OCEANAGOLD
WAIHI OPERATION

Correnso/SUPA Stability 2016 Annual Report

Contents

Appendices

1. PURPOSE

The purpose of the OceanaGold Waihi (OGW) Correnso/SUPA Surface Stability Annual Report is to comply with the requirements of the following Hauraki District Council (HDC) consent conditions:

- LUC 202.2012 (Correnso) Condition 25 – Surface Stability
- LUC 202.2016 (SUPA) Condition 19 – Surface Stability.

2. OBJECTIVES

2.1 AS REQUIRED BY CONDITION 25 OF LUC 202.2012 (CORRENSO)

25. The consent holder shall provide to the Council on an annual basis (within one month of the agreed anniversary) a report:
a) Describing the location, depth height and volume (m³) of stopes; and a summary of the data required by Condition 26 regarding unfilled stope voids; and
b) Describing the lengths of development that, due to the encountered geotechnical conditions where multiple levels overlap, will require backfilling prior to mine closure; and
c) Describing the backfilling and compaction associated with each stope; and
d) Describing the ground conditions revealed by the mine excavations; and
e) Describing the monitoring and measures adopted to ensure ground surface stability, particularly as provided for in Condition 23 and the outcomes of such measures; and
f) Describing the location and depth of exploratory drives;
g) Confirming that the extent of the mining works is confined to CEPPA, as defined in Figure 1.

The agreed anniversary for this report was 20 December, the date in 2013 when the first blast was initiated into the Correnso Consent Area. In agreement with HDC, this anniversary was revised to 31 December to coincide with other calendar-year data collation and reporting.

2.2 AS REQUIRED BY CONDITION 19 OF LUC 202.2016 (SUPA)

19. The consent holder shall provide to the Council an annual report (within one month of the agreed anniversary established in condition 4 or as otherwise agreed in writing by the Council):
a) Describing the location, depth height and volume (m³) of stopes; and a summary of the data required by Condition 20 regarding unfilled stope voids; and
b) Describing the lengths of development that, due to the encountered geotechnical conditions where multiple levels overlap, will require backfilling prior to mine closure; and
c) Describing the backfilling and compaction associated with each stope; and
d) Describing the ground conditions revealed by the mine excavations; and
e) Describing the monitoring and measures adopted to ensure ground surface stability, particularly as provided for in Condition 15 and the outcomes of such measures; and
f) Describing the location and depth of exploratory drives;
g) Confirming that the extent of the mining works is confined to SUPA, as defined in Figure 1.
These reports may be prepared in conjunction with similar reports prepared in accordance with the consent conditions applying to the Correnso Underground Mine.

Note: As at 31 December 2016, mine development had stayed solely within the Correnso boundary and had not crossed into SUPA.

3. LOCATION, DEPTH, HEIGHT AND VOLUME OF STOPES

(Consent conditions: Correnso c.25a, SUPA c.19a)

The stoping methodology for Correnso is Modified Avoca (refer to Appendix A for a graphical representation). This method requires a 'bottom-up' mining technique, whereby each successively higher stope is mined out by driving on the surface of the previously laid backfill of underlying stopes. This technique also requires the development to the extremities of the ore body, then mining back towards the access points. Schematics of Correnso mining operations for the period are presented in Figures 2 and 3.

Stope extraction began in mid 2015, with production continuing throughout 2016. At any one time, multiple stopes are in various states of the production cycle (drilling, blasted stocks, bogging, and backfilling). This means that some stopes may have open voids at the end of the month. By the end of the reporting period, 170,419m³ of stope volume had been extracted, with 168,988m³ backfilled (Figure 1) and mining had reached the 915 level.

Stope design during the period consisted of 5m drives with up to 10m stope panels between the drives. The 10m stope height was the maximum during the year; no stopes were greater, a few were less. This results in an effective maximum void height of 20m; made up of the 10m stope and two 5m drives (one above and one below the stope).

While most of the mine development is along the main vein, mining of minor offshoot 'splay' veins occurs when viable. These are in various states of extraction (Figure 2) and are annotated in Figure 4.

