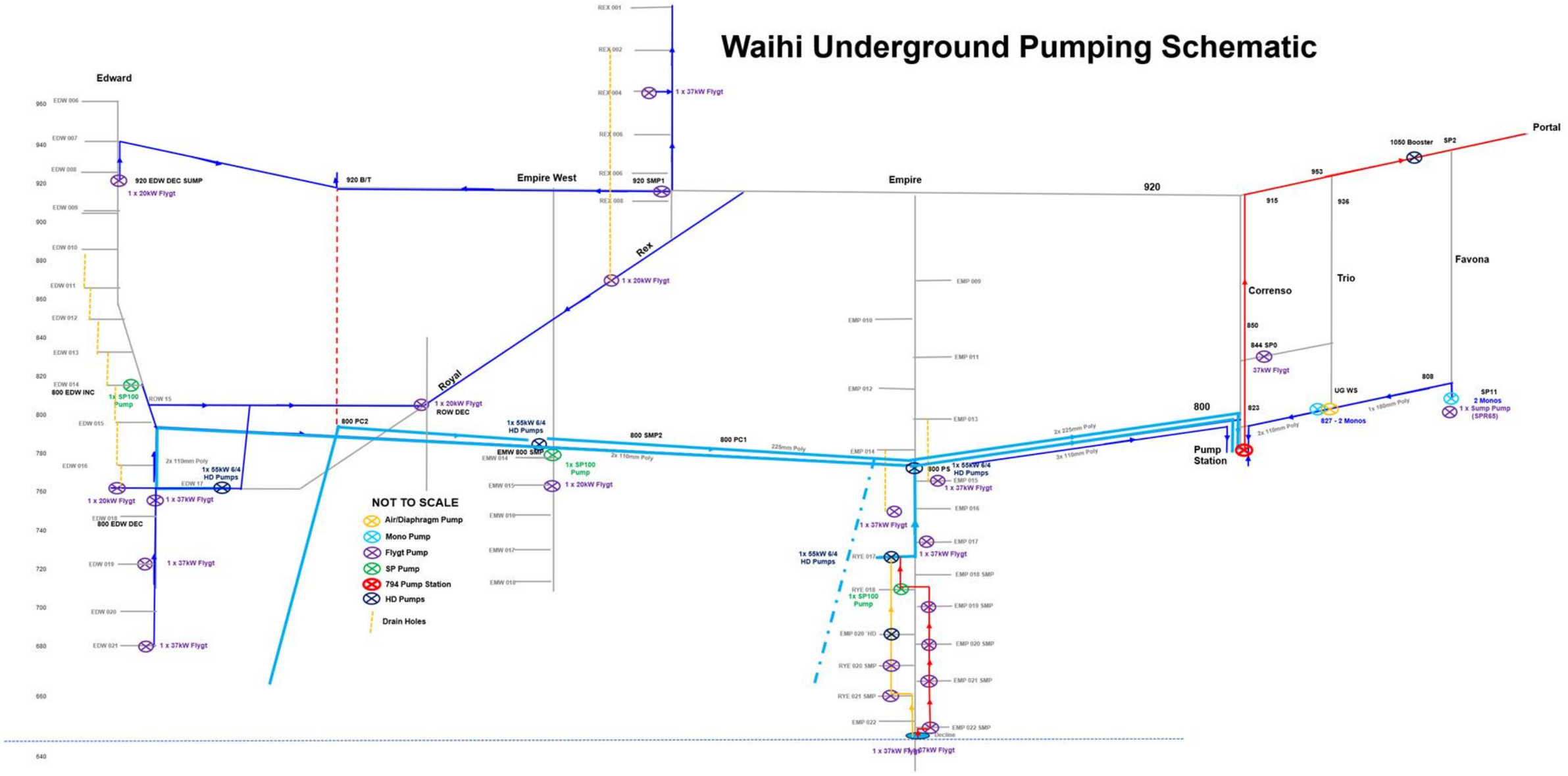


Figure 9. Martha Underground pumping schematic 2024.

6 GROUNDWATER MONITORING

This section is provided to meet Conditions 13a, 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 2024 will not be discussed in depth unless there has been a significant change or trigger reached.

6.1 Monitoring Network

OGNZL has maintained a piezometer network within and around Martha Mine since 1987 and Favona Mine since 2004. The following changes have previously been made to the network:

- Additional Correnso/SUPA piezometers were installed in 2011, 2014 and 2016.
- P106 was drilled northwest of Martha Pit and four vibrating wire piezometers (VWPs) installed in that drill hole during 2017.
- Seven Project Martha piezometers were added to the network during 2019 and three during 2021.
- Two new piezometers (P122 & P123, each connected to 4 VWPs) equipped with telemetry were added during December 2022 – January 2023.
- In 2023 there were a number of upgrades to the network to monitor response from shallow Rex orebody mining. P113 which was dry, was re-drilled in a nearby location, as P113A. P110, P111, P112, & P114 were upgraded to telemetry monitoring and water level loggers were installed in P110, P113 and P114.
- Also in 2023, a VWP (ROW-17) was installed in the Martha Underground Mine at 773 mRL with a single tip at 472 mRL.

Monitoring of BH8 was discontinued in May 2023 as this borehole likely collapsed and a replacement is not considered necessary given WC202 is at the same location.

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. VWPs record values at daily intervals with the data downloaded monthly.

6.1.1 Current Monitoring Network

The Waihi town piezometer network currently has 53 standpipe piezometers and five pneumatic piezometers. An additional 53 vibrating wire piezometers are also included in monitoring Waihi East, south of the Martha Pit and northwest of the Martha Pit.

Monitoring of BH7 and P8-1 ceased in December 2024 due to inconsistent data. It was agreed with the HDC geotechnical reviewer (Peter Fuller), during the annual site visit on 19 November 2024, to stop monitoring BH7 and P8-1. Levels in BH7 are strongly influenced by the nearby stream and P8-1 has had unreliable readings since mid-2023, this bore has likely collapsed.

The current piezometer network locations are shown Figure 10, well depths and average 2024 water depths are shown in Table 2 below.

Table 2. Piezometer network water depths for 2024.

ALLUVIUM					
Well ID	**Depth (mRL)**	**2024 Average GWL (mRL)**	**Average Water Depth (m)**	**Piezometer Type**	**Comment**
P2-4	1101	1108	7	Standpipe	
P8-4	1112	1118	6	Standpipe	
P63-S	1113	1117	4	Standpipe	
P76-S	1109	1111	2	Standpipe	
P77-S	1111	1115	4	Standpipe	
P87-S	1110	1115	5	Standpipe	
P91-1	1113	1119	6	VWP	
P93-1	1105	1116	11	VWP	
P94-1	1114	1115	1	VWP	
P101-1	1102	1107	5	VWP	
P102-1	1109	1113	4	VWP	
WC201-4	1104	1111	7	Standpipe	
WC201-5	1110	1111	1	Standpipe	
WC203-4	1099	1102	3	Standpipe	
GLD004S	1080	1085	5	Standpipe	
YOUNG VOLCANICS					
P2-3	1073	1092	19	Standpipe	
P4-2	1048	1088	40	Standpipe	
P7-2	1039	1091	52	Standpipe	
P7-3	1081	1090	9	Standpipe	
P8-3	1093	1116	23	Standpipe	
P27-1	1074	1078	4	Standpipe	
P63	1070	1090	20	Standpipe	
P64-I	1086	1100	14	Standpipe	
P76-I	1073	1103	30	Standpipe	
P77-I	1046	1095	49	Standpipe	
P78-S	1110	1109	1	Standpipe	
P78-I	1066	1103	37	Standpipe	
P79-S	1091	1096	5	Standpipe	
P79-I	1061	1092	31	Standpipe	
P87-I	1070	1110	40	Standpipe	
P90-1	1100	1115	15	VWP	
P90-2	1020	1100	80	VWP	
P91-2	1097	1119	22	VWP	
P91-3	1011	1112	101	VWP	
P92-1	1096	1119	23	VWP	
P92-2	1000	1108	108	VWP	

YOUNG VOLCANICS cont.					
Well ID	**Depth (mRL)**	**2024 Average GWL (mRL)**	**Average Water Depth (m)**	**Piezometer Type**	**Comment**
P93-3	1015	1089	74	VWP	
P94-2	1094	1114	20	VWP	
P94-3	1016	1101	85	VWP	
P95-1	1091	1115	24	VWP	
P95-2	1031	1102	71	VWP	
P100-1	1066	1081	15	VWP	
P100-2	996	1052	76	VWP	
P101-2	1083	1107	24	VWP	
P101-3	1068	1094	26	VWP	
P102-2	1079	1092	13	VWP	
P102-3	1055	1088	33	VWP	
P107	1089	1111	22	Standpipe	
P108	1116	1121	5	Standpipe	
P109	1091	1096	5	Standpipe	
P110	1097	1104	7	Standpipe	
P111-1	1100	1107	7	VWP	
P112-1	1058	1058	0	VWP	Dry
P113	1062	1062	0	Standpipe	Dry
P113A-1	1090	1089	-	VWP	Dry
P113A-2	1069	1071	2	VWP	
P114	1054	1055	1	Standpipe	
P115	1072	1094	22	Standpipe	
P116	1045	1092	47	Standpipe	
P122-1	1092	1101	9	VWP	
P122-2	1060	1060	0	VWP	Dry
BH6	1053	1111	58	Standpipe	
BH7	1079	1061	-	Standpipe	Ceased Dec-24
BH9	1074	1096	22	Standpipe	
BH11	1075	1093	18	Standpipe	
BH12	1079	1106	27	Standpipe	
GLD004I	1065	1086	21	Standpipe	
WC202-2	1048	1072	24	Pneumatic	
ANDESITE					
P2-1	974	975	1	Standpipe	
P2-2	1035	1045	10	Standpipe	
P7-1	989	1003	14	Standpipe	
P8-1	976	1040	64	Standpipe	Ceased Dec-24
P9-1	1037	1118	81	Standpipe	

ANDESITE cont.					
Well ID	**Depth (mRL)**	**2024 Average GWL (mRL)**	**Average Water Depth (m)**	**Piezometer Type**	**Comment**
P69-S	1114	1132	18	Standpipe	
P69-D	1063	1091	28	Standpipe	
P75	979	1063	84	Standpipe	
P76-D	1056	1097	41	Standpipe	
P77-D	1031	1094	63	Standpipe	
P78-D	1053	1072	19	Standpipe	
P79-D	1048	1087	39	Standpipe	
P87-D	1025	1102	77	Standpipe	
P90-3	983	1084	101	VWP	
P91-4	971	1103	132	VWP	
P92-3	965	1102	137	VWP	
P93-4	975	1039	64	VWP	
P94-4	976	994	18	VWP	
P95-3	1001	1061	60	VWP	
P100-3	981	1044	63	VWP	
P100-4	956	989	33	VWP	
P101-4	1037	1037	0	VWP	Dry
P102-4	1027	1032	5	VWP	
P106-1	1100	1100	0	VWP	Dry
P106-2	1060	1060	0	VWP	Dry
P106-3	1010	1011	1	VWP	
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	998	998	0	VWP	Dry
P113A-3	1035	1059	24	VWP	
P122-3	1032	1032	0	VWP	Dry
P122-4	933	932	-	VWP	Dry
P123-1	1044	1107	63	VWP	
P123-2	1004	1003	-	VWP	Dry
P123-3	964	968	4	VWP	
P123-4	924	925	1	VWP	
WC201-1	1059	1107	48	Pneumatic	
WC201-2	1077	1109	32	Pneumatic	
WC201-3	1097	1111	14	Pneumatic	
WC202-1	1032	1073	41	Pneumatic	
GLD004D	1020	1086	66	Standpipe	

6.1.2 Inspection and Maintenance

The piezometer dip-meters are maintained in good working condition. Calibration 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%. Annual calibrations were completed in 2024.

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 locations with excess accumulated sediment.

The piezometer designs have screens which allow water to flow into the pipe at specified depths. Piezometers that are most impacted by sediment are flushed as required. In November 2019 piezometers P4-1, P4-3, P8-2, P9-2, and P9-3 showed little change after multiple flushing attempts and are no longer monitored. Based on the most recent depth to bottom measurements only two piezometers require flushing, to be completed in 2025.

6.2 Groundwater Results

Groundwater contour plans have been updated for the three principal geological units: alluvium (plus shallow groundwater in weathered young volcanic materials), young volcanics (including ignimbrite), and andesite, based on the average groundwater depths in Table 2. The groundwater plans are presented in Figure 11, Figure 13 and Figure 17 respectively.

6.2.1 Shallow Groundwater

Figure 11 shows the inferred contours for shallow groundwater in alluvium and weathered young volcanic materials and shows the water level trends over time.

Figure 12 shows the trend plots for the piezos that were monitored in 2024. Note that GLD004 has been excluded as the 1085 mRL would compress the scale and WC203-4 has been excluded as there has only been one reading since 2015.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 impacted by the loss of access to WC206. For the purposes of completing the contour plan it was assumed that groundwater level in the alluvium at this location remained the same as in previous years.

Figure 10. Waihi piezometer network 2024.

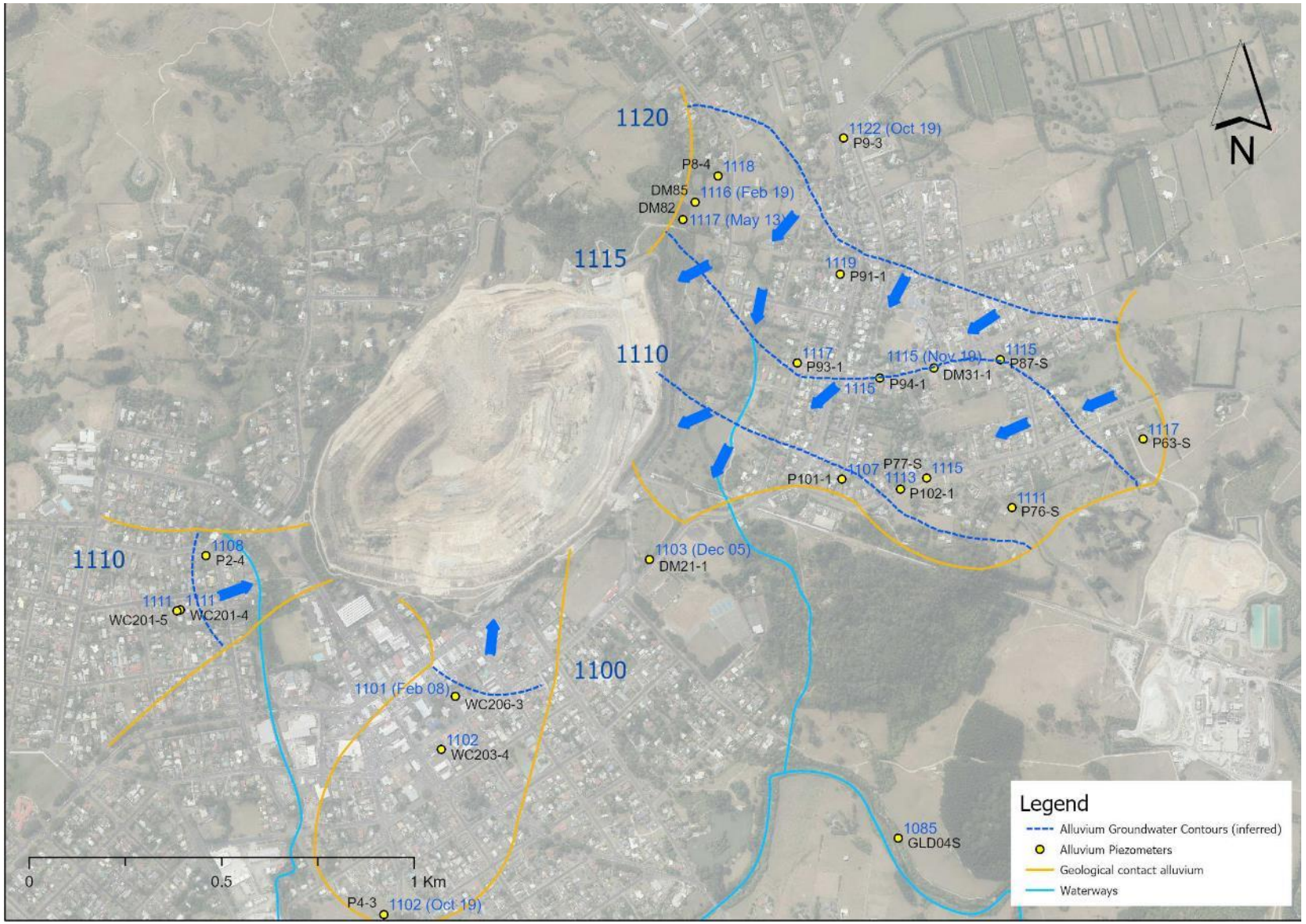


Figure 11. Alluvium water level contours.

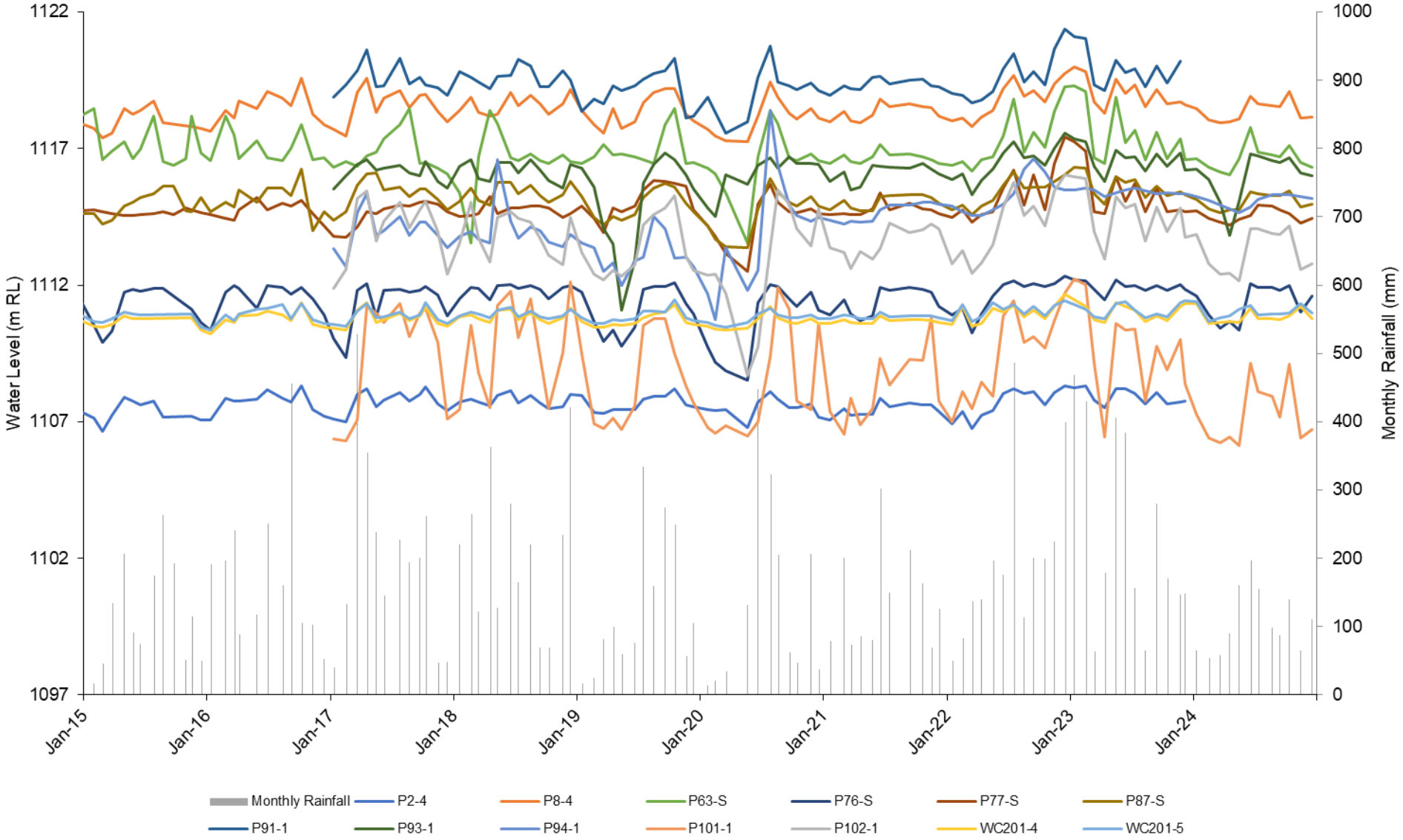


Figure 12. Groundwater level trends – shallow groundwater (alluvium & weathered contact of young volcanics).

6.2.2 Young Volcanics

Groundwater contours in the deeper portions of the young volcanic materials below the shallow groundwater system and groundwater level trends are shown on Figure 13, Figure 14, Figure 15 and Figure 16. As requested by the Peer Reviewer, P107-P110 & P113A-P116 have been removed from Figure 15 and placed in a separate chart (Figure 16). Refer to Appendix F for conceptual hydrogeologic sections relative to the interpreted groundwater flow systems.

The young 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 young volcanic materials are considered to be responsible for much of the settlement and for the settlement patterns around the Martha and Favona Mines. Noting, that dewatering of the deep andesites is also contributing to general settlements across Waihi.

The dewatering pattern in the young volcanics around Martha Mine indicates drainage towards the open pit. The limited groundwater discharge at the contact of the young 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 paleo-valley 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 young 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 young 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 piezometers (VWP), P122 and P123. Note that P123 does not have any sensor tips in the Young Volcanics.

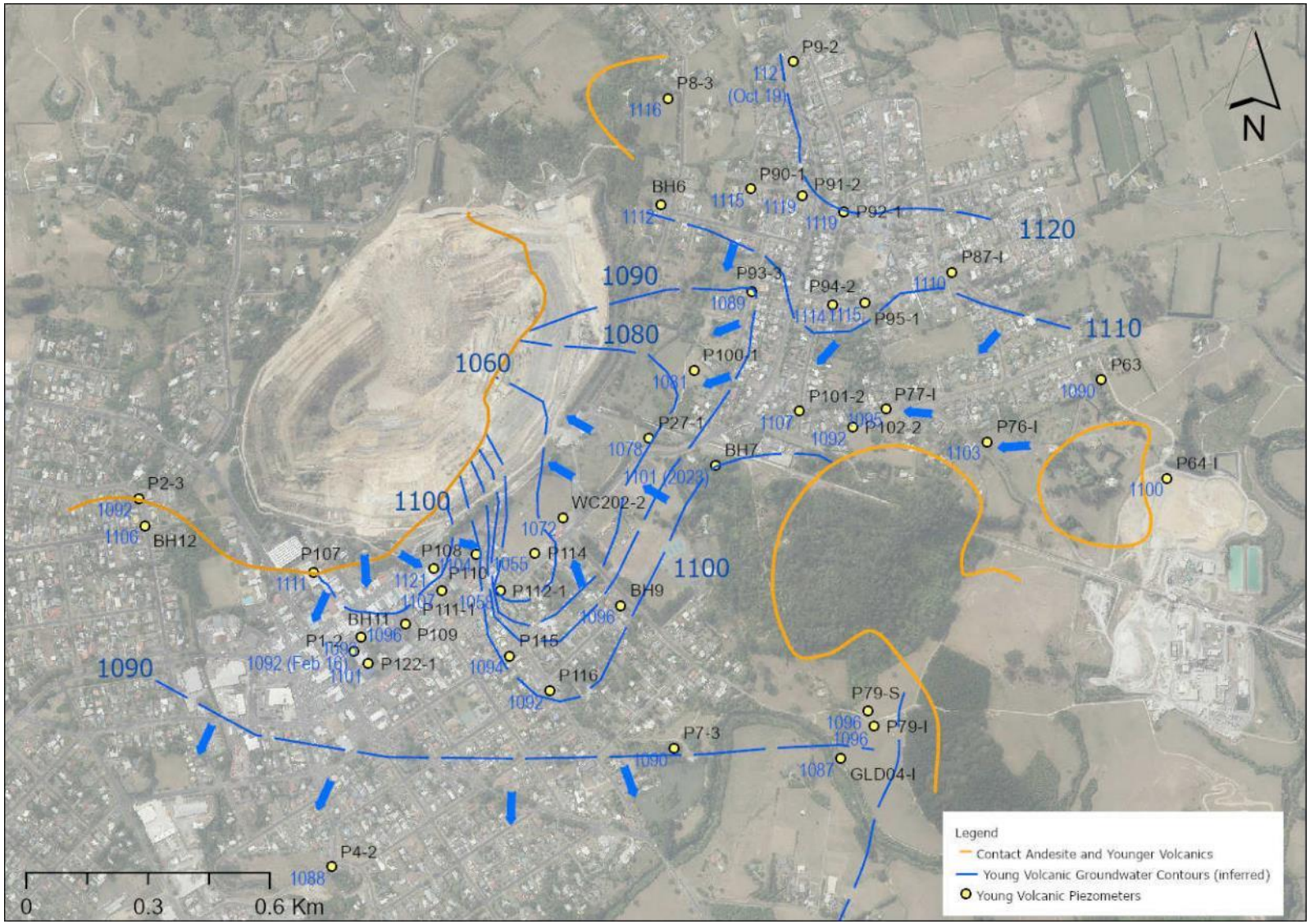


Figure 13. Deeper young volcanic water level contours.

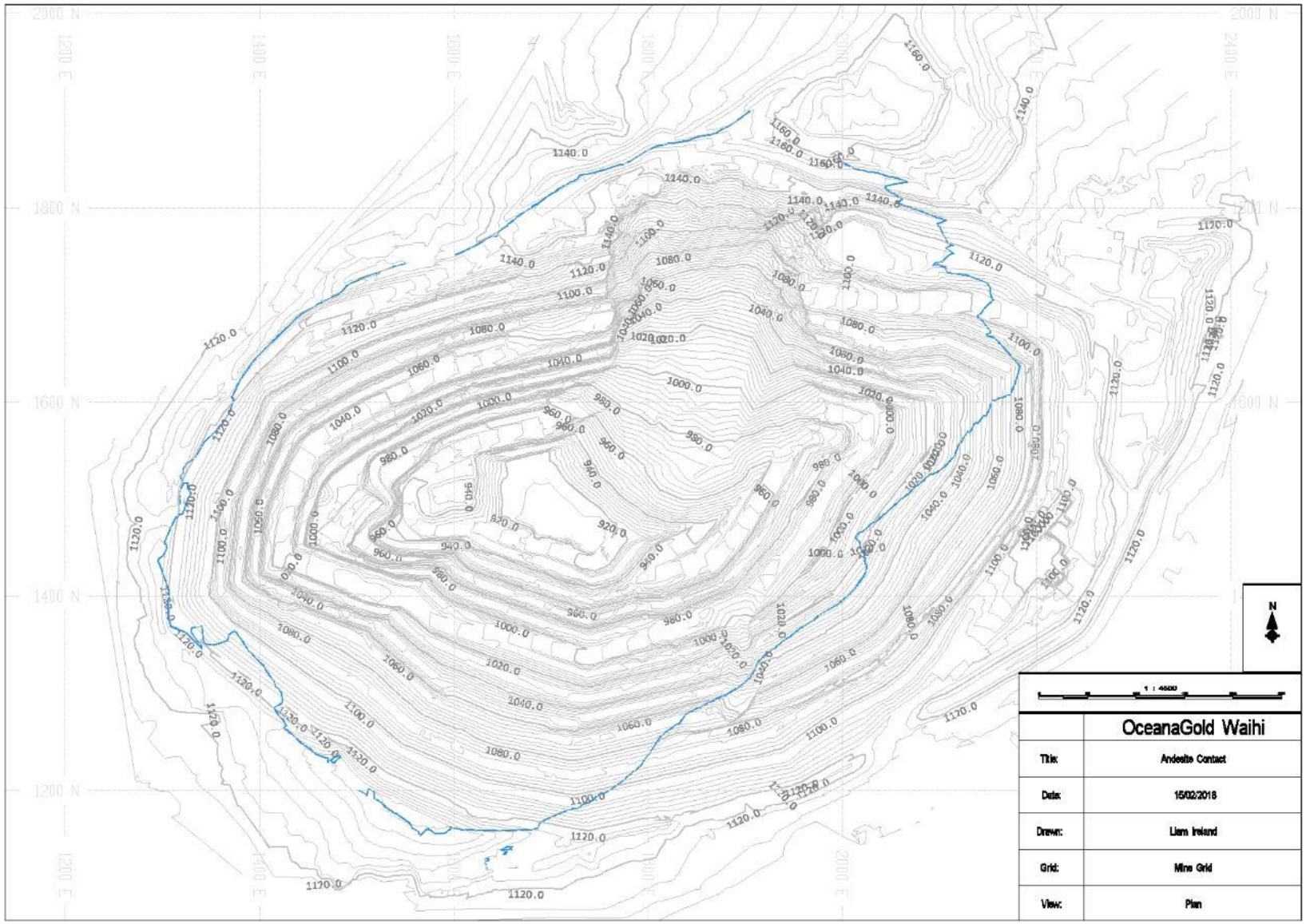


Figure 14. Groundwater level trends – deeper young volcanic materials.

Note: (blue line indicates contact of the young volcanics with the underlying andesite where seepage at the base of the young volcanics would occur).

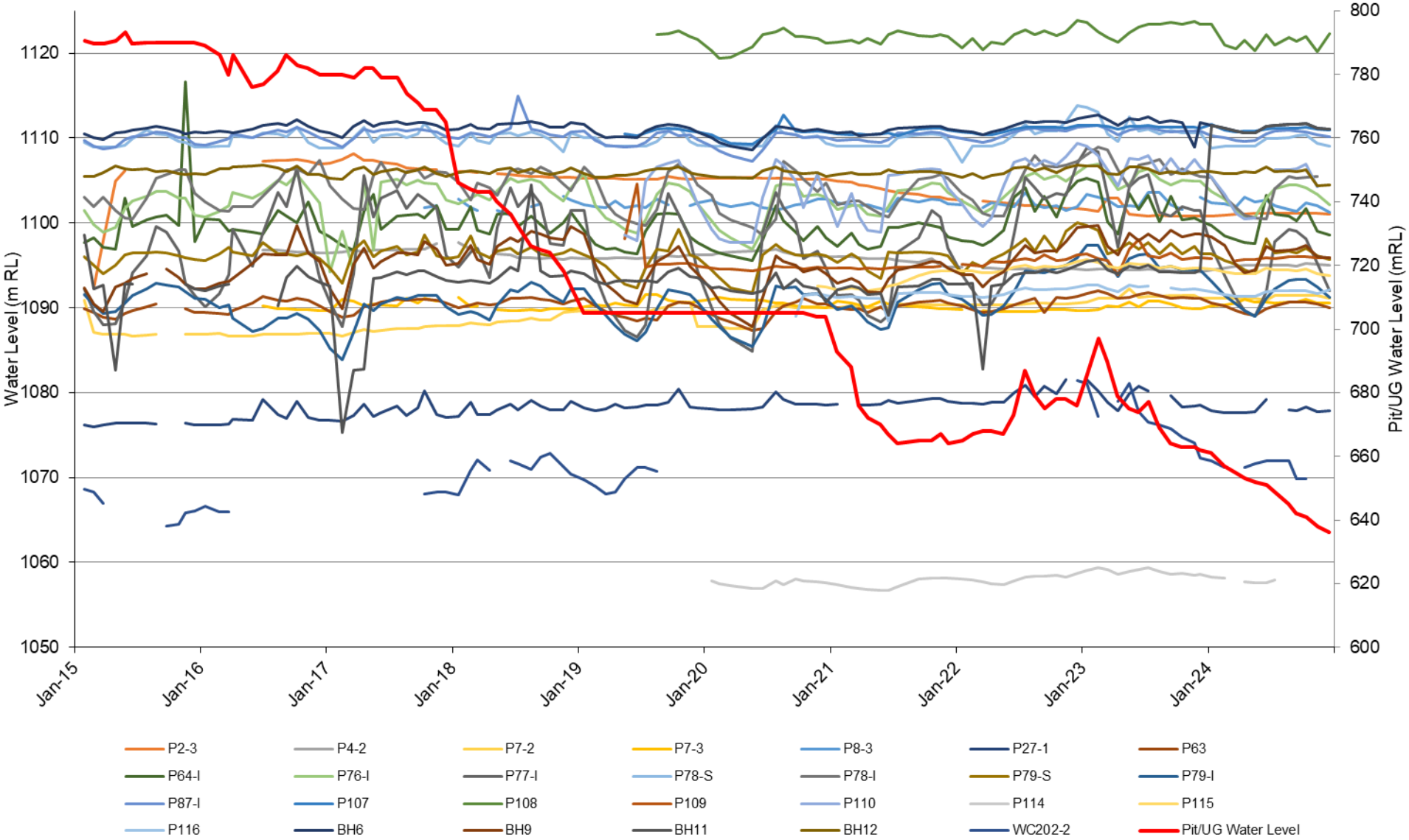


Figure 15. Groundwater level trends – deeper young volcanics near underlying andesite contact.

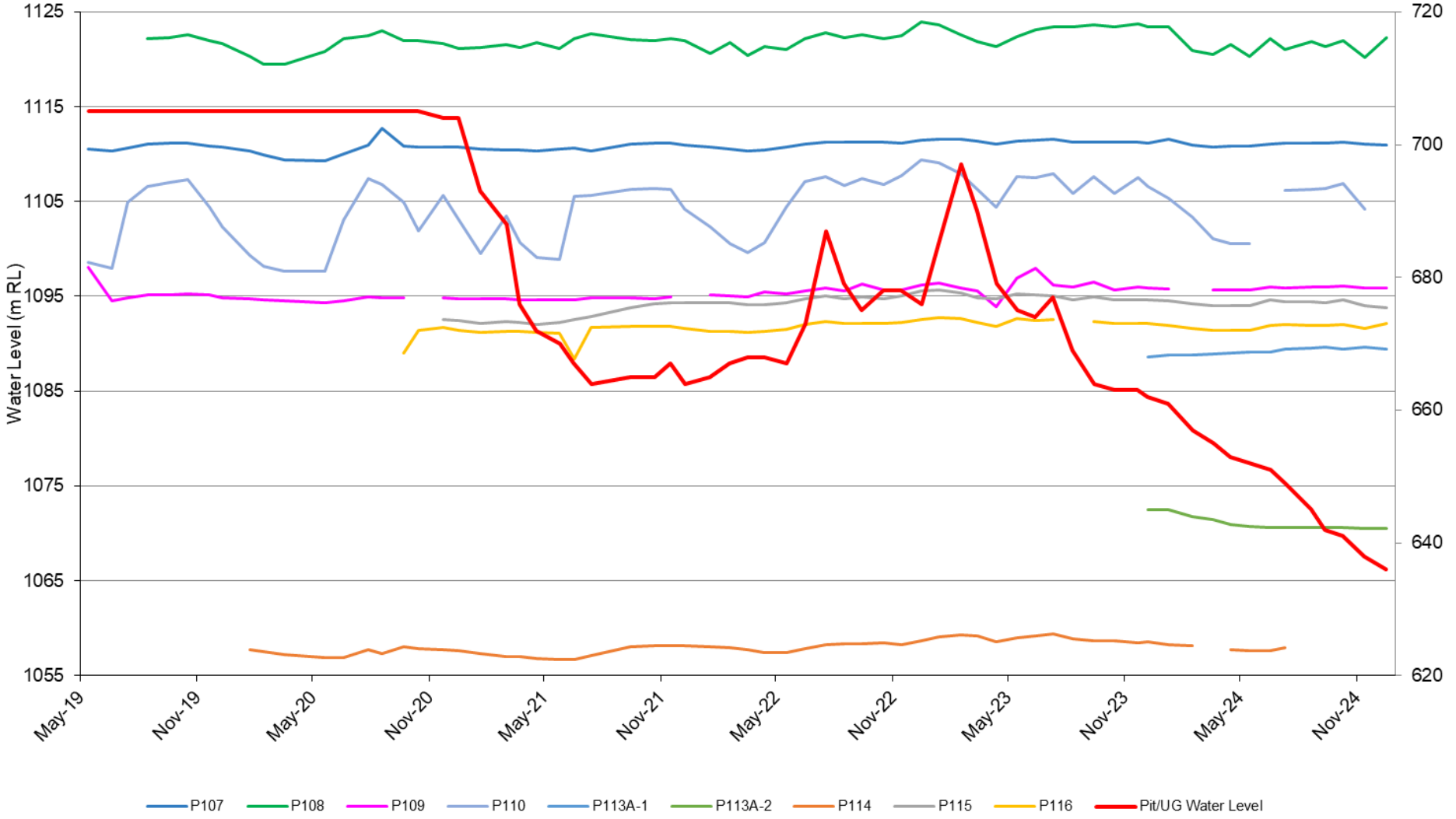


Figure 16. Groundwater level trends – P107-P110 & P113A-P116.

6.2.3 Andesite

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

Figure 17 shows the extent of the dewatering effects in the andesite rock body as a result of dewatering. Data from the vibrating wire piezometer units have been included. Figure 18 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. Refer to Appendix F for conceptual hydrogeologic sections relative to the interpreted groundwater flow systems.

Groundwater levels in the andesite vein systems have responded rapidly and substantially to mine dewatering along the strike of the Martha vein system, Trio vein system (beneath Union Hill), and Favona/Moonlight vein systems (Figure 17). 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 18.

The P123 monitoring data clearly shows that there is a saturated zone in the near surface resulting in water pressures of some 60 m head in the shallowest VWP tip located at 80 m depth (1044 m RL). The tips below that depth show little to no water pressure suggesting dewatering has occurred below 110 m depth (1015 m RL) to a depth of at least 200 m (925 m RL).

Review of the core photographs for P123 and the geologic model of the Martha Pit in that area shows a number of reasons why those conditions might exist. A summary of the geologic conditions near each VWP tip is summarised as follows:

- Tip 1 (80 m BGL - 1044 m RL): Andesite with argillic clay alteration and propylitic alteration.
- Tip 2 (120 m BGL – 1004 m RL): Andesite with argillic clay alteration with a silicified overprint. Fractured with calcite veining.
- Tip 3 (160 m BGL – 964 m RL): Andesite with argillic clay alteration with a silicified overprint. Massive quartz after calcite veining.
- Tip 4 (200 m BGL – 924 m RL): Andesite with silicified overprint. Some fracturing.

The Martha Mine geologic model shows that between an elevation of 1015 to 960 m RL along the northwestern pit face, there are a number of vein sets that dip back behind the pit wall. Those veins are generally at a similar elevation to those observed in the core for P123.

In summary, our interpretation is that rainfall infiltration, combined with the higher water holding capacity and lower permeability of clay altered andesite, results in water being retained in the circa. 110 m below the land surface.

Below that depth (circa 1014 m RL), the rock mass itself is silicified, with fractures and veins providing secondary permeability. That secondary permeability is higher than the permeability of the overlying clay altered andesite rock mass, resulting in the observed underdrainage effect. It is not clear how far that dewatering effect extends to the northwest. 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 17 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 17) 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 vibrating wire and Favona piezometers have been excluded from Figure 18 and are presented in Figure 19 to Figure 36.

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 piezometers (VWP), P122 and P123. P123 has four sensor tips in the Andesite and is shown in Figure 17.

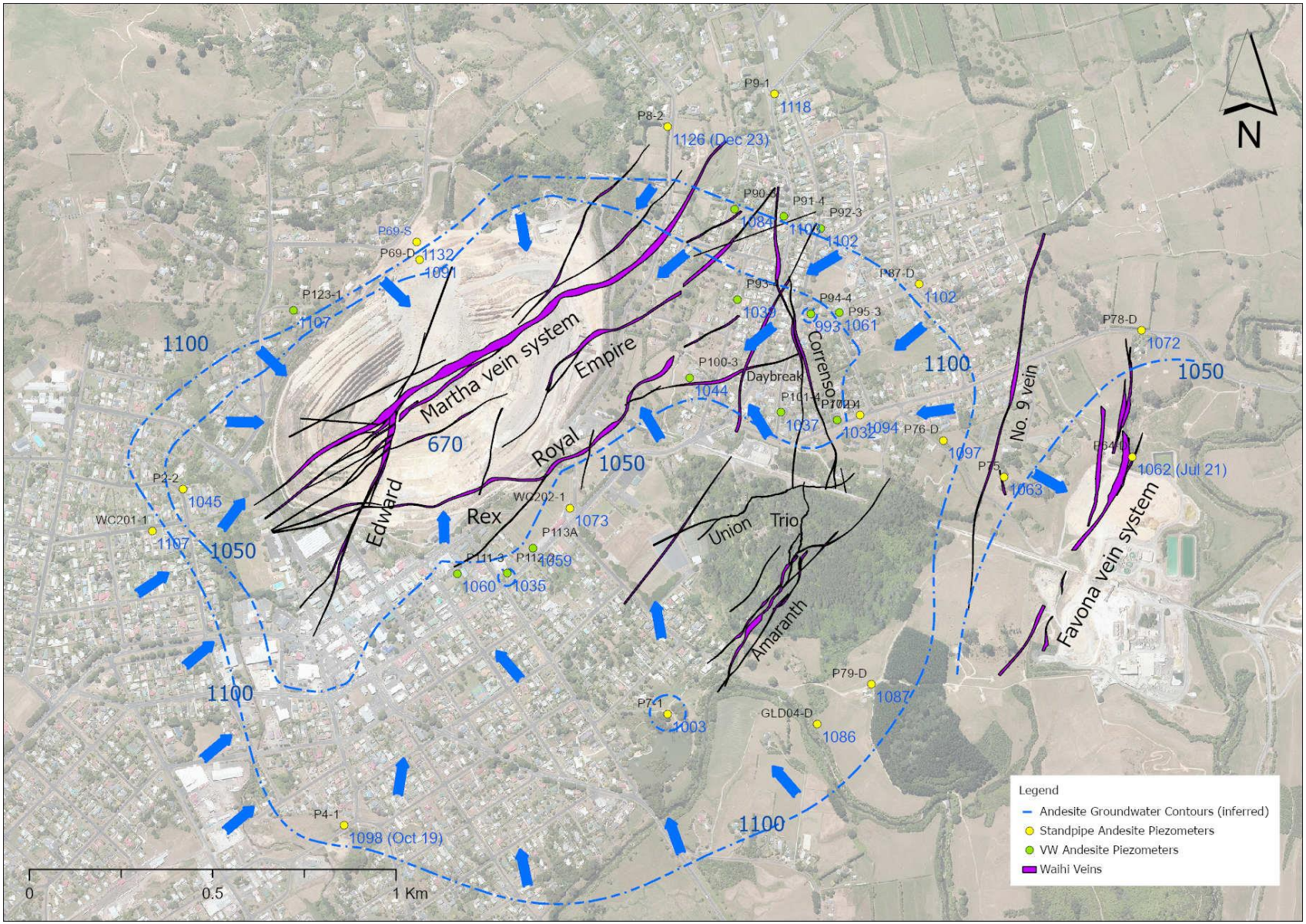


Figure 17. Upper andesite water level contours.

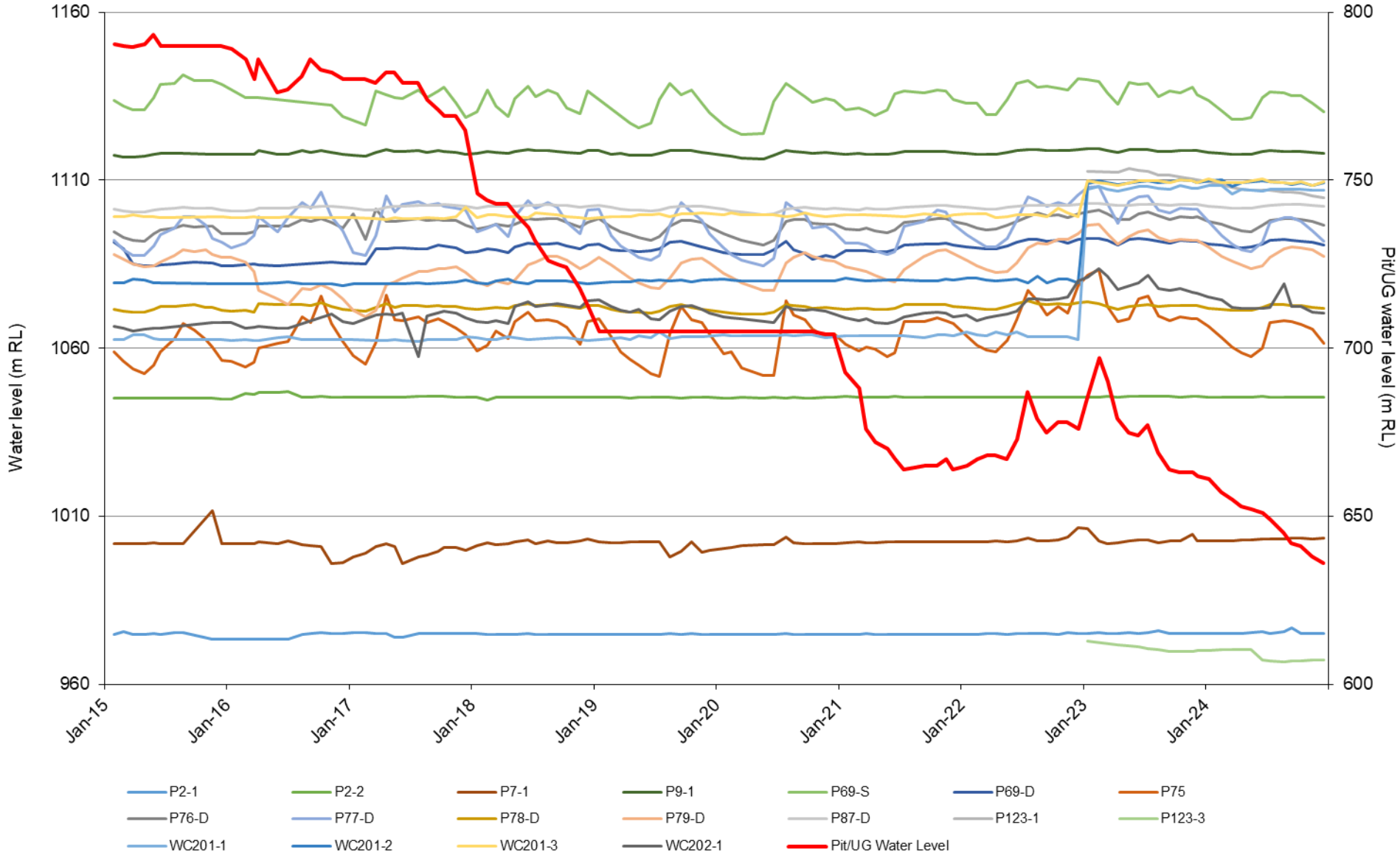


Figure 18. Andesite water level trends.

6.2.4 Martha Groundwater Assessment

The Martha groundwater levels remained relatively stable during the reporting period, following expected trends with an increase in piezometric levels in response to heavy rainfall in the first half of 2023 (

Figure 12, Figure 15, Figure 16, Figure 18). Two triggers were reached during the monitoring period and are discussed below. Many piezometers showed decreases in water level likely due to lower rainfall at the beginning of 2024. Groundwater levels recovered through winter, then declined again later in 2024.

Project Martha piezometers P107 to P110 and P113 to P116 are standpipes installed at varying ground elevations. Figure 16 shows these water levels have remained relatively stable. P113 has remained dry since installation.

Upper Rex Monitoring

In June 2023, amendments were made to the Dewatering and Settlement Monitoring Plan to specifically address additional monitoring requirements as a result of the proposal to mine the Rex orebody to a higher elevation. This was approved by WRC and HDC in August 2023, and more focused monitoring of groundwater level/pressure along the strike of the Rex orebody began in October 2023. Five Project Martha piezometers (P110, P111, P112, P113A & P114) were upgraded with telemetry, providing hourly water level data. In addition, standpipe piezometers P110, P113 and P114 are equipped with water level loggers.

Trigger responses were set for P111, P112, P113A and P114 at a change in water level greater than two metres in less than a one-month period as outlined in the Dewatering and Settlement Monitoring Plan (June 2023). If a response is triggered, this is considered a significant anomaly, and further action should be followed as per the Plan. Two triggers were reached for the piezometers monitoring groundwater levels in the upper Rex area. A 2.75mRL decrease in water level was identified at piezometer P113A (74m deep), for the period 25 September 2024 to 22 October 2024. This level change occurred at a piezometer tip located in the Andesite and is therefore not considered to be a significant anomaly. A 2.93mRL decrease in water level was identified at piezometer P114 (55m deep), for the period 23 October 2024 to 23 December 2024. This is a two-month period and was believed to be related to a water inflow event associated with unravelling of weak rock mass. The area was treated with resin injection through self-drilling anchors to decrease water inflow and stabilise the area. P114 is on telemetry and communications had been malfunctioning so it was not possible to determine if the decrease was over one month. The communications issue was subsequently repaired.

Vibrating wire piezometer P111 (Figure 19) was installed with three tips, one in the young volcanics and two in the andesite layer. The young volcanic piezometer is measuring some water pressure at 1107mRL. The upper andesite piezometer appears to be dry with levels recorded below the tip level, indicating this area may be previously affected by dewatering. The lower andesite piezometer is measuring around 5m of water pressure above the tip, at 1060mRL.

P112 is also a vibrating wire piezometer installed with three tips, one in the young volcanics and two in the andesite layer. The young volcanic piezometer (1058mRL) now appears to be dry, while both the andesite piezometers have been dry (1035mRL & 998mRL) since installation in July 2020 (Figure 20).

