Spring 2011

TECHNOLOGY NEWS

A quarterly publication of the Barrick MIT & MT Technology Groups
Issue 14

AUTOMATED AIR MONITORING AT PVDC

"With the support of MIT & John Digweed, it is now a reality that PVDC can poll weather-flow air quality information in real time."

Holton Burns, Environmental Construction Manager for PVDC

Image Credit: Golder Associates

INSIDE

Meteorology and Air Quality Data: Basic Workflow

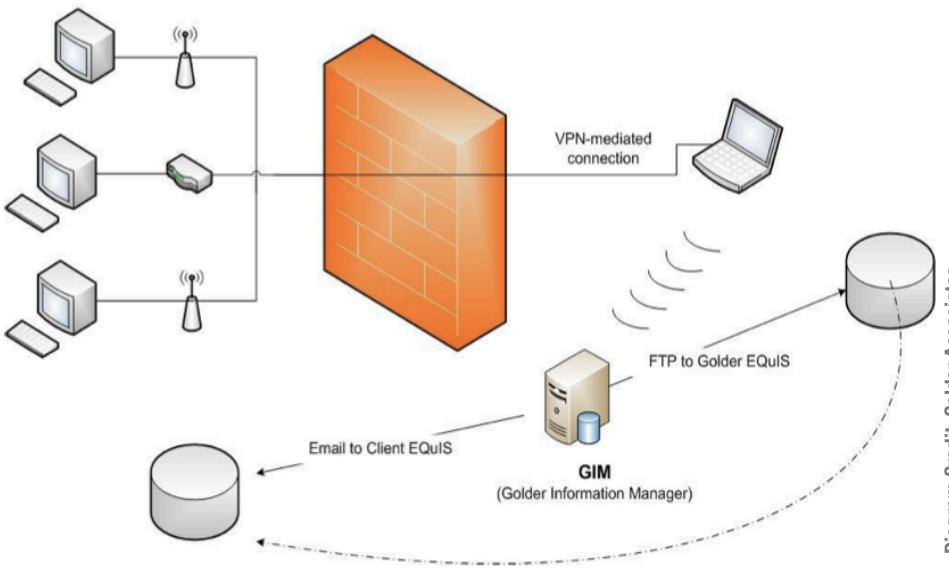


Diagram Credit: Golder Associates

BENEFITS

Golder Solutions' automated air monitoring workflow allows for:

- **Near real-time access to air quality data;**
- **Automated process for upload mediated through Enterprise EDP and GIM;**
- **Minimized time handling data;**
- **Maximized time air quality experts can spend on data validation and analysis.**

Air Quality and Meteorology Network in the Dominican Republic

As part of a new Air Quality and Meteorology Network in the Dominican Republic, Pueblo Viejo Dominicana Corporation (PVDC) have committed to implementing four automated air quality data monitoring systems. Three stations are already in place, with a fourth to be added pending site location approval. The stations are installed and maintained by Golder Solutions, the successful vendor following a recent RFP process.

Twenty (20) primary parameters are being measured by the monitoring stations, and include:

- **Air Quality:**
  - **NO/NOx/NO2**
  - **SO2**
  - **PM10/PM2.5**
- **Meteorology:**
  - **Precipitation**
  - **Relative Humidity (RH)**
  - **Barometric Pressure (BP)**
  - **Temperature**
  - **Wind Speed and Direction**

Each air quality monitoring station uses a Campbell Scientific CR3000 datalogger, and parameters are collected as averaged hourly data. Using Campbell Scientific's LoggerNet software, a polling computer in Golder's Fort Collins office connects to the Barrick network via VPN. If the VPN is disconnected, or the station's internet connection goes down, any data which has not yet been downloaded will be appended to the data file the next time a successful connection is established.

Golder's software parses the newly collected data into a format that is sent directly to the PVDC's environmental data monitoring system: Earthsoft's EQuIS system. The system is hosted in the Salt Lake Data Centre.

The EQuIS system includes software that automatically loads the air monitoring data into its database while also applying Air Quality QA/QC checks: a process which validates and corrects data, based on daily calibration spans and zeros. Data which passes these checks is marked as validated, and is uploaded to the EQuIS system. However, if, for any reason, the data fails these QA/QC checks, the data is not appended to the log file, and an email is generated highlighting the errors found.

On a daily basis, Golder checks the system data for anomalies which might suggest issues with the analytical equipment. On a monthly basis, Golder conducts a full validation process. This validation may, for instance, include invalidating or correcting air quality data based on the measurements of the daily and weekly calibration gases, or invalidating data that may be the result of on-site activities. For the first year of data collection, Golder will also deliver a monthly data report.

