



PRESERVING ORIGINAL DATA VALUES

Andy's 'Andy Tips - No. 27



One of the primary goals in recording and assembling data is (or should be) to preserve where possible the original observation, log or measurement data, so it can be reconciled back to related original documents, thereby providing a clear audit trail

While this approach relates to almost all data collected, two common examples are the recording of drillhole logging depths, and original analysis or assay results.

The following examples present the problem and show how it can be addressed in the geological database.

DRILLHOLE LOGGING DEPTHS

Traditionally drillhole data has been stored with a single pair of 'From-To' depth columns, be it in a spreadsheet or database.

While the original as-logged depths will have been entered initially, general practice has been to overwrite these depth values to reflect any depth corrections or other adjustments. Which means it no longer reflects the values on the logging sheet.

Later interpretation efforts then are more tenuous if the geologist detects a difference against the original logs. Correction? Typo? Wishful thinking?

The screenshot shows the gBore for CoalLog software interface. The main window displays a data table with columns: Hole Name, From Depth, To Depth, Litho Perc, Litho Type, Litho Qual, and Shade. A red box highlights the 'From and To Depths' columns, and a red arrow points to the 'To Depth' column header. The table contains multiple rows of data for different drillholes (DDH015) with various depth ranges and lithology types (e.g., SS, ST, FM, MS, KL, CO, CC, DM, XM).

More recently, some database systems make provision to retain the original as-logged depths. Systems such as gPick add two additional pairs of from-to depth columns –

- A **depth adjustment pair**, in which the corrected depth is added to the From or To Depth Adjustment, thus providing documentation as to what values were assigned to re jig the downhole depths based on geophysical log comparisons or surveyed collar and related measurements.

These are added only at the point of the depth adjustment determination, not on every record.

Hole Name	From Depth	To Depth	From Depth Adj	To Depth Adj	To Depth Logged	From Depth Logged	Recovered
DDH015	87.220	87.450			87.450	87.220	
DDH015	87.450	88.210			88.210	87.450	
DDH015	88.210	90.450			90.450	88.210	
DDH015	90.450	91.390			91.390	90.450	
DDH015	90.450	91.390			91.390	90.450	
DDH015	91.390	93.450			93.450	91.390	
DDH015	93.450	93.450			93.450	91.390	
DDH015	96.500	96.500			96.500	93.450	
DDH015	96.500	96.500			96.500	93.450	
DDH015	96.500	99.470			99.470	96.500	
DDH015	96.500	99.470			99.470	96.500	
DDH015	99.470	100.370			100.370	99.470	
DDH015	99.470	100.370			100.370	99.470	
DDH015	100.370	102.730			102.730	100.370	
DDH015	102.730	103.550			103.550	102.730	
DDH015	102.730	103.550			103.550	102.730	
DDH015	103.550	103.690			103.690	103.550	
DDH015	103.550	103.690			103.690	103.550	
DDH015	103.690	103.780			103.780	103.690	
DDH015	103.690	103.780			103.780	103.690	

- A **calculated / adjusted / working depth pair**. When a depth adjustment value is entered as above, the database recalculates the working depth values above and below the corrected record using pro-rat differences until it encounters the top or bottom of the hole, or another depth correction, which must be honoured.

Hole Name	From Depth	To Depth	From Depth Adj	To Depth Adj	From Depth Logged	To Depth Logged	Rec
DDH015	102.853	103.660			102.730	103.550	
DDH015	103.660	103.798			103.550	103.690	
DDH015	103.798	103.798			103.550	103.690	
DDH015	103.798	103.887			103.690	103.780	
DDH015	103.887	103.946			103.790	103.840	
DDH015	103.946	104.192			103.840	104.090	
DDH015	104.192	104.261			104.090	104.160	
DDH015	104.261	104.330			104.160	104.230	
DDH015	104.330	104.409			104.230	104.310	
DDH015	104.409	105.658	104.330	104.330	104.310	105.670	
DDH015	105.658	107.899			105.670	107.830	
DDH015	107.899	108.087			107.830	108.020	
DDH015	108.087	108.127			108.020	108.060	
DDH015	108.127	108.167			108.060	108.100	
DDH015	108.167	108.474			108.100	108.410	

The result is thus three sets of depth columns, reflecting –

- The original as-logged depths, which will match the original logs
- The individual correction values used to adjust the record depths
- The recalculated interval depths which will be used by the modelling, reporting and display tools during the interpretation and evaluation exercise.