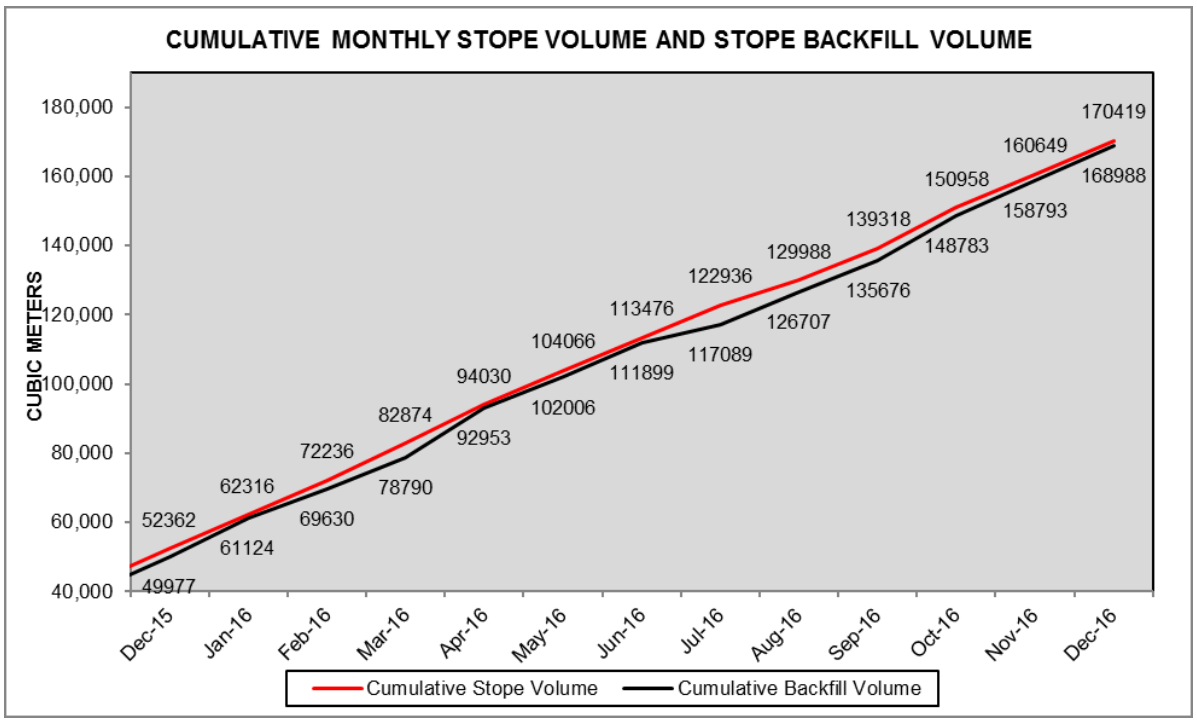


Figure 1: Cumulative monthly stope voids and backfill volumes 2016

4. DEVELOPMENT & EXPLORATION DRIVES

(Consent conditions: Correnso c.25b&f, SUPA c.19b&f)

