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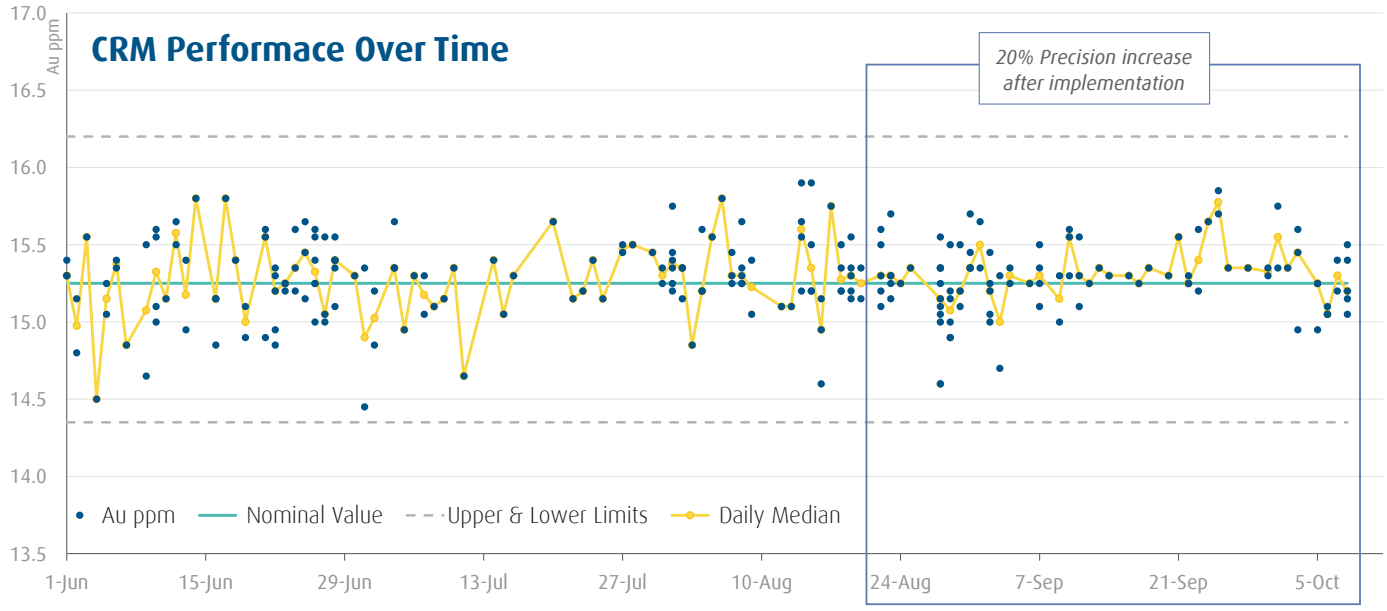
Geochemistry

Improved **Fire Assay** Technology

- **Consistent** detection levels, down to 1 ppb for Au.
- **Robust** and interference free for variable sample matrices.
- **Applicable** to all scales of projects from exploration through to mining.
- **Flexible** capacity, easily scalable to accommodate changing demand.
- **Useful** assays on fully pulverised samples, allowing for additional analyses that are usually required.
- **Reliable,** stable outcome regardless of remoteness and climate extremes.

ALS's advanced in-house technology applied to a well-understood and dependable method provides new precision improvements of **up to 20%.**

The low detection limit combined with superior precision gives confidence in Au grade when classification of ore and waste can have large economic impacts on a project.



The roots of Fire Assay can be traced back as far as the twenty fifth century B.C., (Forbes, 1950) with pyro-metallurgical recovery of gold from ores practiced for more than two thousand years. With the advent of modern analytical instrumentation Fire Assay has become the benchmark method for precious metals analysis in ore and exploration samples since the 1960's. These decades of routine application have given rise to a method with proven, consistent performance; and reliability across geological sample types.

During Fire Assay the sample matrix is removed, leaving only the precious metals for analysis which eliminates all potential interferences before measurement. The matrix removal also results in concentration of the precious metals, allowing for low detection levels. Fire Assay methods can consistently report as low as 1ppb Au.

ALS Method	Sample weight (g)	Detection limit (ppm)
Au-ICP21	30	0.001
Au-ICP22	50	0.001
Au-AA23	30	0.005
Au-AA24	50	0.005
Au-AA25	30	0.010
Au-AA26	50	0.010

Basic Principals of Fire Assay

The Fire Assay technique involves a two-stage process: Fusion and Cupellation, through which precious metals are recovered from a sample and concentrated. During fusion, the sample (typically 30 or 50g) is mixed with flux containing litharge (PbO), silica and variable proportions of reagents such as borax, potassium nitrate, sodium carbonate and flour and heated to approximately 1000ºC to produce a liquid melt. Liberated precious metals are collected by droplets of molten lead and due to density difference gravitate towards the bottom the fusion crucible. Gangue minerals present in the sample remain in the borosilicate "slag" layer which is physically removed from the lead button after cooling and solidifying.

The lead button is then placed in a porous magnesia cupel. In this second stage, the button is heated under oxidising conditions where lead from the button is converted to PbO and absorbed by the cupel. Silver that was added during fusion acts as a collector for the gold and precious metals and after the lead has been removed all that remains is a metallic doré bead containing pure silver, gold and precious metals. This bead (also known as a prill) can then be dissolved through a two-stage digestion; first with nitric acid to remove silver, then with hydrochloric acid for gold dissolution. Gold can then be determined spectroscopically by AAS, ICP-AES or ICP-MS. Alternatively, the silver may be dissolved (parted) with nitric acid and the residual gold determined gravimetrically. Concentrations are normally expressed as parts per million (ppm), which is equivalent to grams per tonne (g/t).

ALS provides a wide range of specialised testing services covering all stages of your project's life cycle.

Please visit **alsglobal.com** for more information on our services and specialties.

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