# Technical Memo

**To:** Chris Cairns, Jennifer Murphy, Hamish Forgan
**Company:** Stavely Minerals Ltd
**From:** Andrew Grieve, Mark Zammit
**Reviewed:**
**Date:** 21-05-2020
**Project:** Thursdays Gossan
**Subject:** Diamond Sampling Duplicate Analysis

## Background

In February 2020, Cube completed a review of sampling and drilling activities carried out at the Thursdays Gossan Project. Due to the poor sample recoveries and sampling methodology, the review highlighted the potential for sample bias. The review recommended a duplicate sampling program of the diamond core to determine the tenor (if any) of bias. Although the review recommended the duplicate sample consist of the remaining half core, Stavely were reticent to do this as they preferred keeping a record of the core, subsequently the majority of the duplicate samples were quarter core. Although technically this is not a 'true' duplicate, the testing program will still give some measure on the presence of bias.

## Process

Cube was supplied with the Stavely drilling database on 13$^{th}$ May 2020. The 'Duplicates' table contained around 650 records. As there were 'Chip' samples and also assays 'pending' in this table, these were removed, resulting in 531 samples available for analysis. Of these, 23 were half core and 508 quarter core. A further breakdown of the samples shows that of the 531 samples, 102 samples were from Sonic drilling.

Assays that had negative values – assumed to be below detection – were reset to the detection value.

The duplicate data was imported into Supervisor and also a Cube Excel template developed for the analysis of duplicates.

## Analysis

As the number of half core samples (23) is less than what is required for a relevant statistical analysis, only a review of the quarter core was undertaken.

Due to the different drill types (DDH and Sonic) an analysis was undertaken using the combined quarter core dataset and then DDH and Sonic separately. The relevant statistics for this analysis are tabulated in Table 1 and Table 2. For the purposes of this exercise, some statistics were not completed for Fe, Ni, Pb and Zn.

**Table 1: Max and Mean Statistical Analysis - Original versus Duplicate (Combined, DDH only and Sonic only)**

| | Max. value | | | | | | Mean | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Original | | | Duplicate | | | Original | | | Duplicate | | |
| Element | All | DDH | Sonic | All | DDH | Sonic | All | DDH | Sonic | All | DDH | Sonic |
| Au | 5.75 | 3.95 | 5.75 | 5.17 | 5.17 | 4.83 | 0.14 | 0.12 | 0.25 | 0.15 | 0.12 | 0.28 |
| Ag | 143 | 143 | 54 | 165 | 165 | 36 | 5 | 5 | 4 | 5 | 5 | 4 |
| Cu | 85000 | 85000 | 35600 | 104500 | 104500 | 37000 | 5878 | 6222 | 4513 | 5991 | 6342 | 4595 |
| Fe | 40 | 40 | 37 | 41 | 41 | 39 | 11 | 11 | 11 | 11 | 11 | 9 |
| Ni | 25900 | 7870 | 25900 | 25600 | 9030 | 25600 | 1010 | 957 | 1224 | 1002 | 964 | 1157 |
| Pb | 871 | 871 | 65 | 847 | 847 | 71 | 28 | 29 | 21 | 29 | 32 | 20 |
| Zn | 1805 | 1805 | 1130 | 2060 | 2060 | 1030 | 128 | 137 | 95 | 135 | 145 | 96 |

*A duplicate sample and its corresponding original sample were removed due to a large variation in the Ag and Cu values which skewed the analysis.

**Table 2: Duplicate Statistical Analysis - Original versus Duplicate (Combined, DDH only and Sonic only)**

| | Average difference (%) | | | Correl. Coefficient | | | CV Average (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| Element | All | DDH | Sonic | All | DDH | Sonic | All | DDH | Sonic |
| Au | -6.0 | -2.9 | -12.1 | 0.77 | 0.76 | 0.77 | 28 | 27 | 31 |
| Ag | -3.6 | -4.9 | 3.9 | 0.94 | 0.94 | 0.95 | 19 | 18 | 16 |
| Cu | -3.4 | -3.7 | -1.8 | 0.97 | 0.97 | 0.98 | 25 | 26 | 24 |
| Fe | -2.5 | - | - | 0.98 | - | - | 33 | - | - |
| Ni | 0.4 | - | - | 0.99 | - | - | 34 | - | - |
| Pb | -10.9 | - | - | 0.99 | - | - | 39 | - | - |
| Zn | -14.4 | - | - | 0.99 | - | - | 35 | - | - |

Using Supervisor, Scatter and QQ plots were produced. These can be found in the Appendix.

## Discussion

Generally, there is a negative bias towards the primary sample i.e the duplicate sample returns a higher grade. The exception for this is for Ni (all drilling types) and Ag (for Sonic).

Although Pb and Zn returned average difference percentages numbers that would be considered significant (-10.9% and -14.4 % respectively), the values in those datasets are relatively low and any differences are exacerbated. The low levels of these elements in terms of potential economics, also makes these differences relatively irrelevant.

For the other elements (Au, Ag, and Cu) when looking at the total drill set, the average difference percentages are acceptable, however the disjoint between Au in DDH (-2.9%) and Sonic (-12.1%) and Ag (-4.9% in DDH and +3.9% in Sonic) will need to be monitored as more drilling progresses. It is difficult to make a definitive statement on reasons for the differences between drilling types due to the there being considerably more DDH samples and also Sonic drilling is restricted to the upper parts of the mineralisation which will have different mineralisation styles and\or weathering effects.

The QQ plots for Au (Figure 6) do show different divergence from the 1:1 line at grades >0.5 g/t when comparing DDH to Sonic, however the low number of data points for Sonic (Figure 3) may be skewing the result.

Another method of determining the performance of duplicates is by the $CV_{avg}$ % (Abzalov, 2008)[1]. Acceptable $CV_{avg}$ % values will vary according to the element and deposit styles. For example: in nuggety gold deposits $CV_{avg}$ % values of up to 40% are deemed acceptable, while for Au in porphyry copper style deposits, a value of up to 15% is deemed acceptable. As the $CV_{avg}$ % for Au lies within this range and combined with what is understood about the mineralisation style, these values at this stage appear acceptable.

The Cu QQ plot for Sonic (Figure 8) shows a marked positive bias towards the duplicate sample in the 5,000 – 12,000 ppm range, however there are <10 data points, which is below the number of data points to make a relevant statistical analysis.

Pb and Zn show a marked grade increase in the duplicate sample towards to higher end results (Figure 11 and Figure 12), however this comparison is on limited data points and within the range of values limited economic value add.

