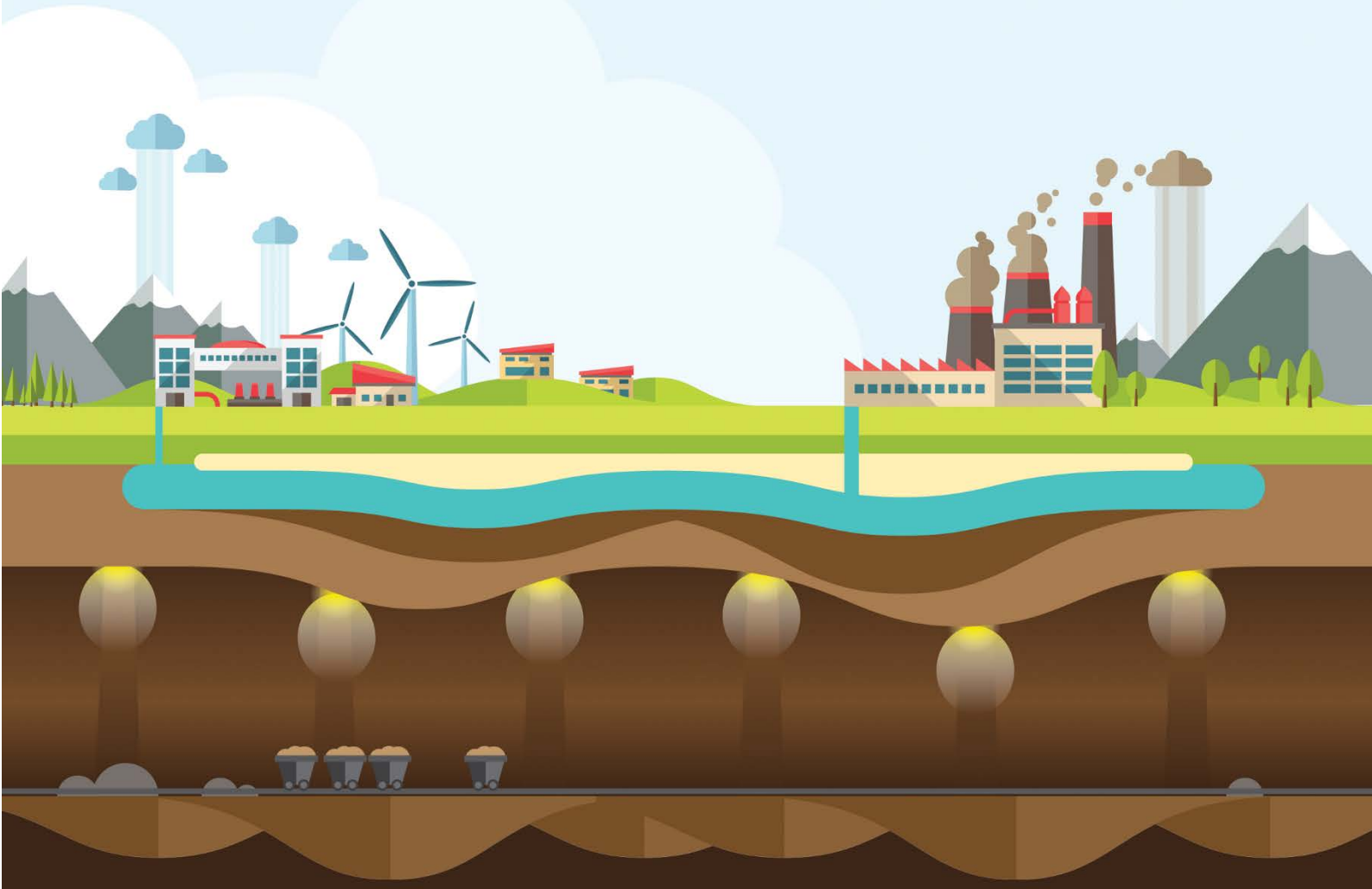
The Role of Good Environmental Data Management in Reducing Risk, and the Challenges Involved.



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THE ROLE OF GOOD ENVIRONMENTAL DATA MANAGEMENT IN REDUCING RISK, AND THE CHALLENGES INVOLVED.

