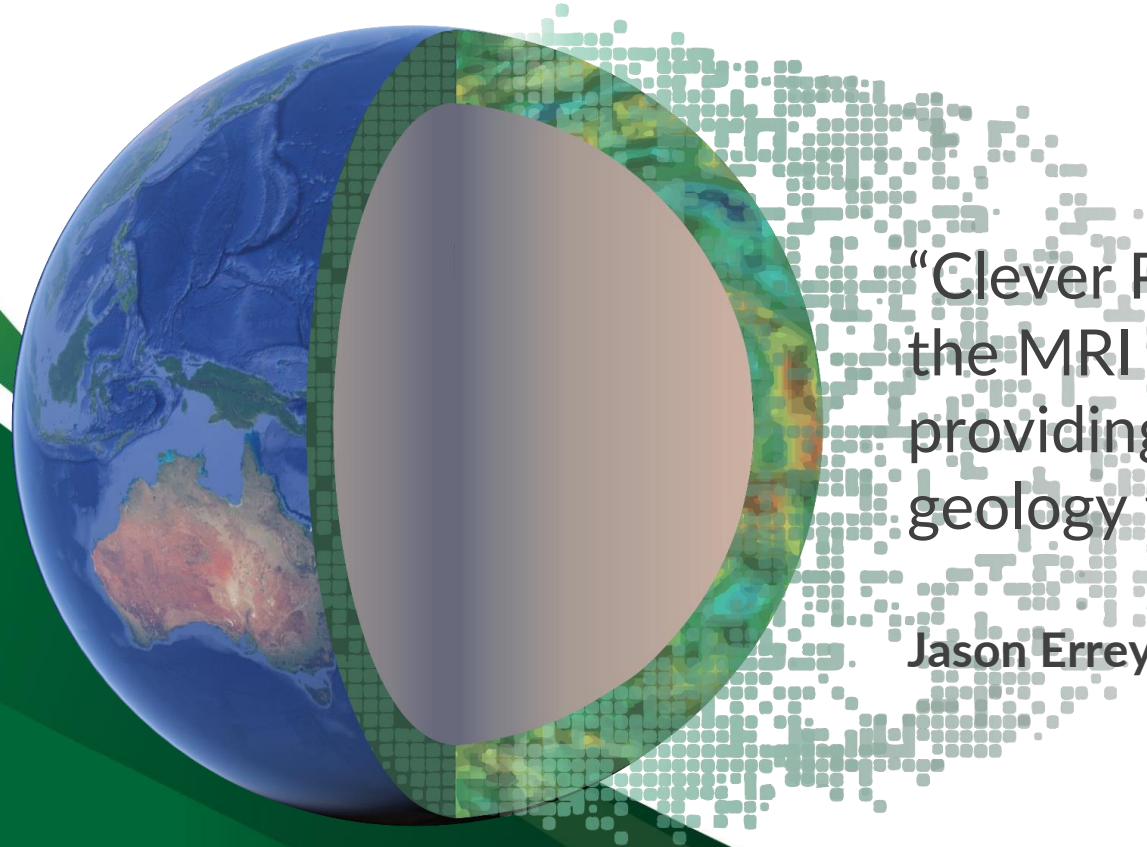
The Project Digital Twin

Fidelity | Communication | Transparency



"Clever Planning with Geology (CPG) creates the MRI of the ground in MyGeoTwin, providing trusted, accessible and 'forever' geology to all stakeholders"

Jason Errey – Clever Planning with Geology

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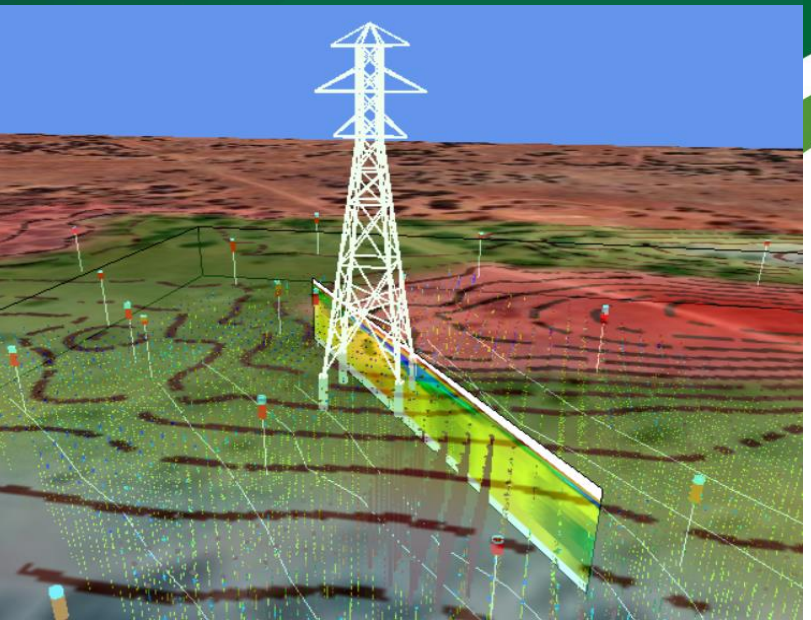
"Moving on from Guesswork"