As the original P113 standpipe piezometer is considered dry, a new deeper monitoring bore was drilled to replace it. The new bore, P113A has three vibrating wire piezometers installed at 1090mRL, 1070mRL, and 1035mRL. The shallow tip (19mBGL) appears to be dry at 1090mRL, while water levels in the deeper tips have remained stable since installation in October 2023. The intermediate tip (39mBGL) did show a decreased level in October 2024 (as discussed above) but stabilised in November 2024. It is measuring around 2m of water pressure above the tip at 1071mRL, and the

deep tip (74mBGL) is measuring around 24m of water pressure above the tip at 1069mRL (Figure 21).

The standpipe piezometers, P110 and P114 have telemetry installed, providing hourly water level data for closer monitoring of groundwater levels in the upper Rex area. Depths of these bores are at 1097mRL for P110, and 1054mRL for P114. Water levels in both of these are stable with P110 measuring around 7m of water pressure at 1104mRL, and P114 measuring around 1m of water pressure at 1055mRL. The other Project Martha standpipe piezometers remained stable during the reporting period, following expected seasonal trends, and continue to be dipped on a monthly basis.

The key to the lithology zone shading for hydrographs below (Figure 19 to Figure 23 and Figure 28 to Figure 36) is shown in Table 3.

Table 3. Lithology shading.

Lithology	
Alluvium	
Young Volcanics	
Andesite	

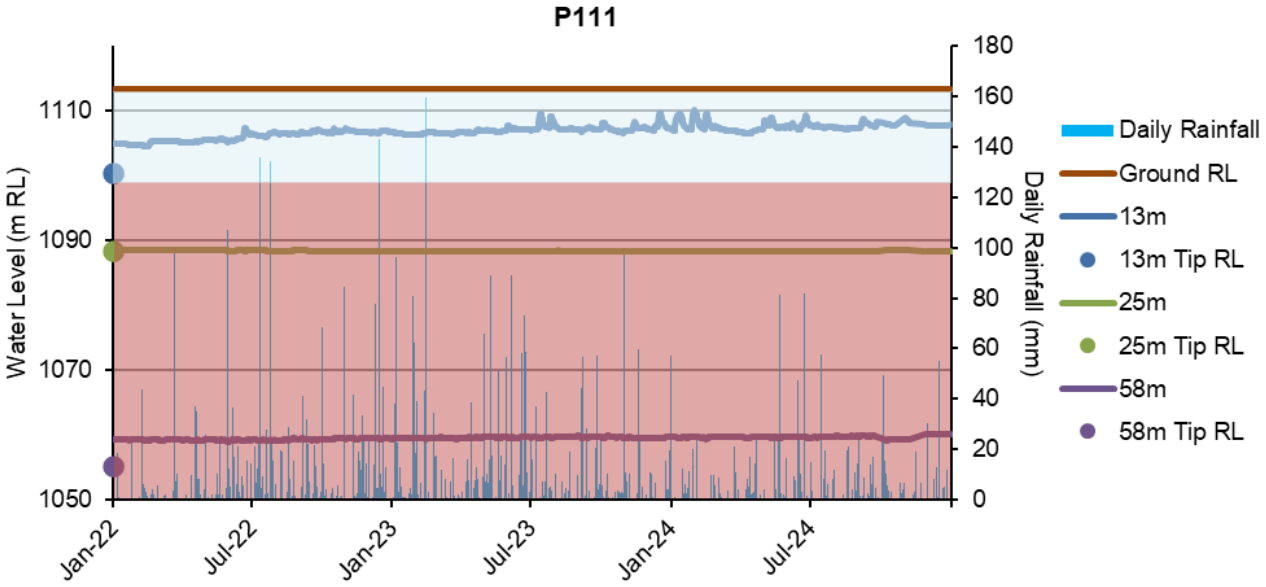


Figure 19. P111 vibrating wire piezometer.

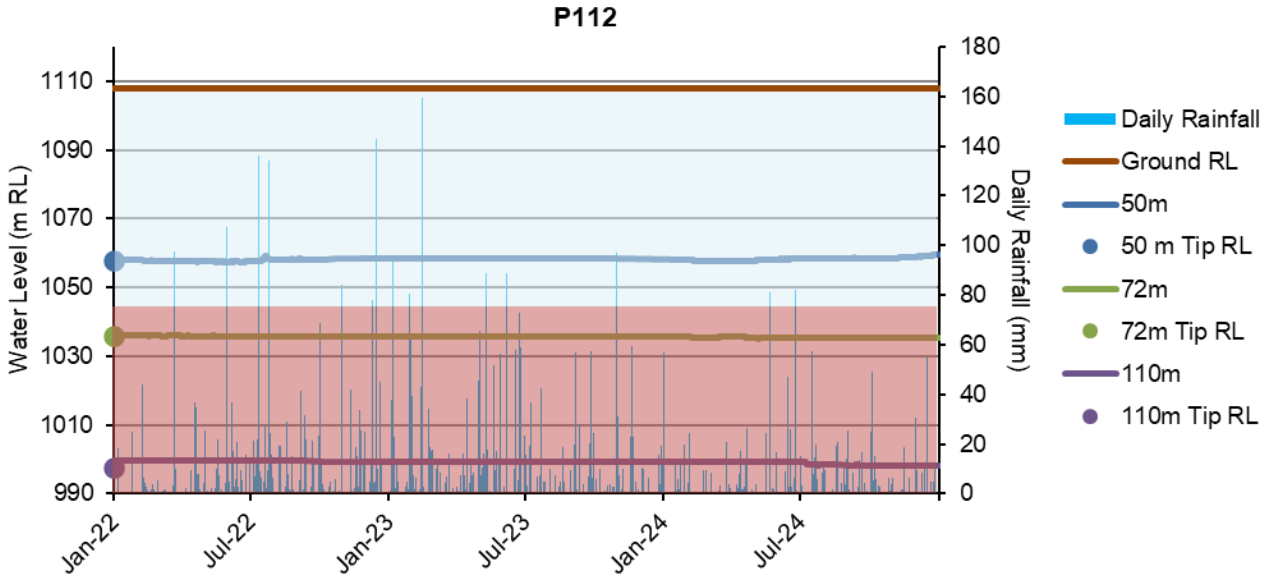


Figure 20. P112 vibrating wire piezometer.

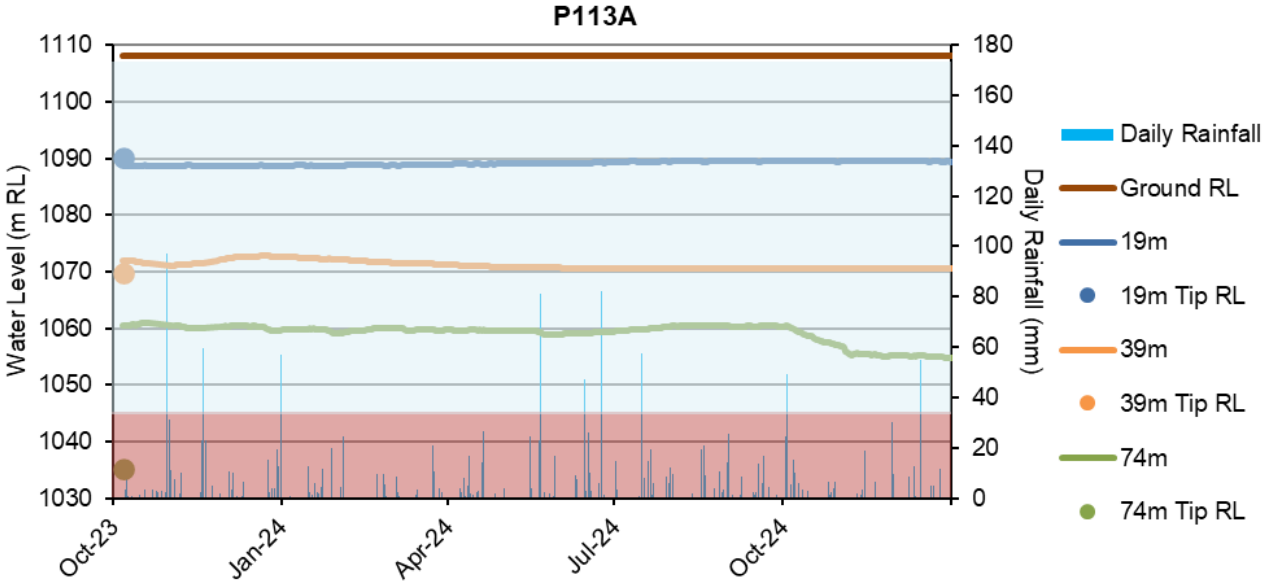


Figure 21. P113A vibrating wire piezometer.

Two new Project Martha piezometers were installed in 2022 – 2023. Locations and tip depths were advised by GWS and discussed with the hydrogeologic peer reviewer. Tip depths and average water levels for 2024 are shown in Table 4. Some tips show little water pressure, indicating dry conditions.

Table 4. Project Martha piezometer depths and water levels.

Piezometer	Target Material	Depth (mRL)	2024 Average GWL (mRL)	Average Water Depth (m)	Comment
P122-1	Upper young volcanics	1092	1101	9	
P122-2	Base young volcanics	1060	1060	0	Dry
P122-3	Upper andesite	1032	1032	0	Dry
P122-4	Lower andesite	933	932	-	Dry
P123-1	Upper andesite	1044	1107	63	
P123-2	Lower andesite	1004	1003	-	Dry
P123-3	Lower andesite	964	968	4	
P123-4	Lower andesite	924	925	1	

P122 was installed in January 2023 with four tips, one in the upper young volcanics, one in the base young volcanics, and two in the andesite layer. Water levels appear to have stabilised in the upper young volcanic piezometer tip with around 9m of water pressure measured at 1101mRL. The other three piezometers appear to be dry at 1060mRL, 1032mRL, and 933mRL (Figure 22).

P123 was installed in December 2022 with all four tips in the andesite layer and these seem to have now stabilised. The 1044mRL tip is measuring around 63m of water pressure above the tip at 1107mRL, the 1004mRL tip is measuring around 0m of water pressure at 1003mRL and is considered to be dry. The 964mRL tip is measuring around 4m of water pressure at 968mRL, and the 924mRL tip is measuring around 1m of water pressure at 925mRL (Figure 23).

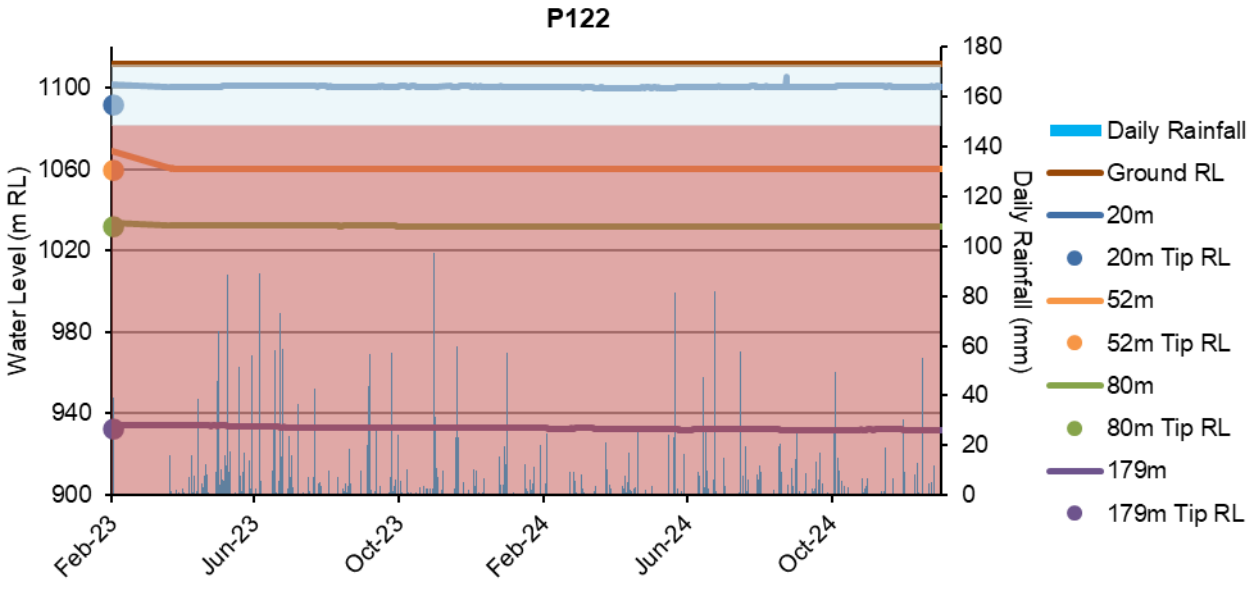


Figure 22. P122 vibrating wire piezometer.

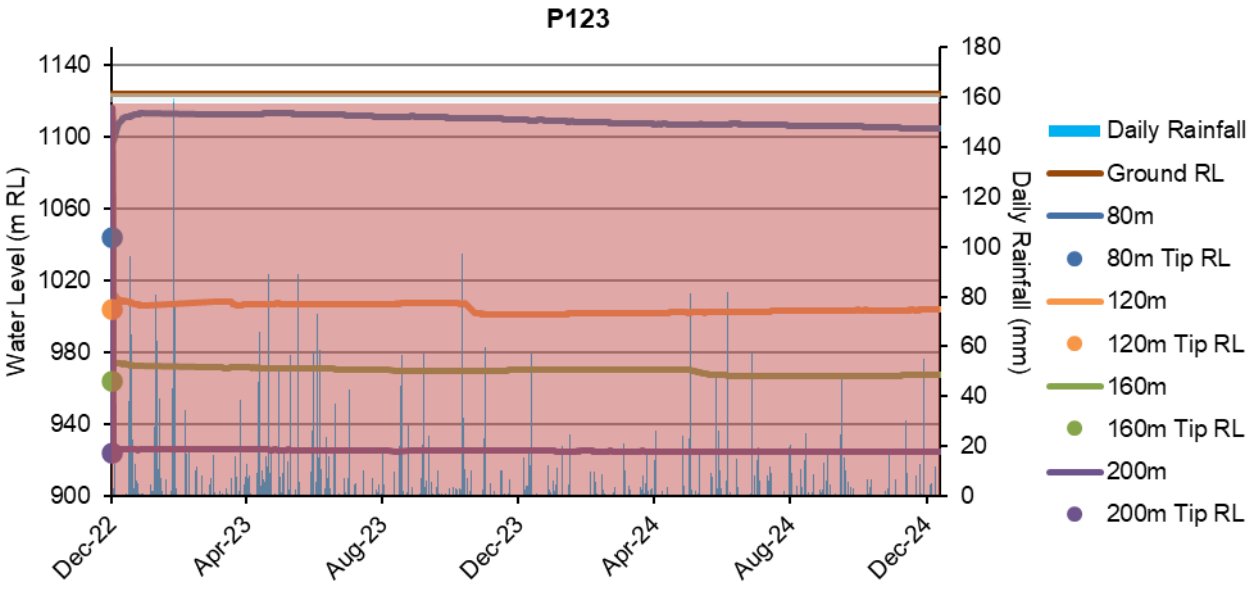


Figure 23. P123 vibrating wire piezometer.

Underground Piezometer ROW-17

In July 2022 a piezometer was installed in an existing exploration drill hole (Figure 24). The drill hole collar is in the Edward decline at 773 mRL and the piezometer tip is at 472 mRL. The hole length is around 350 m, however vertically it is 300 m. It terminates approximately under the Empire West orebody and is set in deep Martha andesite. Piezometer readings show the December 2024 water level at 636 mRL (Figure 25).

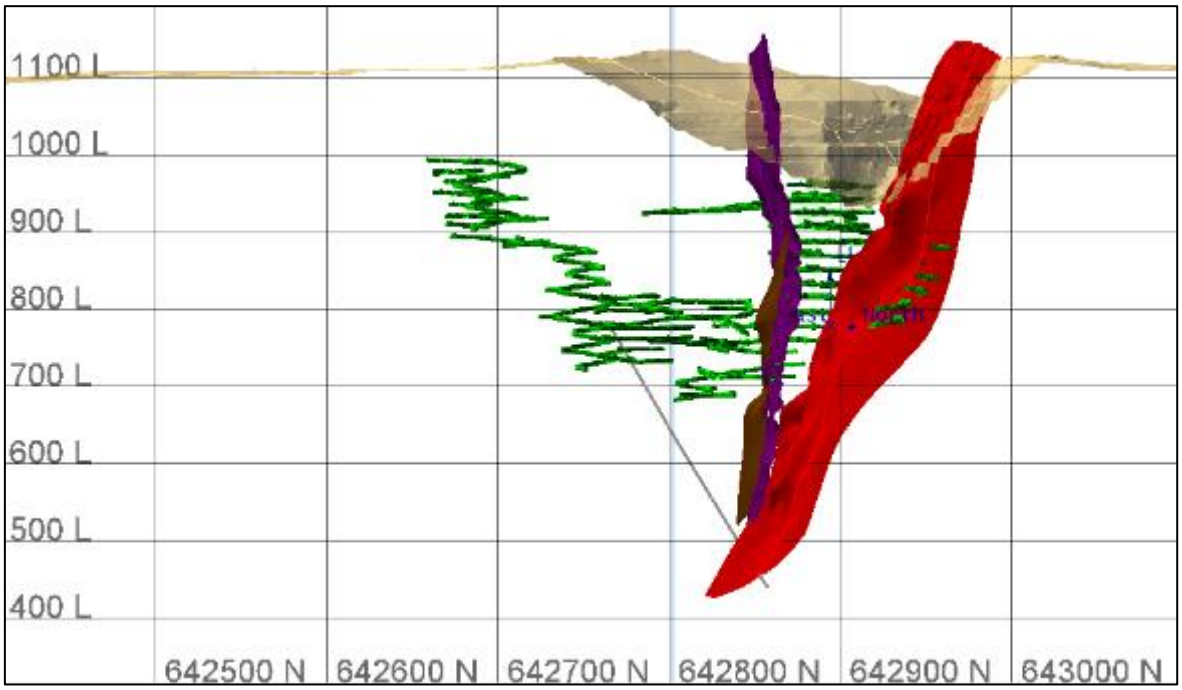


Figure 24. Underground piezometer cross section.

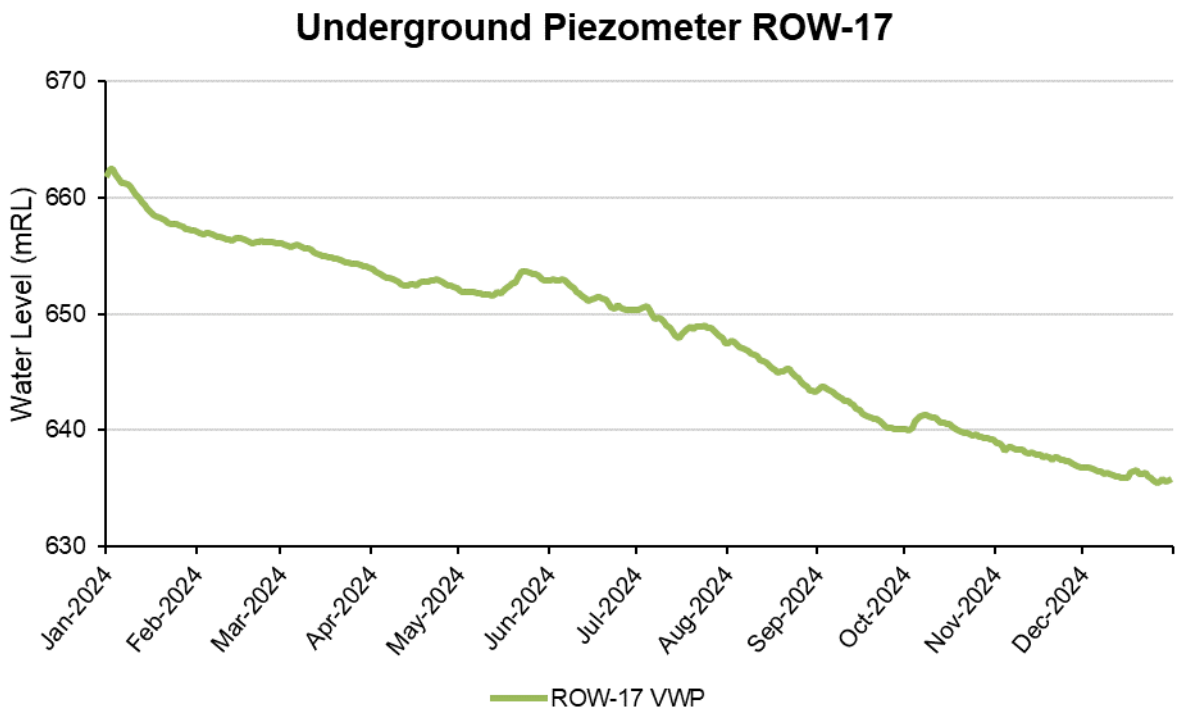


Figure 25. Underground piezometer water level.

Project Martha Water Chemistry

A review of existing piezometers suitable for baseline water chemistry sampling of shallow and deep aquifers of the mine area was undertaken by WWLA in May 2023 in order to demonstrate compliance with Project Martha Consent 139551. Due to limitations of sampling equipment (due to narrow bore diameter, bore depth and large purge volumes required) some of the suggested locations are unable to be sampled easily. Locations that can be sampled were added to the groundwater monitoring schedule, with two rounds of sampling undertaken in 2024. Results are provided in section 11.2.

6.2.5 Favona Groundwater Assessment

In the Favona Mine groundwater accumulates at the 800 level and this is the assumed groundwater level in this area. However, mine development links Favona to Trio and Correnso, which are both part of the Martha groundwater system. Figure 26 shows water level trends in the Favona andesite with the underground dewatering level and

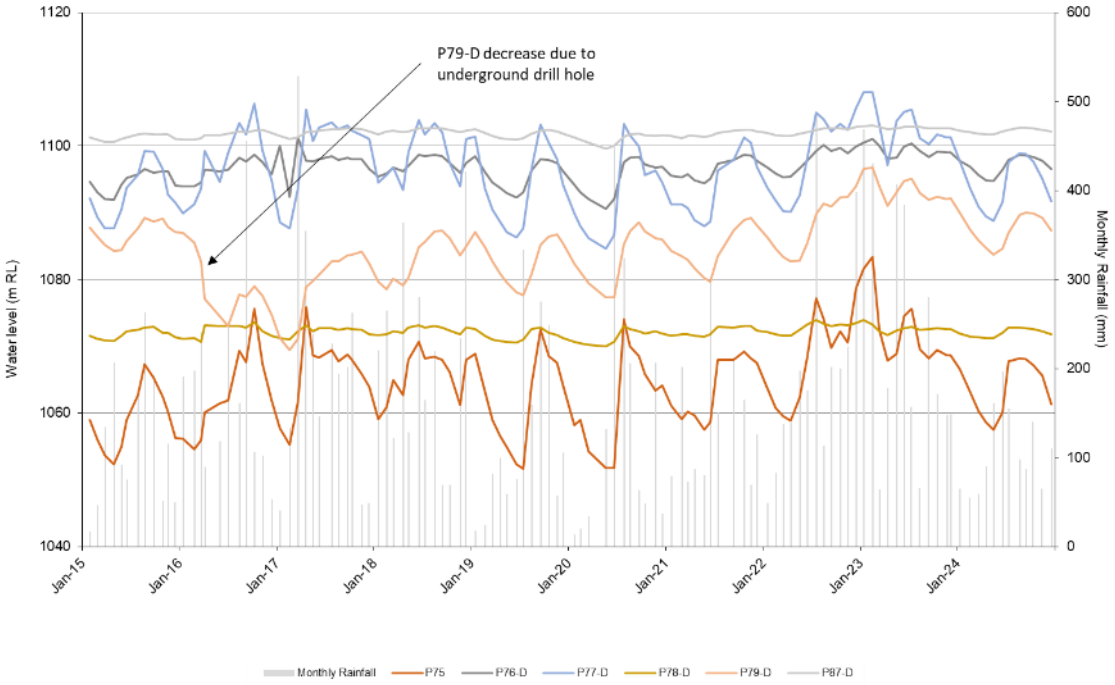


Figure 27 shows selected Favona andesite piezometers with rainfall. This demonstrates how water levels for most Favona wells are influenced by seasonal rainfall periods and not by Martha/Underground dewatering. The majority of the relevant piezometers have shown an increasing trend towards the end of 2022 and beginning of 2023 due to higher than usual rainfall. In 2024 a seasonal level increase occurred over winter, and then dissipated with the reduced rainfall coming into summer. P79-D has recovered to typical levels held prior to its depressurisation in 2016. A slight delayed response to rainfall and drier periods can be noted in four piezometers, with P78-D and P87-D less responsive. No well had a 15m (or greater) decrease during the reporting period.

The Dewatering and Settlement Monitoring Plan states the intentions of OGNZL for baseline groundwater quality sampling for assessment of post closure effects of groundwater movement between the Favona and Martha mineralised groundwater systems, and specifies sampling requirements for standpipe piezometers P76-D, P76-I, P77-D and P77-I. These locations were added to the groundwater monitoring schedule. However, they were not able to be sampled as the bore diameters are too narrow for efficient sampling.

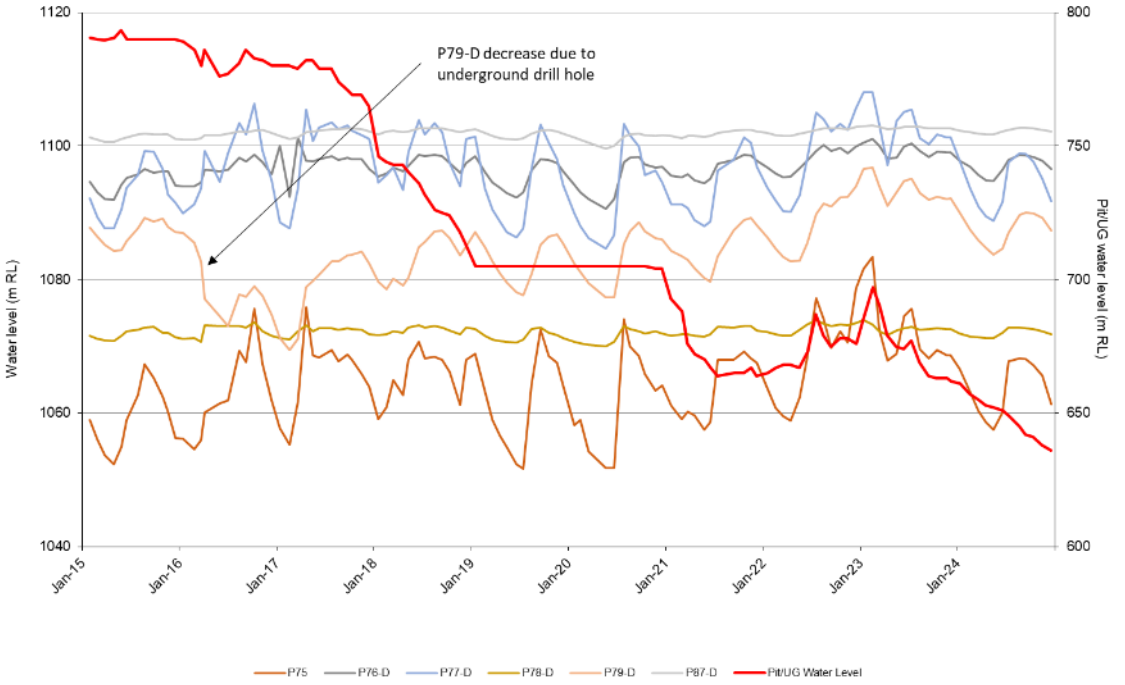


Figure 26. Favona andesite water level trends with underground dewatering level.

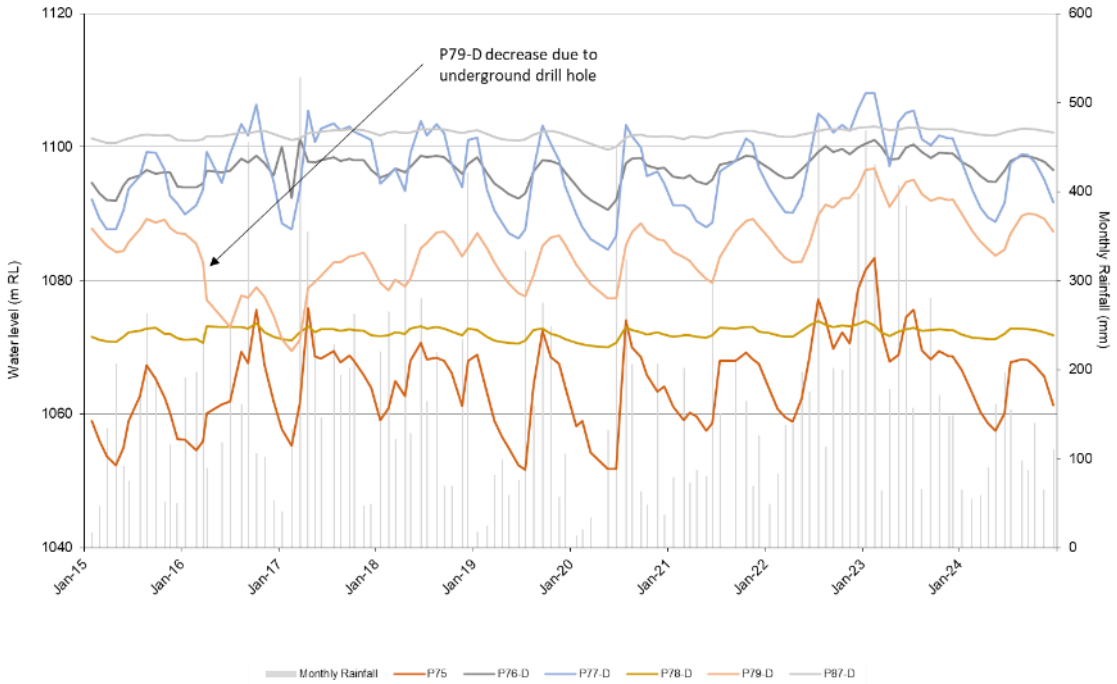


Figure 27. Selected Favona andesite piezometers with rainfall.

6.2.6 Waihi East – CEPA

Six boreholes were drilled between July – September 2011, each with three or four vibrating wire piezometer tips installed. These 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 piezometers and 39 additional settlement markers were installed in early 2014. One further piezometer 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, young volcanics, and andesite rock (

Table 5).

Table 5. Summary of geological units and depths - Waihi East piezometers.

Bore	Shallow	Young 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 28 to Figure 36 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 piezometers have indicated generally 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 was repaired in February 2024.

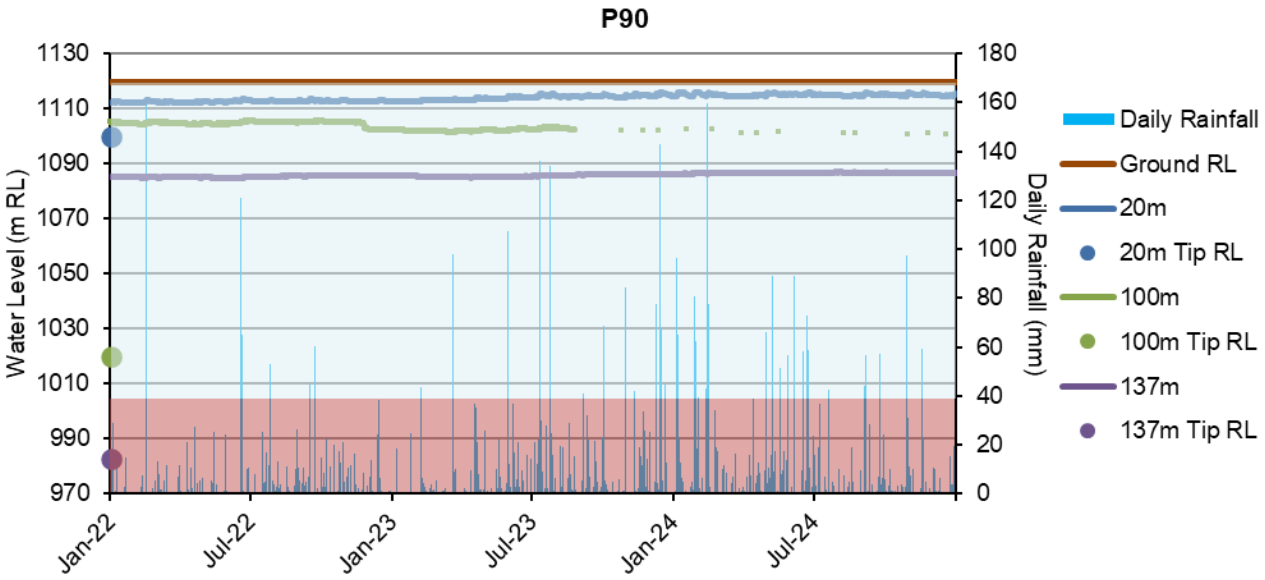


Figure 28. P90 vibrating wire piezometer.

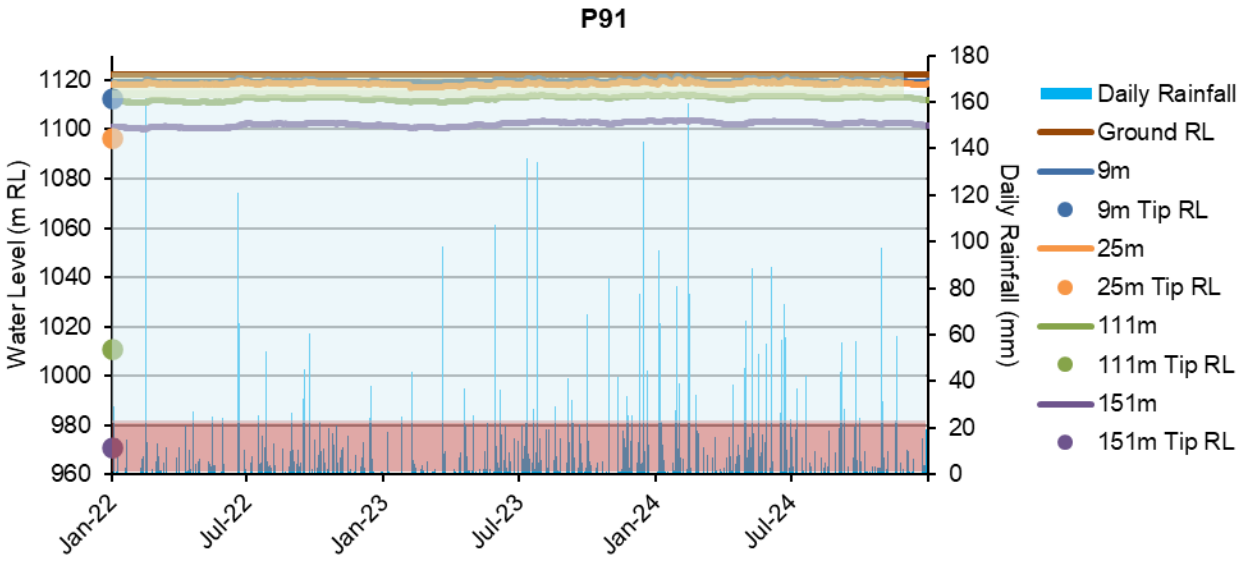


Figure 29. P91 vibrating wire piezometer.

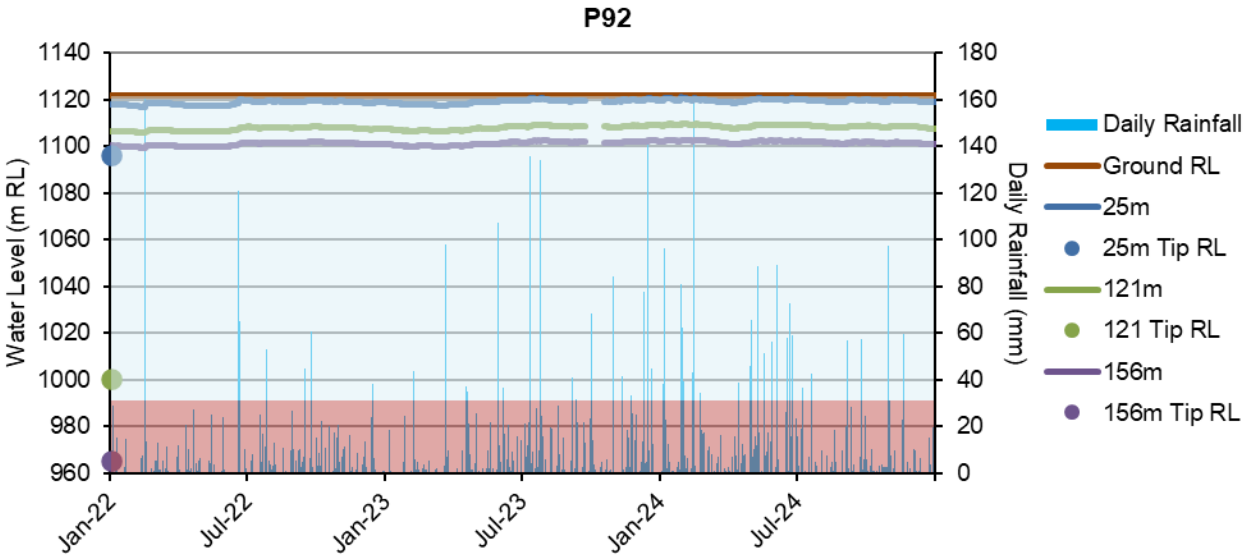


Figure 30. P92 vibrating wire piezometer.

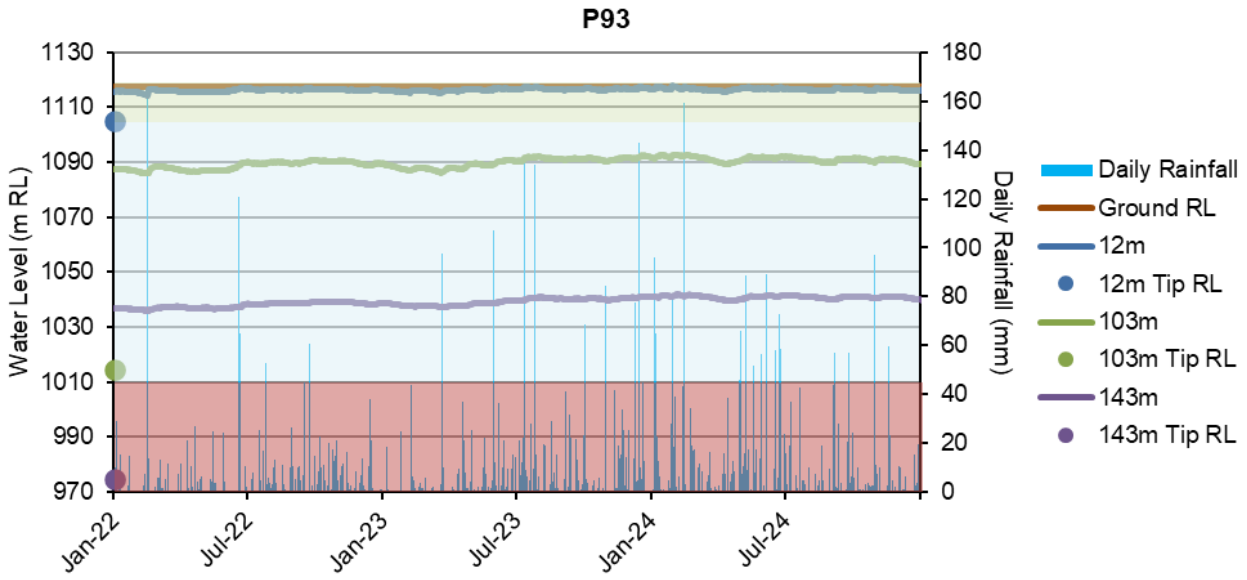


Figure 31. P93 vibrating wire piezometer.

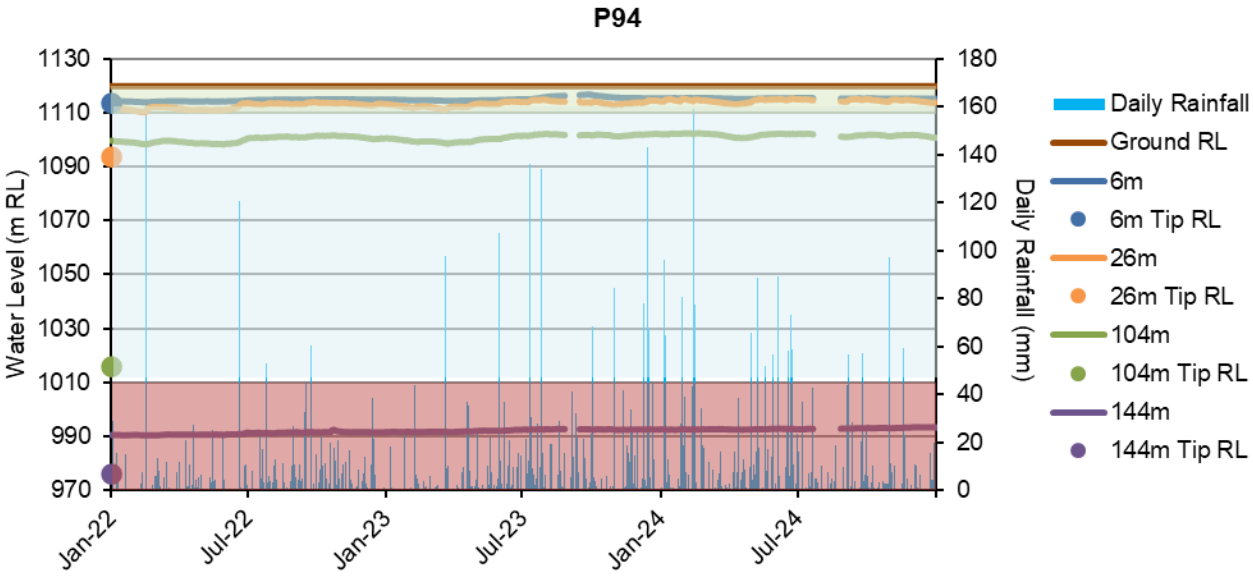


Figure 32. P94 vibrating wire piezometer.

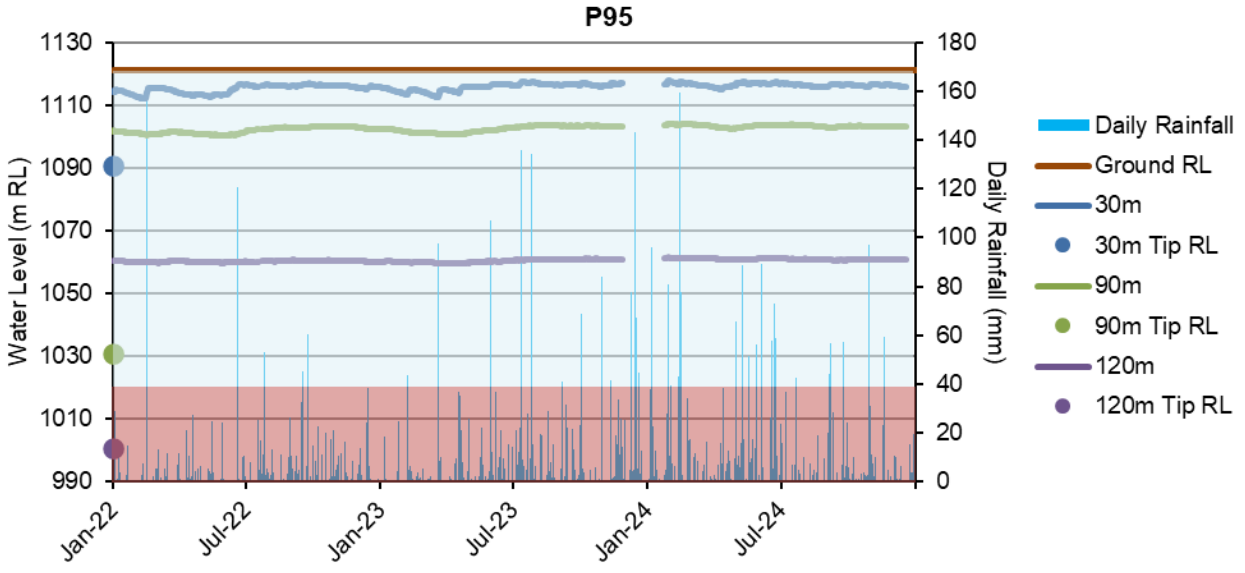


Figure 33. P95 vibrating wire piezometer.

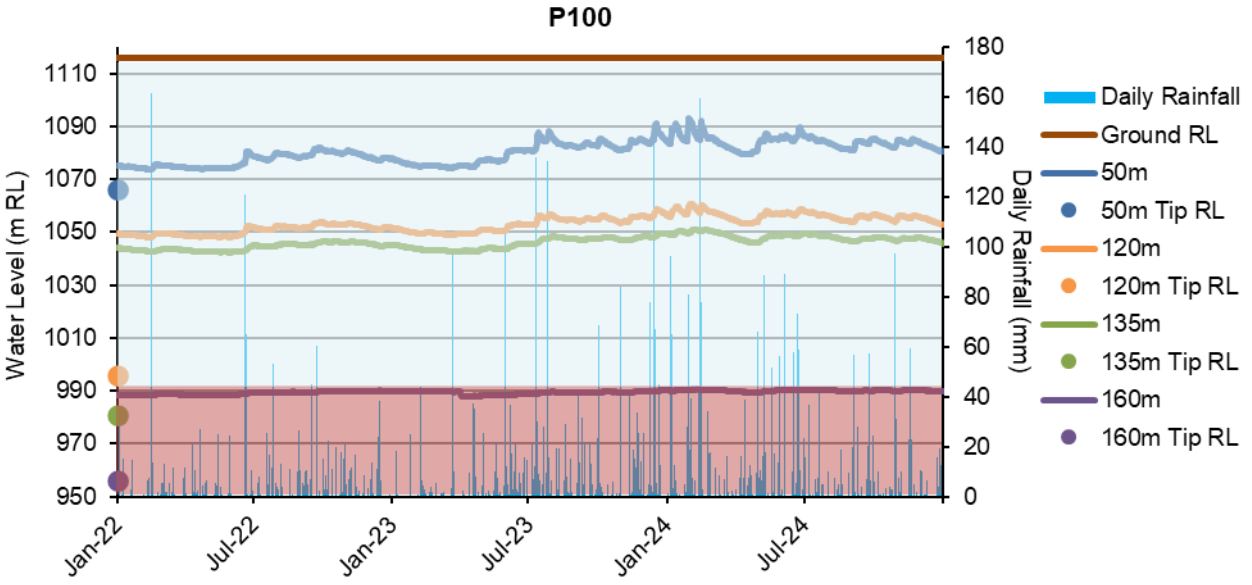


Figure 34. P100 vibrating wire piezometer.

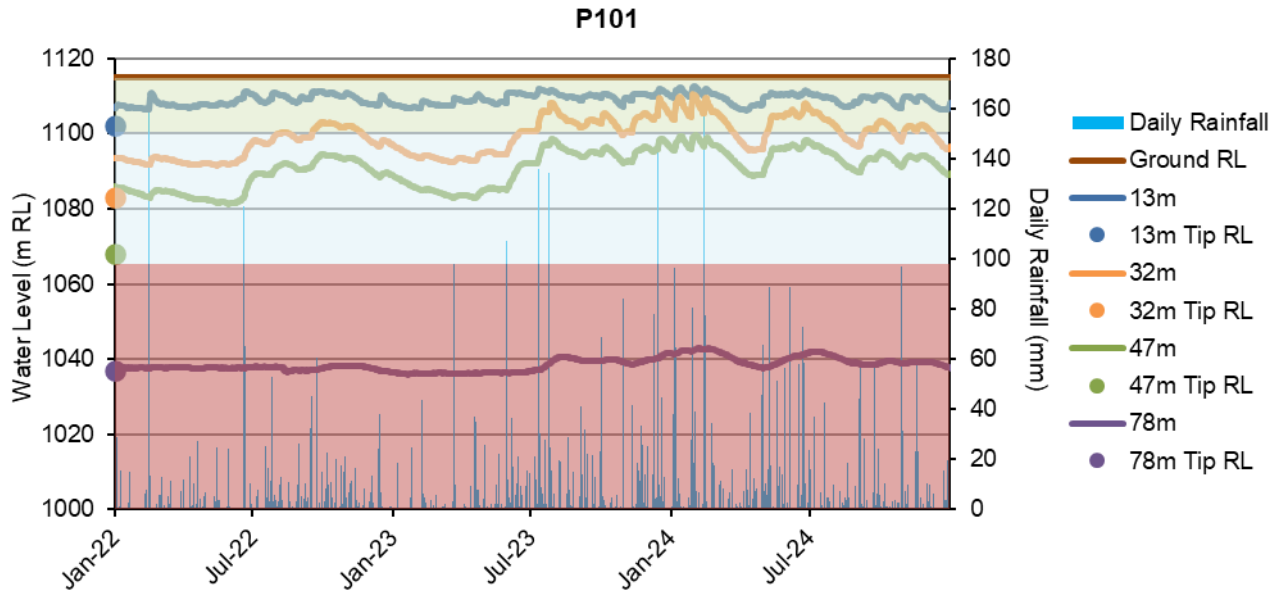


Figure 35. P101 vibrating wire piezometer.