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ABSTRACT

Most mine sites are required to monitor their environment in order to comply with permits and national, international or organisational standards. Is simply meeting these requirements enough to minimise risks?

Just as in financial accounting, appropriate stewardship of environmental data is highly important, not only in its use as information through the life of an operation, but also in the event it is scrutinised, or needs to be relied upon to make a case to either stakeholders or regulators.

This paper and presentation examines how responsible management of environmental data helps to mitigate risks and improve efficiency, and details some of the specific challenges involved.

There are a number of situations where a mine site will need to use their historical monitoring data to prove their case. These range from simply demonstrating environmental commitments to stakeholders, to giving timely and adequate attention and responses to complaints or to defending a case in the unlucky event of an environmental disaster.

In the first instance many mines use spreadsheets to store their data. However, most of us agree that large spreadsheets tend to be very difficult to manage and, above all, very insecure.

The first consideration is ensuring the data is reliable. This means validation, security and auditability. Other challenges are how to ensure that monitoring has been completed in accordance with requirements; that appropriate calculations have been done, reports have been delivered on time, with accurate content and in harmony with permits and obligations. It is also vital that there is adequate visualisation and interpretation tools to provide meaningful information to the environmental department and others, especially when comparing baseline readings with current performance and how compliant the operation is.

KEYWORDS

Environment, Compliance, Due Diligence, Monitoring, Security, Management

WHY SHOULD THE MINING INDUSTRY MONITOR THEIR ENVIRONMENT?

With more and more of the population being concerned about their local environment, across the world more and more governments are making it obligatory for companies to collect and report publicly on the release of pollution and environmental performance.

The British Columbia Ministry of Environment (MOE) believes in sharing key scientific and technical information to better manage the province's natural resources. As part of this, monitoring data is collected by both the ministry on public lands and also permittees under the Environmental Management Act. The Environmental Monitoring System (EMS) is available to the public upon request. Due to the transparency of data available to the public, mining enterprises in B.C must be certain that they are in control and knowledgeable of their data and the interpretations that can be made.

From the National Pollution Inventory (NPI) in Australia and the US Emergency Planning and Community Right to Know legislation, to the European Pollutant Release and Transfer Register in Europe, organisations that can impact the environment need to ensure that they have a full control and overview of their environmental impact before, during and after projects are completed. Increasingly mining companies are now voluntarily and enforced to responsibly decommission and reclaim sites after the project's lifetime. This process is of course not news for mine sites in Canada or the industrial world; however, this development is increasing globally as described by Environmental Resources Management.

Naturally, this will lead to an increased need for maintaining environmental monitoring activities for a long time after the operations are decommissioned. The need for environmental monitoring and good data husbandry is no longer exclusively for the operating phase.

What can happen if an environmental monitoring plan is not managed reliably?

There are many examples of late, where mining companies have been the cause of large and devastating accidents to the environment (see the Wise Uranium Project for none exclusive examples). The total impact and environment damage to communities, waterways, land and wildlife of a tailings dam break can only be described as an environmental disaster.

Companies held responsible for such damage will generally, and in most countries, face severe financial fines for the accident and for the clean-up. However, today, it is also becoming more and more common that directors and managers will be charged with criminal offences for being negligent or irresponsible. Such fines and penalties might even be high due to incomplete execution and documentation of ongoing environmental management. It is no news to the readers of this paper that Canada has seen a fair share of directors prosecuted for environmental negligence as presented by Julie Abouchar, 2015.

In general, mining operations are located in areas with a naturally high concentration of heavy metals and pollutants due to the geology. Without a proper background (pre) and post operational pollution inventory, the company might very well be held responsible for naturally occurring pollution, which might not have been the case if monitoring data from before the incident had been accurately recorded and reliably managed.

In a specific example from recent history a tailings dam collapsed, causing the local water supply to be polluted, spreading eventually to the ocean. The total impact and environment damage to the river, beaches and wildlife is still unclear but has been described as an environmental disaster.

Figure 1: Tailings dam spill in Brazil, 2015. (Getty Images)

A local mining company was held responsible for the damage. The directors are being charged with criminal offenses and the penalties are likely to be even more severe because the background information, prior to the accident, was not registered.