1. Introduction
2. Ground Data Fidelity
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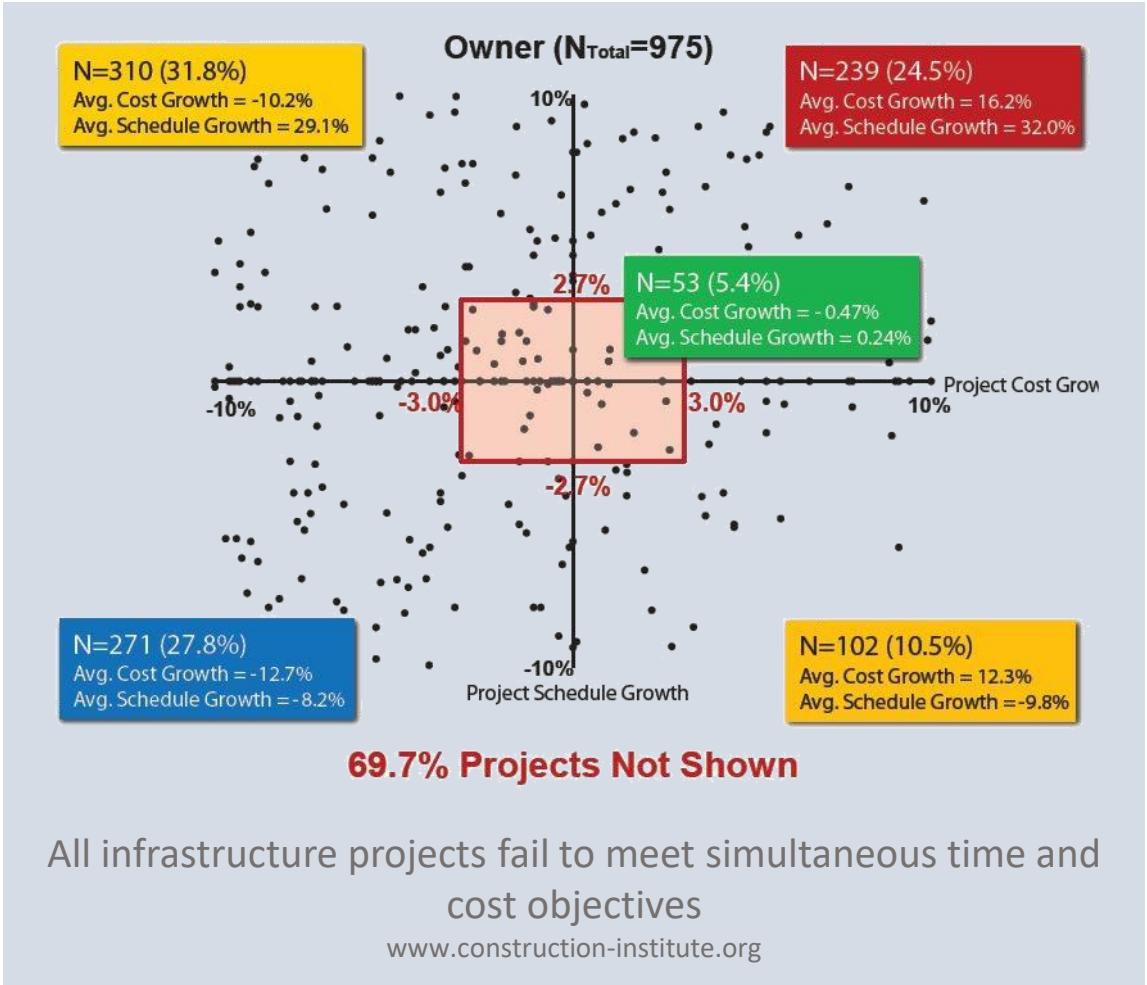
Data, Communication and Risk Management
Analogue Data Always Results in Project Failure

Siloed analogue data results in decentralised decisions, lack accountability and costs cumulatively $100's of Billions every year.

50% of these costs are related to latent ground conditions

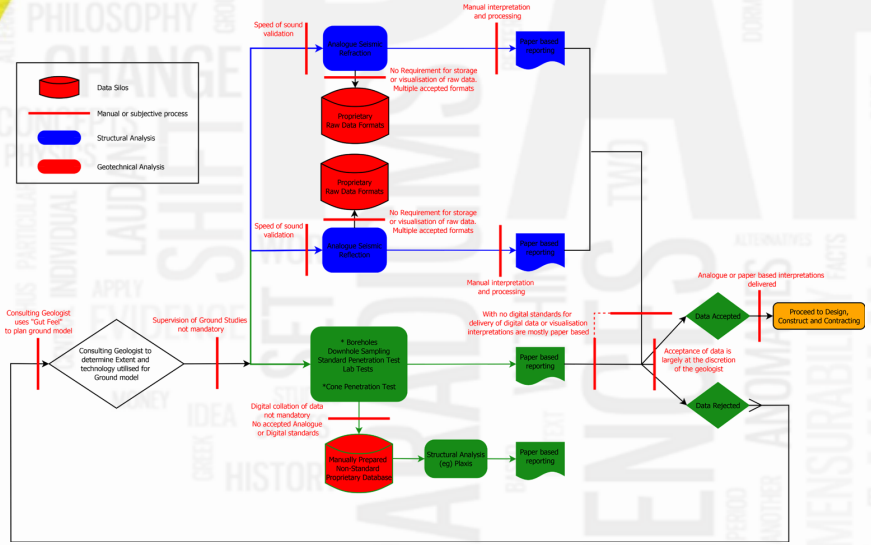


All infrastructure projects fail to meet simultaneous time and cost objectives

www.construction-institute.org

Transforming Disconnected Data
Complex and Siloed to Simple and Transparent

Broken Analogue Process → *What's Changed* → *Trusted Digital Process*



Stakeholder realisation of the scale of current uncontrolled ground risk

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Looming ESG regulation and legislation

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Proving of first generation of digital ground acquisition

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Maturing of digital twin data visualisation and manipulation

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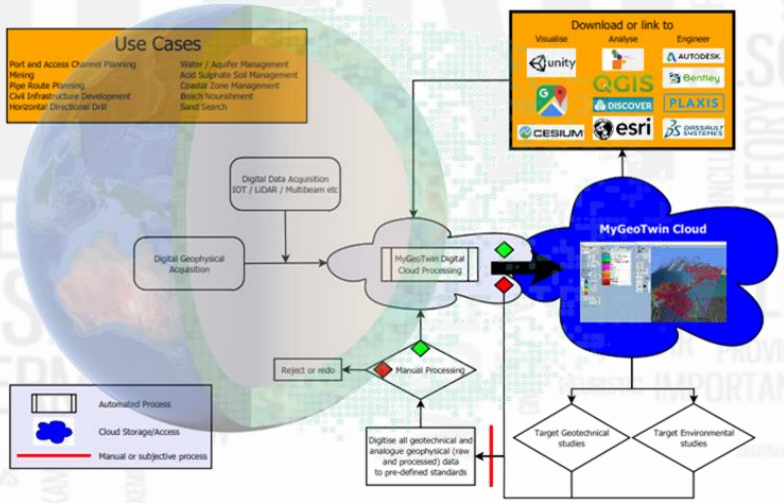
Maturing and acceptance of cloud delivery



MyGeoTwin is used to replace a heavily manual, complex, slow and random processes for collecting, processing and delivering ground data to all stakeholders