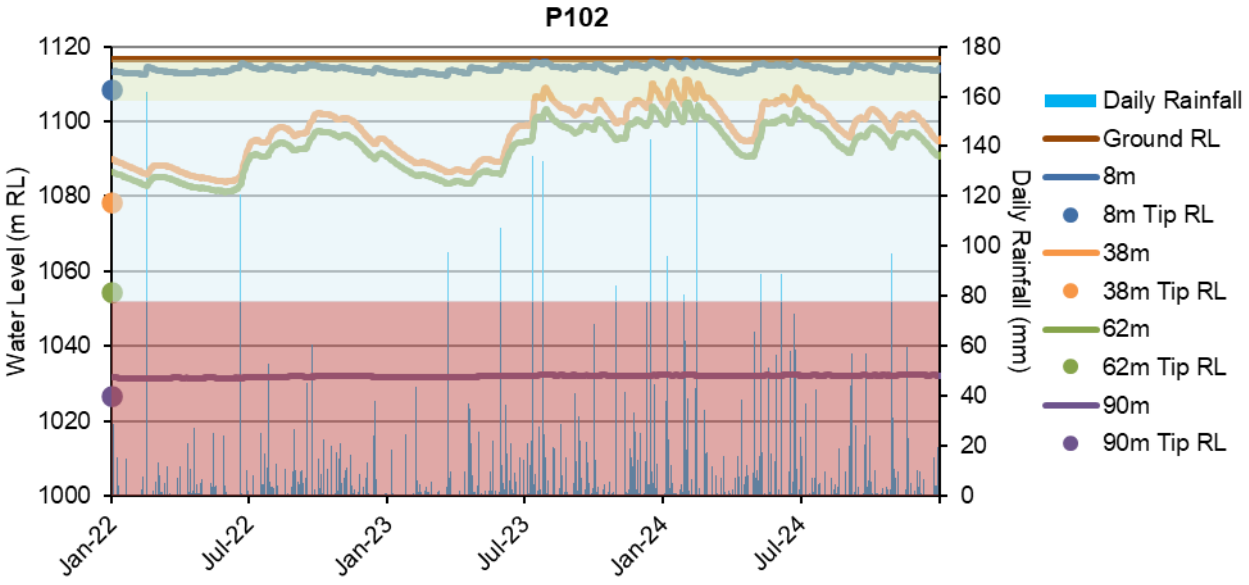


Figure 36. P102 vibrating wire piezometer.

Overall, through 2024, the measured groundwater levels have been generally stable and within historical ranges. Piezometric levels in the young volcanics have continued to show influence from rainfall. This is particularly evident at P101 and P102, which show seasonal response to rainfall.

P101-4, an andesite piezometer, appears to have little water pressure (Figure 35). The tip is at 1037 mRL and at the end of the 2024 monitoring period the measured groundwater level was at 1036 mRL. Therefore, it is considered to be dry.

6.2.7 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 37).

Due to the access restrictions discussed above, only the Black Hill Orchard private well was monitored in 2024. A well search has been undertaken and three wells identified (two northeast and one southwest of the Martha Pit, along strike of the Martha vein system) that OGNZL will investigate monitoring going forward, subject to access arrangements.

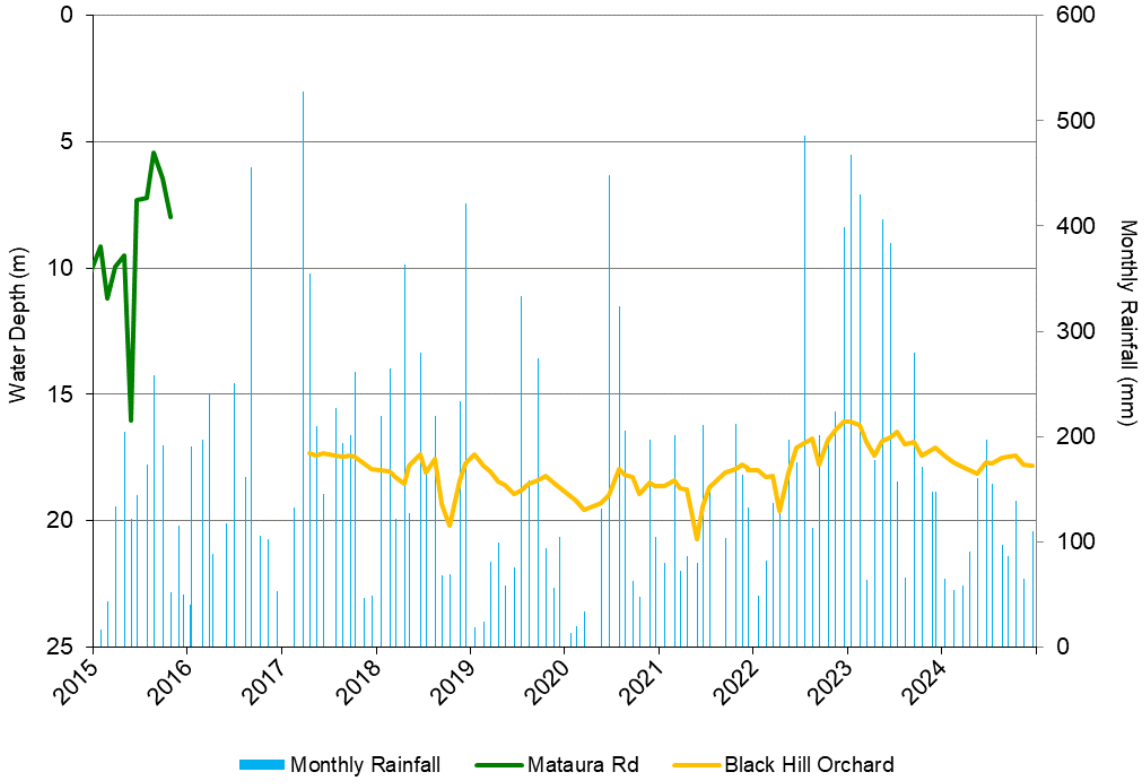


Figure 37. Private bore water levels.

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 a comparison to be made between the settlement survey data and that predicted as part of the consent application.

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 relevant 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 6).

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 6 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 38 shows the predicted settlement zones. These have also been updated with the commencement of Project Martha.

Table 6. Summary of predicted settlement zones 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 6 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 39 is a settlement contour map of raw, unadjusted survey data, that has been segregated from Figure 38 at the request of HDC. This allows easier interpretation of the contour lines.

Figure 40 shows the location of settlement marks monitored by OGNZL up to the end of 2024. Also, included on Figure 40 are the defined subsidence hazard zones related to historical underground mine stopes and shafts (IGNS, 2002). Figure 41 provides the settlement monitoring marks across the Favona Mine and shows the locations of the Favona Mine workings in relation to the marks. Figure 42 provides the marks identified as triggered during the November 2024 survey.

Settlement monitoring was undertaken in May/June and November/December 2024 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 2024.

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 1/11/2024.
- 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.

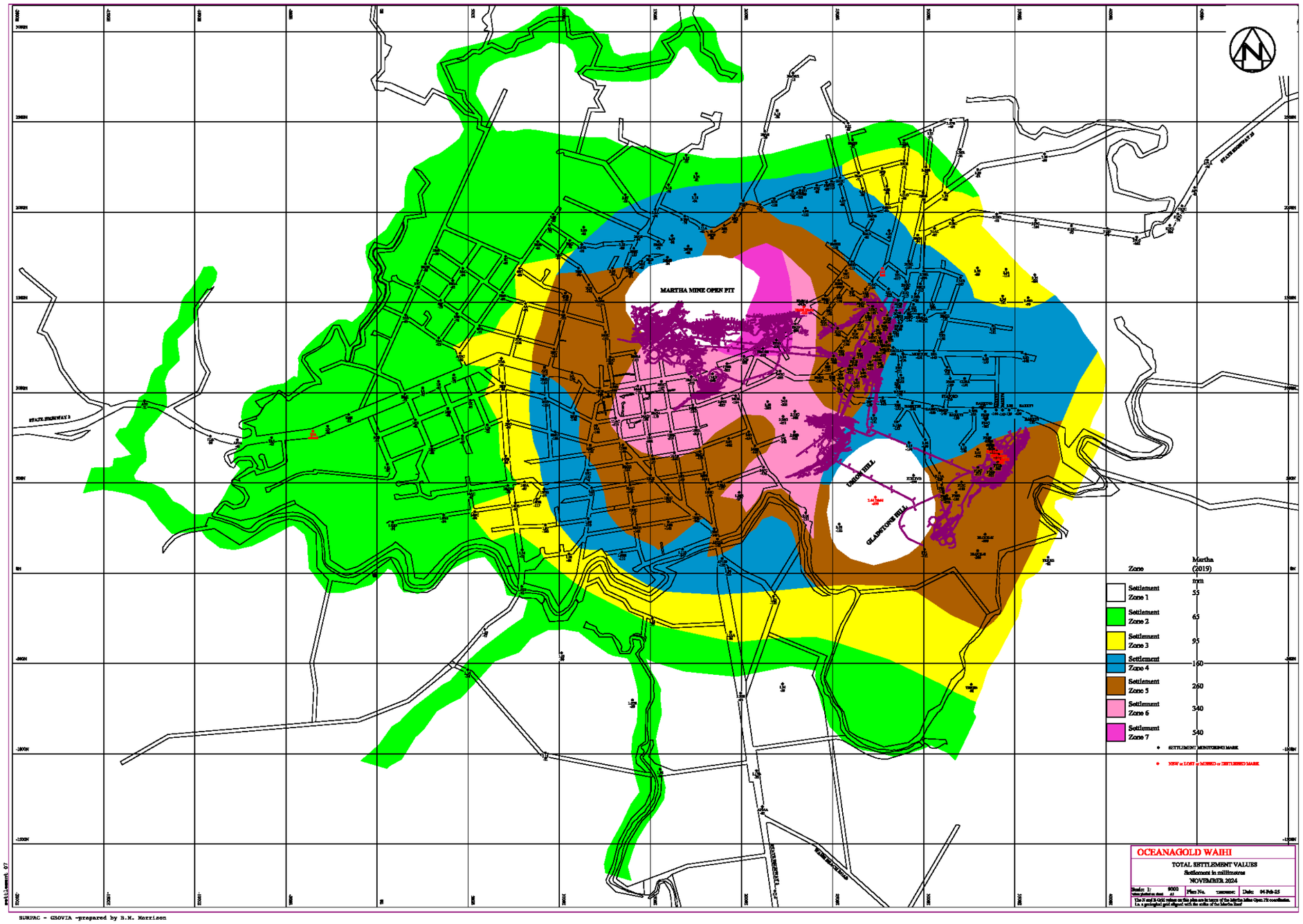


Figure 38. Total settlement zones – November 2024.

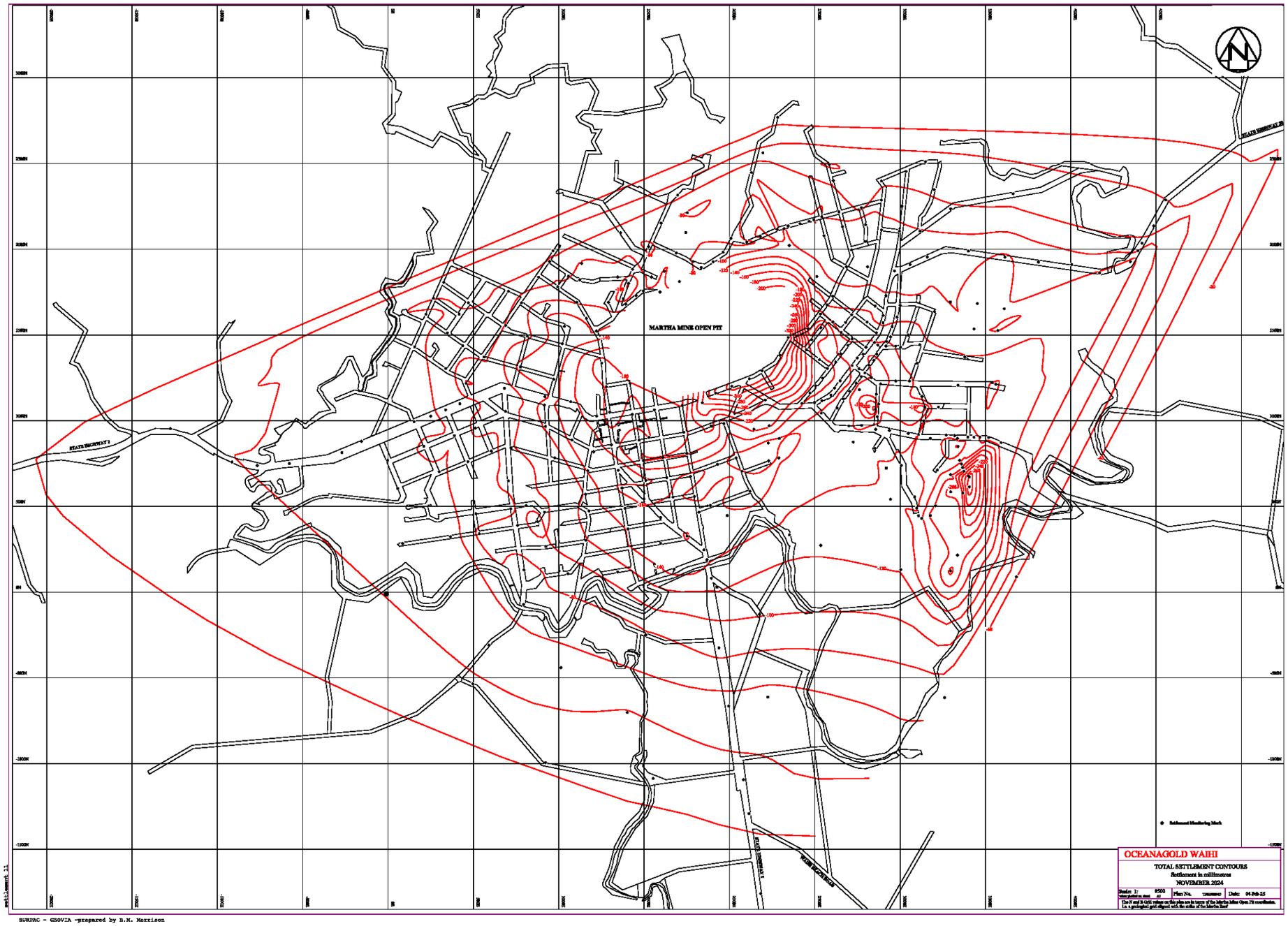


Figure 39. Total settlement contours – November 2024.

Figure 40. Settlement marker location plan, hazard zones, and recent underground activity.

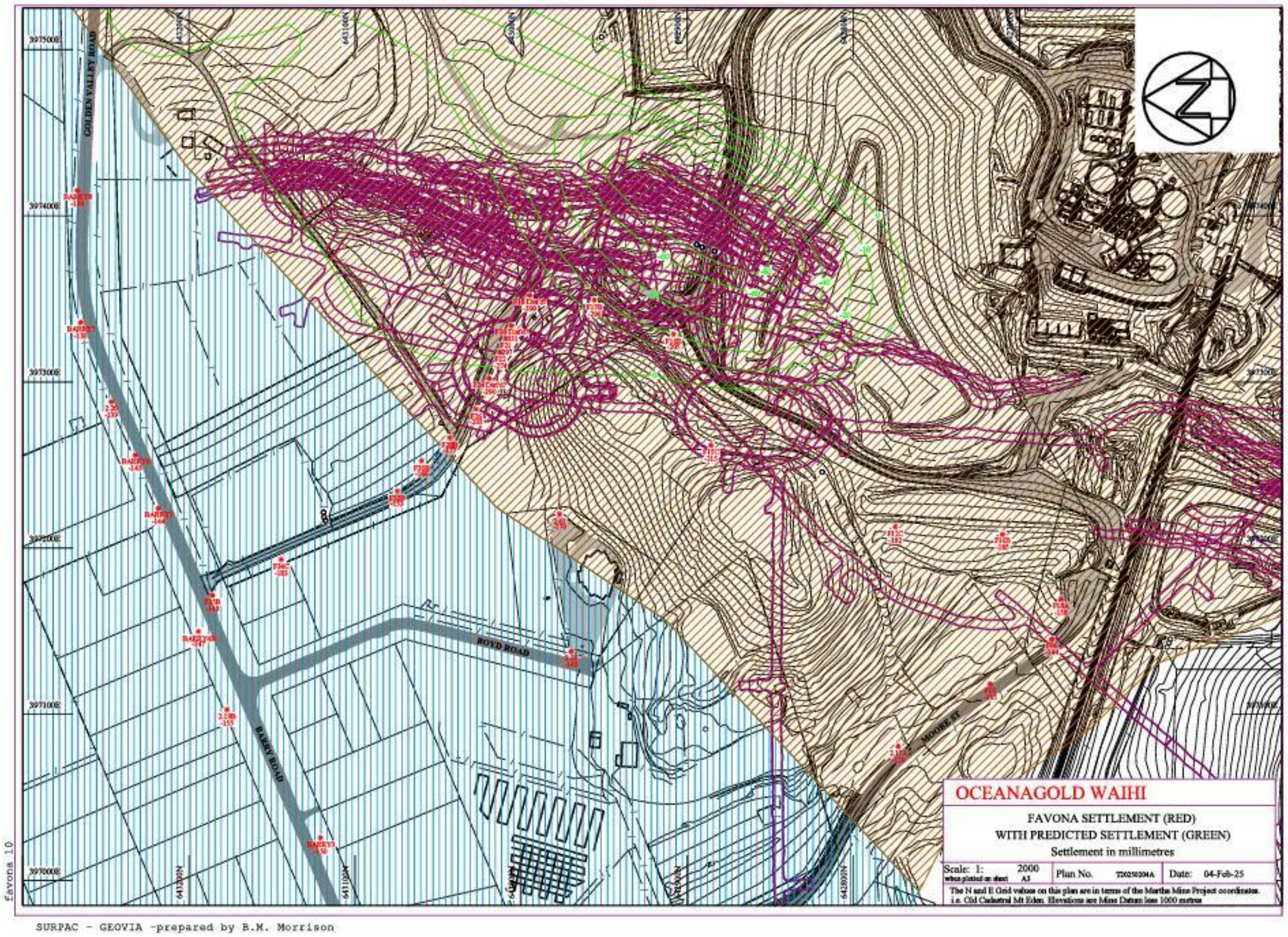


Figure 41. Favona settlement – November 2024.

Figure 42. Triggered settlement marks – November 2024.

7.2 Results

Appendix C presents plans showing the settlement mark locations, measured settlement values and inferred settlement contours.

Time-history plots of settlement survey data for each zone are presented in Appendix D. These plots also depict the zone settlement predictions (for the Martha Extended Project, Trio Development, Correnso Project and Project Martha) 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.

95.7% (330/345) of the marks did not exceed the settlement trigger levels; 15 marks were triggered. This number is similar to 2023.

Figure 42 above shows the location of the ten settlement marks that are located beyond the influence of the Favona Underground that exceeded the trigger limits during the November 2024 survey. The other five marks that exceeded the trigger limits are located above the Favona Underground.

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 onboarding of 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 7. Further discussion regarding each of the triggered survey marks is provided in the following sections.

Table 7. Number of survey marks triggered in each settlement zone.

Zone	Triggered Marks
1	3
2	2
3	4
4	0
5	0
6	1
7	0
Favona	5
Total	**15**

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 22 and 58mm during this reporting period (Figure 45))
- Zone 1 south of Waihi has had a small steady ongoing settlement since 1999 which has reached between 17 and 82mm during this reporting period (
- Figure *44*)
- 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 approximately 20mm during this reporting period (
- Figure *45*)
- Zone 1 north of Waihi which has had no measurable settlement (Figure 46)

This grouping shows that the marks in Zone 1 with a slow ongoing settlement trend are located along the 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. The one marked monitored in Zone 1 to the west of Waihi show little settlement until 2015 and then a small steady on-going settlement showing the widespread effects at depth have reached these markers.

The above observations suggest the following:

- 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.

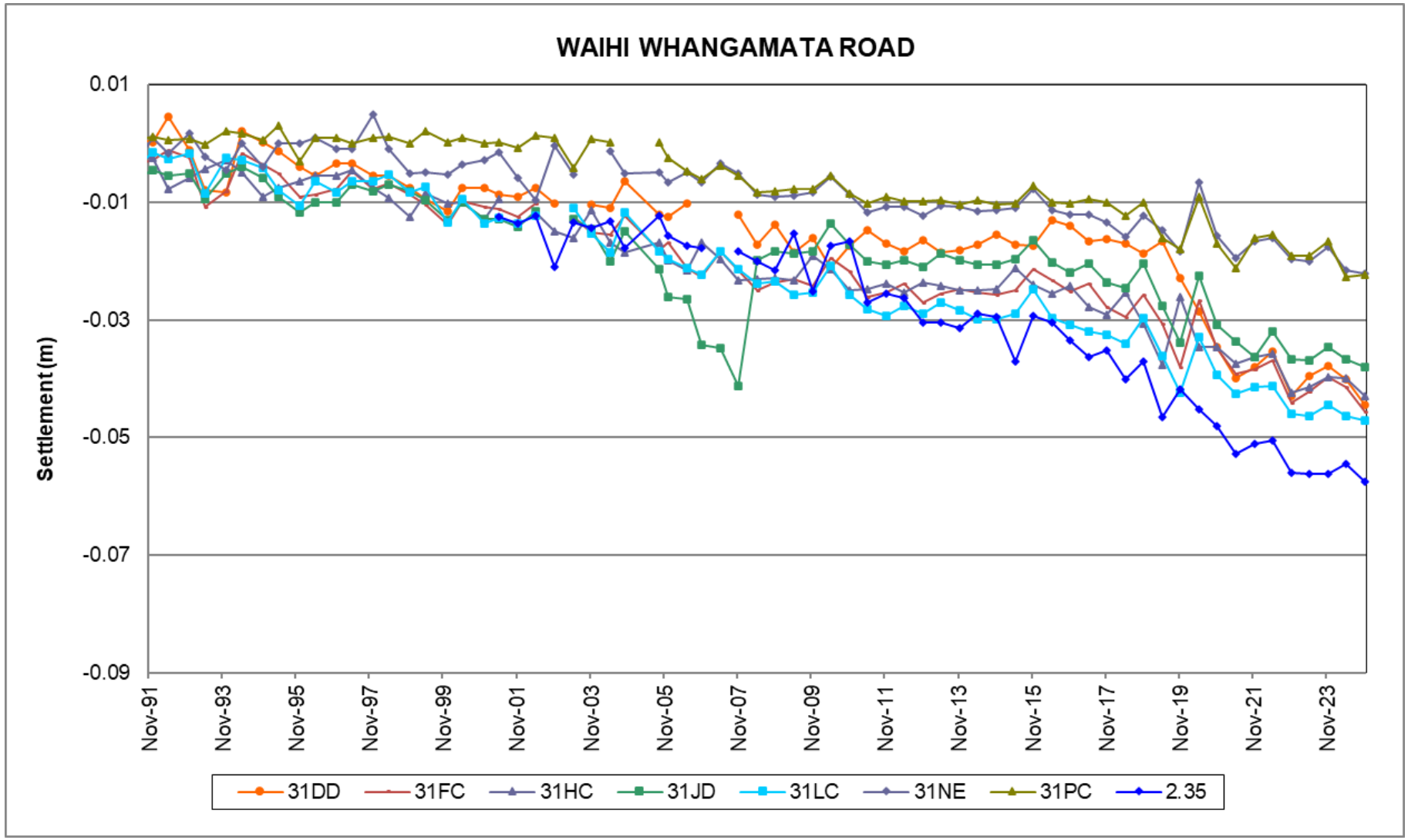


Figure 43. Zone 1 Waihi to Whangamata Road.

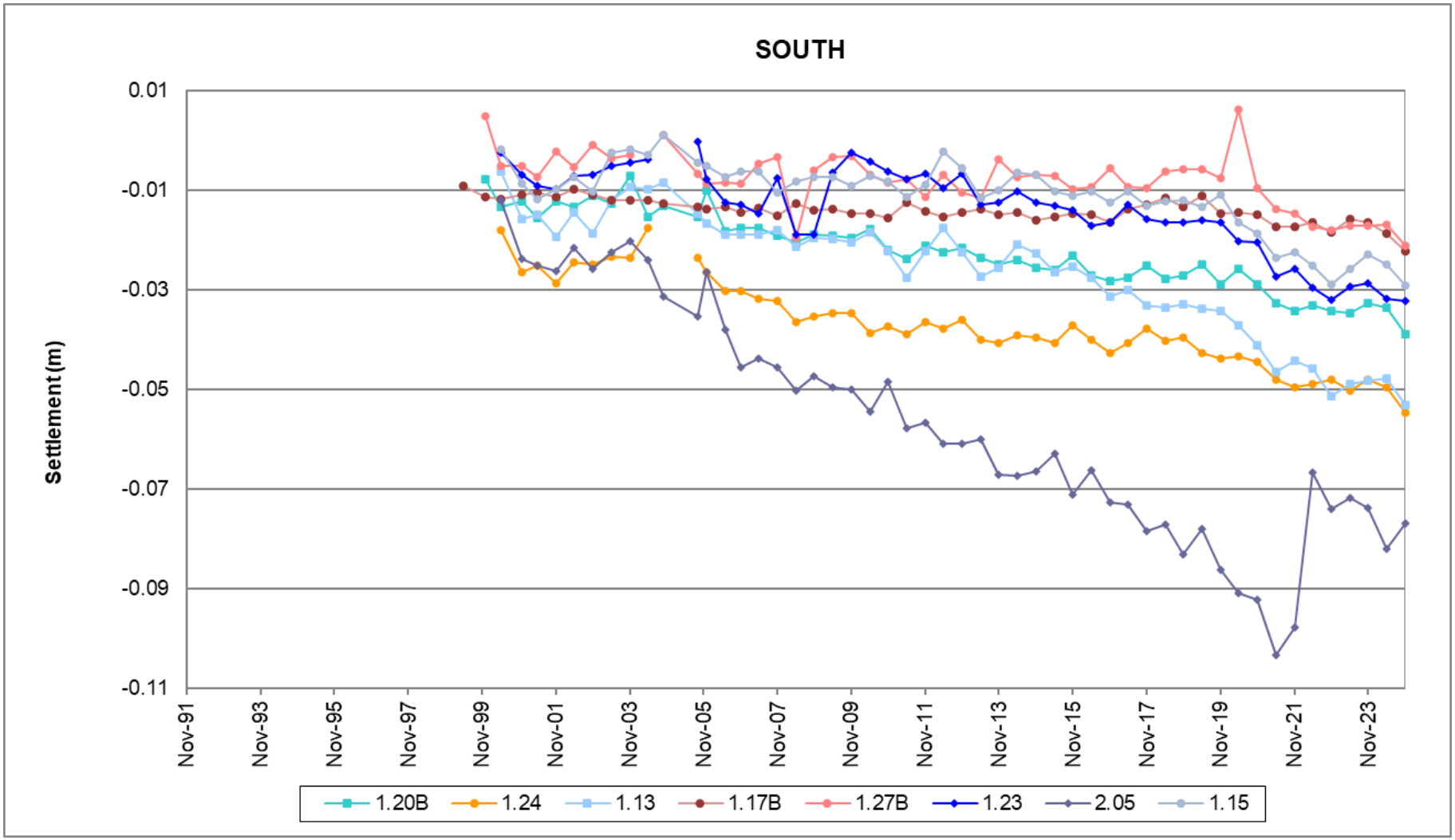


Figure 44. Zone 1 Waihi South.

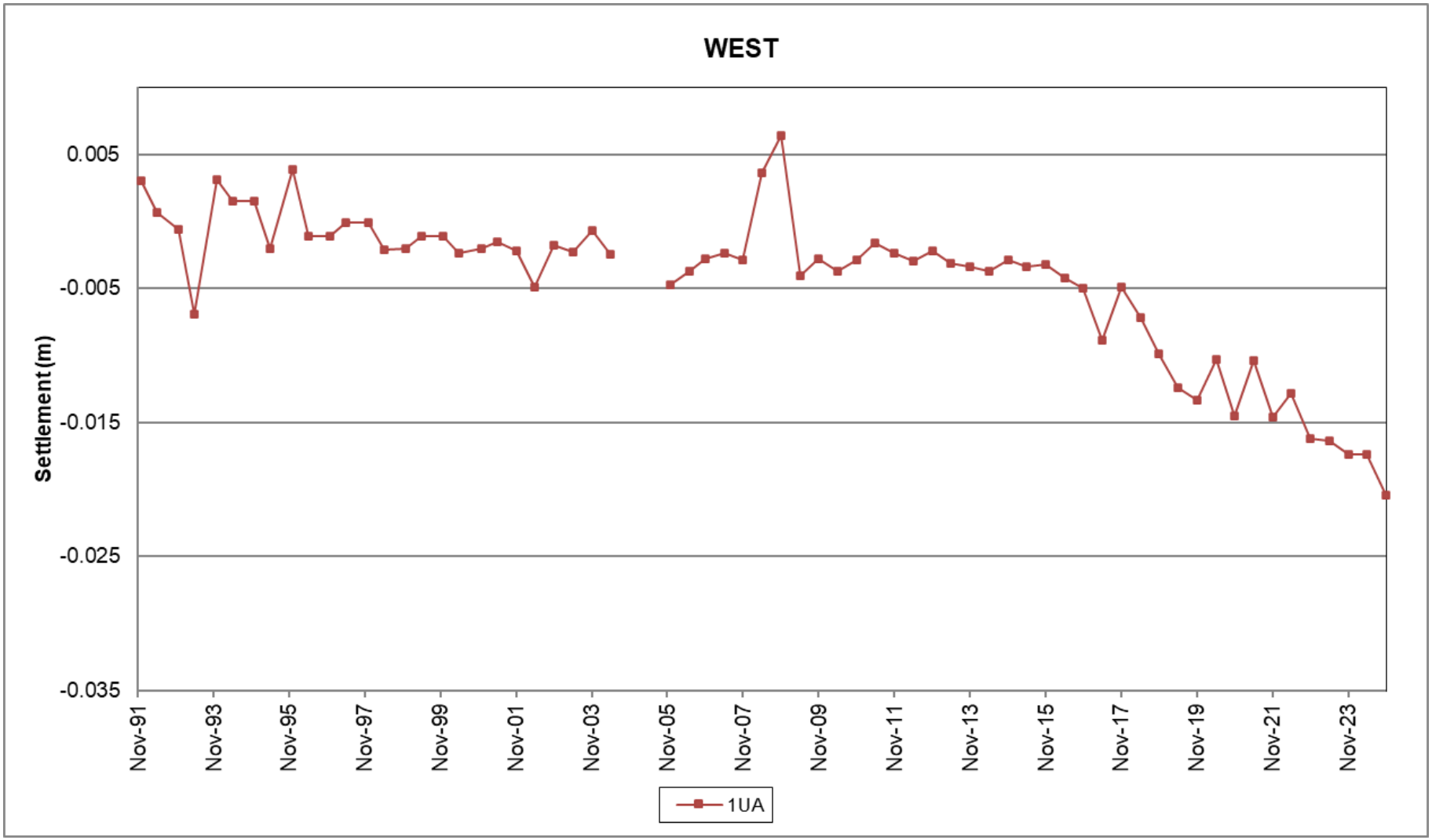


Figure 45. Zone 1 West of Waihi.

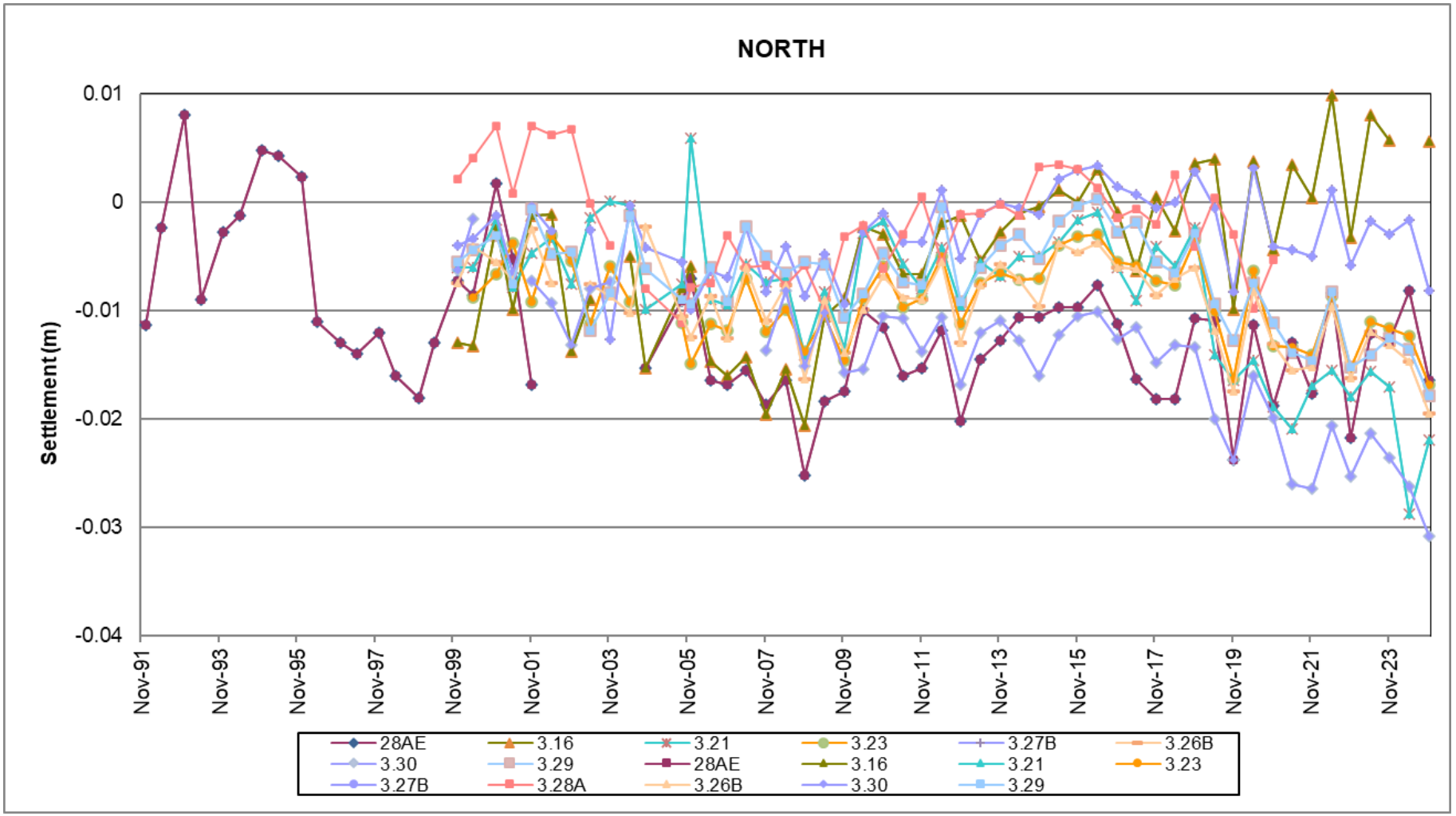


Figure 46. Zone 1 North of Waihi.

The monitoring results that exceed the trigger levels, as shown on the relevant Zone 1 time – history plots, are discussed below.

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

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 is 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 and will be removed from the monitoring programme.

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 two 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 during this reporting period are between 9 and 80mm. Movements exceeding trigger levels are discussed below.

On review, the settlement in Zone 2 which is occurring at Mark 1.04, 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 1.12B continued to exceed the trigger limit by 15 mm in the November 2024 survey. Mark 1.12B will continue to be reviewed with subsequent monitoring surveys.

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. Further, this mark may indicate slow natural settlement or ground creep towards the watercourse which is indicated via the measurement of gradual settlement over time.

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. Total settlements during this reporting period are between 14 and 113mm. Tilts between adjacent marks are well within acceptable limits.

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.

Mark 2FC triggered for the first time since 2019 following the November 2024 survey event. The mark has shown a steady rate of settlement toward the trigger, but an increase in rate of settlement was evident in November 2024. Roadworks were noted nearby to the mark during the reporting period which may have affected settlement in this location. The surveyor noted this mark is located near the Zone 4 boundary. This settlement mark will be monitored closely in the following reporting periods and further investigations will be taken if the mark continues to trigger.

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. Total settlements during this reporting period are between 3 and 140mm. Tilts between adjacent marks are well within acceptable limits.

One mark, 23C, showed a sharp increase in settlement during the May 2020 survey. This mark is located near a drain and may have been influenced by drainage works nearby during the 2019/2020 period. No visual evidence of settlement effects on surrounding land have been identified to date and nearby piezometers have not shown any unusual changes. The settlement in all subsequent surveys continued at a steady rate with the other surrounding settlement monitoring marks. Due to the settlement at this location continuing at a rate in line with expected settlement, the large drop in settlement from the May 2020 survey has had a correction applied. As a result, this mark no longer exceeds the settlement trigger. Graphs showing the settlement rate for this mark are shown below prior to corrections being added (Figure 46) and after corrections were applied (Figure 47).

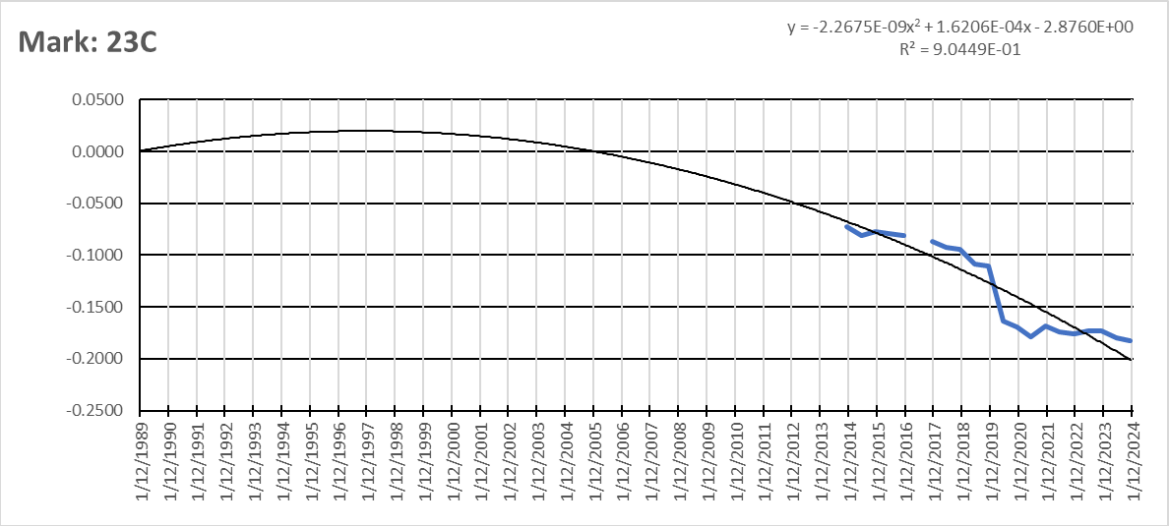


Figure 47. 23C Settlement records prior to correction.

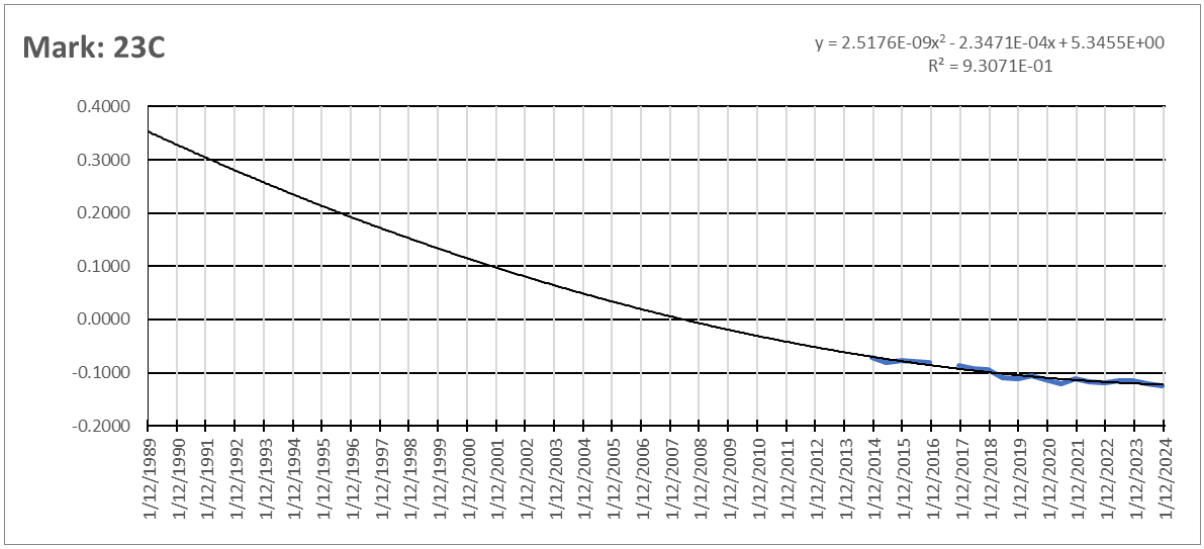


Figure 48. 23C Settlement records after the correction, no longer exceeding trigger limits.

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. Total settlements during this reporting period are between 28 and 186mm.

No marks in Zone 5 that are located outside of the area over the 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. Total settlements during this reporting period are between 6 and 406 mm.

One mark in this zone exceeded the maximum predicted settlement. 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 during this reporting period are between 307 and 320mm. 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 8 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 8. Separation of settlement – Favona marks – November 2024.

Mark	Measured Total Settlement. (mm)	Estimated Martha Settlement. (mm)	Estimated Favona Settlement. (mm)
F02	105	50	55
F04	-	44	-
F06	115	40	75
F08A	124	44	80
F10B	136	44	92
F12C	136	39	97
F14C	-	60	-
F15C	174	55	119
F16B	168	55	113
F17B	300	55	245
F18	390	49	341
F20	328	44	284
F21	295	43	252
F22	271	42	229
F24	230	42	188
F26	199	45	154
F28B	173	49	124
F30B	159	52	107
F32B	129	49	80
F34C	117	58	59
F35B	108	61	47

The largest measured settlement at Favona Mine occurs where the markers overlie mine workings (i.e. marks F06 and F14C 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. Five Favona marks exceeded the maximum predicted settlement in the November 2024 survey: F17B, F18, F20, F21 and F22. All are located on company owned land above active underground workings. Marks F18 and F20 are noted by the surveyor as being disturbed (Figure 41, 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 removed from the monitoring programme.

7.5 Summary

The analysis of the relevant survey data to the end of 2024 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 and most protracted. This is also an area that has historic underground workings which have not been backfilled.

The main area of noteworthy settlement at Favona overlies the underground workings. This 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, such estimates were based on Martha settlement data which was responding to reconsolidation rather than primary consolidation.

In relation to the 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 above, 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. Revised settlement marker corrections have been applied in this reporting period. It should also be noted that there is some crossover of marks between adjacent Mining Permit boundaries.

The settlement and tilt assessments have been grouped into seven areas as follows:

- Favona
- Martha
- Rex
- North Wall
- Correnso
- Correnso South, and
- SUPA.

The assessment of tilt between adjacent settlement marks is summarised in Table 9.

The current assessment of tilt between adjacent settlement marks is summarised below in Tables 10a to 10g. In the following tables an orange cell denotes the locations where tilt greater (steeper) than 1:1000 has been calculated and a green cell denotes a survey monitoring pin that is located above OceanaGold underground mine workings.

Table 9. Summary of Tilt calculations – November 2024 survey.

Table 9a: FAVONA

Mark	x	y	Distance (m)	Nov 2024 Δz (m)	Abs (m)	Δh (m)	Tilt (1:X)
F02	3097.60	490.00		-0.1057	0.1057		
F06	3107.08	445.21	45.78	-0.1155	0.1155	0.0098	4656
F10B	3176.88	446.75	69.82	-0.1361	0.1361	0.0206	3389
F12C	3207.32	503.82	64.69	-0.1361	0.1361	0.0000	7207861
F15C	3297.17	585.32	121.30	-0.1745	0.1745	0.0384	3155
F16B	3367.38	578.70	70.52	-0.1679	0.1679	0.0066	10650
F17B	3405.48	613.91	51.88	-0.2998	0.2998	0.1319	393
F18	3423.83	648.30	38.98	-0.3894	0.3894	0.0895	435
F21	3405.99	672.00	29.66	-0.2948	0.2948	0.0946	314
F24	3388.13	690.85	25.97	-0.2301	0.2301	0.0646	402
F32B	3348.78	769.1	87.59	-0.1289	0.1289	0.1013	865
F34C	3339.49	849.57	81.00	-0.1171	0.1171	0.0117	6896
F35B	3336.68	896.06	46.58	-0.1079	0.1079	0.0092	5063

Table 9b: MARTHA

Mark	x	y	Distance (m)	Nov 2024 Δz (m)	Abs (m)	Δh (m)	Tilt (1:X)
20BB	2533.26	1622.29		-0.1273	0.1273		
20AC	2461.04	1536.91	111.83	-0.1312	0.1312	0.0040	28158
BM20A	2345.50	1484.90	126.71	-0.2552	0.2552	0.1239	1022
20D	2482.07	1473.48	137.05	-0.1642	0.1642	0.0909	1507
19CB	2296.71	1381.40	206.97	-0.2996	0.2996	0.1354	1529
19BB	2191.56	1292.02	138.00	-0.3151	0.3151	0.0155	8906
BM19B	2117.17	1244.36	88.35	-0.3165	0.3165	0.0013	66068
17CB	2014.23	1201.01	111.70	-0.3200	0.3200	0.0035	31857
17BB	1919.52	1160.79	102.90	-0.2471	0.2471	0.0729	1412
17AB	1841.32	1104.80	96.18	-0.2123	0.2123	0.0348	2763
2.04B	1893.21	968.34	145.99	-0.1628	0.1628	0.0495	2950
34CB	1967.74	983.20	76.00	-0.1585	0.1585	0.0044	17458
34BE	1732.56	931.60	164.80	-0.1553	0.1553	0.0075	21984
BM17A	1724.44	1088.92	207.42	-0.1218	0.1218	0.0335	6187
10BC	1560.13	1062.92	216.74	-0.1474	0.1474	0.0256	8459
10AB	1430.61	1037.00	298.38	-0.1467	0.1467	0.0007	415534
BM16	1418.09	1218.03	210.32	-0.1453	0.1453	0.0014	147555
10DC	1279.04	1198.33	221.36	-0.1523	0.1523	0.0070	31596
16BC	1252.81	1336.47	203.34	-0.1474	0.1474	0.0049	41821
BM9B	1220.25	1523.29	330.23	-0.0845	0.0845	0.0629	5252

Table 9c: REX

Mark	x	y	Distance (m)	Nov 2024 Δz (m)	Abs (m)	Δh (m)	Tilt (1:X)
R01	742707.14	495653.61		-0.0058	0.0058		
R02	742734.74	495695.37	50.06	-0.0067	0.0067	0.0009	55617
R03	742815.40	495715.92	83.23	-0.0092	0.0092	0.0025	33293
R04	742788.69	495771.35	61.53	-0.0077	0.0077	0.0015	41020
R05	742830.30	495814.32	59.81	-0.009	0.0090	0.0013	46009
R06	742899.61	495885.98	99.69	-0.0065	0.0065	0.0025	39877

Table 9d: NORTH WALL

Mark	x	y	Distance (m)	Nov 2024 Δz (m)	Abs (m)	Δh (m)	Tilt (1:X)
27AB	2009.08	2064.33		-0.0090	0.0090		
26Q	1963.00	1982.71	93.73	-0.0342	0.0342	0.0251	3728
26PB	1834.84	1893.11	156.38	-0.0515	0.0515	0.0173	9034
26OB	1706.93	1812.27	151.31	-0.0059	0.0059	0.0456	3322
26NC	1641.16	1772.40	228.22	-0.0405	0.0405	0.0346	6600
26MB	1593.46	1750.66	122.11	-0.0494	0.0494	0.0136	8972
26JB	1495.71	1756.55	93.74	-0.0414	0.0414	0.0025	37877
BM26	1542.45	1837.81	100.98	-0.0389	0.0389	0.0105	9627
3.09	1618.51	1870.17	217.54	-0.0358	0.0358	0.0299	7272

Table 9e: CORRENSO

Mark	x	y	Distance (m)	Nov 2024 Δz (m)	Abs (m)	Δh (m)	Tilt (1:X)
25E	2472.35	1162.01		-0.1660	0.1660		
25B	2497.67	1105.83	61.62	-0.1360	0.1360	0.0300	2052
25I	2537.20	1045.04	72.51	-0.1297	0.1297	0.0063	11490
24H	2630.70	1072.28	97.39	-0.1222	0.1222	0.0075	13015
24B	2667.67	1126.40	65.54	-0.1248	0.1248	0.0026	25649
24G	2705.96	1170.46	58.38	-0.1347	0.1347	0.0099	5884
24L	2761.67	1181.33	56.76	-0.1397	0.1397	0.0050	11309
24AC	2743.58	1218.90	41.70	-0.1380	0.1380	0.0017	24403
24F	2772.80	1257.27	48.23	-0.1273	0.1273	0.0107	4515
BM24	2794.55	1279.36	31.00	-0.1218	0.1218	0.0055	5611
24E	2758.43	1303.23	43.29	-0.1273	0.1273	0.0055	7837
24DC	2718.29	1323.13	44.80	-0.1241	0.1241	0.0032	13951
24I	2692.57	1269.71	59.29	-0.1294	0.1294	0.0053	11112
25H	2648.48	1232.96	57.40	-0.1397	0.1397	0.0102	5604
25CB	2615.91	1190.50	53.51	-0.1403	0.1403	0.0006	86962
25G	2594.60	1149.42	46.29	-0.1409	0.1409	0.0006	81134
25F	2542.53	1116.24	61.74	-0.1434	0.1434	0.0026	24138
25B	2497.67	1105.83	46.05	-0.1360	0.1360	0.0074	6207
BM25	2424.91	1100.25	72.97	-0.1529	0.1529	0.0169	4319
25E	2472.35	1162.01	77.88	-0.1660	0.1660	0.0131	5927
25A	2505.13	1203.77	53.09	-0.1633	0.1633	0.0028	19134
25D	2547.05	1248.02	60.95	-0.1645	0.1645	0.0013	47468
21DC	2573.96	1304.15	62.25	-0.1532	0.1532	0.0113	5511
21N	2623.25	1342.44	62.41	-0.1361	0.1361	0.0172	3639

Mark	x	y	Distance (m)	Nov 2024 Δz (m)	Abs (m)	Δh (m)	Tilt (1:X)
21C	2651.57	1389.82	55.20	-0.1221	0.1221	0.0140	3937
21M	2694.90	1439.65	66.03	-0.1126	0.1126	0.0095	6967
21BC	2719.27	1477.80	45.27	-0.0949	0.0949	0.0177	2559
21EB	2799.95	1429.09	94.24	-0.0989	0.0989	0.0040	23801
24K	2783.89	1387.72	44.38	-0.1167	0.1167	0.0178	2491
24J	2749.39	1365.76	40.89	-0.1104	0.1104	0.0063	6505
24DC	2718.29	1323.13	52.77	-0.1241	0.1241	0.0137	3852
22F	2815.91	1325.41	97.65	-0.1259	0.1259	0.0018	55201
22C	2846.39	1352.54	40.80	-0.1435	0.1435	0.0177	2308
22GB	2862.88	1387.97	39.08	-0.1168	0.1168	0.0268	1459
22BC	2916.75	1435.77	72.02	-0.1010	0.1010	0.0158	4555
22I	2918.98	1461.37	25.69	-0.0996	0.0996	0.0014	18703
22H	2869.25	1441.80	53.44	-0.0885	0.0885	0.0111	4812
21P	2849.17	1456.90	25.13	-0.0919	0.0919	0.0034	7285
21FB	2861.65	1512.21	56.70	-0.0715	0.0715	0.0204	2775
21Q	2899.60	1571.32	70.24	-0.0729	0.0729	0.0014	50823
21GC	2901.12	1614.05	42.76	-0.0750	0.0750	0.0021	20464
22KB	2981.80	1603.49	81.37	-0.0656	0.0656	0.0094	8652
2.29B	2953.39	1548.17	62.19	-0.0925	0.0925	0.0270	2306
22J	2944.47	1489.76	59.09	-0.0799	0.0799	0.0126	4693
22I	2918.98	1461.37	38.16	-0.0996	0.0996	0.0196	1943
22H	2869.25	1441.80	53.44	-0.0885	0.0885	0.0111	4812
21EB	2799.95	1429.09	70.46	-0.0989	0.0989	0.0104	6777
21BC	2719.27	1477.80	94.24	-0.0949	0.0949	0.0040	23801
BM21	2654.80	1515.40	74.63	-0.1052	0.1052	0.0103	7228
20F	2605.79	1575.98	77.92	-0.1147	0.1147	0.0095	8190
20E	2535.65	1542.67	77.65	-0.1765	0.1765	0.0617	1257
21C	2651.57	1389.82	191.83	-0.1221	0.1221	0.0544	3525

Table 9f: CORRENSO SOUTH

Mark	x	y	Distance (m)	Nov 2024 Δz (m)	Abs (m)	Δh (m)	Tilt (1:X)
23F	2700.77	968.79		-0.1329	0.1329		
2.13	2725.42	874.95	97.03	-0.0750	0.0750	0.0579	1675
23E	2774.82	972.51	74.15	-0.1323	0.1323	0.0006	134767
2.14A	2853.28	838.67	132.91	-0.0646	0.0646	0.0104	12810
23B	2856.49	949.79	84.77	-0.1177	0.1177	0.0146	5791
BANK1	2866.21	1023.25	74.10	-0.1176	0.1176	0.0001	1096272

Mark	x	y	Distance (m)	Nov 2024 Δz (m)	Abs (m)	Δh (m)	Tilt (1:X)
23C	2856.14	1068.01	45.88	-0.1823	0.1823	0.0647	710
2.25	2874.51	1097.26	34.54	-0.1207	0.1207	0.0616	561
23D	2861.42	1154.89	59.09	-0.1298	0.1298	0.0091	6482
2.24	2885.91	1215.47	65.35	-0.1319	0.1319	0.0021	31324
MATAURA 1	2831.84	1250.81	64.60	-0.1198	0.1198	0.0121	5357
BM24	2794.55	1279.36	46.96	-0.1218	0.1218	0.0019	24144

*Mark 23C has since been corrected at the time of this report. This mark no longer triggers settlement and the tilt reporting would reflect this. The data will be amended for the May 2025 Report.