It is not unrealistic to assume that the area has a naturally higher concentration of some pollutants due to the geology. However, since background data is missing, the company might even find themselves being held responsible for also this background concentration. This would not have been the case if accurate monitoring data from before the incident had been recorded and well managed.

It has been estimated that the restoration project will cost the organisation around £5 billion and take 15 years to complete.

The B.C. Ministry of Environment is committed making unbiased scientific data and information accessible. The principles include using best available techniques and sampling practices, integrating traditional knowledge, and credible data with effective key performance indicators.

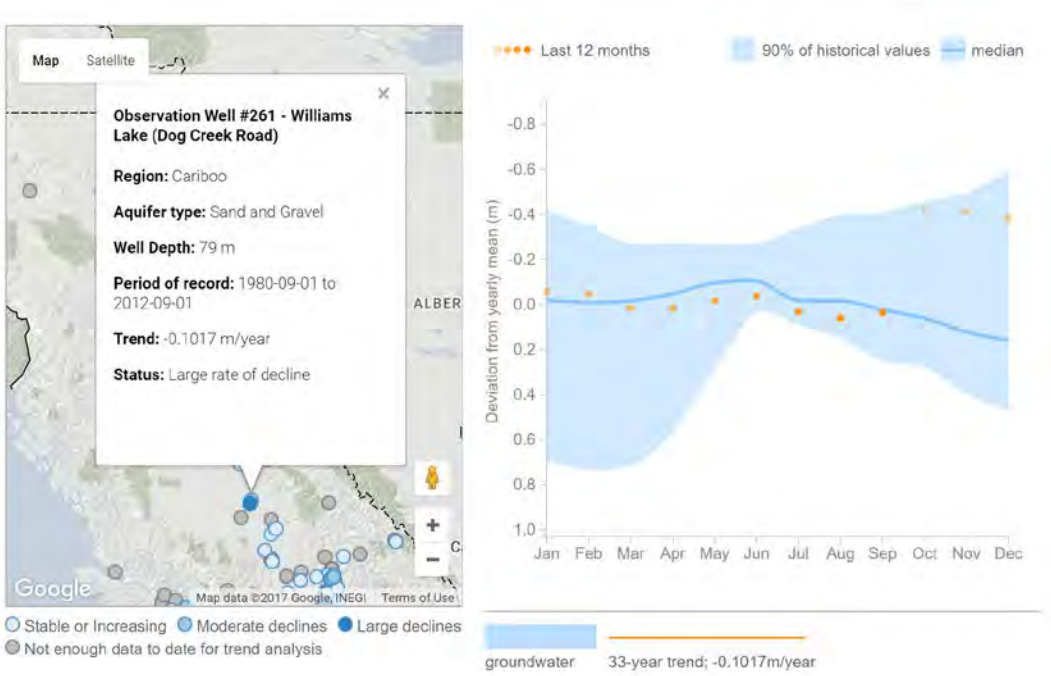

Figure 1: Example of publicly available information on groundwater in B.C. (http://mines.nrs.gov.bc.ca/)

Mining companies with activities and operations in B.C are faced with many challenges and responsibilities to minimize environmental impacts. Aspects such as treacherous terrain, lush forests, glacier fed rivers and streams, and abundance of wildlife all contribute to B.C. natural beauty. The potential for damage to nature contributes to the areas of environmental concern for many stakeholder groups including private citizens and First Nations. There have been many cases in the past where public pressure has delayed or even prevented project approvals. Companies who are not prepared with years of well-established baseline data, as well as strong management plan to ensure permit compliance can be impacted with delays resulting in losses to costs and investor confidence.

List of key risks which can be mitigated

1. Not collecting readings as prescribed by a permit
2. Missing impending compliance breaches by not reading trends
3. Accepting and subsequently reporting incorrect information due to lack of proper validation or calculation
4. Failure to be able to substantiate that data reported has not been tampered with, unless costly re-collation from sources is undertaken
5. Failure to report on time or reporting wrong parameters or locations
6. In the event of a disaster or even a planned release, failure to demonstrate the extent or significance of the pollution relative to previous conditions.