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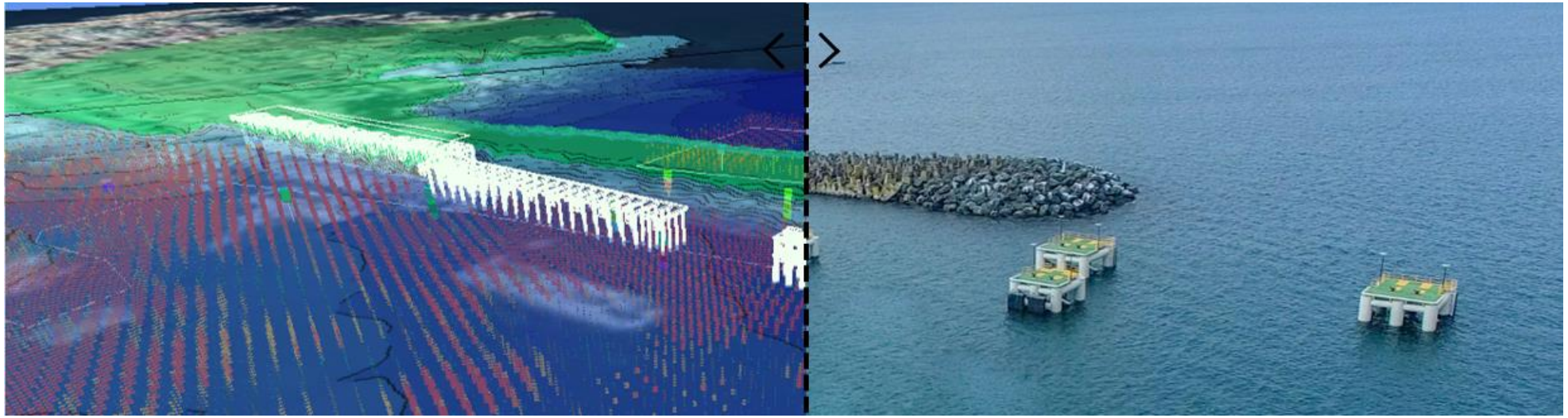
The Mission
Digitising the Globe for Sustainable Planning and Design



Clever Planning with Geology (CPG) will normalise understanding and use of the Digital, verified, auditable and accessible ground model during all phases of the project lifecycle. Our digital acquisition and visualisation technologies will empower all stakeholders, including non-expert and C-Level, to have full transparency on data behind decisions and ensure they are defensible.

Our technology will be the benchmark for maximising sustainability and minimising embodied carbon for all projects connected to the ground. It will addresses the immediate problem of latent geological conditions impacting time and cost and the looming problem of sustainable finance legislation.

CPG will promote the collection of large scale datasets to bake in sustainability to asset management and all planning and project decisions forever.

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"Access to high quality, reliable environmental and geological data enables businesses to achieve their ESG ambitions"

KPMG

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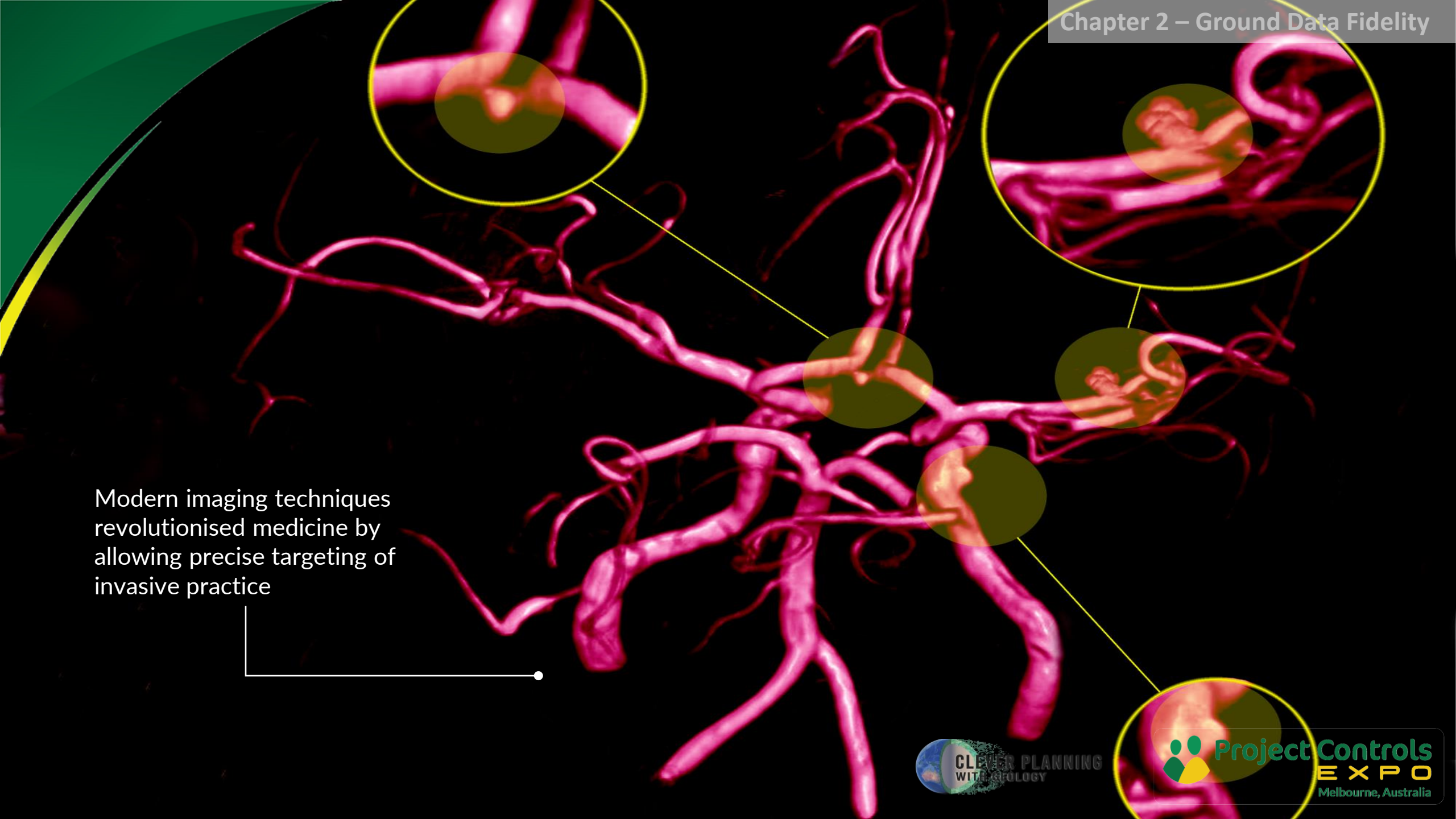
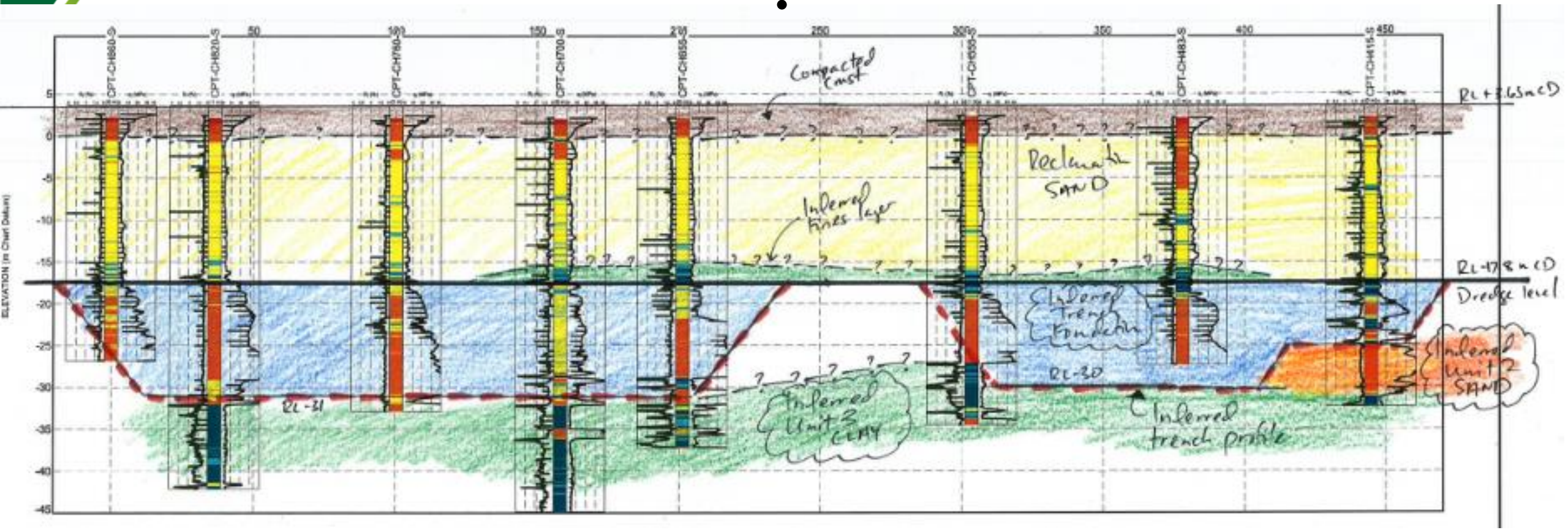