Table 9g: SUPA

Mark	x	y	Distance (m)	Nov 2024 Δz (m)	Abs (m)	Δh (m)	Tilt (1:X)
BM25	2424.91	1100.25		-0.1529	0.1529		
34H	2233.59	970.56	231.14	-0.1338	0.1338	0.0191	12089
2.10	2143.92	950.39	91.91	-0.1179	0.1179	0.0159	5797
34CB	1967.74	983.20	179.21	-0.1585	0.1585	0.0405	4421
34GC	2211.33	1119.52	279.14	-0.2162	0.2162	0.0577	4835
19BB	2191.56	1292.02	173.63	-0.3151	0.3151	0.0989	1755
19CB	2296.71	1381.40	138.00	-0.2996	0.2996	0.0155	8906
21O	2527.37	1356.34	232.01	-0.1564	0.1564	0.1432	1620
20C	2450.61	1413.86	95.92	-0.1855	0.1855	0.0291	3298
20D	2482.07	1473.48	67.41	-0.1642	0.1642	0.0213	3171
BM20A	2345.50	1484.90	137.05	-0.2552	0.2552	0.0909	1507

Table Key:

	Monitoring mark located above mine workings.
	Tilt greater than 1:1000 observed.

8.1 Favona

The locations surveyed in 2024 with tilt values between adjacent marks steeper than the 1:1000 criterion are highlighted in

Table 9 above. The locations of the marks in relation to the Favona mine workings are shown in Figure 49 and Figure 50 below.

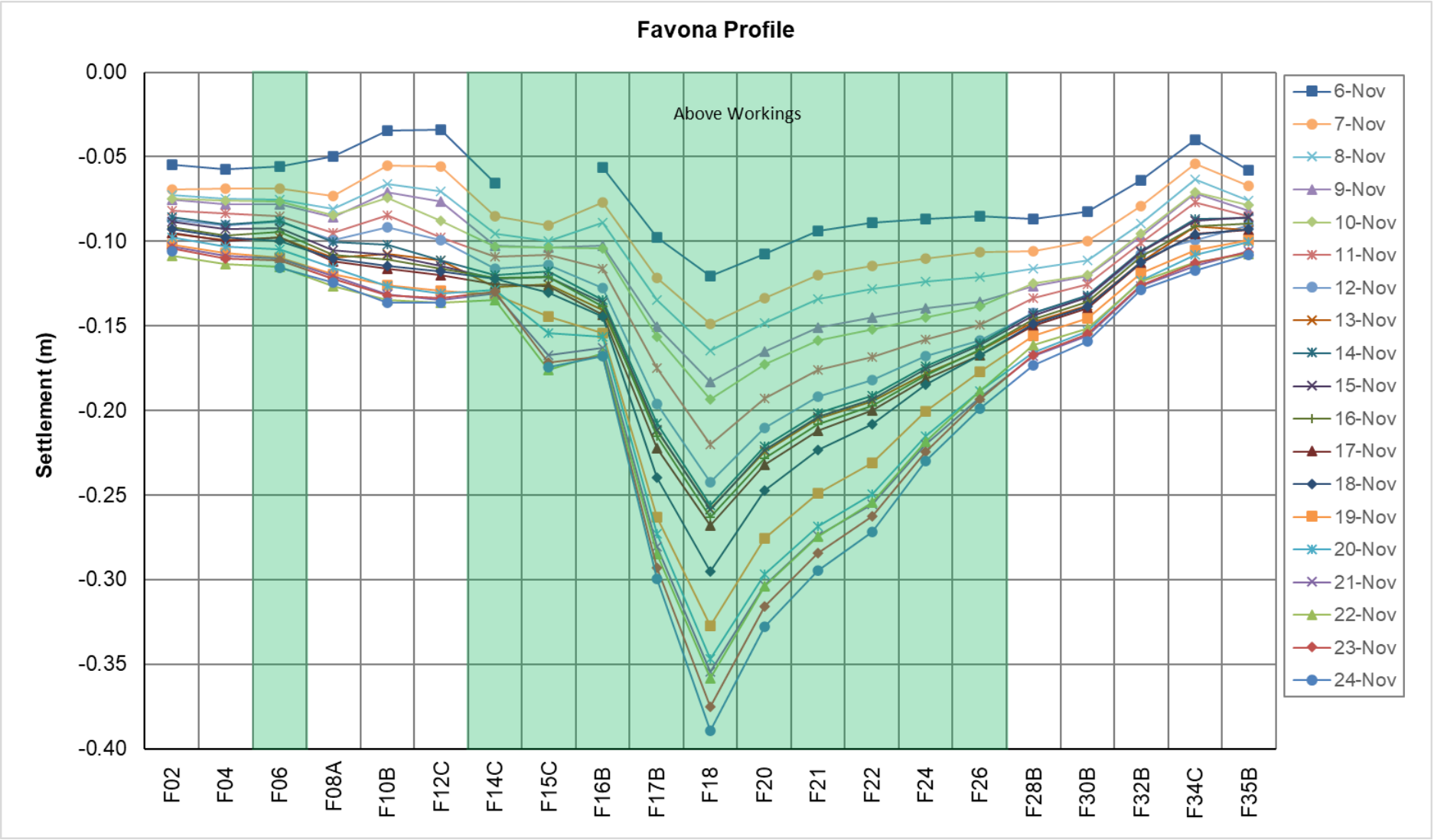


Figure 49. Favona settlement profile.

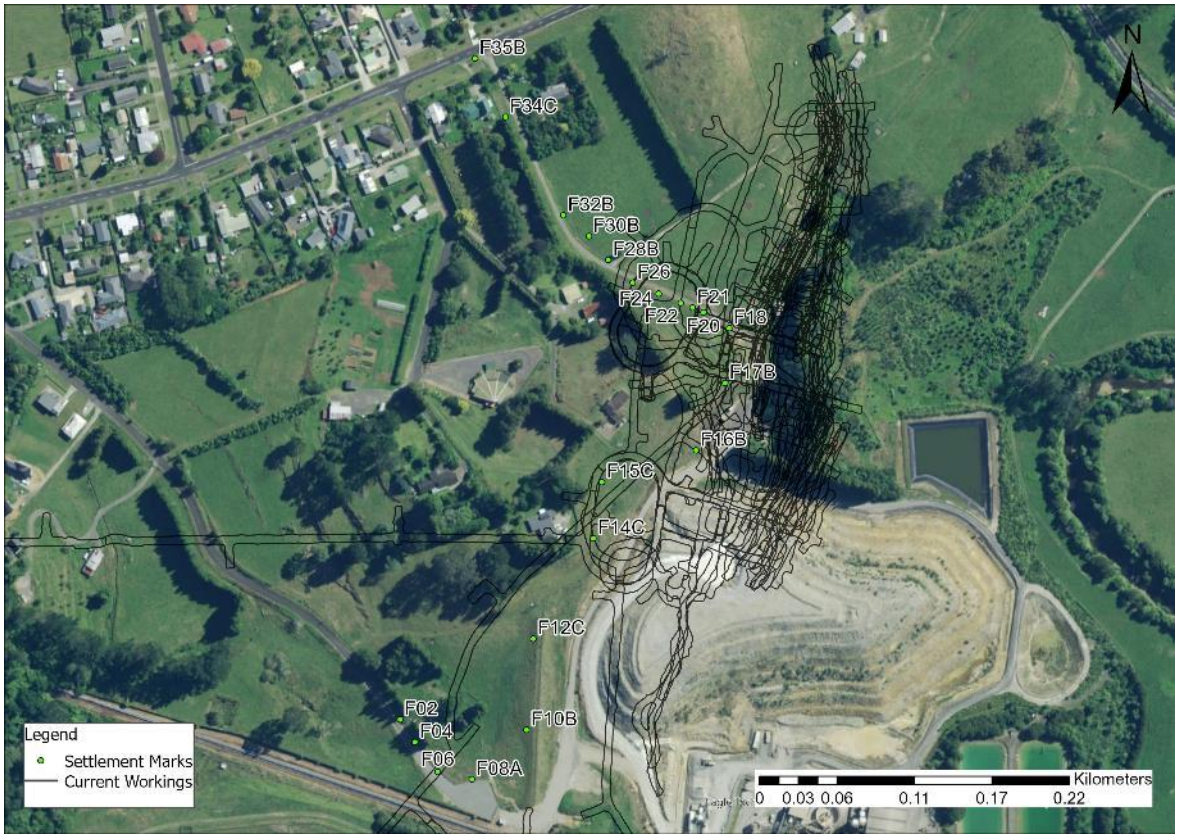


Figure 50. Favona settlement marks and workings.

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/F32B). 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 2024 survey.

All Favona marks showed more settlement than the May 2024 survey, continuing the trend of slow settlement developing 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 the tilt calculations due to some being too close to one another. The minimum distance between the marks which are included in the tilt calculations 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 2023 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.

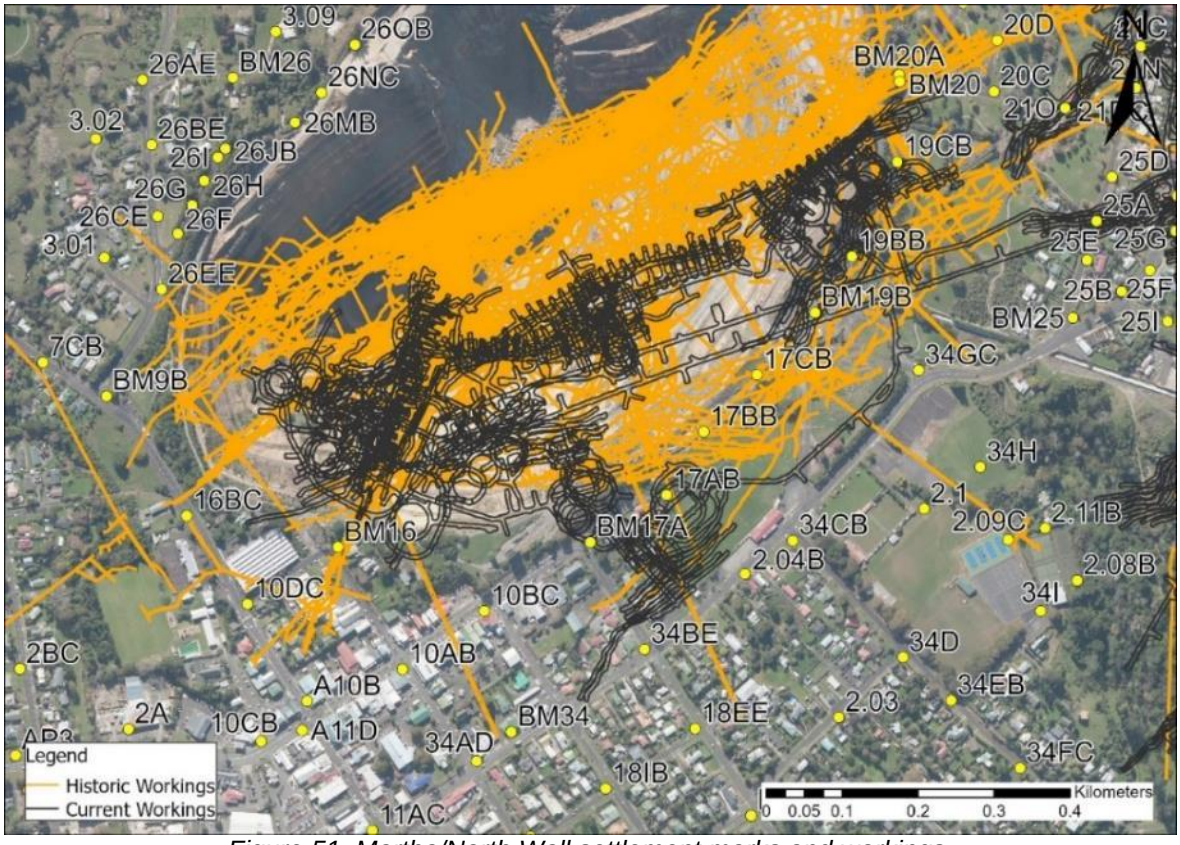


Figure 51. Martha/North Wall settlement marks and workings.

8.3 Rex

The marks above Rex underground were added at request of the HDC geotechnical reviewer Peter Fuller.

No tilt greater than 1:1000 has been identified within this area.

These marks will be added to the historic data in future reports as well as incorporated into the Martha tilt tables going forward. For now, these marks are reported as a separate network and are shown in red in Figure 52.

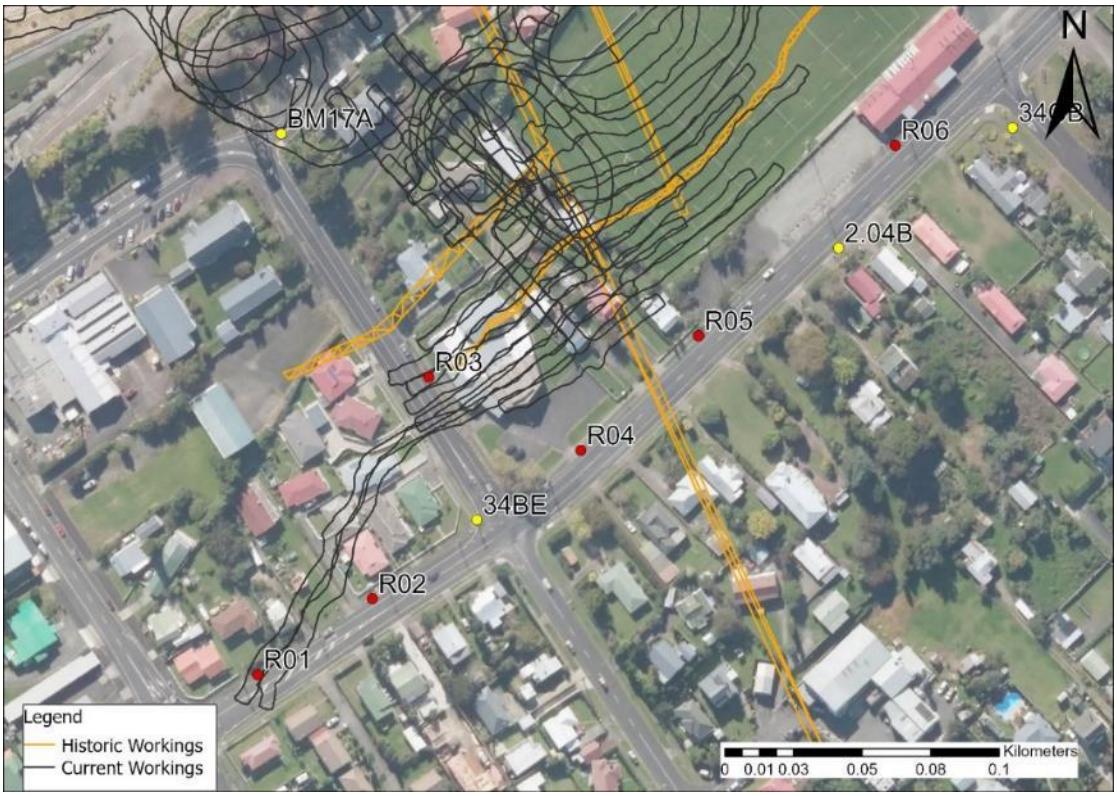


Figure 52. Rex settlement marks (in red) and workings.

8.4 Correnso

Tilt greater than 1:1000 was previously identified in the Correnso South area at two locations associated with Mark 23C. As stated in Section 7.2.4 above, due to the potential influence by drainage works, a correction has been applied to this mark. The tilts previously recorded between marks 23C/2.25 and 23C/BANK (Figure 53) are no longer considered to be greater than 1:1000.

Figure 53. 23C, 2.25 and BANK1 settlement marks and workings.

8.5 SUPA

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

8.6 Historic comparisons

The latest measurements at all survey marks are compared with their three previous survey readings to assess any trends are summarised below in Table 10. In the following tables an orange cell denotes the locations where tilt greater (steeper) than 1:1000 has been calculated and a green cell denotes a survey monitoring pin that is located above OceanaGold underground mine workings.

It should be noted that the tilt assessments are sensitive to the separation distance between the markers. Large, potentially misleading tilt numbers can sometimes be generated if the relevant marks are close together. Additionally, marks can be reviewed which can result in revised corrections. This will modify the tilt calculation.

Table 10. Comparison of historic tilt calculations – May 2023 to November 2024.

Table 10a: FAVONA

Mark	May 23 (1:X)	Nov 23 (1:X)	May 24 (1:X)	Nov 24 (1:X)
F02	N/A	N/A	N/A	N/A
F06	7230	6937	5069	4656
F10B	3035	3341	3490	3389

Mark	May 23 (1:X)	Nov 23 (1:X)	May 24 (1:X)	Nov 24 (1:X)
F12C	20927	35936	43383	7207861
F15C	3044	3184	3412	3155
F16B	9133	17200	17982	10650
F17B	446	414	397	393
F18	462	475	446	435
F21	332	326	319	314
F24	446	434	411	402
F32B	901	890	862	865
F34C	6561	6137	6161	6896
F35B	6560	7278	5480	5063

Table 10b: MARTHA

Mark	May 23 (1:X)	Nov 23 (1:X)	May 24 (1:X)	Nov 24 (1:X)
20BB	N/A	N/A	N/A	N/A
20AC	87956	49233	22494	28158
BM20A	1038	1025	1049	1022
20D	1359	1377	1543	1507
19CB	1430	1455	1573	1529
19BB	10077	10226	9587	8906
BM19B	336285	119836	372363	66068
17CB	74159	30138	53032	31857
17BB	1287	1311	1351	1412
17AB	3063	3005	3102	2763
2.04B	3793	3669	3067	2950
34CB	*	*	32296	17458
34BE	17354	14987	24610	21984
BM17A	4788	5031	5513	6187
10BC	7391	7599	7734	8459
10AB	69684	88228	16512540	415534
BM16	36735	56456	71895	147555
10DC	18438	24046	23287	31596
16BC	30987	40169	57084	41821
BM9B	5657	5470	5154	5252

* Tilt calculation added in May 2024 assessment due to regulator recommendation.

Table 10c: NORTH WALL

Mark	May 23 (1:X)	Nov 23 (1:X)	May 24 (1:X)	Nov 24 (1:X)
27AB	N/A	N/A	N/A	N/A
26Q	4103	4252	3655	3728
26PB	8183	8931	10148	9034
26OB	3336	3388	3571	3322
26NC	5213	5723	5852	6600
26MB	15837	9532	10892	8972
26JB	51364	45179	49998	37877
BM26	28136	10009	11896	9627
3.09	8362	7524	7760	7272

Table 10d: CORRENSO

Mark	May 23 (1:X)	Nov 23 (1:X)	May 24 (1:X)	Nov 24 (1:X)
25E	N/A	N/A	N/A	N/A
25B	2238	2145	2198	2052
25I	7705	9052	11311	11490
24H	32651	14150	14150	13015
24B	15049	16571	23879	25649
24G	5549	5884	3370	5884
24L	21166	696664	5105	11309
24AC	11000	20943	6826	24403
24F	8890	8005	5528	4515
BM24	3137	3015	3137	5611
24E	8132	7187	7982	7837
24DC	10638	15936	7844	13951
24I	5699	5736	2371	11112
25H	10296	11384	6655	5604
25CB	631972	128838	91521	86962
25G	69033	23489	43238	81134
25F	31537	33235	28614	24138
25B	5815	6207	7174	6207
BM25	4771	4451	4398	4319
25E	6363	6311	6808	5927
25A	24413	23340	31702	19134

Mark	May 23 (1:X)	Nov 23 (1:X)	May 24 (1:X)	Nov 24 (1:X)
25D	214594	125924	125924	47468
21DC	5189	4682	6355	5511
21N	6400	5136	3817	3639
21C	3187	3700	4023	3937
21M	5209	6184	5011	6967
21BC	3191	2849	3103	2559
21EB	21133	74827	34152	23801
24K	3036	2703	2410	2491
24J	15069	23863	8726	6505
24DC	6681	6283	4511	3852
22F	35266	145959	23999	55201
22C	2507	2335	2335	2308
22GB	1454	1577	1392	1459
22BC	4929	4830	4766	4555
22I	8359	7616	33205	18703
22H	10073	5450	4206	4812
21P	7976	15223	2631	7285
21FB	3253	3291	2137	2775
21Q	120674	89814	183843	50823
21GC	14303	15329	20464	20464
22KB	7531	8299	7673	8652
2.29B	2139	2169	2207	2306
22J	5798	5054	5327	4693
22I	3223	2127	1840	1943
22H	7120	5450	4206	4812
21EB	6910	8596	7267	6777
21BC	21133	74827	34152	23801
BM21	8178	8652	9073	7228
20F	8190	7704	7341	8190
20E	1398	1380	1302	1257
21C	4054	3962	3782	3525

Table 10e: CORRENSO SOUTH

Mark	May 23 (1:X)	Nov 23 (1:X)	May 24 (1:X)	Nov 24 (1:X)
23F	N/A	N/A	N/A	N/A
2.13	2179	2165	1658	1675
23E	12462	14980	12895	134767
2.14A	27244	24186	8174	12810
23B	19440	34451	5674	5791
BANK1	5422	5992	19668	1096272
23C	679	711	710	710
2.25	611	605	603	561
23D	12800	8543	11779	6482
2.24	8286	13945	14566	31324
MATAURA1	5270	4800	5024	5357
BM24	20026	25453	21893	24144

*Mark 23C has since been corrected at the time of this report. This mark no longer triggers settlement historically and the tilt reporting would reflect this. The data will be amended for the May 2025 Report.

Table 10f: SUPA

Mark	May 23 (1:X)	Nov 23 (1:X)	May 24 (1:X)	Nov 24 (1:X)
BM25	N/A	N/A	N/A	N/A
34H	9912	9955	11841	12089
2.10	2381	2764	15459	5797
34C	2784	2931	10901	4421
34GC	4635	4777	4721	4835
19BB	1825	1844	1816	1755
19CB	10077	10226	9587	8906
21O	1579	1607	1712	1620
20C	4751	3793	4049	3298
20D	3732	2910	3411	3171
BM20A	1359	1377	1543	1507

Table Key:

Monitoring mark located above mine workings.
Tilt greater than 1:1000 observed.

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 conditions. There were two complaints received during 2024 in relation to dewatering or settlement.

One complainant was concerned about ‘slumping’ at the back of their section. OGNZL personnel inspected the property and found a deteriorating retaining wall. Access was arranged from the neighbouring OGNZL property and the retaining wall was replaced.

The other complainant was worried about some cracking to the interior of their property and had noticed the ceiling was slumping. The property was inspected by a registered building inspector who advised that the damage was not mine related.

10 CONTINGENCY ACTIONS

As discussed in section 6.2.4, two triggers were reached for the piezometers monitoring groundwater levels in the upper Rex area.

A 2.75mRL decrease in water level was identified at piezometer P113A (74m deep), for the period 25 September 2024 to 22 October2024. This level change occurred at a piezometer tip located in the Andesite and is therefore not considered to represent a significant anomaly.

A 2.93mRL decrease in water level was identified at piezometer P114 (55m deep), for the period 23 October 2024 to 23 December 2024. This is a two-month period and was believed to be related to a water inflow event associated with unravelling of weak rock mass. The area was treated with resin injection through self-drilling anchors to decrease water inflow and stabilise the area. P114 is on telemetry and communications had been malfunctioning so it was not possible to determine if the decrease was over one month. The communications issue was subsequently resolved.

11 WATER QUALITY RESULTS

11.1 Underground Water Quality

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

The only backfilled mine workings that are 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 7.1 units and 262 mS/m respectively. Sulphate values averaged 1662 g/m^3, iron averaged 4.9 g/m^3 and manganese 9.3 g/m^3. Other metal concentrations were low (Appendix E).

Underground sites were sampled six times in 2024. These included:

- 800 level PC1 bore x4
- 800 level PC2 bore x2

The composite underground mine water was sampled monthly throughout the period.

Figure 54 to Figure show water quality results and 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, while 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.

Treated water is used as service water underground, as discussed in Section 5. Treated water quality is extremely consistent as it needs to comply with water quality parameters prior to river discharge. In 2024 service water made up 8% of the dewatering volume total and is unlikely to have any effect on groundwater quality. Water quality results are provided in Appendix E.

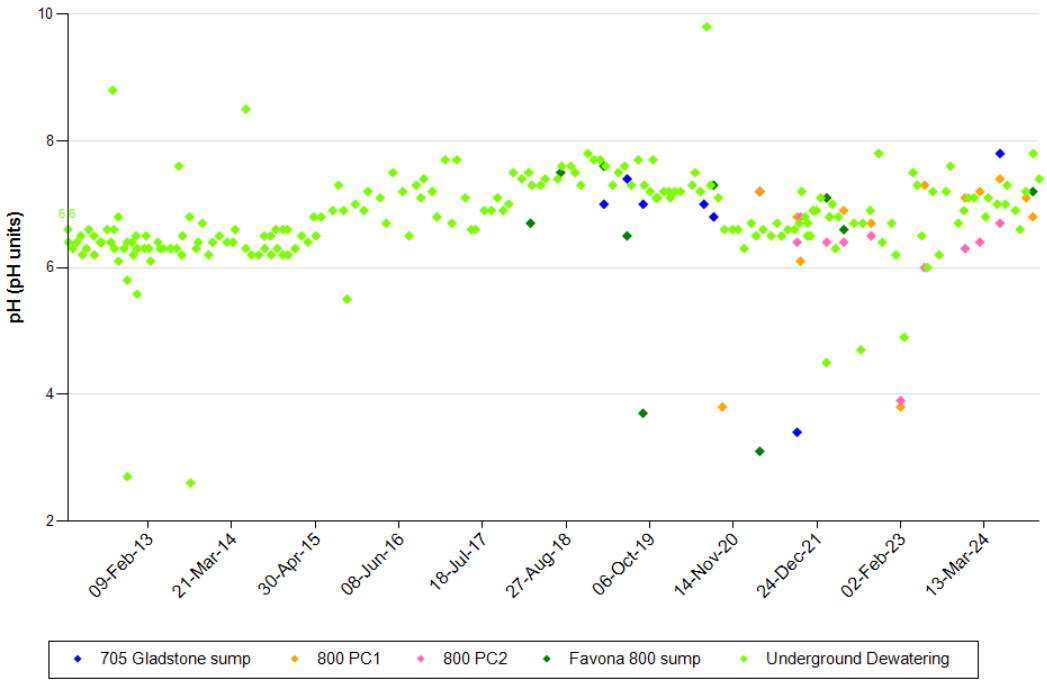


Figure 54. Underground sample sites – summaries of pH results.

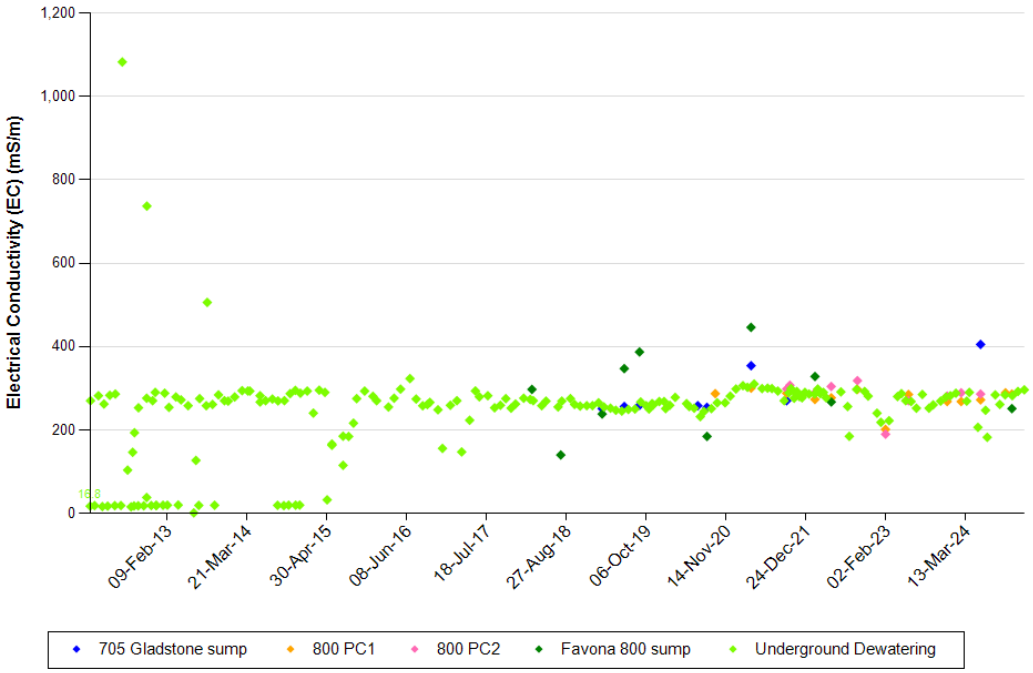


Figure 55. Underground sample sites – summaries of EC results.

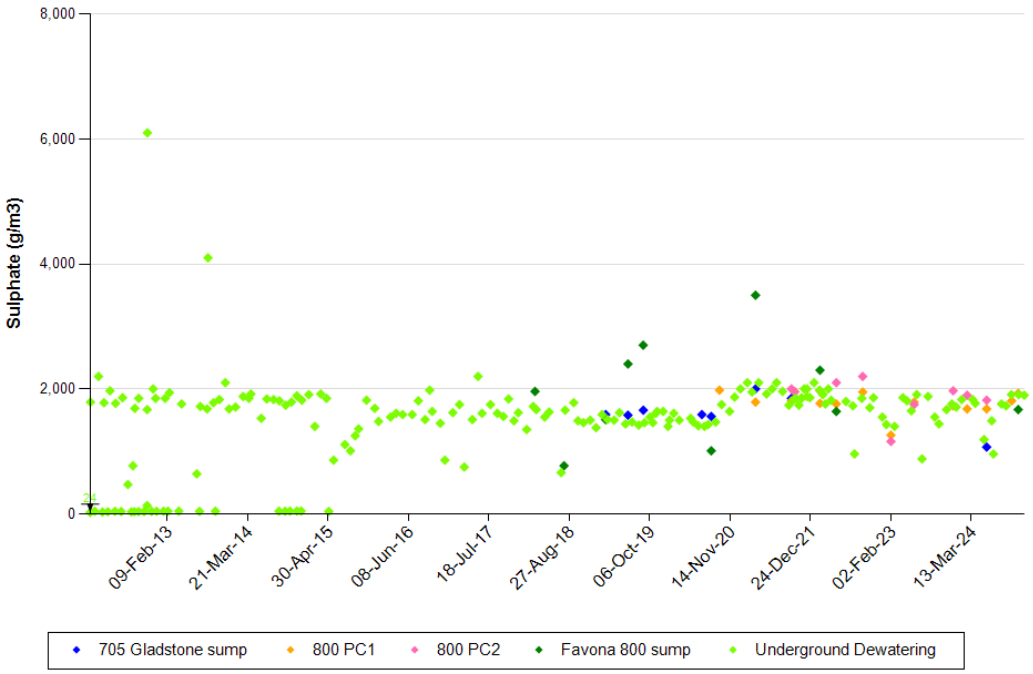


Figure 56. Underground sample sites – summaries of Sulphate results.

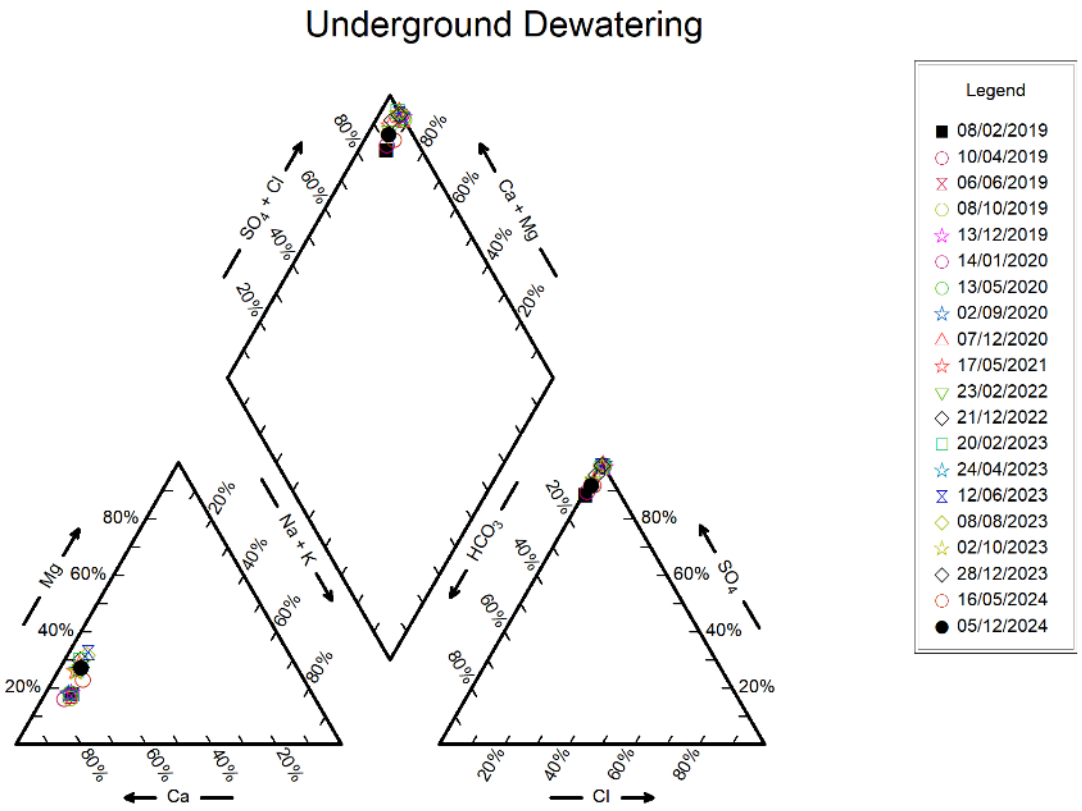


Figure 57. Martha Underground dewatering piper diagram.

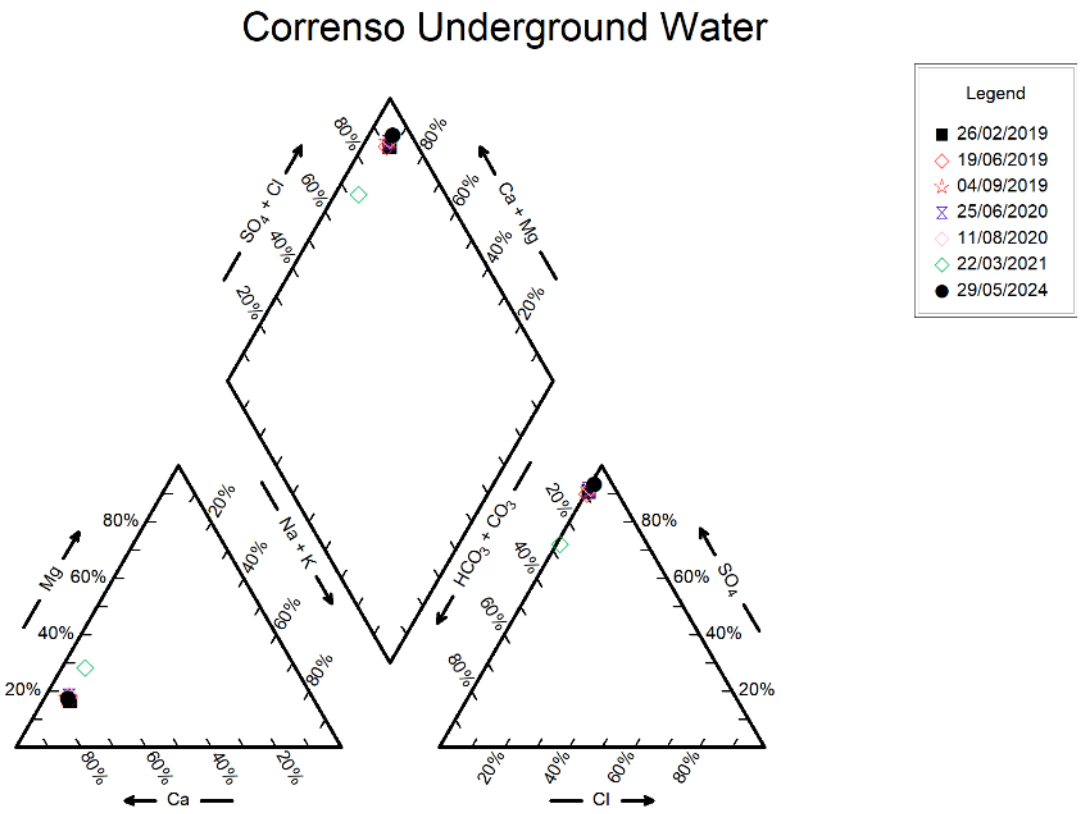


Figure 58. Correnso Underground piper trilinear diagram.

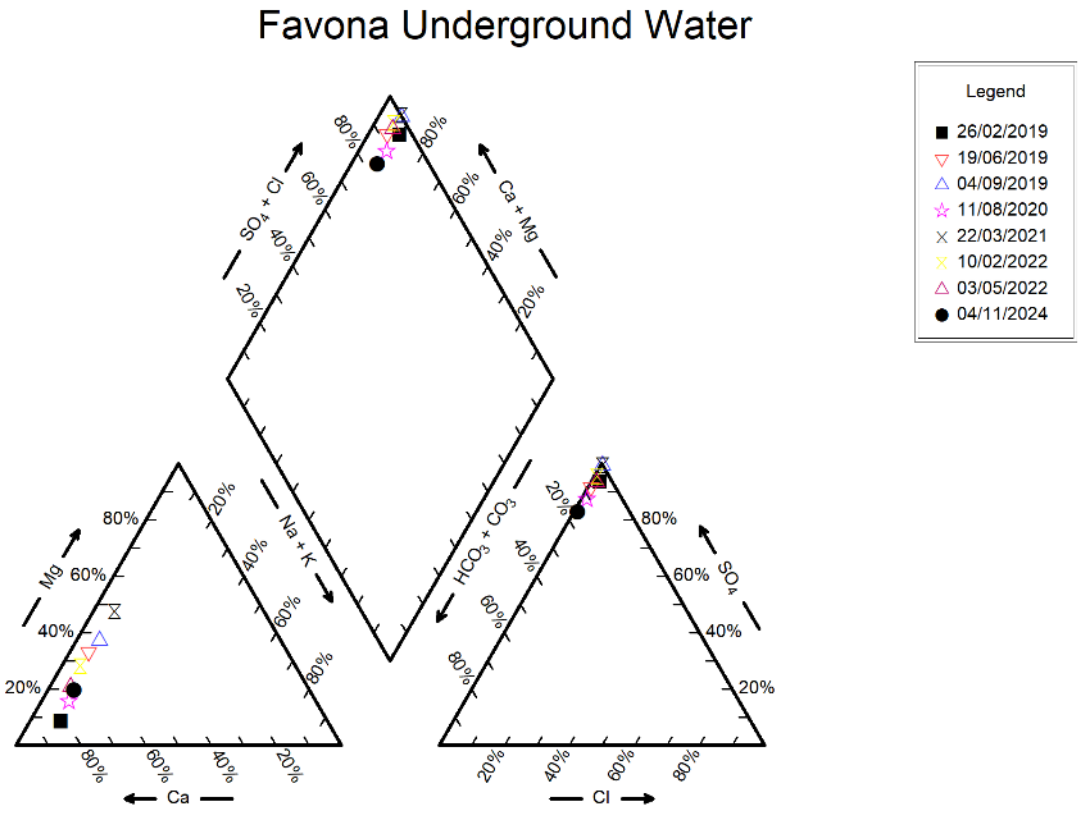


Figure 59. Favona Underground piper trilinear diagram.

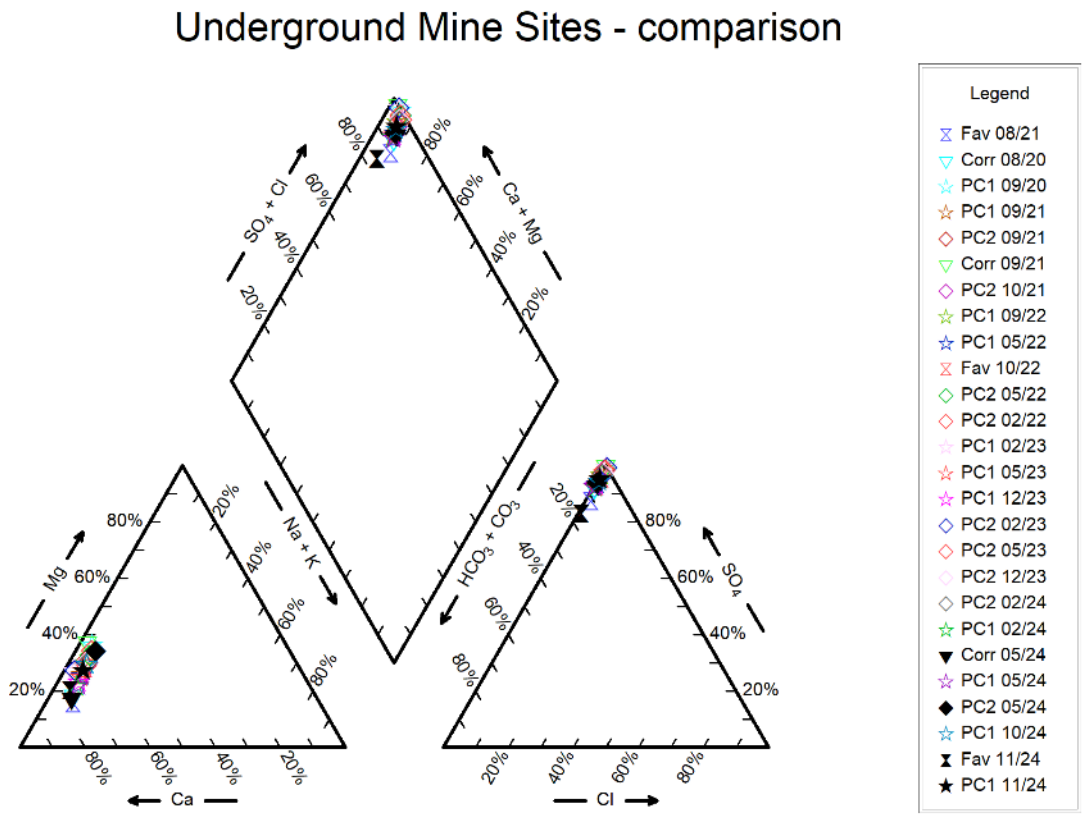


Figure 60. Underground comparison water piper trilinear diagram.

11.2 Martha Piezometer Water Quality

Two rounds of groundwater sampling (Autumn and Spring), from seven standpipe piezometers, were completed in 2024. The autumn results were included in the Shallow and Deep Aquifer Report 2024. Full results of groundwater quality will continue to be presented in this five-yearly report. Summarised results for 2024 are presented below in Table 11.

Table 11. Martha Standpipe Piezometer Water Quality Results 2024.

Well ID	Geological Unit	Number of Samples	Average pH	Average EC (mS/m)	Average SO_4 (g/m^3)	Average Fe (g/m^3)	Average Mn (g/m^3)
P2-4	Alluvium	2	7.8	22.3	6.5	0.03	0.131
P8-4	Alluvium	2	6.9	14.1	3.5	4.55	0.425
BH6	Younger Volcanics	3	6.7	12.5	2.3	0.75	0.420
BH7	Younger Volcanics	1	6.2	9.8	16.0	0.07	0.012
BH9	Younger Volcanics	2	5.8	6.3	5.5	0.02	0.038
BH11	Younger Volcanics	2	5.4	8.9	18.0	0.05	0.118
BH12	Younger Volcanics	2	7.2	17.7	21.5	0.10	0.302

12 FUTURE DEWATERING PREDICTIONS

During the 2021 peer review process it was identified 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.

The MUG dewatering model has been developed based on the historic mining records and is described in detail in the GWS (June 2022) report. The same analytical model has been used to provide updated water volumes. In summary, the peak dewatering requirements are from August 2024 to January 2026 with a pumping rate of 3,905 m3/d required to lower the groundwater level in the working by 100 m to 550 m RL. To hold the groundwater level at that elevation an ongoing dewatering rate of 2,100 m3/d would be required through to January 2029.

13 IMPROVEMENT ACTIVITIES

Works that have been undertaken at the site during 2024 to improve environmental monitoring performance include:

- Developed a closure related groundwater quality baseline monitoring program and commenced sampling.
- Further review of the Martha piezometer network to assess effectiveness.

Proposed improvement activities to be undertaken in 2025 include:

- Review and ground truth for suitability the monitoring wells recommended by WWLA for water quality sampling.
- Develop Conceptual and Numerical groundwater models to assist with predicting dewatering impacts post closure.
- Installation of a second underground piezometer to assist in identifying the extent of drawdown across the underground workings, and also provide a backup if the first underground piezometer (ROW17 VWP) fails.
- Installation of a new multilevel piezometer located to the southwest of the Martha Pit along strike of the Martha vein system.
- Investigate accessing three private wells (two northeast and one southwest of the Martha Pit along strike of the Martha vein system) for groundwater monitoring going forward.

14 REVIEW RECOMMENDATIONS 2024

This section summarises the review recommendations from the Peer Reviewer (David Whiting), Hauraki District Council (Peter Fuller), and Waikato Regional Council (Alan Pattle) on the 2023 report, and how they have been or are going to be addressed.

14.1 Peer Reviewer

Table 12. 2024 Peer Review preliminary comments and actions.

