



Groundwork Consulting



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Transforming geotechnical monitoring data acquisition, 3D visualisation and analytics for modern mining

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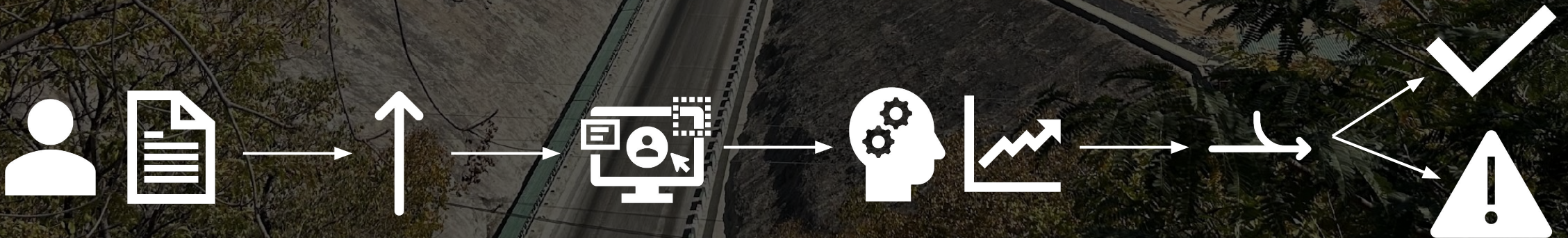


Data as a Digital Asset – Advanced Data Capture

'Because even rocks reserve the internet'

Why?

- Human error and subjectivity
- Physical vulnerability
- Incomplete or missing data
- Delayed error detection





Data as a Digital Asset – Advanced Data Capture

~~'Because even rocks deserve the internet'~~

Benefits

- Enhanced data integrity
- One version one truth
- Advanced visualisation and analytics
- Long-term storage and accessibility
- Improved interoperability
- Standardised data



Data as a Digital Asset – Advanced Data Capture

'Because even rocks reserve the internet'

Linking up to visualisation platforms

- Instant analytical capabilities
- Restricted accessibility removed
- Data silos removed
- Lack of verification removed

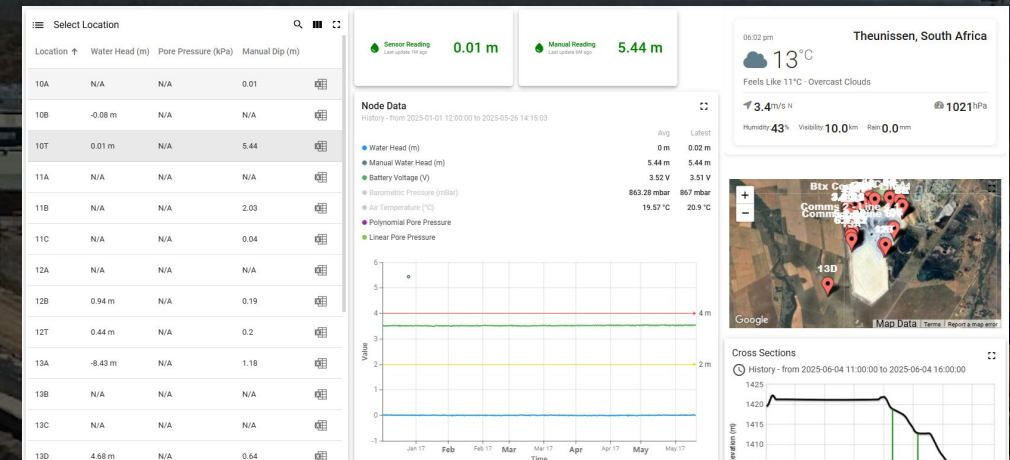


Case Study 1 – Manually collected mine-scale data

'When your mine stability depends on 'Enable Macros', it's time to rethink things.'

Requirements

- Validate data before analysis
- Digitally store all collected data
- Host data in the cloud
- Multi-user access
- Automate analytics
- Trigger alerts and notifications
- Provide data insights and analytics





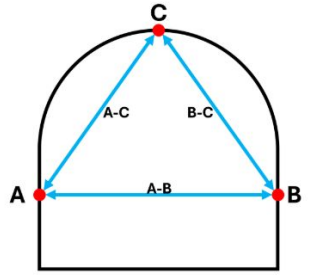
Case Study 1 – Manually collected mine-scale data

~~'When your mine stability depends on Enable Macros', it's time to rethink things.'~~

Solution

- Manually entered data
- Standard sensors integrated
- Ensure capturing completeness
- Validates new data against historical records
- Triggers a warning for deviations
- Compensates for calibration variations
- Instantly processes and analyses data

