

# Making 'BIM' Work for Project Controls

A workshop and case study on how to use digital processes to drive superhuman outcomes on your projects













# ZERO



# Upskill your team in BIM to stay competitive and relevant

- Improve communication, efficiencies, productivity, and safety
- Choose from a suite of skill specialisations in BIM
- 3-day microcredentials delivered in Brisbane
- Learn from industry experts

*Learn more: [bond.edu.au/BIM-MC](https://bond.edu.au/BIM-MC)*






# 4D Planning





A grayscale photograph of a construction site. In the foreground, there are several tall, vertical structures under construction, heavily encased in complex scaffolding. A large tower crane is visible on the left side, its long jib extending diagonally across the upper portion of the frame. In the center-right, a construction worker is silhouetted against the sky, standing on a high platform or formwork. The background shows a hazy, overcast sky. The overall scene conveys a sense of active industrial construction.

# Construction and infrastructure



An aerial, long-exposure photograph of a complex highway interchange at night. The image is dominated by bright, golden-yellow light trails from moving vehicles, creating a sense of motion and flow. The trails form a large, circular loop on the left side and several straight paths that intersect and cross each other. The background is dark, showing the silhouettes of buildings and trees, which are partially illuminated by the ambient light from the roads. The overall composition is dynamic and visually striking.

Digital solutions should solve  
real problems



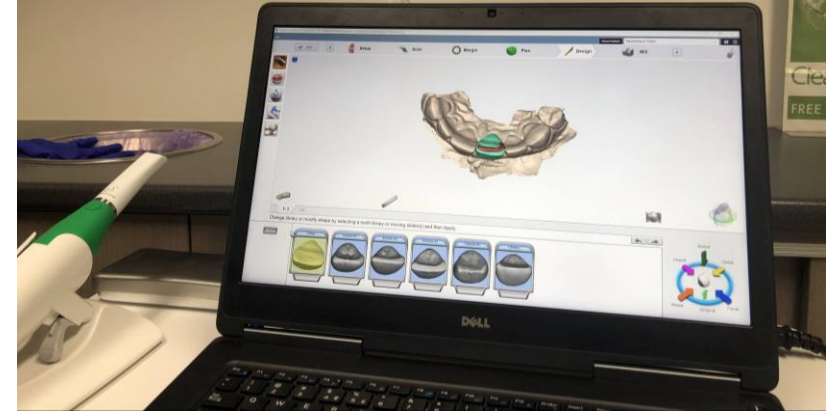
Like broken teeth



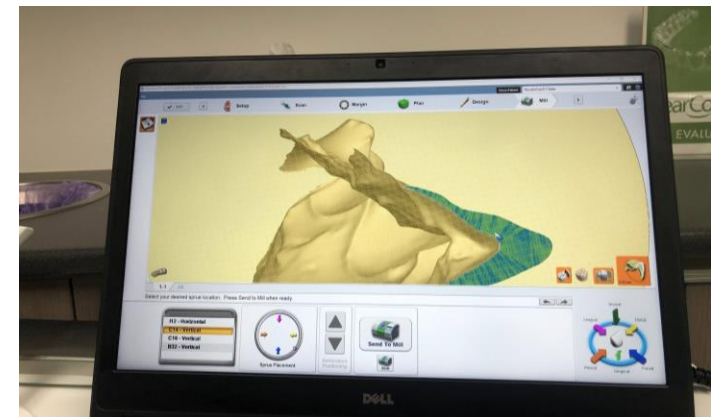
## Laser scan to solids model



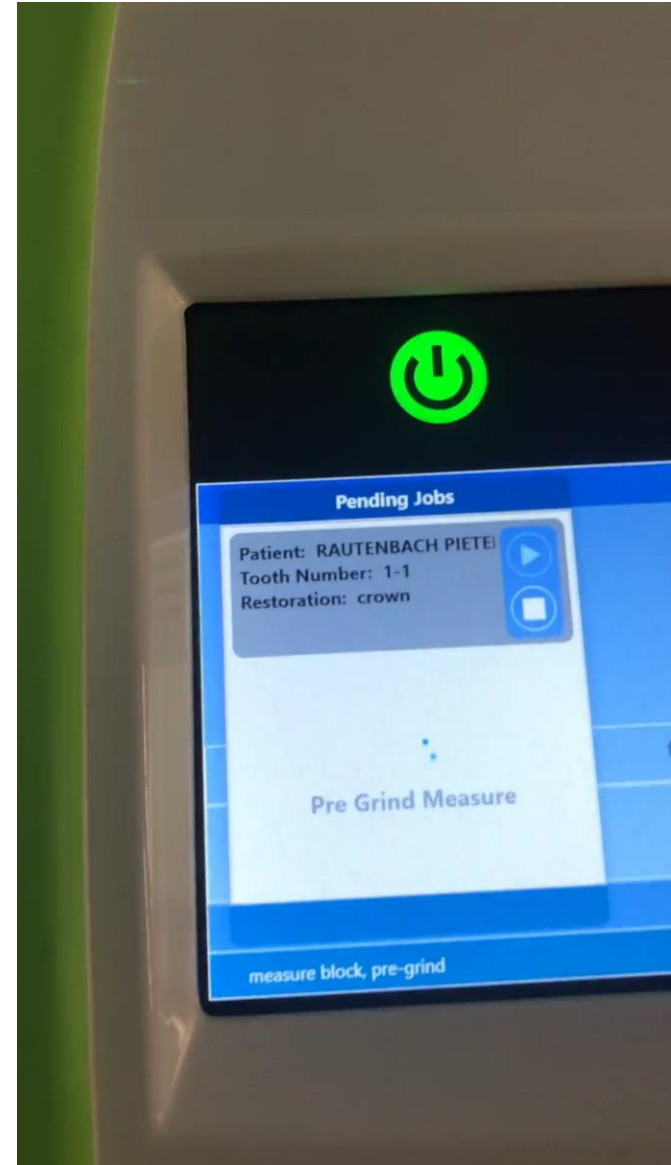
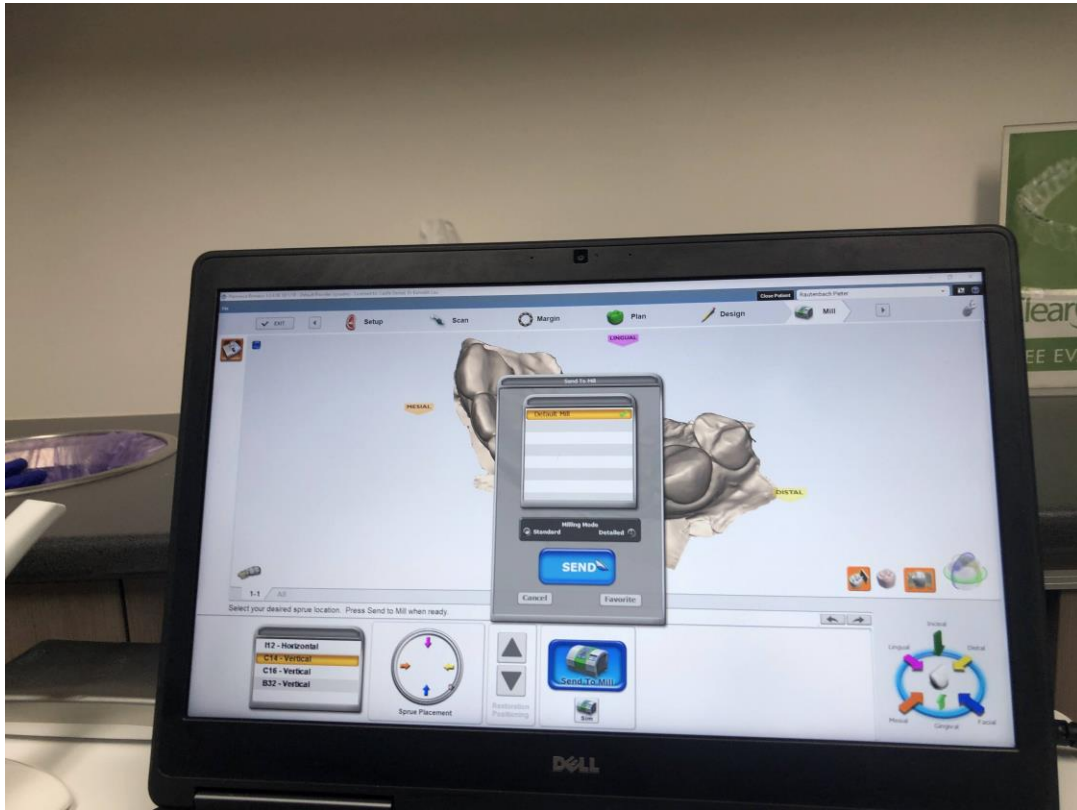
## Computer-aided design



## Structural analysis

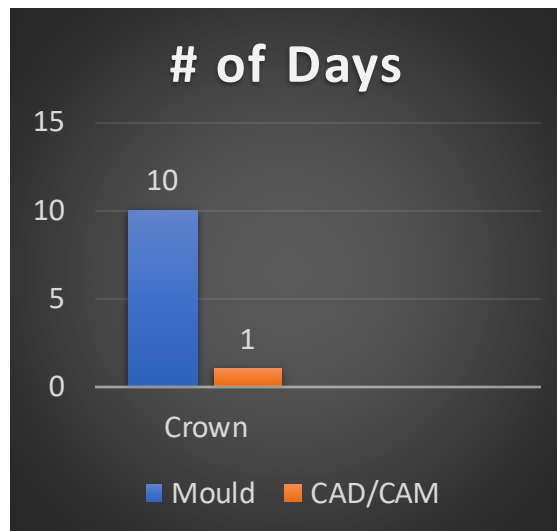


## Interoperability between design and manufacture





# 10x improvement



 **CASTLE  
DENTAL**  
(07) 3350 2517

Visit us at  
Shop D, Level 1  
359 Gympie Rd  
Kedron Qld 4031

Your Family  
friendly dentist



A top-down view of a drafting table with architectural blueprints. The blueprints show various floor plans, including a large central area with a circular pattern of small circles. Drafting tools are scattered around: a pair of compasses on the left, an orange highlighter and a green highlighter at the top, a black pen with its cap off on the right, and a clear triangular ruler on the right side. The text "Current State of using digital for planning" is overlaid in white in the center.

Current State of using digital  
for planning



Import IFC  
Open IFC  
Batch Convert IFC  
Select IFC Imported  
Extract IFC Ids  
Remove IFC Ids  
Set Global IFC Ids  
Revise IFC AEOCSIM step  
Optimize IFC  
Export IFC Enhanced  
IFC Diff  
Convert to SP  
Load Properties Mapping  
Load Properties Families  
GeomGym Blog

ggRevitIFC

Properties (3D) x

3D View

3D View: (3D) Edit Type

Graphics

View Scale: 1 : 100  
Scale Value: 1: 100  
Detail Level: Medium  
Parts Visibility: Show Original  
Visibility/Graphic: Edit...  
Graphic Display: Edit...  
Discipline: Coordination  
Show Hidden Li: By Discipline  
Default Analysis: None  
Sun Path:

Extents

Crop View:   
Crop Region Vis:   
Annotation Crop:   
Far Clip Active:   
Far Clip Offset: 304800.0  
Scope Box: None  
Section Box:

Camera

Rendering Setti...: Edit...  
Locked Orientat...:   
Projection Mode: Orthographic  
Eye Elevation: 15507.9  
Target Elevation: 8473.0  
Camera Position: Adjusting