Creating a structured monitoring plan from permits and other obligations

The monitoring required by various site permits is often collectively termed a monitoring plan. Usually this is routine and repeated regularly throughout the duration of a permit, or until the permit is amended. However, routine does not necessarily mean the plan will be uncomplicated.

Each permit contains a list of conditions which must be met. Often the monitoring plan is not a tidy, separate appendix, but must be interpreted and extracted from the various conditions, and the monitoring plan built up piece by piece referencing the various conditions and clauses which contain the requirements.

The resulting plan accounts for usually many hundreds of different parameters which must be measured at potentially hundreds of different locations at varying frequencies, from a variety of different measuring instruments, field readings, consultants and laboratories.

Permits and obligations remain important for mine closures and remediation projects for a long time and the time factor alone suggest that something more robust than a spreadsheet will be required. This ideally lends itself to automation thorough various digital data loggers and meters as well as coherent database system for verification, compliance and analysis. An automated solution might demand some resources for set-up, but once the plan is in an automated system it can be used repeatedly, and amended simply as needed, thus decrease long-term resource allocations for monitoring.

Good planning helps to ensure all required monitoring is being done on time

Not only must the plan be managed in terms of what must be done, but also in verifying that it has been done or at least attempted. Sometimes access to remote stations is challenging, particularly in the Canadian winter. Dry wells where samples are physically impossible to take need also be acknowledged that the hole was confirmed dry during the required monitoring timeframe.

Managing a monitoring plan manually is difficult. In many cases not all sample points require the same set of analyses. Some may be upstream of a discharge point, some may be downstream, each with different sets of priorities. Some will require additional lab analyses only if field tests exceed set values. Some will require more frequent monitoring if analysis results exceed certain values. Some will require special treatment to the samples at some intervals but not others. Manual checklists and spreadsheets would require constant review and update to ensure the plan is followed as prescribed.

With so many samples and different sets of analyses, labs typically use a chain of custody to transfer responsibility from their client once the samples are received. Tracking numbers are assigned, and the operator or consultant must then reconcile the sample results once received, often up to 30 days later. Not only must operators account that all their samples had results returned, but that all the planned parameters and QA/QC samples were analysed.

Additionally, in conformance with internal or required quality checks, a replicate ‘anonymous’ sample may be delivered to the lab and compared against the ‘true’ samples. These checks help to ensure the laboratory processes are consistent. Internally driven sample reference numbers can help reconcile the replicate samples to the points they were taken from.

Another QAQC check belongs to ‘blank’ samples, where the wear and tear of the instruments, the quality of distilled water, or the trip itself can potentially have deleterious effects on results. Keeping a ‘blank’ sample guards against outliers or extraneous results caused by handling practices. Maintaining these results in line with the associated samples shows strong data management and organization.

In some cases, where automatic loggers are in place, be it a data historian system, a weather station, or otherwise – there are cases where data collection is stopped due to instrument error or external factors. Being warned of missing data can aid the organisation to review and fix problems before they become issues.

Not only accurate data, but the correct data. The correct time period and sampling locations, but increasingly important is frequency. With advances in logging, increasingly data as being collected at a higher frequency than the permit requires, a good monitoring plan can extract the relevant data from these large streams.

How automated validation gives more accurate and intelligent data

Collation of readings from spreadsheets and other manually created files for reporting can be very hard to do accurately, risking inaccurate reporting

When different labs are involved, different naming conventions for common analytes can cause confusion for anyone who's not a chemist. Combine this issue with various units of measure, and the management of discrete data streams becomes burdensome.

An automated system can store physical limits and not allow values outside a desired range (e.g. pH = 0 to 14), or the outlier checking can be a moving limit. E.g. Mean of the past 2 years + 20% or mean +2 standard deviations. There is inherent need for flexibility to define data boundaries specific to the parameter and sample point (and even data source), because each combination with have different variance, normal boundary norms and accuracies.

Automation lends itself to allow for alerts regarding data input success or failure. There can be an alert that new data was committed, a summary of exceedances and breaches, and many other alerts to system processes. In this way, processes for importing and validating data can be fairly automated, with signals indicating to the users on items that need attention.

It has been known (on rainy days?!) for technicians to re-order and re-submit readings from a previous visit. These can sometimes be tracked by automated checksum reporting.