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[1] Quality Control of Assay Data: A Review of Procedures for Measuring and Monitoring Precision and Accuracy (Exploration and Mining Geology, Vol 17, No's 3 – 4, p. 131 – 144, 2008)

## Spatial Analysis of Duplicates

Figure 1 below shows the spatial location of the duplicate data (right) compared to the complete project data (left). In this instance, Cu assays have been plotted for RC, DD and Sonic drilling methods.

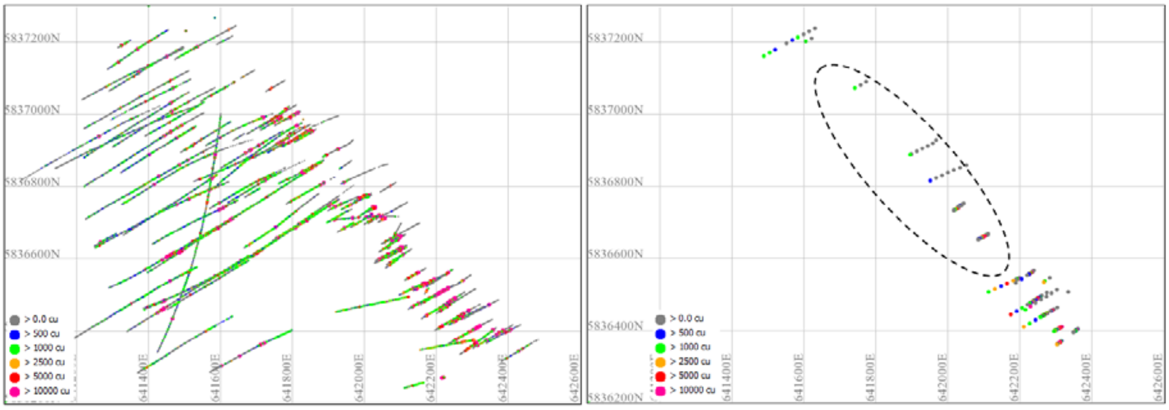



**Figure 1: Plan View of All RC and DD Cu Assays (left) and Duplicate Cu Assays (right) – Cu ppm**

Figure 2 shows the same data but in longsection (looking toward $050^0$). Drilling intersecting the Cayley Lode at depth and within the hangingwall have been excluded from Figure 2, focusing only on intersections within the shallower (<200m) portion of the deposit. In both plan and longsection images, it is clear that the existing duplicate data is focused on drilling at the south-eastern portion of the deposit. Assuming more drilling is planned in the area of the dashed outlines, it is recommended that duplicate data be collected. If only minor drilling in planned, duplicate samples will need to be taken from historical holes.

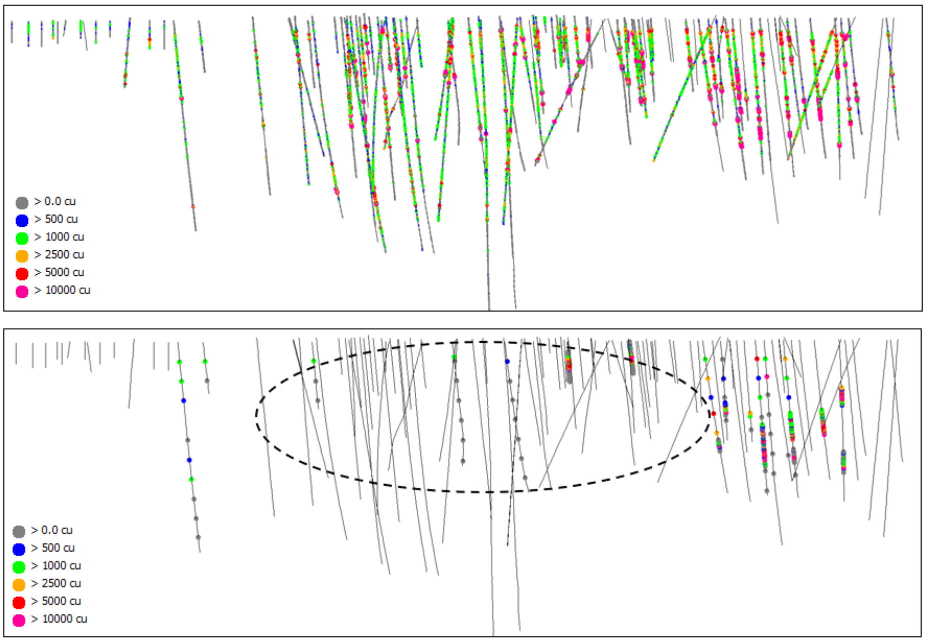



**Figure 2: Longsection View Looking $050^0$ of All RC and DD Cu Assays (top) and Duplicate Cu Assays (bottom) – Cu ppm**

## Conclusions and Recommendations

Generally, at this stage there does not appear to be any significant bias between the original and duplicate samples, however, there are local variations for some elements within certain grade ranges, which should be monitored on an on-going basis as more data is collected.

Cube recommends that duplicate sampling continue as this will provide more confidence in any future Resource estimates. Given the current duplicate data is clustered around the south-eastern area of the deposit, it is recommended that duplicate data be taken for drilling (future or historic) within the central and north-western areas of the deposit.

The important factor to remember is that this data is only comparing what was actually captured in the sample and due to the low sample recoveries (especially in the earlier holes) there is still the potential for bias that cannot be measured with this current analysis. At least for the upper zones, an analysis of any DDH and Sonic twins is recommended. This is assuming that contamination issues noted in the Sonic drilling during the February 2020 Drilling and Sampling audit are no longer present.