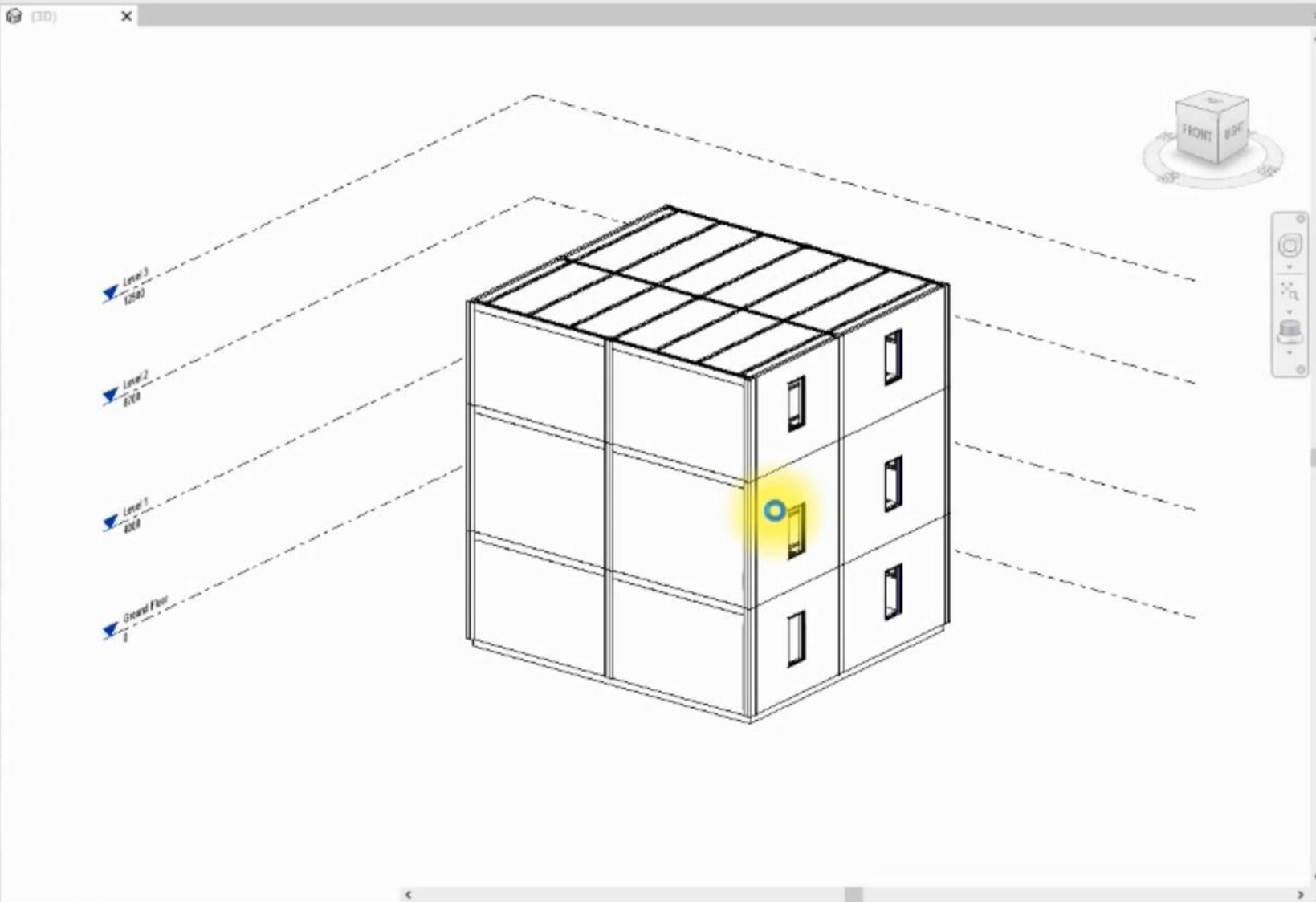
Identity Data

View Template: <None>  
View Name: (3D)  
Dependency: Independent  
Title on Sheet:

Phasing

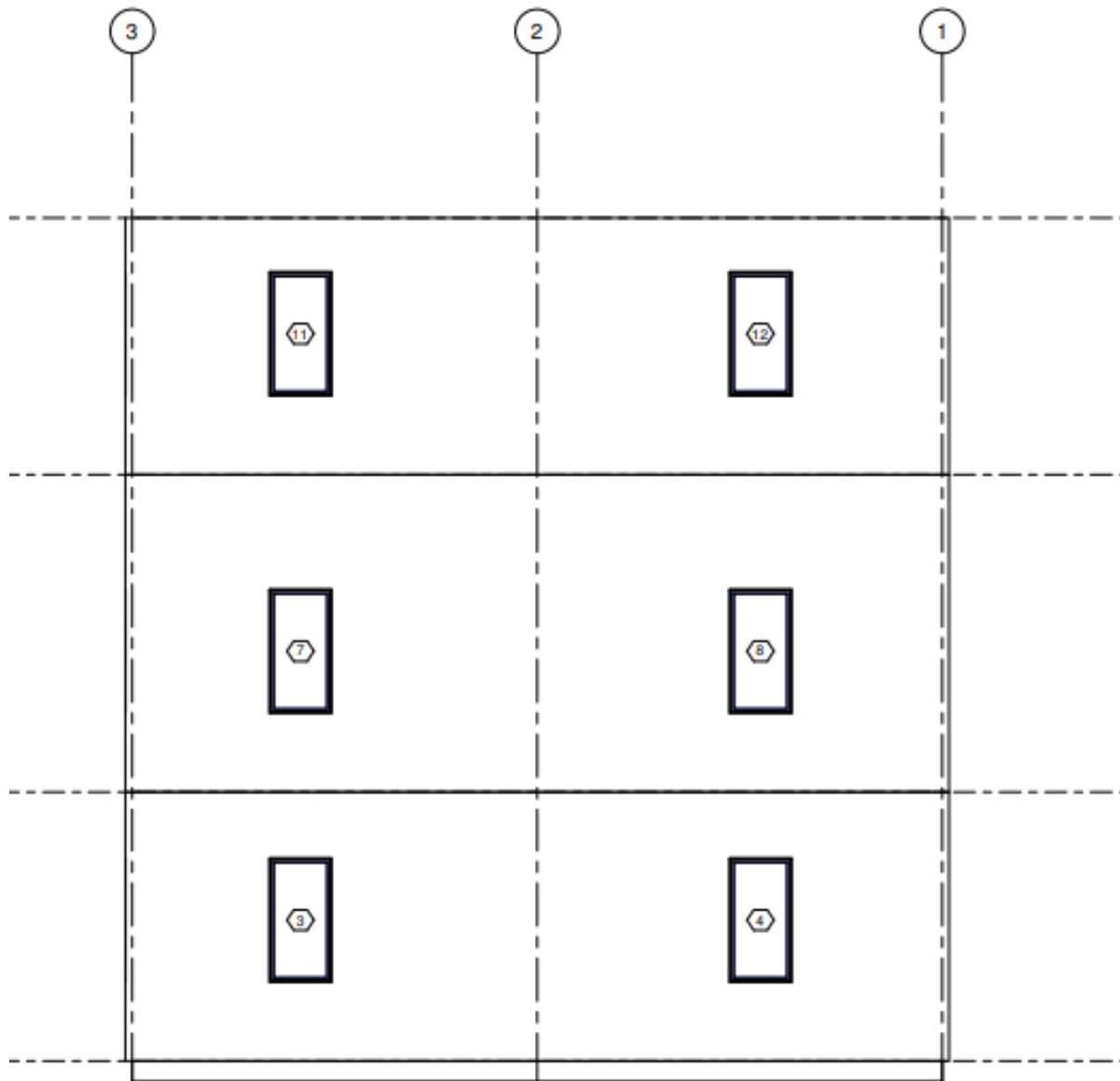
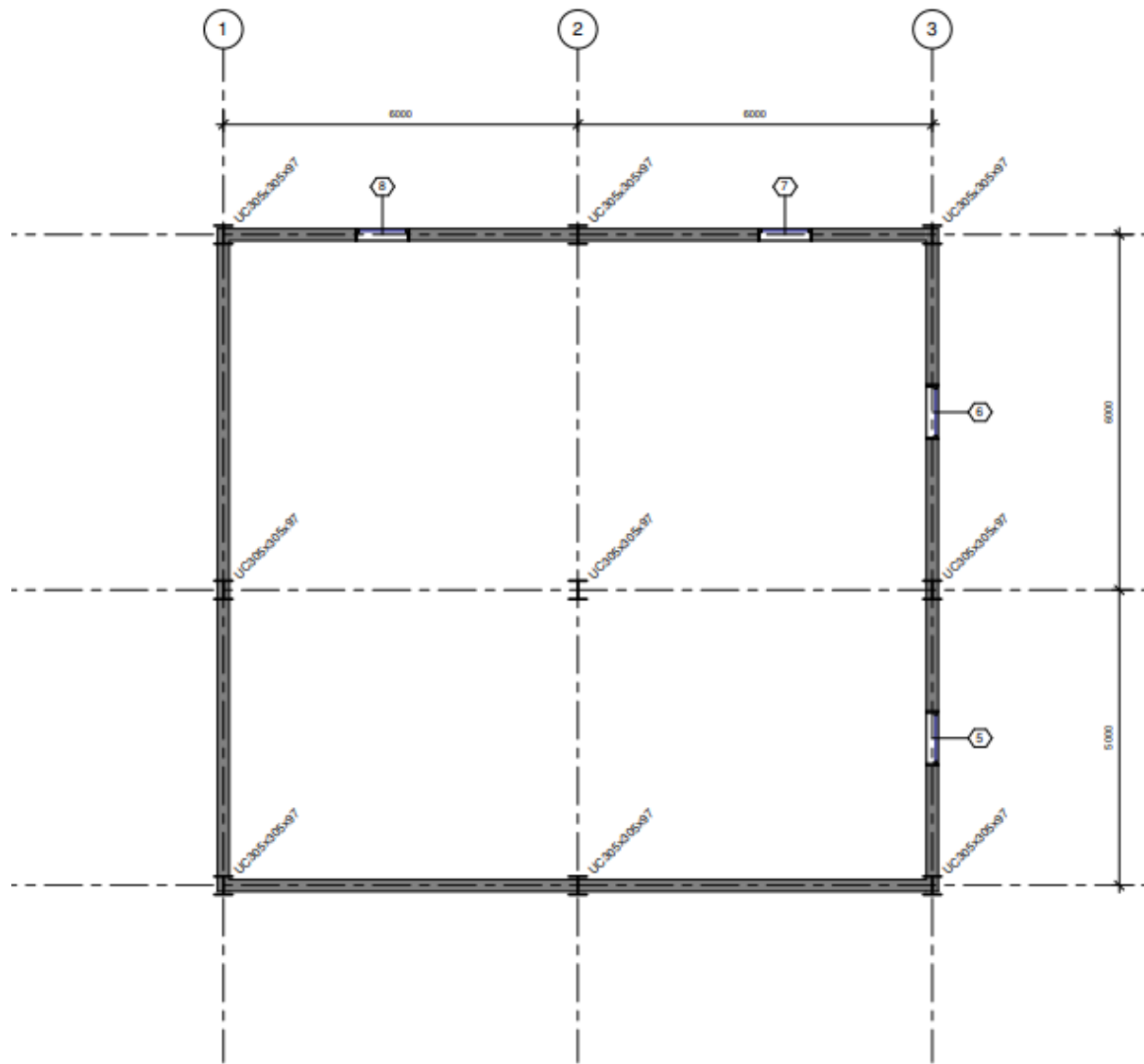
Phase Filter: Show All  
Phase: New Construction

Properties help Apply



Project Browser - tower small

- Views (all)
  - Structural Plans
  - Floor Plans
    - Ground Floor
    - Level 1
    - Level 2
    - Level 3
    - Site
    - True North
  - Ceiling Plans
    - Ground Floor
    - Level 1
    - Level 2
    - Level 3
  - 3D Views
    - (3D)
  - Elevations (Building Elevation)
    - East
    - North
    - South
    - West
  - Sections (Building Section)
    - Section 1
  - Legends
  - Schedules/Quantities (all)
    - Door Schedule
    - Window Schedule
  - Sheets (all)
  - Families
    - Annotation Symbols
    - Cable Trays
    - Ceilings
    - Columns
    - Conduits
    - Curtain Panels
    - Curtain Systems
    - Curtain Wall Mullions
    - Detail Items
    - Division Profiles
    - Doors
    - Duct Systems
    - Ducts
    - Flex Ducts
    - Flex Pipes
    - Floors
    - Furniture