PR Ref	Report Ref	Comment	Action
2.1		Overall comment on report.	NA
2.2		"Introduction" – missing Section number	Updated to section 1.
2.3	s. 1	Suggest rewording the third sentence in second paragraph to the following to better define Cumulative Rainfall Departure. *"The CRD is calculated by determining the mean of the rainfall for the period in question, subtracting the mean from each data point to determine the departure from the mean, and accumulating the resultant departures."* The cyclonic events in January – February 2023 influenced the high rainfall totals for these months and suggest this should have been stated in the text.	Updated with suggested wording.
2.4	s. 3.2	Figure 3 – Missing "Favona" boundary in legend. Suggest indicate that Favona is not current being mined in legend.	Figure 3 updated to include Favona boundary and current workings.
2.5	s. 4	General comment on Section 4 - Dewatering	NA
2.6	s. 4.1	General comment on Section 4.1 – Future dewatering	NA
2.7	s. 5.3	Section 5.3. "Groundwater Results" - Suggest update this section to include the real time logging of piezometers P111, P112, P113 and P114 to monitor response from shallow Rex orebody mining. Also suggest state the water level loggers equipped in standpipe piezometers P113 and P114.	Section 6.1, updated as suggested.
2.8	s. 5.3.2	In the text there is no reference to Figure 12 "Groundwater level trends – shallow groundwater". There appears to be missing water level hydrographs of some of the active piezometers (for example: P93-1, P94-1, P101-1 and P102-1) on Figure 12. No reason has been provided for the selected piezometers shown on Figure 12. The Peer Reviewer assumes that piezometers that are not currently active have been removed from the Figure, as they contribute minimal information to current water level trend conditions, and they make the graph busy.	Figure 12 shows the piezos that were actively monitored in 2024. Text has been updated to state this.

PR Ref	Report Ref	Comment	Action
2.9	s. 5.3.3	Last paragraph. The piezometer P123 does not have VWP sensor tips within the young volcanics and should be excluded under this section heading as irrelevant.	Updated to make it clear that P123 has no sensor tips in the Young Volcanics.
2.10	s. 5.3.4	”In the fourth paragraph there is stated: *“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.”* This section in the report needs to be amended to include deep depressurisation to the north – northwest of the pit as is evident by readings from the new multilevel piezometer P123. A desktop study by GWS Ltd a couple of years back did not find conclusive evidence of a major fault behind the north-northwest wall. The shallow sensor in P123 does not appear to show dewatering effects, however, the deeper VWP sensors show significant depressurisation. This depressurisation affect at depth maybe from drainage from historic workings, sub-horizontal drains, or along veining in the pit wall, or possible faults connected to the pit. The extent of this deep depressurisation to the north – northwest is unknown. The depressurisation at depth at the location of P123 is shown on the Conceptual Hydrogeological Sections 1 and 3 in Appendix F. In Section 5.3.4 you may need to refer to Section 5.3.5 “Martha Groundwater Assessment” for a more specific discussion of P123 sensor tip responses. The Peer Reviewer recommend in future to present two sensor tip responses (shallow P123-1 and deep P123-3) on Figure 17 “Andesite water level trends”. The P123-4 sensor tip response has been excluded for presentation on Figure 17 as this would require rescaling the Y axis which would result in loss in graph resolution.	Updated commentary on the deep depressurisation to the north – northwest of the pit has been provided by WWLA. Figure 18 “Andesite water level trends” updated to include two sensor tip responses (shallow P123-1 and deep P123-3).
2.11	s. 6.3.5	The Peer Reviewer suggests including a separate Figure in this section which provides P107 to P110 and P113A – P116 water level hydrographs. It is difficult for the reader to discern the piezometer water levels on Figure 15 due to the number of piezometer plots.	New figure added
		The Peer Reviewer notes pressure readings of P112 VWP in the young volcanics is 1m above the sensor tip. The absence of a flat steady line for the time series data may indicate the sensor is not indicating dry conditions. The response shows subtle variations, which may be a very subdued delayed response from rainfall events. Nevertheless, there needs to be caution exercised with accepting the results as it may be possibly dry. If dry then the VWP sensor is not appropriate to be assigned a trigger level response for shallow Rex orebody mining.	The P112-1 level continues to be within 1m of the sensor tip and is considered to be dry.

PR Ref	Report Ref	Comment	Action
		Project Martha Water Chemistry: The Peer Reviewer understands there is work in progress to meet Project Martha Consent condition 139551, and there has been issues with sampling some standpipe piezometers. The Peer Reviewer requests OGNZL/WWLA provide a list/plan of the standpipe piezometers to be sampled for baseline water chemistry at this point in time and include information if additional standpipe piezometers need to be installed.	2024 groundwater quality results are presented in section 11.2. WWLA have proposed additional standpipe piezometers which will be reviewed for suitability in 2025. This includes two new proposed standpipes.
2.12	s. 5.3.6	General comment on Section 5.3.6 – Favona Groundwater Assessment	NA
2.13	s. 5.3.8	The peer reviewer requests a Figure showing the location of these landholder bores relative to the mining and TSF operations is included in future reports.	The single landholder bore that is currently monitored is shown in Figure 10.
2.14	s. 14	The Peer Reviewer notes for recommendations: 8.3 b), 8.3 c) and 8.10 which recommends additional piezometers to be installed that OGNZL query the necessity of these works and the HDC geotechnical reviewer is in agreement. Point 8.3 c) and 8.10 are referring to the same proposed piezometer location, so the Peer Reviewer was suggesting two additional piezometers. The reasons for these additional piezometers can be discussed during the site visit. The reasoning for these piezometers is to fill gaps in the current network and track depressurisation in andesite and potential dewatering occurring in the young volcanics.	Refer to Table 13 regarding installation of additional piezometers.
2.15	s. 15	The Peer Reviewer understanding that works towards meeting these outstanding consent conditions have been commissioned in 2023/2024 with work already started in defining and ground truthing the feasibility of sampling standpipe bores for water chemistry sampling of shallow and deep aquifers.	Refer to Table 13 regarding water chemistry, and prediction of future impacts and post closure effects.
2.16	App F	The Peer Reviewer queries the presentation of No 9 veining intersecting the Young Volcanics on Figure 4 “Section 1 P90 Series Conceptual Section”. This is incorrect and it should truncate at the top of the andesite as the timing of the young volcanics are post mineralisation.	Figure 4 updated
		Description under Figure 6 Section 2 “P100 Series Conceptual Hydrogeological Section” states the following “The groundwater flow direction is oblique to parallel to the section orientation with most of the flow moving towards the Martha Pit in the west or Favona in the east.” Suggest rewording as follows:	Section text updated

PR Ref	Report Ref	Comment	Action
		"The groundwater flow direction is oblique to parallel to the section orientation with most of the flow in the Andesite moving towards underground workings and Martha Pit in the west or Favona underground workings in the east. Groundwater flow in the young volcanics is towards the Martha Pit in the west and also downward leakage."	
		The term "*overlying post mineralisation Andesite*" in the descriptive text implies the upper Andesite formed after mineralisation. Is this correct? From Figure 2 in the D&S report (see below) it appears that mineralisation does not occur in the upper Andesite in the west but occurs in the upper Andesite to the east associated with the Favona orebody. This requires to be clarified in the descriptive text accompanying the Conceptual Hydrogeological Sections.	Section text updated

Table 13. 2024 Peer Review Report recommendations and actions.

PR Ref	Report Ref	Recommendation	Action
8.3	NA	Additional piezometers to be installed to improve network coverage. These piezometers are listed in order of priority:	
		a) A second underground piezometer located below Empire orebody to track underground dewatering.	To be installed in 2025
		b) One multilevel piezometer located to the southwest of the Martha Pit along strike of the Martha vein system where there is an absence of groundwater monitoring infrastructure.	To be installed in 2025
		c) One multilevel piezometer in the andesite north of the Martha Pit.	OGL query the necessity. HDC geotechnical reviewer in agreement.
8.4	NA	Develop a numerical groundwater model for Martha Underground dewatering predictions and closure recovery predictions.	WWLA commissioned to develop a conceptual groundwater model as the first step in developing a numerical groundwater model. Both to be completed in 2025.
8.5	NA	Address editorial comments provided in the preliminary comments deliverable.	Addressed – refer to previous table.

PR Ref	Report Ref	Recommendation	Action
8.6	6.3.5	Include a separate figure in section 6.3.5 “Martha Groundwater Assessment” which provides P107 to P110 and P113A – P116 water level hydrographs. It is difficult for the reader to discern the piezometer water levels on Figure 15 due to the number of piezometer plots.	New figure added
8.11	6.3.8	Consider installing piezometers near private bores to confirm if future groundwater changes are directly influenced by mining activities.	A well search has been undertaken and three wells identified (two northeast and one southwest of the Martha Pit, along strike of the Martha vein system) that OGNZL will investigate monitoring going forward, subject to access arrangements.
8.12	12	Modelling is updated on a yearly basis which takes into account changes in mine planning and water management practices. Alternatively, a numerical groundwater model is developed and updated yearly based on mine planning data and recalibration.	Section updated with the latest information from the WWLA Technical Memo (MUG Dewatering Rate Predictions, 18 September 2024). Note: Depth of drawdown and inflows are derived based on the mining plan. Extent of drawdown is not assessed.
8.15	11	Summary of water chemistry results are included in the D & S annual report, possibly as a subsection in Section 10 or 11.	Summary of water chemistry results are included in section 11.2.
	15	Currently the DW&S Report does not have a section on Predicted Post Closure Effects. The Peer Reviewer recommends that a section on “Predicted Post Closure Effects” should be included in future DW&S Reports.	Improvement Activities for 2025 include developing Conceptual and Numerical groundwater models to assist with predicting dewatering impacts post closure.
8.16	6.3.6	Sampling of standpipe piezometers P76D, P76I, P77D and P77I should be included in the groundwater chemistry sampling program of aquifer systems.	These piezometers were not able to be sampled as the bore diameters are too narrow for sampling equipment.
8.17	App F	Conceptual hydrogeological sections should be updated on an annual basis when new data comes available, i.e. significant changes in piezometric levels, additional data from new installed piezometers, changes/additions to mine infrastructure.	Sections updated for 2024 report.

14.2 Hauraki District Council

Table 14. Hauraki District Council recommendations and actions

Report Ref	Recommendation	Action
pg14	As there is now access to the pit from underground, the first sentence in section 3.1 should be changed to “Access from the surface to Martha Pit …”.	Updated
pg14	Are the relatively new connections (via portals) between the underground and Martha Pit worthy of a mention?	Not updated as these have been in place since 2023.
pg 32	The last paragraph mentions the two new VWP’s, P122 and P123 and it would be helpful if reference could be made to their respective locations (Figure 13 for P122 and Figure 16 for P123) even though that occurs later in the text.	Cross references to Figures 13 & 16 added.
pg 33	The location of piezometer P112 has not been included in Figure 13 – this was requested in the response to the 2022 Dewatering and Settlement Monitoring Report.	P112 has been added to this figure.
pg 34	Figure 14 is illegible and should be removed if a clearer copy can’t be created.	Figure replaced with a clearer version.
pg 36	Is the last sentence about Favona piezometers being presented in Figures 18 to 35 correct?	Yes
pgs 43-44	It would be beneficial to include the conceptual hydrogeological sections in Appendix F in the main text as a summary of the overall hydrological conditions for the Martha area.	OGNZL’s view is that this supplementary report, produced by our groundwater consultant at the request of the peer review panel, sits best in the appendices.
pg 54	Is it possible to improve the resolution of the total settlement contour levels in Figure 38 so values can be read? Without that, Figure 38 has limited value in the report.	Zoomed in and higher resolution figures have been used.
pg 63	A minor typo in Section 6.2.4, paragraph 2, exceeded should be “exceed”.	Corrected
pg 67	New mark 34CB has not been included in Table 10b - this was requested in the response to the 2022 Dewatering and Settlement Monitoring Report.	34CB has been added for 2024 (both May & Nov)
pg 71	It would be helpful if a Figure (like Figure 47) showing the location and labels for markers relevant to Martha could be included ahead of Table 10.	New figure added
pg 99	Is condition 39 of the HDC Favona consent still relevant/worthy of inclusion?	Condition 39 of resource consent 85.020.326.E is included in Appendix A

Report Ref	Recommendation	Action
pg 41	The newly installed piezometer P123-1 measures water at just 12m below the surface behind the NW wall of Martha pit. This result seems unusual as Andesite extends to the surface on this western side and the source of the water is not mentioned in the report. If this extends closer to the north wall of Martha it may well have implications for pit wall stability for the wall further west from the current failure. I think both Peer Reviewers need to be advised of this result (assuming that hasn't already occurred) so they can consider its origin and implication to pit wall stability.	Peer Reviewers have been advised of this result via the 2023 report.
App D	While separate plots of piezo results have been included for the instruments above the Rex workings, results for settlement markers 34BE, 2.04B and 34CB are still 'buried' in the overall plot in the Figure for Zone 6 in Appendix D. Can we ask (again) that these be included separately, preferably in the main text where they refer to settlement above Rex?	A separate plot has been created for the REX settlement markers and included in Appendix D.

14.3 Waikato Regional Council

Table 15. Waikato Regional Council recommendations and actions

Report Ref	Recommendation	Action
App F	Review the sections presented in Appendix F (Figures 4, 6, 8) and extend them to edge of the basin	The sections have been extended to include only GLD04-D to retain vertical resolution.
App F	Develop a section along strike to show the likely largest extent of groundwater drawdown effects	New section (Figure 10) added to Appendix F.
6.3.8	Undertake a well search to identify users that could be affected by the pumping. Depending on the outcome that may lead to assessment of likely drawdown effects of any users identified and review of monitoring requirements for private wells.	A well search has been undertaken and three wells identified (two northeast and one southwest of the Martha Pit, along strike of the Martha vein system) that OGNZL will investigate monitoring going forward, subject to access arrangements.
	Install two additional monitoring wells within the lobe of alluvium under the urban area where previously P4-3, WC203-4 were operative	WC203-4 has been rediscovered and is now being monitored again. OGNZL is considering installing a shallow standpipe as

Report Ref	Recommendation	Action
		part of a new piezo installation southwest of the Martha Pit along strike of the Martha vein system.
5.3.1	It is noted in Section 5.3.1 of the report that as the result of a review of the groundwater monitoring network undertaken by GWS a number of new and replacement monitoring piezometers were installed in 2023 (including P122 as discussed above). A copy of the GWS review has not been sighted by this reviewer and would likely provide helpful information to support the comments made herein.	The GWS report was supplied to WRC on 07/02/25.

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 below in Table 16. Note that the Correnso/Golden Link take 124860 has been superseded by Project Martha Water Permit 139551.

Table 16. 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)	Full	Environmental Material Risk Management Plan – Water, December 2023

Description	Consent (Condition)	Compliance	Comment
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, June 2023
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.	(2)	Full	Defined in this document. 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.	(2)	Full	Section 6 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.	(2)	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.	(2)	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 8 Correspondence in Tilt Reports
a) explain the cause of the non-conformance,	(3)	Full	Section 8
b) agree with the Council on the appropriate settlement contingency measures to be implemented as described,	(3)	Full	Propose ongoing monitoring
c) implement settlement contingency measures as appropriate,	(3)	Full	Not considered necessary as on company owned farmland

Description	Consent (Condition)	Compliance	Comment
d) advise the Council on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.	(3)	Full	Propose ongoing monitoring
The report shall include at least the following information:	(4)	Full	
a) volume of groundwater abstracted	(4)	Full	Section 5
b) data from monitoring undertaken during the previous year including groundwater contour plans	(4)	Full	Section 6
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.	(4)	Full	Section 6 & 10
This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information.	(4)	Full	WWLA & OGNZL staff
d) any contingency actions that may have been taken during the year.	(4)	Full	Section 10
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.	(4)	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.	Schedule 1 (5)	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.	Schedule 1 (5)	Full	Defined in approved Plan

Description	Consent (Condition)	Compliance	Comment
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.	Schedule 1 (5)	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.	Schedule 1 (5)	Full	No inconsistency identified
Dewatering and Settlement Monitoring Report. The Report shall, as a minimum, provide the following information:	Schedule 1 (6)	Full	
i) volume of groundwater abstracted	Schedule 1 (6)	Full	Section 5
ii) data from monitoring undertaken during the previous year including groundwater contour plans	Schedule 1 (6)	Full	Section 6
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.	Schedule 1 (6)	Full	Section 6 & 10
This analysis shall be undertaken by a party appropriately experienced and qualified to assess the information.	Schedule 1 (6)	Full	WWLA & OGNZL staff
iv) any contingency actions that may have been taken during the year.	Schedule 1 (6)	Full	Section 10
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.	Schedule 1 (6)	Full	This section
Monitoring - Tilt:	Schedule 1 (7)	Full	
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:	Schedule 1 (7)	Full	Section 8
i) explain the cause of the non-conformance,	Schedule 1 (7)	Full	Section 10

Description	Consent (Condition)	Compliance	Comment
ii) agree with the Councils on the appropriate settlement contingency measures to be implemented,	Schedule 1 (7)	Full	Propose ongoing monitoring
iii) implement settlement contingency measures as appropriate,	Schedule 1 (7)	Full	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.	Schedule 1 (7)	Full	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:	Schedule 1 (7)	Full	This report
a) The volume of groundwater abstracted;	Schedule 1 (7)	Full	Section 5
b) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;	Schedule 1 (7)	Full	Section 6
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;	Schedule 1 (7)	Full	Annual Report reviewed by WWLA and Engineering Geology
d) Any contingency actions that may have been taken during the year; and	Schedule 1 (7)	Full	Section 10
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.	Schedule 1 (7)	Full	This section
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.	(4)	Full	Section 5
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.	(5)	Full	Latest plan June 2023

Description	Consent (Condition)	Compliance	Comment
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.	(5)	Full	Defined in plan iii) No significant flooded workings as yet
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.	(5)	Full	Defined in 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. 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.	(5)	Full	Plan June 2023
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:	(6)		This report
a) The volume of groundwater abstracted;	(6)	Full	Section 5
(i) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;	(6)	Full	Section 6
(ii) 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	(6)	Full	Section 6 & 10

Description	Consent (Condition)	Compliance	Comment
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;			
(iii) Any contingency actions that may have been taken during the year; and	(6)	Full	Section 10
(iv) 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.	(6)	Full	Section 15
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:	(7)	Full	Section 8
(i) explain the cause of the non-conformance,	(7)	Full	Section 10
(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,	(7)	Full	Propose ongoing monitoring
(iii) implement agreed settlement contingency measures as appropriate within the agreed time limit,	(7)	Full	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.	(7)	Full	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.	(8)	Partial	Pit sampling limited, dewatering sampled monthly. Favona and Correnso Underground WQ measured separately. Underground dewatering from Project Martha bores commenced.
Other Water Users	(9)	Full	

Description	Consent (Condition)	Compliance	Comment
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.			
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 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.	(14) (15) (16) (17)	Full	Dewatering and Settlement Monitoring Plan approved June 2023 (Conditions 14-18)

Description	Consent (Condition)	Compliance	Comment
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.	(18)		
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 d. Advise the Councils on the steps the consent holder proposes to take in order to prevent any further occurrence of the situation.	(19)	Full	Notification of tilts greater than 1:1000 provided in Tilt Report No non-conformances
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.	(20)		No significant anomalies identified
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:	(22)	Full	This report
a. The volume of groundwater abstracted;	(22)	Full	Section 5

Description	Consent (Condition)	Compliance	Comment
b. The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;	(22)	Full	Section 6
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;	(22)	Full	Sections 6, 7 and 10
d. Any contingency actions that may have been taken during the year; and	(22)	Full	Section 10
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.	(22)	Full	This section
f. The report shall be forwarded in a form acceptable to the Councils.			
Project Martha Groundwater take permit	**139551**		
Dewatering Level **1.** The exercise of this consent shall not result in groundwater lowering to a level below 500mRL.	(1)	Full	Groundwater level not lowered below 500 mRL.
MONITORING **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.	(2)	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.	(3)	Full	As above.

Description	Consent (Condition)	Compliance	Comment
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.	(4)	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.	(5)	N/A	
MONITORING OF THE SHALLOW AND DEEP AQUIFERS 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.	(6)	Full	Provided to Waikato Regional Council in July 2024
Favona Underground Mine HDC Land Use Consent	**85.020.326.E**		

Description	Consent (Condition)	Compliance	Comment
Settlement and De-watering Monitoring Report 39.The consent holder shall provide to the Council an annual Settlement and De-watering Monitoring Report. The report shall include at least the following information:	(39)		This report
a) The volume of groundwater abstracted;	(39)	Full	Section 5
b) The data from monitoring undertaken during the previous year, including groundwater contour plans (derived from the data) in respect of the piezometer network;	(39)	Full	Section 6
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;	(39)	Full	Section 6 & 10
d) Any contingency actions that may have been taken during the year; and	(39)	Full	Section 10
e) Comment on compliance with Conditions 33 - 38 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.	(39)	Full	Section 15

16 CONCLUSIONS

16.1 Dewatering

Monitoring of the groundwater levels and dewatering, ground surface settlement, ground surface tilt, and water quality in and around the Martha, Favona, Trio, Correnso, SUPA and Project Martha operations was undertaken by OGNZL during 2024 in accordance with the consent conditions and the approved monitoring plan.

By the end of 2024 the underground groundwater levels had been lowered to a maximum depth of approximately 636 mRL.

Groundwater levels remained stable in the Martha area during 2024, with an increase in piezometric levels in response to seasonal rainfall. Two triggers were reached during the monitoring period. A greater than 2m level change over one month occurred for both piezometer P113A (74m deep) and piezometer P114 (55m deep). These were reported to HDC and are discussed in more detail within the report.

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 young volcanic materials and overlying alluvium have not responded to the significant dewatering of the underlying vein-hosting 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.

16.2 Settlement and Tilt

Settlement monitoring, to assess any ground surface movement effects from groundwater changes, was conducted by OGNZL in May/June and November/December 2024. These settlement survey results indicated that 95.7% (330/345) of marks were within the predicted settlement ranges, based on the Project Martha predicted settlement. Of the greater-than-predicted settlements, five 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.

Variable settlement was measured across the Waihi Township settlement monitoring network through the 2024 monitoring period. This is considered to be a response to ongoing dewatering of structures within the deeper andesite of the Martha groundwater system. No widespread ongoing dewatering effects were observed in the young 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 of settlement 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).

16.3 Groundwater Quality

Some elevated trace metal results were measured during laboratory testing of underground water samples during the 2024 monitoring period. However, this is expected, and all underground water is currently collected and treated.

17 DEFINITIONS

Term	Definition
CEPA	Correnso Extensions Project Area
CRD	Cumulative Rainfall Departure
HDC	Hauraki District Council
MDDP	Martha Drill Drives Project
OGNZL	OceanaGold New Zealand Ltd
VWP	Vibrating Wire Piezometer
WRC	Waikato Regional Council
WWLA	Williamson Water & Land Advisory

18 REFERENCES

Davies B., 2002: A review of the structural framework and evolution of the Waihi District, Hauraki Goldfield, New Zealand. Unpublished Internal Report, Newmont.

Davies B., 2004: Updated structural environment for the Waihi District. Unpublished Internal Memorandum, Newmont.

Engineering Geology Ltd, 2008: East Layback Project – Ground Settlement. Technical Report for Newmont Waihi Gold, November 2008.

Engineering Geology Ltd, 2010: Proposed Trio Development Project – Assessment of Ground Settlement. Technical Report for Newmont Waihi Gold, June 2010.

Engineering Geology Ltd, 2012. Evidence of Trevor Matuschka at Correnso Hearing. Prepared for Newmont Waihi Gold, November 2012.

IGNS, 2002: Waihi Underground mine workings Stage II investigations Volume 2 – Figures. Prepared for Waihi Underground Mine Workings Technical Working Party. Client Report 2002/46, August.

GWS Ltd, 2010: Proposed Trio Development Project – Assessment of Groundwater Inflows and Throughflows. Technical Report for Newmont Waihi Gold, June 2010.

Newmont Waihi Gold, 2013: Favona Water Quality Monitoring, Annual Report 2013. Unpublished Internal Report, Newmont, October 2013.

URS, 2003: Favona Underground Mine Assessment of Groundwater Issues. Favona Underground Project (Document) 9, 19 March.

URS 2008; Martha Pit Lake – An Assessment of Water Balance and Water Quality. Technical Report for Newmont Waihi Gold, September 2008.

URS 2009; Martha Pit Lake – An Assessment of Water Balance and Water Quality. Technical Report for Newmont Waihi Gold, August 2009.

URS, 2009: Favona Temporary Stockpile – Water Quality Report.

WWLA, 2024: Martha Underground (MUG) and Wharekirauponga Underground (WUG) Dewatering Rate Predictions. Technical Memo for OGNZL, September 2024.

Appendix A Relevant Consent Conditions

Extract from conditions of Waikato Regional Council Resource Consents 109742 to 109746 (Favona), 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.

   The Plan shall be reviewed at least annually by the consent holder. 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.

   The Plan may form part of the Water Management Plan associated with consent numbers 971311, 971318-971320, W1742 and W1743.

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

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 85.020.326.E (Favona), as pertaining to Dewatering and Settlement:

Settlement, Dewatering & Water Quality Monitoring Report

39. The consent holder shall provide to the Council an annual Settlement and De-watering 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 Conditions 33 – 38 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 (Trio), 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 for Trio – 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 (Correnso), 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 (Correnso), 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

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 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
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.

21. 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.

22. 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

23. 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.

Appendix B Surveyor Reports

MEMORANDUM

TO: **MARK BURROUGHS**

FROM: **BRUCE MORRISON**

DATE: **26TH JUNE 2024**

SUBJECT: **GROUND SETTLEMENT MONITORING -MAY 2024**

Introduction

This report outlines the results from the May 2024 Ground Settlement Monitoring Survey.

Field Method

The settlement monitoring marks were levelled during May and June 2024, for OceanaGold by myself utilising a surveyor Jason Kerr, and an experienced *Kauri Gold* assistant under my supervision.

Equipment used for this 'May 2024' event was a new LEICA LS15 0.3 electronic digital level (SN 710477) paired with the LEICA 3 section 4.05 metre fibreglass bar coded GKNL4F staff. To minimise 'windage', the staff was typically used in 2 section 'mode'. 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-six 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
May 2023	+14.1	+10.7
Nov 2023	+14.4	+10.2
May 2024	+13.3	+4.9

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 1PA was again missed owing to a road gravel heap over it. Mark 3.16 was missed owing to a gravel heap over this mark.

Mark 2.18 was again missed as it was under the same large pile of tree prunings at the time of this survey.

Marks 18F, F07A, F09A, and F14C have been lost. New marks 18FB and F09B have been established.

Results

Two A1 plans are attached -one (T20240625A) 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.

The second A1 plan "Total Settlement Contours" (T20240625B) shows the contours (in 20 millimetre intervals) deduced from the settlement marks. The locations of these settlement marks are shown with black 'stars'.

The first A1 plan "Total Settlement Values" (T20240625A) 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 (1:114) 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 0.1859 metres of relative vertical movement to give a gradient of 1:682. The distance between marks BM20A and 20D using GPS measurements, calculates at 137.047 metres, and shows 0.1567 metres of relative vertical movement to give a gradient of 1:874. The distance between marks 20C and BM20A, when checked by GPS measurements, calculates at 126.865 metres, and show 0.1272 metres of relative vertical movement to give a gradient of 1:997.

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.

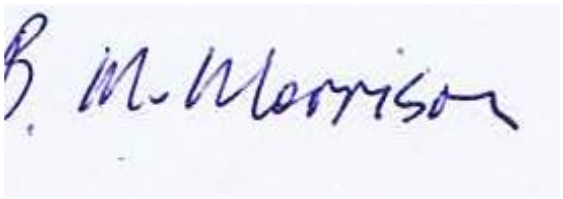
The comments included below attempt to explain the probable reason for 'excess' movement. The comments are *Dist'd* for BM20 in Zone 6. For Zone4, 7 of the 8 marks are near Zone 5. For Zone 3, 6 of the 6 marks

are located near Zone 4 or Zone 5. For Zone 2, 12 of the 14 marks are located near Zone 3 or Zone 4. For Zone 1, 2.44 is *Dist'd,* 10 of 13 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 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 May-24	Comments
1	Zone7	BM19B	1/05/2024	2117.17	1244.355	35.5198	-0.3462	
1	Zone7	19BB	1/05/2024	2191.56	1292.022	35.5157	-0.3421	
1	Zone7	17CB	1/05/2024	2014.23	1201.01	35.4512	-0.3224	
3	Zone6	BM20	1/05/2024	2342.50	1476.25	35.5639	-0.4169	Dist'd
1	Zone6	BM20A	1/05/2024	2345.50	1484.901	35.7409	-0.3363	
1	Zone6	19CB	1/05/2024	2296.71	1381.4	34.9086	-0.3213	
1	Zone6	17BB	1/05/2024	1919.52	1160.787	37.3395	-0.2915	
1	Zone6	17AB	1/05/2024	1841.32	1104.802	36.8617	-0.2536	
1	Zone6	34GC	1/05/2024	2211.33	1119.517	32.1214	-0.2304	
1	Zone6	2.04B	1/05/2024	1893.21	968.34	29.0718	-0.219	
1	Zone6	34H	1/05/2024	2233.59	970.561	32.1455	-0.2016	

1	Zone6	2.10	1/05/2024	2143.92	950.387	30.2676	-0.2013
1	Zone6	18EE	1/05/2024	1750.73	809.328	23.4252	-0.1962
1	Zone6	34AD	1/05/2024	1470.88	886.92	29.7534	-0.1934
1	Zone6	18C	1/05/2024	1494.95	767.19	27.4617	-0.1932
1	Zone6	18IB	1/05/2024	1611.19	784.79	25.8241	-0.1913
1	Zone6	34BE	1/05/2024	1732.56	931.603	28.32	-0.1867
1	Zone6	10BC	1/05/2024	1560.13	1062.92	38.0897	-0.1779
1	Zone6	34CB	1/05/2024	1967.74	983.20	30.0288	-0.1777
1	Zone6	BM34	1/05/2024	1528.38	903.297	30.3089	-0.1742
1	Zone6	34FC	1/05/2024	2120.79	587.93	19.0338	-0.1722
1	Zone6	BM17A	1/05/2024	1724.44	1088.919	40.0201	-0.1681
1	Zone6	11AC	1/05/2024	1308.26	859.512	29.3298	-0.1671
1	Zone6	10AB	1/05/2024	1430.61	1036.998	34.989	-0.164
1	Zone6	18AB	1/05/2024	1632.39	667.733	22.133	-0.1584
1	Zone6	2.08B	1/05/2024	2289.75	782.64	24.5281	-0.1583
1	Zone6	2.11C	1/05/2024	2292.35	896.99	26.6085	-0.1552
1	Zone6	1.28B	1/05/2024	1987.03	447.706	12.0919	-0.153
1	Zone6	2.09C	1/05/2024	2228.35	868.63	28.6369	-0.147
1	Zone6	34I	1/05/2024	2229.55	765.534	28.4594	-0.1388
1	Zone6	2.06	1/05/2024	2351.95	334.473	11.2723	-0.1294
1	Zone5	20C	1/05/2024	2450.61	1413.86	36.2983	-0.2091
1	Zone5	21DC	1/05/2024	2573.96	1304.152	37.747	-0.1927
1	Zone5	20E	1/05/2024	2535.65	1542.672	37.0686	-0.1922
1	Zone5	A10B	1/05/2024	1298.62	1049.614	30.6776	-0.1892
1	Zone5	25D	1/05/2024	2547.05	1248.02	36.8525	-0.1883
1	Zone5	21O	1/05/2024	2527.37	1356.342	35.9889	-0.1869
1	Zone5	16BC	1/05/2024	1252.81	1336.473	39.4427	-0.1848
1	Zone5	25A	1/05/2024	2505.13	1203.768	35.9257	-0.1841
1	Zone5	25E	1/05/2024	2472.35	1162.013	34.7618	-0.1817
1	Zone5	20D	1/05/2024	2482.07	1473.478	36.5378	-0.1796
1	Zone5	BM25	1/05/2024	2424.91	1100.253	33.4691	-0.179
1	Zone5	24L	1/05/2024	2761.67	1181.326	39.3041	-0.1741
1	Zone5	10DC	1/05/2024	1279.04	1198.326	35.291	-0.1741

1	Zone5	BM16	1/05/2024	1418.09	1218.03	46.4225	-0.1719
1	Zone5	21N	1/05/2024	2623.25	1342.435	38.2776	-0.1714
1	Zone5	2.41	1/05/2024	3296.32	685.398	46.248	-0.1684
1	Zone5	25G	1/05/2024	2594.60	1149.415	37.5774	-0.1671
1	Zone5	25H	1/05/2024	2648.48	1232.956	38.9087	-0.167
1	Zone5	25CB	1/05/2024	2615.91	1190.496	38.2849	-0.1664
1	Zone5	25F	1/05/2024	2542.53	1116.24	35.9878	-0.1651
1	Zone5	10CB	1/05/2024	1222.46	1025.86	29.7696	-0.1625
1	Zone5	25B	1/05/2024	2497.67	1105.828	34.8168	-0.1602
1	Zone5	12CE	1/05/2024	1499.92	543.077	20.9753	-0.1601
1	Zone5	BM12	1/05/2024	1370.27	607.735	23.9487	-0.158
1	Zone5	24AC	1/05/2024	2743.58	1218.9	40.0775	-0.1579
1	Zone5	2.03	1/05/2024	1930.08	745.94	22.5863	-0.1571
1	Zone5	13AC	1/05/2024	1751.98	327.376	18.588	-0.1569
1	Zone5	34EB	1/05/2024	2073.93	705.952	24.6307	-0.1569
1	Zone5	25I	1/05/2024	2537.20	1045.036	34.6769	-0.1558
1	Zone5	18G	1/05/2024	1669.05	554.602	18.4682	-0.1546
1	Zone5	24DC	1/05/2024	2718.29	1323.127	39.6265	-0.1543
1	Zone5	21C	1/05/2024	2651.57	1389.816	38.4579	-0.1543
1	Zone5	24F	1/05/2024	2772.80	1257.274	40.1201	-0.1536
1	Zone5	22F	1/05/2024	2815.91	1325.407	40.2242	-0.1533
1	Zone5	24E	1/05/2024	2758.43	1303.234	40.355	-0.1531
1	Zone5	18B	1/05/2024	1510.36	650.578	23.5543	-0.1527
1	Zone5	BM24	1/05/2024	2794.55	1279.361	40.3909	-0.1522
1	Zone5	24K	1/05/2024	2783.89	1387.719	40.6061	-0.1518
1	Zone5	1.28A	1/05/2024	1888.26	505.887	13.2041	-0.1514
1	Zone5	34D	1/05/2024	2038.90	783.431	25.3348	-0.1513
1	Zone5	24G	1/05/2024	2705.96	1170.464	39.7922	-0.1506
1	Zone5	20AC	1/05/2024	2461.04	1536.905	37.0087	-0.1504
1	Zone5	2A	1/05/2024	1069.03	1111.858	23.7942	-0.1486
1	Zone5	21EB	1/05/2024	2799.95	1429.087	41.6257	-0.1479
1	Zone5	BM18	1/05/2024	1771.96	674.528	19.4234	-0.147
1	Zone5	12DC	1/05/2024	1596.95	435.491	19.96	-0.1455

1	Zone5	12AC	1/05/2024	1388.32	488.888	19.0405	-0.1446	
1	Zone5	13BC	1/05/2024	1850.36	246.587	13.7164	-0.1446	
1	Zone5	24H	1/05/2024	2630.70	1072.279	36.1493	-0.1445	
1	Zone5	18HC	1/05/2024	1821.52	466.47	14.8834	-0.1445	
1	Zone5	24J	1/05/2024	2749.39	1365.756	40.2267	-0.1444	
1	Zone5	20BB	1/05/2024	2533.26	1622.291	37.8687	-0.1424	
1	Zone5	24B	1/05/2024	2667.67	1126.399	39.3796	-0.1417	
1	Zone5	15A	1/05/2024	1204.79	818.863	28.7678	-0.1409	
1	Zone5	21M	1/05/2024	2694.90	1439.648	39.1766	-0.1389	
1	Zone5	AP22A	1/11/2023	1868.44	188.565	12.4012	-0.1378	
1	Zone5	1.10B	1/05/2024	1597.98	284.28	16.7772	-0.137	
1	Zone5	12BC	1/05/2024	1405.27	368.295	14.911	-0.1367	
1	Zone5	15BC	1/05/2024	1169.90	708.855	26.3288	-0.1361	
1	Zone5	20F	1/05/2024	2605.79	1575.98	37.5655	-0.1361	
1	Zone5	BM13	1/05/2024	1426.61	269.34	13.5703	-0.1348	
1	Zone5	11BB	1/05/2024	1348.57	710.573	26.9268	-0.1321	
1	Zone5	4DB	1/05/2024	1033.26	1550.66	32.246	-0.1318	
1	Zone5	BM21	1/05/2024	2654.80	1515.397	39.4216	-0.1318	
1	Zone5	21K	1/05/2024	2681.11	1572.207	39.9941	-0.1312	
1	Zone5	21BC	1/05/2024	2719.27	1477.799	41.2645	-0.1304	
1	Zone5	2.17A	1/05/2024	3085.76	555.866	36.9017	-0.1278	
1	Zone5	4B	1/05/2024	1021.54	1448.629	31.2489	-0.1255	
1	Zone5	2BC	1/05/2024	970.20	1241.898	30.3812	-0.1248	
1	Zone5	30C	1/05/2024	2573.54	1675.395	38.4385	-0.1154	
1	Zone5	BM9B	1/05/2024	1220.25	1523.285	34.7469	-0.1105	
1	Zone5	7CB	1/05/2024	1161.74	1597.63	30.6077	-0.1081	
1	Zone5	AP3	1/05/2024	918.94	1140.585	26.0629	-0.1074	
1	Zone5	26F	1/05/2024	1392.77	1680.261	43.8553	-0.0846	
1	Zone5	26Q	1/05/2024	1963.00	1982.711	73.6687	-0.0824	
1	Zone5	26R	1/05/2024	1905.59	1927.165	71.3551	-0.0801	
1	Zone5	26PB	1/05/2024	1834.84	1893.106	67.9426	-0.08	
3	Zone5	18F	1/05/2024	1752.28	551.027	LOST	LOST	LOST
3	Zone5	18FB	1/05/2024	1794.53	557.104	15.9427	new mark	new mark
1	Zone4	23C	1/05/2024	2856.14	1068.014	37.5409	-0.2252	Nr Zone 5

1	Zone4	23AB	1/05/2024	3145.42	1078.73	37.1854	-0.1864	?
1	Zone4	22C	1/05/2024	2846.39	1352.544	40.3054	-0.1739	Nr Zone 5
1	Zone4	2.24	1/05/2024	2885.91	1215.469	41.2733	-0.1737	Nr Zone 5
1	Zone4	BANK1	1/05/2024	2866.21	1023.248	37.7859	-0.1684	Nr Zone 5
1	Zone4	23D	1/05/2024	2861.42	1154.885	38.8487	-0.1682	Nr Zone 5
1	Zone4	23E	1/05/2024	2774.82	972.514	37.6959	-0.1656	Nr Zone 5
1	Zone4	23F	1/05/2024	2700.77	968.793	36.6327	-0.1649	Nr Zone 5
1	Zone4	2.25	1/05/2024	2874.51	1097.261	37.9716	-0.1636	Nr Zone 5
1	Zone4	MATAURA1	1/05/2024	2831.84	1250.806	41.0601	-0.1597	
1	Zone4	22GB	1/05/2024	2862.88	1387.968	40.8367	-0.1575	
1	Zone4	2.13	1/05/2024	2725.42	874.951	47.1993	-0.1566	
1	Zone4	2.14A	1/05/2024	2853.28	838.669	41.3133	-0.1543	
1	Zone4	2.19B	1/05/2024	3270.21	916.063	38.5551	-0.1538	
1	Zone4	23B	1/05/2024	2856.49	949.794	38.7472	-0.1529	
1	Zone4	BARRY1	1/05/2024	3047.74	926.576	38.1126	-0.1522	
1	Zone4	MORTON	1/05/2024	2975.42	1231.913	40.7102	-0.1495	
1	Zone4	BARRY3	1/05/2024	3176.85	895.991	37.682	-0.1486	
1	Zone4	21P	1/05/2024	2849.17	1456.9	41.8379	-0.1454	
1	Zone4	BARRY4B	1/05/2024	3320.16	912.693	38.886	-0.1446	
1	Zone4	BARRY2B	1/05/2024	2937.67	943.59	38.5528	-0.1445	
1	Zone4	BARRY5	1/05/2024	3397.59	904.647	40.9902	-0.1422	
1	Zone4	1.11B	1/05/2024	1675.83	133.622	9.0212	-0.1418	
1	Zone4	22BC	1/05/2024	2916.75	1435.77	42.1	-0.1418	
1	Zone4	STAFORD	1/05/2024	3139.86	998.179	37.3124	-0.1418	
1	Zone4	BARRY6	1/05/2024	3432.52	904.356	42.4761	-0.1412	
1	Zone4	22E	1/05/2024	3055.20	1231.504	40.783	-0.1405	
1	Zone4	BM23	1/05/2024	3107.42	921.049	38.0867	-0.1404	
1	Zone4	2HB	1/05/2024	1078.24	886.849	24.3855	-0.1398	
1	Zone4	22I	1/05/2024	2918.98	1461.367	41.9094	-0.1398	
1	Zone4	22H	1/05/2024	2869.25	1441.796	41.618	-0.1388	
1	Zone4	2.16	1/05/2024	3007.62	739.64	33.5892	-0.1386	
1	Zone4	2.20	1/05/2024	3467.69	904.56	43.7839	-0.1372	
1	Zone4	2.23	1/05/2024	3560.02	1212.795	36.6356	-0.1369	
1	Zone4	22M	1/05/2024	2973.44	1434.656	41.6692	-0.1368	
1	Zone4	2.15	1/05/2024	2918.94	723.52	38.3618	-0.1351	

1	Zone4	22A	1/05/2024	3003.28	1429.771	41.6421	-0.1306
1	Zone4	22L	1/05/2024	3047.70	1499.876	40.9911	-0.1306
1	Zone4	BARRY8	1/05/2024	3592.28	871.451	37.9314	-0.1303
1	Zone4	BARRY7	1/05/2024	3518.87	901.897	43.6112	-0.1301
1	Zone4	CUBA	1/05/2024	3224.32	1079.177	35.8245	-0.1287
1	Zone4	GW	1/05/2024	3128.83	1140.936	38.5412	-0.1282
1	Zone4	AP100	1/05/2024	1893.80	81.273	11.7802	-0.1276
1	Zone4	22J	1/05/2024	2944.47	1489.763	42.4225	-0.1272
1	Zone4	BM2	1/05/2024	915.74	1091.799	24.8242	-0.1263
1	Zone4	2.22	1/05/2024	3339.13	1206.603	40.3516	-0.1262
1	Zone4	22D	1/05/2024	3100.02	1335.441	41.4505	-0.1256
1	Zone4	1.05	1/05/2024	1176.96	473.454	21.8139	-0.1255
1	Zone4	21FB	1/05/2024	2861.65	1512.211	42.645	-0.1253
1	Zone4	21L	1/05/2024	2806.79	1575.074	43.0823	-0.1215
1	Zone4	21AC	1/05/2024	2716.64	1617.767	39.6879	-0.1211
1	Zone4	2.29B	1/05/2024	2953.39	1548.172	42.587	-0.1198
1	Zone4	BM22	1/05/2024	3115.79	1442.952	40.6178	-0.1164
1	Zone4	2.27	1/05/2024	3379.40	1371.481	37.7542	-0.1164
1	Zone4	27KB	1/05/2024	2320.23	2120.206	63.3294	-0.1162
1	Zone4	1.26	1/05/2024	1926.81	30.053	15.0908	-0.116
1	Zone4	2GB	1/05/2024	922.38	967.661	22.6698	-0.1157
1	Zone4	26BE	1/05/2024	1408.78	1800.553	38.8108	-0.1153
1	Zone4	15C	1/05/2024	1156.82	571.077	24.2065	-0.1151
1	Zone4	21Q	1/05/2024	2899.60	1571.317	43.124	-0.1132
1	Zone4	1.06	1/05/2024	1159.34	302.26	17.2183	-0.1128
1	Zone4	21I	1/05/2024	2854.70	1668.793	41.6406	-0.1119
1	Zone4	22KB	1/05/2024	2981.80	1603.49	42.8472	-0.1095
1	Zone4	30BB	1/05/2024	2604.86	1726.50	41.546	-0.1089
1	Zone4	26CE	1/05/2024	1377.77	1711.891	40.5959	-0.1077
1	Zone4	21J	1/05/2024	2773.44	1688.923	39.9595	-0.1072
1	Zone4	21GC	1/05/2024	2901.12	1614.054	43.441	-0.1058
1	Zone4	2.31B	1/05/2024	3201.23	1637.289	42.091	-0.1023
1	Zone4	1.09B	1/05/2024	1344.14	117.48	9.923	-0.1021
1	Zone4	SM822	1/05/2024	2512.91	1841.132	41.4565	-0.1016
1	Zone4	27N	1/05/2024	2179.57	2075.985	71.911	-0.0996

1	Zone4	BM15	1/05/2024	976.94	783.004	20.5172	-0.0993	
1	Zone4	2.30B	1/05/2024	3000.35	1672.941	43.1691	-0.0985	
1	Zone4	27E	1/05/2024	2494.09	2171.622	50.3408	-0.0974	
1	Zone4	4.08	1/05/2024	2350.64	2022.324	73.2111	-0.096	
1	Zone4	21HC	1/05/2024	2916.84	1728.842	42.8802	-0.0958	
1	Zone4	7BB	1/05/2024	1105.69	1689.902	35.9365	-0.0908	
1	Zone4	26AE	1/11/2023	1432.47	1883.479	37.5432	-0.0896	
1	Zone4	4.07	1/05/2024	2554.47	2079.237	45.0468	-0.0863	
1	Zone4	3.01	1/05/2024	1291.95	1690.334	37.2936	-0.0859	
1	Zone4	4.05	1/05/2024	2809.68	1897.682	40.6156	-0.0858	
1	Zone4	3.04B	1/05/2024	1123.76	1821.498	39.2801	-0.0848	
1	Zone4	27H	1/05/2024	2413.27	2149.757	57.0265	-0.084	
1	Zone4	27J	1/05/2024	2344.14	2136.138	62.1323	-0.0836	
1	Zone4	BM30	1/05/2024	2715.36	1996.207	44.0834	-0.0802	
1	Zone4	26H	1/05/2024	1452.90	1729.593	49.9599	-0.0789	
1	Zone4	27F	1/05/2024	2466.48	2164.026	52.3179	-0.077	
1	Zone4	3.02	1/05/2024	1344.87	1837.735	34.9411	-0.0761	
1	Zone4	3.09	1/11/2023	1618.51	1870.174	51.9163	-0.0757	
1	Zone4	26MB	1/05/2024	1593.46	1750.66	58.9677	-0.0754	
1	Zone4	26JB	1/05/2024	1495.71	1756.55	53.7283	-0.0741	
1	Zone4	3.11A	1/05/2024	1786.17	1929.216	62.1483	-0.0738	
1	Zone4	30AB	1/05/2024	2685.64	1898.443	46.235	-0.0736	
1	Zone4	27DC	1/05/2024	2541.24	2190.709	48.1866	-0.0729	
1	Zone4	27AB	1/05/2024	2009.08	2064.33	73.4802	-0.0704	
1	Zone4	27L	1/05/2024	2280.24	2115.405	65.838	-0.0699	
1	Zone4	3.10A	1/05/2024	1689.03	1978.29	53.435	-0.0694	
1	Zone4	27O	1/05/2024	2101.57	2042.821	75.022	-0.0685	
1	Zone4	BM26	1/11/2023	1542.45	1837.805	45.4207	-0.0654	
1	Zone4	3.13	1/05/2024	1744.89	2097.492	53.7598	-0.0648	
1	Zone4	1.12B	1/05/2024	794.14	-73.011	11.0417	-0.063	
1	Zone4	26OB	1/05/2024	1706.93	1812.27	67.1804	-0.0544	
1	Zone4	3.6A	1/05/2024	1526.28	2015.74	38.9175	-0.0481	
3	Zone4	2.18	1/05/2024	3218.04	712.756	missed	missed	missed
1	Zone3	2CE	1/05/2024	774.75	1313.19	34.6066	-0.1193	Nr Zone 5
1	Zone3	2.34	1/05/2024	3452.45	1683.502	37.7018	-0.1115	Nr Zone 4

