FIG WORKING WEEK 2025
AND Locate25 THE NATIONAL GEOSPATIAL CONFERENCE
Collaboration, Innovation and Resilience: Championing a Digital Generation
FIG Geospatial Council of Australia
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3D Geological Modelling for Hydro Power Tunnel Drilling:

Combined use of Generic GIS Tools and AI-Assisted Scripting

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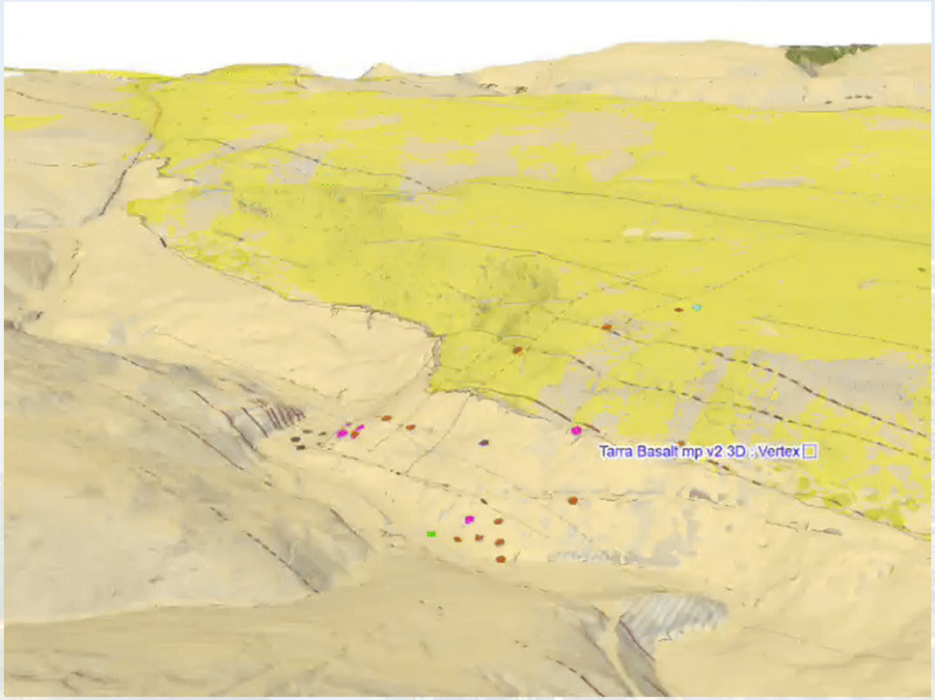
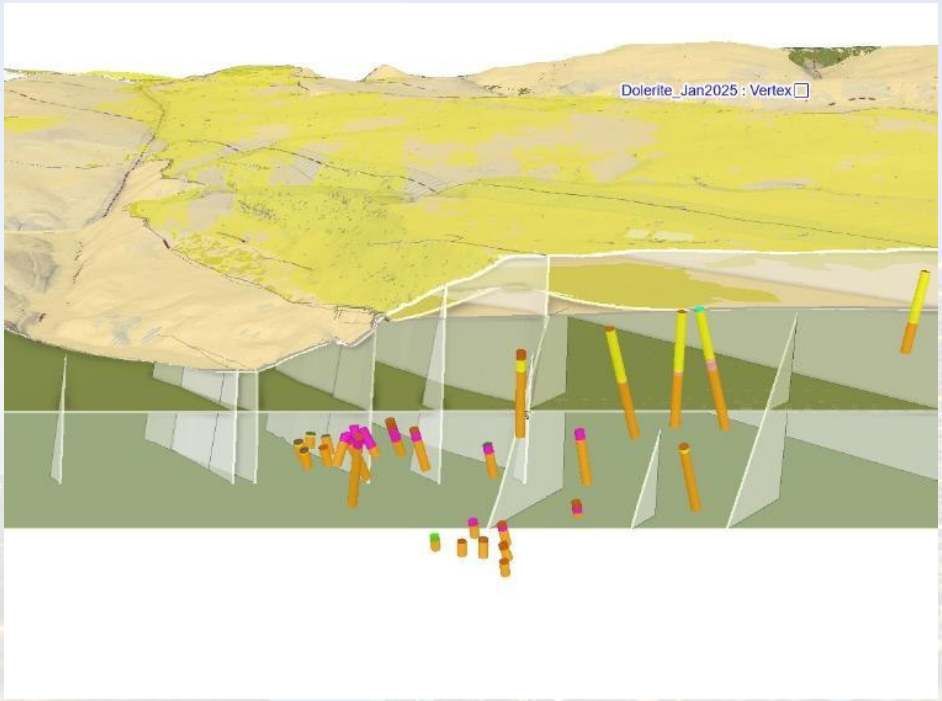