# MTO - Excel

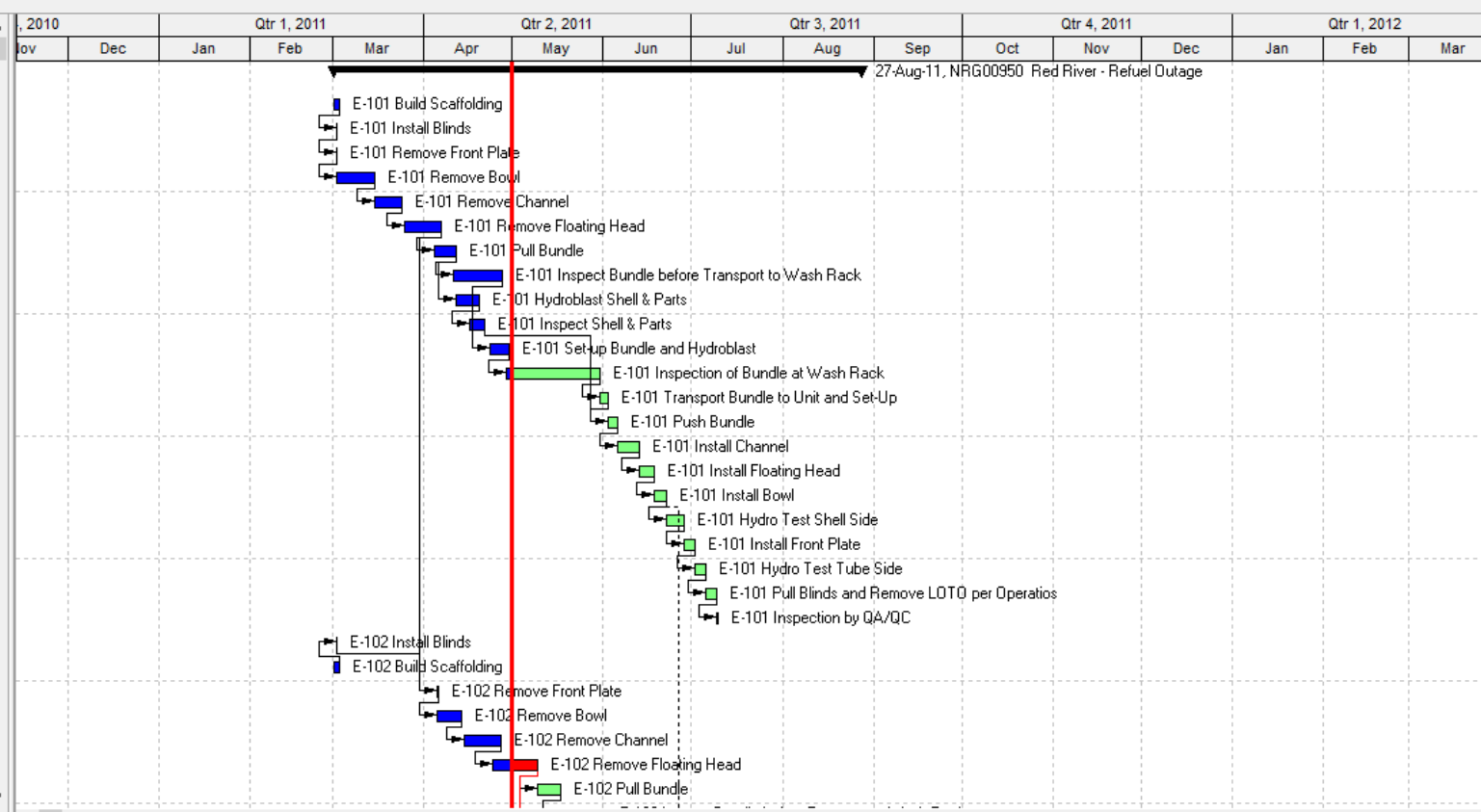


<Multi-Category Material Takeoff>			
A	B	C	D
Family and Type	Material: Name	Material: Area	Material: Volume
Basic Wall: Generic - 200m	Concrete, Precast	22 m <sup>2</sup>	4.38 m <sup>3</sup>
Basic Wall: Generic - 200m	Concrete, Precast	10 m <sup>2</sup>	1.92 m <sup>3</sup>
Basic Wall: Generic - 200m	Concrete, Precast	17 m <sup>2</sup>	3.33 m <sup>3</sup>
Basic Wall: Generic - 200m	Concrete, Precast	15 m <sup>2</sup>	2.99 m <sup>3</sup>
Basic Wall: Generic - 200m	Concrete, Precast	19 m <sup>2</sup>	3.81 m <sup>3</sup>
Basic Wall: Generic - 200m	Concrete, Precast	38 m <sup>2</sup>	7.68 m <sup>3</sup>
Basic Wall: Generic - 200m	Concrete, Precast	30 m <sup>2</sup>	6.00 m <sup>3</sup>
Basic Wall: Generic - 200m	Concrete, Precast	11 m <sup>2</sup>	2.16 m <sup>3</sup>
Basic Wall: Generic - 200m	Concrete, Precast	38 m <sup>2</sup>	7.69 m <sup>3</sup>
Basic Wall: Generic - 200m	Concrete, Precast	27 m <sup>2</sup>	5.40 m <sup>3</sup>
Basic Wall: Generic - 200m	Concrete, Precast	17 m <sup>2</sup>	3.48 m <sup>3</sup>



Activities

Layout: Classic Schedule Layout		Filter: All Activities			
Activity ID	Activity Name	Original Duration	Remaining Duration	Schedule % Complete	Start
<b>NRG00950 Red River - Refuel Outage</b>					
A1010	E-101 Build Scaffolding	1	0	100%	01-Mar-11
A1020	E-101 Install Blinds	0	0	100%	02-Mar-11
A1030	E-101 Remove Front Plate	0	0	100%	02-Mar-11
A1040	E-101 Remove Bowl	14	0	100%	02-Mar-11
A1050	E-101 Remove Channel	9	0	100%	15-Mar-11
A1060	E-101 Remove Floating Head	11	0	100%	25-Mar-11
A1070	E-101 Pull Bundle	5	0	100%	04-Apr-11
A1080	E-101 Inspect Bundle before Transport to W.	12	0	100%	11-Apr-11
A1090	E-101 Hydroblast Shell & Parts	6	0	100%	12-Apr-11
A1100	E-101 Inspect Shell & Parts	3	0	100%	16-Apr-11
A1110	E-101 Set-up Bundle and Hydroblast	6	0	100%	23-Apr-11
A1120	E-101 Inspection of Bundle at Wash Rack	32	30	5.29%	29-Apr-11
A1130	E-101 Transport Bundle to Unit and Set-Up	3	3	0%	30-May-11
A1140	E-101 Push Bundle	3	3	0%	02-Jun-11
A1150	E-101 Install Channel	7	7	0%	05-Jun-11
A1160	E-101 Install Floating Head	5	5	0%	13-Jun-11
A1170	E-101 Install Bowl	4	4	0%	18-Jun-11
A1180	E-101 Hydro Test Shell Side	6	6	0%	22-Jun-11
A1190	E-101 Install Front Plate	4	4	0%	28-Jun-11
A1200	E-101 Hydro Test Tube Side	3	3	0%	02-Jul-11
A1210	E-101 Pull Blinds and Remove LOTO per Op	4	4	0%	05-Jul-11
A1220	E-101 Inspection by QA/QC	1	1	0%	09-Jul-11
A1230	E-102 Install Blinds	0	0	100%	02-Mar-11
A1240	E-102 Build Scaffolding	1	0	100%	01-Mar-11
A1250	E-102 Remove Front Plate	0	0	100%	05-Apr-11
A1260	E-102 Remove Bowl	9	0	100%	05-Apr-11
A1270	E-102 Remove Channel	10	0	100%	14-Apr-11
A1280	E-102 Remove Floating Head	15	9	41.46%	24-Apr-11
A1290	E-102 Pull Bundle	8	8	0%	09-May-11



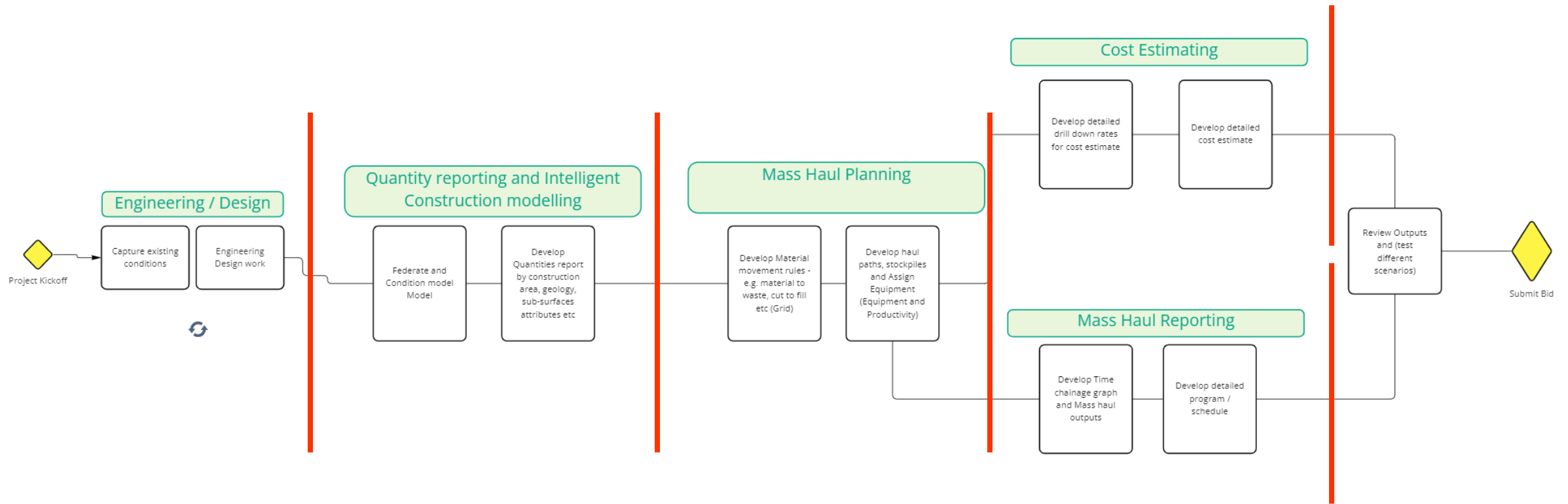
General Status Resources Predecessors Successors

Activity: A1020 E-101 Install Blinds Project: NRG00950

Activity ID	Activity Name	Relations	Lag	Activity Status	Primary Resource
A1010	E-101 Build Scaffolding	FS	0	Completed	FCarp.Finish Carpenter

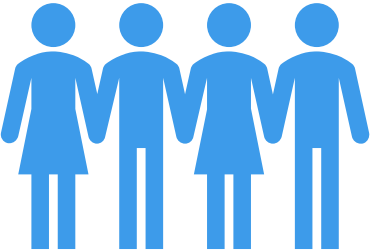
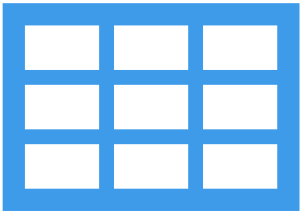


# The current process on Infrastructure Projects



Customer – “We hardly get the opportunity to review our schedules, never mind optimise them – and we need to live with multi-billion-dollar bids for years if we win them”

# The current planning process is manual with no link to 3D



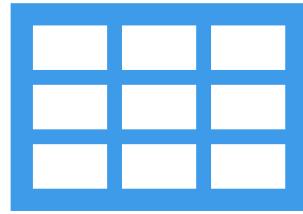
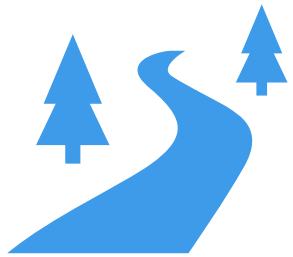
Often more than 20,000x tasks