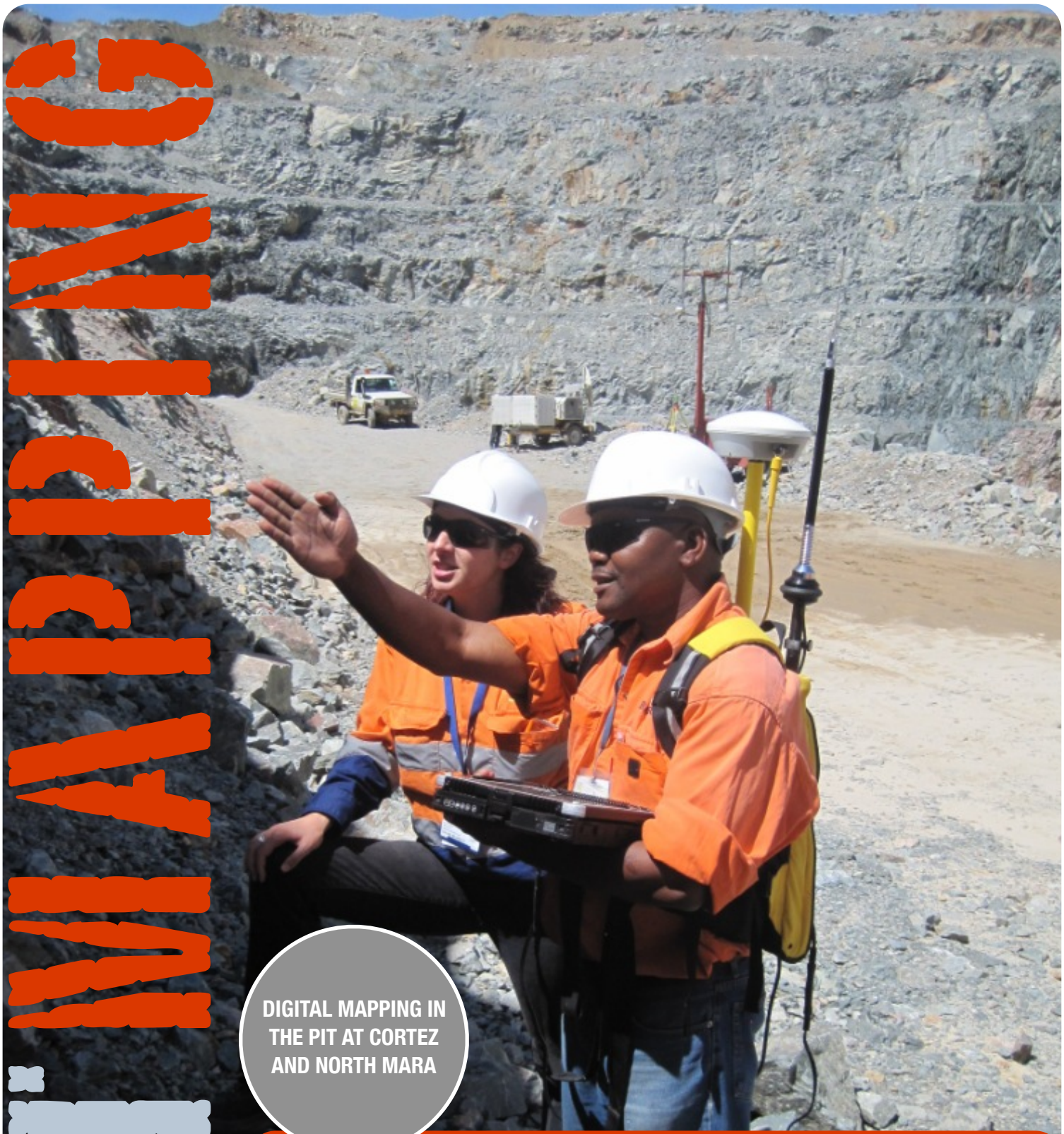
The responsibilities of this monitoring workflow will, over the course of the year, be transferred to PVDC staff. Golder will be facilitating this knowledge and technology transfer, to ensure on-site technicians are fully trained to keep these systems running smoothly.

Article contributed by John Digweed.

"The future of PV will one day be a fully integrated data collection system of about a dozen weirs, 30+ monitoring wells, half a dozen ponds and multiple meteorological and air monitoring sites all following the same reporting protocols using the EQuIS EDP process."

Holton Burns,
Environmental Construction Manager for PVDC

MAPPING



DIGITAL MAPPING IN THE PIT AT CORTEZ AND NORTH MARA

Digital mapping is something the mining industry has been exploring for years. A lot of “solutions” have been proposed over the years, but there were almost always problems with the hardware or software, and often both. The eventual benefit of collecting mapping data digitally was usually determined to be not worth the effort.

Recently, however, Tom Whittle, at the Cortez mine, has spearheaded the development of a truly user-friendly, high productivity ArcPad-based digital mapping application that has proven its worth in the Pipeline and Cortez Hills open pits.

This application was recently implemented at North Mara, to rave reviews, and is currently being adapted for Exploration surface mapping.

GENESIS OF THE CORTEZ GEOLOGICAL MAPPING SYSTEM (CGMS)

It was not easy.

Tom Whittle, a Mine Geologist at the Cortez Mine, has been working with digital mapping since 2003. He started with a system designed for Exploration use, and worked with the contractor who wrote it to modify it for use in the Pipeline pit.