Yours sincerely,

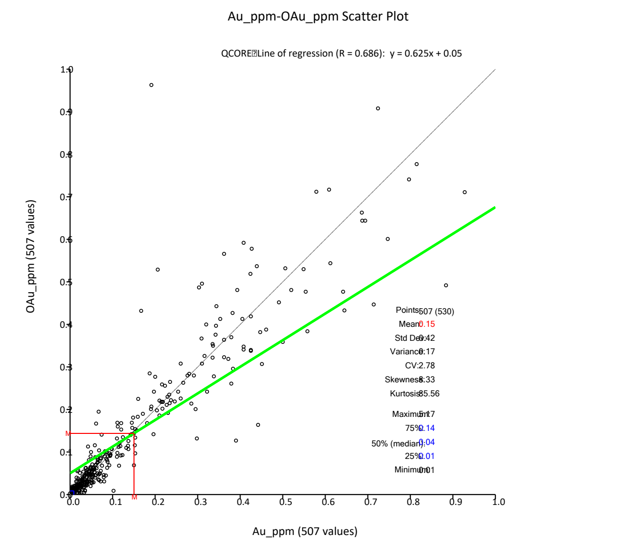
Andrew Grieve

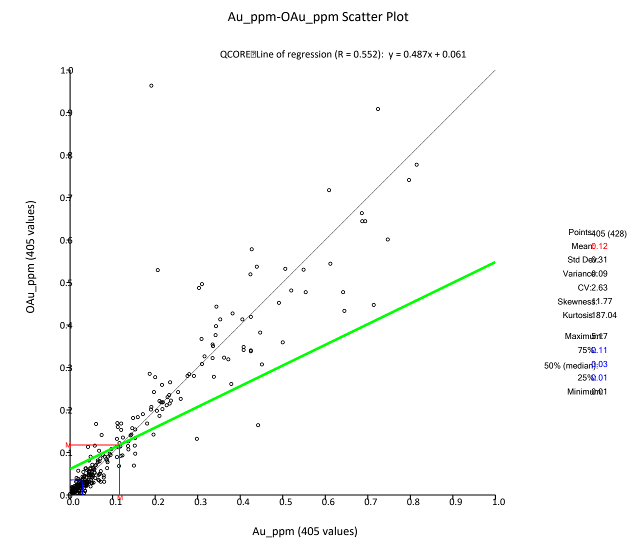
Senior Geological Consultant

Mark Zammit

Principal Consultant Geologist

# Appendix



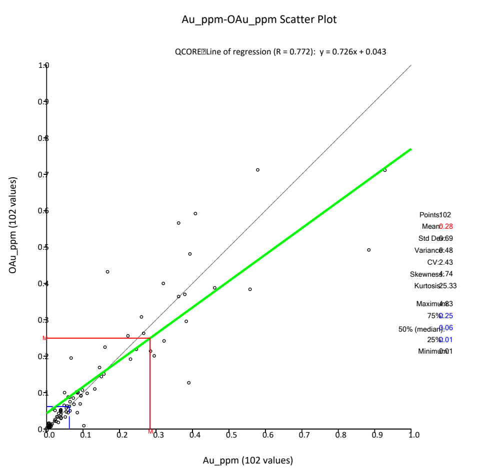