Figures 4 and 5 indicate development progress in Correnso as at 31 December 2016. As noted earlier, the SUPA boundary had not been crossed at year end.

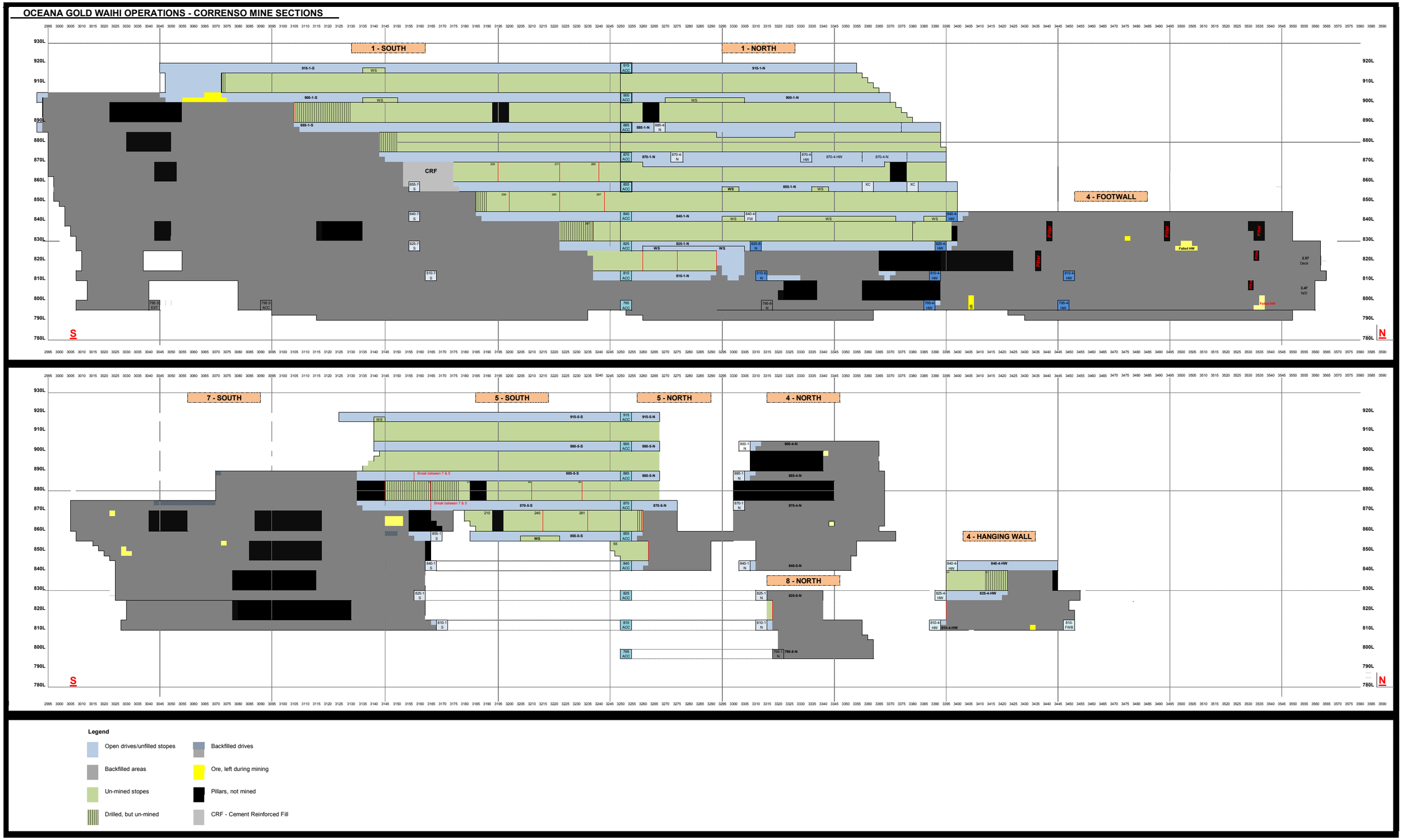
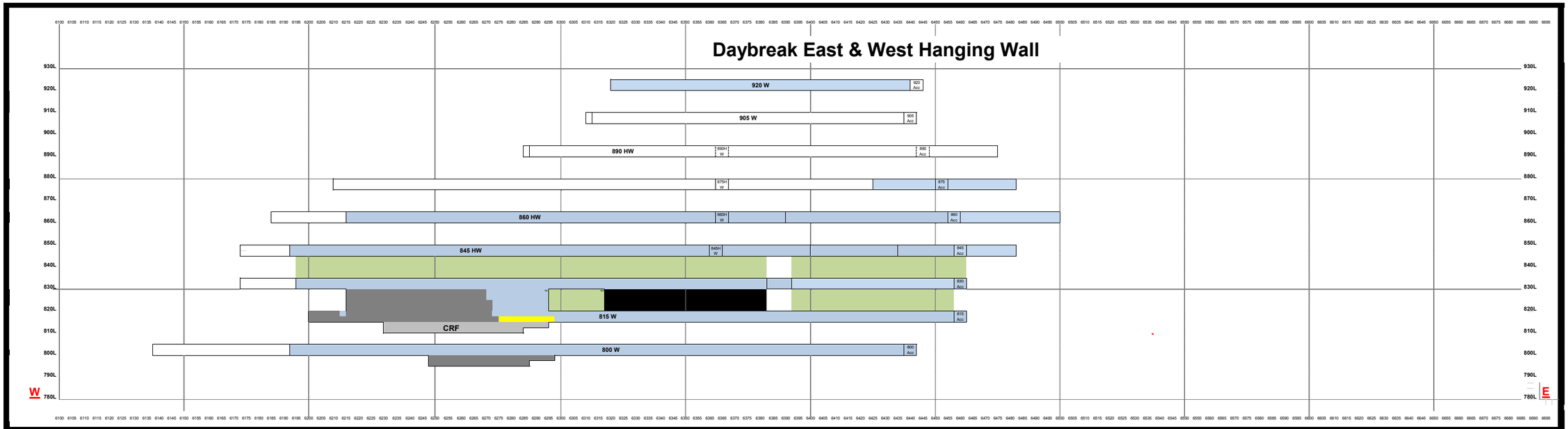


