IDL- MDL- PQL

What the "L" is going on?

What does all this alphabet soup really mean?

Just as your eye cannot see infinitely smaller details, somewhere between a period and an atom your eye fails to discern detail. All instrumentation has an inherent minimum level below which it no longer functions reliably.

Imagine trying to determine when a sail creeps over the horizon at sea, a white sail against white caps means you will not be certain when the triangular dot you are looking at is a sail or another wave. An entire fleet of sails could pass unnoticed if the mast height never exceeds the height of the average wave. As the sail approaches, at some point, depending on a thousand different details, your eye will be able to discern a sail. You can not tell if the sail belongs to a ship or a row boat, but it exists. This corresponds to the instrument detection limit (IDL). We can see something at this level, but it is not determinable how big it is at this point, but it exists.

Obviously, if the sea is rough, the sail needs to get much closer before we recognize it as a sail. This means our IDL can, and does change. Rather than try to see the maximum distance possible all the time, we establish a distance where we can be confident with 99% certainty we will see an approaching sail. This is where a method detection level (MDL) is defined. An MDL is the smallest amount that we can be 99% certain of seeing, if it's present. With 99% certainty, we won't miss a positive. As soon as we try to establish that 99% certainty we are thrown into statistics. The Code of Federal Regulations[1] defines the statistics used to define the MDL. The MDL for an analytical instrument is a very fuzzy area to use. We know that the compound is present but the amount is only broadly estimated. It could be a row boat or a frigate. Enter the practical quantitation limit (PQL). While the IDL is defined by the physics of the moment, and the MDL is defined by the statistical window, the PQL is essentially arbitrary. There are recommendations, PQL = IDL x 10 or MDL x 6 and others... but no governmental regulation covers the PQL. It comes down to what the laboratory feels comfortable signing their name to, confidently, on a daily basis. The final arbiter of the PQL is the concentration of the lowest standard analyzed for that sample set. Laboratories almost universally have set their PQL to the concentration of that lowest standard. You put your own row boat in the water and see how far out you can recognize a row boat. It is recommended that all values between the PQL and MDL be reported. They are real, the concentration is fuzzy, but their values can give indications or trends and should be reported.

[1] Code of Federal Regulations. Part 136 Appendix B