Schaft Creek Project -

Three-Dimensional Modelling of Acid-Base-Accounting Data

prepared for:

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P.Geo. and A.Sc.T. Notice

This study is based on detailed technical information interpreted through standard and advanced chemical and geoscientific techniques available at this time. As with all geoscientific investigations, the findings are based on data collected at discrete points in time and location. In portions of this report, it has been necessary to infer information between and beyond the measured data points using established techniques and scientific judgement. In our opinion, this report contains the appropriate level of geoscientific information to reach the conclusions stated herein.

This study has been conducted in accordance with British Columbia provincial legislation as stated in the Engineers and Geoscientists Act and in the Applied Science Technologists and Technicians Act.

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Report Summary

Important Note: This report is not compliant with National Instrument 43-101 for mineral exploration, resource estimates, and economic investment.

This report for the Schaft Creek Project is one in a series of phased reports on metal leaching and acid rock drainage (ML-ARD). Based on previous ML-ARD work for the Schaft Creek Project, net-acid-generating materials can be separated from net-acid-neutralizing materials using the Adjusted Total-Sulphur-Based Net Potential Ratio:

Adj TNPR = (Neutralization Potential - 10)/(Total sulphur * 31.25)

Any Adjusted TNPR value below 2.0 is predicted to be net acid generating, after some lag time.

Adjusted TNPR is basically a ratio of two independent variables (total sulphur and NP), and is thus not necessarily amenable to direct interpolation and three-dimensional (3D) modelling within the proposed pit area. Therefore, the three-dimensional distribution of Adj TNPR in the Schaft Creek pit was evaluated in two ways:

1) Adj TNPR values were modelled directly, and
2) total sulphur and NP modelled separately, but combined locally, to obtain local Adj TNPR values.

Also, based on 634 acid-base accounts of rock at Schaft Creek, the statistical distributions of total sulphur, NP, and Adjusted TNPR resembled lognormal distributions, rather than normal distributions. Therefore, three-dimensional modelling focussed on the logarithmic values of Adj TNPR, total sulphur, and NP.

Spatial interpolations among the 634 measured values were based on inverse distance weighting at the third power, allowing localized variability and heavy emphasis on the nearest values. Less weighting (first and second power), and thus stronger interpolation over longer distances, was checked against the results using third power. A lower power indicated less or the same amount of net-acid-generating rock within the ultimate pit shell. Therefore, third power was retained as a safety factor. The three-dimensional interpolation and visualization were conducted on a grid 20 m by 20 m by 20 m.

Volumes of Net-Acid-Generating and Net-Neutralizing Rock within the Approximate Ultimate Pit

The two approaches for three-dimensional modelling of acid-base-accounting data indicated 3.6-5.1% of the pit rock, by volume, would be net acid generating. The greater majority would be net neutralizing.

Most net-acid-generating rock would not be mined in the initial years of operation, because it is at depth within the pit. This provides some years to prepare for excavation of most net-acid-generating rock.

Although not NI 43-101 compliant, the net-acid-generating rock may not be strongly biased towards ore or waste grades. Thus, the waste rock is still predicted to contain up to 5.1% net-acid-generating rock.

There are options to dilute the ore rock with the net-acid-generating waste to lower the percentage reporting to the waste-rock pile, to dispose of net-acid-generating rock separately, or to mix the rock together within the waste-rock pile.

Areas of Net-Acid-Generating and Net-Neutralizing Rock on the Approximate Ultimate-Pit Walls

The two approaches for three-dimensional modelling of acid-base-accounting data indicated 3.8-5.9% of the ultimate-pit-wall-rock area would be net acid generating. The greater majority would be net neutralizing.

Most net-acid-generating areas on the pit walls lay beneath the lowest elevation of the ultimate pit rim. As a result, most net-acid-generating areas on the pit walls may be submerged after closure and pit-lake formation.

Recommendation

When the geologic and geostatistical block models are finalized for the Schaft Creek Project, Copper Fox Metals Inc. should add log10 values of Adjusted TNPR, total sulphur, and NP to them. This would provide predictions of net-acid-generating volumes and pit-wall areas, by elevation, consistent with all geological, geotechnical, and economic information for the Schaft Creek Project.

1. INTRODUCTION

Whenever mined rock is exposed to air and moisture, the rates of weathering, oxidation, and leaching can accelerate. If sulphide minerals like pyrite are exposed, the oxidation will release acidity, some metals, sulphate, and heat. If the acidity is not neutralized by minerals like calcite or feldspar in the rock, the resulting acidic water is called "acid rock drainage" (ARD) in British Columbia.

Whether sulphide minerals are present or not, weathering can still lead to accelerated metal leaching (ML). For example, the simple dissolution of carbonate minerals can release metals like manganese.

ML-ARD is often associated with minesites, where it is well documented (e.g., Morin and Hutt, 1997 and 2001). As a result, the accurate prediction and control of ML-ARD at minesites in British Columbia are high priorities of the provincial government, as explained in its formal Policy, Guidelines, and draft Prediction Manual (Price and Errington, 1998; Price, 1998; Price et al., 1997). This report follows the recommendations of those documents. Because ML-ARD cannot be accurately assessed or predicted in one step or in one year, the provincial documents recommend a phased approach. This approach often spans several years, to focus on and resolve significant uncertainties.

The copper-gold-molybdenum Schaft Creek Project is located northwestern British Columbia and is being developed by Copper Fox Metals Inc. ML-ARD predictions for the Schaft Creek Project have followed the recommended provincial phased approach, as explained in the following reports.

Morin, K.A., and N.M. Hutt. 2007. Schaft Creek Project - Prediction of Metal Leaching and Acid Rock Drainage, Phase 1. Report for Rescan Environmental Services.

Morin, K.A., and N.M. Hutt. 2008. Schaft Creek Project - Prediction of Metal Leaching and Acid Rock Drainage, Phase 2. Report for Rescan Environmental Services.

Morin, K.A., and N.M. Hutt. 2009. Schaft Creek Project - Prediction of Metal Leaching and Acid Rock Drainage for Overburden in the Proposed Pit Area. Report for Copper Fox Metals Inc.

Morin, K.A., and N.M. Hutt. 2010. Schaft Creek Project - ML-ARD Assessment of Surficial Samples from the Proposed Access Road. Report for Copper Fox Metals Inc.

Morin, K.A., and N.M. Hutt. 2010. Schaft Creek Project - Mineralogical Studies and Geochemical Kinetic Tests for Metal Leaching and Acid Rock Drainage from Rock and Tailings. Report for Copper Fox Metals Inc.

Morin, K.A., and N.M. Hutt. 2010. Schaft Creek Project - Acid-Base Accounting and Solid-Phase Total-Element Contents for Rock. Report for Copper Fox Metals Inc.

This ML-ARD report for the Schaft Creek Project uses three-dimensional modelling of acid-base accounting (ABA) data to estimate the amounts and locations of net-acid-generating rock within the proposed ultimate pit. This includes estimates of pit-wall areas expected to be net acid generating and their elevation. First, Chapter 2 reviews the earlier work on acid-base accounting, so that the approach to three-dimensional modelling described in Chapter 3 can be understood better. Chapter 4 discusses the results of three-dimensional modelling, specifically the volumes and ultimate-pit-wall areas of net-acid-generating rock.

2. SUMMARY OF ACID-BASE-ACCOUNTING RESULTS

The most recent compilation and interpretation of acid-base accounting (ABA) for Schaft Creek rock is contained in Morin and Hutt (2010c). The following summary was copied from that report.

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This report for the Schaft Creek Project is one in a series of phased reports on metal leaching and acid rock drainage (ML-ARD). It compiles and interprets the latest information on the geochemical static tests of acid-base accounting (ABA) and solid-phase total-element contents for cored rock.

In total, 634 rock samples from core have been collected and analyzed over the years of ML-ARD studies. The objectives of the sampling were as follows.

- To collect samples of discrete rock units, generally reflecting the abundance of the rock units in the holes.
- To collect samples from three-dimensional distributions in all three zones that will be mined as one large pit.
- To collect samples with ranges of assay levels, to ensure waste, low-grade ore, and ore were assessed for their ML-ARD characteristics.
- To collect a few samples that were purposely biased with elevated levels of visual sulphides, to ensure higher-sulphide rock at Schaft Creek was analyzed for its ML-ARD characteristics.

These samples were analyzed for Sobek (U.S. EPA 600) expanded ABA, and for total-element contents based on ICP-MS and XRF (x-ray-fluorescence) whole-rock techniques.

<u>Results of Acid-Base Accounting</u>

Paste pH, measured in a mixture of deionized water and pulverized samples, ranged from 7.4 to 9.8 in the 634 rock samples. Thus, no Schaft Creek rock was acidic at the time of analysis, although most samples had been exposed to weathering and oxidation for years to decades.

Total sulphur ranged from <0.01%S (detection limit) to 13.5%S, with a mean of 0.45%S and a median of 0.18%S. Statistically, sulphide represented 82% of total sulphur on average, with a median of 86%. Thus, the two parameters were typically interchangeable, but not identical.

Approximately 22% of the samples had sulphur-species analyses within the relatively unreliable range below roughly 0.04%S. Thus, a decision was made to avoid the uncertainties and inaccuracies in calculations involving two or more sulphur species at these low levels. Consequently, ML-ARD estimates of acid potential for Schaft Creek rock used the single approach of total sulphur and associated Total-Sulphur-Based Acid Potentials (TAP). This recognizes acid potential may be overestimated by TAP, but on average this will be less than by 20%.

Sobek (U.S. EPA 600) Neutralization Potential (NP) ranged from 4 kg $CaCO_3$ equivalent/tonne to a maximum of 243 kg/t, with mean and median values of 76 and 71 kg/t. Some portion of the measured NP is typically unavailable for neutralization. This "Unavailable" NP can be roughly estimated from samples with acidic paste pH, but there were none for Schaft Creek. It can also be estimated from acidic kinetic tests, but no Schaft Creek kinetic tests are currently acidic. Thus, a value of 10 kg/t is chosen for Schaft Creek rock, based on the typical values observed at other sulphidic minesites with ARD potential.

Correlations with inorganic-carbon-based neutralization potential suggested most of the carbonate was calcite and dolomite, consistent with past mineralogical studies. Correlations also suggested Sobek NP represented this inorganic carbonate when analytical inaccuracy and Unavailable NP were considered. Finally, NP and carbonate correlated with Loss-on-Ignition (LOI). LOI typically reflects the loss from the samples during analysis of some or all sulphur, carbon, and/or tightly bound or crystalline water, and offers a surrogate measurement of NP at the Schaft Creek Project.

The acid-generating and acid-neutralizing capacities of the 634 rock samples were combined as Adjusted Total-Sulphur-Based Net Potential Ratios (Adj TNPR), with a criterion of 2.0. This included the subtraction of 10 kg/t of unavailable NP from measured NP. Adjusted TNPR ranged from 0.001 (the default value where NP $\leq$ 10 kg/t and thus the net-acid-generating sample has no Available NP) to 554 (net neutralizing). The arithmetic mean and median were 40.9 and 11.4, respectively, indicating most samples were net neutralizing.

Only 84 (13.2%) of the 634 samples had Adj TNPR values below 2.0, and 86.8% was net neutralizing. A sensitivity analysis (1) replacing total sulphur with sulphide plus unaccounted-for sulphur and (2) assuming all measured NP was available (Unavailable NP = 0 kg/t) had a minor effect on the percentages. For these alternatives, 87-90% of samples remained net neutralizing. Thus, the ML-ARD status of Schaft Creek rock samples is not strongly sensitive to these adjustments of sulphur and NP.

It is important to note that these percentages were "unweighted", in that they were based only on sample numbers. They do not necessarily reflect tonnages and volumes within the deposit. Three-dimensional modelling of ABA is currently in progress, to obtain weight- and volume-based estimates of net-acid-generating and net-neutralizing rock.

Based on simple correlations, a rock sample at Schaft Creek with more than 2% total sulphur would likely be net acid generating no matter the NP level. In contrast, a sample with less than 0.2%S would likely be net neutralizing, even for relatively inaccurate sulphur analyses below 0.04%S. Also, rock samples with a measured NP above 140 kg/t were consistently net neutralizing.

Kinetic testing of Schaft Creek rock has shown that the lag time until a sample becomes net acidic could be predicted from (1) the initial amount of total sulphur and (2) the initial amount of Available NP. Roughly 10% of the ~13% of net-acid-generating samples would become acidic within 13 years after initial exposure. Also, half the ~13% would be acidic after 34 years, and all would be acidic 65 years after initial exposure. This explains why acidic pH levels are not readily detected in relatively recent net-acid-generating rock samples at Schaft Creek.

3. APPROACHES FOR THREE-DIMENSIONAL MODELLING OF ABA DATA

Important Note: This report is not compliant with National Instrument 43-101 for mineral exploration, resource estimates, and economic investment.

3.1 Input Parameters

As explained in Chapter 2 and in Morin and Hutt (2010c), Adjusted Total-Sulphur-Based Net Potential Ratio was calculated from available Neutralization Potential (NP) and total sulphur:

Adj TNPR = $[NP-10]/[\%S_{total} * 31.25]$

For Schaft Creek rock, a value of 2.0 or greater represents net-acid-neutralizing rock that is not predicted to become acidic at any time. A value less than 2.0 represents net-acid-generating rock that will release acidity and acid rock drainage (ARD) after some lag time. For example, approximately half the net-acid-generating samples were predicted to be acidic after 34 years, and all acidic after 65 years of exposure and oxidation.