Modern imaging techniques revolutionised medicine by allowing precise targeting of invasive practice

Boreholes are the most common data source for ground models. Contrasting modern medical imagery, typical ground models are primitive



oemgglobal

Borehole Log

Project Name: Yamba Pipe Route
Datum: 0
BH2: 1 of 3

Client	CVC	Easting	529001	Azimuth	0	Drill Type	MD100 Track Mount
Hole ID	BH2	Northing	6745125	Inclination	90	Start Date	15/09/2014
Project	CVC002	Projection	GDA94 MGA(56)	Elevation	0	End Date	15/09/2014

Method	Penetration	Support	Depth (m)	Graphic Log	Classification Symbol	Description of Strata	Moisture	Consistency / Density Index	Insitu Testing	Photographic Log	Comments
AS		C	0.00		SM	Silty SAND, fine sand	SM	VL			Topsoil
					SC	Clayey SAND, fine sand, dark brown	M	L			Estuarine
W		M	1.00		SM	Silty SAND, fine to medium sand, dark grey	W		3,3,4 n=7		pp 10kPa
			2.00					VL			possible fine shell grit
			3.00		SM	trace shells			2,3,3 n=8		No Shell Grit observed
			4.00		SM	trace of fine rounded gravel			1,0,1 n=1		
			5.00		SW	SAND, fine to medium sand, grey, some silt, well graded					collapsed 1-2m after SPT removal
			6.00						1,0,2 n=2		pp 10kPa
			7.00					MD	6,6,7 n=13		pp 100kPa
			8.00					VL			pp 50kPa
			9.00		SM	Silty SAND, fine to medium			9,3,2 n=5		

Method
AS: Auger Screwing
AD: Auger Drilling
RR: Roller/tricone
W: Washbore
CT: Cable Toot
HA: Hand Auger
DT: Diatube
B: Blank bit

V: V bit
T: TC bit
*bit shown by suffix eg ADT

Support
M: Mud
N: Nil
C: Casing

Water
Water level

Penetration
1 2 3 ▼ no resistance ranging to refusal

Classification Symbols and Soil Description based on United Classification System

Moisture
D: dry
M: moist
W: wet
Wp: plastic Limit
W_L: liquid Limit

Consistency/density index
VS:very soft
S:soft
F: firm
St: stiff
VSt: very stiff
H: hard
fb: friable
VL: Very Loose
L: loose
MD: medium dense
D: dense
VD: very dense

Logged: Strider Duerinckx
Drilled By:DE Drilling
Revision: 1

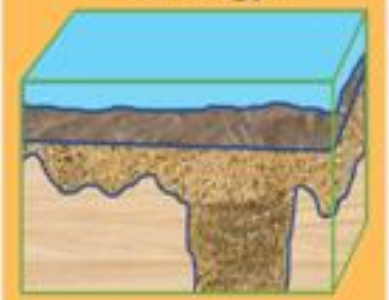
Boreholes result in a highly disturbed, non-continuous and highly interpreted understanding of the ground.

The subjectivity of boreholes is not reported to stakeholders.

Geology is messy and unpredictable.

Old analogue geophysics is unreliable. Only new generation digital geophysics is capably of resolving complex geological structures for targeting geotechnical and environmental studies

Geology



- Geology highly variable
- Rocks vary in strength complicating engineering
- Sediments vary in quality and grain size changing engineering and contamination loads
- Accurately mapping soil and rock characteristics is key to project success.