**Figure 3: Au Scatter plots – All (top), DDH (middle) and Sonic (bottom)**

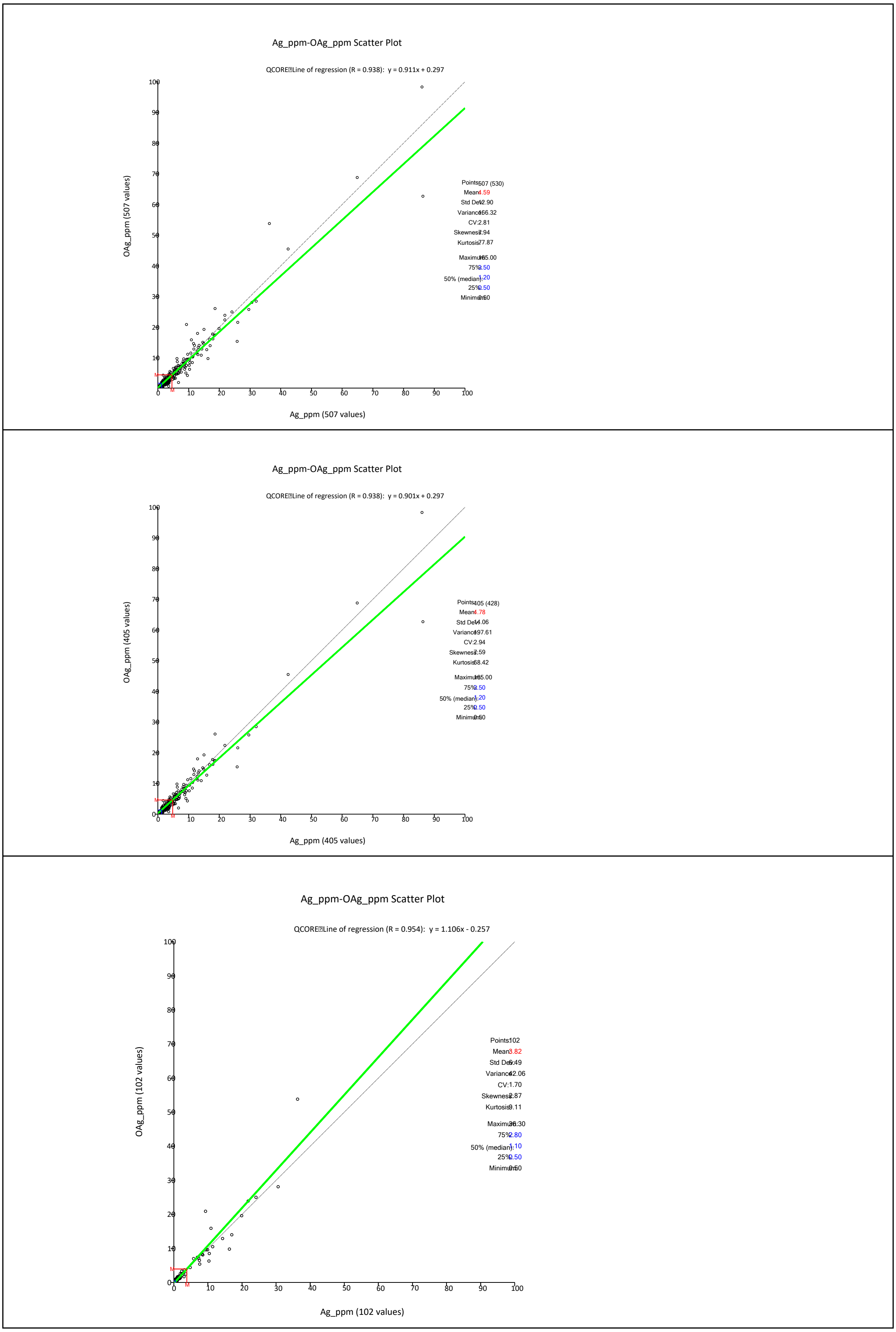



**Figure 4: Ag Scatter plots – All (top), DDH (middle) and Sonic (bottom)**