Date of measurement * yyyy/mm/dd	Time of measurement * --:--
Station * xc-01-03	
A-B reading (mm) *	
A-C reading (mm) *	
B-C reading (mm) *	
Person who took the measurement *	
Any additional comments	
Email address for confirmation *	Tape ID *





Case Study 1 – Manually collected mine-scale data

~~'When your mine stability depends on manually collected data, it's time to rethink things.'~~

Solution

- Generates graphs to display trends.
- Calculations (RoC/Inverse velocity)
- Heatmaps
- Notifications
- Direct downloads
- API integration
- Cloud storage
- Multi-user access



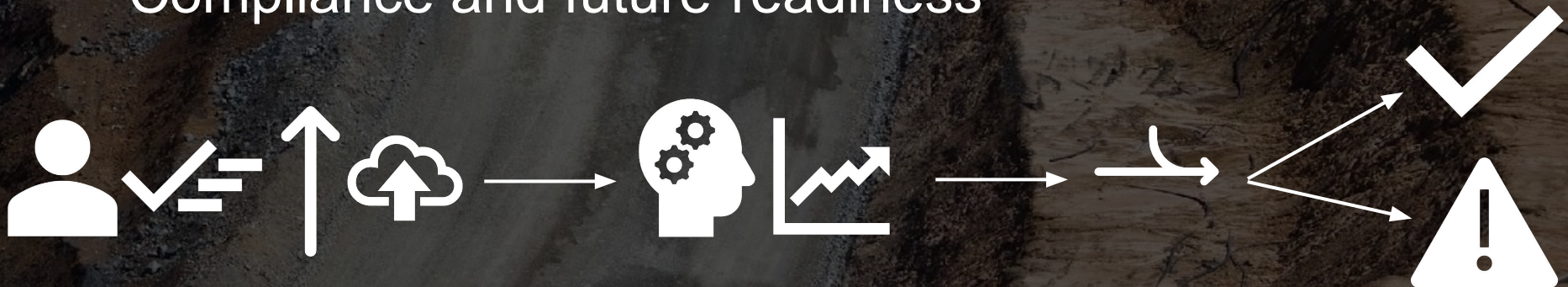
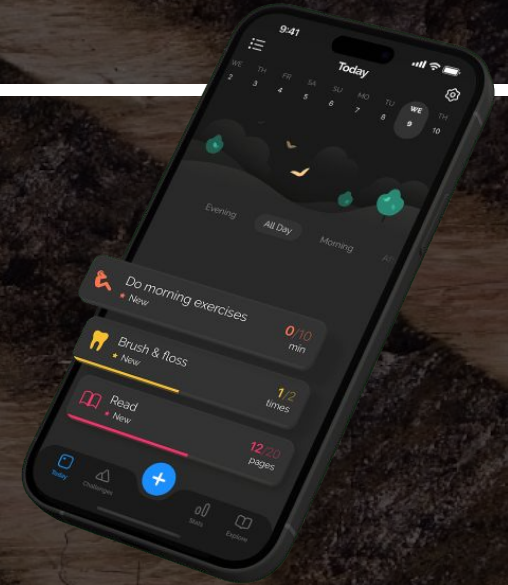


Data as a Digital Asset – Mobile Applications

'From clipboard to cloud - paper cuts, just insights.'

Why?

- Real-time digital storage
- Instant synchronisation and cloud integration
- Enhanced data verification and integrity
- Improved accessibility and decision support
- Compliance and future-readiness





Case Study 2 – Mobile applications in use

'From clipboard to cloud - no paper cuts, just insights.'

Requirements

- Real-time monitoring for locations without sensors
- Verification of readings
- Auditable
- Cross reference readings
- User insight
- Offline functionality