Ways to ensure that if pollution levels are rising unexpectedly that appropriate staff are aware so they can act

With an automated solution, it will become systematised to check all incoming data for not only abnormalities, but also for trends indication rising pollution levels. Rising awareness at an early stage will of course increase the chance to mitigate pollution and accidents before it happens. A system should be able to recognise increasing pollution automatically and act upon pre-defined processes, for example sending warning emails to relevant staff.

Why security and audit trails are important

Transparency of data collected and reported is key to maintaining the right to operate, particularly in environmentally sensitive areas where data is routinely scrutinized and potentially even available to the public. A professional system should offer a full audit trail for data updates and changes, indicating what any previous values were, and who changed them. The ability to store lab reference numbers and associated embedded PDFs for lab certificate files, adds further credibility and auditability to the data. This aspect of an automated system is one of the principal advancements over spreadsheet data tracking.

Ensuring accurate reports are sent on time

Cases of falsification of reports not only risks litigation and financial damage, it can also damage the reputation of the company or even the industry. Following the automation of data collection and validation, a management system can greatly reduce the risks of inadequate or inaccurate reporting.

An accurate report might sometimes require that the collected data is reviewed prior to submittal. A system to automatically execute required and planned calculations can also allow for processes of review and rework if data is deemed inadequate.

Often many reports must be submitted on a schedule. A system can schedule and send an email with the required report to relevant staff or even directly to regulators. By using an automated system for delivery, there can also be history (log) of reports sent, thus ensuring a library of generated and presented reports.

How to manage follow-on tasks in the event of a breach

The validation of data will automatically generate permit and compliance breaches if the organisation is unlucky. Next question is what to do in case a breach is identified. Further to a spreadsheet, an automatic solution can generate a workflow for these breaches. The workflow in itself can be communicated to relevant staff and all actions and progress will be recorded.

Recovering from a mining disaster: Why reliable monitoring data is vital for the mining industry and its Directors

The mining industry is known for being highly regulated by authorities and shareholders around the world due its potential impact on local communities and the environment. In the past, Directors of mining organisations have been shielded from being liable for decisions made by the company they represent. However, changes in values and regulations across the world means that there has been a rise in claims against Directors for allegations of environment mismanagement, health & safety and corrupt practices.

Directors of companies of all sizes are now being considered liable for the impact of corporate decisions...even before accidents have occurred.

That is why environmental monitoring is even more essential to ensure that industrial processes are compliant with legal requirements and the best environmental practices. The best way to decrease the risk of criminal charge in the unlucky event of an accident is to demonstrate a proper due diligence process and to implement an environmental management system as explained by Donna S.K. Shier and Raj Bharati. An effective software management system to manage monitoring requirements is a key part of any significant environmental monitoring system.

CONCLUSIONS

Many mines will aim adhere to the conditions of their permit, and try to do the monitoring they're required to, but then fail to adequately check to ensure it was all done on time, and correctly, checked against compliance limits etc. Once recorded, some mines do not then store the results they have collected properly so that they can be reliably retrieved if needed.

If a disaster strikes, having an effective and efficient system in place to manage monitoring, from planning to storing the results for analysis and reporting is essential for several reasons.

Firstly, to ensure you can prove you did everything possible to prevent it, secondly that you have plans in place to minimise the impact your activities have on the environment.

The financial risks of not having a proper environmental planning and management system for monitoring in place can be hugely significant, with Directors now at risk of being prosecuted, it has never been so important for companies to ensure they are effectively recording, monitoring and acting on data to avoid government intervention, damage to their reputation and even prosecution.

Using an environmental monitoring management solution can benefit the company and its directors by:-

a) Helping to ensure the plan for monitoring is adhered to and none missed
b) Reducing the risk of compliance breaches by configurable warning system
c) Increasing confidence by accurate and up-to-date reports to relevant stakeholders
d) Reducing the risk of lawsuits by maintaining a coherent audit trail of all data
e) Reducing the risk of extended responsibility by a secure and verifiable storage of historic and present environmental data
f) Removing many sources of human error by automating many tasks such as calculation, validation and reporting

The above list directly refers to risk reduction. However significant monitoring plans can take considerable resource to manage effectively. Automating much of the process is usually straightforward, often with very short payback times.

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