Outdated Analogue Technology

Maps Depth to Layer (Quantitative Technology)

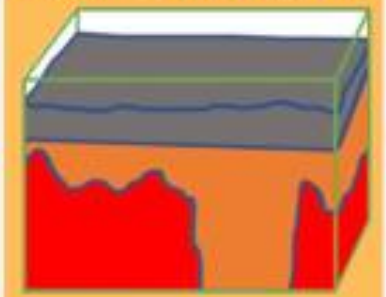
Maps Quality Changes (Quantitative Technology)

- Is Outdated 2Dimensional Analogue Acquisition
- Subjective, manual processing
- Requires Boreholes for Processing and Interpretation

- Legacy Reflection
- Low fidelity / fails in complex geology
- No Qualitative (quality) signal
- Restrictive data formats

- Legacy Refraction
- Low fidelity / fails in complex geology
- No Quantitative (depth) signal
- Restrictive data formats

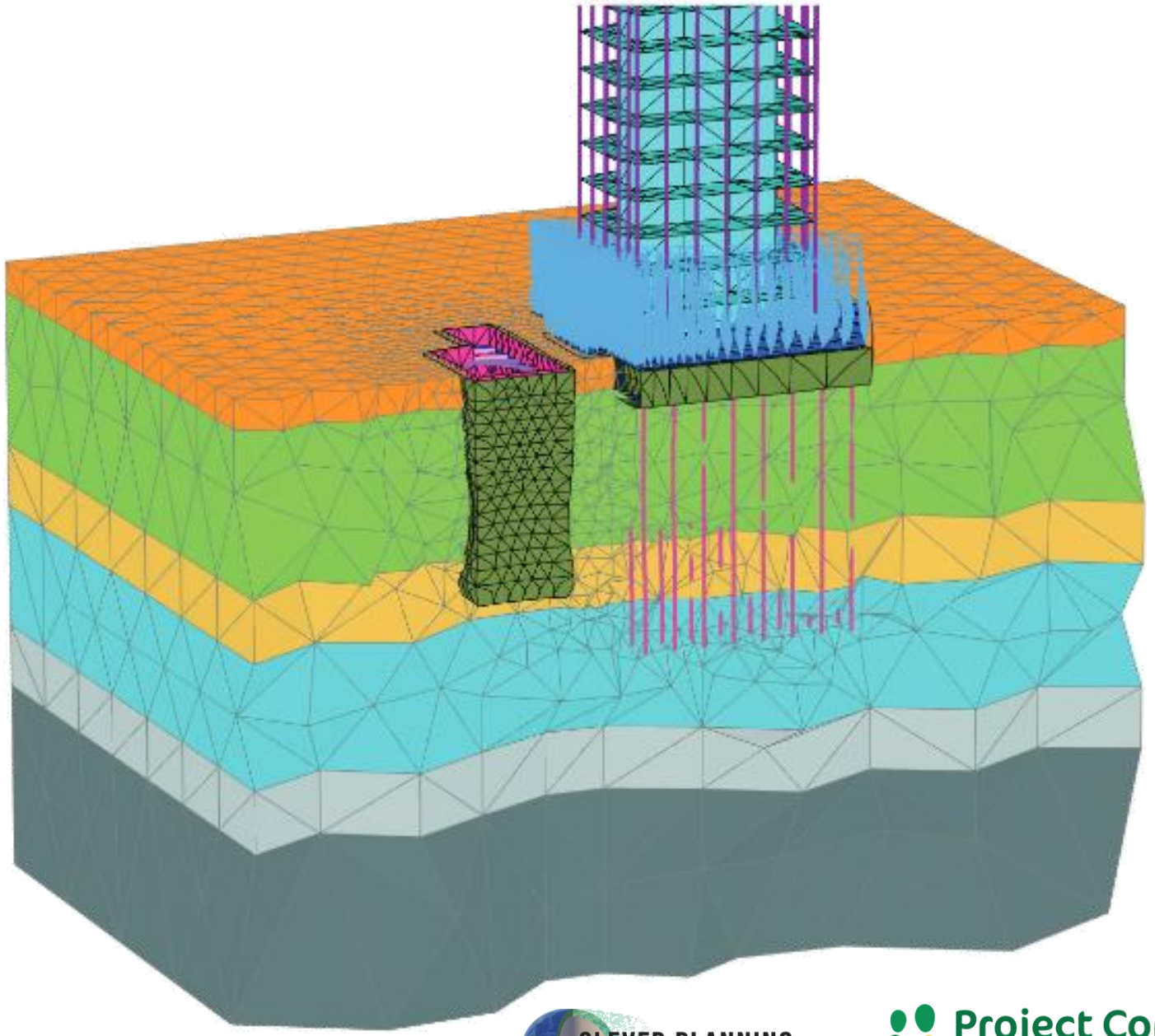
New Generation

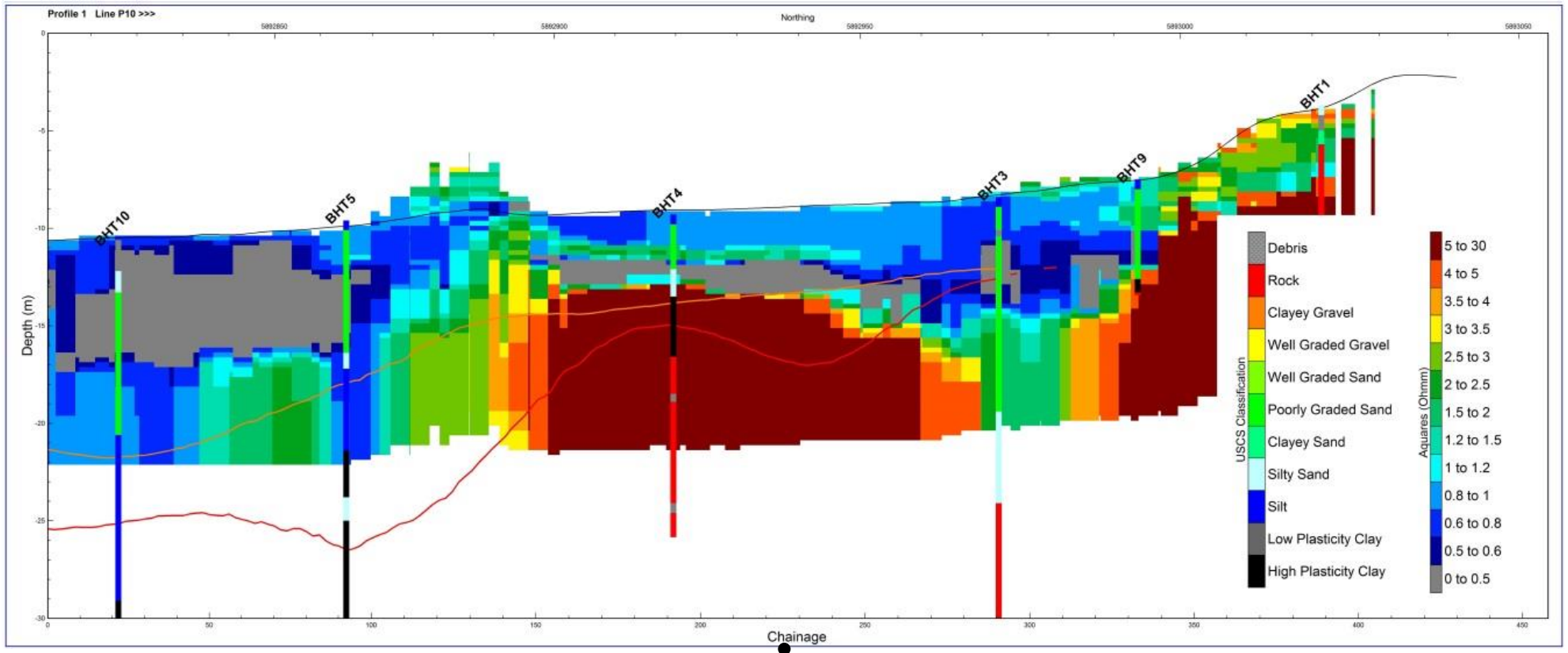


- Digital acquisition and ***real time*** machine processing
- Realistic and verified replica of the environment
- Qualitative ***and*** Quantitative signal
- ***25cm*** resolution
- ***Forever data*** ready for any current & future simulation or visualisation technology