Adj TNPR is basically a ratio of two independent variables, and is thus not necessarily amenable to direct interpolation and three-dimensional (3D) modelling within the proposed pit area. Therefore, the 3D distribution of Adj TNPR was evaluated in two ways: (1) Adj TNPR values modelled directly, and (2) total sulphur and NP modelled separately but combined locally to obtain local Adj TNPR values.

3.2 Statistical Distributions of Input Parameters

As explained in Section 3.1, input parameters for 3D modelling of ABA data were Adjusted TNPR, total sulphur, and NP. For reasonable statistical interpretations, the input parameters should display some type of distribution, with a normal or Gaussian being the simplest and best known.

Histograms of Adj TNPR, total sulphur, and NP were heavily weighted towards lower values and did not display normal distributions (Figures 3-1, 3-3, and 3-5). However, these parameters were generally lognormally distributed (Figures 3-2, 3-4, and 3-6). Therefore, 3D modelling focussed on the logarithmic values of Adj TNPR, total sulphur, and NP.

3.3 Statistical Interpolation of ABA Data

There were 634 ABA analyses used in this 3D modelling (Chapter 2, Appendix A, and Morin and Hutt, 2010c). Approximate ultimate pit shell and surface topography (not NI 43-101 compliant) were taken from AutoCAD diagrams provided by Knight Piésold Ltd (Figures 3-7 to 3-11).

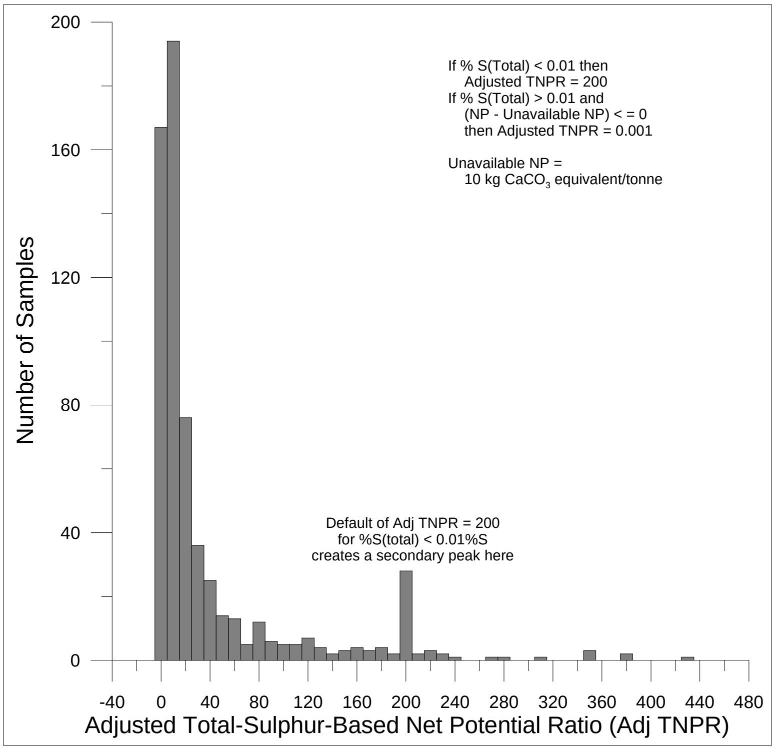

Figure 3-1. Histogram of Adjusted Total-Sulphur-Based Net Potential Ratio, on an arithmetic scale.

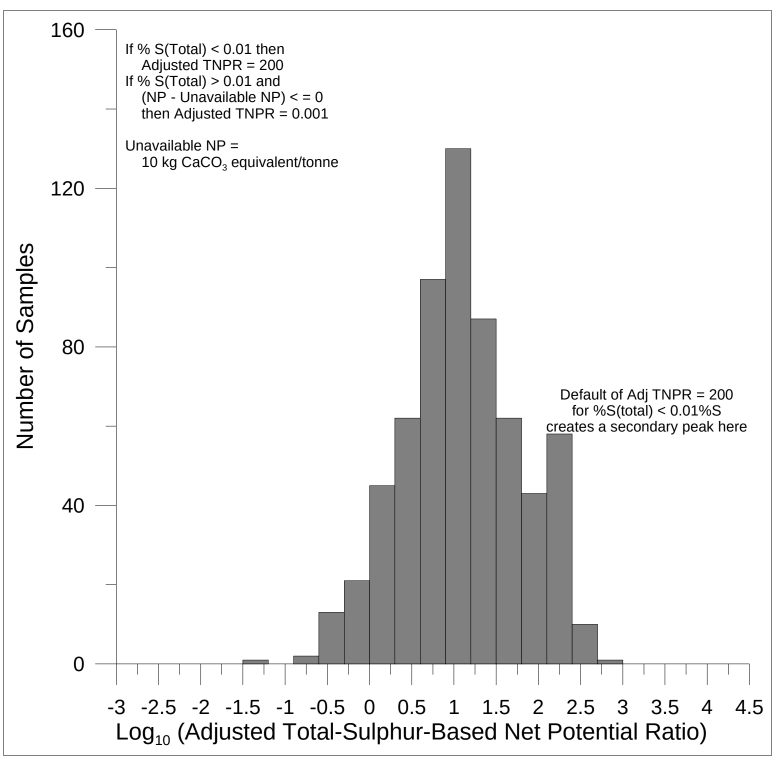

Figure 3-2. Histogram of Adjusted Total-Sulphur-Based Net Potential Ratio, on a log10 scale.

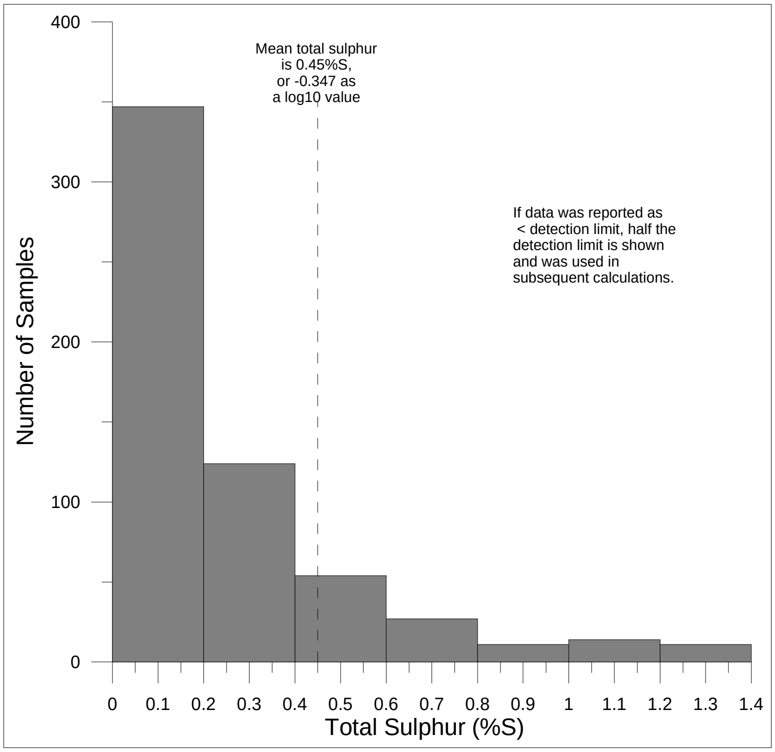

Figure 3-3. Histogram of total sulphur, on an arithmetic scale.

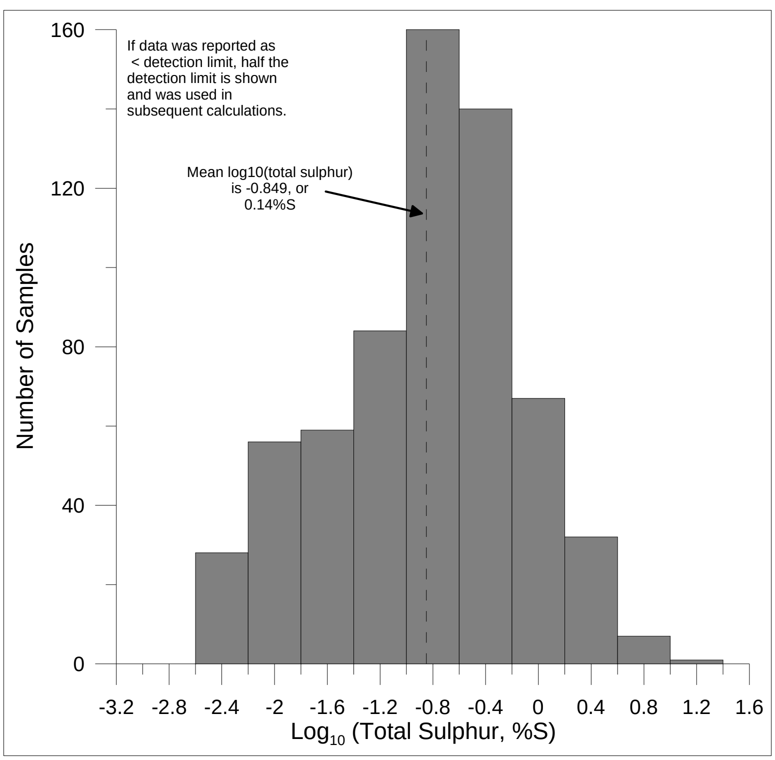

Figure 3-4. Histogram of total sulphur, on a log10 scale.

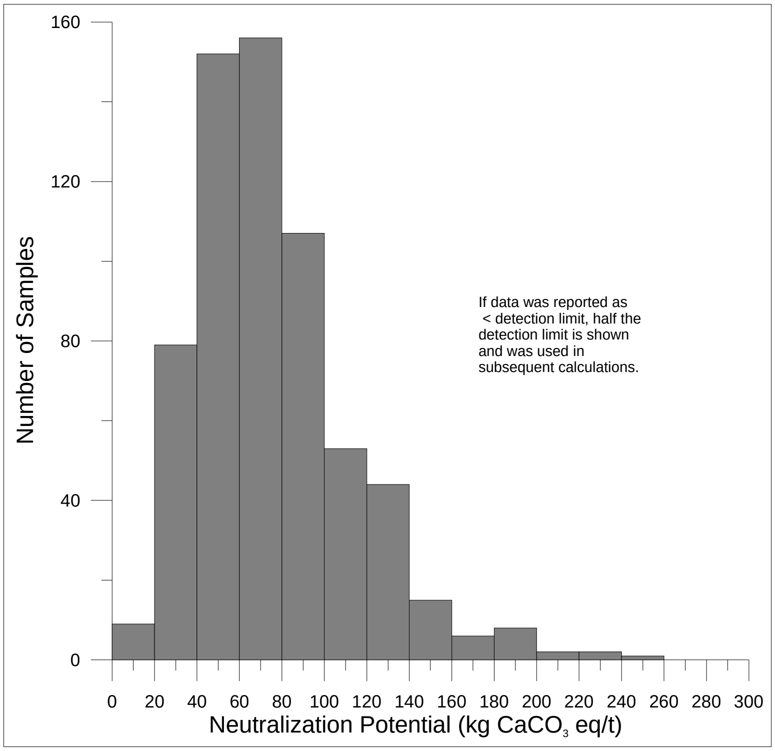

Figure 3-5. Histogram of Neutralization Potential, on an arithmetic scale.

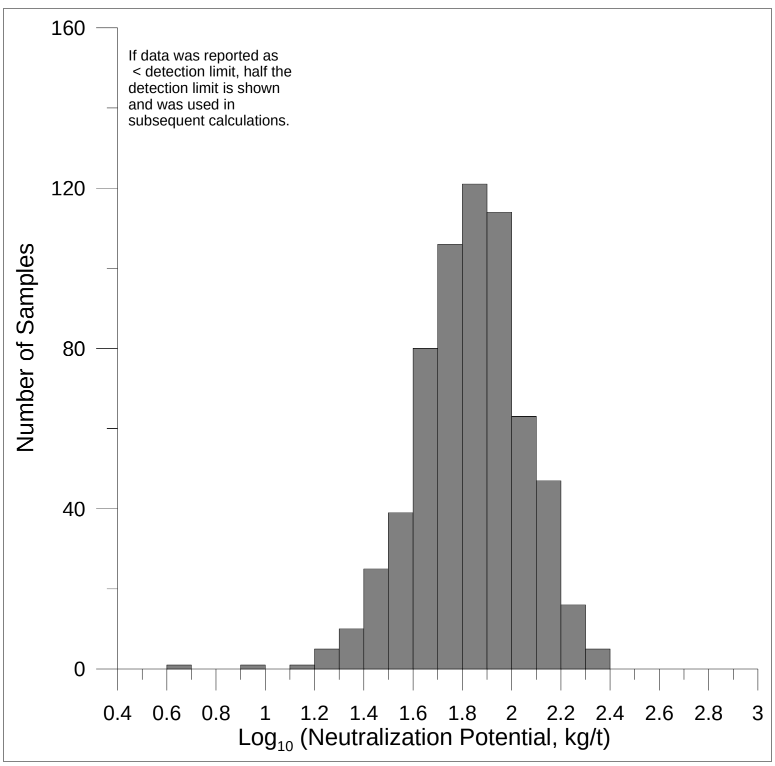

Figure 3-6. Histogram of Neutralization Potential, on a log10 scale.