Figure 2: Schematic Long Section of Correnso Veins



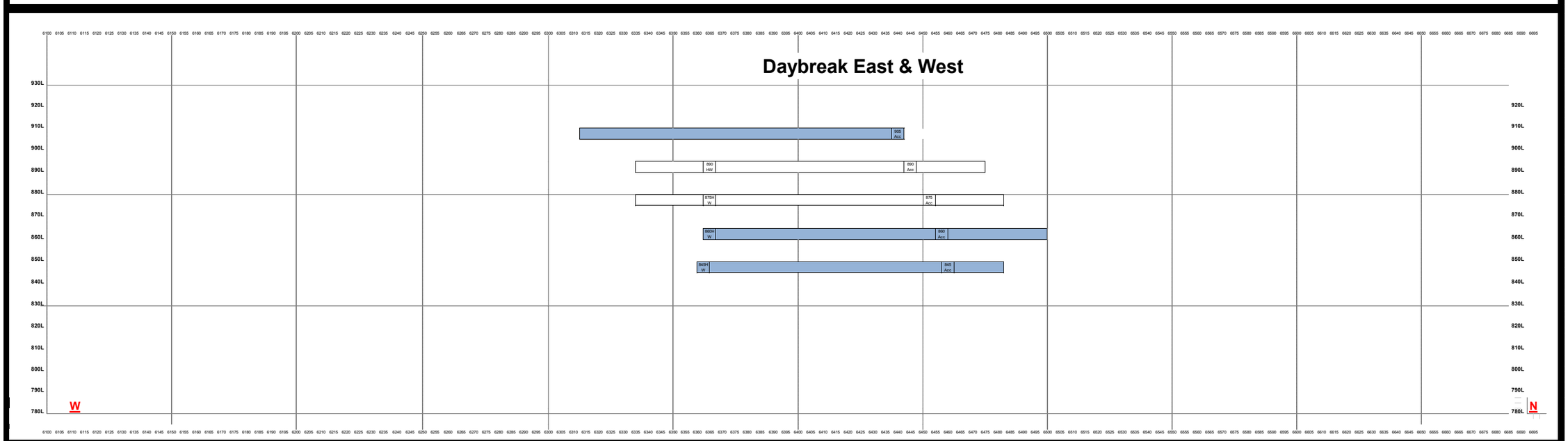


Figure 3: Schematic Long Section of Daybreak Veins

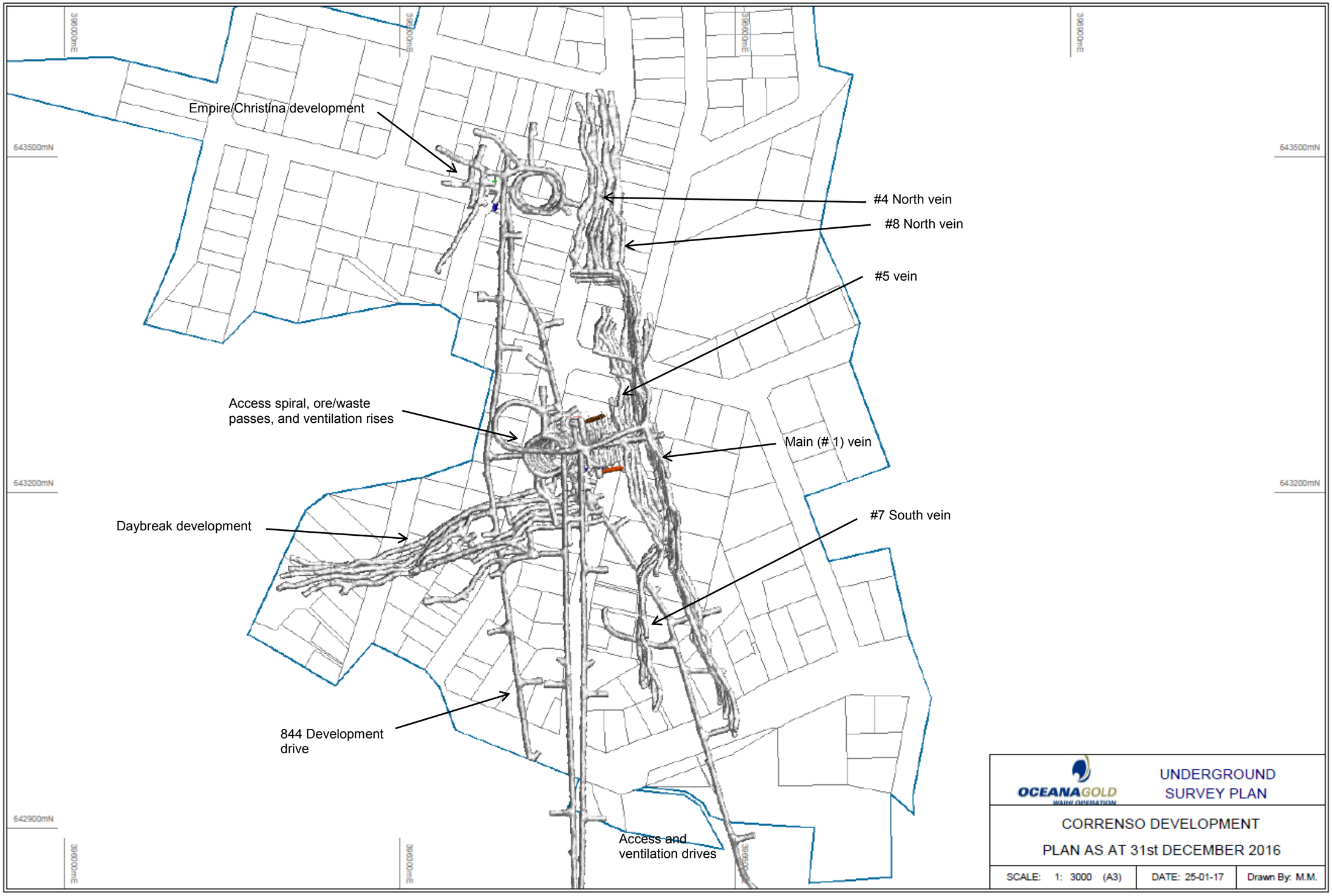


Figure 4: Correnso Development – Plan View (overlaying property boundaries)