Context

- **Background:** Upgrading or exploring new renewable energy potential is crucial to achieving Australia's renewable energy targets
- Understanding the geology of the site from geotechnical drilling investigations is one of the most critical works in the construction of hydroelectric power generation.
- A key part to building the geological model lies in understanding the geological layers from borehole samples.



Context

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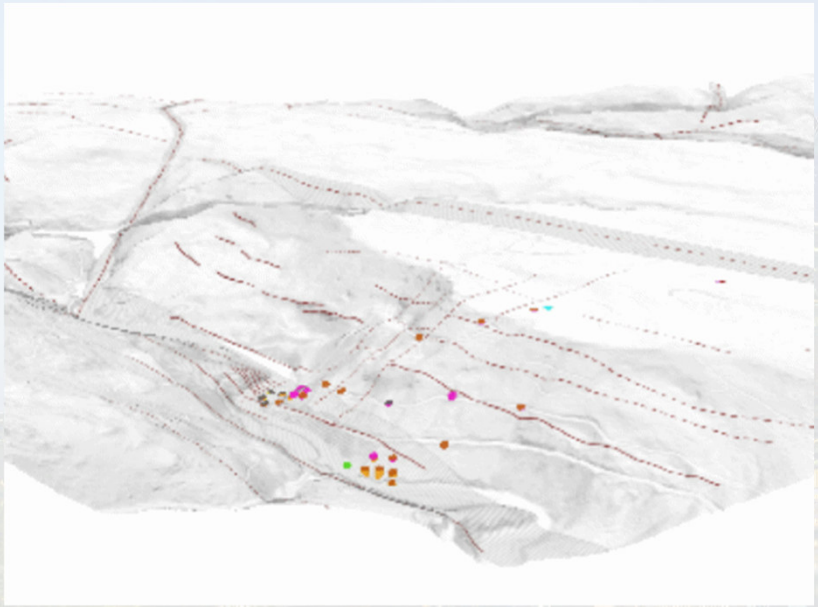
- Understanding the geology of the site from geotechnical drilling investigations is one of the most critical works in the construction of hydroelectric power generation.
- A key part to building the geological model lies in understanding the geological layers from borehole samples.
- **Problem identification**
  - Cost of the additional geology software and training
  - Data integration with field data collection
  - Limitation on GIS platform
  - Knowledge gap on scripting
- **Objective**: Develop a 3D model to identify geological structures, enabling designers to create designs that best adapt to the underlying geological model

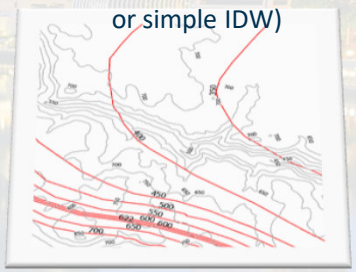
Data input and method



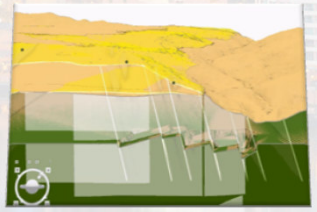
- **Input:** Boreholes (lithology) string and fault lines
- **Methods**:

2D interpolation → 2D to 3D model → 3D model to Long section

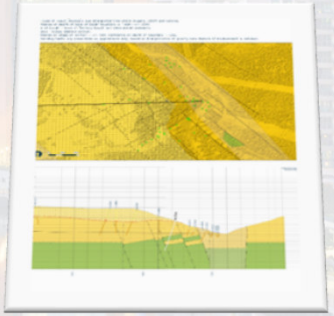
Boreholes string → Contour line → Raster interpolation (Kriging or simple IDW)