Simple, unverified and subjective ground and environmental data are used to create foundation models, foundation designs and construction strategies.

There is no oversight or accountability in this process yet substantial project risk and carbon is embodies into the project at this point.

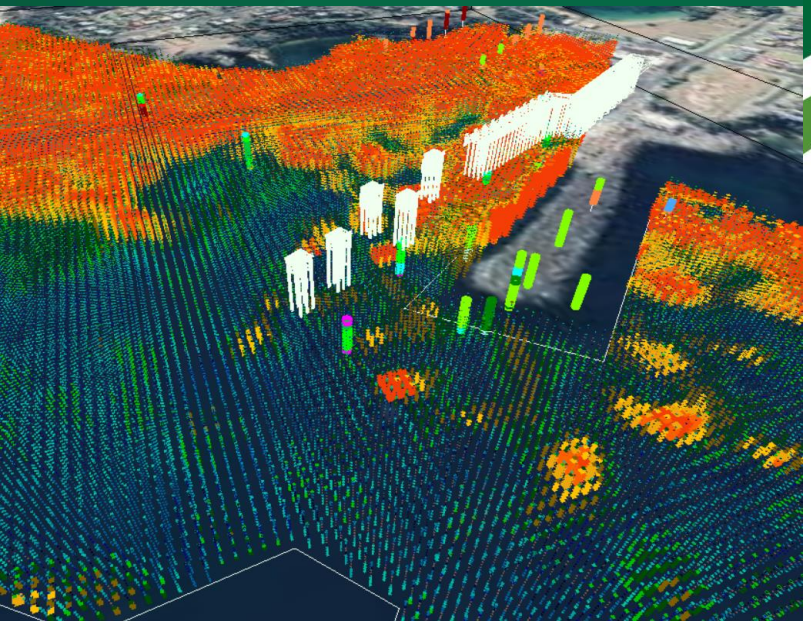




Multiple incorrect conclusions were drawn from untargeted boreholes and analogue geophysics.

In this instance, digital geophysics allowed contractors to work with all stakeholders to greatly improve ESG project outcomes for Eden Port

A digital, verified and auditable ground model underpins the understanding of ESG risk of ground connected infrastructure for financial institutions and investors



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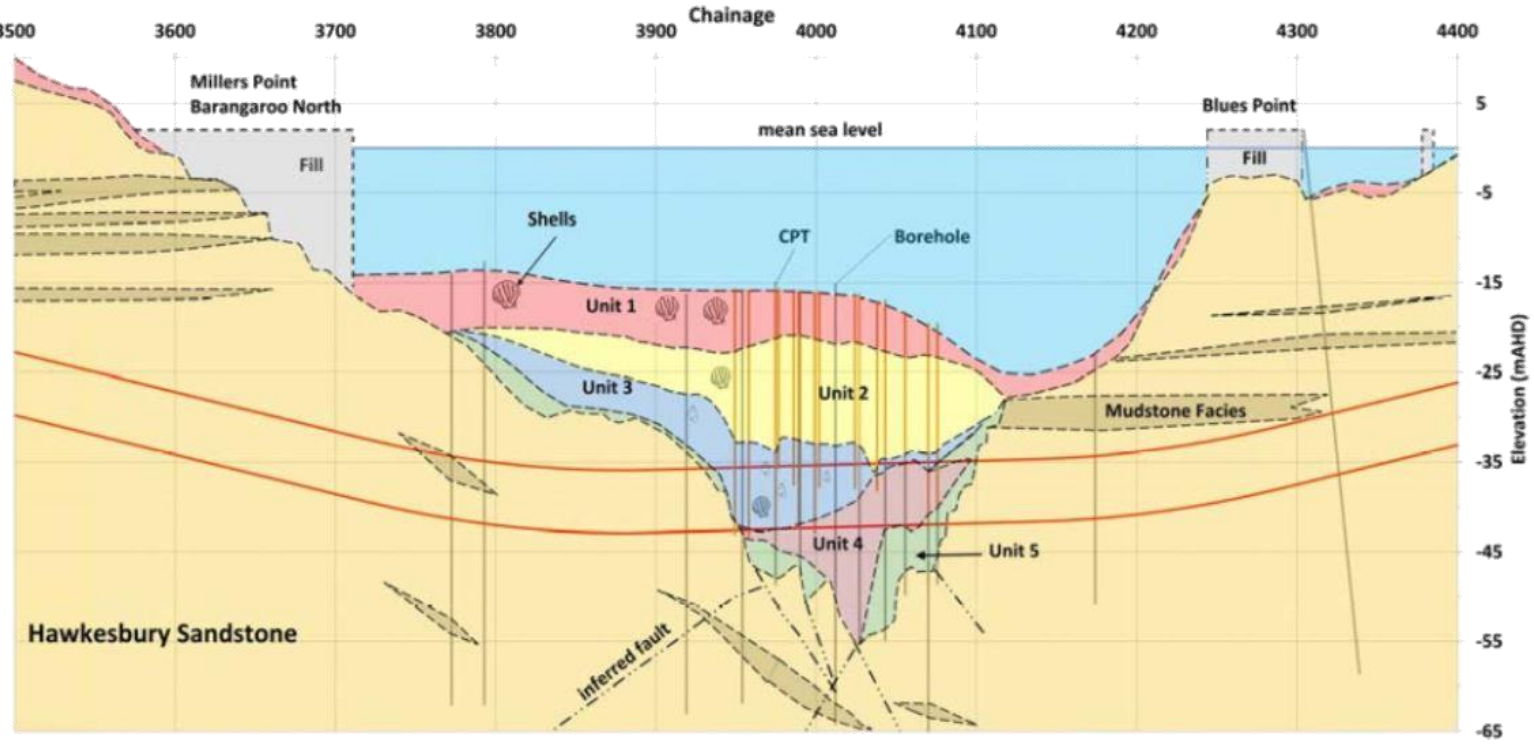
There are no standards for the digital delivery of environmental or geotechnical data.