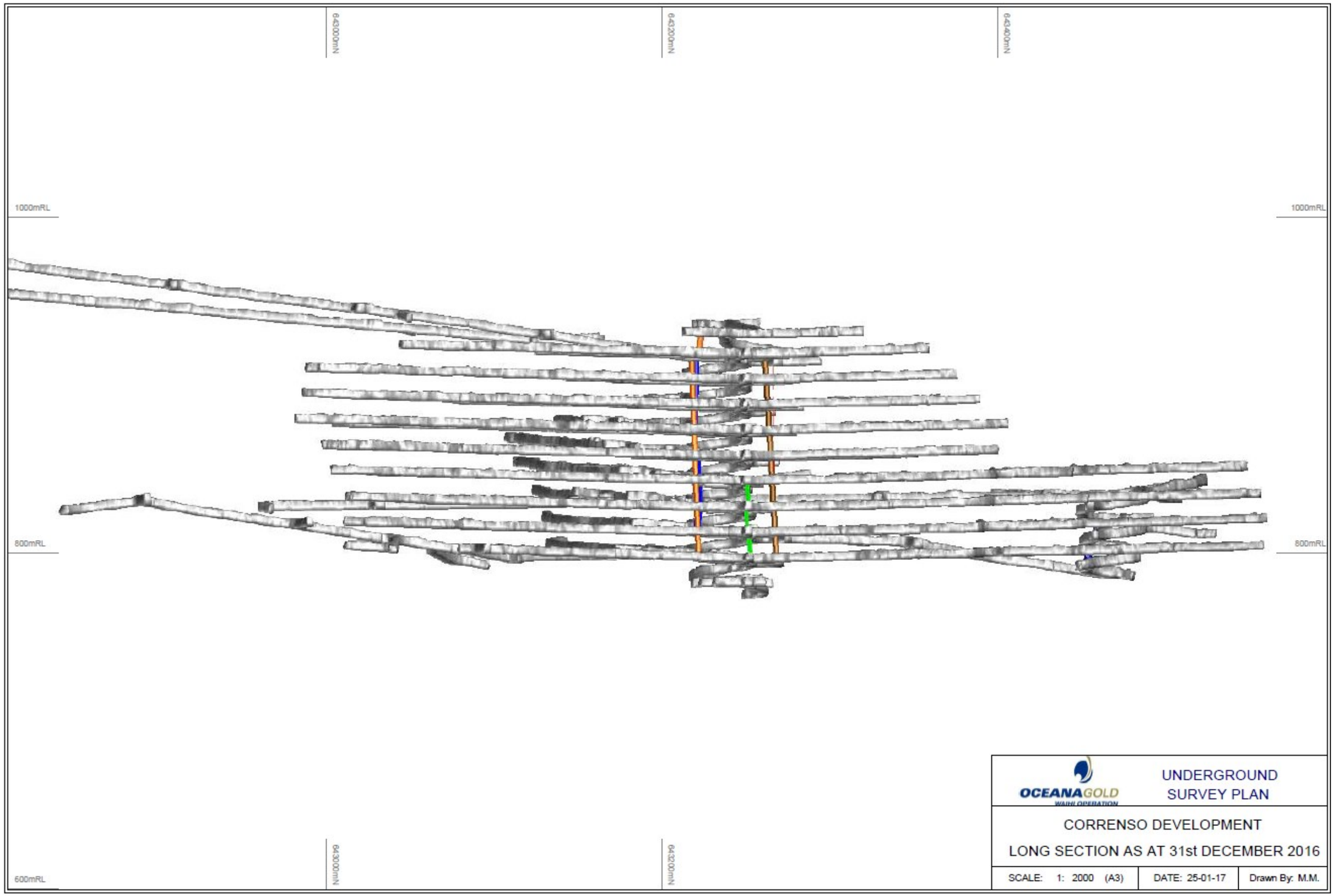


Figure 5: Correnso Development – Long Section View (left to right: south to north)

5. BACKFILLING AND COMPACTION OF STOPES

(Consent conditions: Correnso c.25c, SUPA c.19c)

All stopes extracted to date are backfilled as is dictated by the mining method and conditions. Compaction occurs during backfilling by the machine placing the fill in the stope, then continues with subsequent operations of heavy machinery on top of the backfill. Historically this gives good compaction and the high clay-content of the fill provides a good binding medium.

6. GROUND CONDITION REVEALED BY EXCAVATIONS

(Consent conditions: Correnso c.25d, SUPA c.19d)

Ground conditions for Correnso are mostly as expected. Q-value estimates are from 1 to 80 representing rock mass categories Poor to Very Good according to Barton's (1974) ground support guidelines. Localised areas of poorer ground are encountered relating to intersecting structures and converging veins.

The northernmost extents of Correnso have mined the #4-vein, a different vein zone to the main #1-vein. The separation between the two systems is marked by the "Quartz-Calcite fault", a northeast-trending steeply-dipping zone of late-stage quartz and calcite veining which is strongly jointed with local cavities. Where the Correnso veining continues north of the quartz-calcite fault (between the 795 and 840 levels) it dips at a relatively shallow angle (45 – 55 degrees) to the east, in contrast with the rest of the ore-body which is more-or-less sub-vertical in aspect. The rock mass beyond the immediate hanging wall of the #4-vein is locally heavily sheared and this has meant a higher level of support by way of extensive cable-bolting has been needed. Production from this zone has necessitated short stope-panel lengths.

Production from the #4-vein was virtually completed by the end of 2016 with very few stability issues. As stopes are completed the areas have been tight-filled.

Daybreak ground conditions are similar to Correnso. The most significant areas of poor ground encountered in Daybreak development are related to the intersection of the quartz-calcite fault, the quartz-calcite fault is also intersected by Correnso development as mentioned above with a similar effect on ground conditions.

Development commenced late in 2016 towards the Empire and Christina Vein systems. Rock mass conditions encountered to date are mostly Good to Very Good.

Areas of poor ground when encountered are relatively restricted in extent and do not extend for more than 25 – 30 m along strike. Additional ground support (shotcrete and/or cable bolts) is installed in accordance with site standards and sound mining procedures. The areas encountered to date are all part of scheduled stope panels which are backfilled immediately as part of the stope cycle and would not be expected to have significant stability issues associated.

Additional cable bolts are installed as determined by the geotechnical engineer where there are intersecting discontinuities with wedge potential. This is also in accordance with standard practices.

7. MONITORING AND MEASURES FOR STABILITY

(Consent conditions: Correnso c.25e, SUPA c.19e)

Multipoint Borehole Extensometers (MPBX) were installed during the early stages of mine development on the 795, 810, 825, 855 and 900 levels. The instruments are all installed in the intersections between the access and the main (#1-vein) ore-drives as representing the widest openings on the vein, as well as being the areas expected to see the most induced stresses as mining retreats towards the accesses. The MPBXs are inserted and grouted into up-hole boreholes and measure micro-displacements as low as 0.1 mm between “anchors”. The MPBXs utilised at Correnso have anchors at 1, 2, 3, 4, 6 and 8 m up the drillholes.

Additionally, five 2-anchor “clock-it” extensometers are installed into the backs of the 915 level with anchors set at 2.5 m and 6 m up the holes.

None of the above instruments showed any indications of significant ground movement or stress concentrations. As stoping occurred on the lower levels of Correnso the MPBXs on the 795, 810 and 825 levels have been lost, as expected. Readings prior to the MPBXs being destroyed indicated overall stable conditions.

A micro-seismic monitoring system is installed (as per consent condition 23d) to provide additional reassurance that mining activity would not be causing instability. Micro-seismicity can be basically described as micro-earthquakes less than 0 magnitude, too small to be felt on surface but detectable by sensitive equipment located underground.