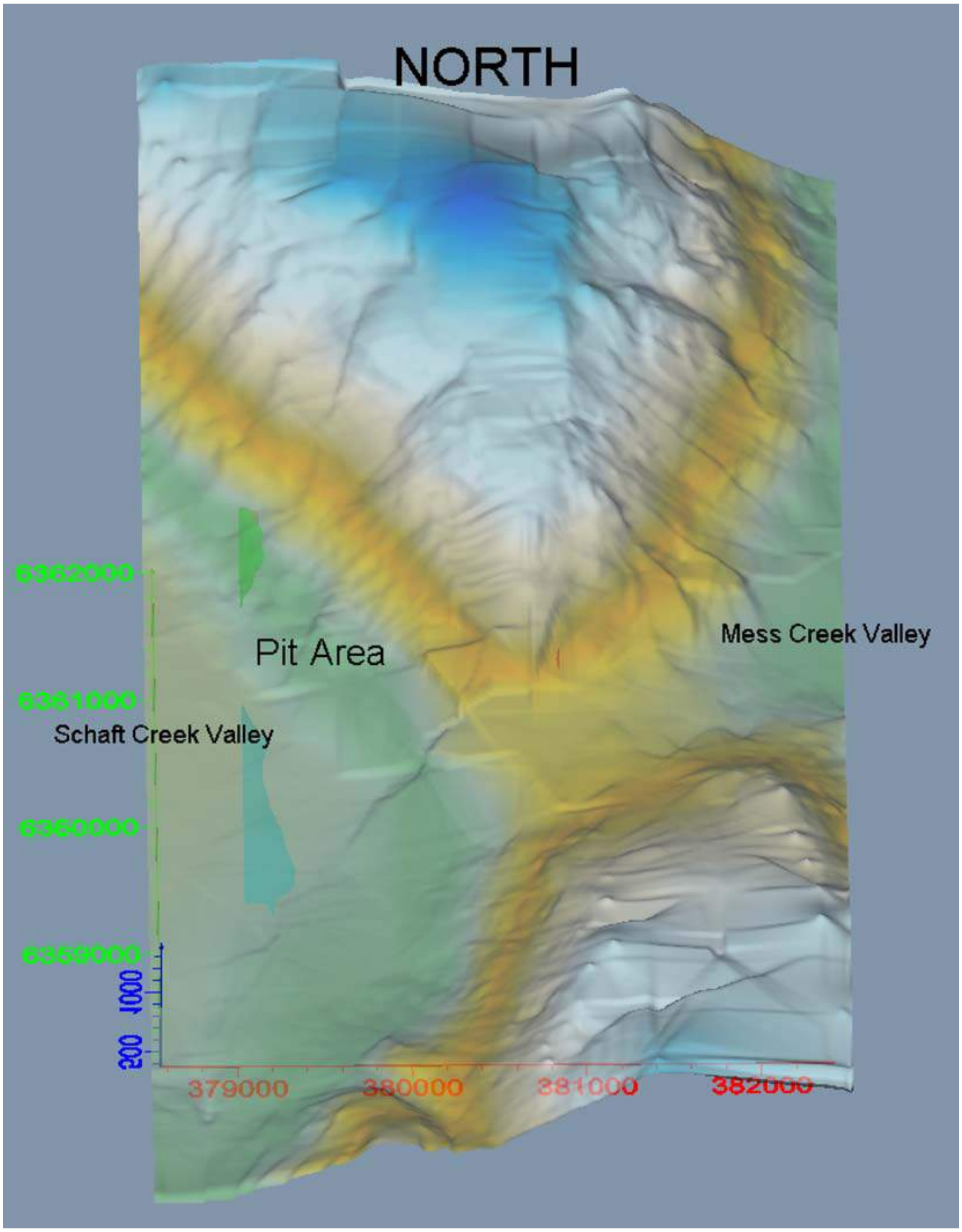

Figure 3-7. Surface topography of the Schaft Creek area looking north.

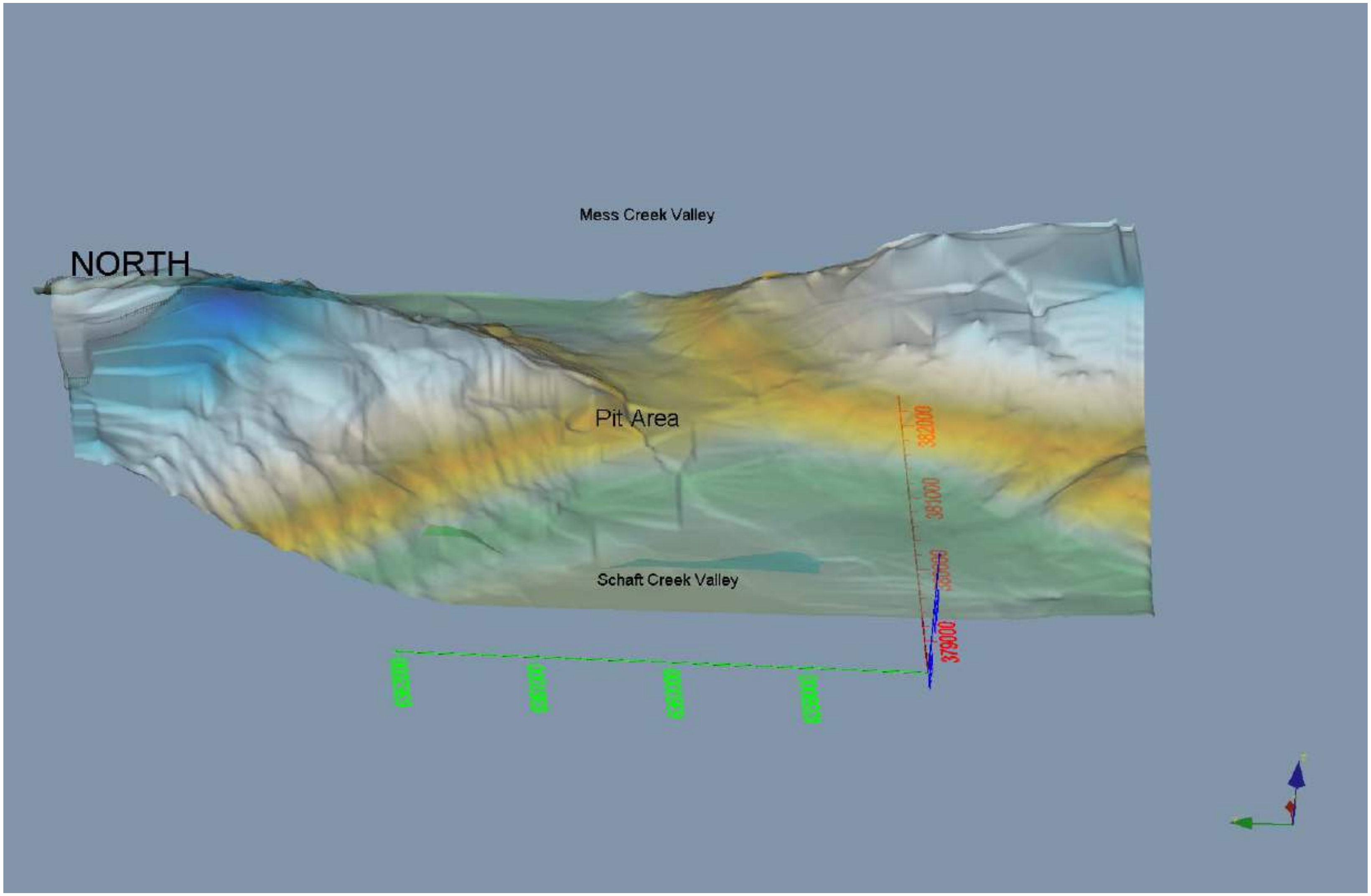

Figure 3-8. Surface topography of the Schaft Creek area looking east.

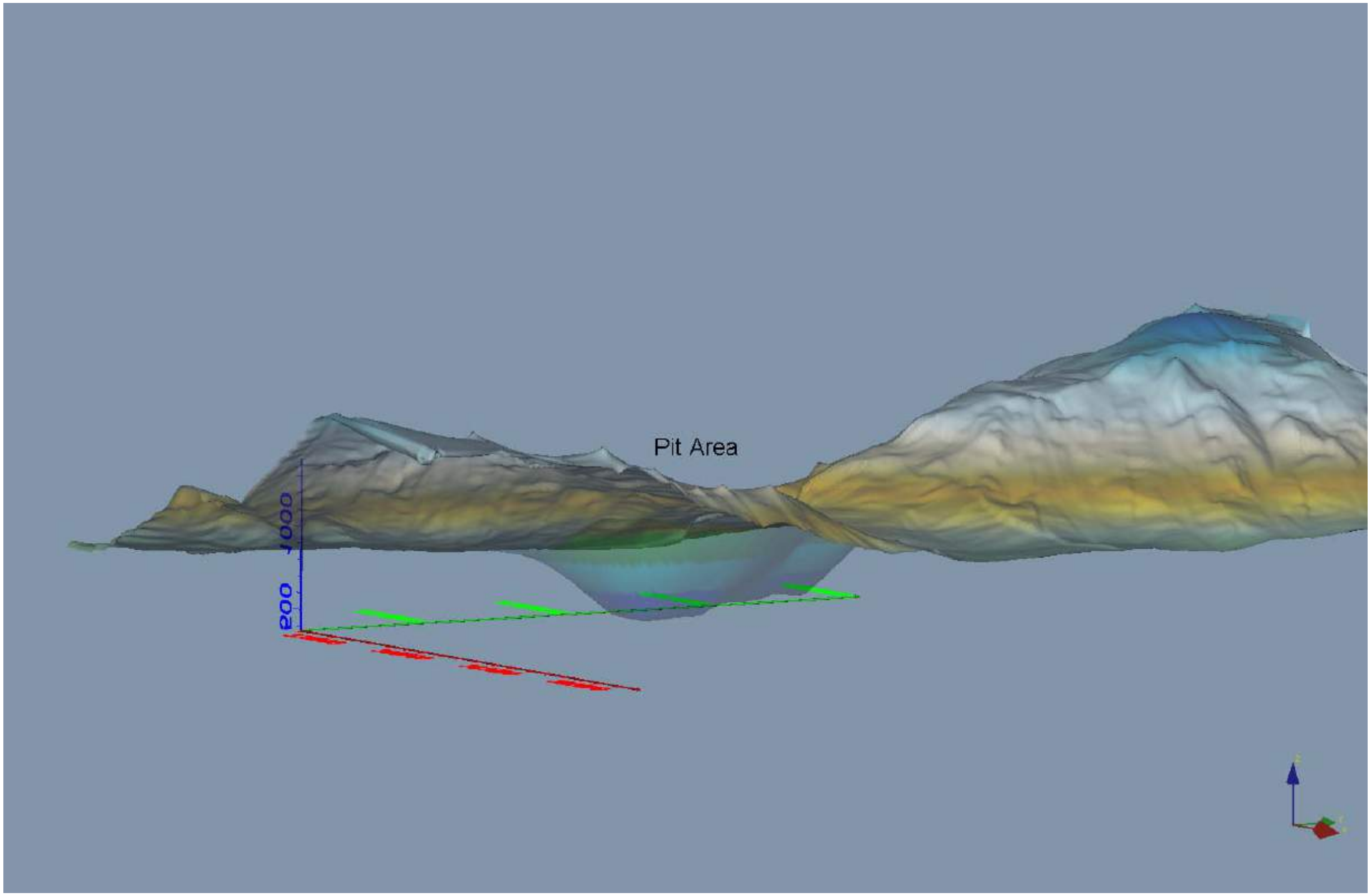

Figure 3-9. Surface topography of the Schaft Creek area looking northwest and showing the underlying ultimate pit shell.

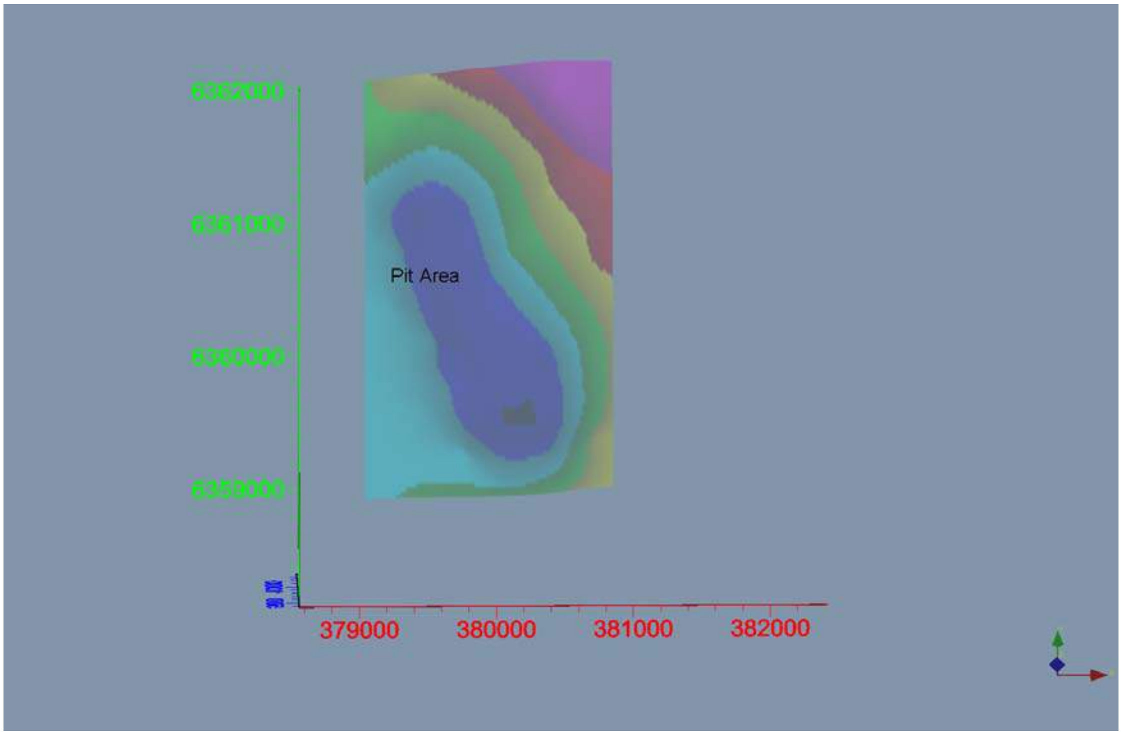

Figure 3-10. Approximate ultimate pit shell for the Schaft Creek Project looking north.