2D into 3D object → Extrude

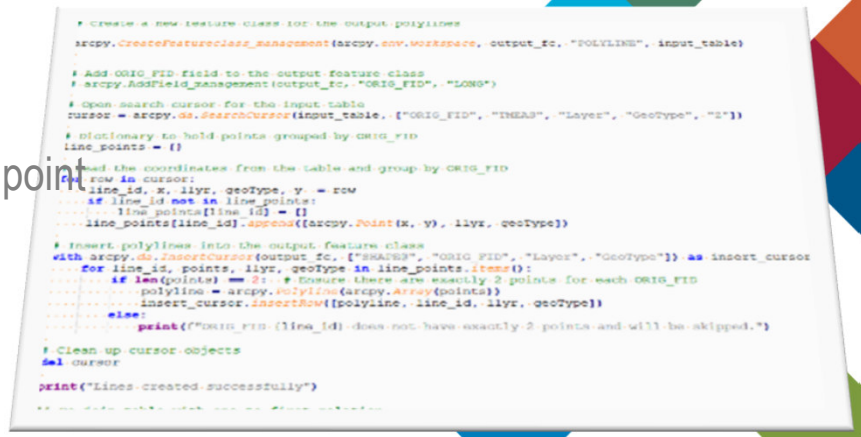


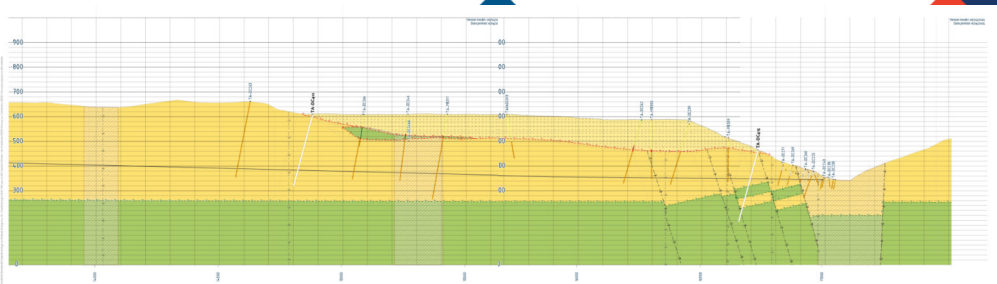
AI-assisted scripting



From 3D model to long section

- Convert XYZ into Route (Chainage) and Z: Tunnel alignment, boreholes point location, lithology string, and faults
- Pseudo code:
  - Get the geometry of each layer [Chainage , z]
  - Convert [Chainage , z] into [x , y] geometry.
- **AI-assisted** scripting using ChatGPT
  - Question: “Create 3D polyline that preserves attributes from XYZ table”
  - Review and iterate ~ need script basic understanding
    - Grammatically correct script but result in error.
    - Not achieving objective: Re-write the question or input



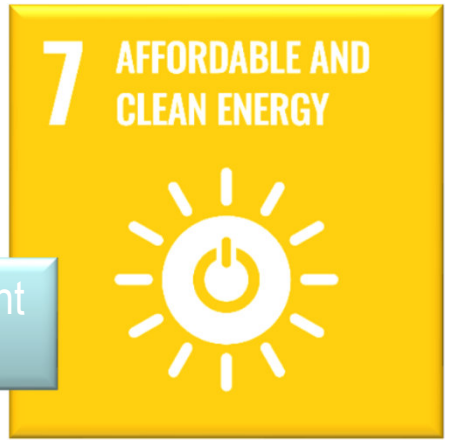


Take home messages

- The combined use of spatial analytical tools and AI opens opportunity to answer spatial question
- It speeds up the learning process and fill the knowledge gap
- The challenge would be to review/assess the answer produced by AI
- Limitation and future work:
  - Abrupt geological features such as raft or lens have not been considered in this model
  - To make a smoother automatic process from the input to long section
- AI-assisted scripting closely coupled with generic GIS platform opens opportunities for us to answer spatial questions that never been explored before.

The most relevant SDGs related to the presentation and theme of this session

1st relevant SDG



2nd relevant SDG

3rd relevant SDG

SUSTAINABLE DEVELOPMENT GOALS

International Federation of Surveyors supports the Sustainable Development Goals

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STEP 1: SELECT HERE THE THREE MOST RELEVANT SDGs
STEP 2: COPY THE SDG INTO PREVIOUS SLIDE