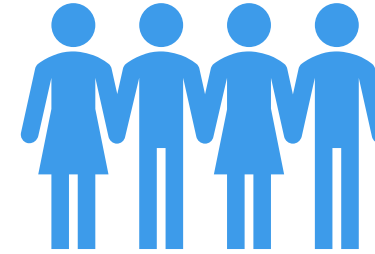
Activity ID	Activity Name	Original Duration	Remaining Duration	Schedule % Complete	Start
NRG00950	Red River - Refuel Outage	170	117	30.00%	01-Mar-11
A1010	E-101 Build Scaffolding	1	0	100%	01-Mar-11
A1020	E-101 Install Blinds	0	0	100%	02-Mar-11
A1040	E-101 Remove Front Plate	14	0	100%	02-Mar-11
A1050	E-101 Remove Channel	9	0	100%	15-Mar-11
A1060	E-101 Remove Floating Head	11	0	100%	25-Mar-11
A1070	E-101 Pull Bundle	5	0	100%	04-Apr-11
A1080	E-101 Inspect Bundle before Transport to Wash Rack	12	0	100%	11-Apr-11
A1090	E-101 Hydroblast Shell & Parts	6	0	100%	12-Apr-11
A1100	E-101 Inspect Shell & Parts	3	0	100%	16-Apr-11
A1110	E-101 Set-up Bundle and Hydroblast	6	0	100%	23-Apr-11
A1120	E-101 Inspection of Bundle at Wash Rack	32	30	5.25%	29-Apr-11
A1130	E-101 Transport Bundle to Unit and Set-Up	3	3	0%	20-May-11
A1140	E-101 Push Bundle	3	3	0%	02-Jun-11
A1150	E-101 Install Channel	7	7	0%	05-Jun-11
A1160	E-101 Install Floating Head	5	5	0%	13-Jun-11
A1170	E-101 Install Bowl	4	4	0%	18-Jun-11
A1180	E-101 Hydro Test Shell Side	6	6	0%	22-Jun-11
A1190	E-101 Install Front Plate	4	4	0%	28-Jun-11
A1200	E-101 Hydro Test Tube Side	3	3	0%	02-Jul-11
A1210	E-101 Pull Blinds and Remove LOTD per Op	4	4	0%	05-Jul-11
A1220	E-101 Inspection by QA/QC	1	1	0%	09-Jul-11
A1230	E-102 Install Blinds	0	0	100%	02-Mar-11
A1240	E-102 Build Scaffolding	1	0	100%	01-Mar-11
A1250	E-102 Remove Front Plate	0	0	100%	05-Apr-11
A1260	E-102 Remove Bowl	9	0	100%	05-Apr-11
A1270	E-102 Remove Channel	10	0	100%	14-Apr-11
A1280	E-102 Remove Floating Head	15	0	41.66%	24-Apr-11
A1290	E-102 Pull Bundle	8	8	0%	09-May-11



# Planning in manual with no link to 3D models or attributes



Often more than 20,000x tasks

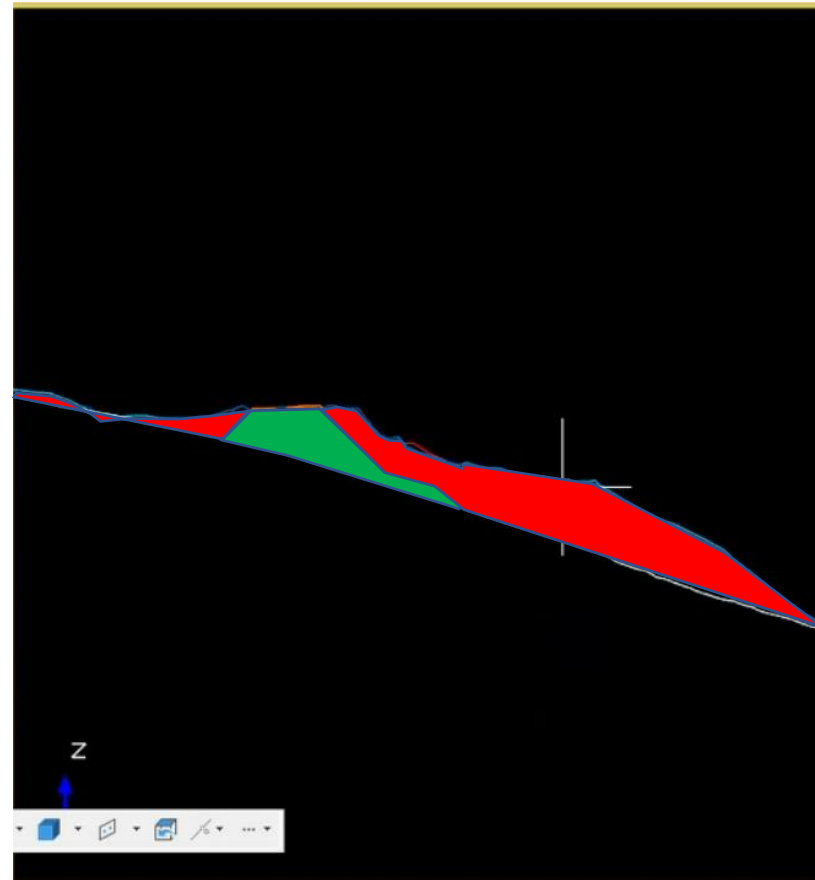


Layout: Classic Schedule Layout Filter All: Critical

Activity ID	Activity Name	OD	RD	Schedule % Complete
EC00515	City Center Office Building Addition	580	567	2.67%
EC00515.D&E	Design and Engineering	0	0	0%
EC00515.Found	Foundation	0	0	0%
EC00515.Structure	Structure	0	0	0%
EC00515.Mechanicals	Mechanical/Electrical Systems	575	562	4.19%
EC00515.Ex-Finish	Exterior Finishes	0	0	0%
EC00515.Int-Finish	Interior Finishes	106	106	0%
EC1700	Drywall in Offices	36	36	0%
EC1820	Touch-up and Clean-up	2	2	0%
EC1840	Finishes Complete	0	0	0%
EC1850	Punch List	5	5	0%
EC1860	Building Addition Complete	0	0	0%
EC00515.Int-Finish.Fixtures	Plumbing and Lighting Fixtures	0	0	0%
EC00515.Int-Finish.Coverings	Floor and Carpeting	12	12	0%
EC1790	Install Floor and Carpeting	12	12	0%
EC00515.Int-Finish.Carp	Carpentry	59	59	0%
EC1740	Install Ceiling Grid	36	36	0%
EC1800	Finish Carpentry and Millwork	12	12	0%



We are wasting money because of poor planning



Project Scope



Money Wasted







Our performance is poor

# Delays to large-scale construction projects more than double since start of pandemic

12 JAN, 2022 | BY ROB HORGAN

## **Nine out of ten projects experience cost overrun**

The vast majority of construction projects completed in twenty countries over the course of a 70-year period—85%, to be exact!—experienced cost overrun

## **45% of construction professionals report spending more time than expected on non-optimal activities**

What were these non-optimal activities? [The biggest culprits](#) were fixing mistakes, looking for project data, and managing conflict resolution.

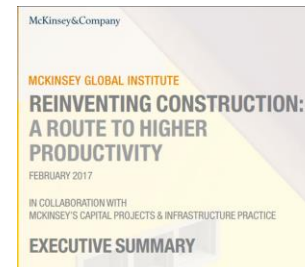
## **Productivity changes could save the industry \$1.63 trillion per year**

[According to McKinsey](#), boosting productivity could save nearly \$1.7 trillion annually. That's a huge impact from tidying up roughly 14 hours of work each week per person!



# What is causing the poor performance?

- ▶ Processes and parties are siloed - *“a decentralized system is incapable of success”*
- ▶ Information is lost between handover and phases
- ▶ Organisations don't learn from their mistakes
- ▶ Poor decisions are made based on poor information
- ▶ Our adoption of technology is poor
  
- ▶ **In Summary** - The right information is not provided to the right people at the right time



Independent  
Project  
Analysis



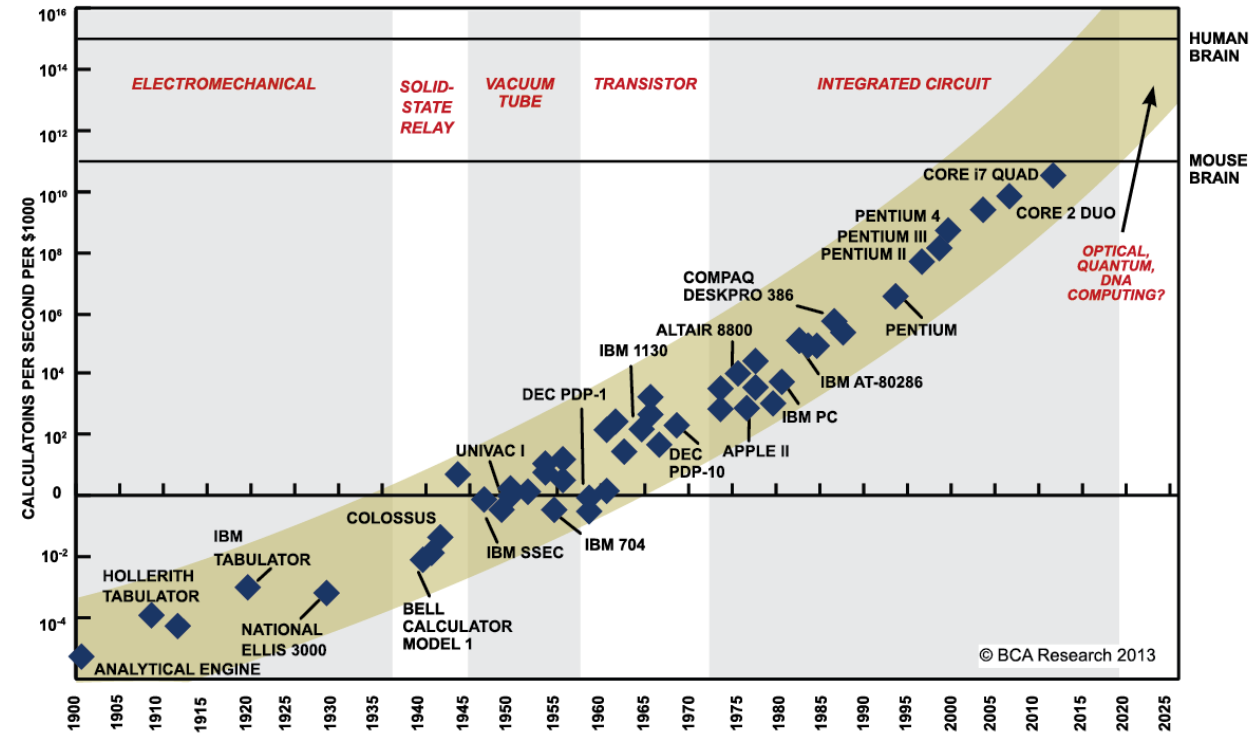
# Technological progress is changing the world

Moore's law is the observation that the number of transistors in a dense integrated circuit (IC) **doubles about every two years**

Maybe the most powerful graph ever conceived is Ray Kurzweil's graph of Moore's law and computing power.

It has or will transform every industry on the planet, construction is no different.

IT innovates the economy and technology's exponential pace of progress is the key driver of market disruption and is a key driver of economic growth.



SOURCE: RAY KURZWEIL, "THE SINGULARITY IS NEAR: WHEN HUMANS TRANSCEND BIOLOGY", P.67, THE VIKING PRESS, 2006. DATAPPOINTS BETWEEN 2000 AND 2012 REPRESENT BCA ESTIMATES.

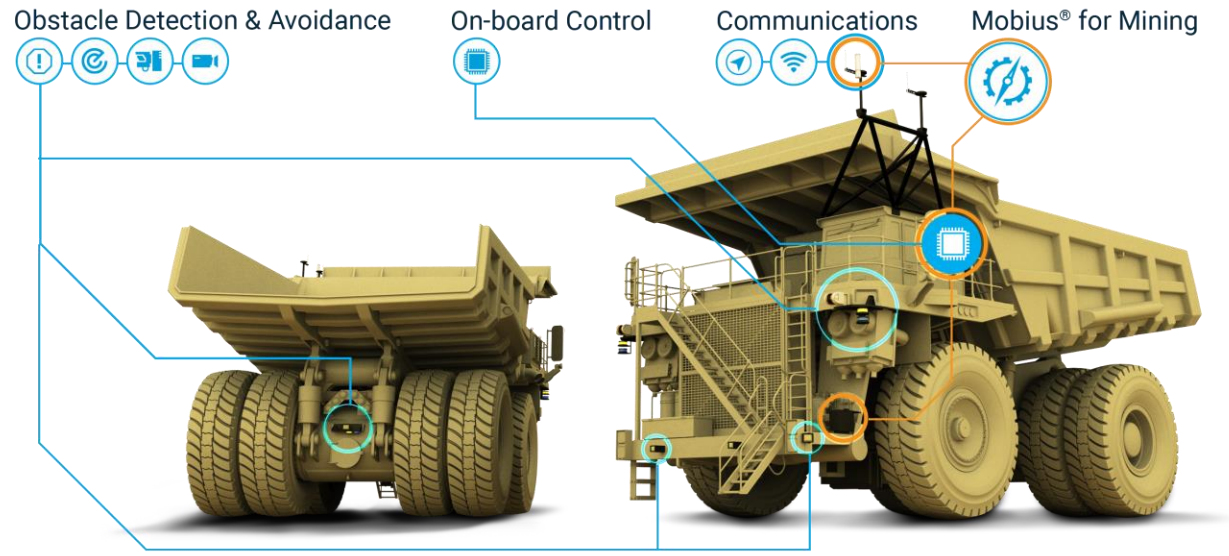




# The construction industry is among the least digitized.

McKinsey Global Institute industry digitization index; 2015 or latest available data


Relatively low digitization  Relatively high digitization  
 ● Digital leaders within relatively undigitized sectors



## BHP reveals \$1bn win from data automation

By Kate Weber  
Feb 15 2022  
12:45PM

0 Comments

Uses machine learning to cast new eye over old exploration data.