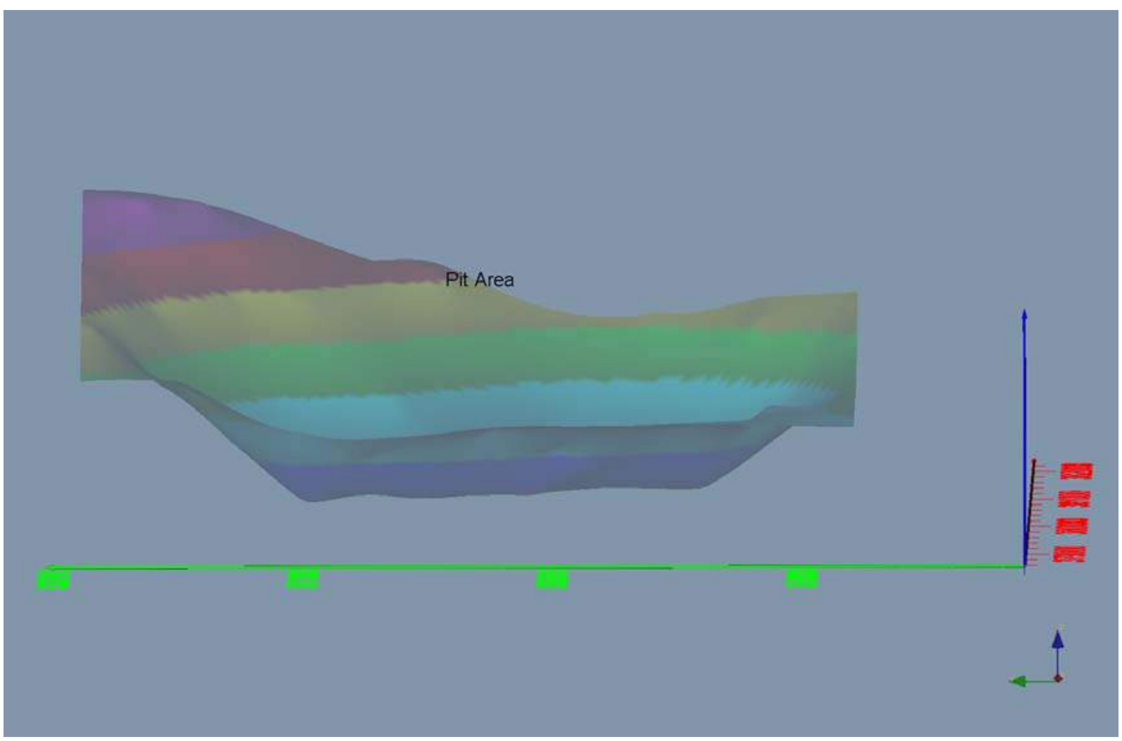

Figure 3-11. Approximate ultimate pit shell for the Schaft Creek Project looking east.

Spatial interpolations among the 634 measured values were based on inverse distance weighting at the third power, allowing localized variability and heavy emphasis on the nearest values. Less weighting (first and second power), and thus stronger interpolation over longer distances, was checked against the results using third power. A lower power indicated less or the same amount of net-acid-generating rock within the ultimate pit shell, and thus third power was retained as a safety factor. The 3D interpolation and visualization was provided by Golden Software's Voxler software, using a grid 20 m by 20 m by 20 m.

Two-dimensional horizontal planes 20 m apart (i.e., at elevations 20 m apart) were exported to Golden Software's Surfer software for elevation-specific estimates of net-acid-generating and net-neutralizing rock. Because in a general sense the Schaft Creek pit will be mined from the uppermost elevations downward, this approach provided a general time sequence for mining of the ARD categories.

4. RESULTS OF THREE-DIMENSIONAL MODELLING OF ABA DATA

As explained in Chapter 3, Adjusted TNPR values from the 634 ABA samples were modelled directly. Also, 634 values of total sulphur and NP were modelled separately, and then mathematically combined locally to obtain Adjusted TNPR. The latter approach was preferable, because the former employs a ratio of two generally independent parameters at their levels within Schaft Creek rock (Figure 4-1). Analyses were first transformed to log10 values, because they were more lognormally than normally distributed (Figures 3-1 to 3-6).

4.1 Volumes of Net-Acid-Generating and Net-Neutralizing Rock with the Approximate Ultimate Pit

Based on the approaches defined in Chapter 3, three-dimensional modelling showed that the volume of net-acid-generating rock within the approximate ultimate pit shell was a maximum of roughly 5%.

The higher percentage of 5.1% of net-acid-generating rock was obtained from three-dimensional interpolations of log10 Adjusted TNPR (Figures 4-2 to 4-4, and Appendix B1). In contrast, the lower percentage of 3.6% of net-acid-generating rock was obtained from three-dimensional interpolations of log 10 values of total sulphur and Neutralization Potential, with subsequent local calculation of Adjusted TNPR (Figures 4-5 to 4-7, and Appendix B2).

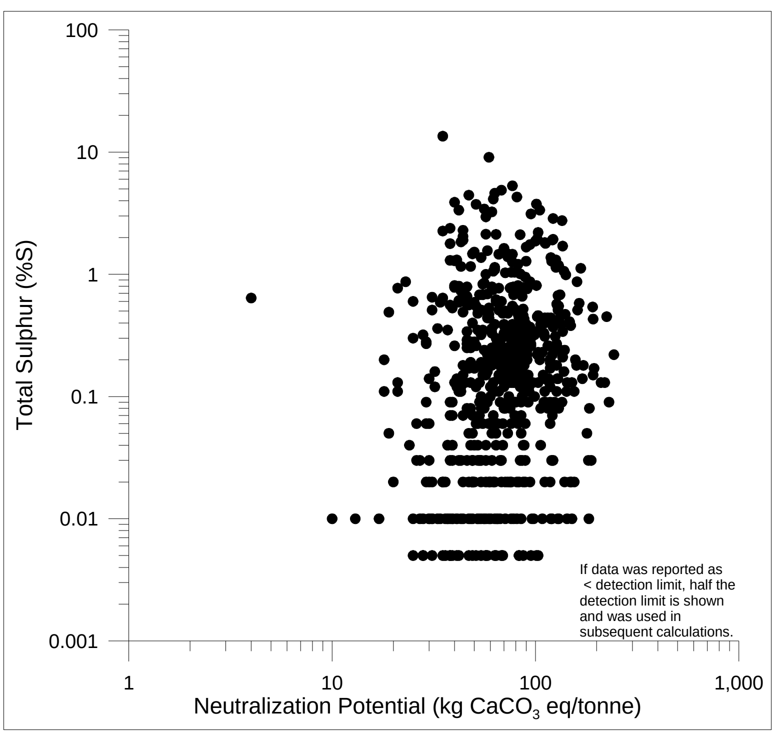

Figure 4-1. Total sulphur vs. Neutralization Potential in the 634 ABA samples of Schaft Creek rock.

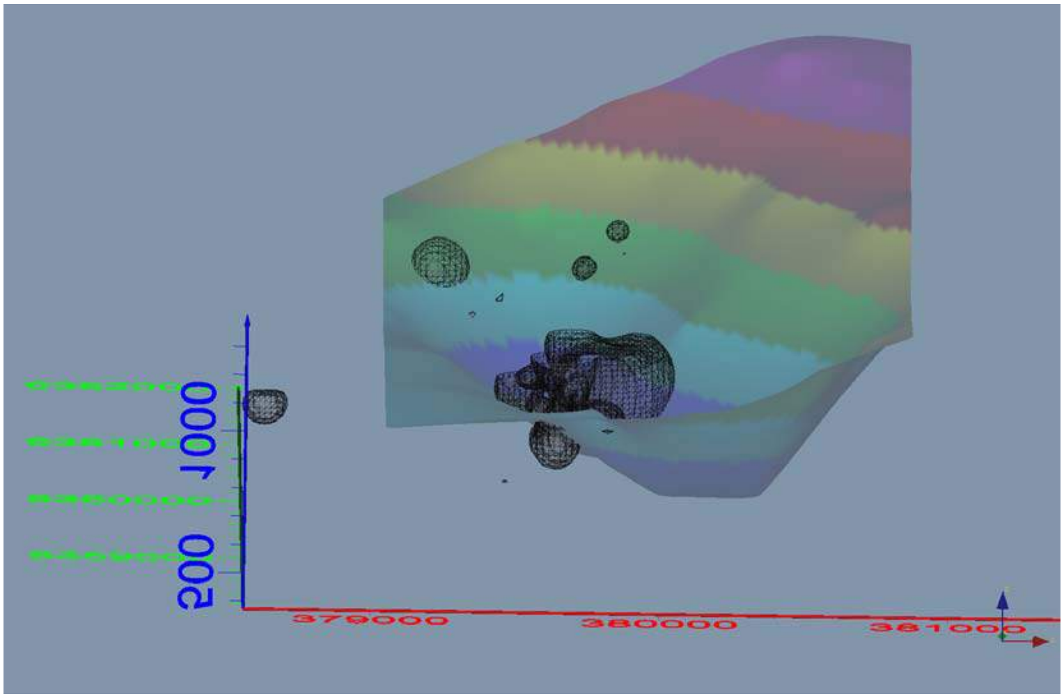

Figure 4-2. Net-acid-generating zones within the approximate ultimate pit shell and on pit walls, looking north, based on three-dimensional modelling of log10 Adjusted TNPR from 634 ABA samples.

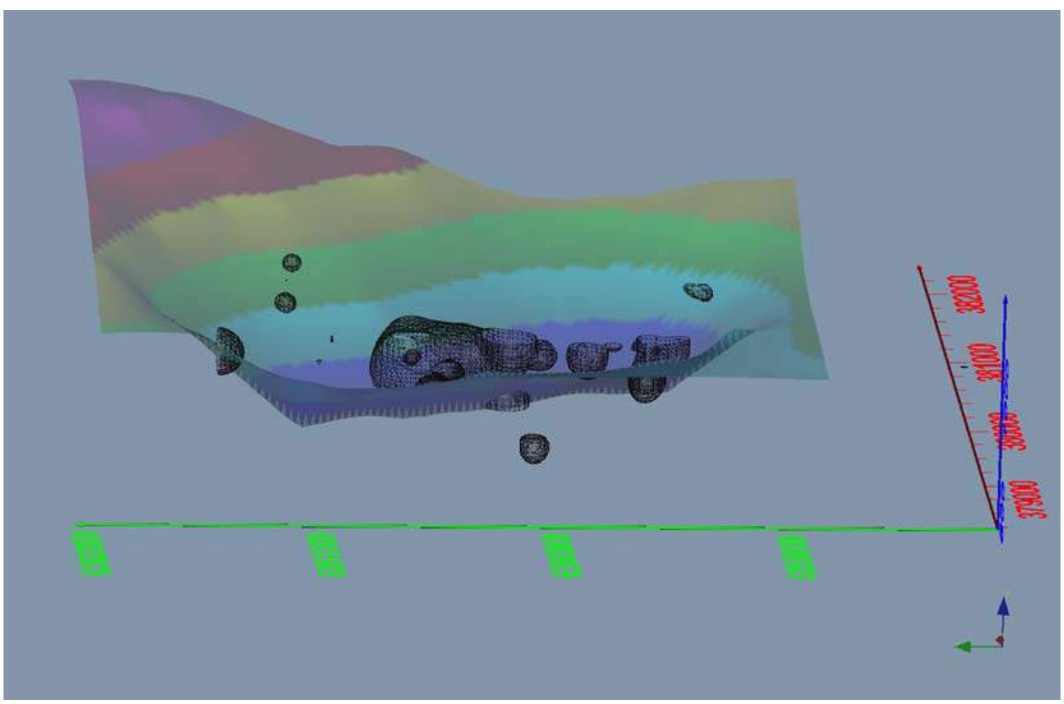

Figure 4-3. Net-acid-generating zones within the approximate ultimate pit shell and on pit walls, looking east, based on three-dimensional modelling of log10 Adjusted TNPR from 634 ABA samples.