ASSAY RESULTS

Assay results are normally reported as a numerical value; except when other factors prevent the accurate determination of that value. This may be due to a variety of circumstances, but commonly include –

- The sample was not analysed (not requested) for a particular element or property.
- The analysis was requested, but the sample went AWOL, and was thus reported as missing in the analytical report

- There was insufficient sample material to facilitate the analysis.
- The concentration of the element or property was below the detection limit of the equipment or process being employed.
- Or, less commonly, above the detection limit range.

Analytical results as reported by the labs will contain the results for those assays that were successful, but also a variety of non-numeric characters indicating the status and reason for analyses that could not be performed satisfactorily

SAMPLE TYPE: ROCK CHIP		PROJECT No:				
ELEMENT UNIT METHOD	Cu ppm G001	Pb ppm G001	Zn ppm G001	Ag ppm G001	Au ppm G001	
SH01	11	<S	58	<S	<S	
SH02	12	<S	25	<S	<S	
SH03	13	<S	34	<S	<S	
SH04	13	<S	24	<S	<S	
SH05	109	<S	27	<S	<S	
SH06	18	<S	85	<S	<S	
SH07	18	<S	100	<S	<S	
SH08	16	<S	117	<S	<S	
SH09	19	<S	166	<S	<S	
SH10	13	<S	86	<S	<S	
SH11	790	<S	100	<S	<S	
SH12	203	110	276	<S	<S	
SH13	36	<S	25	<S	<S	
SH14	13	<S	168	<S	<S	
SH15	5	<S	61	<S	<S	
SH16	47	<S	107	<S	<S	
SH17	302	<S	25	<S	<S	
SH18	292	<S	66	<S	<S	
SH19	4040	<S	62	<S	<S	
SH20	N.R.	N.R.	N.R.	N.R.	N.R.	
SH9D	22	<S	121	<S	<S	

DR. J. DEAR		No of Samples	
VERBAL	SAMPLE NUMBER	Date Received	Completed
		22/02/88	09/03/88
		Ag ppm	As ppm
		16582	16582
HRRS40 ironstone		240	15
HRRS41 "		370	30
HRRS42 "		770	70
		500	5
		1	210
		5	1.89 %
		13	3650



Databases, and the majority of evaluation systems, expect assays to have numerical values with which to work, and given a strange alpha character, will general spit the dummy....

So a common practice has been to replace the meaningful lab reported character-based values with archane negative values, each assigned to mean something. The problem is that you don't have an easy means to determine that meaning, and worse, any statistical or other mathematical procedure run on the numbers will be biased unless these spurious values are first removed.

Au_ppm	Au1_ppm	Cu_ppm	Pb_ppm	Zn_ppm	Ag_ppm	As_ppm	Bi_ppm
-0.00123	-0.00123	75	-0.00123	-0.0012	-0.00123	-0.00123	-0.00123
0.01700	-0.00123	105	-0.00124	90	-0.00124	-0.00123	-0.00123
0.01700	-0.00123	160	-0.00124	95	-0.00124	-0.00123	-0.00123
0.01700	-0.00123	90	-0.00124	60	-0.00124	-0.00123	-0.00123
0.02700	-0.00123	120	-0.00124	85	-0.00124	-0.00123	-0.00123
0.01300	-0.00123	30	5	85	-0.00124	-0.00123	-0.00123
0.01300	-0.00123	70	-0.00124	105	-0.00124	-0.00123	-0.00123
0.01	-0.00123	5	75	-0.00124	-0.00123	-0.00123	-0.00123
0.01700	-0.00123	75	-0.00124	95	-0.00124	-0.00123	-0.00123
0.01500	0.015	100	-0.00124	100	-0.00124	-0.00123	-0.00123
0.01700	-0.00123	100	-0.00124	95	-0.00124	-0.00123	-0.00123
0.01500	-0.00123	130	-0.00124	115	-0.00124	-0.00123	-0.00123
-0.00124	-0.00123	40	5	100	-0.00124	-0.00123	-0.00123
-0.00124	-0.00123	30	5	55	-0.00124	-0.00123	-0.00123
-0.00124	-0.00123	25	5	45	-0.00124	-0.00123	-0.00123
0.00800	-0.00123	80	-0.00124	50	-0.00124	-0.00123	-0.00123
-0.00124	-0.00123	50	-0.00124	80	-0.00124	-0.00123	-0.00123
-0.00124	0.008	75	-0.00124	80	-0.00124	-0.00123	-0.00123
-0.00124	-0.00123	135	-0.00124	90	-0.00124	-0.00123	-0.00123
0.00800	-0.00123	180	-0.00124	125	-0.00124	-0.00123	-0.00123
0.00800	-0.00123	185	-0.00124	140	-0.00124	-0.00123	-0.00123
-0.00124	-0.00123	100	-0.00124	115	-0.00124	-0.00123	-0.00123
-0.00124	-0.00123	85	-0.00124	85	-0.00124	-0.00123	-0.00123

Another common method of dealing with the 'below detection limit' values is to put them in as a value of half the detection limit for that analyte and analytical method. Which is not entirely unreasonable but it means that no ready identification of these 'BDL' assays remains in the data.