Mining giant BHP has unlocked around \$1 billion in "value" in the first year of a major data automation initiative.



Source: Imagining construction's digital future | McKinsey



# Automated scheduling direct from the design

A nice idea or practical in the real world?

A few years ago, we tinkered with the idea of using algorithm to develop the schedule from the 3d model









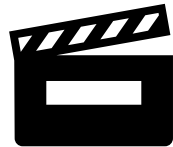
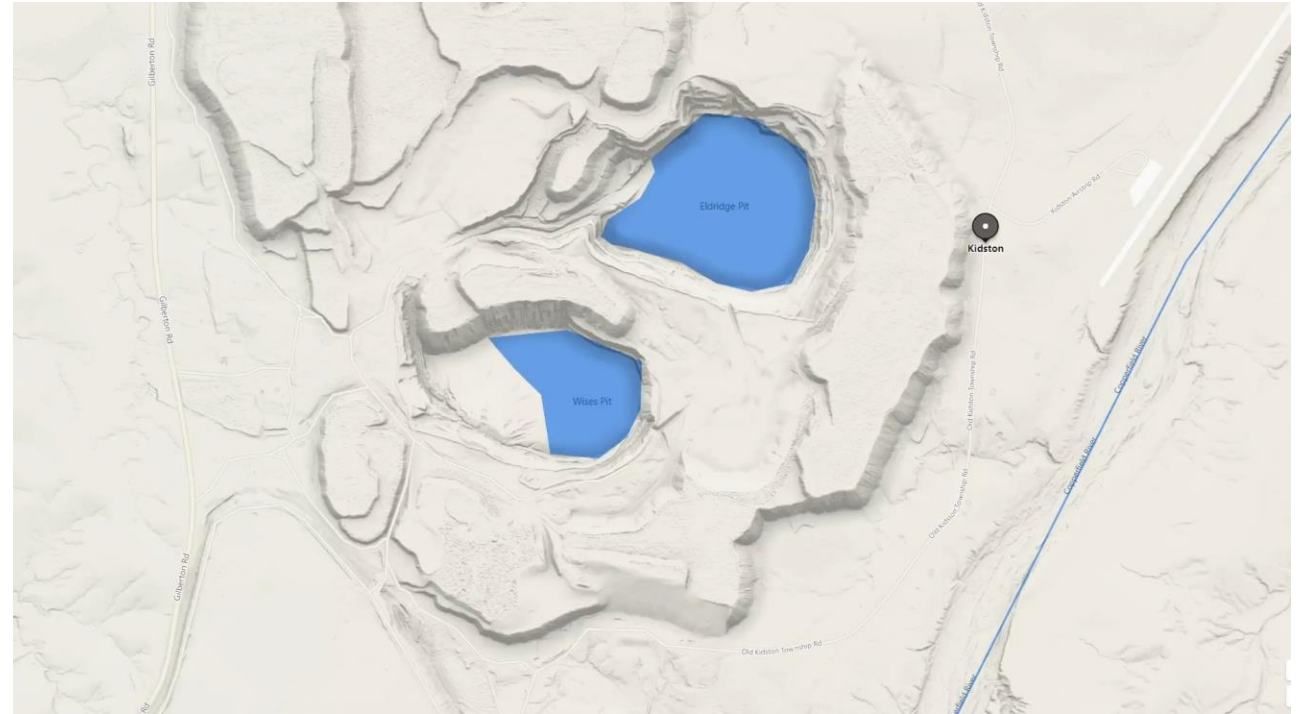
Can these workflows be used  
on real infrastructure  
projects?



This is common in mining



# KIDSTON PUMPED STORAGE HYDRO - KPSH



**Kidston**  
Pumped Storage Hydro Project



# ABOUT ME: JEAN-LUC LEJEUNE

- Project Engineer on the Kidston Pumped Storage Hydro
- Background on Tier 1 civil infrastructure projects
- No prior experience with Deswik before June 2022.
- Familiar with AutoCAD and P6

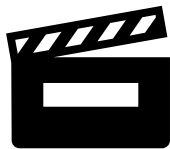


**Kidston**  
Pumped Storage Hydro Project



# ABOUT THE PROJECT: KPSH

- KIDSTON PUMPED STORAGE HYDRO – First pumped storage hydro project in Australia for 40 years
- First to be developed by the private sector
- Third largest electricity storage device in the country
- Pumped Storage – Hydroelectric energy storage using reservoirs at different elevations [a big battery]



**Kidston**

Pumped Storage Hydro Project





# ABOUT THE PROJECT: KPSH

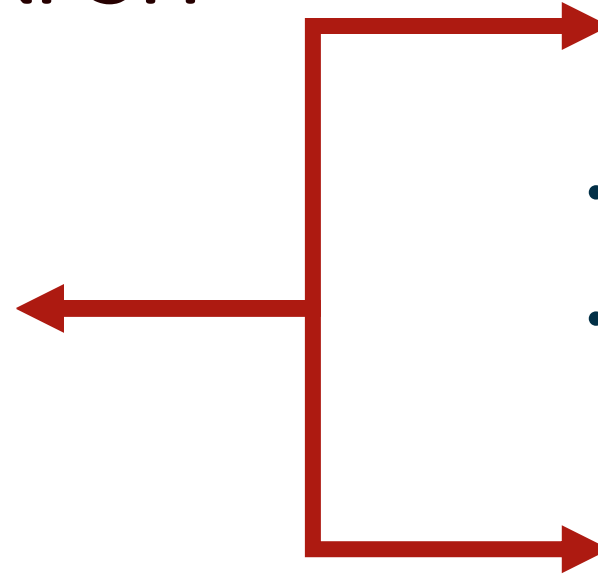


## Client - Genex Power

ASX listed energy company focused on developing a portfolio of renewable energy

## Other projects [In operation and development]

- 50MW Jemalong Solar Project
- 50MW Bouldercombe Battery
- 150MW Kidston Wind Project
- 2GW Bulli Creek Clean Energy Project



CREATIVE CONSTRUCTION™

- Significant hydro and marine experience
- Numerous pumped hydro projects completed



- Tier 1 tunnelling and infrastructure contractor
- Diversifying into the pumped storage hydro market



**Kidston**

Pumped Storage Hydro Project

# HISTORY

- Prospecting as early as **1868**
- Official discovery of gold **1907**
- Kidston Gold Mine in Production
  - 1921 – 1945
  - 1984 – 2001
- Once Australia's largest open cut gold mine, producing 200,000 – 300,000oz each year