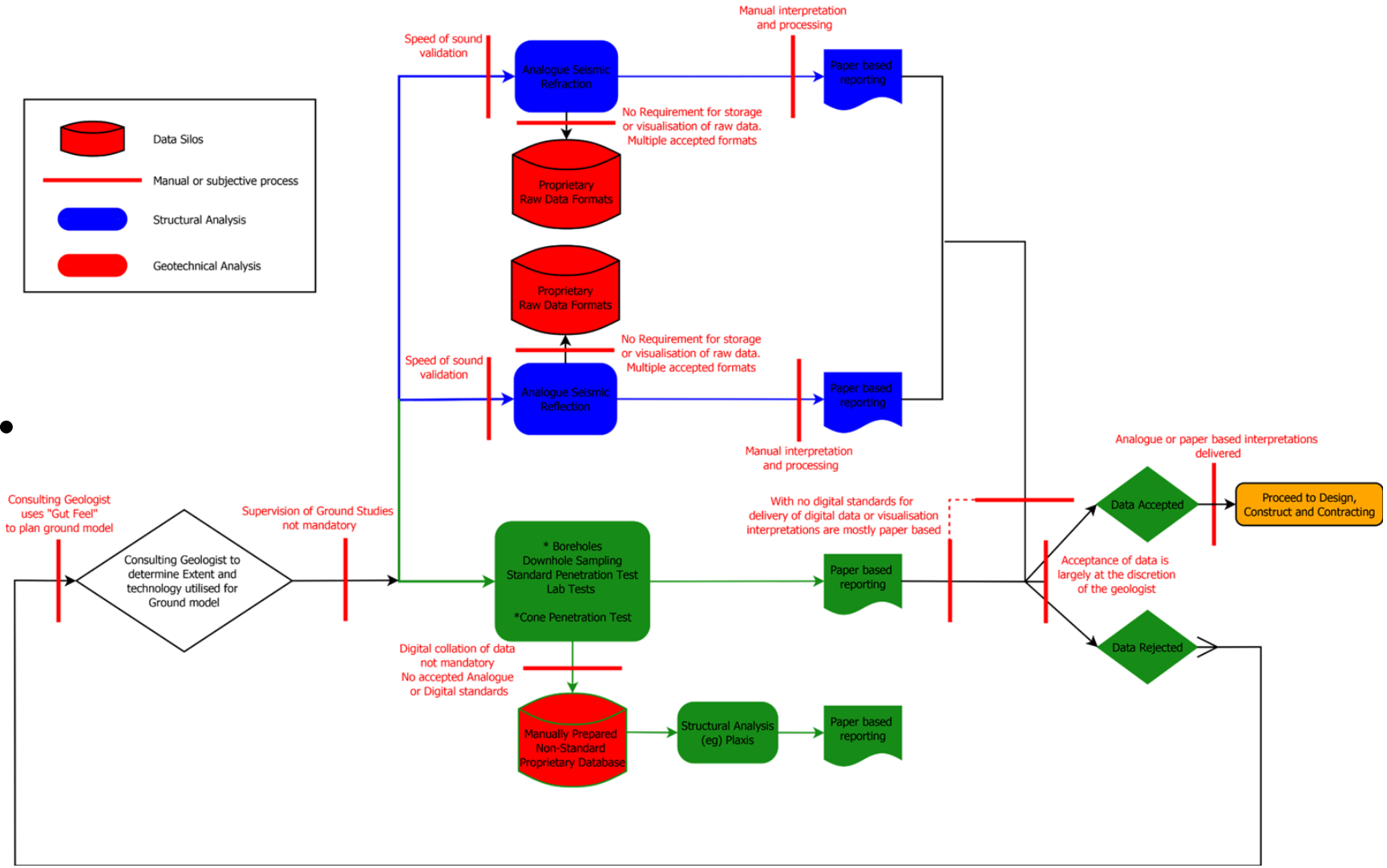
Sadly, data is almost always provided in highly technical PDF documents, proprietary formats and/or uncontrolled excel files.

Data is not currently designed for sharing or stakeholder engagement

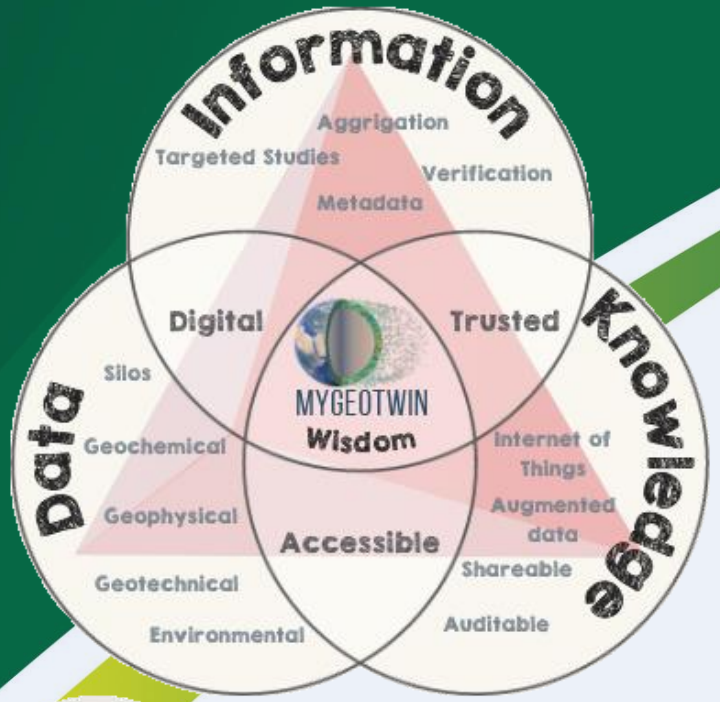
This cartoon, with no provenance, is how risk and ESG at the proposed multi $Billion Sydney Harbour Metro tunnel was explained to stakeholders less than 10 years ago.