1	Zone3	14DB	1/05/2024	876.99	411.215	15.1471	-0.1067	Nr Zone 4
1	Zone3	A33C	1/05/2024	456.03	1219.226	35.8436	-0.0963	Nr Zone 5?
1	Zone3	2.36	1/05/2024	3433.14	1534.879	35.9191	-0.0961	Nr Zone 4
1	Zone3	1.25	1/05/2024	2175.94	-129.105	20.0507	-0.0953	Nr Zone 4
1	Zone3	2.40B	1/05/2024	3572.85	1526.452	33.1456	-0.0945	
1	Zone3	4.02	1/05/2024	2797.90	2143.571	45.755	-0.0941	
1	Zone3	2.33	1/05/2024	3294.51	1691.952	40.2997	-0.0932	
1	Zone3	4EC	1/05/2024	782.01	1687.78	41.1176	-0.0921	
1	Zone3	1.07	1/05/2024	924.43	267.487	12.4924	-0.0912	
1	Zone3	31BC	1/05/2024	3159.33	1954.857	45.4927	-0.0898	
1	Zone3	4A	1/05/2024	815.01	1494.154	40.6834	-0.089	
1	Zone3	BM31	1/05/2024	2967.04	1873.475	43.2766	-0.0889	
1	Zone3	2DA	1/05/2024	682.15	1189.579	35.7997	-0.0889	
1	Zone3	4.03B	1/05/2024	2794.90	2044.783	43.7926	-0.0883	
1	Zone3	15DB	1/05/2024	917.56	466.148	15.5932	-0.0868	
1	Zone3	2FC	1/05/2024	720.33	843.055	23.9212	-0.0853	
1	Zone3	4.01C	1/05/2024	2891.78	2113.146	47.2935	-0.0846	
1	Zone3	14EA	1/05/2024	808.56	504.723	17.0843	-0.0845	
1	Zone3	14CB	1/05/2024	759.10	389.766	18.8127	-0.0831	
1	Zone3	4.04	1/05/2024	2662.60	2131.765	45.9124	-0.0828	
1	Zone3	31AC	1/05/2024	3059.04	1910.629	44.0603	-0.0822	
1	Zone3	29DB	1/05/2024	2996.63	2106.664	47.7988	-0.0801	
1	Zone3	1.08	1/05/2024	1052.91	107.171	16.5194	-0.0794	
1	Zone3	1.21A	1/05/2024	1939.94	-325.504	19.6507	-0.079	
1	Zone3	14BC	1/05/2024	535.45	340.672	20.9068	-0.0787	
1	Zone3	2EB	1/05/2024	689.02	1054.621	29.2541	-0.0779	
1	Zone3	1.22	1/05/2024	1510.00	-249.925	15.8557	-0.0771	
1	Zone3	3.25	1/05/2024	3116.90	2107.056	49.8058	-0.0756	
1	Zone3	14FB	1/05/2024	705.60	649.144	20.1468	-0.0726	
1	Zone3	3.24B	1/05/2024	3012.46	2251.58	51.9874	-0.0681	
1	Zone3	29AC	1/05/2024	2641.62	2218.071	48.5105	-0.0654	
1	Zone3	29CE	1/05/2024	2891.84	2285.59	51.5658	-0.0638	
1	Zone3	29B	1/05/2024	2772.84	2242.217	49.9965	-0.0502	
1	Zone2	1K	1/05/2024	511.74	957.174	29.5917	-0.0773	Nr Zone 3
1	Zone2	7AC	1/05/2024	994.54	1781.823	43.516	-0.0759	Nr Zone 3

1	Zone2	3.03	1/05/2024	1134.46	1917.237	39.3398	-0.0751	Nr Zone 4
1	Zone2	3.14	1/05/2024	1752.75	2214.323	48.7516	-0.075	Nr Zone 4
1	Zone2	BM4	1/05/2024	689.21	1555.547	42.269	-0.0717	Nr Zone 3
1	Zone2	33F	1/05/2024	347.95	1511.678	42.0369	-0.0716	Nr4FBbelo
1	Zone2	3.12	1/05/2024	1599.68	2152.411	40.2572	-0.0706	Nr Zone 4
1	Zone2	4FB	1/05/2024	562.51	1370.97	39.3627	-0.0704	Nr Zone 3
1	Zone2	BM7	1/05/2024	1057.32	1843.069	44.1072	-0.0692	Nr Zone 4
1	Zone2	1C	1/05/2024	421.48	1098.886	34.7821	-0.0665	Nr Zone 3
1	Zone2	6A	1/05/2024	946.43	1928.115	47.502	-0.066	Nr Zone 4
1	Zone2	33E	1/05/2024	437.71	1437.524	40.9804	-0.0659	Nr4FBabov
1	Zone2	1JB	1/05/2024	604.79	822.761	26.4045	-0.0657	Nr Zone 3
1	Zone2	33A	1/05/2024	338.15	1303.893	36.713	-0.0656	Nr Zone 3
1	Zone2	1.04	1/05/2024	795.98	129.359	12.7953	-0.0636	
1	Zone2	1B	1/05/2024	337.50	1062.935	33.9951	-0.0621	
1	Zone2	3.07	1/05/2024	1362.08	2096.82	48.0381	-0.0611	
1	Zone2	1I	1/05/2024	468.34	761.228	27.2686	-0.0604	
1	Zone2	BM14	1/05/2024	718.16	485.955	19.8288	-0.0588	
1	Zone2	33DB	1/05/2024	265.40	1714.719	46.3598	-0.0586	
1	Zone2	BM6	1/05/2024	881.86	1837.081	46.2256	-0.058	
1	Zone2	5C	1/05/2024	705.43	1754.71	45.1601	-0.0569	
1	Zone2	33GA	1/05/2024	415.95	1621.638	45.3447	-0.0558	
1	Zone2	14AC	1/05/2024	515.17	457.622	24.0193	-0.0538	
1	Zone2	1FB	1/05/2024	210.46	850.779	29.8248	-0.0527	
1	Zone2	3.22A	1/05/2024	2891.15	2398.649	56.652	-0.0527	
1	Zone2	BM29	1/05/2024	2608.80	2400.756	55.9563	-0.0521	
1	Zone2	1EB	1/05/2024	388.60	912.09	30.4268	-0.0521	
1	Zone2	3.15	1/05/2024	1696.24	2315.821	39.0966	-0.0514	
1	Zone2	1HC	1/05/2024	299.70	702.8	27.0398	-0.0511	
1	Zone2	1A	1/05/2024	249.92	1026.38	33.3257	-0.05	
1	Zone2	1O	1/05/2024	-271.35	814.183	22.7077	-0.05	
1	Zone2	3.05	1/05/2024	966.29	1990.771	47.1827	-0.0497	
1	Zone2	1GB	1/05/2024	-2.87	769.742	29.2864	-0.0483	
1	Zone2	BM5	1/05/2024	325.93	1806.47	47.7981	-0.0473	
1	Zone2	1ME	1/05/2024	-155.40	879.887	26.0966	-0.0466	
1	Zone2	BM1	1/05/2024	152.75	994.869	32.7686	-0.046	

1	Zone2	33B	1/05/2024	156.88	1430.80	34.4074	-0.0456	
1	Zone2	5AC	1/05/2024	470.30	1688.454	47.0325	-0.0453	
1	Zone2	1.03B	1/05/2024	365.55	323.37	19.3817	-0.0435	
1	Zone2	1.01	1/05/2024	56.47	604.075	25.4438	-0.0431	
1	Zone2	33C	1/05/2024	222.53	1621.241	44.4055	-0.0426	
1	Zone2	1.02D	1/05/2024	85.42	283.3	18.6577	-0.0403	
1	Zone2	1RA	1/05/2024	-579.06	750.356	16.7301	-0.0377	
1	Zone2	1.14	1/05/2024	496.74	-535.095	8.4358	-0.0338	
1	Zone2	AP2	1/05/2024	-1276.40	954.13	5.767	-0.029	
1	Zone2	1.16	1/05/2024	1552.97	-1086.27	18.3549	-0.0231	
3	Zone2	1PA	1/05/2024	-351.51	787.24	missed	missed	missed
3	Zone1	2.44	1/05/2024	2734.64	421.025	27.2193	-0.6094	Dist'd
1	Zone1	2.05	1/05/2024	2535.68	272.682	20.7571	-0.123	Nr Zone 3
1	Zone1	31NE	1/05/2024	4349.43	1927.421	33.3235	-0.1051	?
1	Zone1	31LC	1/05/2024	4168.53	1862.106	32.0668	-0.1008	Nr Zone 3
1	Zone1	31FC	1/05/2024	3614.22	1954.15	43.4022	-0.0999	Nr Zone 3
1	Zone1	2.35	1/05/2024	3609.80	1652.681	34.0882	-0.0975	Nr Zone 3
1	Zone1	31HC	1/05/2024	3810.83	1924.65	40.306	-0.0895	Nr Zone 3
1	Zone1	31JD	1/05/2024	4005.65	1911.423	35.5324	-0.0881	Nr Zone 3
1	Zone1	31DD	1/05/2024	3400.43	1989.833	46.6722	-0.0877	Nr Zone 3
1	Zone1	31PC	1/05/2024	4393.52	1991.662	37.7047	-0.078	?
1	Zone1	31QC	1/05/2024	4417.71	2035.374	39.6003	-0.0754	?
1	Zone1	28AE	1/05/2024	2128.26	2448.76	85.9052	-0.0711	Nr Zone 2
1	Zone1	3.21	1/05/2024	2585.77	2493.375	64.9082	-0.068	Nr Zone 2
1	Zone1	3.30	1/05/2024	3296.29	2235.94	50.3652	-0.0575	Nr Zone 2
1	Zone1	3.26B	1/05/2024	3200.09	2347.92	55.4038	-0.0507	
1	Zone1	1.23	1/05/2024	1013.01	-440.769	13.2594	-0.0492	
1	Zone1	1.20B	1/05/2024	1995.49	-664.093	22.0243	-0.0482	
1	Zone1	1.24	1/05/2024	2225.16	-613.228	16.6861	-0.0475	
1	Zone1	3.23	1/05/2024	3035.80	2453.651	59.6115	-0.0461	
1	Zone1	3.29	1/05/2024	3662.64	2323.533	44.9052	-0.0453	
1	Zone1	AP1A	1/05/2024	4557.10	2288.33	42.4547	-0.0453	
1	Zone1	AP1	1/05/2024	4486.29	2137.008	41.3492	-0.0433	
1	Zone1	3.27B	1/05/2024	3148.37	2510.53	60.2696	-0.042	
1	Zone1	AP2A	1/05/2024	-766.18	738.506	12.3086	-0.0411	

1	Zone1	1.13	1/05/2024	591.36	-310.80	7.0514	-0.0411	
1	Zone1	1.27B	1/05/2024	1401.56	-701.57	15.3267	-0.0344	
1	Zone1	1UA	1/05/2024	-914.75	759.054	8.722	-0.0326	
1	Zone1	1.17B	1/05/2024	2082.20	-1093.92	25.5746	-0.029	
1	Zone1	AP24A	1/05/2024	2114.57	-1292.93	28.0476	-0.0276	
1	Zone1	1.15	1/05/2024	923.35	-995.413	14.3452	-0.0268	
1	Zone1	AP20No2	1/05/2024	-2303.63	731.69	20.185	-0.0202	
1	Zone1	BM28/2	1/05/2024	2282.46	2770.684	101.8814	-0.0043	
1	Zone1	AP19	1/05/2024	-3242.58	480.68	-6.5213	0	Control
1	Zone1	BUH5	1/05/2024	5480.15	2780.649	52.7029	0	Control
1	Zone1	C1	1/05/2024	2183.23	-1759.33	32.8139	0	Control
1	Zone1	3.16	1/05/2024	2195.60	2563.077	missed	missed	missed
3	Favona	F18	1/05/2024	3423.83	648.3	39.9448	-0.3866	dist'd?
3	Favona	F20	1/05/2024	3411.70	665.722	40.8757	-0.3284	dist'd?
1	Favona	F21	1/05/2024	3405.99	671.998	40.7182	-0.2951	
1	Favona	F17B	1/05/2024	3405.48	613.912	43.9456	-0.2939	
3	Favona	F24	1/05/2024	3388.13	690.846	40.5987	-0.2892	dist'd?
1	Favona	F22	1/05/2024	3399.79	678.393	40.6637	-0.2727	
1	Favona	F15C	1/05/2024	3297.17	585.319	57.305	-0.2115	
1	Favona	BLOCK-S	1/05/2024	3295.82	124.324	24.8059	-0.2061	
1	Favona	F16B	1/05/2024	3367.38	578.696	46.3613	-0.2047	
1	Favona	F26	1/05/2024	3374.47	705.541	40.5659	-0.2	
1	Favona	BLOCK-N	1/05/2024	3336.45	215.694	24.2763	-0.1867	
1	Favona	F10B	1/05/2024	3176.88	446.75	49.2446	-0.1835	
1	Favona	F12C	1/05/2024	3207.32	503.824	53.4711	-0.1817	
1	Favona	F34C	1/05/2024	3339.49	849.569	40.1604	-0.1801	
1	Favona	F28B	1/05/2024	3365.21	727.17	40.4869	-0.1728	
1	Favona	F30B	1/05/2024	3359.36	748.26	40.6739	-0.1636	
1	Favona	F08A	1/05/2024	3126.97	430.49	42.7209	-0.1566	
1	Favona	F32B	1/05/2024	3348.78	769.103	40.84	-0.152	
1	Favona	F35B	1/05/2024	3336.68	896.063	39.7507	-0.1465	
1	Favona	F06	1/05/2024	3107.08	445.21	40.475	-0.1428	
1	Favona	ITXCIVB	1/05/2024	2943.85	542.17	32.5826	-0.1401	
1	Favona	F02	1/05/2024	3097.60	490	38.1762	-0.1345	
1	Favona	FP1	1/05/2024	3004.15	131.25	45.388	-0.121	

1	Favona	TRIG 24	1/05/2024	3260.76	-615.678	25.6642	-0.0658	
1	Favona	TRIG 22	1/05/2024	3681.97	89.358	26.1301	-0.0599	
3	Favona	F07A	1/05/2024	3110.57	437.24	lost	lost	lost
3	Favona	F14C	1/05/2024	3275.29	551.312	lost	lost	lost
3	Favona	F09B	1/05/2024	3150.37	376.268	45.4118	new mark	New mark

MEMORANDUM

TO: **MARK BURROUGHS**

FROM: **BRUCE MORRISON**

DATE: **28TH JANUARY 2025**

SUBJECT: **GROUND SETTLEMENT MONITORING -NOVEMBER 2024**

Introduction

This report outlines the results from the November 2024 Ground Settlement Monitoring Survey.

Field Method

The settlement monitoring marks were levelled during November 2024, for OceanaGold by myself utilising a surveyor Jason Kerr, and an experienced *Kauri Gold* assistant under my supervision.

Equipment used for this 'November 2024' event was a LEICA LS15 0.3 electronic digital level (SN 710477) paired with the LEICA 3 section 4.05 metre fibreglass bar coded GKNL4F staff. 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-seven 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
May 2023	+14.1	+10.7
Nov 2023	+14.4	+10.2
May 2024	+13.3	+4.9
Nov 2024	+17	+1

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 1PA was again missed owing to a road gravel heap over it. Mark 21J has been lost to section development.

Marks 18F, F07A, F09A, and F14C have been lost. Marks 18FB and F09B established in May 2024 have deduced previous settlement applied.

Results

Two A1 plans are attached -one (T20250124C) 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.

The second A1 plan "Total Settlement Contours" (T20250124B) shows the contours (in 20 millimetre intervals) deduced from the settlement marks. The locations of these settlement marks are shown with black 'stars'.

The first A1 plan "Total Settlement Values" (T20250124C) 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 (1:114) is now occurring between BM20A and BM20 –sufficient to decide to omit BM20 from the settlement 'contour' calculation.

The total settlement 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 0.1891 metres of relative vertical movement to give a gradient of 1:670. The distance between marks BM20A and 20D using GPS measurements, calculates at 137.047 metres, and shows 0.1588 metres of relative vertical movement to give a gradient of 1:863. The distance between marks 20C and BM20A, when checked by GPS measurements, calculates at 126.865 metres, and show 0.1278 metres of relative vertical movement to give a gradient of 1:992.

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.

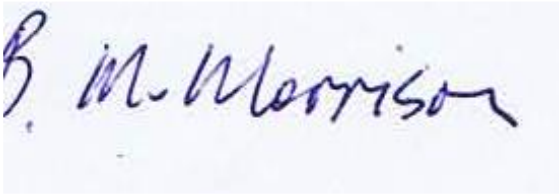
The comments included below attempt to explain the probable reason for 'excess' movement. The comments are *Dist'd* for BM20 in Zone 6. For Zone 4, 9 of the 10 marks are near Zone 5. For Zone 3, 13 of the 15 marks

are located near Zone 4 or Zone 5. For Zone 2, 20 of the 22 marks are located near Zone 3 or Zone 4. For Zone 1, 2.44 is *Dist'd,* 7 of 15 other marks are located near Zone 2 or Zone 5.

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 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-24	Comments
1	Zone7	BM19B	1/11/2024	2117.17	1244.355	35.511	-0.355	
1	Zone7	19BB	1/11/2024	2191.56	1292.022	35.508	-0.3498	
1	Zone7	17CB	1/11/2024	2014.23	1201.01	35.441	-0.3326	
3	Zone6	BM20	1/11/2024	2342.50	1476.25	35.559	-0.4218	Dist'd
1	Zone6	BM20A	1/11/2024	2345.50	1484.901	35.736	-0.3412	
1	Zone6	19CB	1/11/2024	2296.71	1381.4	34.902	-0.3279	
1	Zone6	17BB	1/11/2024	1919.52	1160.787	37.326	-0.305	
1	Zone6	17AB	1/11/2024	1841.32	1104.802	36.852	-0.2633	
1	Zone6	34GC	1/11/2024	2211.33	1119.517	32.117	-0.2348	
1	Zone6	2.04B	1/11/2024	1893.21	968.34	29.064	-0.2268	
1	Zone6	34H	1/11/2024	2233.59	970.561	32.142	-0.2051	
1	Zone6	2.10	1/11/2024	2143.92	950.387	30.264	-0.2049	

1	Zone6	18EE	1/11/2024	1750.73	809.328	23.418	-0.2034
1	Zone6	18C	1/11/2024	1494.95	767.193	27.453	-0.2019
1	Zone6	18IB	1/11/2024	1611.19	784.79	25.815	-0.2004
1	Zone6	34AD	1/11/2024	1470.88	886.92	29.749	-0.1978
1	Zone6	34BE	1/11/2024	1732.56	931.603	28.313	-0.1937
1	Zone6	10BC	1/11/2024	1560.13	1062.92	38.081	-0.1866
1	Zone6	34CB	1/11/2024	1967.74	983.202	30.023	-0.1835
1	Zone6	BM17A	1/11/2024	1724.44	1088.919	40.009	-0.1792
1	Zone6	BM34	1/11/2024	1528.38	903.297	30.304	-0.1791
1	Zone6	34FC	1/11/2024	2120.79	587.931	19.03	-0.176
1	Zone6	11AC	1/11/2024	1308.26	859.512	29.324	-0.1729
1	Zone6	10AB	1/11/2024	1430.61	1036.998	34.981	-0.172
1	Zone6	18AB	1/11/2024	1632.39	667.733	22.127	-0.1644
1	Zone6	2.08B	1/11/2024	2289.75	782.64	24.524	-0.1624
1	Zone6	2.11C	1/11/2024	2292.35	896.99	26.604	-0.1597
1	Zone6	1.28B	1/11/2024	1987.03	447.706	12.088	-0.1569
1	Zone6	2.09C	1/11/2024	2228.35	868.63	28.633	-0.1509
1	Zone6	34I	1/11/2024	2229.55	765.534	28.456	-0.1422
1	Zone6	2.06	1/11/2024	2351.95	334.473	11.271	-0.1307
1	Zone5	20C	1/11/2024	2450.61	1413.86	36.294	-0.2134
1	Zone5	20E	1/11/2024	2535.65	1542.672	37.063	-0.1978
1	Zone5	A10B	1/11/2024	1298.62	1049.614	30.671	-0.1958
1	Zone5	21DC	1/11/2024	2573.96	1304.152	37.744	-0.1957
1	Zone5	25D	1/11/2024	2547.05	1248.02	36.848	-0.1928
1	Zone5	16BC	1/11/2024	1252.81	1336.473	39.437	-0.1905
1	Zone5	25A	1/11/2024	2505.13	1203.768	35.922	-0.1878
1	Zone5	25E	1/11/2024	2472.35	1162.013	34.757	-0.1865
1	Zone5	21O	1/11/2024	2527.37	1356.342	35.99	-0.1858
1	Zone5	20D	1/11/2024	2482.07	1473.478	36.535	-0.1824
1	Zone5	BM25	1/11/2024	2424.91	1100.253	33.466	-0.1821
1	Zone5	BM16	1/11/2024	1418.09	1218.03	46.413	-0.1814
1	Zone5	10DC	1/11/2024	1279.04	1198.326	35.284	-0.1811
1	Zone5	21N	1/11/2024	2623.25	1342.435	38.275	-0.174

1	Zone5	25G	1/11/2024	2594.60	1149.415	37.574	-0.1705
1	Zone5	2.41	1/11/2024	3296.32	685.398	46.246	-0.1704
1	Zone5	25CB	1/11/2024	2615.91	1190.496	38.281	-0.1703
1	Zone5	25H	1/11/2024	2648.48	1232.956	38.906	-0.1697
1	Zone5	10CB	1/11/2024	1222.46	1025.855	29.763	-0.1691
1	Zone5	25F	1/11/2024	2542.53	1116.24	35.984	-0.1689
1	Zone5	24L	1/11/2024	2761.67	1181.326	39.31	-0.1682
1	Zone5	12CE	1/11/2024	1499.92	543.077	20.97	-0.1654
1	Zone5	BM12	1/11/2024	1370.27	607.735	23.943	-0.1637
1	Zone5	18FB	1/11/2024	1794.53	557.104	15.938	-0.1635
1	Zone5	25B	1/11/2024	2497.67	1105.828	34.814	-0.163
1	Zone5	2.03	1/11/2024	1930.08	745.943	22.581	-0.1624
1	Zone5	13AC	1/11/2024	1751.98	327.376	18.583	-0.1619
1	Zone5	34EB	1/11/2024	2073.93	705.952	24.628	-0.1596
1	Zone5	18G	1/11/2024	1669.05	554.602	18.464	-0.1588
1	Zone5	25I	1/11/2024	2537.20	1045.036	34.674	-0.1587
1	Zone5	24DC	1/11/2024	2718.29	1323.13	39.623	-0.1578
1	Zone5	18B	1/11/2024	1510.36	650.578	23.55	-0.157
1	Zone5	1.28A	1/11/2024	1888.26	505.887	13.199	-0.1565
1	Zone5	24AC	1/11/2024	2743.58	1218.90	40.079	-0.1564
1	Zone5	21C	1/11/2024	2651.57	1389.816	38.456	-0.1562
1	Zone5	2A	1/11/2024	1069.03	1111.858	23.787	-0.1558
1	Zone5	24K	1/11/2024	2783.89	1387.719	40.603	-0.1549
1	Zone5	22F	1/11/2024	2815.91	1325.407	40.223	-0.1545
1	Zone5	24E	1/11/2024	2758.43	1303.234	40.354	-0.1541
1	Zone5	34D	1/11/2024	2038.90	783.43	25.332	-0.1541
1	Zone5	24F	1/11/2024	2772.80	1257.274	40.12	-0.1537
1	Zone5	BM18	1/11/2024	1771.96	674.528	19.417	-0.1534
1	Zone5	BM24	1/11/2024	2794.55	1279.361	40.39	-0.1531
1	Zone5	20AC	1/11/2024	2461.04	1536.905	37.007	-0.1521
1	Zone5	21EB	1/11/2024	2799.95	1429.087	41.622	-0.1516
1	Zone5	24G	1/11/2024	2705.96	1170.464	39.792	-0.1508
1	Zone5	12DC	1/11/2024	1596.95	435.491	19.955	-0.1505

1	Zone5	24B	1/11/2024	2667.67	1126.399	39.372	-0.1493	
1	Zone5	12AC	1/11/2024	1388.32	488.888	19.036	-0.1491	
1	Zone5	13BC	1/11/2024	1850.36	246.587	13.712	-0.149	
1	Zone5	18HC	1/11/2024	1821.52	466.47	14.879	-0.1489	
1	Zone5	24J	1/11/2024	2749.39	1365.756	40.223	-0.1481	
1	Zone5	15A	1/11/2024	1204.79	818.86	28.761	-0.1477	
1	Zone5	24H	1/11/2024	2630.70	1072.279	36.147	-0.1468	
1	Zone5	20BB	1/11/2024	2533.26	1622.291	37.866	-0.1451	
1	Zone5	21M	1/11/2024	2694.90	1439.648	39.171	-0.1445	
1	Zone5	1.10B	1/11/2024	1597.98	284.28	16.772	-0.1422	
1	Zone5	BM13	1/11/2024	1426.61	269.34	13.563	-0.1421	
1	Zone5	AP22A	1/11/2024	1868.44	188.57	12.397	-0.1420	
1	Zone5	15BC	1/11/2024	1169.90	708.855	26.323	-0.1419	
1	Zone5	12BC	1/11/2024	1405.27	368.295	14.907	-0.1407	
1	Zone5	11BB	1/11/2024	1348.57	710.573	26.919	-0.1399	
1	Zone5	4DB	1/11/2024	1033.26	1550.66	32.238	-0.1398	
1	Zone5	20F	1/11/2024	2605.79	1575.98	37.562	-0.1396	
1	Zone5	BM21	1/11/2024	2654.80	1515.397	39.417	-0.1364	
1	Zone5	4B	1/11/2024	1021.54	1448.63	31.241	-0.1334	
1	Zone5	21K	1/11/2024	2681.11	1572.207	39.992	-0.1333	
1	Zone5	21BC	1/11/2024	2719.27	1477.799	41.262	-0.1329	
1	Zone5	2BC	1/11/2024	970.20	1241.898	30.374	-0.132	
1	Zone5	2.17A	1/11/2024	3085.76	555.866	36.901	-0.1285	
1	Zone5	30C	1/11/2024	2573.54	1675.395	38.435	-0.1189	
1	Zone5	BM9B	1/11/2024	1220.25	1523.285	34.74	-0.1174	
1	Zone5	7CB	1/11/2024	1161.74	1597.63	30.6	-0.1158	
1	Zone5	AP3	1/11/2024	918.94	1140.585	26.057	-0.1133	
1	Zone5	26F	1/11/2024	1392.77	1680.261	43.849	-0.0909	
1	Zone5	26Q	1/11/2024	1963.00	1982.711	73.663	-0.0881	
1	Zone5	26PB	1/11/2024	1834.84	1893.106	67.935	-0.0876	
1	Zone5	26R	1/11/2024	1905.59	1927.165	71.348	-0.0872	
1	Zone4	23C	1/11/2024	2856.14	1068.014	37.538	-0.2281	Nr Zone 5
1	Zone4	23AB	1/11/2024	3145.42	1078.732	37.183	-0.1888	?
1	Zone4	22C	1/11/2024	2846.39	1352.544	40.304	-0.1753	Nr Zone 5
1	Zone4	2.24	1/11/2024	2885.91	1215.469	41.273	-0.174	Nr Zone 5

1	Zone4	BANK1	1/11/2024	2866.21	1023.248	37.783	-0.1713	Nr Zone 5
1	Zone4	23D	1/11/2024	2861.42	1154.885	38.846	-0.1709	Nr Zone 5
1	Zone4	23E	1/11/2024	2774.82	972.514	37.697	-0.1645	Nr Zone 5
1	Zone4	2.25	1/11/2024	2874.51	1097.26	37.973	-0.1622	Nr Zone 5
1	Zone4	MATAURA1	1/11/2024	2831.84	1250.806	41.059	-0.1608	Nr Zone 5
1	Zone4	22GB	1/11/2024	2862.88	1387.968	40.834	-0.1602	Nr Zone 5
1	Zone4	23F	1/11/2024	2700.77	968.793	36.639	-0.1586	
1	Zone4	2.19B	1/11/2024	3270.21	916.063	38.554	-0.1549	
1	Zone4	BARRY1	1/11/2024	3047.74	926.576	38.112	-0.1528	
1	Zone4	2.14A	1/11/2024	2853.28	838.669	41.315	-0.1526	
1	Zone4	23B	1/11/2024	2856.49	949.794	38.748	-0.1521	
1	Zone4	2.13	1/11/2024	2725.42	874.951	47.205	-0.1509	
1	Zone4	MORTON	1/11/2024	2975.42	1231.913	40.709	-0.1507	
1	Zone4	BARRY3	1/11/2024	3176.85	895.991	37.681	-0.1496	
1	Zone4	2.18	1/11/2024	3218.04	712.756	44.539	-0.1477	
1	Zone4	1.11B	1/11/2024	1675.83	133.622	9.016	-0.147	
1	Zone4	BARRY4B	1/11/2024	3320.16	912.693	38.884	-0.1466	
1	Zone4	2HB	1/11/2024	1078.24	886.849	24.379	-0.1463	
1	Zone4	22E	1/11/2024	3055.20	1231.504	40.779	-0.1445	
1	Zone4	BARRY5	1/11/2024	3397.59	904.647	40.988	-0.1444	
1	Zone4	BARRY2B	1/11/2024	2937.67	943.59	38.553	-0.1443	
1	Zone4	22BC	1/11/2024	2916.75	1435.773	42.098	-0.1438	
1	Zone4	BARRY6	1/11/2024	3432.52	904.356	42.474	-0.1433	
1	Zone4	21P	1/11/2024	2849.17	1456.9	41.841	-0.1423	
1	Zone4	22H	1/11/2024	2869.25	1441.796	41.615	-0.1418	
1	Zone4	2.23	1/11/2024	3560.02	1212.795	36.631	-0.1415	
1	Zone4	22I	1/11/2024	2918.98	1461.367	41.908	-0.1412	
1	Zone4	BM23	1/11/2024	3107.42	921.049	38.087	-0.1401	
1	Zone4	22M	1/11/2024	2973.44	1434.656	41.666	-0.14	
1	Zone4	STAFORD	1/11/2024	3139.86	998.179	37.315	-0.1392	
1	Zone4	2.20	1/11/2024	3467.69	904.56	43.782	-0.1391	
1	Zone4	22L	1/11/2024	3047.70	1499.876	40.985	-0.1367	
1	Zone4	2.16	1/11/2024	3007.62	739.64	33.5915	-0.1363	
1	Zone4	AP100	1/11/2024	1893.80	81.273	11.773	-0.1348	
1	Zone4	2.15	1/11/2024	2918.94	723.52	38.363	-0.1339	

1	Zone4	22A	1/11/2024	3003.28	1429.771	41.639	-0.1337
1	Zone4	2.22	1/11/2024	3339.13	1206.603	40.345	-0.1328
1	Zone4	BM2	1/11/2024	915.74	1091.799	24.818	-0.1325
1	Zone4	GW	1/11/2024	3128.83	1140.936	38.538	-0.1314
1	Zone4	1.05	1/11/2024	1176.96	473.454	21.808	-0.1314
1	Zone4	BARRY8	1/11/2024	3592.28	871.451	37.93	-0.1303
1	Zone4	CUBA	1/11/2024	3224.32	1079.177	35.823	-0.1302
1	Zone4	22D	1/11/2024	3100.02	1335.441	41.446	-0.1301
1	Zone4	BARRY7	1/11/2024	3518.87	901.897	43.609	-0.1301
1	Zone4	22J	1/11/2024	2944.47	1489.763	42.42	-0.1297
1	Zone4	21FB	1/11/2024	2861.65	1512.211	42.642	-0.1283
1	Zone4	21L	1/11/2024	2806.79	1575.074	43.079	-0.1248
1	Zone4	21AC	1/11/2024	2716.64	1617.767	39.685	-0.124
1	Zone4	2.29B	1/11/2024	2953.39	1548.172	42.583	-0.1238
1	Zone4	26BE	1/11/2024	1408.78	1800.553	38.803	-0.1231
1	Zone4	1.26	1/11/2024	1926.81	30.053	15.084	-0.1228
1	Zone4	27KB	1/11/2024	2320.23	2120.206	63.323	-0.1226
1	Zone4	2GB	1/11/2024	922.38	967.661	22.664	-0.1215
1	Zone4	BM22	1/11/2024	3115.79	1442.952	40.613	-0.1212
1	Zone4	15C	1/11/2024	1156.82	571.077	24.201	-0.1206
1	Zone4	2.27	1/11/2024	3379.40	1371.481	37.75	-0.1206
1	Zone4	1.06	1/11/2024	1159.34	302.262	17.212	-0.1191
1	Zone4	21Q	1/11/2024	2899.60	1571.317	43.12	-0.1172
1	Zone4	21I	1/11/2024	2854.70	1668.793	41.636	-0.1165
1	Zone4	22KB	1/11/2024	2981.80	1603.49	42.842	-0.1147
1	Zone4	26CE	1/11/2024	1377.77	1711.891	40.589	-0.1146
1	Zone4	30BB	1/11/2024	2604.86	1726.496	41.543	-0.1119
1	Zone4	1.09B	1/11/2024	1344.14	117.48	9.915	-0.1101
1	Zone4	21GC	1/11/2024	2901.12	1614.054	43.437	-0.1098
1	Zone4	BM15	1/11/2024	976.94	783.004	20.509	-0.1075
1	Zone4	2.31B	1/11/2024	3201.23	1637.289	42.086	-0.1073
1	Zone4	SM822	1/11/2024	2512.91	1841.132	41.452	-0.1061
1	Zone4	27N	1/11/2024	2179.57	2075.99	71.905	-0.1056
1	Zone4	2.30B	1/11/2024	3000.35	1672.941	43.164	-0.1036
1	Zone4	27E	1/11/2024	2494.09	2171.622	50.335	-0.1032

1	Zone4	21HC	1/11/2024	2916.84	1728.842	42.875	-0.101	
1	Zone4	4.08	1/11/2024	2350.64	2022.324	73.207	-0.1001	
1	Zone4	7BB	1/11/2024	1105.69	1689.902	35.929	-0.0983	
1	Zone4	3.01	1/11/2024	1291.95	1690.33	37.286	-0.0935	
1	Zone4	4.07	1/11/2024	2554.47	2079.237	45.041	-0.0921	
1	Zone4	3.04B	1/11/2024	1123.76	1821.498	39.273	-0.0919	
1	Zone4	26AE	1/11/2024	1432.47	1883.479	37.542	-0.0908	
1	Zone4	4.05	1/11/2024	2809.68	1897.682	40.612	-0.0894	
1	Zone4	27J	1/11/2024	2344.14	2136.138	62.127	-0.0889	
1	Zone4	27H	1/11/2024	2413.27	2149.757	57.023	-0.0875	
1	Zone4	26H	1/11/2024	1452.90	1729.593	49.952	-0.0868	
1	Zone4	26MB	1/11/2024	1593.46	1750.663	58.959	-0.0841	
1	Zone4	BM30	1/11/2024	2715.36	1996.207	44.08	-0.0836	
1	Zone4	3.02	1/11/2024	1344.87	1837.735	34.934	-0.0832	
1	Zone4	27F	1/11/2024	2466.48	2164.026	52.312	-0.0829	
1	Zone4	3.09	1/11/2024	1618.51	1870.174	51.91	-0.082	
1	Zone4	26JB	1/11/2024	1495.71	1756.55	53.721	-0.0814	
1	Zone4	3.11A	1/11/2024	1786.17	1929.216	62.141	-0.0811	
1	Zone4	30AB	1/11/2024	2685.64	1898.443	46.229	-0.0796	
1	Zone4	27DC	1/11/2024	2541.24	2190.709	48.181	-0.0785	
1	Zone4	27AB	1/11/2024	2009.08	2064.334	73.474	-0.0766	
1	Zone4	3.10A	1/11/2024	1689.03	1978.29	53.428	-0.0764	
1	Zone4	27L	1/11/2024	2280.24	2115.41	65.832	-0.0759	
1	Zone4	3.13	1/11/2024	1744.89	2097.492	53.751	-0.0736	
1	Zone4	27O	1/11/2024	2101.57	2042.821	75.018	-0.0725	
1	Zone4	BM26	1/11/2024	1542.45	1837.805	45.414	-0.0721	
1	Zone4	1.12B	1/11/2024	794.14	-73.011	11.033	-0.0717	
1	Zone4	26OB	1/11/2024	1706.93	1812.27	67.173	-0.0618	
1	Zone4	3.6A	1/11/2024	1526.28	2015.739	38.912	-0.0536	
3	Zone4	21J	1/11/2024	2773.44	1688.923	lost	missed	
1	Zone3	2CE	1/11/2024	774.75	1313.191	34.6	-0.1259	Nr Zone 5
1	Zone3	14DB	1/11/2024	876.99	411.215	15.137	-0.1168	Nr Zone 4
1	Zone3	2.34	1/11/2024	3452.45	1683.502	37.699	-0.1143	Nr 2.33
1	Zone3	A33C	1/11/2024	456.03	1219.226	35.838	-0.1019	Nr 2CE
1	Zone3	2.36	1/11/2024	3433.14	1534.879	35.914	-0.1012	Nr Zone 4

1	Zone3	1.25	1/11/2024	2175.94	-129.105	20.046	-0.1	Nr Zone 4
1	Zone3	1.07	1/11/2024	924.43	267.487	12.484	-0.0996	Nr Zone 4
1	Zone3	2.40B	1/11/2024	3572.85	1526.452	33.141	-0.0991	Nr Zone 4
1	Zone3	2.33	1/11/2024	3294.51	1691.952	40.294	-0.0989	Nr Zone 4
1	Zone3	4EC	1/11/2024	782.01	1687.78	41.111	-0.0987	Nr Zone 5
1	Zone3	2FC	1/11/2024	720.33	843.055	23.908	-0.0985	Nr Zone 4
1	Zone3	4.02	1/11/2024	2797.90	2143.571	45.751	-0.0981	Nr Zone 4
1	Zone3	15DB	1/11/2024	917.56	466.148	15.583	-0.097	Nr Zone 4
1	Zone3	14EA	1/11/2024	808.56	504.723	17.072	-0.0968	Nr Zone4
1	Zone3	4A	1/11/2024	815.01	1494.154	40.677	-0.0954	Nr Zone 5
1	Zone3	31BC	1/11/2024	3159.33	1954.857	45.488	-0.0945	
1	Zone3	2DA	1/11/2024	682.15	1189.579	35.795	-0.0936	
1	Zone3	BM31	1/11/2024	2967.04	1873.475	43.272	-0.0935	
1	Zone3	14CB	1/11/2024	759.10	389.766	18.803	-0.0928	
1	Zone3	4.03B	1/11/2024	2794.90	2044.783	43.789	-0.0919	
1	Zone3	14BC	1/11/2024	535.45	340.67	20.896	-0.0895	
1	Zone3	4.04	1/11/2024	2662.60	2131.765	45.907	-0.0882	
1	Zone3	4.01C	1/11/2024	2891.78	2113.146	47.29	-0.0881	
1	Zone3	1.08	1/11/2024	1052.91	107.171	16.511	-0.0878	
1	Zone3	31AC	1/11/2024	3059.04	1910.629	44.056	-0.0865	
1	Zone3	14FB	1/11/2024	705.60	649.144	20.133	-0.0864	
1	Zone3	2EB	1/11/2024	689.02	1054.621	29.246	-0.086	
1	Zone3	1.21A	1/11/2024	1939.94	-325.504	19.644	-0.0857	
1	Zone3	29DB	1/11/2024	2996.63	2106.66	47.795	-0.0839	
1	Zone3	3.25	1/11/2024	3116.90	2107.056	49.801	-0.0804	
1	Zone3	1.22	1/11/2024	1510.00	-249.925	15.856	-0.0768	
1	Zone3	3.24B	1/11/2024	3012.46	2251.58	51.984	-0.0715	
1	Zone3	29AC	1/11/2024	2641.62	2218.071	48.505	-0.0709	
1	Zone3	29CE	1/11/2024	2891.84	2285.59	51.56	-0.0696	
1	Zone3	29B	1/11/2024	2772.84	2242.22	49.992	-0.0547	
1	Zone2	1K	1/11/2024	511.74	957.174	29.584	-0.085	Nr Zone 3
1	Zone2	7AC	1/11/2024	994.54	1781.82	43.509	-0.0829	Nr Zone 4
1	Zone2	3.03	1/11/2024	1134.46	1917.237	39.332	-0.0829	Nr Zone 4
1	Zone2	3.14	1/11/2024	1752.75	2214.323	48.746	-0.0806	Nr Zone 4
1	Zone2	BM4	1/11/2024	689.21	1555.547	42.261	-0.0797	Nr Zone 3

1	Zone2	3.12	1/11/2024	1599.68	2152.411	40.25	-0.0778	Nr Zone 4
1	Zone2	33F	1/11/2024	347.95	1511.678	42.031	-0.0775	Nr 33E
1	Zone2	4FB	1/11/2024	562.51	1370.97	39.356	-0.0771	Nr Zone 3
1	Zone2	BM7	1/11/2024	1057.32	1843.069	44.1	-0.0764	Nr Zone 4
1	Zone2	33E	1/11/2024	437.71	1437.524	40.973	-0.0733	Nr Zone 3
1	Zone2	6A	1/11/2024	946.43	1928.115	47.495	-0.073	Nr Zone 4
1	Zone2	1C	1/11/2024	421.48	1098.886	34.776	-0.0726	Nr Zone 3
1	Zone2	1JB	1/11/2024	604.79	822.761	26.398	-0.0722	Nr Zone 3
1	Zone2	1.04	1/11/2024	795.98	129.359	12.787	-0.0719	Nr Zone 3
1	Zone2	33A	1/11/2024	338.15	1303.893	36.707	-0.0716	Nr Zone 3
1	Zone2	BM14	1/11/2024	718.16	485.955	19.818	-0.0696	Nr Zone 3
1	Zone2	3.07	1/11/2024	1362.08	2096.818	48.03	-0.0692	Nr Zone 4
1	Zone2	1B	1/11/2024	337.50	1062.935	33.99	-0.0672	Nr Zone 3
1	Zone2	1I	1/11/2024	468.34	761.228	27.262	-0.067	Nr Zone 3
1	Zone2	33DB	1/11/2024	265.40	1714.719	46.352	-0.0664	On pole
1	Zone2	BM6	1/11/2024	881.86	1837.081	46.218	-0.0656	Nr Zone 3
1	Zone2	14AC	1/11/2024	515.17	457.622	24.008	-0.0651	Nr Zone 3
1	Zone2	5C	1/11/2024	705.43	1754.71	45.154	-0.0630	
1	Zone2	33GA	1/11/2024	415.95	1621.638	45.338	-0.0625	
1	Zone2	1FB	1/11/2024	210.46	850.779	29.816	-0.0615	
1	Zone2	1HC	1/11/2024	299.70	702.8	27.031	-0.0599	
1	Zone2	1EB	1/11/2024	388.60	912.09	30.419	-0.0599	
1	Zone2	BM29	1/11/2024	2608.80	2400.756	55.951	-0.0574	
1	Zone2	1A	1/11/2024	249.92	1026.38	33.319	-0.0567	
1	Zone2	3.22A	1/11/2024	2891.15	2398.649	56.648	-0.0567	
1	Zone2	1O	1/11/2024	-271.35	814.183	22.702	-0.0557	
1	Zone2	3.05	1/11/2024	966.29	1990.771	47.177	-0.0554	
1	Zone2	3.15	1/11/2024	1696.24	2315.821	39.093	-0.055	
1	Zone2	1.03B	1/11/2024	365.55	323.37	19.371	-0.0542	
1	Zone2	1.02D	1/11/2024	85.42	283.3	18.644	-0.054	
1	Zone2	5AC	1/11/2024	470.30	1688.454	47.024	-0.0538	
1	Zone2	1GB	1/11/2024	-2.87	769.742	29.281	-0.0537	
1	Zone2	BM5	1/11/2024	325.93	1806.47	47.792	-0.0534	
1	Zone2	33B	1/11/2024	156.88	1430.804	34.4	-0.053	
1	Zone2	BM1	1/11/2024	152.75	994.869	32.762	-0.0526	

1	Zone2	1ME	1/11/2024	-155.40	879.887	26.091	-0.0522	
1	Zone2	33C	1/11/2024	222.53	1621.241	44.398	-0.0501	
1	Zone2	1.01	1/11/2024	56.47	604.075	25.437	-0.0499	
1	Zone2	1RA	1/11/2024	-579.06	750.356	16.726	-0.0418	
1	Zone2	1.14	1/11/2024	496.74	-535.095	8.432	-0.0376	
1	Zone2	AP2	1/11/2024	-1276.40	954.13	5.765	-0.031	
1	Zone2	1.16	1/11/2024	1552.97	-1086.27	18.352	-0.026	
3	Zone2	1PA	1/11/2024	-351.51	787.24	missed	missed	
3	Zone1	2.44	1/11/2024	2734.64	421.025	27.23	-0.5987	Dist'd
1	Zone1	2.05	1/11/2024	2535.68	272.682	20.758	-0.1221	Nr Zone 5
1	Zone1	31NE	1/11/2024	4349.43	1927.421	33.323	-0.1056	Nr river
1	Zone1	31FC	1/11/2024	3614.22	1954.151	43.398	-0.1041	Nr 31DD
1	Zone1	31LC	1/11/2024	4168.53	1862.106	32.066	-0.1016	Nr River
1	Zone1	2.35	1/11/2024	3609.80	1652.681	34.085	-0.1007	Nr Zone 3
1	Zone1	31HC	1/11/2024	3810.83	1924.654	40.303	-0.0925	Nr 31FC
1	Zone1	31DD	1/11/2024	3400.43	1989.833	46.668	-0.0919	Nr Zone 3
1	Zone1	31JD	1/11/2024	4005.65	1911.423	35.531	-0.0895	Nr 31HC
1	Zone1	28AE	1/11/2024	2128.26	2448.76	85.897	-0.0793	Nr Zone 2
1	Zone1	31PC	1/11/2024	4393.52	1991.662	37.705	-0.0777	Nr 31NE
1	Zone1	31QC	1/11/2024	4417.71	2035.374	39.602	-0.0737	Nr 31PC
1	Zone1	3.30	1/11/2024	3296.29	2235.94	50.3605	-0.0622	Nr Zone 2
1	Zone1	3.21	1/11/2024	2585.77	2493.375	64.915	-0.0612	Nr Zone 2
1	Zone1	3.16	1/11/2024	2195.60	2563.077	95.596	-0.0564	Nr 28AE
1	Zone1	3.26B	1/11/2024	3200.09	2347.92	55.399	-0.0555	Nr Zone 2
1	Zone1	1.20B	1/11/2024	1995.49	-664.093	22.019	-0.0535	
1	Zone1	1.24	1/11/2024	2225.16	-613.228	16.681	-0.0526	
1	Zone1	3.23	1/11/2024	3035.80	2453.651	59.607	-0.0506	
1	Zone1	1.23	1/11/2024	1013.01	-440.769	13.259	-0.0496	
1	Zone1	3.29	1/11/2024	3662.64	2323.533	44.901	-0.0495	
1	Zone1	3.27B	1/11/2024	3148.37	2510.53	60.263	-0.0486	
1	Zone1	1.13	1/11/2024	591.36	-310.80	7.046	-0.0465	
1	Zone1	AP2A	1/11/2024	-766.18	738.506	12.304	-0.0457	
1	Zone1	AP1A	1/11/2024	4557.10	2288.33	42.455	-0.045	
1	Zone1	AP1	1/11/2024	4486.29	2137.008	41.351	-0.0415	
1	Zone1	1.27B	1/11/2024	1401.56	-701.57	15.3225	-0.0386	

1	Zone1	1UA	1/11/2024	-914.75	759.054	8.719	-0.0356	
1	Zone1	1.17B	1/11/2024	2082.20	-1093.92	25.571	-0.0326	
1	Zone1	1.15	1/11/2024	923.35	-995.41	14.341	-0.0310	
1	Zone1	AP24A	1/11/2024	2114.57	-1292.93	28.045	-0.0302	
1	Zone1	AP20No2	1/11/2024	-2303.63	731.69	20.184	-0.0212	
1	Zone1	BM28/2	1/11/2024	2282.46	2770.684	101.874	-0.0117	
1	Zone1	AP19	1/11/2024	-3242.58	480.68	-6.5213	0	control
1	Zone1	BUH5	1/11/2024	5480.15	2780.649	52.7029	0	control
1	Zone1	C1	1/11/2024	2183.23	-1759.33	32.8139	0	control
3	Favona	F18	1/11/2024	3423.83	648.3	39.941	-0.3904	Dist'd?
3	Favona	F20	1/11/2024	3411.70	665.722	40.873	-0.3311	Dist'd?
1	Favona	F21	1/11/2024	3405.99	671.998	40.716	-0.2973	
1	Favona	F17B	1/11/2024	3405.48	613.912	43.944	-0.2955	
3	Favona	F24	1/11/2024	3388.13	690.846	40.598	-0.2899	Dist'd?
1	Favona	F22	1/11/2024	3399.79	678.393	40.662	-0.2744	
1	Favona	F15C	1/11/2024	3297.17	585.319	57.302	-0.2145	
1	Favona	BLOCK-S	1/11/2024	3295.82	124.324	24.806	-0.206	
1	Favona	F16B	1/11/2024	3367.38	578.696	46.361	-0.205	
1	Favona	F26	1/11/2024	3374.47	705.541	40.563	-0.2029	
1	Favona	BLOCK-N	1/11/2024	3336.45	215.694	24.275	-0.188	
1	Favona	F10B	1/11/2024	3176.88	446.75	49.243	-0.1851	
1	Favona	F34C	1/11/2024	3339.49	849.569	40.158	-0.1825	
1	Favona	F12C	1/11/2024	3207.32	503.824	53.471	-0.1818	
1	Favona	F28B	1/11/2024	3365.21	727.17	40.483	-0.1767	
1	Favona	F30B	1/11/2024	3359.36	748.26	40.672	-0.1655	
1	Favona	F08A	1/11/2024	3126.97	430.49	42.72	-0.1575	
1	Favona	F32B	1/11/2024	3348.78	769.103	40.839	-0.153	
1	Favona	F35B	1/11/2024	3336.68	896.063	39.749	-0.1482	
1	Favona	F06	1/11/2024	3107.08	445.21	40.474	-0.1438	
1	Favona	ITXCIVB	1/11/2024	2943.85	542.17	32.585	-0.1377	
1	Favona	F02	1/11/2024	3097.60	490	38.176	-0.1347	
1	Favona	FP1	1/11/2024	3004.15	131.25	45.388	-0.121	
1	Favona	TRIG 24	1/11/2024	3260.76	-615.678	25.662	-0.068	
1	Favona	TRIG 22	1/11/2024	3681.97	89.358	26.128	-0.062	