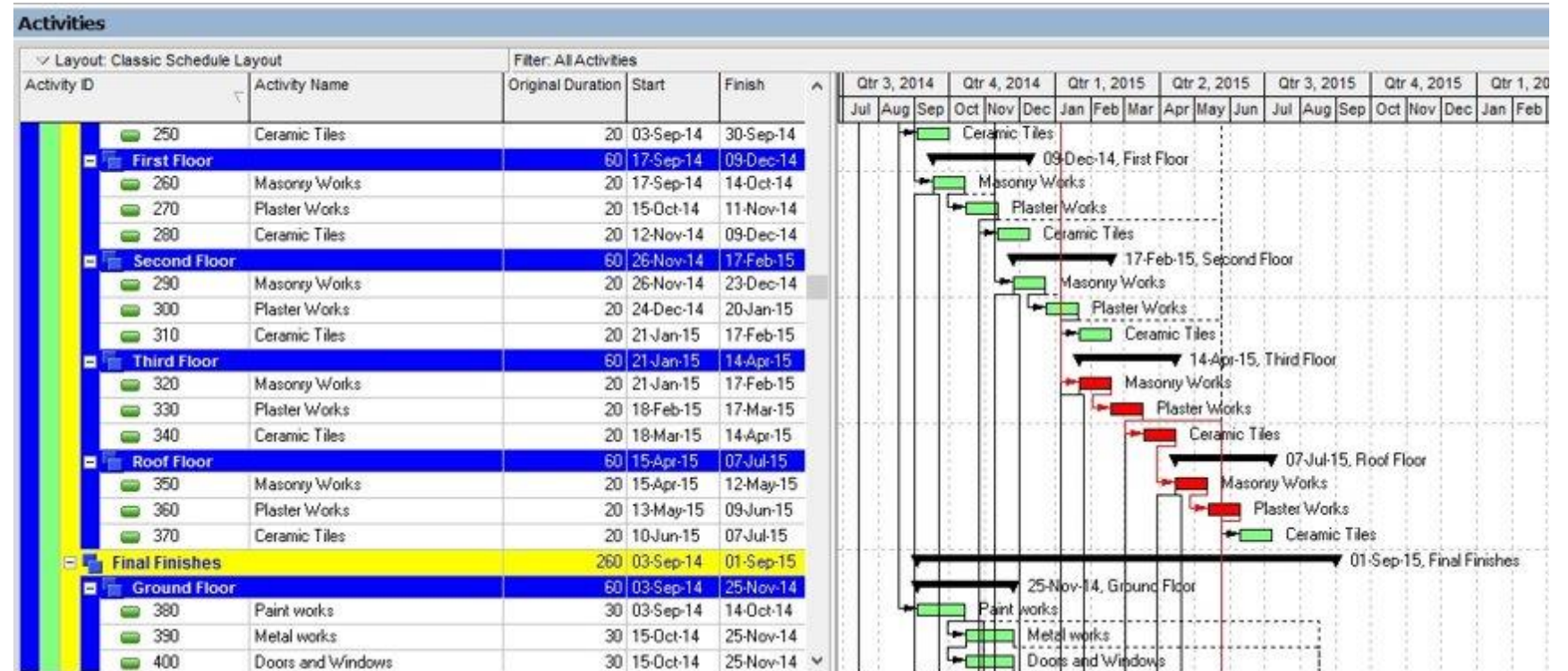


**Kidston**

Pumped Storage Hydro Project

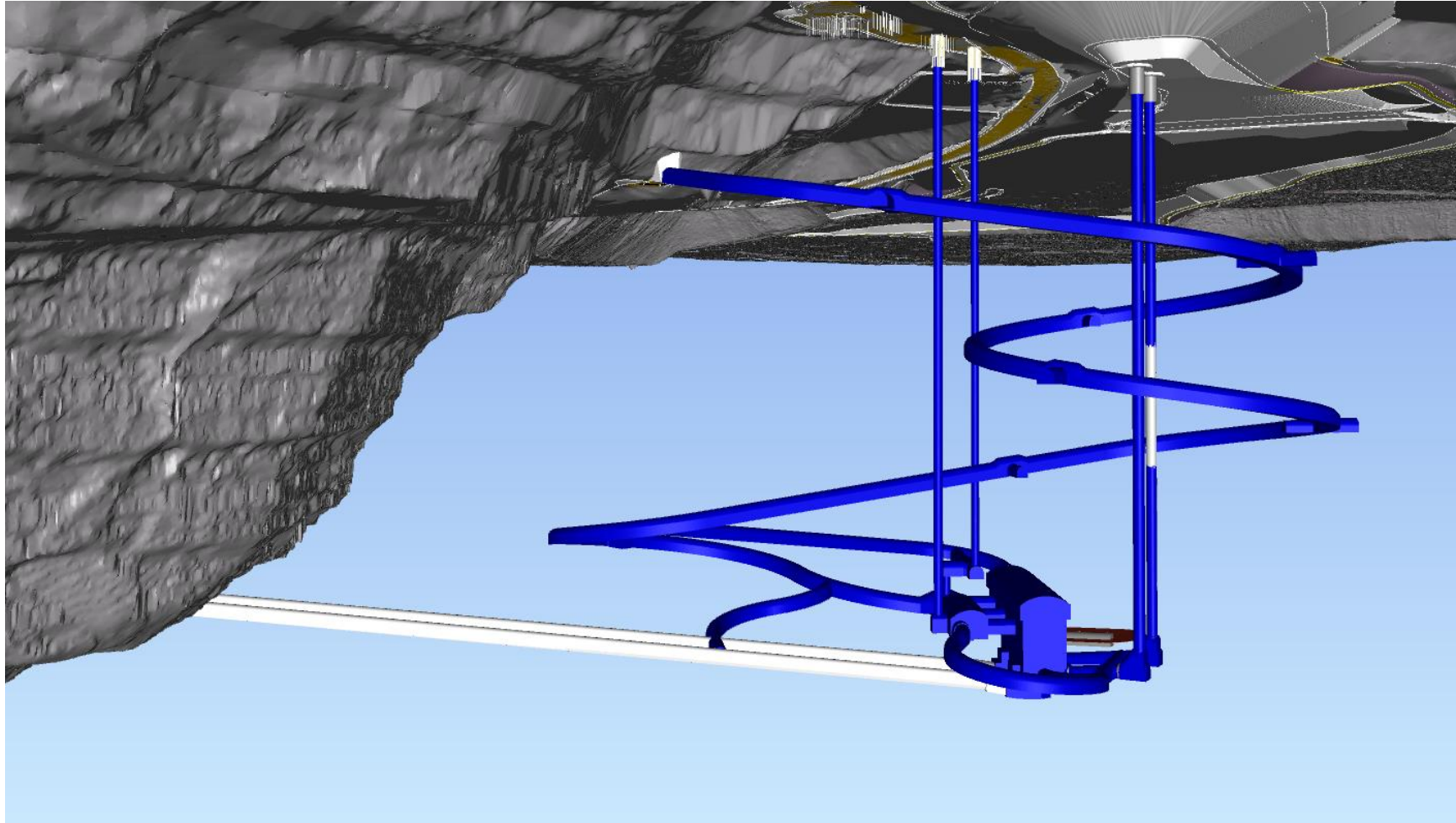
# KPSH ANIMATION - TRADITIONAL PROGRAMS

- P6
- Microsoft project
- Excel
- Lacks visual representation of the works

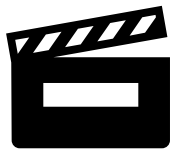




# KPSH UNDERGROUND INFRASTRUCTURE



- Multiple excavation fronts running in parallel
- Competing priorities
- Numerous activity drivers
- Multiple global constraints

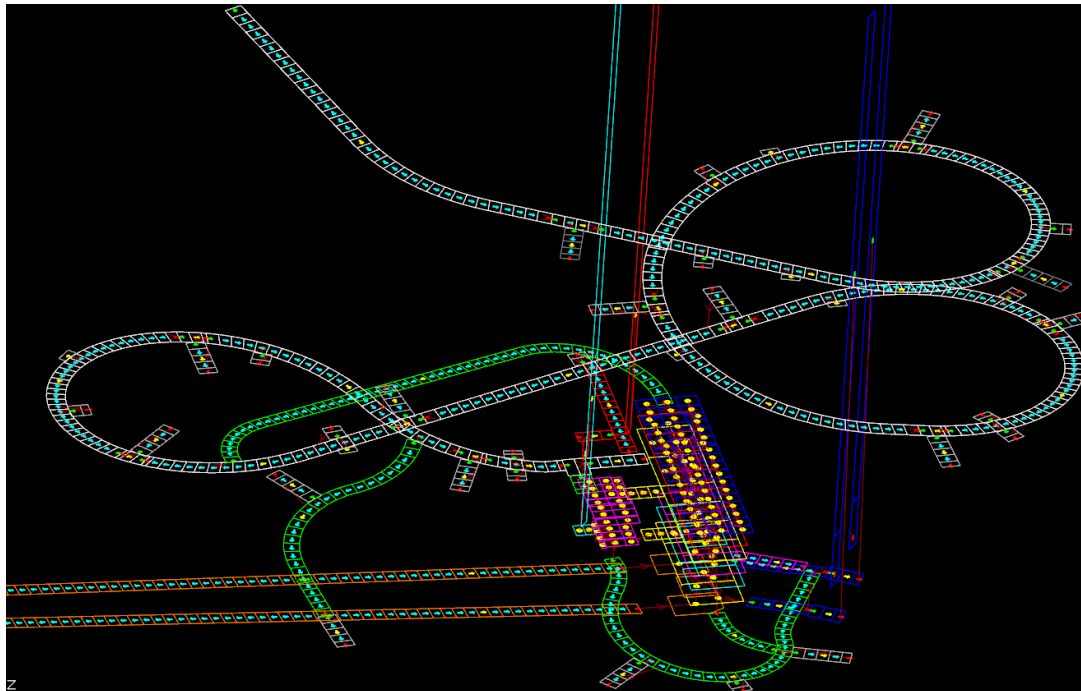


**Kidston**  
Pumped Storage Hydro Project





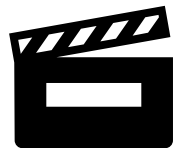
# DESWIK.IS - Interactive Scheduler



The screenshot shows the DESWIK.IS software interface. At the top, there's a menu bar with options like File, Home, View, Filtering, Setup, Tasks, Resources, Rules, Scheduling, and Blend. Below the menu, there are filters for 'Group: ACT TYPE', 'Sort: <No Sorting>', and 'Filter: <No Filtering>'. The main area is divided into a Gantt chart on the right and a task list table on the left. The Gantt chart shows a timeline from July 22 to October 10, with various task bars in different colors. The task list table has columns for Group Name, Activity Type, Warning, Level, Sequence, Description, Task rate, Rate, Duration, Percentage complete, Start, Finish, Task name, Resource, ID, and a checkbox. The table contains many rows of task data.

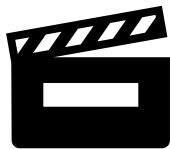
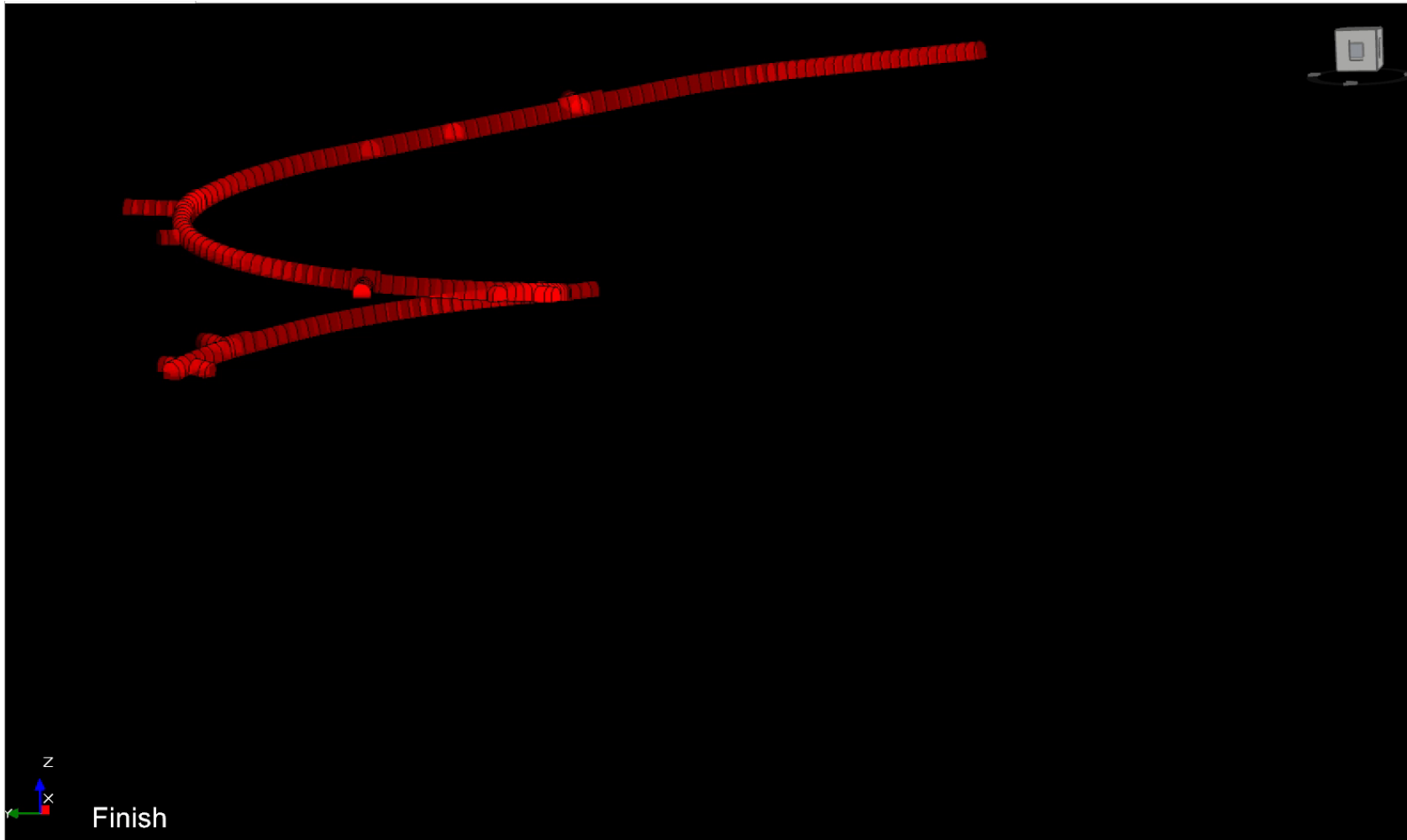
Group Name	ACTIVITY TYPE	Warning	LEVEL	SEQUENCE	Description	Task rate	Rate	Duration	Percentage complete	Start	Finish	Task name	Resource	ID
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 0	26/07/2022 6	Aula Schickel	Felix Junber	MAT_1647823
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 1	21/07/2022 3	Aula Schickel	Felix Junber	MAT_1647824
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 2	22/07/2022 2	Aula Schickel	Felix Junber	MAT_1647825
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 3	23/07/2022 1	Aula Schickel	Felix Junber	MAT_1647826
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 4	24/07/2022 1	Aula Schickel	Felix Junber	MAT_1647827
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 5	25/07/2022 1	Aula Schickel	Felix Junber	MAT_1647828
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 6	26/07/2022 1	Aula Schickel	Felix Junber	MAT_1647829
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 7	27/07/2022 1	Aula Schickel	Felix Junber	MAT_1647830
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 8	28/07/2022 1	Aula Schickel	Felix Junber	MAT_1647831
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 9	29/07/2022 1	Aula Schickel	Felix Junber	MAT_1647832
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 10	30/07/2022 1	Aula Schickel	Felix Junber	MAT_1647833
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 11	31/07/2022 1	Aula Schickel	Felix Junber	MAT_1647834
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 12	01/08/2022 1	Aula Schickel	Felix Junber	MAT_1647835
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 13	02/08/2022 1	Aula Schickel	Felix Junber	MAT_1647836
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 14	03/08/2022 1	Aula Schickel	Felix Junber	MAT_1647837
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 15	04/08/2022 1	Aula Schickel	Felix Junber	MAT_1647838
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 16	05/08/2022 1	Aula Schickel	Felix Junber	MAT_1647839
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 17	06/08/2022 1	Aula Schickel	Felix Junber	MAT_1647840
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 18	07/08/2022 1	Aula Schickel	Felix Junber	MAT_1647841
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 19	08/08/2022 1	Aula Schickel	Felix Junber	MAT_1647842
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 20	09/08/2022 1	Aula Schickel	Felix Junber	MAT_1647843
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 21	10/08/2022 1	Aula Schickel	Felix Junber	MAT_1647844
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 22	11/08/2022 1	Aula Schickel	Felix Junber	MAT_1647845
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 23	12/08/2022 1	Aula Schickel	Felix Junber	MAT_1647846
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 24	13/08/2022 1	Aula Schickel	Felix Junber	MAT_1647847
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 25	14/08/2022 1	Aula Schickel	Felix Junber	MAT_1647848
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 26	15/08/2022 1	Aula Schickel	Felix Junber	MAT_1647849
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 27	16/08/2022 1	Aula Schickel	Felix Junber	MAT_1647850
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 28	17/08/2022 1	Aula Schickel	Felix Junber	MAT_1647851
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 29	18/08/2022 1	Aula Schickel	Felix Junber	MAT_1647852
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 30	19/08/2022 1	Aula Schickel	Felix Junber	MAT_1647853
300	MAT		300	0	MAT	40.00/mw	40/mw	0.00	0.00	21/07/2022 31	20/08/2022 1	Aula Schickel	Felix Junber	MAT_1647854