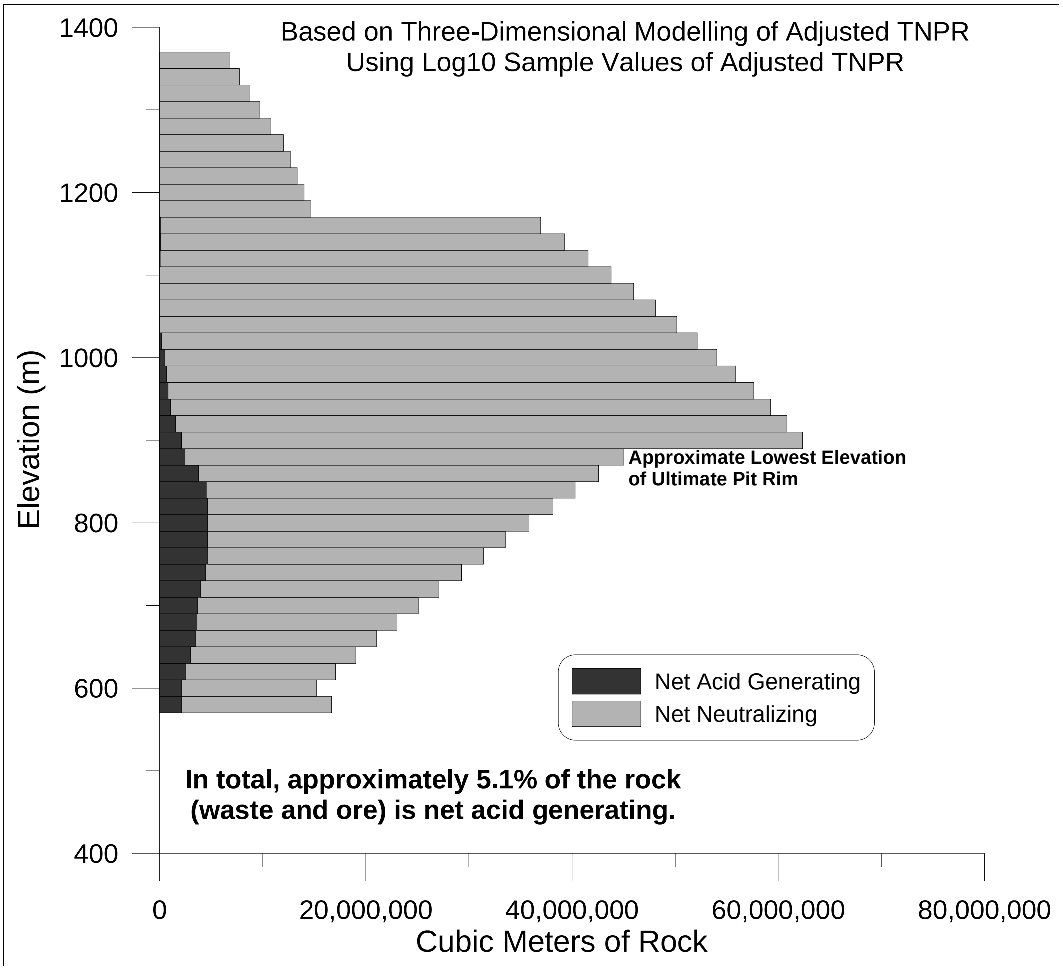

Figure 4-4. Volumes of net-acid-generating and net-neutralizing rock by elevation within the approximate ultimate pit shell, based on three-dimensional modelling of log10 Adjusted TNPR from 634 ABA samples.

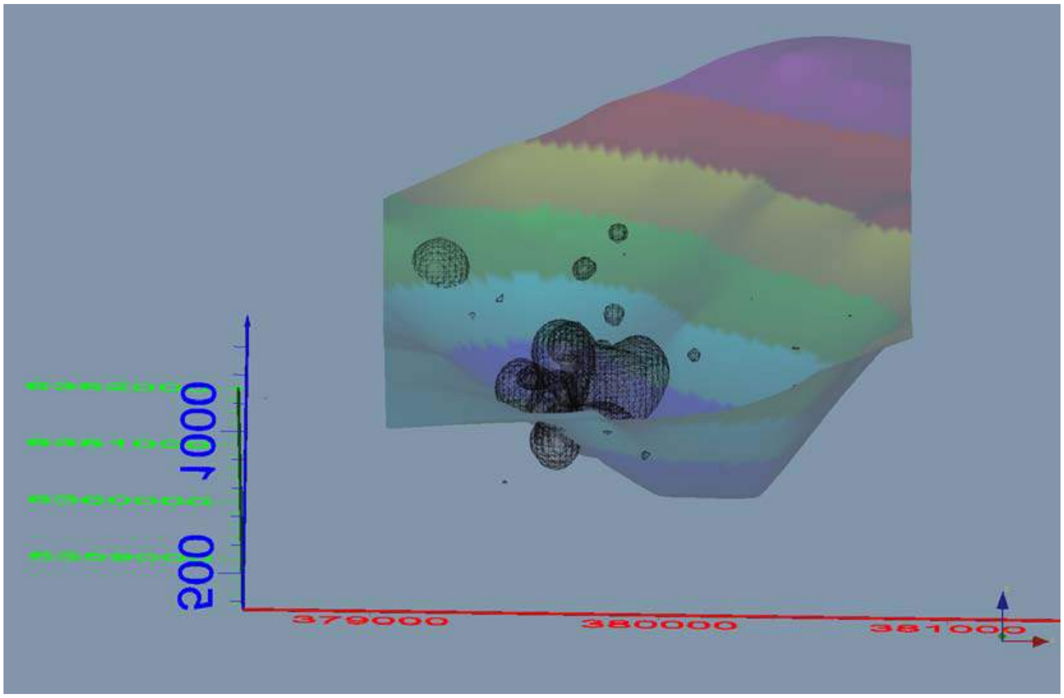

Figure 4-5. Net-acid-generating zones within the approximate ultimate pit shell and on pit walls, looking north, based on three-dimensional modelling of log10 total sulphur and log 10 NP from 634 ABA samples.

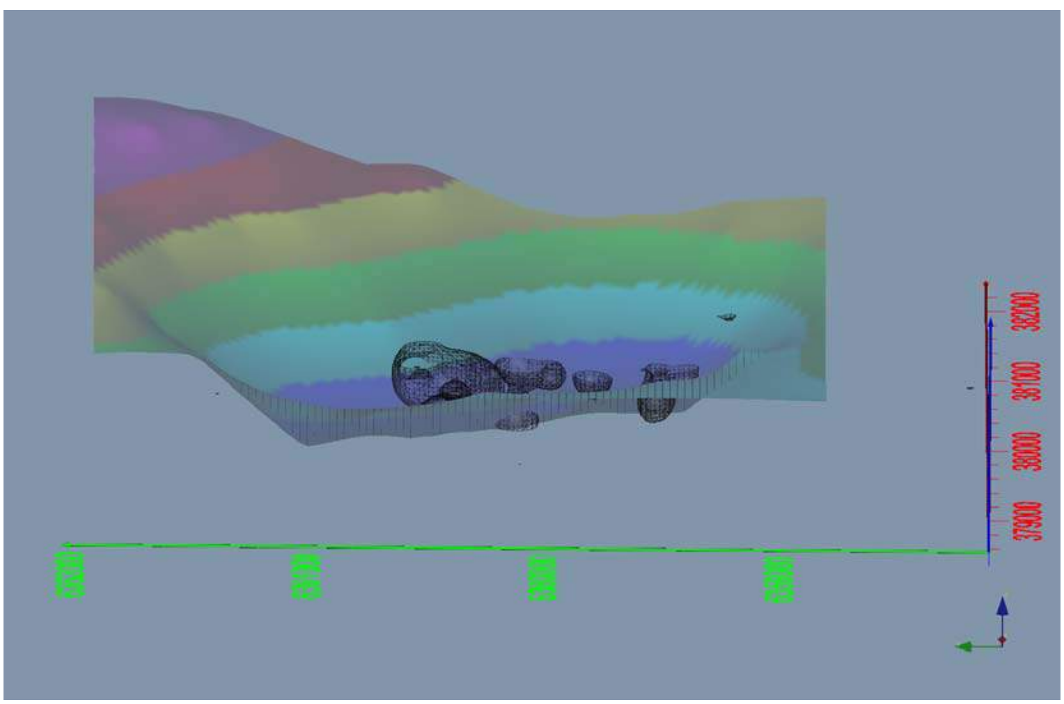

Figure 4-6. Net-acid-generating zones within the approximate ultimate pit shell and on pit walls, looking east, based on three-dimensional modelling of log10 total sulphur and log10 NP from 634 ABA samples.

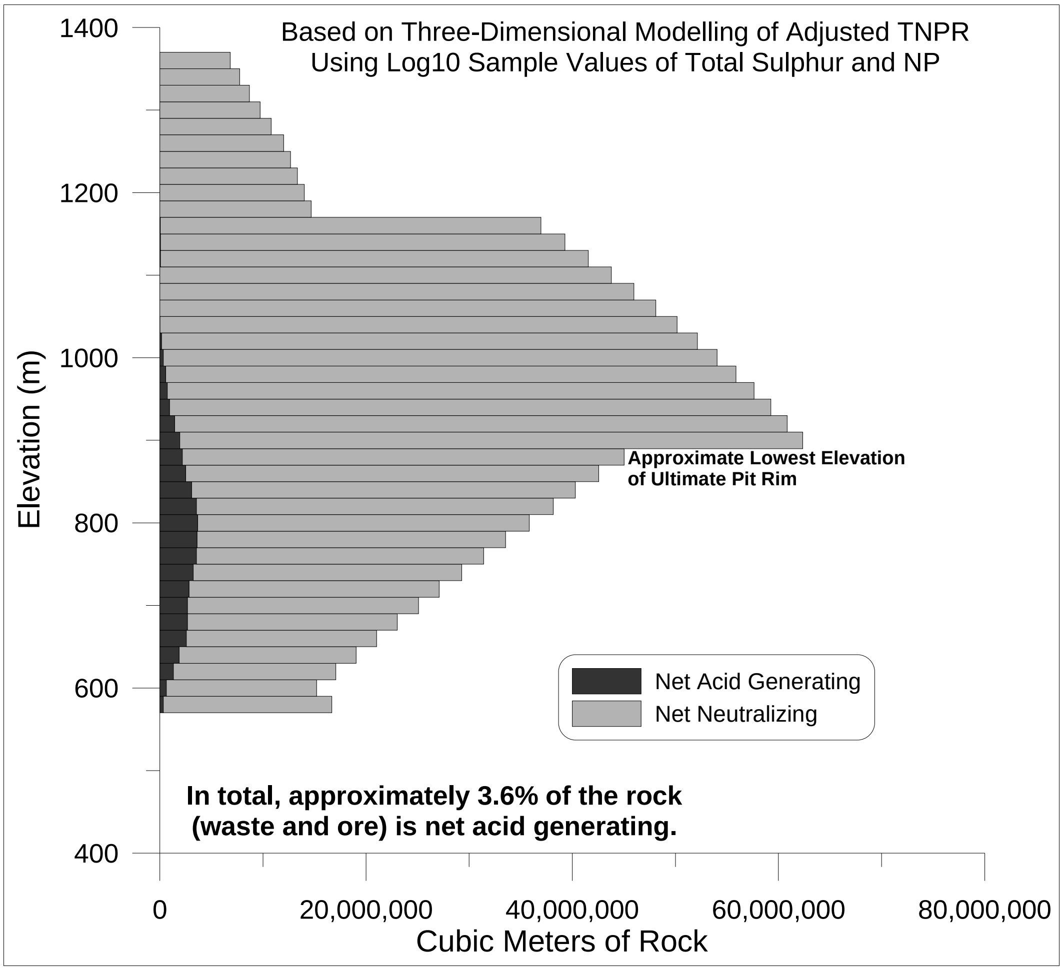

Figure 4-7. Volumes of net-acid-generating and net-neutralizing rock by elevation within the approximate ultimate pit shell, based on three-dimensional modelling of log10 total sulphur and log 10 NP from 634 ABA samples.

In both cases, most net-acid-generating rock laid beneath the lowest elevation of the ultimate pit rim (Figures 4-4 and 4-7). Because the mine plan generally calls for the pit to be mined from the top downwards, most net-acid-generating rock would not be mined until years into operation. This provides some years to prepare for excavation of most net-acid-generating rock.

Some net-acid-generating rock would be ore grade, and thus would be sent to the mill where the copper sulphide would be removed and the resulting net-neutralizing tailings sent to the tailings impoundment. The separation of ore grade and waste grade blocks at the Schaft Creek Project requires NI 43-101 certification, which this study does not meet. Therefore, the net-acid-generating rock will not be separated into ore and waste in this report.

However, in a general sense, the proportion of net-acid-generating samples was similar for both approximate ore grade and approximate waste grade (Figure 4-8). There was a somewhat higher percentage of net-acid-generating ore-grade samples, suggesting more of the net-acid-generating rock would be ore. Nevertheless, the waste rock is still predicted to contain up to 5.1% net-acid-generating rock. There are options to dilute ore rock with the net-acid-generating waste to lower the percentage reporting to the waste-rock pile, to dispose of net-acid-generating rock separately, or to mix the rock together within the waste-rock pile.