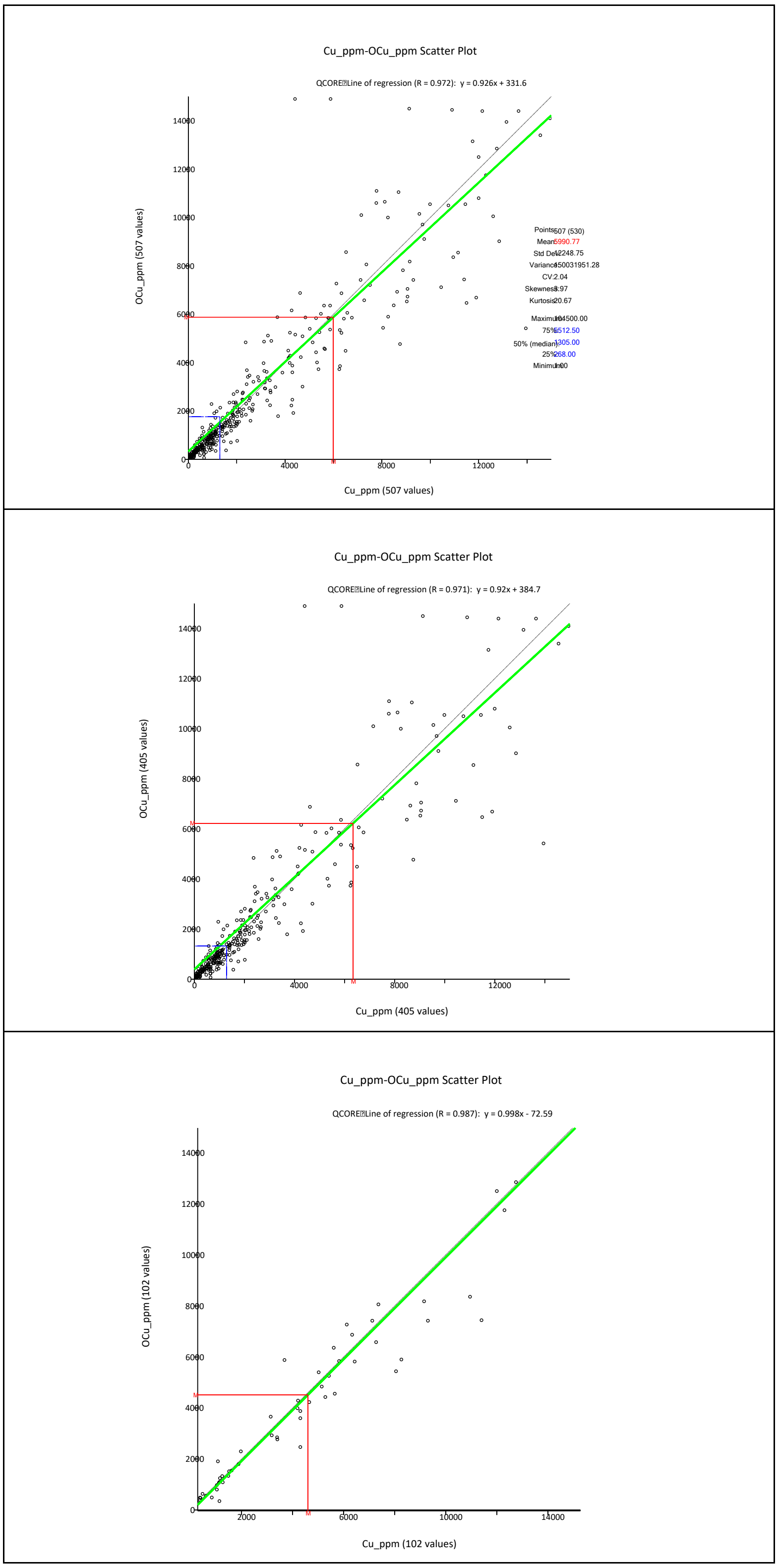



**Figure 5: Cu Scatter plots – All (top), DDH (middle) and Sonic (bottom)**

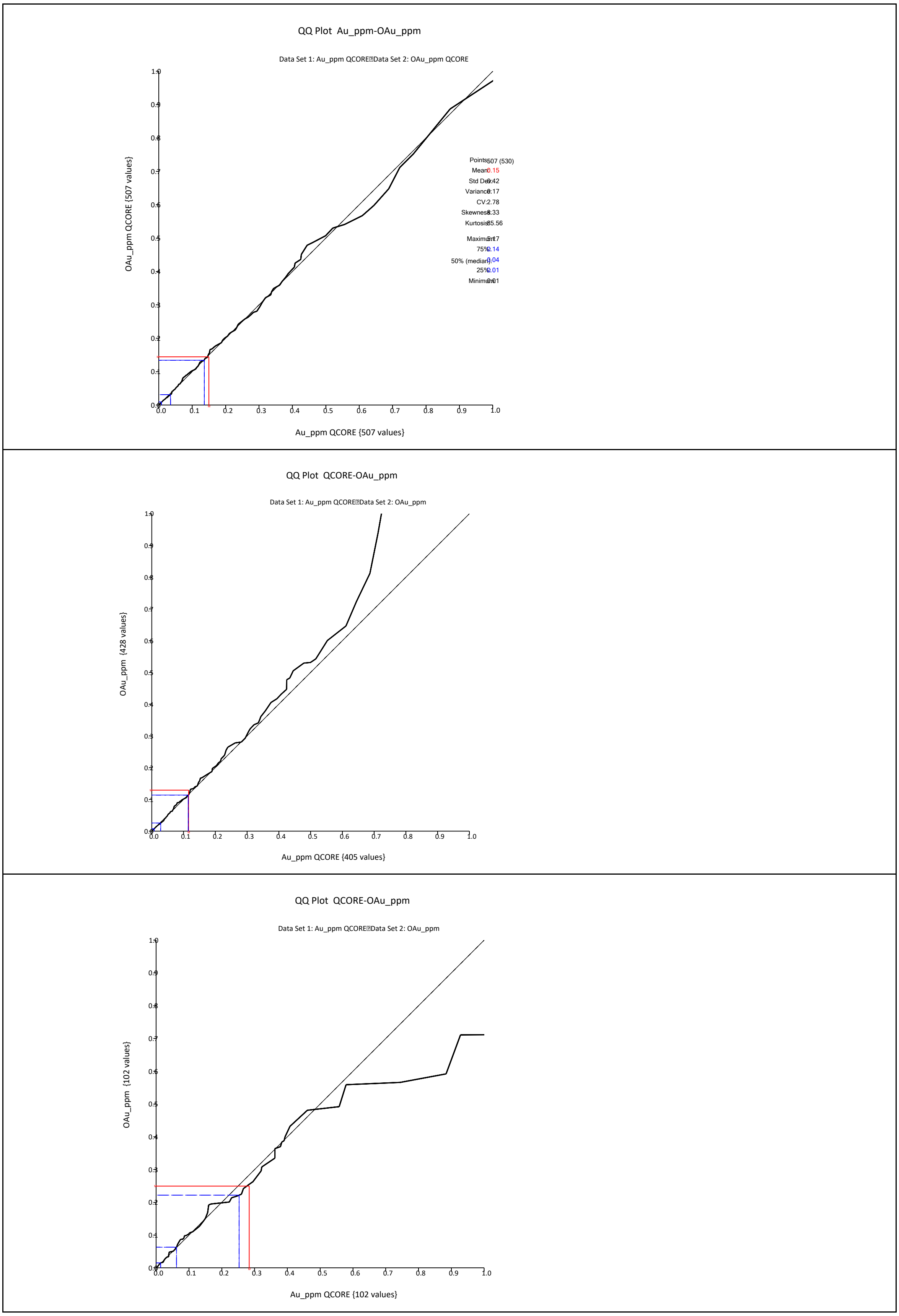



**Figure 6: Au QQ plots – All (top), DDH (middle) and