The purpose of the seismic system is to monitor regional stability and the rock mass response to mining activities in the critical areas. Given the shallow depth of stoping and a relatively benign stress regime, the seismic system is not expected to record many non-blasting related seismic events. The maximum horizontal stresses pre-mining at 300 m depth are measured at 22 MPa; maximum vertical stresses (from the weight of the overlying rock) are around 15 MPa. These stresses are well below the 60 to 120 MPa average range of measured strengths of the rock mass that hosts the Correnso ore body.

It is generally accepted in industry that event magnitudes of:

Magnitude	Potential impact
$mL \leq 0.0$	does not impact on operations
$0.0 < mL \leq 0.5$	could potentially impact on operations, but typically marginally.
$0.5 < mL \leq 1.0$	could impact on operations and even cause damage if sufficiently close to workings.
$1.0 < mL \leq 2.0$	could require special energy absorbent support systems
$mL > 2$	definitely requires special energy absorbent support systems.

The agreed critical magnitude for Correnso is a conservative ML = -0.5. Any seismic event of ML = -0.5 and above are thus defined as an "anomalous result", and has to be reported to the HDC on a monthly basis and the following details are required:

- Event magnitude and location coordinates.
- Image plot of the seismic events that includes existing openings and significant geological structures.
- Explanation of the probable cause of the seismic events.

Levels of seismicity are overall low and there have only been a few reportable events during the year. The reportable events above mL-0.5 do not show any clustering or trends and most of the readings are well away from mine activity. There have been no volumes of unusual activity reported by the seismologists who monitor the data, nor any volumes of unusual magnitude events.

8. MINING CONFINED TO CONSENT BOUNDARIES

(Consent conditions: Correnso c.25g, SUPA c.19g)

Figure 6 displays the current mine development overlying an aerial projection, with the CEPPA and SUPA boundaries superimposed. All current Correnso works are entirely within the CEPPA consent boundary, and the SUPA boundary was not crossed during the year.

Figure 6: Correnso Development – Plan View (with CEPA and SUPA boundaries)

9. REVIEW OF CONSENT CONDITION REQUIREMENTS

a) Mining methods used require stope voids to be backfilled
   All stopes are backfilled as is required for the Avoca mining method (pictorial representation in Appendix A).

b) Limits to upper levels of stoping
   The uppermost level on which stoping has been carried out by the end of 2016 was the 915 (900 – 915); the first stope blasts in this level were in the last week of the year.

c) Backfilling where required by geotechnical conditions
   Refer Section 5.

d) Seismic monitoring and rock movement monitoring
   Refer Section 7 above for monitoring systems.

e) Grouting of surface-drilled holes
   No surface-drilled exploration has been undertaken over Correnso during the reporting period.

f) Interception of surface-drilled holes with water flows, and their treatment
   Two surface drilled holes have been intersected by Correnso development during the period. All holes were assessed in accordance with Standard Operating Procedures ("Management of Intersecting Surface Diamond Drillholes"), and grouted where necessary within 36 hours. One low-flowing hole proved problematic to seal had to be re-grouted, then adjacent split-sets became a conduit and also had to be grouted to achieve an adequate seal. Refer Appendix C for details.

g) Works confined within consent boundaries
   Refer Section 8 for work locations.

10. CONCLUSION

OceanaGold believes it has fully complied with Conditions 25 (of HDC LUC 202.2012) and 19 (of HDC LUC 202.2016) and that the risk of ground surface instability is extremely low due to the geology of the area and best practice underground mining methodologies which have been employed.

11. REFERENCES

Dunn, M. 2014. Correnso Stage 2B Geotechnical Study. NEM013. Internal Newmont Report prepared by SRK Consulting (Australasia).

Barton et al (1974). Barton, N., Lien, R. and Lunde, J. 1974. Engineering classification of rock masses for the design of tunnel support. Rock Mech., May. 189-236.

CKL (Pagan M), June 2015. Correnso Mine Waihi Report. Survey Verification Report for Hauraki District Council.

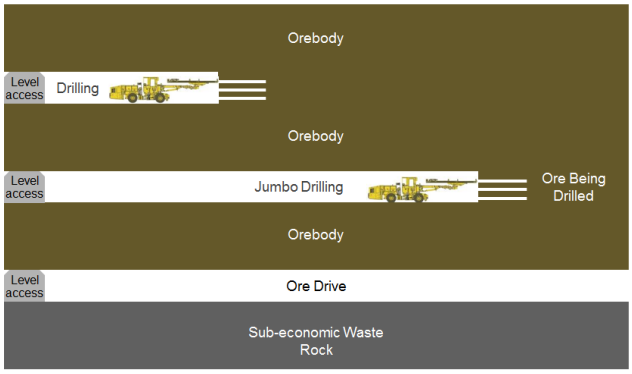
Mining One (Fuller, P), February 2015. Verification of CEPA underground mine workings relative to cadastral boundaries on the surface. Report for Hauraki District Council.