Appendix C Plans of Settlement Marks & Contours

MARTHA MINE OPEN PIT

UNION HILL

GLADSTONE HILL

STATE HIGHWAY 2

STATE HIGHWAY 25

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

NEW or LOST or MISSED or DISTURBED MARK

OCEANAGOLD WAIHI

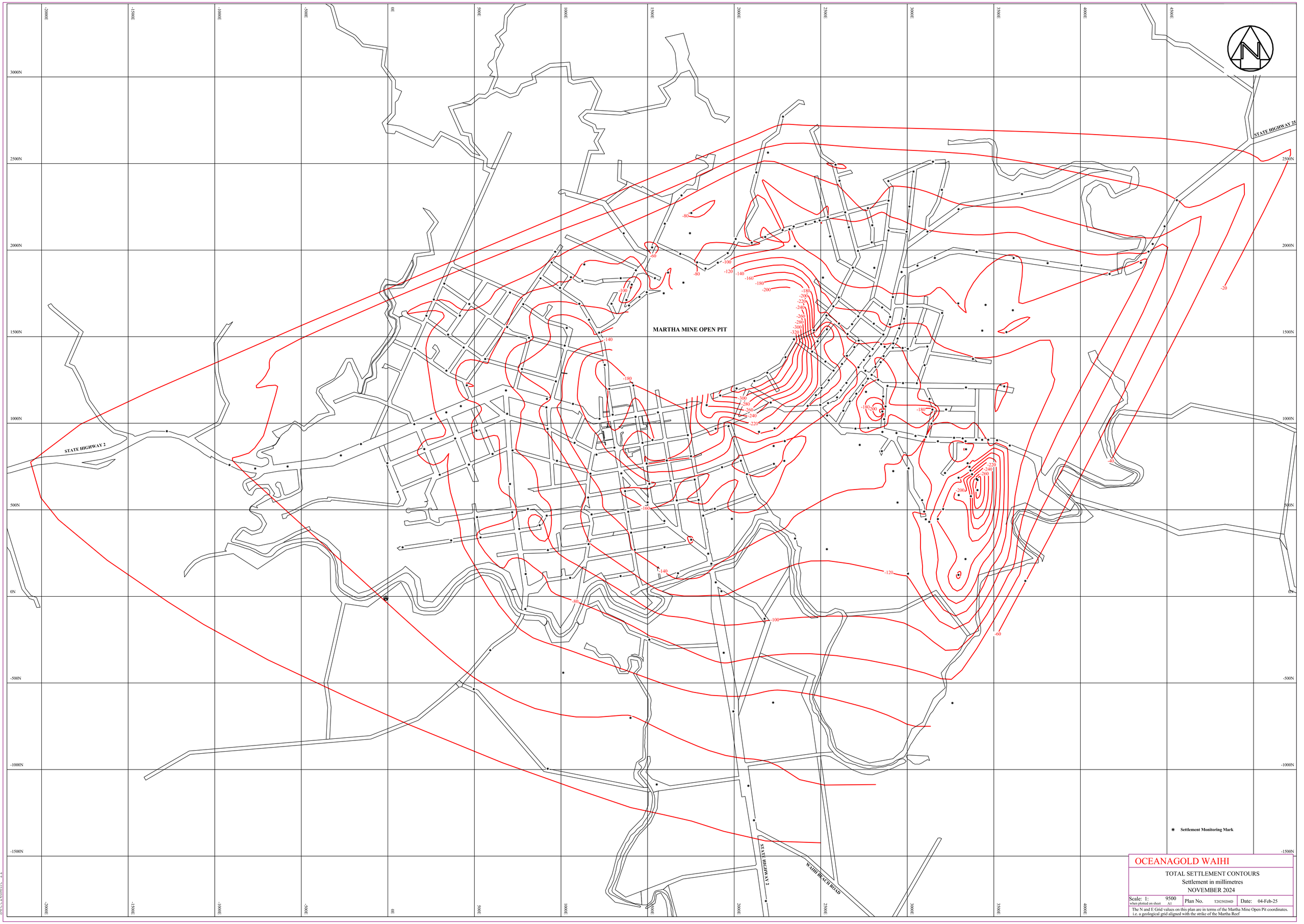
TOTAL SETTLEMENT VALUES
Settlement in millimetres
NOVEMBER 2024

Scale: 1: 9000 when plotted on sheet A1 | Plan No. T2025020 4C | Date: 04-Feb-25

The N and E Grid values on this plan are in terms of the Martha Mine Open Pit coordinates. i.e. a geological grid aligned with the strike of the Martha Reef

settlement 07

SURPAC - GEOVIA -prepared by B.M. Morrison



OCEANAGOLD WAIHI

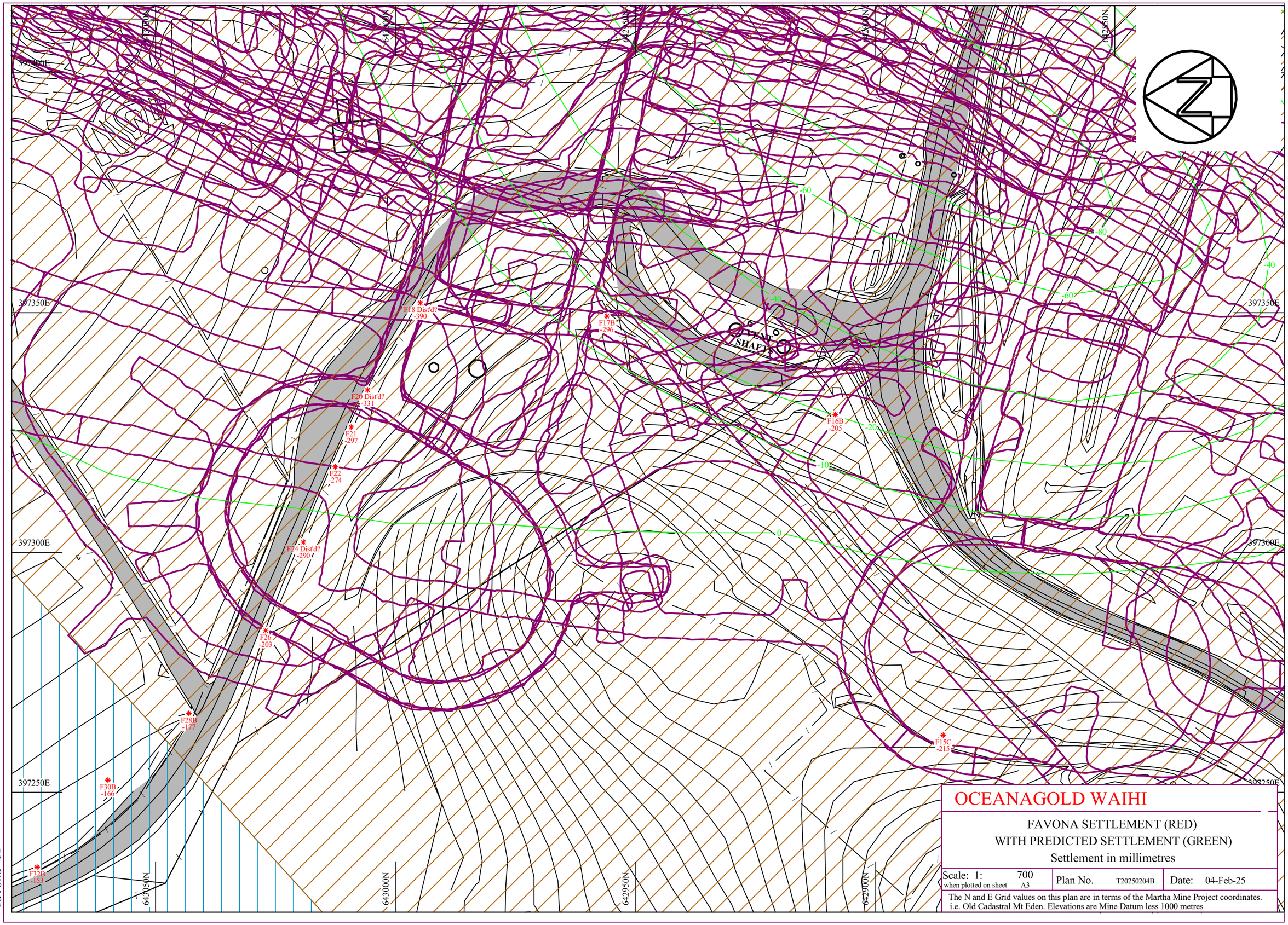
TOTAL SETTLEMENT CONTOURS
Settlement in millimetres
NOVEMBER 2024

Scale: 1: 9500 (when plotted on sheet A1)	Plan No. T2025024D	Date: 04-Feb-25

The N and E Grid values on this plan are in terms of the Martha Mine Open Pit coordinates. i.e. a geological grid aligned with the strike of the Martha Reef

settlement_11

SURPAC - GEOVIA -prepared by B.M. Morrison



OCEANAGOLD WAIHI

FAVONA SETTLEMENT (RED)
WITH PREDICTED SETTLEMENT (GREEN)
Settlement in millimetres

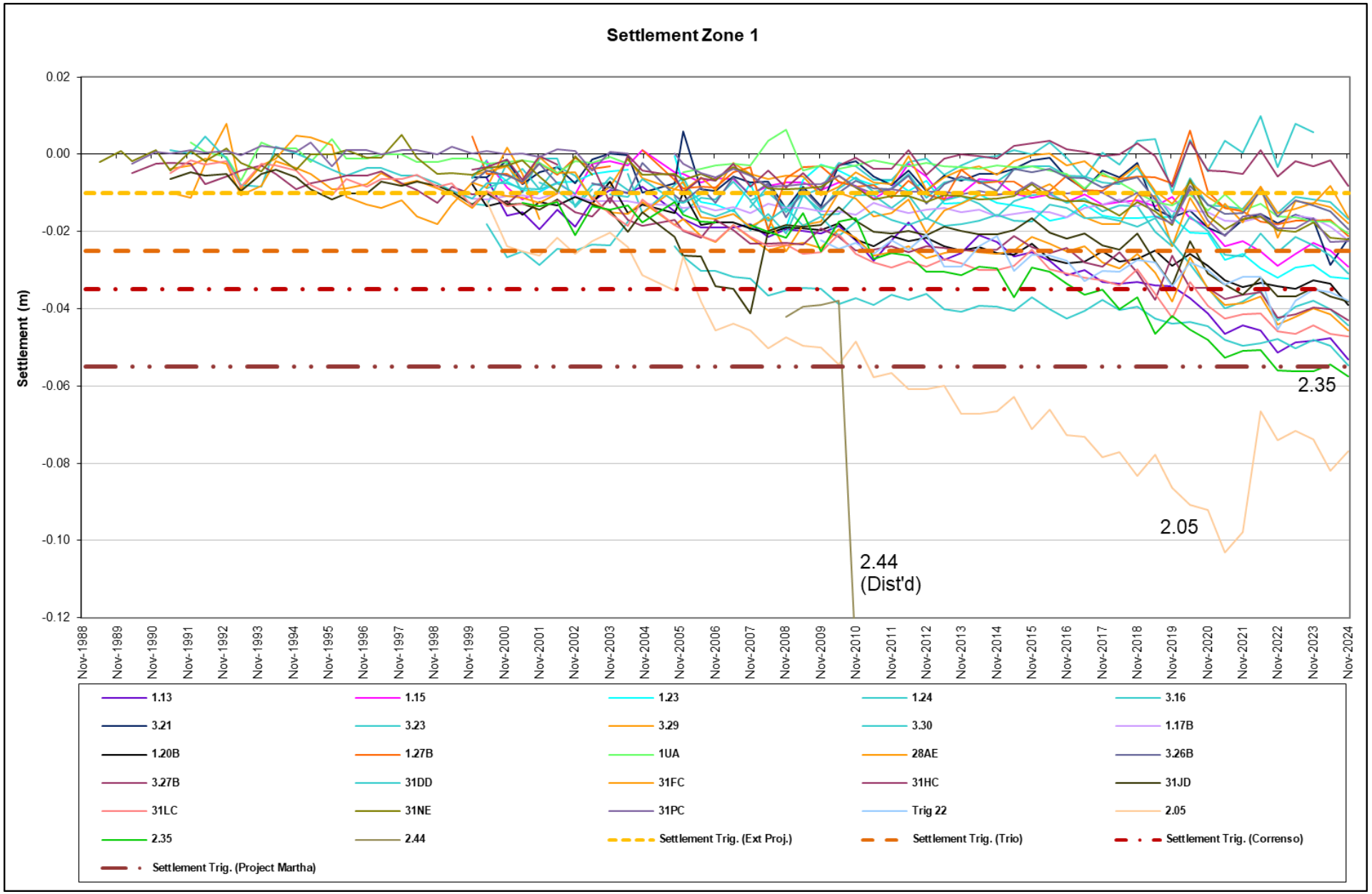
Scale: 1: 700 when plotted on sheet A3	Plan No. T20250204B	Date: 04-Feb-25

The N and E Grid values on this plan are in terms of the Martha Mine Project coordinates.
i.e. Old Cadastral Mt Eden. Elevations are Mine Datum less 1000 metres

favona 11

SURPAC - GEOVIA -prepared by B.M. Morrison

Appendix D Trend Plots of Settlement Zone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Settlement (m)
0.02
0.00
-0.02
-0.04
-0.06
-0.08
-0.10
-0.12
2.35
2.05
2.44
(Dist'd)
Nov-1988
Nov-1989
Nov-1990
Nov-1991
Nov-1992
Nov-1993
Nov-1994
Nov-1995
Nov-1996
Nov-1997
Nov-1998
Nov-1999
Nov-2000
Nov-2001
Nov-2002
Nov-2003
Nov-2004
Nov-2005
Nov-2006
Nov-2007
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
Nov-2022
Nov-2023
Nov-2024
1.13
1.15
1.23
1.24
3.16
3.21
3.23
3.29
3.30
1.17B
1.20B
1.27B
1UA
28AE
3.26B
3.27B
31DD
31FC
31HC
31JD
31LC
31NE
31PC
Trig 22
2.05
2.35
2.44
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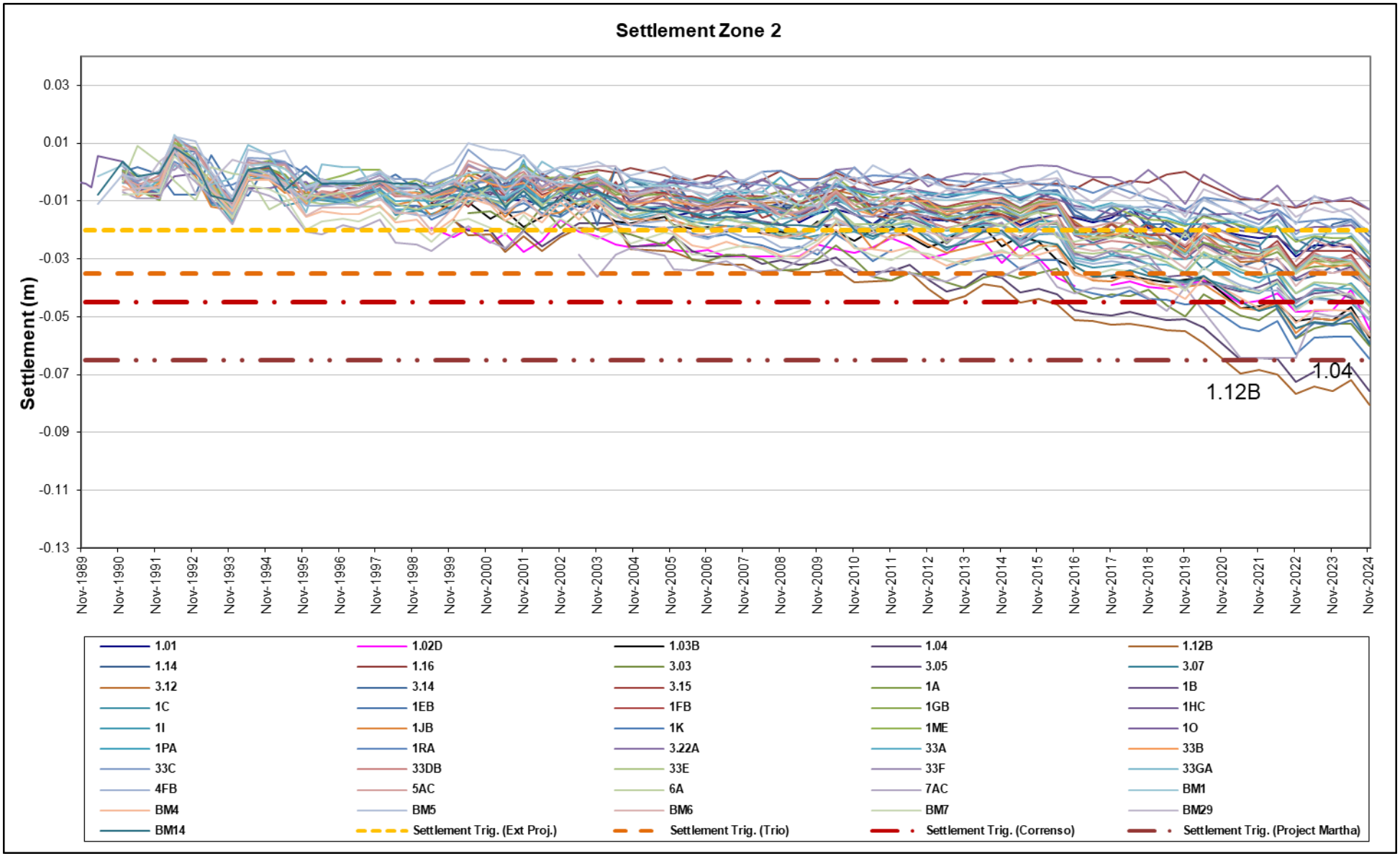
Settlement Trig. (Trio)
Settlement Trig. (Correnso)
Settlement Trig. (Project Martha)


Settlement Zone 2
Settlement (m)
0.03
0.01
-0.01
-0.03
-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
Nov-2001
Nov-2002
Nov-2003
Nov-2004
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Nov-2011
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Nov-2013
Nov-2014
Nov-2015
Nov-2016
Nov-2017
Nov-2018
Nov-2019
Nov-2020
Nov-2021
Nov-2022
Nov-2023
Nov-2024
1.04
1.12B
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
1EB
1FB
1GB
1HC
1I
1JB
1K
1ME
1O
1PA
1RA
3.22A
33A
33B
33C
33DB
33E
33F
33GA
4FB
5AC
6A
7AC
BM1
BM4
BM5
BM6
BM7
BM29
BM14
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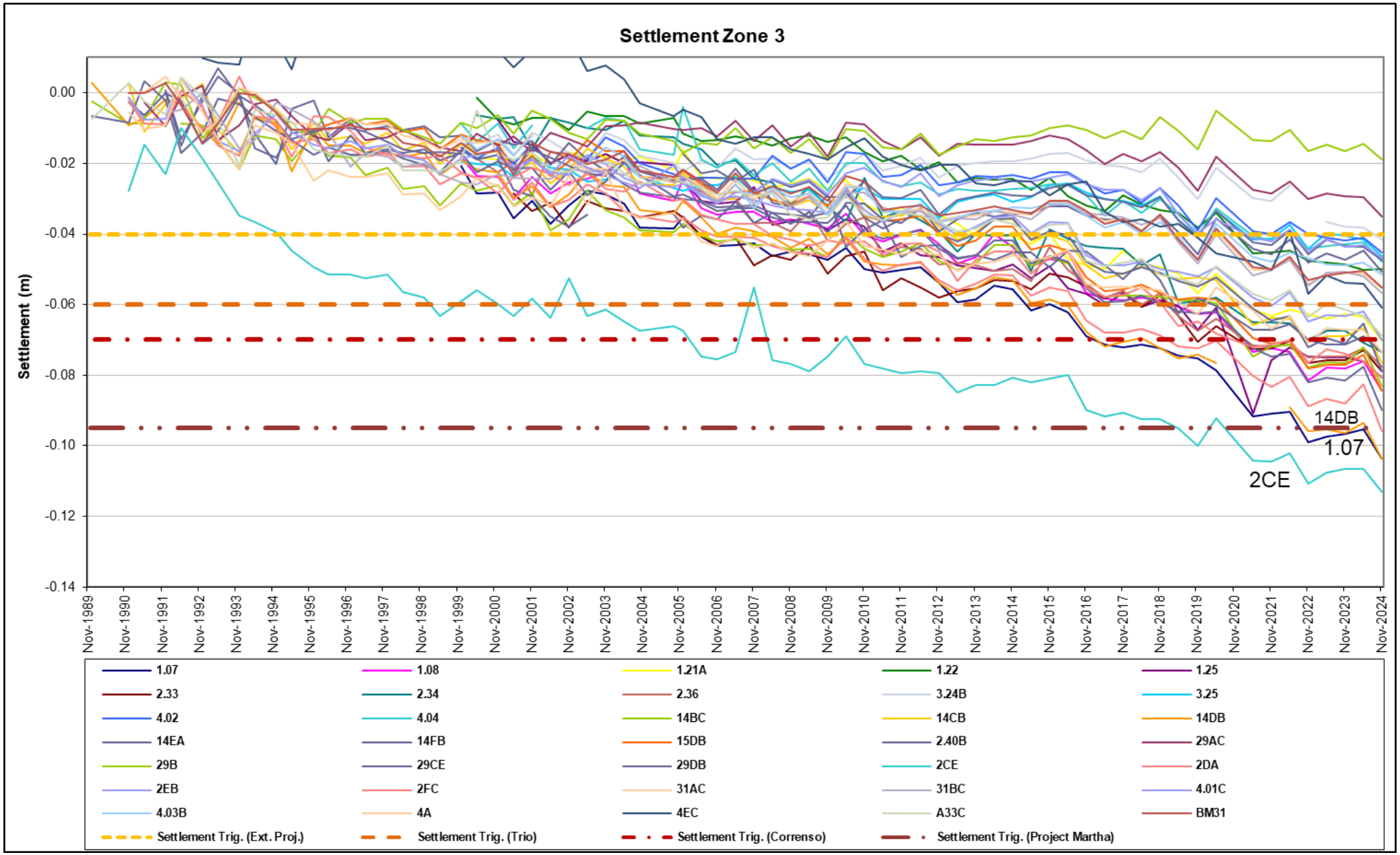
Settlement Trig. (Trio)
Settlement Trig. (Correnso)
Settlement Trig. (Project Martha)


Settlement Zone 3
Settlement (m)
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-0.02
-0.04
-0.06
-0.08
-0.10
-0.12
-0.14
Nov-1989
Nov-1990
Nov-1991
Nov-1992
Nov-1993
Nov-1994
Nov-1995
Nov-1996
Nov-1997
Nov-1998
Nov-1999
Nov-2000
Nov-2001
Nov-2002
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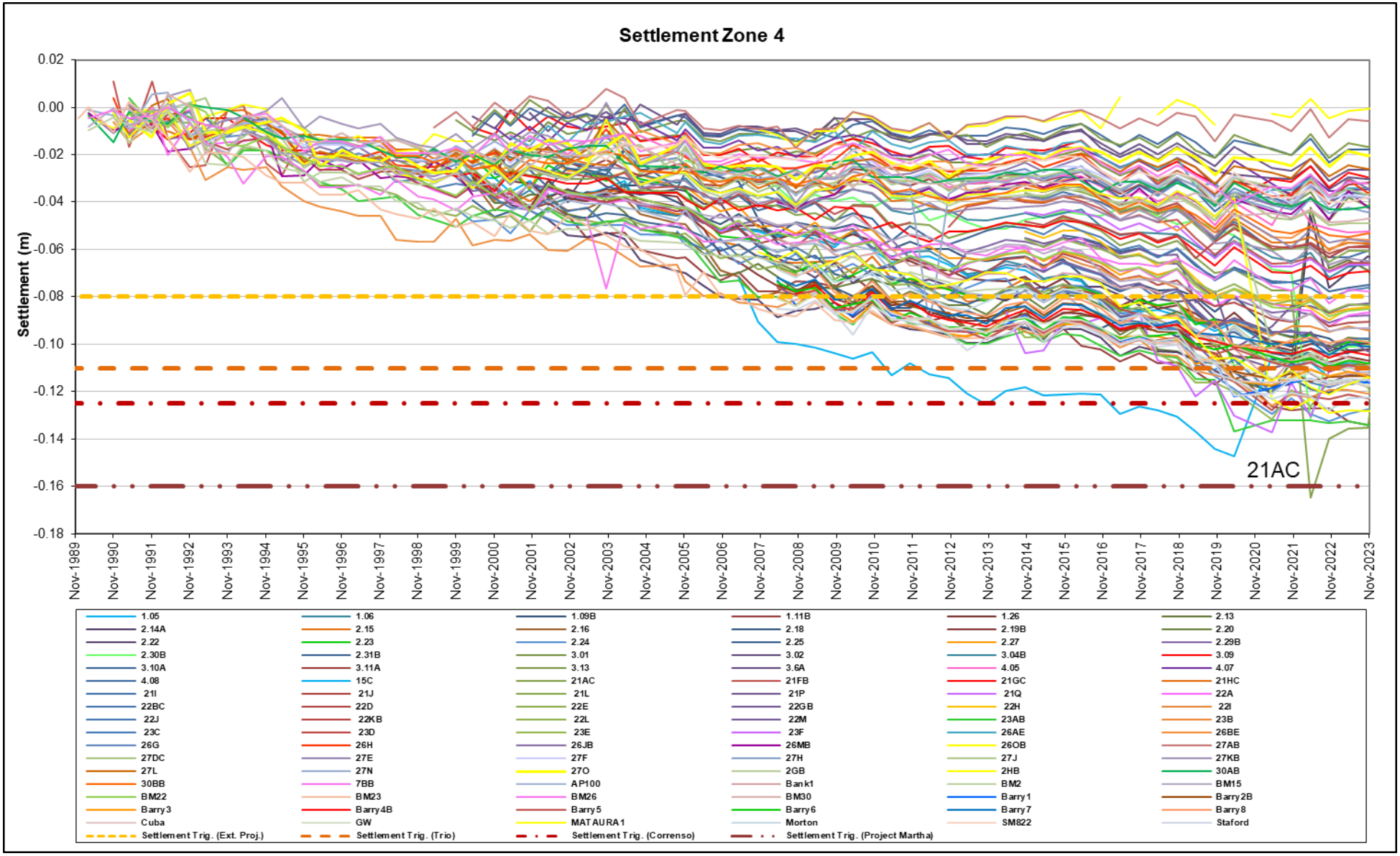
Nov-2010
Nov-2011
Nov-2012
Nov-2013
Nov-2014
Nov-2015
Nov-2016
Nov-2017
Nov-2018
Nov-2019
Nov-2020
Nov-2021
Nov-2022
Nov-2023
Nov-2024
14DB
1.07
2CE
1.07
1.08
1.21A
1.22
1.25
2.33
2.34
2.36
3.24B
3.25
4.02
4.04
14BC
14CB
14DB
14EA
14FB
15DB
2.40B
29AC
29B
29CE
29DB
2CE
2DA
2EB
2FC
31AC
31BC
4.01C
4.03B
4A
4EC
A33C
BM31
Settlement Trig. (Ext. Proj.)
Settlement Trig. (Trio)
Settlement Trig. (Correnso)
Settlement Trig. (Project Martha)


Settlement Zone 4
Settlement (m)
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0.00
-0.02
-0.04
-0.06
-0.08
-0.10
-0.12
-0.14
-0.16
-0.18
21AC
Nov-1989
Nov-1990
Nov-1991
Nov-1992
Nov-1993
Nov-1994
Nov-1995
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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
Nov-2023
1.05
1.06
1.09B
1.11B
1.26
2.13
2.14A
2.15
2.16
2.18
2.19B
2.20
2.22
2.23
2.24
2.25
2.27
2.29B
2.30B
2.31B
3.01
3.02
3.04B
3.09
3.10A
3.11A
3.13
3.6A
4.05
4.07
4.08
15C
21AC
21FB
21GC
21HC
21I
21J
21L
21P
21Q
22A
22BC
22D
22E
22GB
22H
22I
22J
22KB
22L
22M
23AB
23B
23C
23D
23E
23F
26AE
26BE
26G
26H
26JB
26MB
26OB
27AB
27DC
27E
27F
27H
27J
27KB
27L
27N
27O
2GB
2HB
30AB
30BB
7BB
AP100
Bank1
BM2
BM15
BM22
BM23
BM26
BM30
Barry1
Barry2B
Barry3
Barry4B
Barry5
Barry6
Barry7
Barry8
Cuba
GW
MATAURA1
Morton
SM822
Staford
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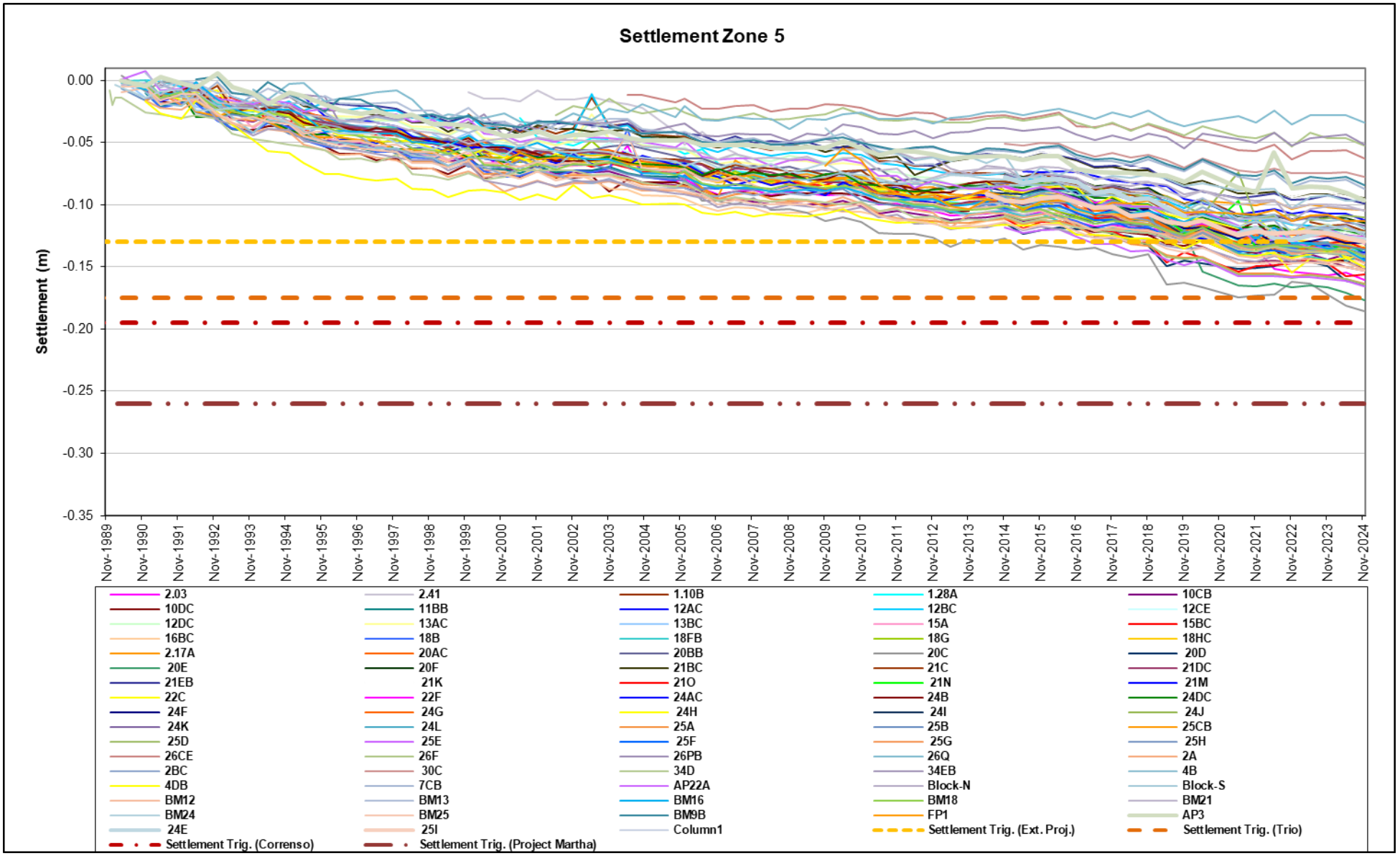
Settlement Trig. (Trio)
Settlement Trig. (Correnso)
Settlement Trig. (Project Martha)


Settlement Zone 5
Settlement (m)
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-0.20
-0.25
-0.30
-0.35
Nov-1989
Nov-1990
Nov-1991
Nov-1992
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Nov-2018
Nov-2019
Nov-2020
Nov-2021
Nov-2022
Nov-2023
Nov-2024
2.03
2.41
1.10B
1.28A
10CB
10DC
11BB
12AC
12BC
12CE
12DC
13AC
13BC
15A
15BC
16BC
18B
18FB
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
AP22A
Block-N
Block-S
BM12
BM13
BM16
BM18
BM21
BM24
BM25
BM9B
FP1
AP3
24E
25I
Column1
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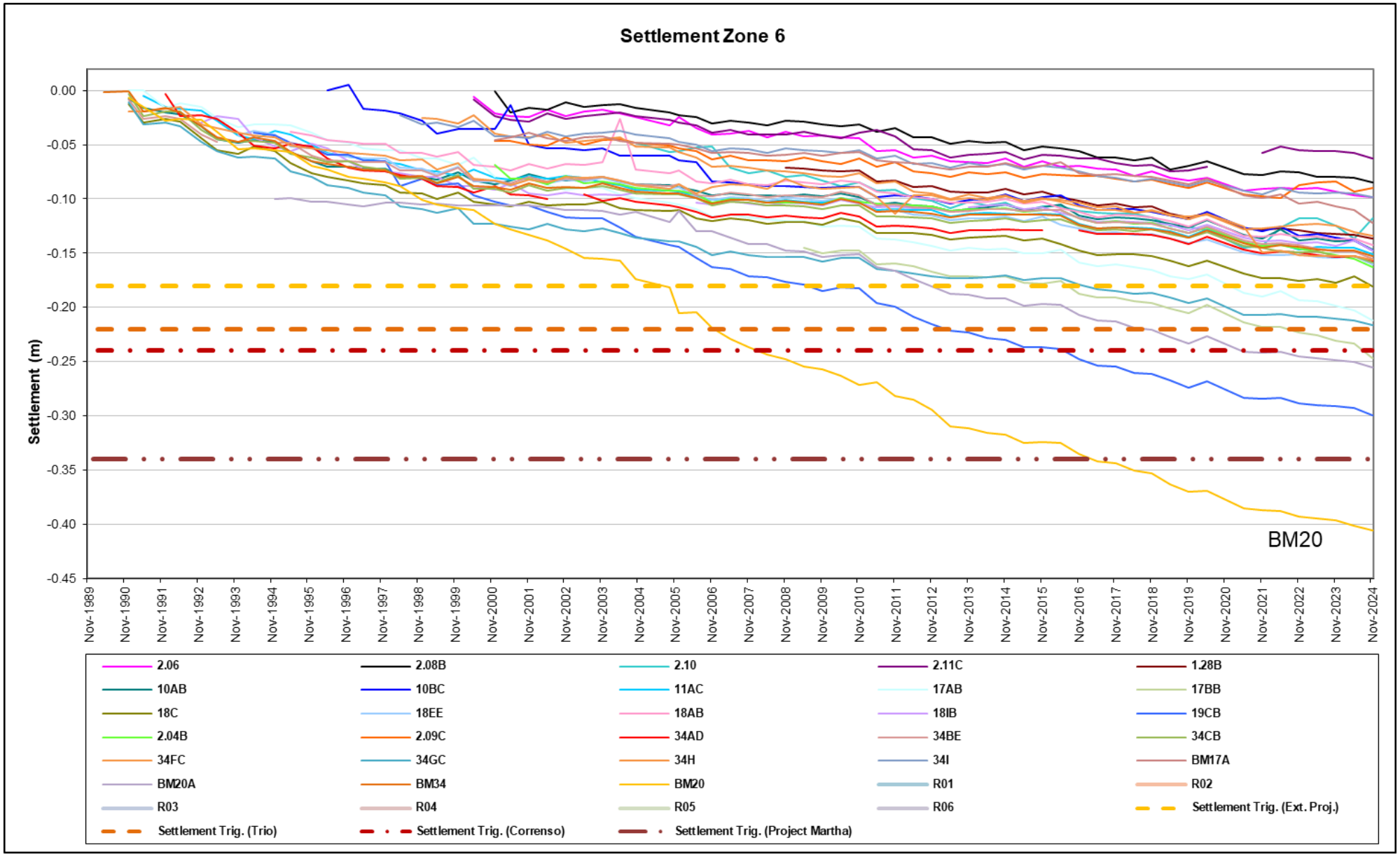
Settlement Trig. (Trio)
Settlement Trig. (Corrensо)
Settlement Trig. (Project Martha)


Settlement Zone 6
Settlement (m)
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-0.10
-0.15
-0.20
-0.25
-0.30
-0.35
-0.40
-0.45
Nov-1989
Nov-1990
Nov-1991
Nov-1992
Nov-1993
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Nov-2012
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Nov-2015
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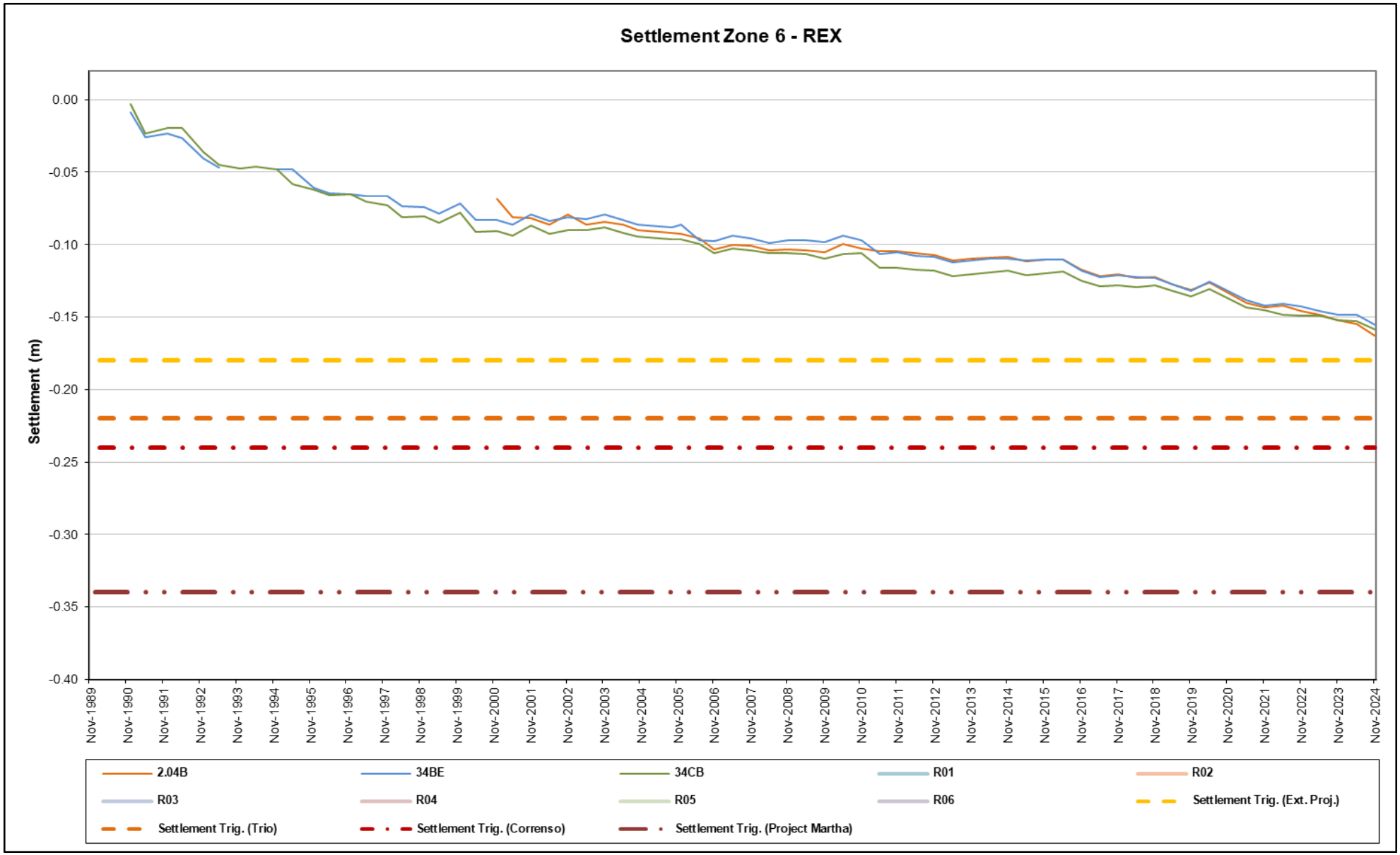
Nov-2017
Nov-2018
Nov-2019
Nov-2020
Nov-2021
Nov-2022
Nov-2023
Nov-2024
BM20
2.06
2.08B
2.10
2.11C
1.28B
10AB
10BC
11AC
17AB
17BB
18C
18EE
18AB
18IB
19CB
2.04B
2.09C
34AD
34BE
34CB
34FC
34GC
34H
34I
BM17A
BM20A
BM34
BM20
R01
R02
R03
R04
R05
R06
Settlement Trig. (Ext. Proj.)
Settlement Trig. (Trio)
Settlement Trig. (Correnso)
Settlement Trig. (Project Martha)


Settlement Zone 6 - REX
Settlement (m)
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-0.10
-0.15
-0.20
-0.25
-0.30
-0.35
-0.40
Nov-1989
Nov-1990
Nov-1991
Nov-1992
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Nov-1994
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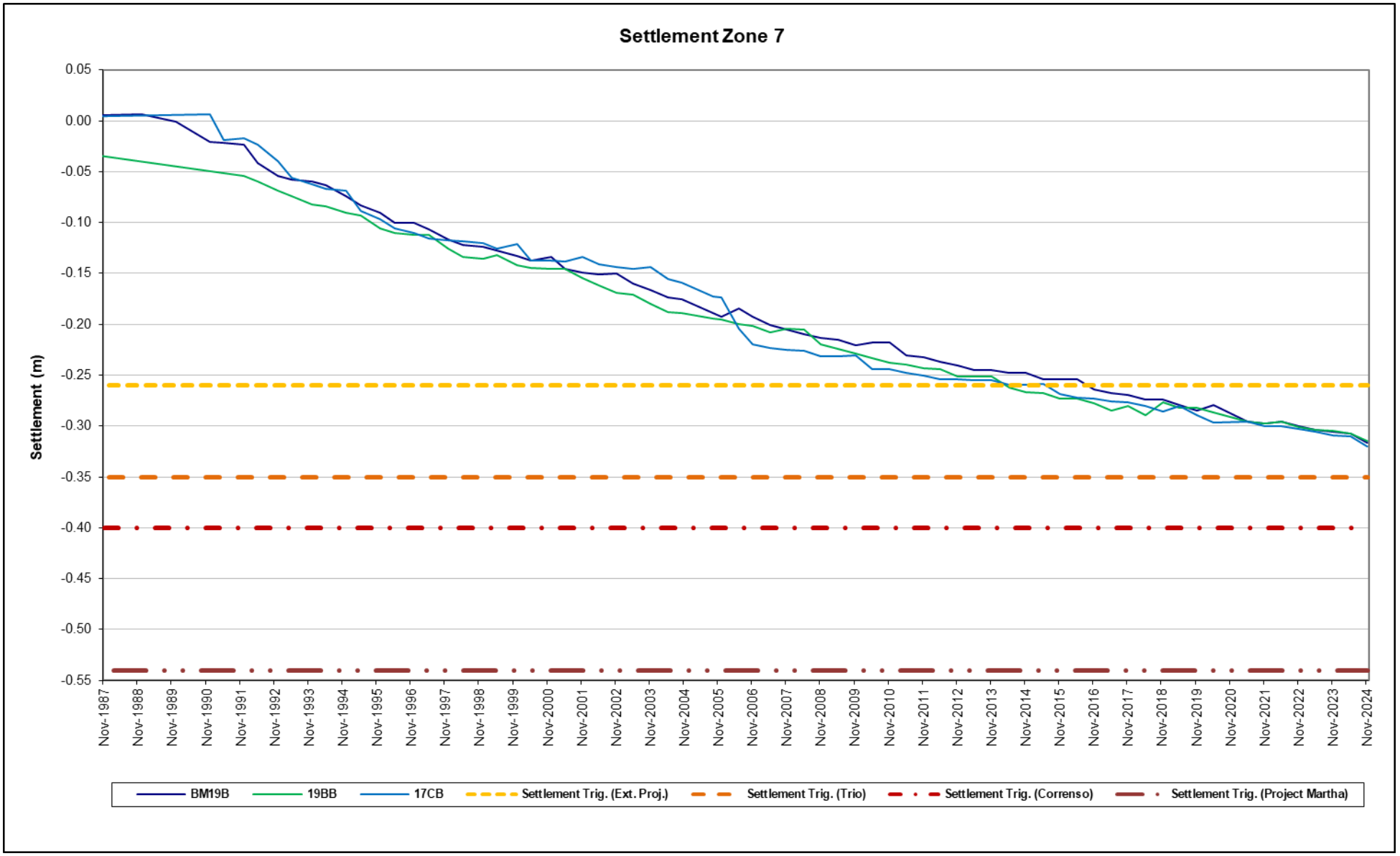
Nov-2012
Nov-2013
Nov-2014
Nov-2015
Nov-2016
Nov-2017
Nov-2018
Nov-2019
Nov-2020
Nov-2021
Nov-2022
Nov-2023
Nov-2024
2.04B
34BE
34CB
R01
R02
R03
R04
R05
R06
Settlement Trig. (Ext. Proj.)
Settlement Trig. (Trio)
Settlement Trig. (Correnso)
Settlement Trig. (Project Martha)


Settlement Zone 7
Settlement (m)
0.05
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-0.05
-0.10
-0.15
-0.20
-0.25
-0.30
-0.35
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Nov-2021
Nov-2022
Nov-2023
Nov-2024
BM19B
19BB
17CB
Settlement Trig. (Ext. Proj.)
Settlement Trig. (Trio)
Settlement Trig. (Correnso)
Settlement Trig. (Project Martha)

Appendix E Water Quality Results 2024

Pit/Underground Dewatering Water Quality Results 2024

Date	Data Point	FLS Comments	FLS EC (mS/m)	FLS pH	FLS Temp	Acidity (pH 3.7)	Alk-Bicarb	Alk-T	AlA	AlS	SbA	SbS	AsA	AsS	Bicarb	CdA	CdS	CaSO	COD	Cl	CrA	CrS	Cr6col	CoA	CoS
29/05/2024	705 Gladstone sump					1	70	71		0.012		0.0146		0.0046	86		0.00026	360	11	9		0.0005	0.01		0.0043
4/11/2024	800 PC1	Clear water sampled from tap at pump station				1	113	113	0.021	0.007	0.0007	0.0006	0.004	0.002	138	0.0028	0.0029	550		11	0.001	0.001	0.001	0.0151	0.0155
3/10/2024	800 PC1	Sample collected by Zibo				1	113	114	0.013	0.006	0.0004	0.0004	0.002	0.002	138	0.00195	0.002	520		13	0.001	0.001	0.001	0.0131	0.0133
29/05/2024	800 PC1					1	145	145		0.006		0.0017		0.031	177		0.0032	490	7	7		0.001	0.01		0.015
21/02/2024	800 PC1					1	152	152		0.006		0.0011		0.04	185		0.00044	580	6	11		0.001	0.01		0.007
29/05/2024	800 PC2					1	161	161		0.006		0.0004		0.002	196		0.0001	420	19	7		0.001	0.01		0.0024
21/02/2024	800 PC2					1	93	93		0.015		0.0005		0.002	113		0.0025	570	6	10		0.001	0.01		0.0165
4/11/2024	Favona 800 sump	High sediment load in sample due to runoff into sump				1	370	370	55	0.03	0.0054	0.0036	0.081	0.002	460	0.0083	0.0028	510		17	0.059	0.001	0.001	0.23	0.118
5/12/2024	Underground Dewatering		302.6	6.9	26.5	1	162	162	2	0.01	0.0029	0.0035	0.019	0.003	197	0.00152	0.00113	560		15	0.0061	0.001	0.001	0.0158	0.0127
6/11/2024	Underground Dewatering	High temp possibly due to water sitting in black pipe	295.8	7.3	29.0	1	220	220	1.4	0.011	0.0025	0.0024	0.01	0.003	260	0.002	0.0018	550		12	0.0041	0.001	0.001	0.0155	0.0135
1/10/2024	Underground Dewatering		297.0	7.1	25.8	1	165	165	3.5	0.011	0.0026	0.0021	0.029	0.003	200	0.00163	0.00122	540		13	0.0119	0.001	0.001	0.0189	0.0124
4/09/2024	Underground Dewatering		279.4	6.3	25.6	1	99	99	1.66	0.017	0.0018	0.0021	0.0149	0.0024	120	0.0031	0.0032	480		11	0.0046	0.0009	0.001	0.026	0.024
12/08/2024	Underground Dewatering		294.6	6.8	25.9	1	158	158	2.9	0.008	0.0031	0.0036	0.018	0.0029	192	0.0023	0.00176	520		17	0.0077	0.0005	0.001	0.021	0.0162
2/07/2024	Underground Dewatering		201.2	6.9	18.0	1	79	79	0.27	0.024	0.0016	0.0016	0.004	0.003	96	0.00156	0.00173	290		9	0.001	0.001	0.001	0.02	0.022
24/06/2024	Underground Dewatering		271.1	6.7	22.7	1	141	141	6.6	0.022	0.0042	0.0026	0.024	0.003	172	0.0082	0.0064	470		11	0.0133	0.0012	0.001	0.07	0.054
16/05/2024	Underground Dewatering		192.0	6.8	20.2	1	90	90		0.011		0.0042		0.005	110		0.00138	370	16	17		0.001	0.01		0.0181
2/04/2024	Underground Dewatering		301.3	6.5	25.3	1	138	138		0.015		0.0032		0.014	168		0.0009	550	132	13		0.001	0.01		0.0135
20/03/2024	Underground Dewatering		340.1	6.5	28.1	1	167	167		0.01		0.0041		0.008	200		0.00107	590	81	14		0.001	0.01		0.0117
25/01/2024	Underground Dewatering		297.6	6.8	29.6	1	240	240		0.015		0.0055		0.006	290		0.00117	540	6	16		0.001	0.01		0.0135