Sonic (bottom)**

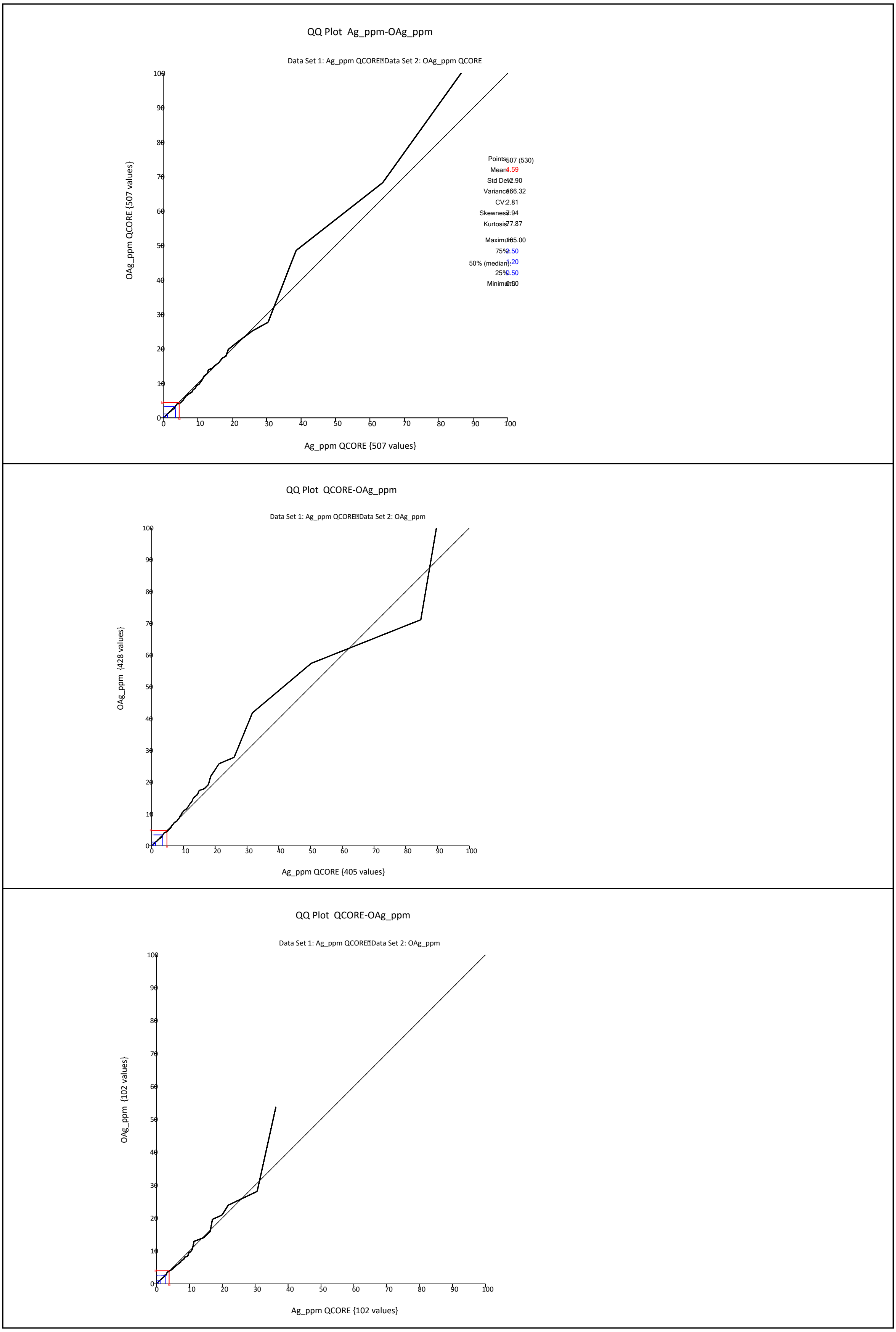



**Figure 7: Ag QQ plots – All (top), DDH (middle) and Sonic (bottom)**

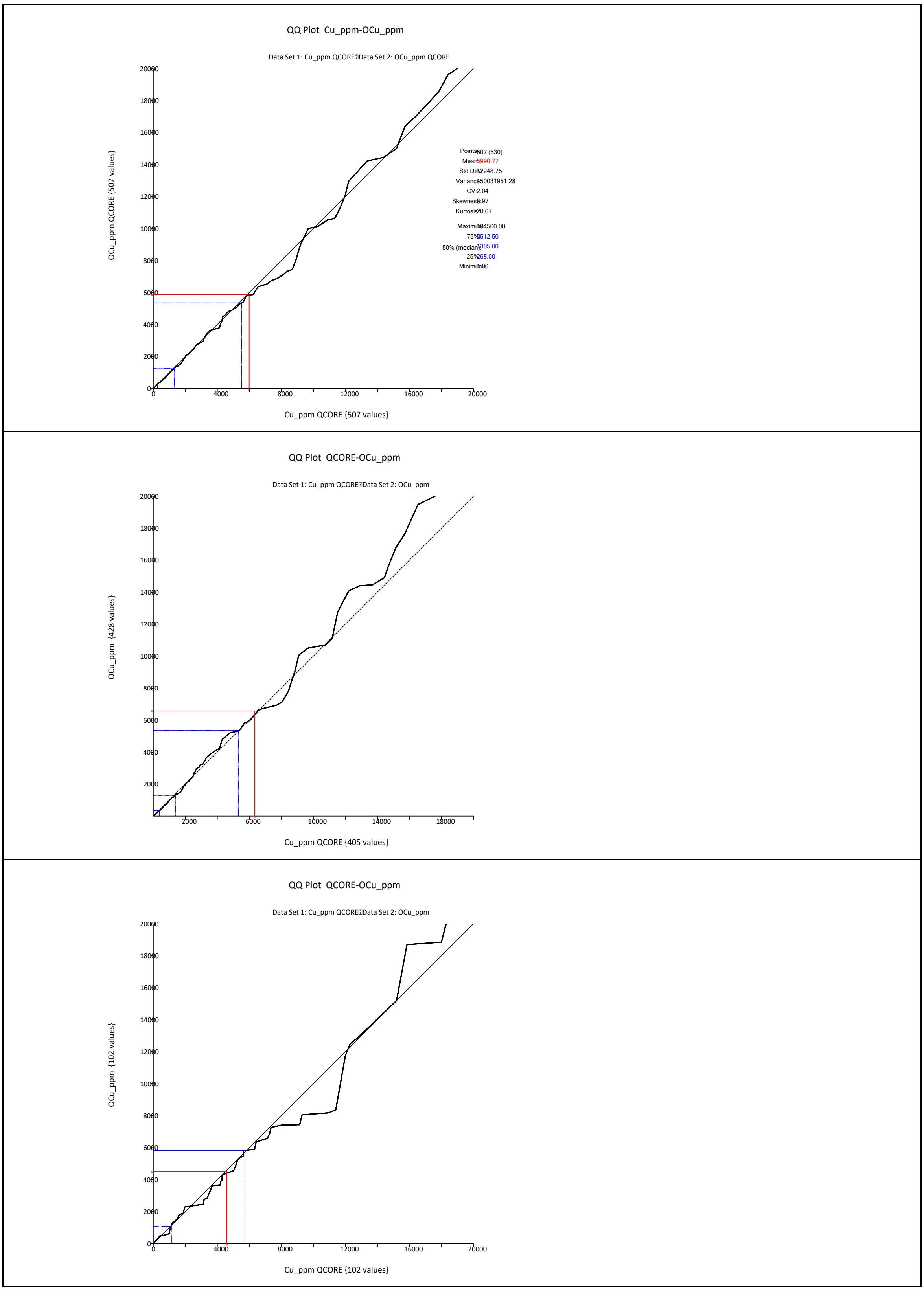



**Figure 8: Cu QQ plots – All (top), DDH (middle) and