QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES FOR DATABASES

Ted Eggleston, Ph.D., RM SME, P.Geo.1

Introduction

Consider for a moment, on a recent project, MTS reviewed the database which contained 110,000 samples. The project had just been approved for US$5.5 billion so each sample supported an investment of US$50,000. Thus, MTS considers database integrity to be of paramount importance. Location data (collar and downhole surveys) should be error-free. Error rates in geochemical, density, and geological tables must be <1% to satisfy industry standards. Geochemical and geological data must be properly flagged for use/do not use. And, the right data must be stored in the database and accessible for geological modeling and Mineral Resource estimation.

This paper sets out considerations when undertaking quality assurance (QA) and quality control (QC) evaluations (collectively QA/QC) on upload and storage of information in a project database.

Database Quality Assurance and Quality Control

Database QA/QC is possibly the most overlooked aspect of QA/QC. The accuracy and integrity of the data is of paramount importance to the accuracy of any resource and/or mine models based on the database. In today's world, most assay data are transferred electronically and the possibility of errors due to data transcription is minimal, but errors occur, especially when the program used to transfer the data is a spreadsheet. Extreme care must be exercised when using spreadsheets to transfer and/or manipulate data from an analytical laboratory. Macros used to automate the data transfer must be checked and re-checked. An improperly written macro can produce a database full of errors. Verify any data transfer against the original documents. That verification should be accompanied by a proper signoff by the person responsible for loading the data into the database. Geological and geotechnical logs should be signed off on by both the logging geologist and the senior peer reviewer before the data are officially in the database.

Database integrity starts with password limited access to the database. Most company databases are housed in software specifically designed for that purpose such as acQuire™, Fusion™, DataShed™, and many other database management software packages. All have the ability to limit access by various levels of password permissions. Three or four people per organization only should have unlimited access to the database. Those few people should fully understand the importance of the data in the database. Others should have access limited to their work responsibilities. Project geologists and technicians, for example, that are logging core or determining density or performing point load tests should have the ability to add core logs and

[1] Mine Technical Services, 18124 Wedge Parkway, #924, Reno, Nevada, 89511, USA; ted.eggleston@minetechnicalservices.com

other data to the database, but not to change those data once they are signed off on and become a permanent part of the database. They should not be able to edit any data in the database. That should be done by the database manager after a formal request by the geologist responsible for the change signed off by the geological manager. A complete digital log of who requested the change, when it was requested, what was changed and why it was necessary, and signoffs (database manager, geologist, and geological manager) should be maintained by the database manager. Most database management software automatically logs changes to the data. We need only to access that log and require the additional information and signoffs before the data can be added or changed in the database.

Next, any data to be incorporated into the database should be entered into a spreadsheet or intermediate database file that is separate from the main database and appended to the database only by those that have proper access. Never share passwords. Everyone involved with the project needs to have access to the data, some need to add data, some need only to retrieve data, but very few need full editorial access.

Geological data are typically entered by the geologist responsible for collecting the data. Manual data entry from paper copies of logs by geologists typically leads to significant error rates if the data are not carefully verified after they are loaded. Data entered from paper copies should be verified automatically by comparing codes to reference (lookup) tables in the software and disallowing any code not in the reference table. These are some of the data types that should be entered into an intermediate file that requires signoff by the geologist/technician responsible for the data and the geological manager. Until the signoffs are complete, the data should not be part of the database.

Changes to reference (lookup) tables should be simple, but must be performed by the database manager at the request of the geological manger and with his/her signoff.

After data are entered into the database, entirely too many geologists make corrections, change codes, and/or re-interpret rock types on the fly and do not properly document those changes (mea culpa). In MTS' experience, those changes are typically necessary, legitimate changes; however, without oversight, this process leads to significant error rates and should be eliminated by requiring all changes to the database to be done through the database manager who logs all changes with who did the change and when it was done as well as who requested the change and why. This produces an auditable data chain of changes. In general, it is probably better to have a technician enter geological data and then have it verified by the geologist responsible for the work. Any changes must be documented with a note in the geological log and software logs with who did the change, when it was done, who requested the change, and why was the change necessary.

For any type of data that must be manually entered into the database, it is always better to have the data entered by two people into separate data files (double entry). The resulting databases are then compared, and discrepancies resolved. Errors will still creep in but the error rate will be quite small.

Backup the database daily, weekly, and monthly. Weekly and monthly backups should be off site and monthly backups should be on dismountable hardware with each month on a separate disk, tape, etc.

When data are added to the database, rigorous signoff procedures should be followed to ensure the integrity of the data. An example is that when a geologist finishes a geological log they must sign off on the log and indicate that signoff in the database. The senior geologist on the project or their designated representative should check the logging and signoff in the database as having checked and approved the log. This will minimize logging errors and drifting logging procedures.

Periodic internal audits of the database provide a level of comfort with the database. Errors are minimized and the data are generally quite clean after internal audits; however, periodic external audits of the database are required to verify the integrity of the database and ensure that the error rate is less than 1% which is the industry-accepted upper limit.