So, are there better ways of storing this analytical data and its related metadata?

The system employed in the gPick system, as an example, does a similar 'smoke and mirrors' thing with the actual analytical results so that only numerical values appear in the assay values loaded. In summary, -

- Assays flagged as not received or insufficient sample are simply left blank (null)

- Values below detection limit are pumped in at half the detection limit, or another value, or null, as dictated by the relevant resource geologist.

So the data looks nice and neat, and can be processed with prestidigitators numerical.

Surface Multi-Element Analysis
Analysis Data Management

	B ppm	Bi ppm	Ca ppm	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cs ppm
0.15	800.00	0.05	32.10	7.00	29.00	8.81		
0.11	1,400.00	0.02	46.10	3.20	6.00	3.23		
0.15	2,000.00	0.05	31.50	5.10	6.00	3.88		
0.13	2,300.00	0.00	26.50	5.40	6.00	8.81		
0.18	4,100.00	0.02	43.00	11.40	20.00	5.61		
0.16	4,100.00	0.02	8.15	15.30	31.00	4.71		
0.15	7,900.00	0.02	25.10	13.40	32.00	6.23		
0.01	13,600.00	0.02	15.10	19.00	19.00	2.36		
0.07	10,000.00	0.03	25.50	19.50	9.00	3.07		
0.01	11,000.00	0.03	25.40	18.10	3.00	2.84		
0.13	16,200.00	0.04	13.60	21.90	12.00	2.38		
0.14	9,100.00	0.03	16.15	23.40	21.00	3.44		
0.02	12,000.00	0.03	21.90	17.50	4.00	0.98		
0.01	17,000.00	0.02	13.45	23.50	34.00	8.49		
0.10	7,100.00	0.02	13.96	21.30	27.00	6.34		
0.06	18,100.00	0.03	13.85	22.30	28.00	3.20		
0.13	12,100.00	0.02	31.50	20.00	23.00	9.18		
0.05	20,300.00	0.03	21.30	23.50	13.00	1.59		
0.05	18,200.00	0.03	22.20	16.90	13.00	1.38		
0.11	10,600.00	0.03	26.20	7.90	8.00	0.67		
0.06	14,100.00	0.04	16.50	19.90	21.00	1.20		

But what of our audit-trail, and the ability to identify the reasons for the blank spaces?

Surface Multi-Element Analysis
Analysis Data Management

Current Projects: SG_Biloela

Display Details Toggle

In the side menu of the assay forms are two radio buttons. By default just the numerical 'working' assay values are displayed.

Selecting the other button expands the display; for every analyte two additional columns are displayed –

- A status column, with codes indicating the analysis status for that element for that sample.

- An original assay value, displaying the reported result value as it appeared on the original lab result sheet or certificate.



Important ! –

Ensuring your database system allows you to preserve an audit trail greatly speeds up independent reviews, resource estimation documentation and the preparation of the JORC 'Table 1' compliance requirements

Surface Multi-Element Analysis
Analysis Data Management

	Cd ppm	Cd ppm Status	Cd ppm Orig	Ce ppm	Ce ppm Status	Ce ppm Orig
0.05	NA	NA	NA	32.10	NA	32.1
0.02	NA	NA	NA	46.10	NA	46.1
0.05	NA	NA	NA	31.50	NA	31.5
0.00	BDL	<0.005		43.00	43	
0.02				8.15	8.15	
0.02				25.10	25.1	
0.02				22.90	22.9	
0.03	IS	IS		25.50	25.5	
0.04				25.40	25.4	
0.03				13.60	13.6	
0.03				16.15	16.15	
0.03				21.90	21.9	
0.02				13.45	13.45	
0.00	BDL	<0.005		13.95	13.95	
0.03				13.55	13.55	

Please feel free to give me a whistle if you have any comments or questions.

All the best!

Andy the Analogue Geologist

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