Appendix A

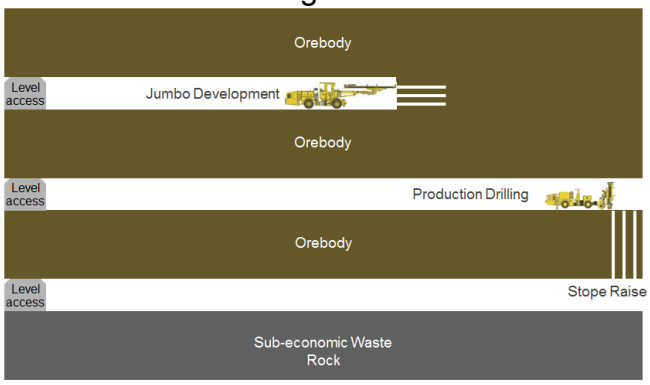
Modified Avoca Technique

Schematic of Modified Avoca Technique

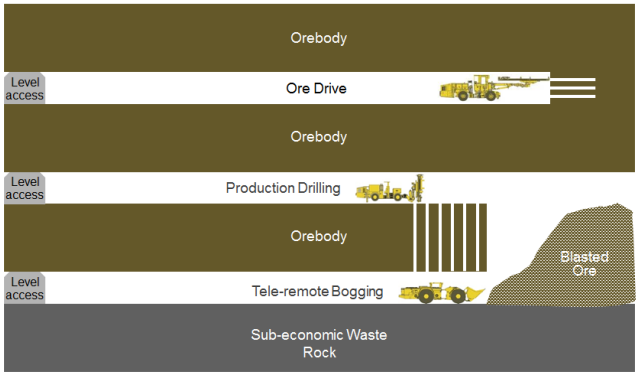
1 Drill drive access



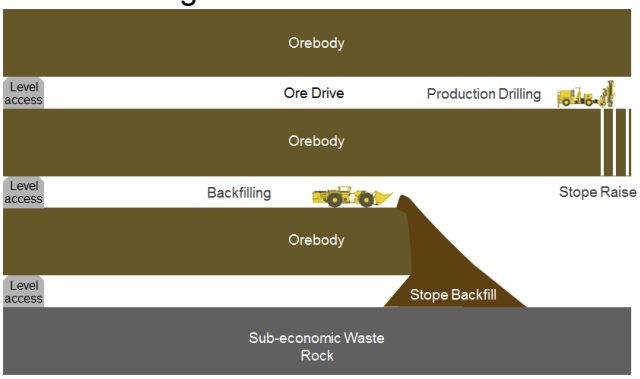
2 Production drilling



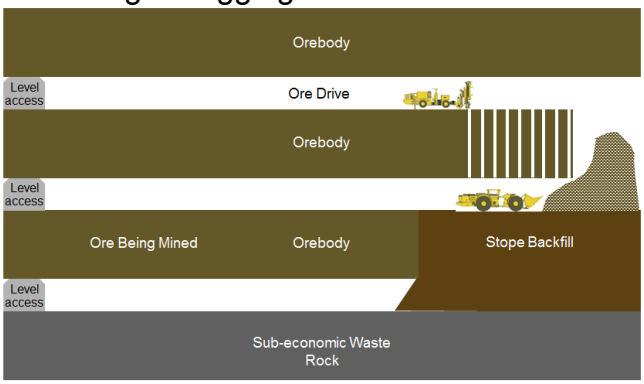
3 Production blasting & bogging



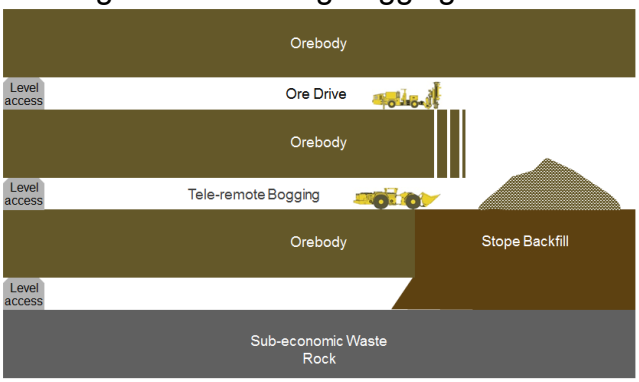
4 Backfilling



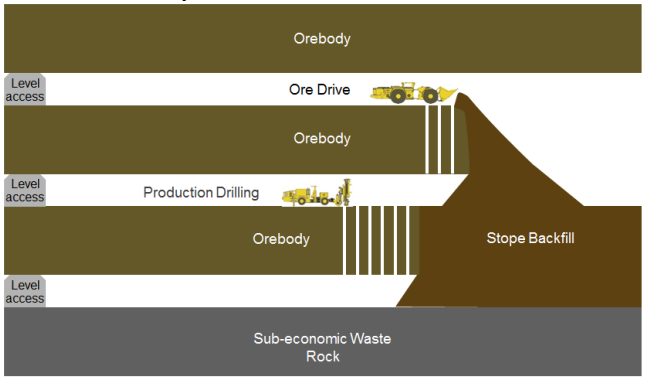
5 Blasting & bogging over backfill



6 Progressive blasting/bogging



7 Multi-level production/backfill

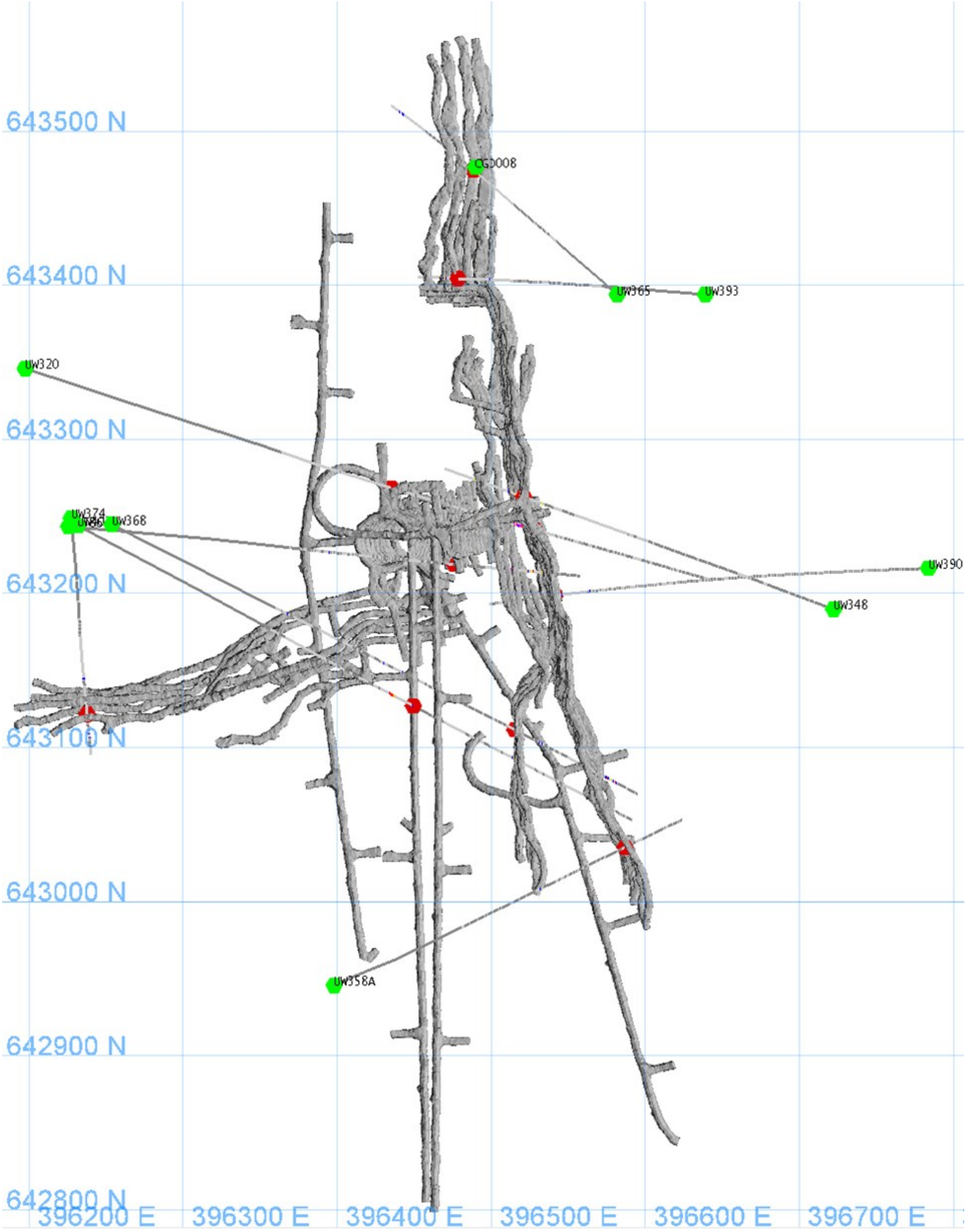


Appendix B

Surface Drillholes Intersecting Workings

Hole ID	Level	Drive	E	N	mRL	Date intersected	Pickup	Grouting status	Comments
CGD008	810	C4-FW	396488.5	643473.4	821.4	13/06/2015	Estimated	Not grouted	Hole dry - no evidence of being a water conduit at this level: no Fe staining
UW320	912	ACC	396432.0	643265.1	917.8	13/04/2015	Surveyed	Not grouted	Hole dry
UW348	900	C1-N	396520.5	643263.4	907.6	14/12/2015	Estimated	Grouted	Trickling water which ceased within a day - grouted 16/12/2015
UW 358A	900	C1-S	396586.7	643035.2	910.6	27/07/2016	Estimated	Grouted	Low flow, originally grouted within 12 hours, re-grouted after 36 hours. Surrounding split sets grouted as were acting as a conduit. Flow was approximately 1ltr/min.
UW365	810	C4-FW	396488.4	643474.8	821.4	9/06/2015	Estimated	Not grouted	Hole dry