There is no targeting, connection, cross-checking, validation etc between contractors let alone stakeholders – and this is just basic data acquisition



MyGeoTwinTM allows any number of project iterations to tested in a digital replica of the existing environment to achieve the best ESG outcomes



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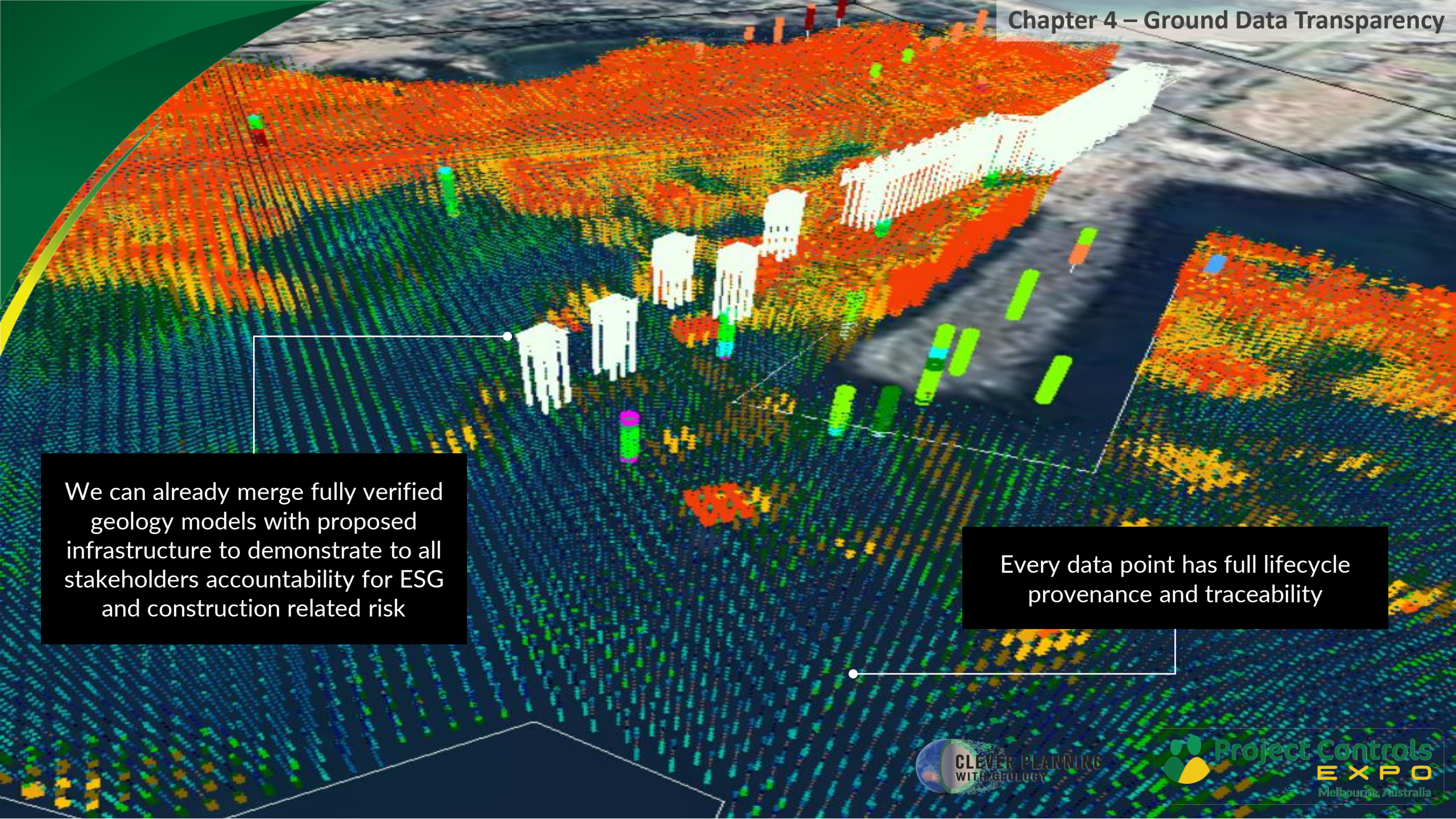
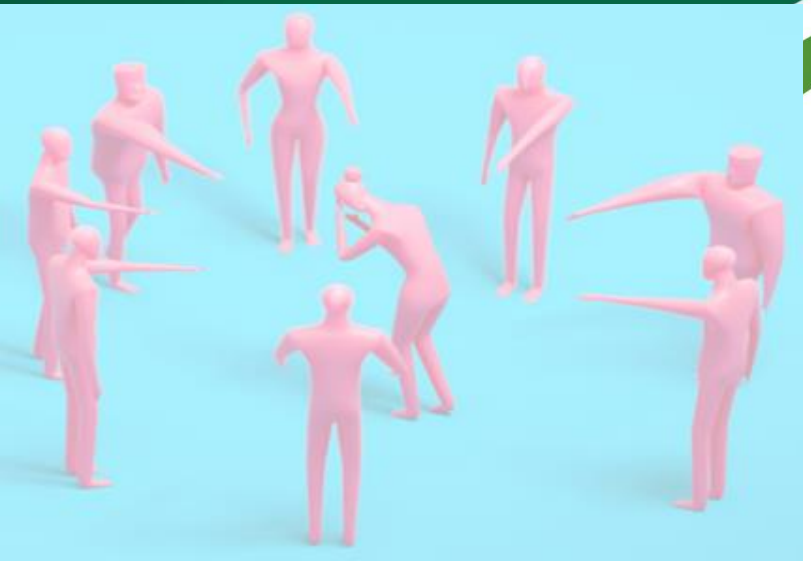


We can already merge fully verified geology models with proposed infrastructure to demonstrate to all stakeholders accountability for ESG and construction related risk

Every data point has full lifecycle provenance and traceability

Ending the blame game:

Ground risks can now be understood with residual risk appropriately mitigated, assigned and/or costed



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Clever Planning with Geology is on the verge of integrating the verified and auditable geology digital twin with full data provenance and unlimited datasets to allow for full project simulation prior to contracting

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THANK YOU

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