Sonic (bottom)**

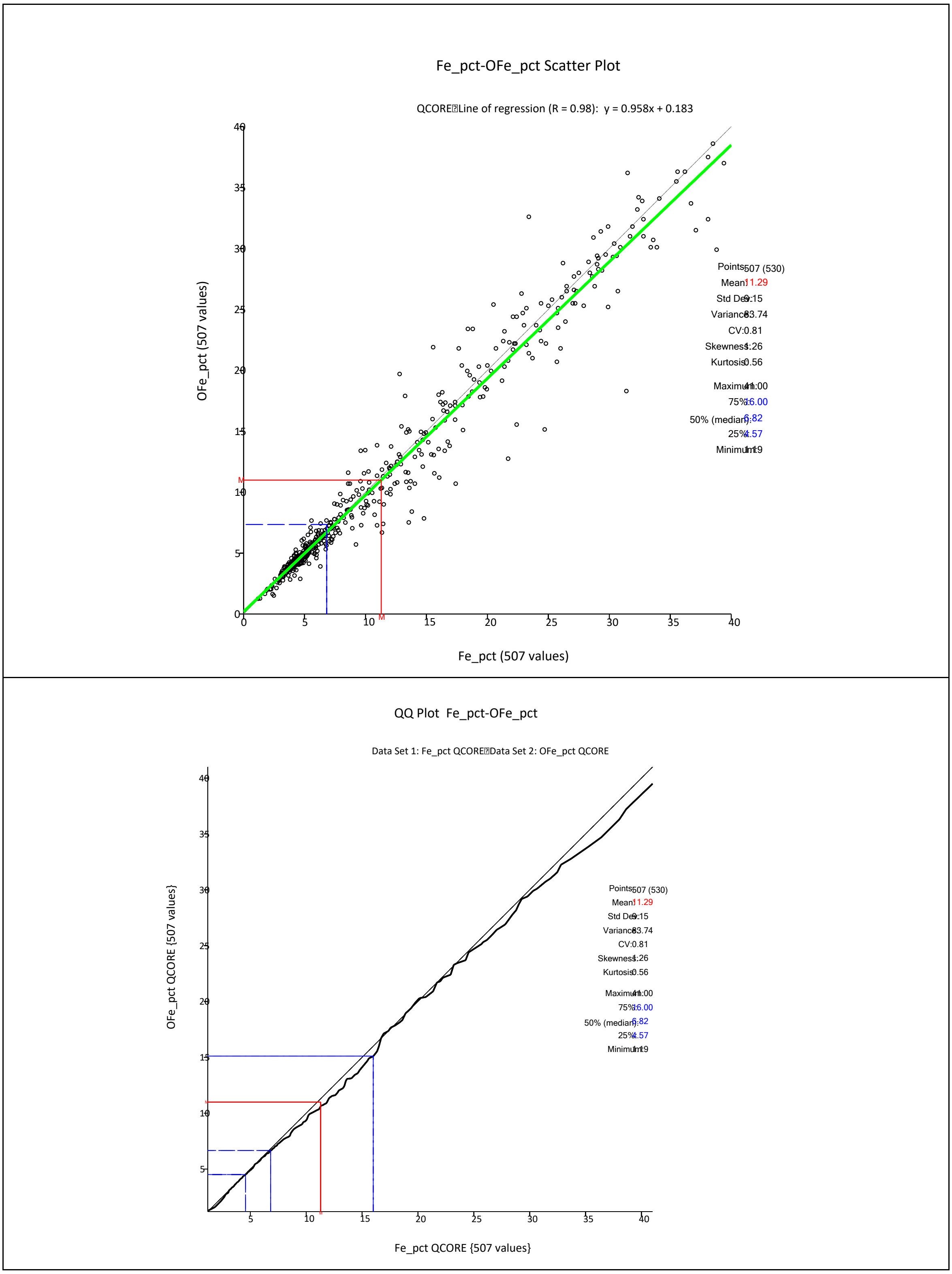



**Figure 9: Fe Duplicates – Scatter and QQ plots (all drill types)**

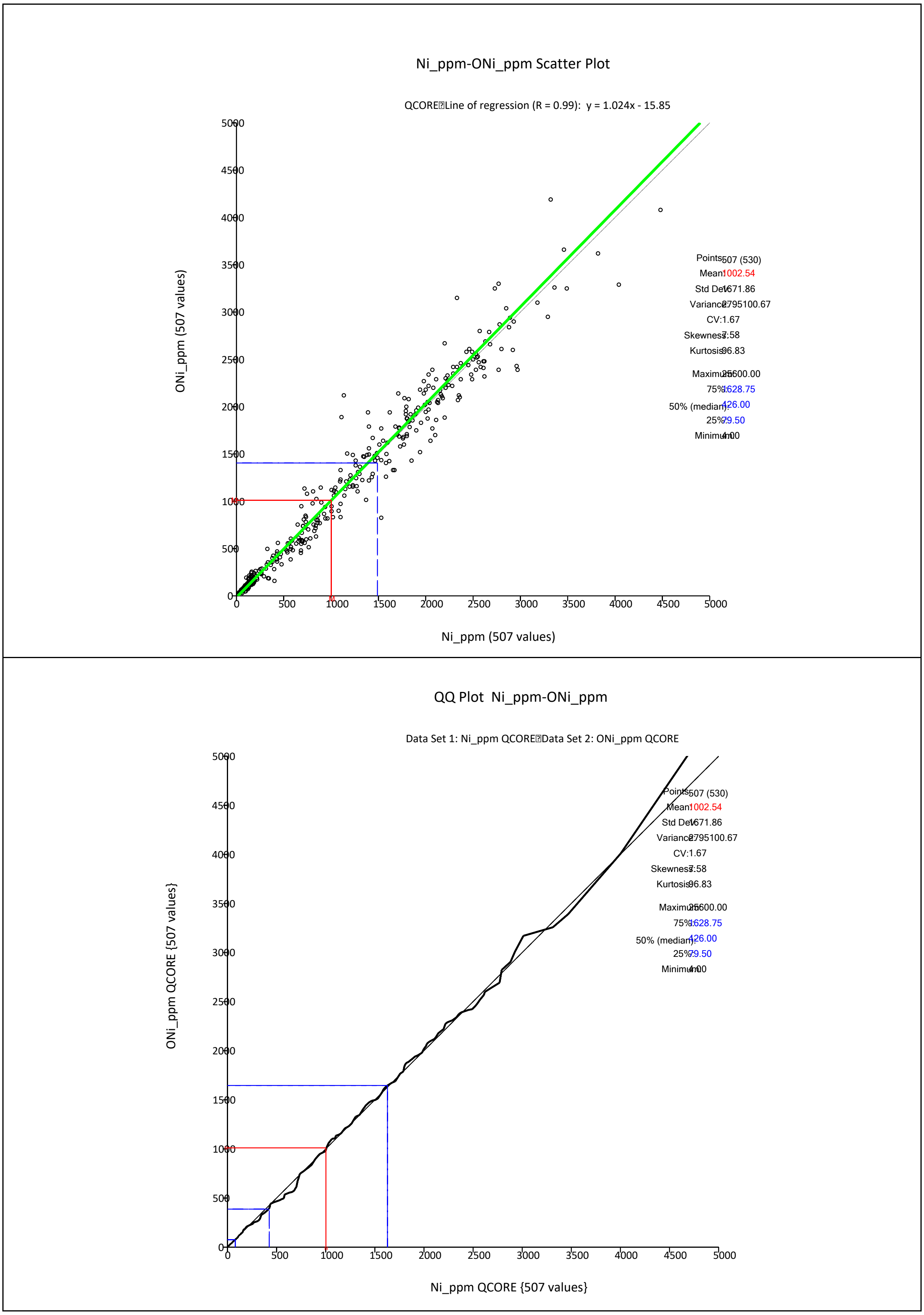
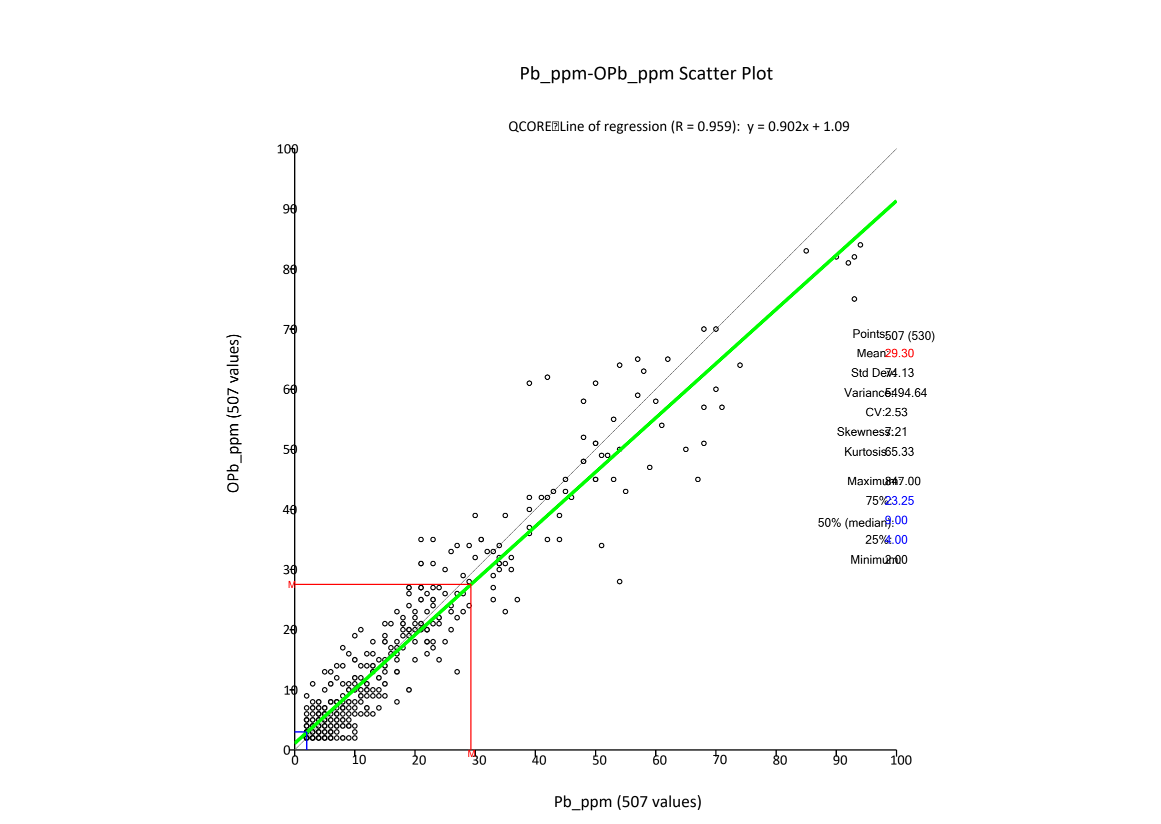