UW368	825	C7-S	396515.3	643114.2	833.1	26/08/2015	Surveyed	Grouted	Minor flow - hole re-grouted 16/12/2015
UW386	915	ORE PASS	396482.3	643218.5	914.9	4/02/2015	Surveyed	Not grouted	Hole dry - now in ore pass
UW390	840	C1-S	396541.4	643199.0	844.1	25/03/2015	Surveyed	Not grouted	Hole dry - no evidence of being a water conduit at this level: no Fe staining
UW393	840	C4-HW	396472.9	643416.3	851.4	16/08/2015	Estimated	Not grouted	Hole dry
UW402	953	CDD	396449.3	643126.9	930.5	17/12/2014	Surveyed	Grouted	Hole was producing minimal water for only a few hours
UW402	855	C7-S	396515.0	643092.4	864.6	18/10/2015	Surveyed	Not grouted	Dry - second time intersecting hole with development - was grouted on the 953
UW374	860	DB-HWW	396237.7	643120.7	871.9	16/12/2016	Surveyed	Not grouted	Hole was dry, no indication of previous water – i.e. no Fe staining, etc.

Overleaf is plan view of Correnso and Daybreak development with surface drillholes intersected and their pierce points (no surface holes have yet been intersected by Empire development). Green points indicate the drillhole collars in view while the red points indicate the approximate intersection point of surface drillholes with development.


643500 N
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396200 E
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