The initial versions of the application "worked", but it was cumbersome, and the available hardware was temperamental at best. Tom was working at the cutting edge, and paying the price. Only his diligence and interest kept the application alive as it evolved.

The breakthrough came in 2008. Hardware had steadily improved over the years, to the point where the rugged laptops being used for pit mapping were real computers. The software of choice, ArcPad, from Esri, had also improved dramatically.

But perhaps most important, Tom engaged the assistance of Scott Randolph, of Habitat Management Inc, in Denver, Colorado. Scott is a professional programmer, with extensive experience programming ArcPad, especially for data collection in the natural resource industries.

Prior to Scott's involvement, the writer convened a couple of digital mapping workshops in Elko in 2008. Interested parties, of whom Tom was a key attendee, were brought together to assess the state of the art in hardware and software; to assess the lessons learned from Tom's work at Cortez; and to assess the viability of creating a new system that could work for pit mapping and Exploration surface mapping.

The workshop result was a comprehensive database schema for digital mapping, flexible enough to be used for surface and pit mapping, but rigorous enough to ensure consistency in data collection while still being easy to use and support.

Taking advantage of this schema, Tom worked with Scott to implement it in Esri's ArcSDE software, meaning the mapping data was to be stored in a spatial database, with all the data management and security controls inherent in a database.

Gone were the days of trying to manage an ever growing number of files and folders!

Thanks to Scott's GeoMerge application, gone also was the cumbersome and tricky process of moving the appropriate files back and forth from the office computer to the field computer. This had been a serious drawback to ease of use of the early versions of the application.

GeoMerge makes moving the key files to and from the field computer fast and easy.

In summary, thanks primarily to the persistence and dedication of Tom Whittle, supported by his boss, we now have an easy-to-use, flexible digital geologic mapping system that is suitable for use in open pits or for surface geological mapping.

Recent improvements to the system include the ability to link photographs to specific data points for easy retrieval "in-context", and the ability to export the pit mapping data directly to Vulcan, using an application programmed by MapTek and funded by the MIT group in the Corporate office.

Article contributed by Iain Allen.

CGMS Functionality

Spatial Data

The CGMS uses real time GPS correction to establish location. Nine geodatabase feature classes are used to capture:

- Lithology
- Alteration
- Structure
- Geotechnical information
- General notes

Data is captured as points, lines or polygons, as appropriate. Digital photo capture allows photos to be linked to the relevant feature and location. Local grids are supported, and data can be converted between projections.

Attribute Data

Almost all attribute data entry is via pick-list, ensuring consistent data entry and eliminating typing, except for general notes. Once a spatial feature is captured, the data entry form opens automatically, essentially providing a checklist of attributes to be entered for each feature, and ensuring complete, consistent data collection.

Mapping data is stored in an ArcSDE database, and moved to and from the field computer using the custom GeoMerge application. This makes data transfer and management simple and easy.

Data Validation

Existing data can be edited in the field, as more information becomes available. The changes are reconciled with the database when the data is checked in. Once the data is checked in to the SDE database, final verification and editing is done in ArcMap by the mappers.

A recent addition to the application, not directly part of the mapping tools, but closely related, is the ability to export the validated pit mapping data directly to Vulcan. This is done using scripts written by Maptek.

Spring 2011

CONTACT US

Mining Information Technology Group

Brookfield Place,
TD Canada Trust Tower
Suite 3700
161 Bay Street
Toronto ON M5J 2S1

ANDREW SCOTT — TEAM LEAD
+1.416.307.7206
+1.416.786.5064 (M)
ASCOTT@BARRICK.COM

ANTON MEYER — MIT LEAD, NORTH AMERICA
+1.775.777.5680
+1.775.340.3645 (M)
AMEYER@BARRICK.COM

JOHN DIGWEED — OBSERVATIONS AND MEASUREMENTS, SANTIAGO
+56.2.340.2133
+56.9.84493310 (M)
JDIGWEED@BARRICK.COM

JAE K. CRAMER — IT PROJECT MANAGER
+1.801.916.2804
+1.801.990.3758 (M)
JCRAMER@BARRICK.COM

IAIN ALLEN — SPATIAL SYSTEMS
+1.416.307.5063
+1.647.286.3330 (M)
IALLEN@BARRICK.COM

RICARDO AGUILERA — MIT LEAD, SOUTH AMERICA
+56.2.340.2066
RXAGUILERA@BARRICK.COM

JAY SMITH — MIT LEAD, AFRICA
+27.11.553.7000
+27.83.225.7126 (M)
JBSMITH@BARRICK.COM

Mining Technology Group

JAMES KENNEDY — SENIOR MINING ENGINEER
+1.801.990.3833
JKENNEDY@BARRICK.COM

SALAR JAVID — PROJECT ENGINEER
+1.416.307.2926
SJAVID@BARRICK.COM

PETER GOWER — SENIOR PRODUCTION SYSTEMS ENGINEER
+1.416.307.5136
+1.416.727.5024 (M)
PGOWER@BARRICK.COM