**Figure 10: Ni Duplicates – Scatter and QQ plots (all drill types)**



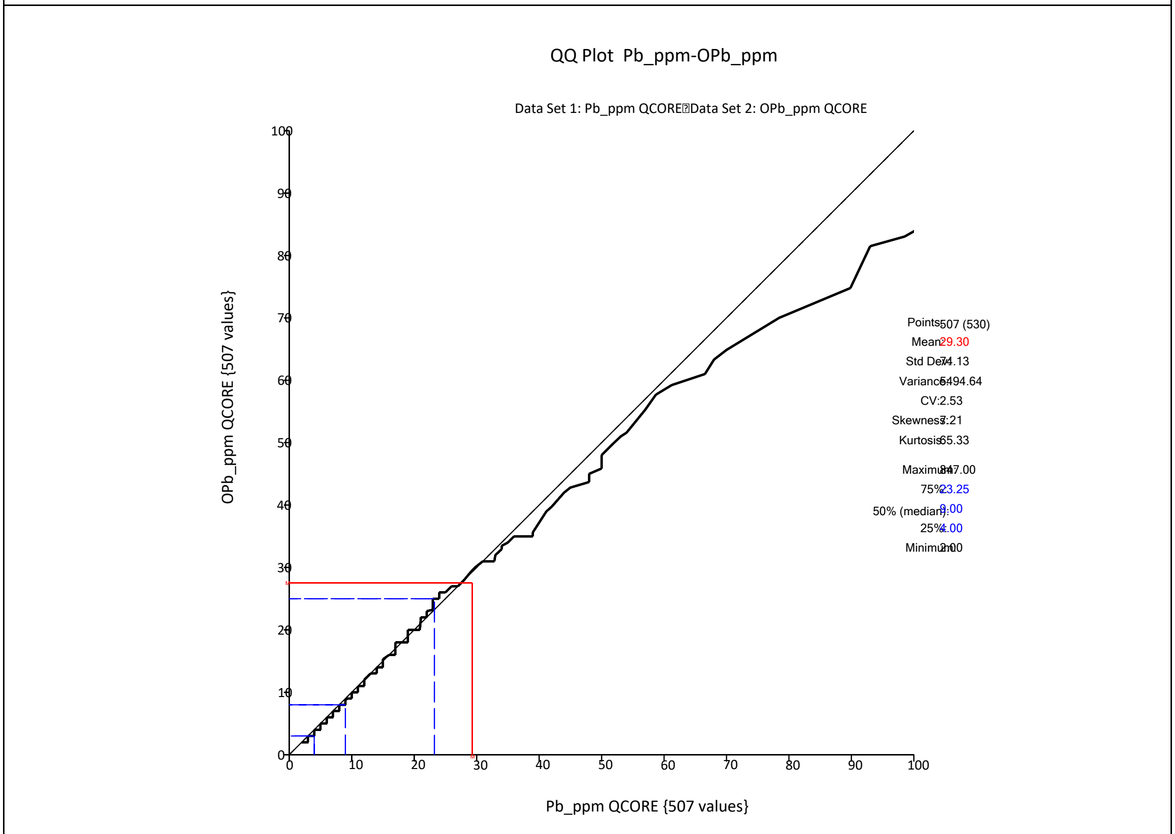




**Figure 11: Pb Duplicates – Scatter and QQ plots (all drill types)**

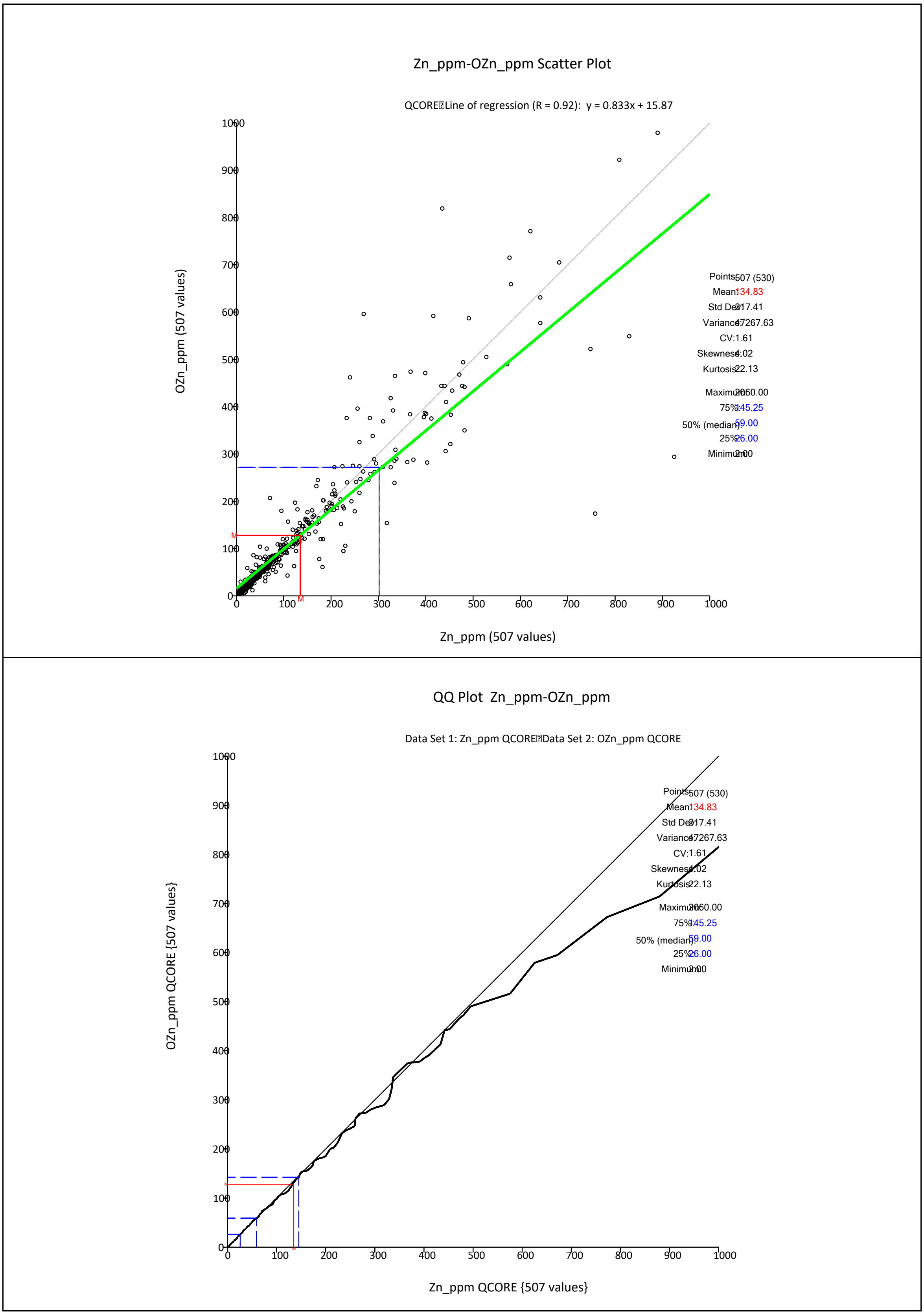



**Figure 12: Zn Duplicates – Scatter and QQ plot (all drill types)**