- Linked the 3D model to the schedule
- Created logic links based off rules
- 90% of the schedule generated at the click of a button



**Kidston**  
Pumped Storage Hydro Project

# KPSH ANIMATION



**Kidston**  
Pumped Storage Hydro Project

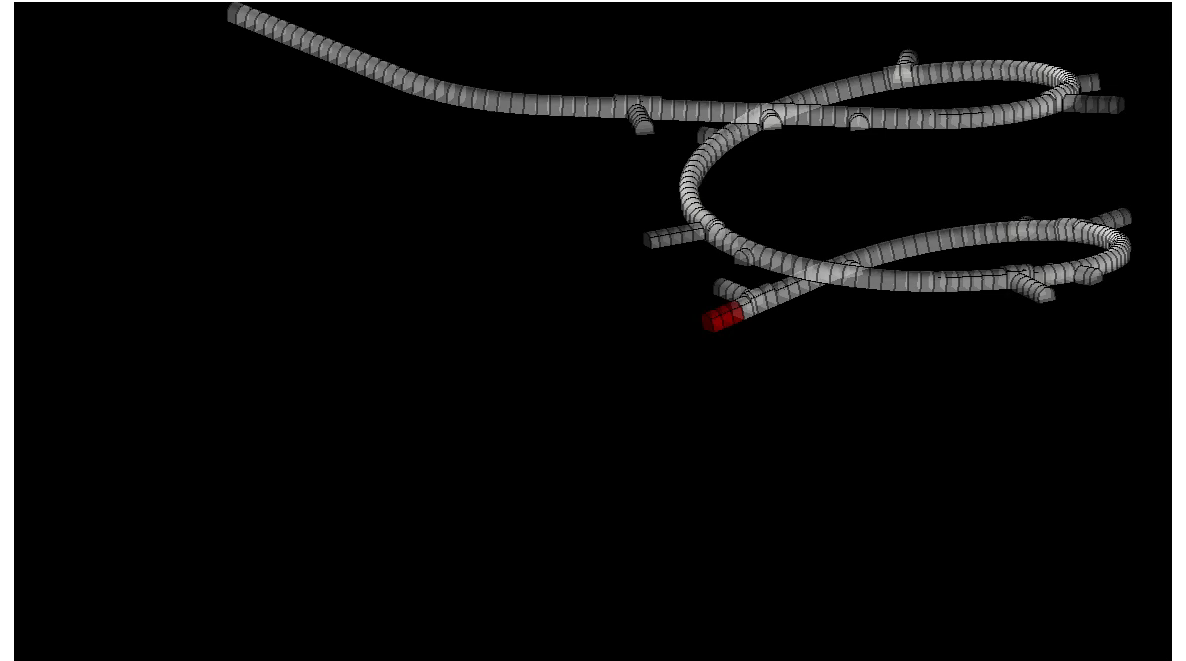


# KPSH ANIMATION - BENIFITS

When a room can see how a project plays out in 3D,

Highlights any logic flaws

Allowed us to re-focus resources on priority headings



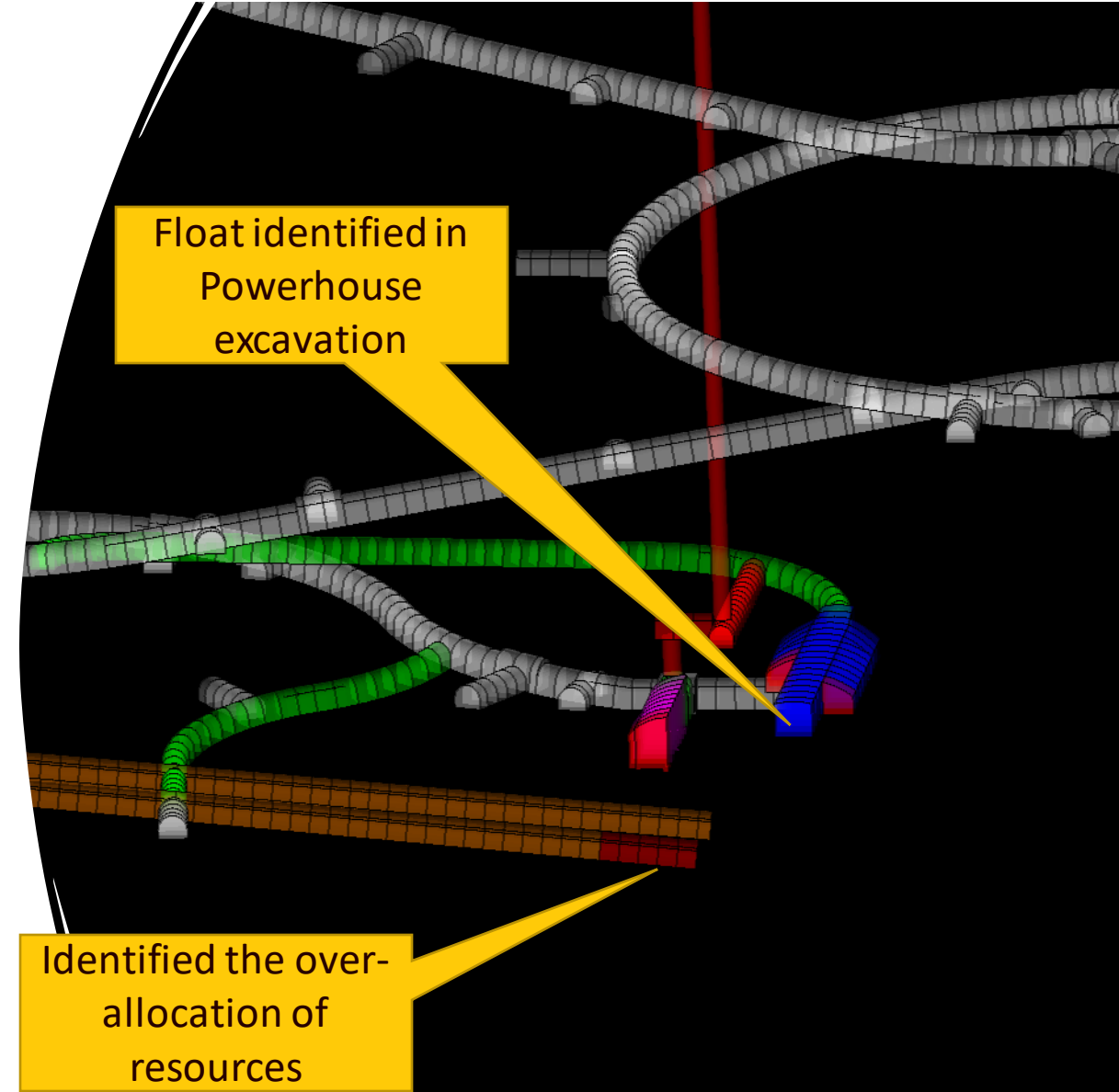
**Kidston**  
Pumped Storage Hydro Project





# KPSH ANIMATION – Adit 2

- Engaged Deswik to schedule based off our P6 program and logic
- Identified:
  - Logic errors
  - Resourcing over-allocation
- Allowed MDJH JV:
  - Re-focus resources to maintain and improve on critical path
- Construction team was able to create a new link in Deswik IS update the schedule



**Kidston**

Pumped Storage Hydro Project



# CONSTRUCTION CAPABILITY - INTERFACE

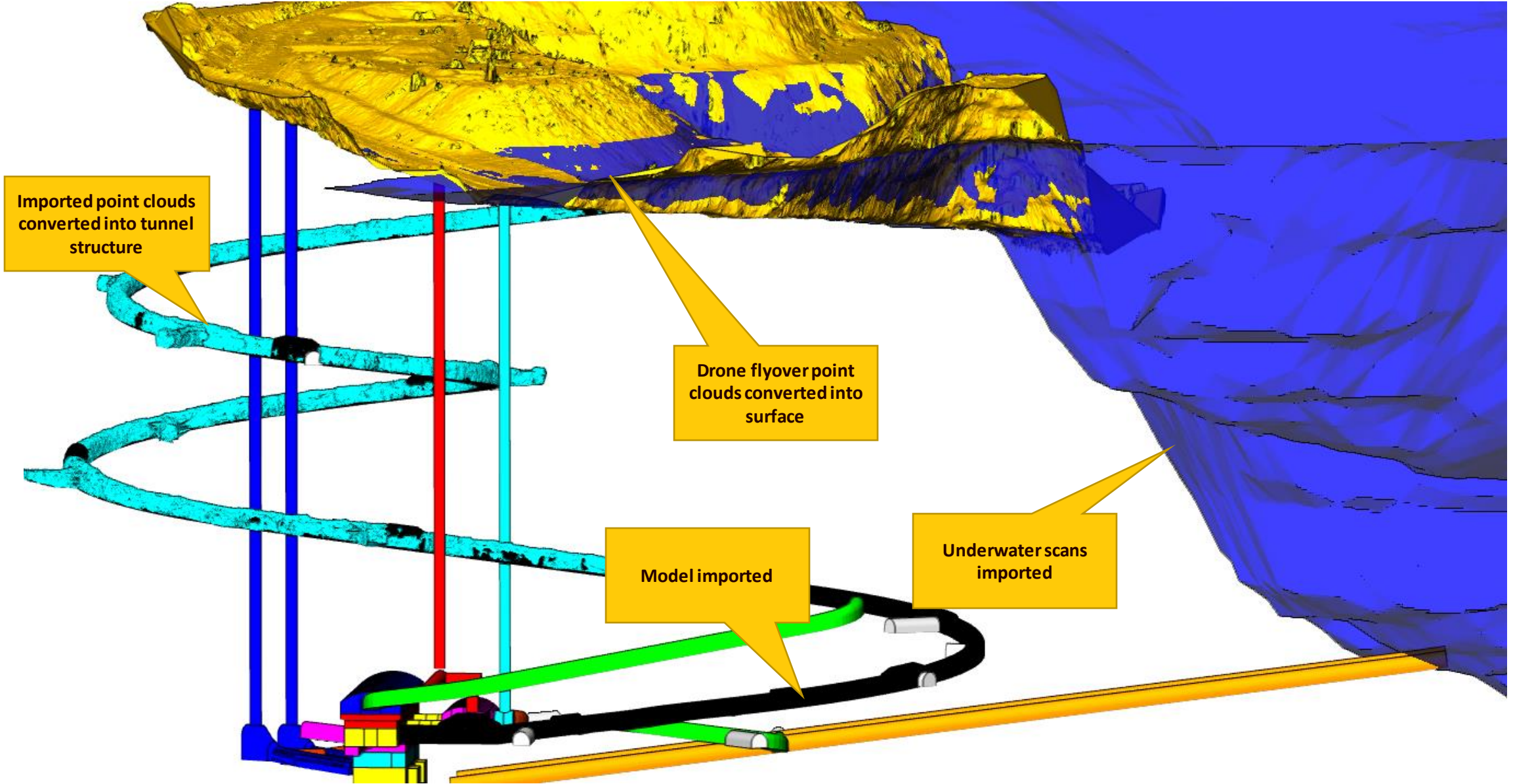
Deswik provided benefits to the project in its ability to act as both:

- A multi-platform viewer [similar to Navisworks].
  - Can import/export almost any file format
  - Merge all design data with as-builts and use layers to turn off/on
- CAD functionality and design aspects.
  - Create shapes, tunnels, alignment etc.
  - Convert point-clouds into as-built surfaces
  - Boreholes, turn-outs etc



**Kidston**  
Pumped Storage Hydro Project





**Kidston**

Pumped Storage Hydro Project





# CONSTRUCTION CAPABILITY - GEOTECHNICAL

- Provides visual interpretation of data observed underground
- Extents/impacts easily derived
- Allows for faster decision making



**Kidston**

Pumped Storage Hydro Project



# CONSTRUCTION CAPABILITY - GEOTECHNICAL

- Provides visual interpretation of data observed underground
- Extents/impacts easily derived
- Allows for faster decision making