In summary, the two approaches for three-dimensional modelling of acid-base-accounting data indicated 3.6-5.1% of the pit rock, by volume, would be net acid generating. The greater majority would be net neutralizing. Most net-acid-generating rock would not be mined in the initial years of operation. This provides some years to prepare for excavation of most net-acid-generating rock. Although not NI 43-101 compliant, the net-acid-generating rock may not be strongly biased towards ore or waste grades. Thus, the waste rock is still predicted to contain up to 5.1% net-acid-generating rock. There are options to dilute the ore rock with the net-acid-generating waste to lower the percentage reporting to the waste-rock pile, to dispose of net-acid-generating rock separately, or to mix the rock together within the waste-rock pile.

4.2 Areas of Net-Acid-Generating Rock on Ultimate-Pit Walls

As explained in Section 4.1, the two approaches for three-dimensional modelling indicated 3.6-5.1% of rock within the approximate ultimate pit shell would be net acid generating. Some net-acid-generating zones pass through the ultimate pit walls (Figures 4-2, 4-3, 4-5, and 4-6). Thus, areas of the ultimate pit walls are predicted to have net-acid-generating zones.

Areas of these net-acid-generating zones were estimated, like volumes (Section 4.1), based on 20-m lateral planes representing elevation. The linear traces of net-acid-generating zones at a particular elevation, multiplied by 20 m, provided areas by elevation. Based on direct interpolations of log10 Adjusted TNPR, 5.9% of the ultimate pit wall would be net acid generating (Figure 4-9 and Appendix C1), similar to the volume estimate of 5.1% from Section 4.1. Most of that area was beneath the lowest elevation of the ultimate pit rim, and thus much may be submerged after closure and pit-lake formation.

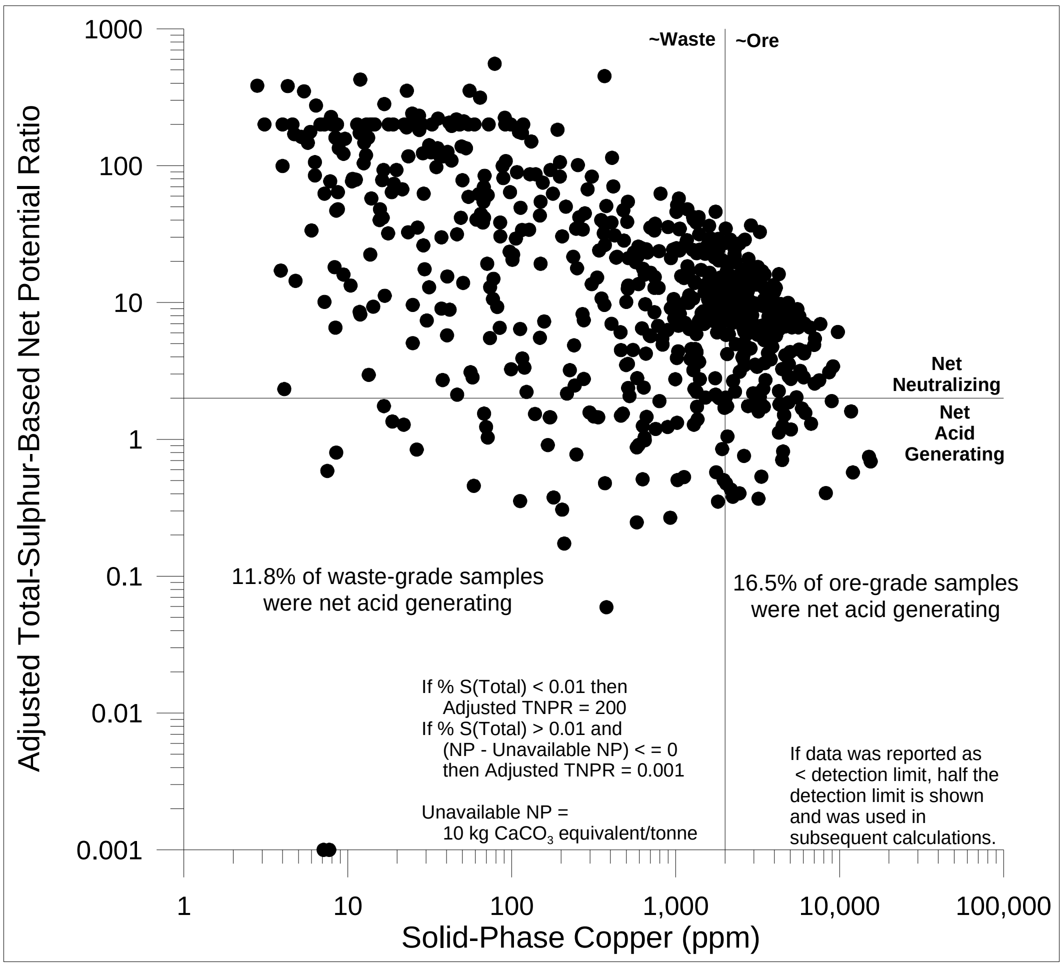

Figure 4-8. Adjusted Total-Sulphur-Based Net Potential Ratio vs. solid-phase copper in the 634 ABA samples of Schaft Creek rock, showing percentages of net-acid-generating samples for approximate ore-grade and waste-grade samples.

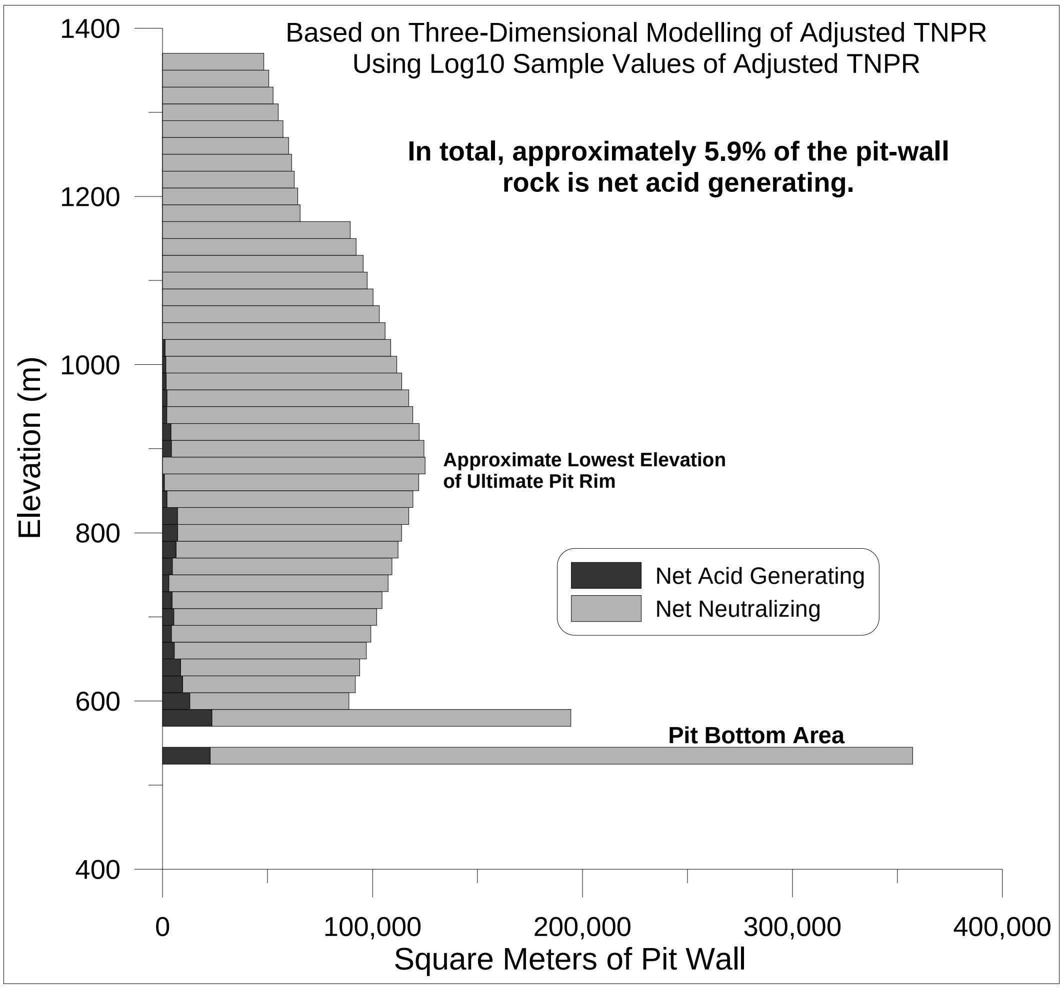

Figure 4-9. Areas of net-acid-generating and net-neutralizing rock by elevation on the approximate ultimate pit-shell walls, based on three-dimensional modelling of log10 Adjusted TNPR from 634 ABA samples.

Based on direct interpolations of log10 total sulphur and log10 NP, locally combined as Adjusted TNPR, 3.8% of the ultimate pit wall would be net acid generating (Figure 4-10 and Appendix C2). This is similar to the volume estimate of 3.6% from Section 4.1. Most of that area was beneath the lowest elevation of the ultimate pit rim, and thus much may be submerged after closure and pit-lake formation.

In summary, the two approaches for three-dimensional modelling of acid-base-accounting data indicated 3.8-5.9% of the ultimate-pit-wall-rock area would be net acid generating. The greater majority would be net neutralizing. Most net-acid-generating areas on the pit walls lay beneath the lowest elevation of the ultimate pit rim. As a result, most net-acid-generating areas on the pit walls may be submerged after closure and pit-lake formation.

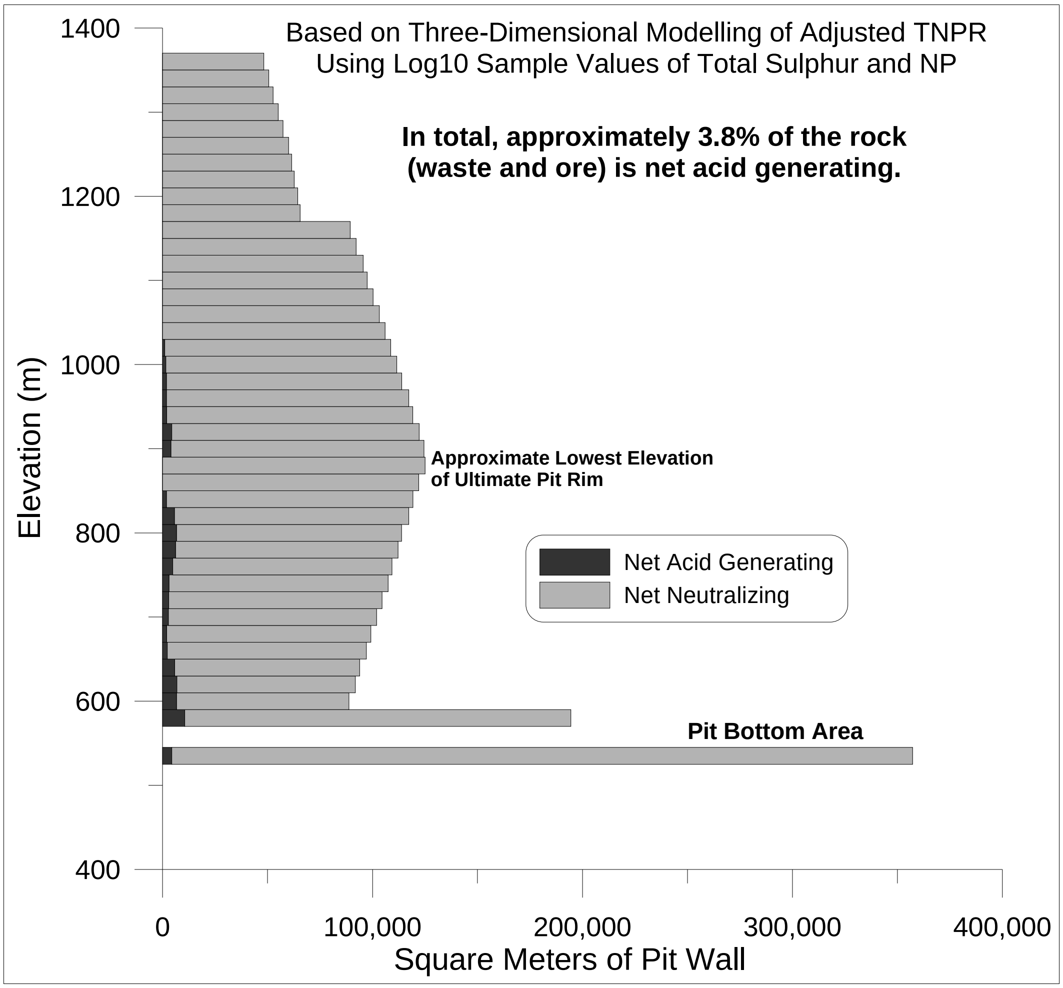

Figure 4-10. Areas of net-acid-generating and net-neutralizing rock by elevation on the approximate ultimate pit-shell walls, based on three-dimensional modelling of log10 total sulphur and NP from 634 ABA samples.

5. CONCLUSIONS AND RECOMMENDATIONS

Important Note: This report is not compliant with National Instrument 43-101 for mineral exploration, resource estimates, and economic investment.

Net-acid-generating materials at Schaft Creek can be separated from net-acid-neutralizing materials using the Adjusted Total-Sulphur-Based Net Potential Ratio:

Adj TNPR = (Neutralization Potential - 10)/(Total sulphur * 31.25)

Any Adjusted TNPR value below 2.0 is predicted to be net acid generating, after some lag time.