Date	Data Point	CuA	CuS	CNTOT	EC (mS/m)	F-	NH3	AuS	Hard	FeA	FeS	FeT	PbA	PbS	MgSO	MnA	MnS	HgA	HgS	HgT	NiA	NiS	NO3-N	NOxN	NO2-N	NH4N	pH	PTO	KSO	DRP	SeA	SeS	SeT	SI
29/05/2024	705 Gladstone sump		0.002	0.02	405		3.3	0.0006	1120	0.18		0.55		0.0001	50		1.76	8E-05		8E-05		0.0151	280	280	1.69	240	7.8	0.102	14.2	0.2		0.0018	0.002	38
4/11/2024	800 PC1	0.0065	0.0055	0.002	286	0.38	0.00191		1920	0.29	0.08		0.042	0.027	136	11.5	12.2		8E-05	8E-05	0.029	0.03	1.93	2	0.1	1.39	6.8	0.017	11.2		0.002	0.002		36
3/10/2024	800 PC1	0.0046	0.003	0.002	289	0.39	8E-05		1880	0.29	0.04		0.035	0.0038	143	11.8	12.5		8E-05	8E-05	0.024	0.025	0.28	0.28	0.1	0.03	7.1	0.004	11.8		0.002	0.002		37
29/05/2024	800 PC1		0.0031	0.02	272		0.00025	0.0006	1610	0.38		0.44		0.0007	92		8.9	8E-05		8E-05		0.026	0.1	0.1	0.1	0.049	7.4	0.025	9.2	0.004		0.002	0.0021	38
21/02/2024	800 PC1		0.001	0.02	268		0.0002	0.0006	1890	0.54		0.59		0.0002	105		9.5	8E-05		8E-05		0.0087	0.1	0.1	0.1	0.055	7.2	0.013	9.3	0.004		0.002	0.0021	39
29/05/2024	800 PC2		0.001	0.02	286		3.2E-05	0.0006	1640	83		83		0.0002	146		8.3	8E-05		8E-05		0.0055	0.1	0.1	0.1	0.025	6.7	0.004	12	0.04		0.002	0.0021	14.4
21/02/2024	800 PC2		0.0053	0.02	289		2.3E-05	0.0006	2100	0.58		0.63		0.021	162		12.6	8E-05		8E-05		0.045	1.15	1.17	0.1	0.036	6.4	0.004	12.4	0.004		0.002	0.0021	38
4/11/2024	Favona 800 sump	0.3	0.001	0.02	251	0.16	4E-05		1630	58	0.04		0.26	0.0002	84	10.3	6.8		8E-05	0.0026	0.24	0.123	0.26	0.28	0.1	0.01	7.2	8.2	9.3		0.002	0.002		27
5/12/2024	Underground Dewatering	0.0138	0.0018	0.002	292	0.4	0.0065		1980	3	0.05		0.067	0.0005	138	10.7	11.1		8E-05	8E-05	0.027	0.021	4.4	5.1	0.68	1.18	7.4	0.35	12.6		0.0017	0.0022		33
6/11/2024	Underground Dewatering	0.01	0.0012	0.002	282	0.35	0.0159		1910	1.93	0.04		0.042	0.0006	129	10.3	9.8		8E-05	8E-05	0.026	0.023	2.9	3.4	0.48	1.12	7.8	0.53	12.5		0.002	0.002		39
1/10/2024	Underground Dewatering	0.035	0.0024	0.003	284	0.34	0.00106		1960	5.8	0.05		0.139	0.0005	151	12.6	11.8		8E-05	0.00023	0.033	0.021	1.67	2.1	0.39	0.33	7.2	0.53	11.8		0.002	0.002		35
4/09/2024	Underground Dewatering	0.032	0.0095	0.002	261	0.36	0.00041		1700	2.5	0.06		0.076	0.0045	122	10.3	10.4		8E-05	9E-05	0.061	0.052	2.9	3.1	0.23	0.4	6.6	0.195	12.1		0.0012	0.0015		34
12/08/2024	Underground Dewatering	0.027	0.0025	0.006	284	0.32	0.0037		1820	3.9	0.02		0.086	0.00019	127	10.3	9.1		8E-05	0.00013	0.046	0.035	4.4	4.8	0.41	1.89	6.9	0.39	11.8		0.002	0.002		32
2/07/2024	Underground Dewatering	0.0064	0.0049	0.002	182	0.31	0.0018		1030	0.2	0.04		0.0024	0.0002	73	4.6	4.6		8E-05	8E-05	0.051	0.053	14.7	14.9	0.17	0.39	7.3	0.057	7.6		0.002	0.002		21
24/06/2024	Underground Dewatering	0.165	0.0103	0.002	247	0.31	0.00072		1600	5.6	0.04		0.166	0.0009	103	13.7	11.1		8E-05	0.00035	0.176	0.142	11.2	11.4	0.24	0.34	7	0.62	9.6		0.002	0.002		33
16/05/2024	Underground Dewatering		0.21	0.14	206		0.0024	0.0012	1220	0.24		0.63		0.0002	75		5.5	8E-05		8E-05		0.031	4.3	4.6	0.33	1.17	7	0.031	10.9	0.004		0.004	0.0023	23
2/04/2024	Underground Dewatering		0.0024	0.02	290		0.0182	0.0006	1870	3.1		10.9		0.0003	123		9.6	8E-05		0.00015		0.025	8.2	8.3	0.11	6	7.1	0.039	11.5	0.004		0.002	0.0021	35
20/03/2024	Underground Dewatering		0.001	0.02	269		0.00039	0.0006	2000	12.4		105		0.0006	125		9.8	8E-05		0.0021		0.022	1.39	1.57	0.18	0.29	6.8	0.24	12.7	0.004		0.002	0.0022	36
25/01/2024	Underground Dewatering		0.0013	0.02	288		0.0047	0.0006	1830	14.7		142		0.0005	117		9.4	8E-05		0.00052		0.026	5	5.9	0.92	1.8	7.1	0.96	13.7	0.004		0.002	0.0037	34

Date	Data Point	AgA	AgS	NaSO	SO4	Sum Anion	Sum Cation	TiA	TiS	TKN	TSS	UA	US	CNWAD	ZnA	ZnS
29/05/2024	705 Gladstone sump		0.0001	32	1070	44	41			240	200			0.02		0.043
4/11/2024	800 PC1	0.0002	0.0002	49	1930	43	41	0.00042	0.00045	2.1	10	9E-05	7E-05	0.002	1.09	1.13
3/10/2024	800 PC1	0.0002	0.0002	49	1810	40	41	0.00037	0.00037	0.11	3	7E-05	7E-05	0.002	0.74	0.75
29/05/2024	800 PC1		0.0002	51	1680	38	35			0.16	7			0.02		1.49
21/02/2024	800 PC1		0.0002	57	1680	38	41			0.13	3			0.02		0.51
29/05/2024	800 PC2		0.0002	45	1820	41	35			0.1	13			0.02		0.084
21/02/2024	800 PC2		0.0002	51	1900	42	45			0.22	3			0.02		0.97
4/11/2024	Favona 800 sump	0.0002	0.0002	37	1670	43	35	0.00098	0.00022	4.2	22000	0.00141	0.00021	0.02	4.4	0.69
5/12/2024	Underground Dewatering	0.0002	0.0001	56	1900	44	43	0.00041	0.00034	1.76	940	0.00016	0.00012	0.002	0.59	0.42
6/11/2024	Underground Dewatering	0.0002	0.0002	53	1910	45	41	0.00043	0.00039	2.1	1710	0.00016	0.00011	0.002	0.93	0.73
1/10/2024	Underground Dewatering	0.0002	0.0002	52	1910	44	42	0.00045	0.00034	0.81	1480	0.00018	7E-05	0.002	0.73	0.38
4/09/2024	Underground Dewatering	0.0001	0.0001	48	1730	39	37	0.00052	0.00046	1.1	590	0.00016	0.00013	0.002	1.15	1.1
12/08/2024	Underground Dewatering	0.0002	0.0001	50	1760	41	39	0.00049	0.00034	2.3	1100	0.00017	0.00011	0.004	0.85	0.53
2/07/2024	Underground Dewatering	0.0002	0.0002	28	960	23	22	0.00031	0.00031	0.63	19	0.00024	0.00024	0.002	0.53	0.54
24/06/2024	Underground Dewatering	0.0002	0.0002	35	1490	35	34	0.00086	0.00046	1.05	1590	0.00054	0.00031	0.002	2.8	1.92
16/05/2024	Underground Dewatering		0.001	51	1190	27	27			2.4	35			0.11		0.6
2/04/2024	Underground Dewatering		0.0002	53	1770	41	41			7.7	101			0.02		0.48
20/03/2024	Underground Dewatering		0.0002	57	1830	42	43			1.05	1220			0.02		0.38
25/01/2024	Underground Dewatering		0.0002	54	1830	44	40			3.7	3700			0.02		0.26

Appendix F Conceptual Hydrogeologic Sections

At the request of the independent peer review panel for OGL's Waihi gold mining operation, the following presents three conceptual hydrogeologic sections at key locations though Waihi. Figures 1 and 2 show the section locations relative to the interpreted groundwater flow systems. It has been proposed that these sections are updated and included in the annual dewatering and settlement compliance report. Figures 3 to 8 below show the details of the sections, and a brief discussion is provided for each.

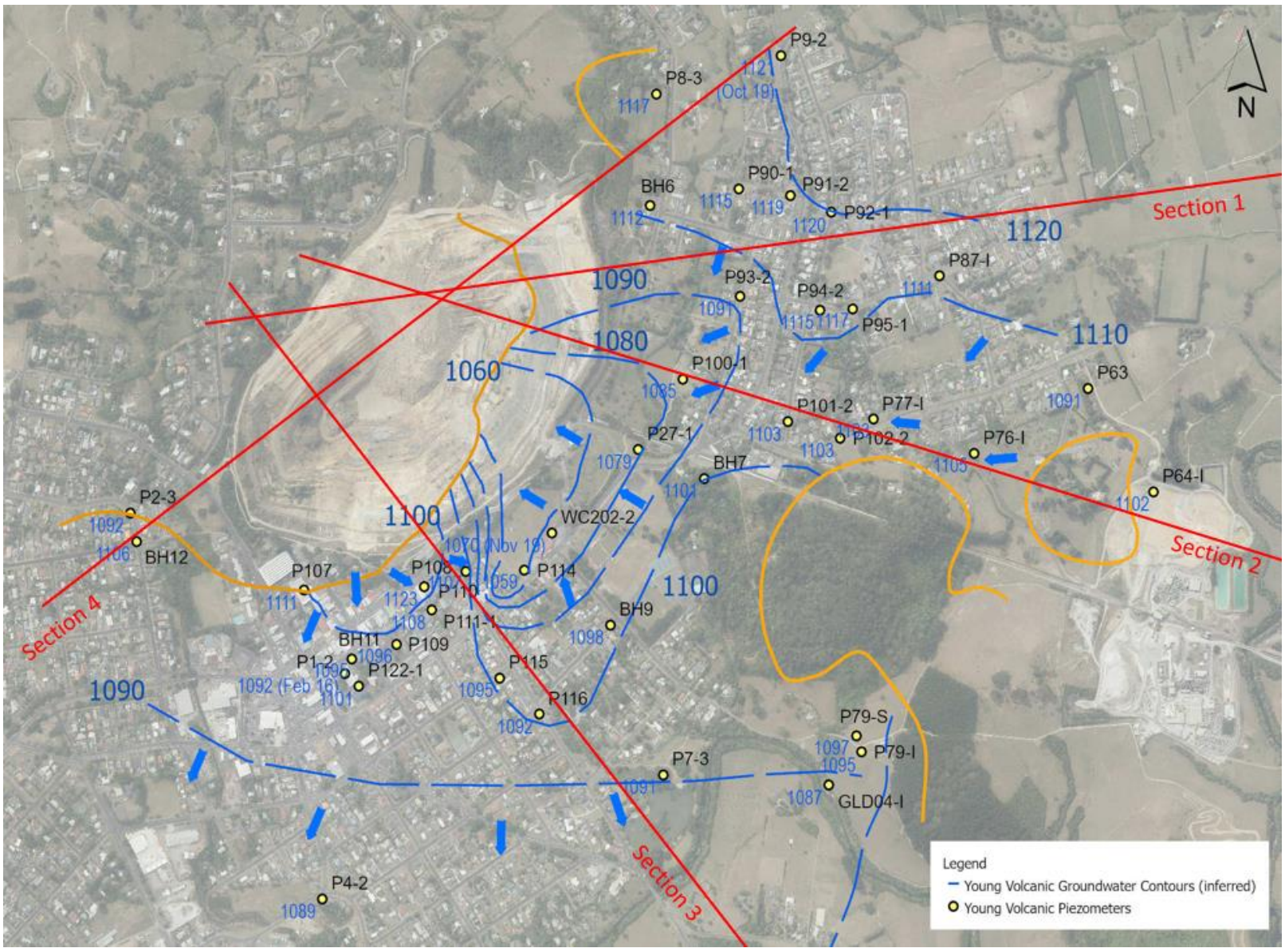

Figure 1 Section Line Locations Relative to Young Volcanics Interpreted Piezometric Surface

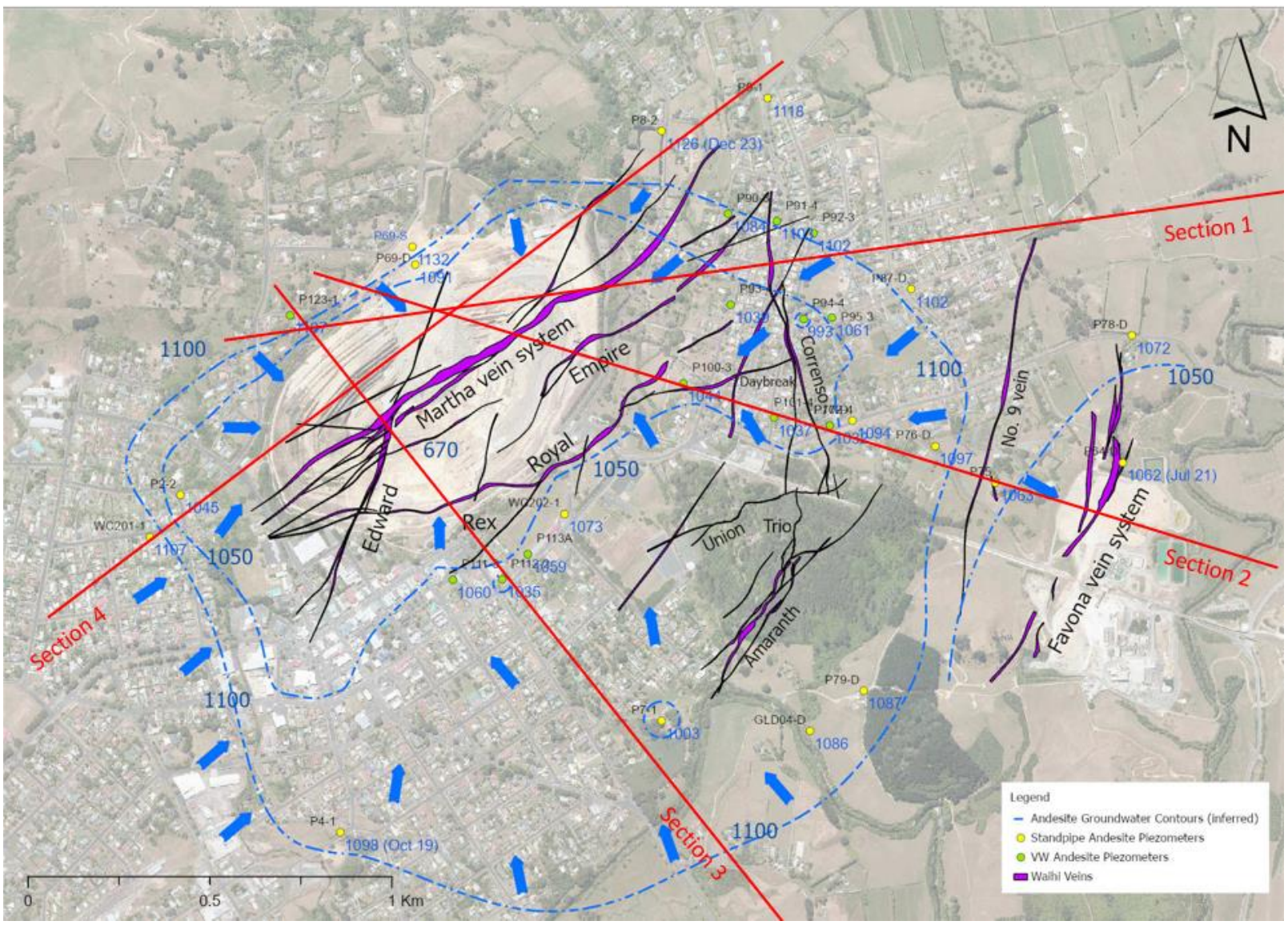

Figure 2 Section Line Locations Relative to Andesite Interpreted Piezometric Surface

Section 1 - P90 Series

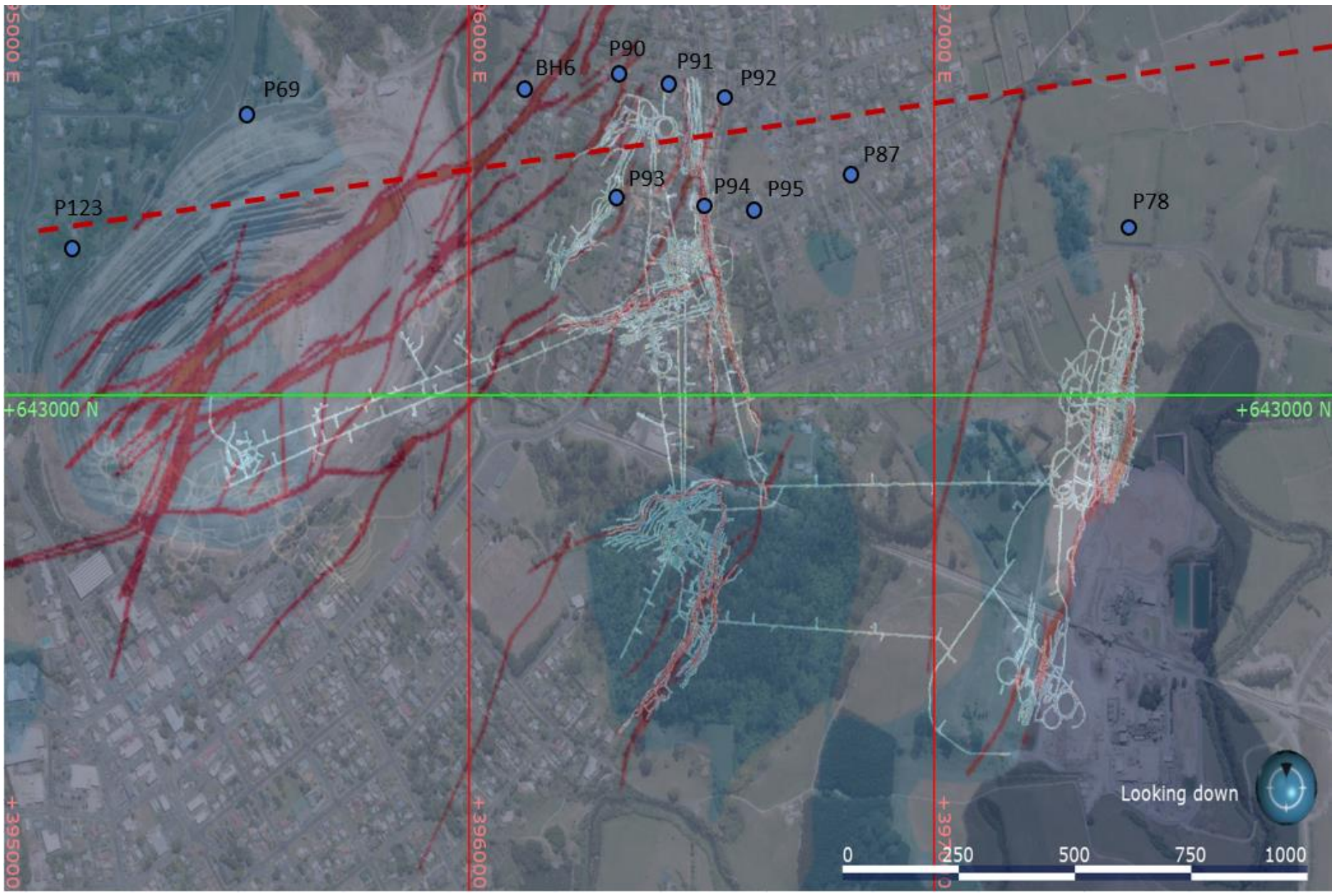

Figure 3 Section 1 P90 Series Section Location – Vein Systems and Underground Workings Shown

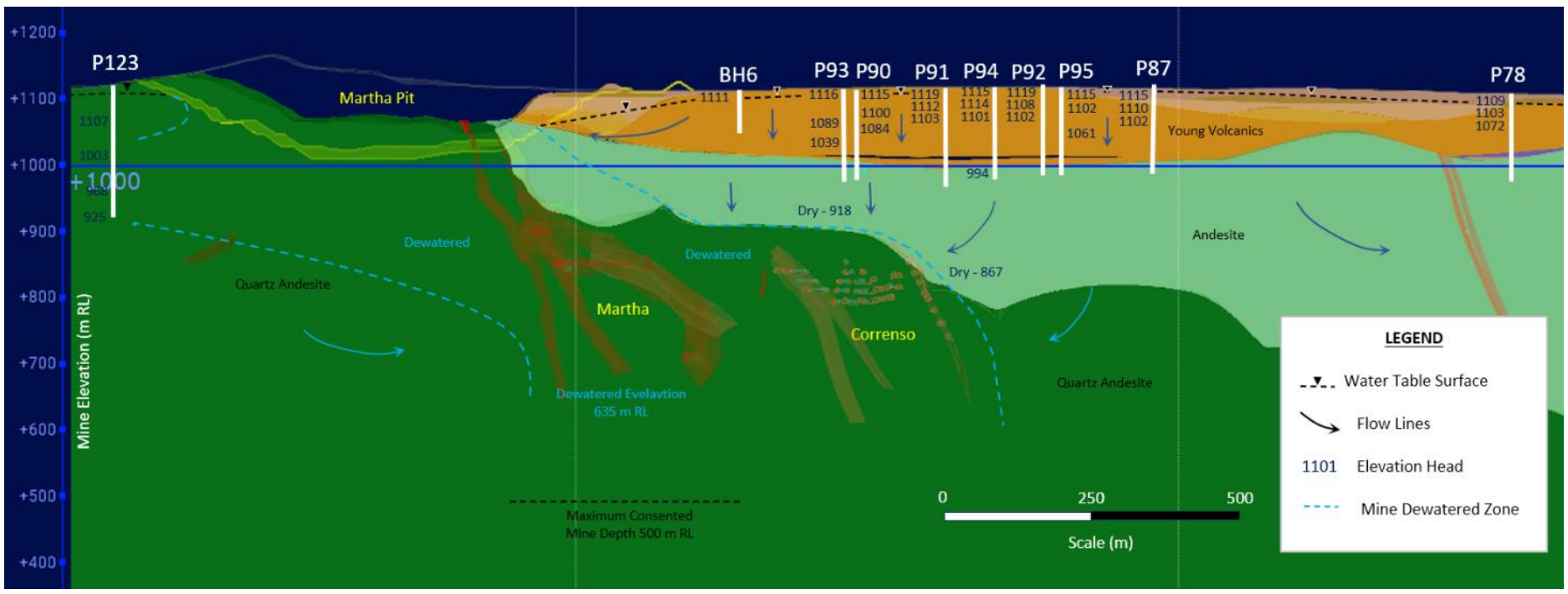

Figure 4 Section 1 P90 Series Conceptual Hydrogeologic Section

Description

The P90 series piezometers were constructed through Waihi East for the purpose of monitoring effects associated with underground mining of the Correnso and Martha ore bodies. The section shows a sequence of young volcanic materials some 100 m in thickness that overlie post mineralisation andesite that thickens to the east. The groundwater flow direction is oblique to the section orientation with most flow coming out of the plane (as shown in Figures 1 and 2) with some flow paths moving towards the Martha Pit.

The section illustrates that there is a dewatered zone in the Andesite host rock that extends from the Correnso underground workings to the Martha Pit. This dewatered zone exists within the Quartz Andesite with some limited propagation up into the overlying post-mineralization Andesite. The installation of an additional andesite piezometer P123 has shown a depressurised zone exists, extending out to the northwest behind the pit wall.

A permanent water table is observed within the Young Volcanic units that are perched over the post-minealization Andesite due to low permeability materials at the contact of the two geologic units. Vertically downward hydraulic gradients are noted to occur that increases locally where under drainage effects occur due to underground dewatering. The groundwater flow directions are illustrated in Figure 4 with some groundwater being lost to the underground to the west and further east flowing away from the Martha Pit. Some shallow groundwater within the Young Volcanics discharges near the edge of the pit.

Section 2 – P100 Series

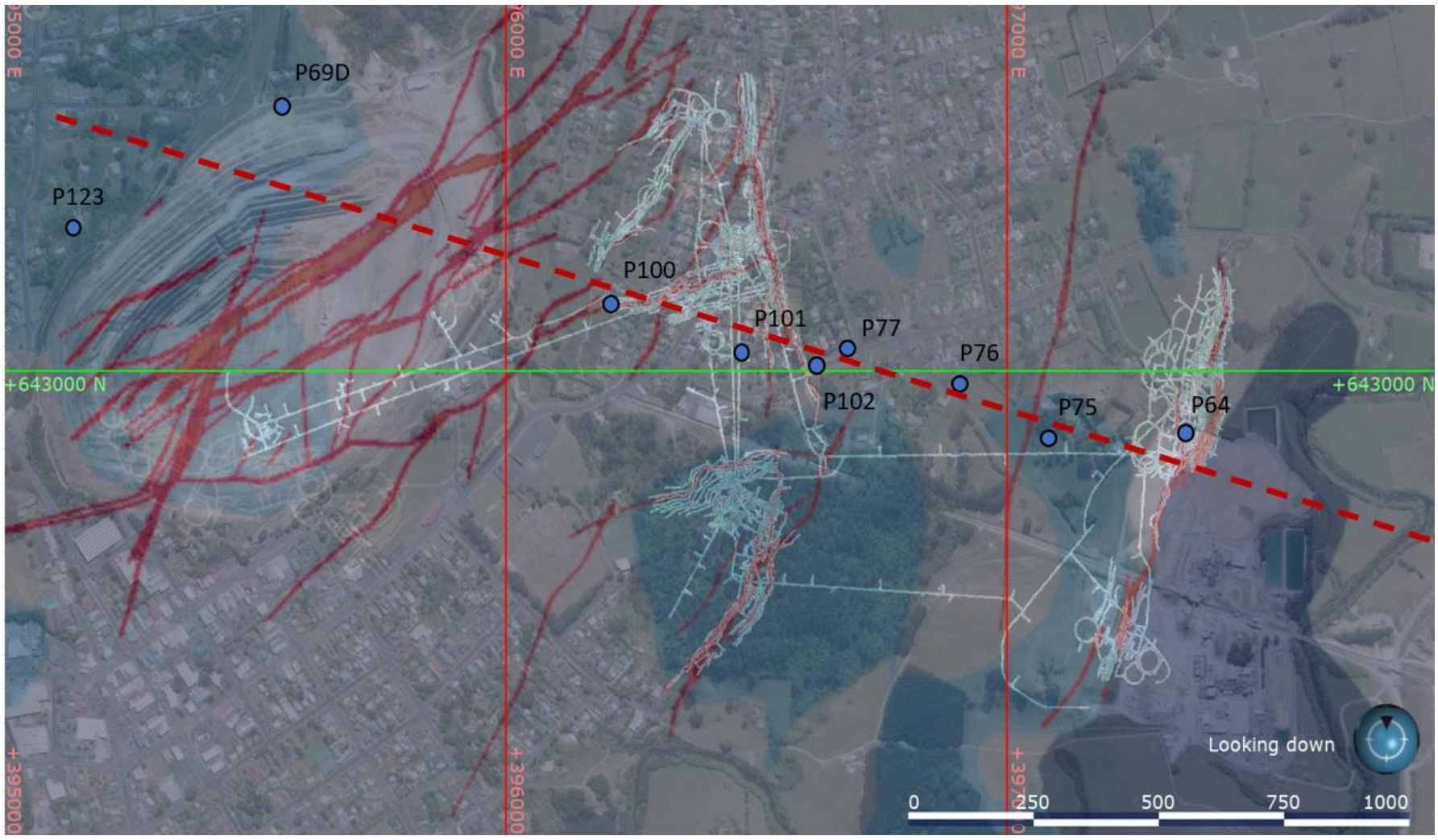

Figure 5 Section 2 P100 Series Section Location – Vein Systems and Underground Workings Shown

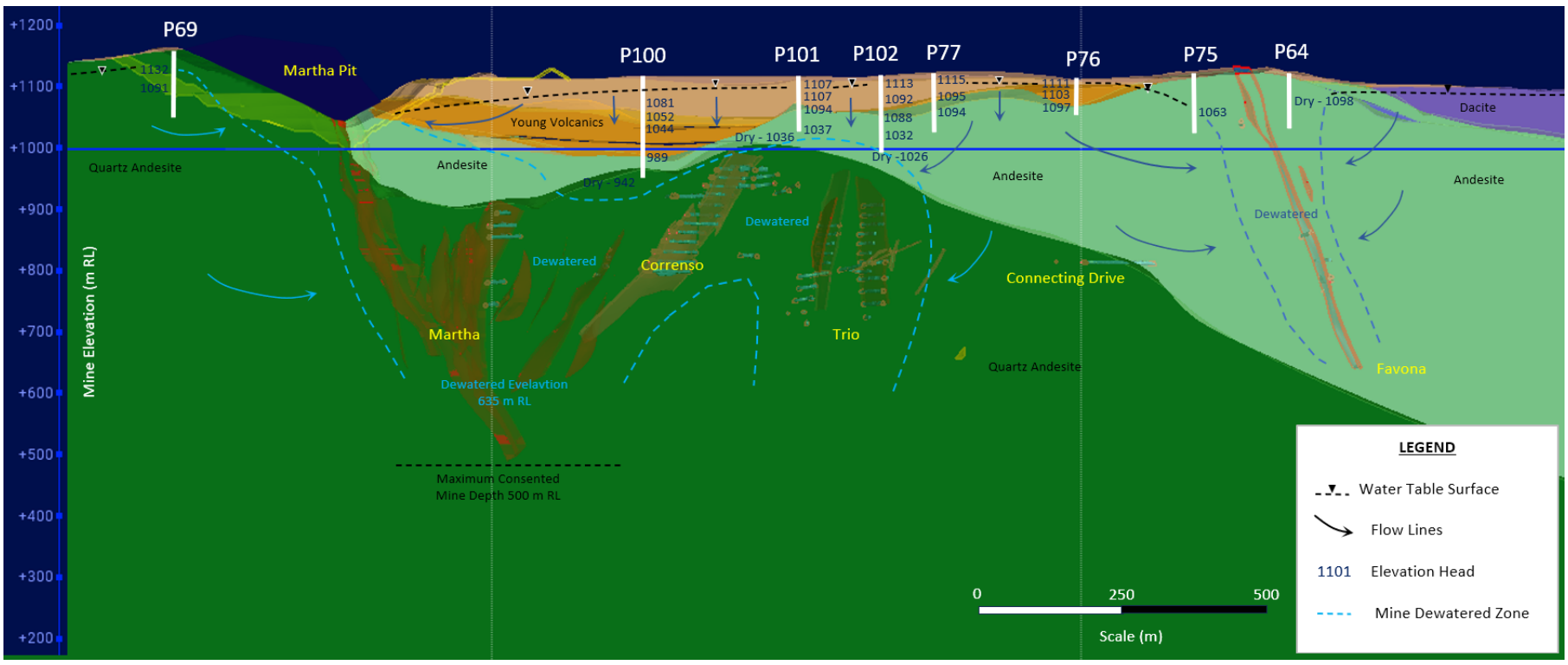

Figure 6 Section 2 P100 Series Conceptual Hydrogeologic Section

Description

The P100 series piezometers were constructed through Waihi for the purpose of monitoring effects associated with underground mining of the Correnso, Trio and Favona ore bodies. The section shows a sequence of young volcanic materials some 150 m in maximum thickness that thins to the east towards Union Hill. These deposits overly post mineralisation andesite that thickens to the east. The groundwater flow direction is oblique to parallel to the section orientation with most of the flow in the Andesite moving towards underground workings and Martha Pit in the west or Favona underground workings in the east. Groundwater flow in the young volcanics is towards the Martha Pit in the west and also downward leakage.

The section illustrates that there is a dewatered zone that extends between the Martha, Correnso and Trio underground workings in the Andesite host rock. The dewatered zone is limited in its eastern extent and does not propagate out to Favona which has its own localised dewatered zone. The low permeability rockmass between the zones creates this separation. An access drive physically connects Favona to the other ore bodies and a localised dewatered zone exists around it. A groundwater divide exists between the Favona and Trio with groundwater flowing either west towards Trio/Correnso or east towards Favona.

A permanent water table is observed within the Young Volcanic units that are perched over the post-mineralization Andesite due to low permeability materials at the contact of the two geologic units. A vertically downward hydraulic gradient is noted to be present that increases locally where under drainage effects occur due to underground dewatering. Some shallow groundwater within the Young Volcanics discharges near the edge of the pit.

Section 3 – P110 Series

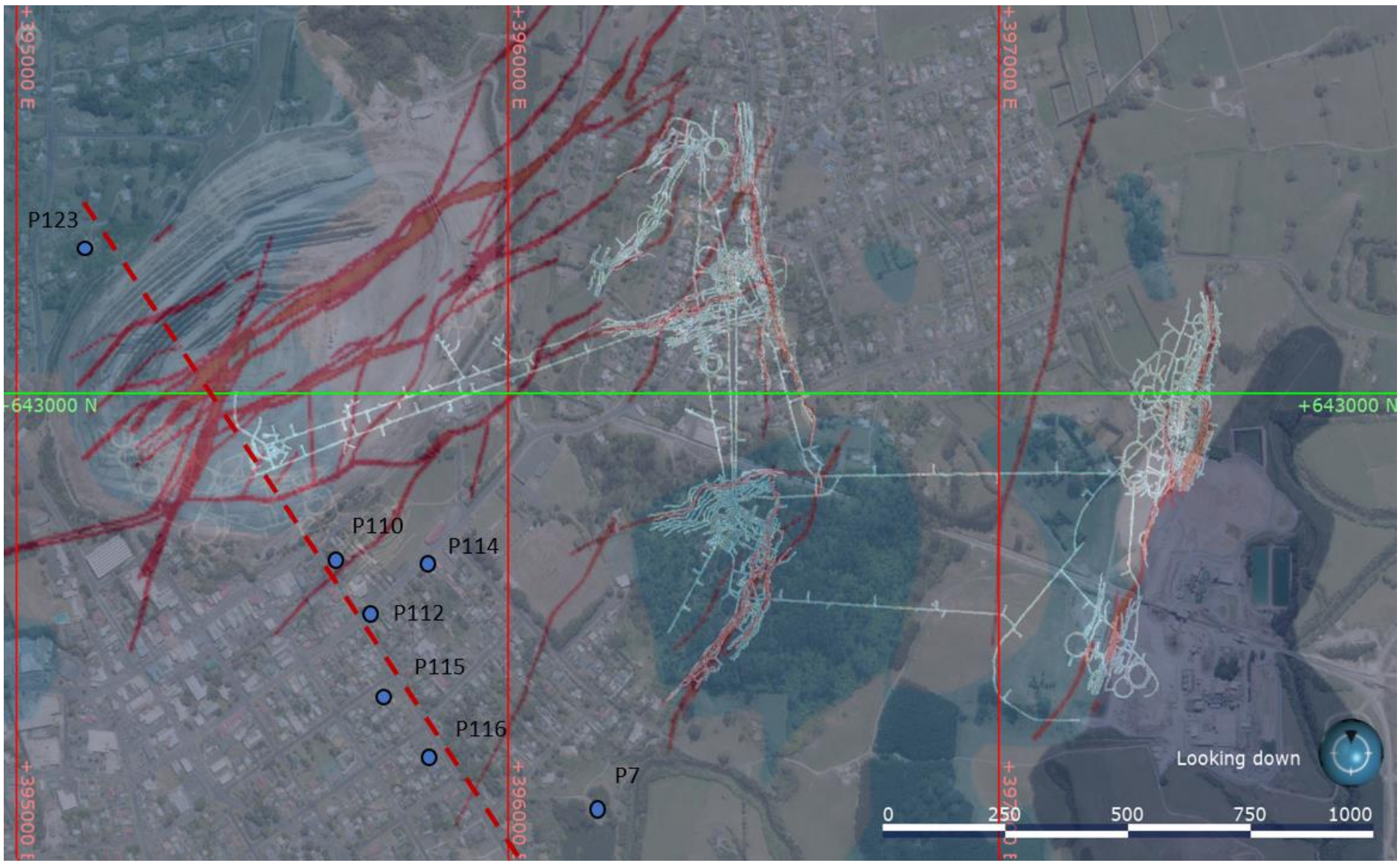

Figure 7 Section 3 P110 Series Section Location – Vein Systems and Underground Workings Shown

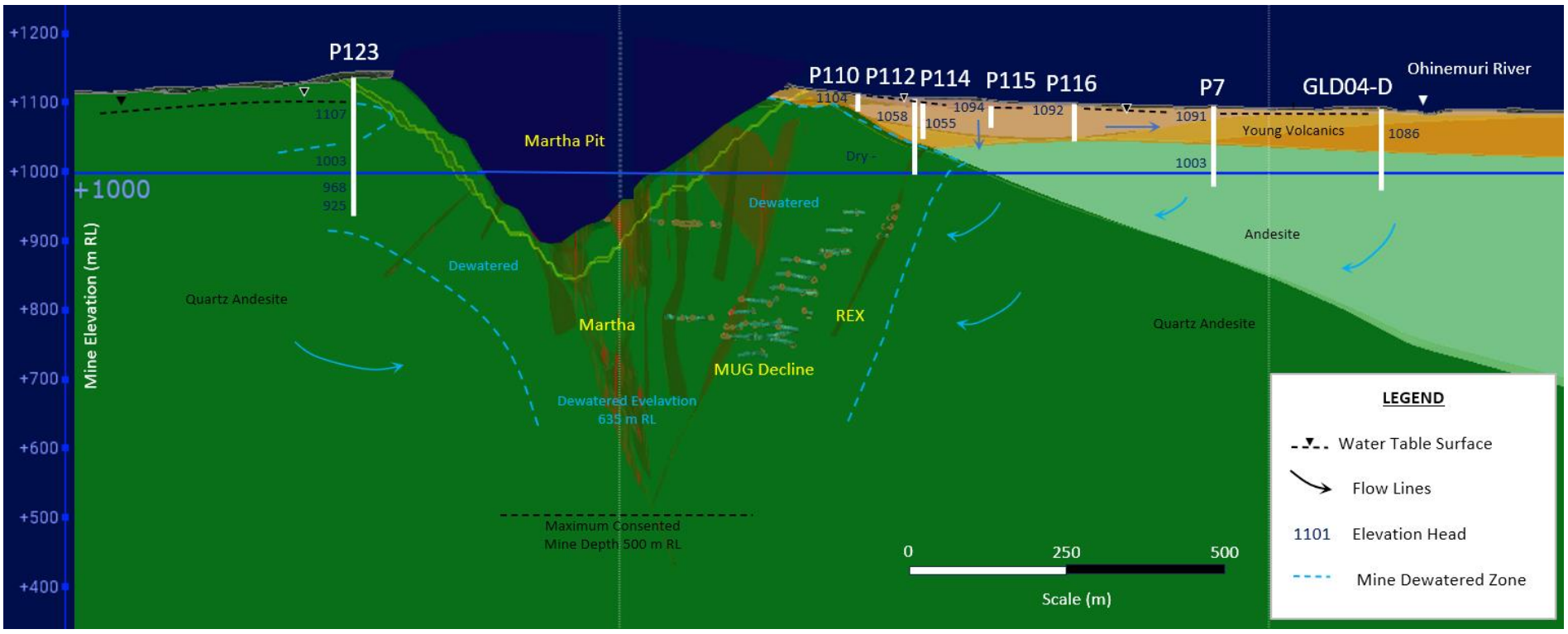

Figure 8 Section 3 P110 Series Conceptual Hydrogeologic Section

Description

The P110 series piezometers were constructed through Waihi for the purpose of monitoring effects associated with the Martha Pit and underground mine. The section shows a sequence of young volcanic materials up to 80 m in thickness overlying post-mineralization Andesite which thickens considerably to the east. The groundwater flow direction is parallel to the section orientation.

A dewatered zone exists around the Martha Pit and the decline that is being advanced to allow the underground mining of the Martha ore body. The dewatering extends out to include the Rex and Royal vein systems via crosscutting structures. Groundwater flow towards the dewatered zone in the mineralised host rock to the north. There is a groundwater divide between P115 and P116 where groundwater in the post-mineralization Andesite flows to the south. The installation of an additional andesite piezometer P123 has shown a depressurised zone exists, extending out to the northwest behind the pit wall.

A permanent water table is observed within the Young Volcanic units that are perched over the host Andesite and post-mineralization Andesite due to low permeability materials at the contact of the two geologic units. Vertically downward hydraulic gradients are noted to be present that increases locally where under drainage effects occur due to underground dewatering. Shallow groundwater within the Young Volcanics flows to the south down gradient where it discharges into the Ohinemuri River.

Section 4 – MUG Line of Strike

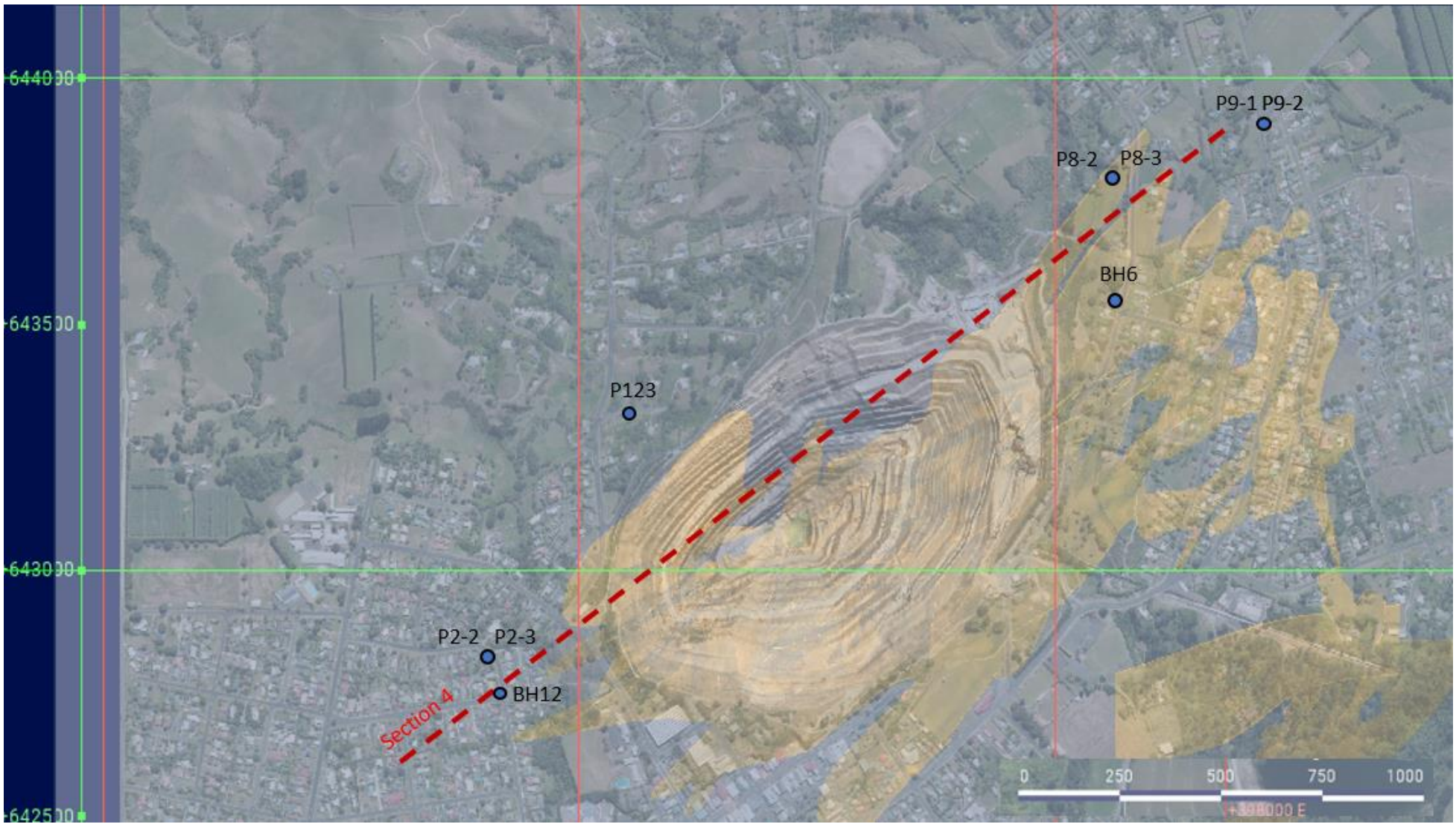

Figure 9 Section 4 MUG Line of Strike Section Location – Vein Systems and Underground Workings Shown

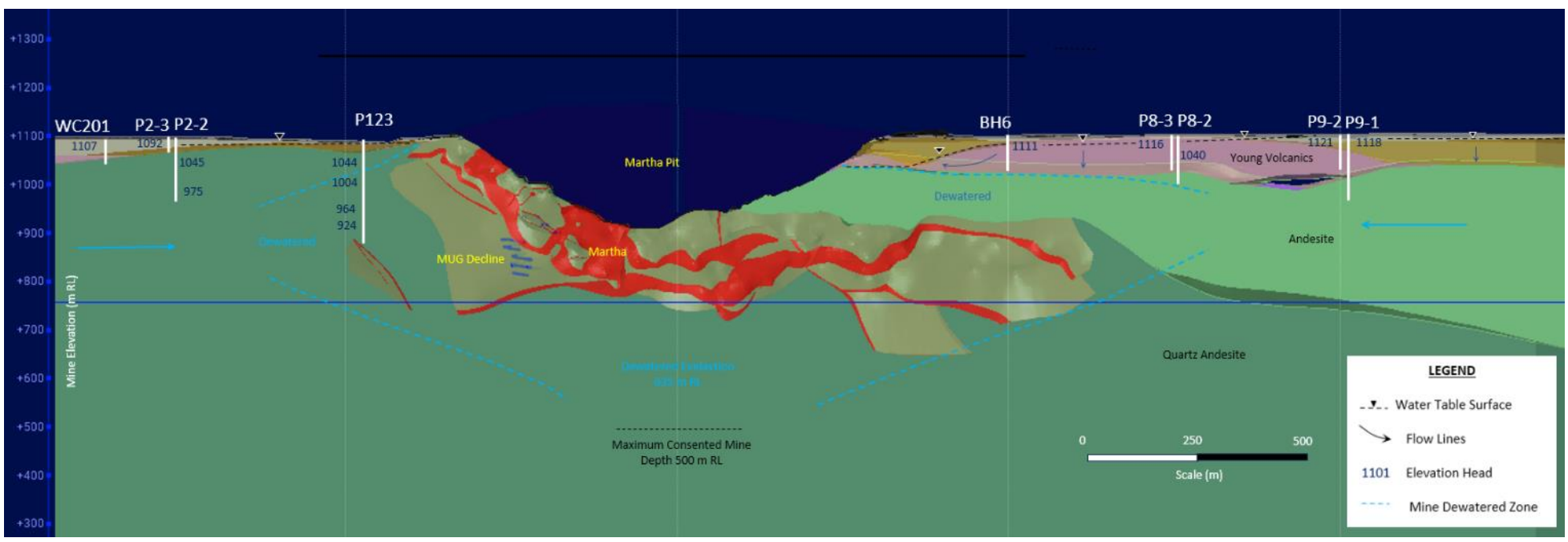

Figure 10 Section 4 MUG Line of Strike Section Location Conceptual Hydrogeologic Section

A conceptual hydrogeologic section has been developed along strike of the dominant structures hosting the vein systems. The purpose of the section is to determine the extent of dewatering within the andesite rock unit. The section shows a sequence of young volcanic materials up to 100 m in thickness overlying post-mineralization Andesite which thickens considerably to the east. The groundwater flow direction is parallel to the section orientation.

Conceptually, the section shows that dewatering occurs along the length of the MUG vein system and shows that the andesite host rock is dewatered at depth. The lateral extent of dewatering within the andesite at depth is not completely closed out along strike. As indicated by P123, a piezometric surface is present in the andesite in the near surface but is dewatered at depth. That is interpreted to be a function of the lower rockmass permeability in the near surface due to the effects of alteration and higher permeability at depth due to veining and fracturing.

A permanent water table is observed within the Young Volcanic units that are perched over the host Andesite and post-mineralization Andesite due to low permeability materials at the contact of the two geologic units. Vertically downward hydraulic gradients are noted to be present that increases locally where under drainage effects occur due to underground dewatering.