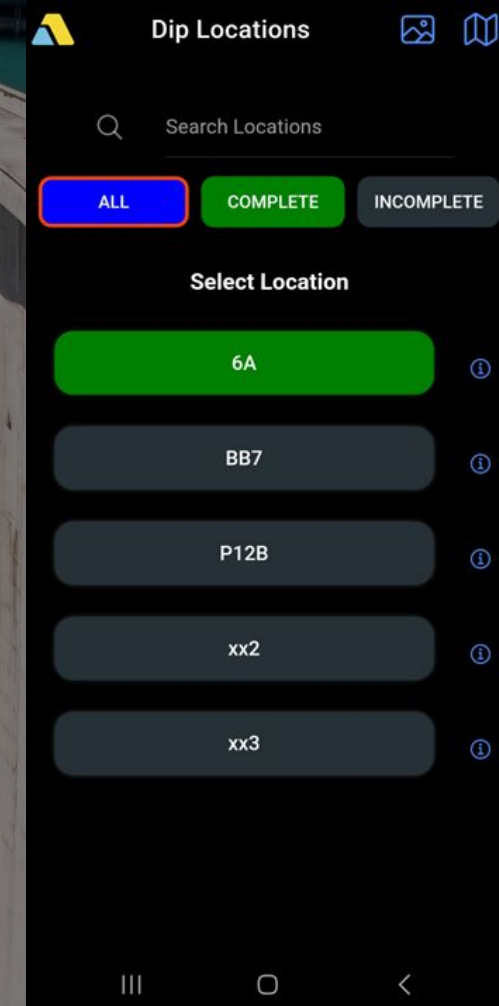


Case Study 2 – Mobile applications in use

‘From clipboard to cloud - no paper cuts, just insights.’

Solution

- IIoT sensors deployed at critical locations
- Manual data entry via a mobile application
- Custom-built APIs, enabling seamless communication between the mobile application and the analytics platform.
- Non-cellular data usage
- Theft implications reduced
- Verification at point of capture





Case Study 2 – Mobile applications in use

‘From clipboard to cloud - no paper cuts, just insights.’

Solution

- Historical trends immediately available, allowing user insight
- Anomalies flagged on platform for investigation
- Geo-fencing
- Proper data structures
- Complete data sets
- Instant analysis via platform
- API integration

The image displays two mobile application interfaces side-by-side. The left interface, titled 'Dip Meter Reading For 6A', features a 'REFERENCE IMAGE' button at the top. Below it are four input fields for measurements: 'Select Employee' (a dropdown menu), 'Top of standpipe to tailings (a) (m)' (0), 'Top of standpipe to water (b) (m)' (0), and 'Top of standpipe to bottom (c) (m)' (0). Each measurement field has an eye icon to its right. The 'Water Head' field is highlighted with a yellow border and shows a value of 0 (m). Below these fields is a 'Comments' text area and a green 'SAVE & UPLOAD' button at the bottom. The right interface, titled 'Site Map', shows a satellite map of a site with several blue location pins labeled P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15, P16, P17, P18, P19, P20, P21, P22, P23, P24, P25, P26, P27, P28, P29, P30, P31, P32, P33, P34, P35, P36, P37, P38, P39, P40, P41, P42, P43, P44, P45, P46, P47, P48, P49, P50, P51, P52, P53, P54, P55, P56, P57, P58, P59, P60, P61, P62, P63, P64, P65, P66, P67, P68, P69, P70, P71, P72, P73, P74, P75, P76, P77, P78, P79, P80, P81, P82, P83, P84, P85, P86, P87, P88, P89, P90, P91, P92, P93, P94, P95, P96, P97, P98, P99, P100. The map has 'Map' and 'Satellite' toggle buttons at the top and a compass icon at the bottom right.



Data and Security

'One unprotected sheet away from becoming a case study'

Mechanisms for data security

- Dedicated independent networks for IIoT devices
- Secure API gateways with authorisation controls
- Outbound data posting to external platforms
- Use of independent cellular networks and edge computing



Data and Security

‘One unprotected sheet away from becoming a case study’

Dedicated independent networks for IIoT devices

1. Separate network exclusively for IIoT devices (such as seismic network)
2. Transmit only operational data, preventing the exposure of sensitive company information
3. LoRaWAN or private LTE networks



Data and Security

'One unprotected sheet away from becoming a case study'

Secure API gateways with authorisation controls

1. Develop secure APIs that allow only authorised external parties
2. Token-based authentication, role-based access control, and encryption
3. API-based integration with a cloud analytics provider can ensure that only pre-approved data subsets are accessible



Data and Security

'One unprotected sheet away from becoming a case study'

Outbound data posting to external platforms

1. Push relevant data to external analytics platforms
2. Eliminates the need for external connections to the mining network
3. Send automated daily reports to a cloud-based geotechnical risk assessment platform, where ML and/or AI-driven models process the data



Data and Security

'One unprotected sheet away from becoming a case study'

Use of independent cellular networks and edge computing

1. Mobile applications and IIoT devices can operate on dedicated cellular networks instead of being connected to a corporate IT infrastructure
2. Edge computing solutions allow data to be processed locally on devices before being transmitted securely
3. Remote mining site using satellite connectivity to collect and transmit seismic data without link to ICT network



Conclusion

- **Data capturing via platforms and applications structure your data and make it a digital asset**
- **Large scale implementation of sensors are not required for visualisation and analytics**
- **Platforms and applications allow for multi-layer verification and insights**
- **Analytics happen immediately reducing time and resources**
- **Methods in place to maintain data security and satisfy requirements**