Adjusted TNPR is basically a ratio of two independent variables (total sulphur and NP), and is thus not necessarily amenable to direct interpolation and three-dimensional (3D) modelling within the proposed pit area. Therefore, the three-dimensional distribution of Adj TNPR, based on 634 acid-base accounts for rock at Schaft Creek and a 20 m x 20 m x 20 m grid, was evaluated in two ways:

1) Adj TNPR values were modelled directly, and
2) total sulphur and NP modelled separately, but combined locally, to obtain local Adj TNPR values.

The statistical distributions of total sulphur, NP, and Adjusted TNPR resembled lognormal distributions, rather than normal distributions. Therefore, 3D modelling focussed on the logarithmic values of Adj TNPR, total sulphur, and NP. Inverse-distance interpolation to the third power allowed localized variability and heavy emphasis on the nearest values. Less weighting (first and second power), and thus stronger interpolation over longer distances, was checked against the results using third power. A lower power indicated less or the same amount of net-acid-generating rock within the ultimate pit shell. Therefore, third power was retained as a safety factor.

Volumes of Net-Acid-Generating and Net-Neutralizing Rock within the Approximate Ultimate Pit

The two approaches for three-dimensional modelling of acid-base-accounting data indicated 3.6-5.1% of the pit rock, by volume, would be net acid generating. The greater majority would be net neutralizing.

Most net-acid-generating rock would not be mined in the initial years of operation. This provides some years to prepare for excavation of most net-acid-generating rock.

Although not NI 43-101 compliant, the net-acid-generating rock may not be strongly biased towards ore or waste grades. Thus, the waste rock is still predicted to contain up to 5.1% net-acid-generating rock.

There are options to dilute the ore rock with the net-acid-generating waste to lower the percentage reporting to the waste-rock pile, to dispose of net-acid-generating rock separately, or to mix the rock together within the waste-rock pile.

Areas of Net-Acid-Generating and Net-Neutralizing Rock on the Approximate Ultimate-Pit Walls

The two approaches for three-dimensional modelling of acid-base-accounting data indicated 3.8-5.9% of the ultimate-pit-wall-rock area would be net acid generating. The greater majority would be net neutralizing.

Most net-acid-generating areas on the pit walls lay beneath the lowest elevation of the ultimate pit rim. As a result, most net-acid-generating areas on the pit walls may be submerged after closure and pit-lake formation.

Recommendation

When the geologic and geostatistical block models are finalized for the Schaft Creek Project, Copper Fox Metals Inc. should add log10 values of Adjusted TNPR, total sulphur, and NP to them. This would provide predictions of net-acid-generating volumes and pit-wall areas, by elevation, consistent with all geological, geotechnical, and economic information for the Schaft Creek Project.

6. REFERENCES

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APPENDIX A. Locations of Drillholes, Drillhole Traces, and Acid-Base-Accounting Samples within the Schaft Creek Approximate Ultimate Pit

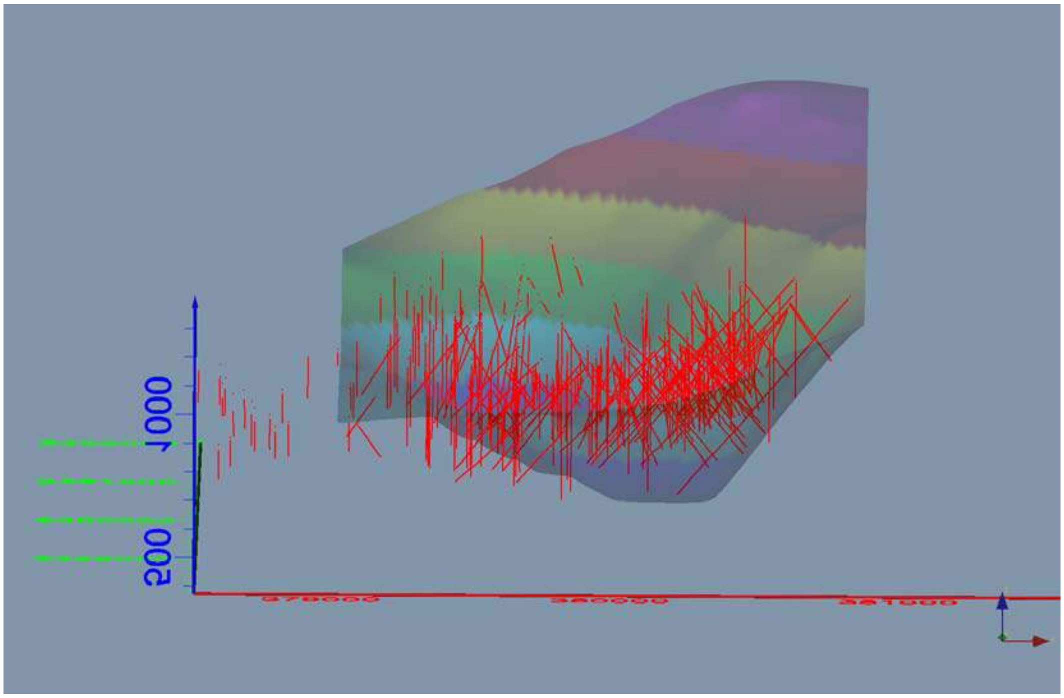

Figure A-1. Locations of all drillholes in and around the Schaft Creek approximate pit, looking north; many drillholes are historical and samples were not available from them.

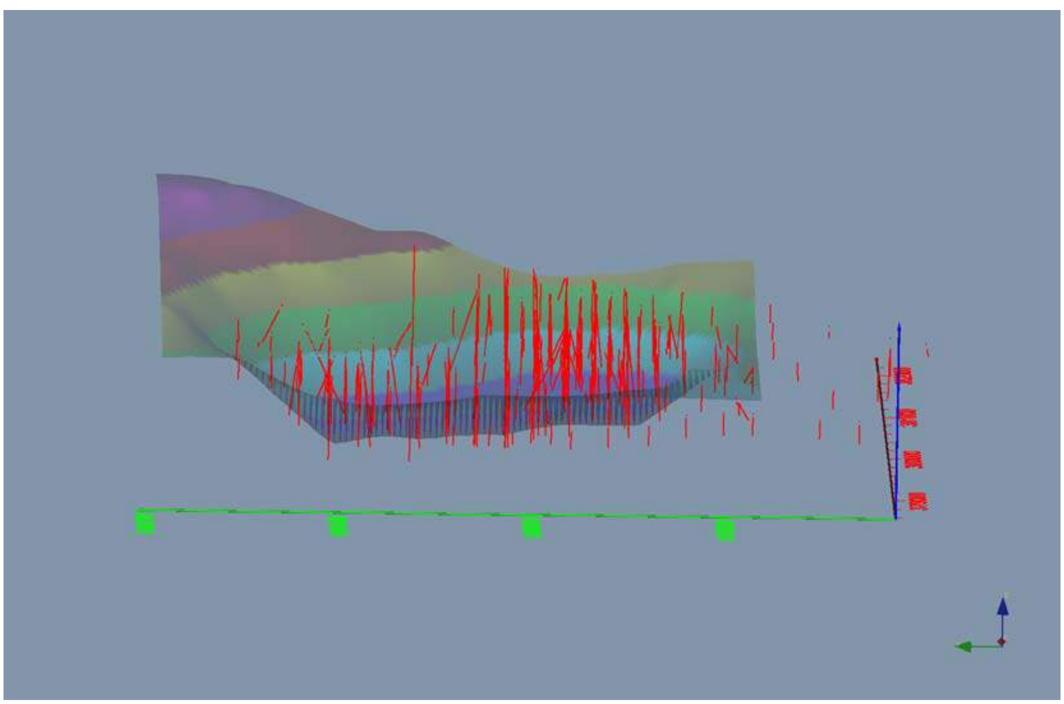

Figure A-2. Locations of all drillholes in and around the Schaft Creek approximate pit, looking east; many drillholes are historical and samples were not available from them.

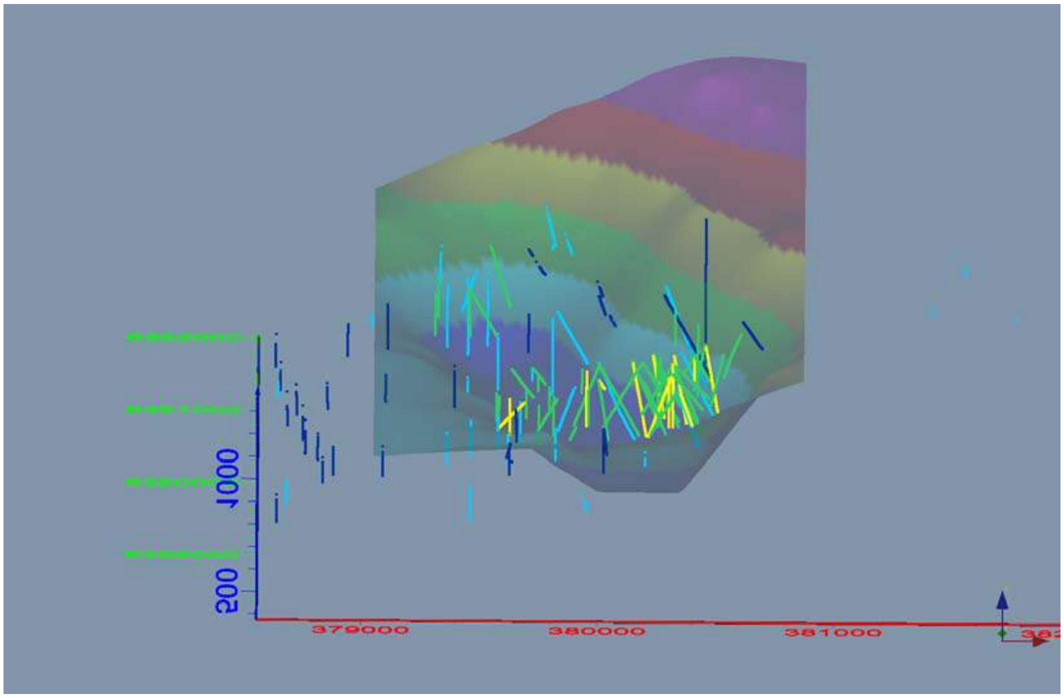

Figure A-3. Locations of Copper Fox drillholes in and around the Schaft Creek approximate pit, looking north (yellow = drilled in 2005, green = 2006; dark blue = 2007, light blue = 2008); these were the primary source for acid-base-accounting samples.

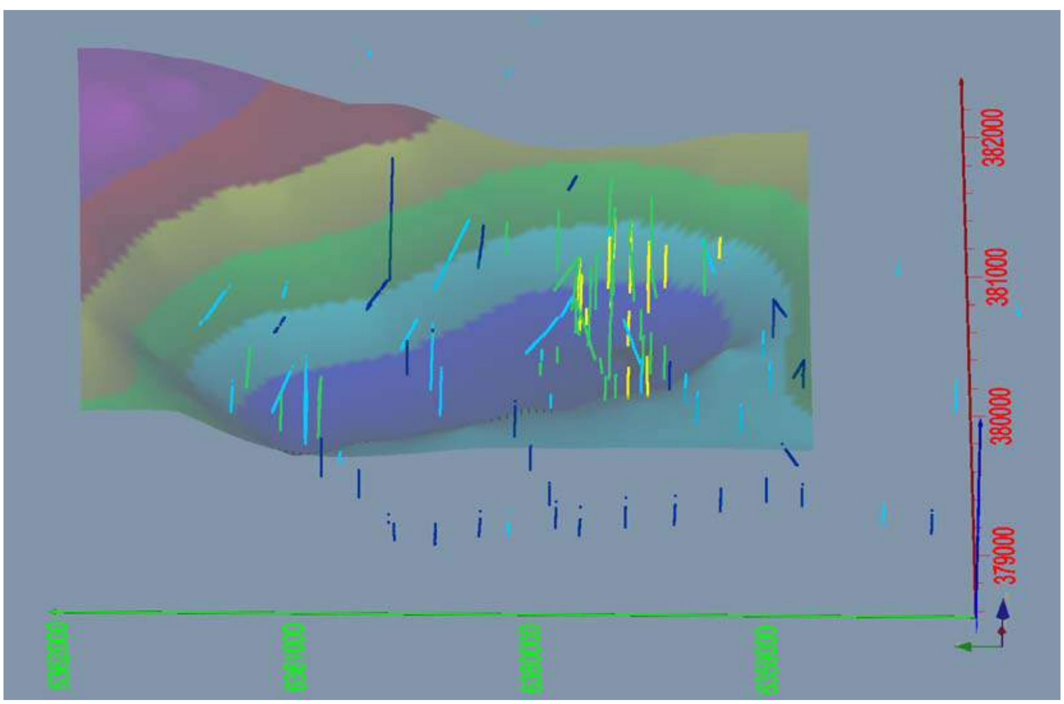

Figure A-4. Locations of Copper Fox drillholes in and around the Schaft Creek approximate pit, looking east (yellow = drilled in 2005, green = 2006; dark blue = 2007, light blue = 2008); these were the primary source for acid-base-accounting samples.

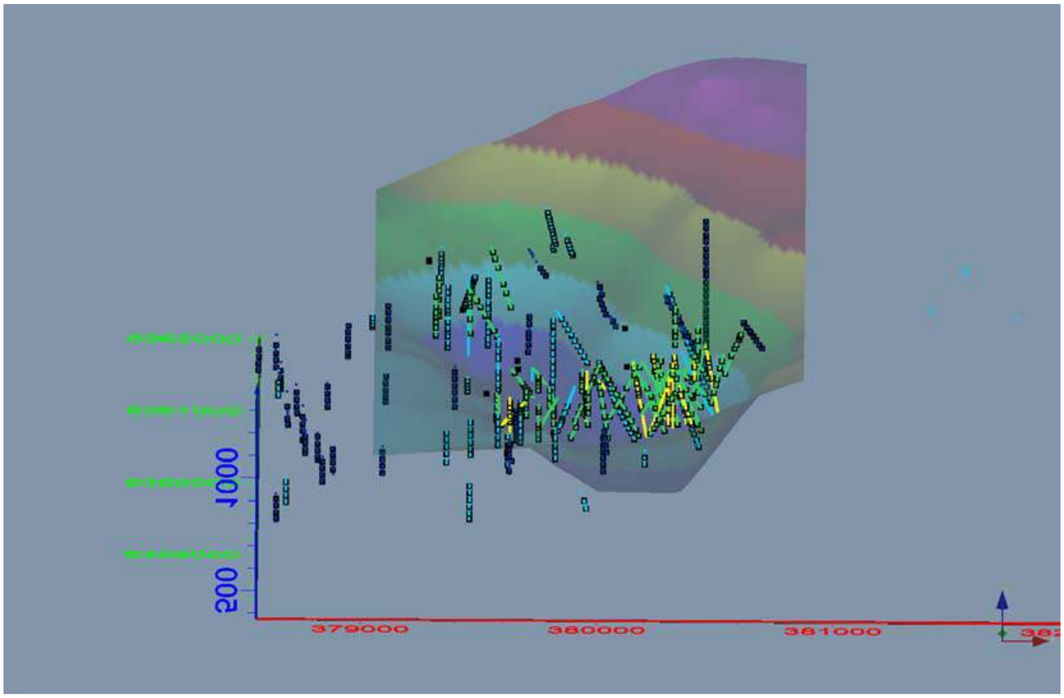

Figure A-5. Locations of acid-base-accounting samples, superimposed on drillhole traces as black boxes, looking north; compare with Figure A-3.

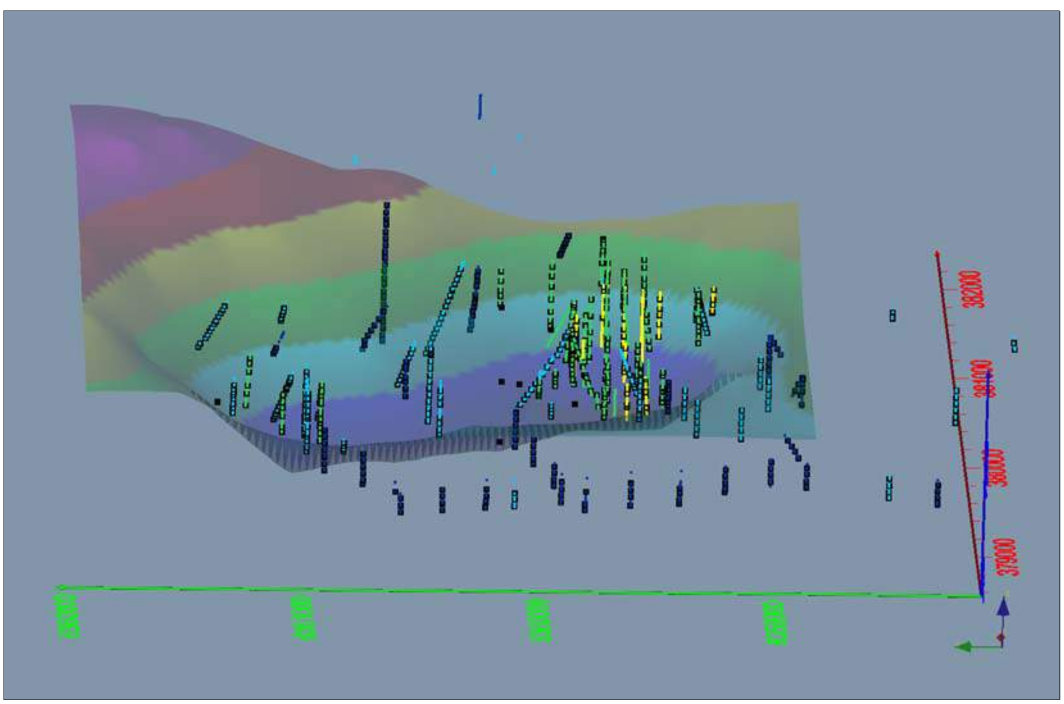

Figure A-6. Locations of acid-base-accounting samples, superimposed on drillhole traces as black boxes, looking east; compare with Figure A-4.

APPENDIX B. Elevation-Based (Horizontal-Plane) Modelled Estimates for Volumes of Net-Acid-Generating and Net-Acid-Neutralizing Rock from the Schaft Creek Approximate Ultimate Pit

B1. Volumes Based on Interpolations of Log10 Adjusted Total-Sulphur-Based Net Potential Ratio

Table B-1. Volumes of Net-Acid-Generating and Net-Acid-Neutralizing Rock from the Schaft Creek Approximate Ultimate Pit Based on Interpolations of Log10 Adjusted Total-Sulphur-Based Net Potential Ratio (NOT NI 43-101 COMPLIANT)

Elevation (m)[1]	Net Neutralizing (m^3)	Net Acid Generating (m^3)	Total (m^3)
580	14509825	2160175	16670000
600	13042220	2153780	15196000
620	14515540	2556460	17072000
640	16014280	3021720	19036000
660	17513920	3514080	21028000
680	19408540	3623460	23032000
700	21388240	3691760	25080000
720	23098280	3977720	27076000
740	24821240	4462760	29284000
760	26721300	4690700	31412000
780	28873440	4658560	33532000
800	31170460	4661540	35832000
820	33500320	4659680	38160000
840	35768660	4523340	40292000
860	38817700	3758300	42576000
880	42581720	2462280	45044000
900	60227380	2120620	62348000
920	59283900	1552100	60836000
940	58209320	1050680	59260000
960	56794740	829260	57624000
980	55184260	679740	55864000
1000	53579080	460920	54040000
1020	51935320	196680	52132000
1040	50162040	17960	50180000
1060	48099460	536	48099996
1080	45971920	89.6	45972010
1100	43782920	1084	43784004
1120	41488360	67640	41556000
1140	39193900	98100	39292000
1160	36888540	75460	36964000
1180	14676000	0	14676000
1200	14012000	0	14012000
1220	13344000	0	13344000
1240	12672000	0	12672000
1260	11996000	0	11996000
1280	10804000	0	10804000
1300	9724000	0	9724000
1320	8696000	0	8696000
1340	7736000	0	7736000
1360	6824000	0	6824000
TOTAL	1213030825	65727185	1278758010
Percentage of Total	94.9%	5.1%	100%

[1] Elevation was discretized every 20 m to calculate volumes. The exception was the base of the pit. Elevation 580 m was extended from 535 m to 590 m (55 m), and its corresponding volume was adjusted to 45% due to the narrowing of the pit to the base.

B2. Volumes Based on Interpolations of Log10 Total Sulphur and Log10 Neutralization Potential

Table B-2. Volumes of Net-Acid-Generating and Net-Acid-Neutralizing Rock from the Schaft Creek Approximate Ultimate Pit Based on Interpolations of Log10 Total Sulphur and Log10 Neutralization Potential (NOT NI 43-101 COMPLIANT)

Elevation (m)[1]	Net Neutralizing (m^3)	Net Acid Generating (m^3)	Total (m^3)
580	16335850	334150	16670000
600	14570780	625220	15196000
620	15762100	1309900	17072000
640	17158460	1877540	19036000
660	18448200	2579800	21028000
680	20355240	2676760	23032000
700	22405300	2674700	25080000
720	24255520	2820480	27076000
740	26045300	3238700	29284000
760	27867660	3544340	31412000
780	29922700	3609300	33532000
800	32156580	3675420	35832000
820	34593900	3566100	38160000
840	37201700	3090300	40292000
860	40068620	2507380	42576000
880	42870460	2173540	45044000
900	60413940	1934060	62348000
920	59408540	1427460	60836000
940	58318280	941720	59260000
960	56901600	722400	57624000
980	55306680	557320	55864000
1000	53703980	336020	54040000
1020	51976100	155900	52132000
1040	50172620	7380	50180000
1060	48099500	506	48100006
1080	45971920	88	45972008
1100	43782940	1064	43784004
1120	41505680	50300	41555980
1140	39224360	67640	39292000
1160	36924580	39420	36964000
1180	14676000	0	14676000
1200	14012000	0	14012000
1220	13344000	0	13344000
1240	12672000	0	12672000
1260	11996000	0	11996000
1280	10804000	0	10804000
1300	9724000	0	9724000
1320	8696000	0	8696000
1340	7736000	0	7736000
1360	6824000	0	6824000
TOTAL	1232213090	46544908	1278757998
Percentage of Total	96.4%	3.6%	100%

[1] Elevation was discretized every 20 m to calculate volumes. The exception was the base of the pit. Elevation 580 m was extended from 535 m to 590 m (55 m), and its corresponding volume was adjusted to 45% due to the narrowing of the pit to the base.

APPENDIX C. Elevation-Based (Horizontal-Plane) Modelled Estimates for Areas of Net-Acid-Generating and Net-Acid-Neutralizing Wall Rock from the Schaft Creek Approximate Ultimate Pit

C1. Areas Based on Interpolations of Log10 Adjusted Total-Sulphur-Based Net Potential Ratio

Table C-1. Areas of Net-Acid-Generating and Net-Acid-Neutralizing Rock from the Schaft Creek Approximate Ultimate Pit Based on Interpolations of Log10 Adjusted Total-Sulphur-Based Net Potential Ratio (NOT NI 43-101 COMPLIANT)

Elevation (m)[1]	Net Neutralizing (m^3)	Net Acid Generating (m^3)	Total (m^3)
Lateral Pit Bottom	334477	22747	357225
580	170907	23528	194435
600	75699	13082	88781
620	82201	9585	91785
640	85231	8630	93861
660	91363	5679	97042
680	94942	4270	99212
700	96557	5425	101982
720	100022	4522	104544
740	104339	3052	107391
760	104589	4717	109305
780	105728	6495	112224
800	106663	7228	113891
820	110177	7150	117327
840	117173	2118	119291
860	121057	926	121983
880	125098	0	125098
900	120206	4245	124451
920	118224	4048	122272
940	117171	2037	119209
960	115167	2115	117282
980	112248	1717	113965
1000	110000	1590	111590
1020	107521	1170	108691
1040	105970	0	105970
1060	103259	0	103259
1080	100272	0	100272
1100	97467	0	97467
1120	95533	0	95533
1140	92192	0	92192
1160	89431	0	89431
1180	65543	0	65543
1200	64376	0	64376
1220	62677	0	62677
1240	61558	0	61558
1260	60082	0	60082
1280	57357	0	57357
1300	55122	0	55122
1320	52649	0	52649
1340	50606	0	50606
1360	48196	0	48196
TOTAL	4089054	146074	4235128
Percentage of Total	96.6%	3.4%	100%

[1] Elevation was discretized every 20 m to calculate areas. The exception was the base of the pit. Elevation 580 m was extended from 535 m to 590 m (55 m). Also, the area of the approximately lateral pit bottom was calculated separately.

C2. Areas Based on Interpolations of Log10 Total Sulphur and Log10 Neutralization Potential

Table C-2. Areas of Net-Acid-Generating and Net-Acid-Neutralizing Rock from the Schaft Creek Approximate Ultimate Pit Based on Interpolations of Log10 Total Sulphur and Log10 Neutralization Potential (NOT NI 43-101 COMPLIANT)

Elevation (m)[1]	Net Neutralizing (m^3)	Net Acid Generating (m^3)	Total (m^3)
Lateral Pit Bottom	352784	4441	357225
580	183883	10552	194435
600	82055	6725	88781
620	84928	6857	91785
640	88084	5777	93861
660	94761	2281	97042
680	97285	1926	99212
700	99201	2781	101982
720	101620	2925	104544
740	104238	3152	107391
760	104467	4838	109305
780	106041	6183	112224
800	107137	6754	113891
820	111595	5732	117327
840	117416	1876	119291
860	121983	0	121983
880	125098	0	125098
900	120364	4087	124451
920	117792	4479	122272
940	117306	1903	119209
960	115382	1899	117282
980	112093	1872	113965
1000	110003	1587	111590
1020	107595	1096	108691
1040	105970	0	105970
1060	103259	0	103259
1080	100272	0	100272
1100	97467	0	97467
1120	95533	0	95533
1140	92192	0	92192
1160	89431	0	89431
1180	65543	0	65543
1200	64376	0	64376
1220	62677	0	62677
1240	61558	0	61558
1260	60082	0	60082
1280	57357	0	57357
1300	55122	0	55122
1320	52649	0	52649
1340	50606	0	50606
1360	48196	0	48196
TOTAL	4145404	89724	4235128
Percentage of Total	97.9%	2.1%	100%

[1] Elevation was discretized every 20 m to calculate areas. The exception was the base of the pit. Elevation 580 m was extended from 535 m to 590 m (55 m). Also, the area of the approximately lateral pit bottom was calculated separately.