**Kidston**

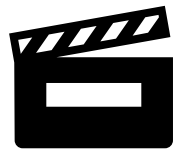
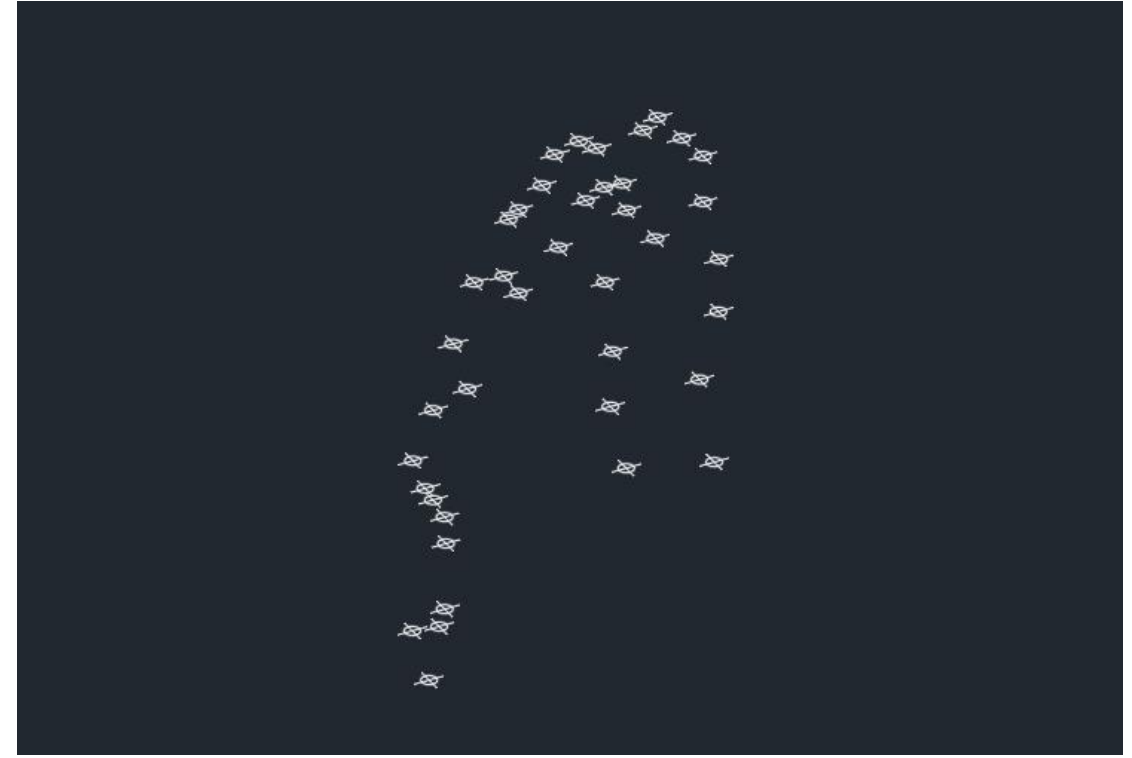
Pumped Storage Hydro Project





# CONSTRUCTION CAPABILITY - GEOTECHNICAL

- Had survey pick up the points of the fault

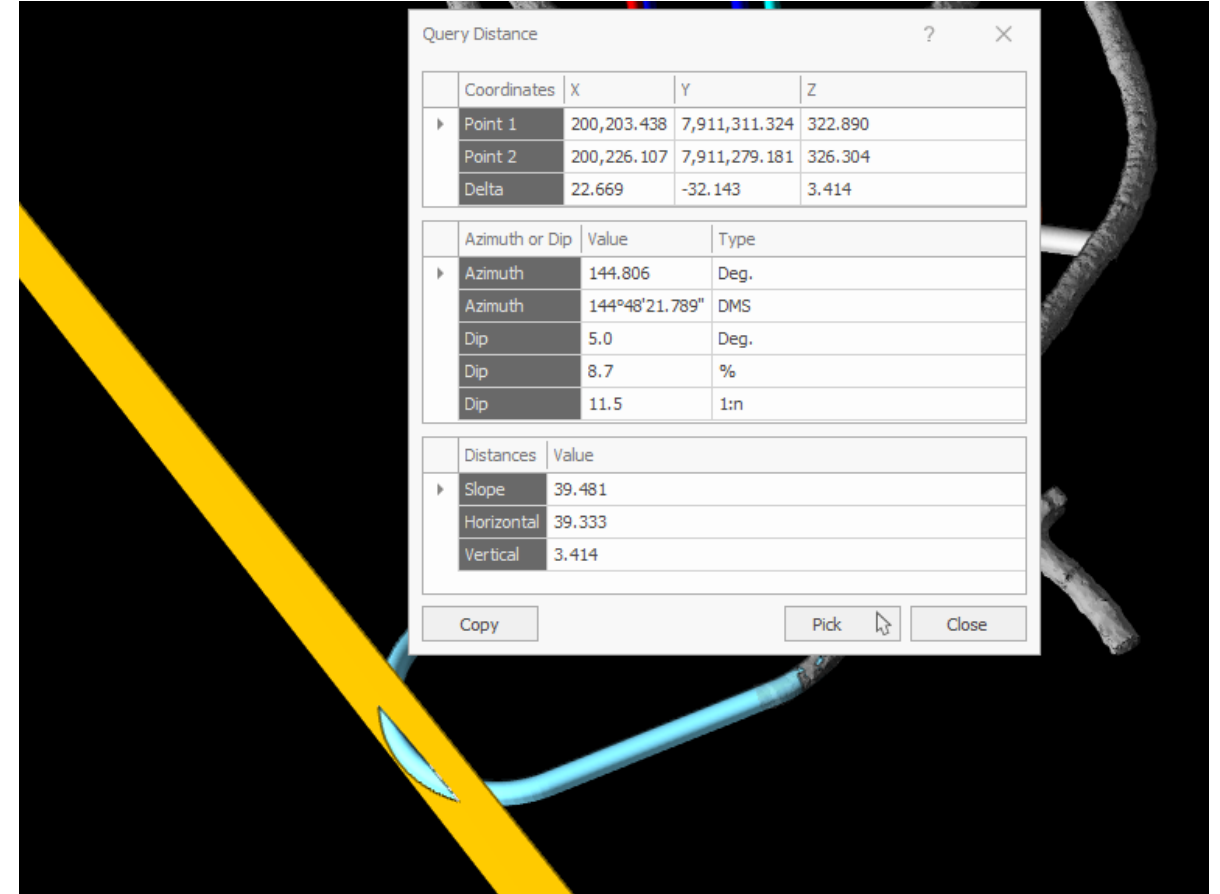
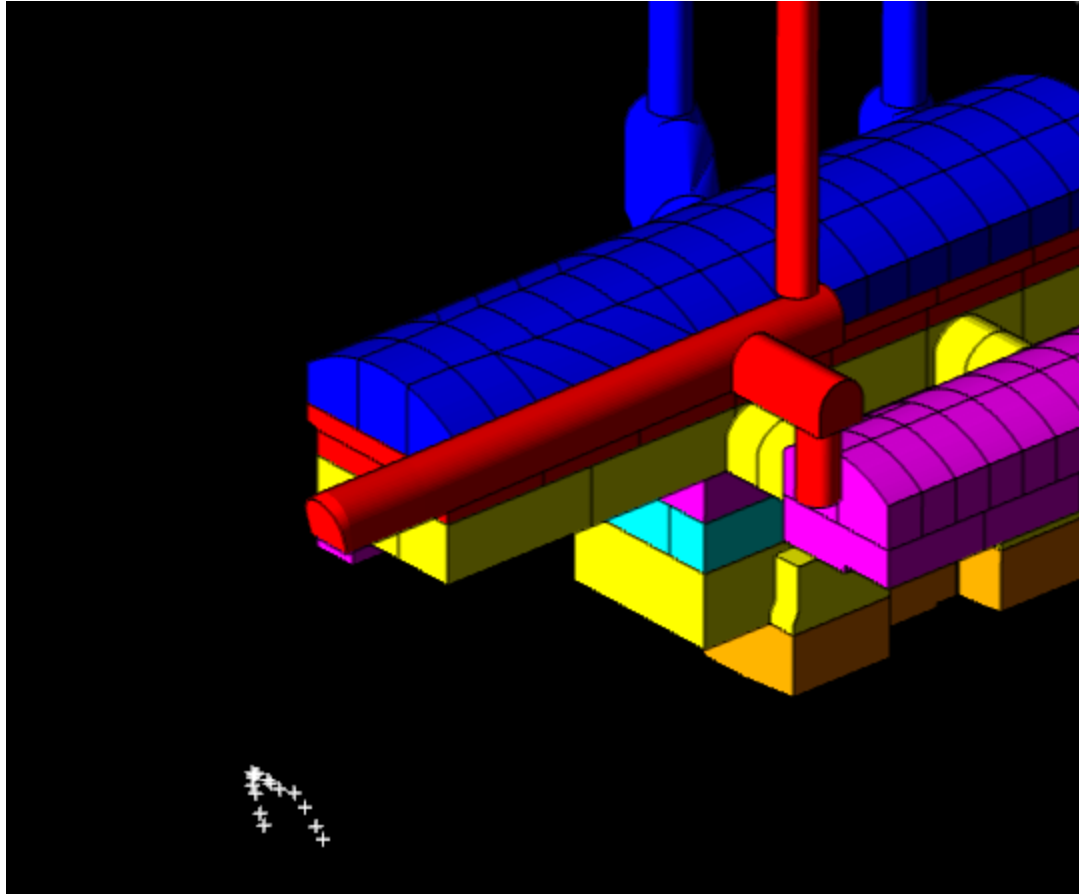


**Kidston**  
Pumped Storage Hydro Project





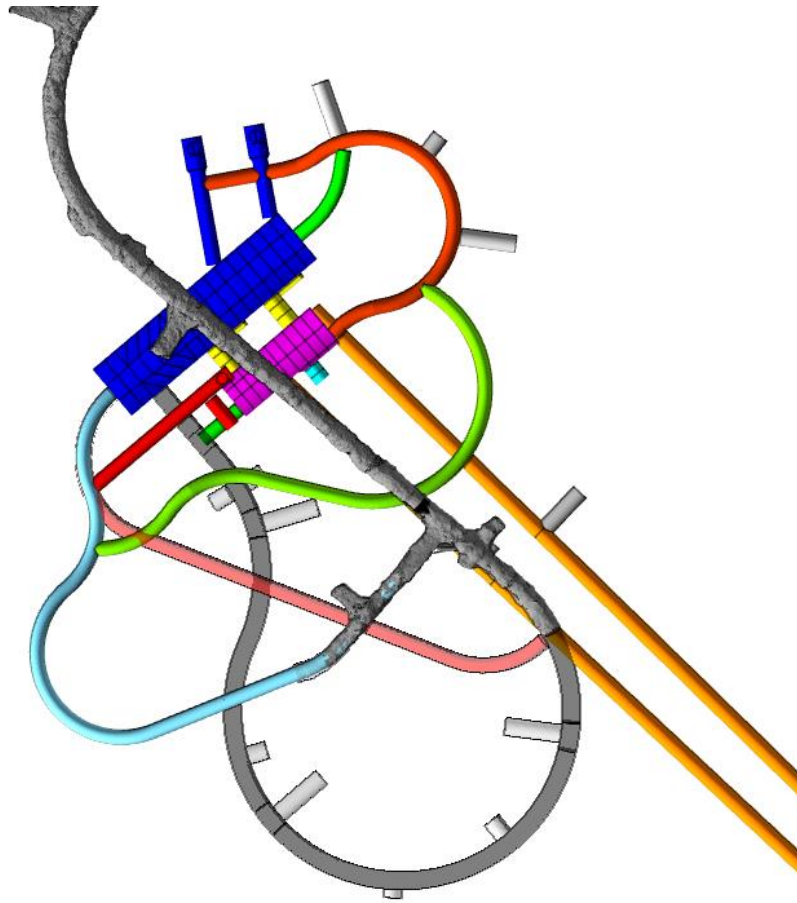
# CONSTRUCTION CAPABILITY - GEOTECHNICAL



**Kidston**  
Pumped Storage Hydro Project



# OPTIONEERING



- Introduction of new drives to optimise access to portions of the project [i.e shafts]
- Optioneering conducted to determine best path forward to maintain production and reduce overall downtime
- The following is a concept workshopped at KPSH

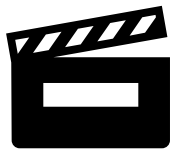
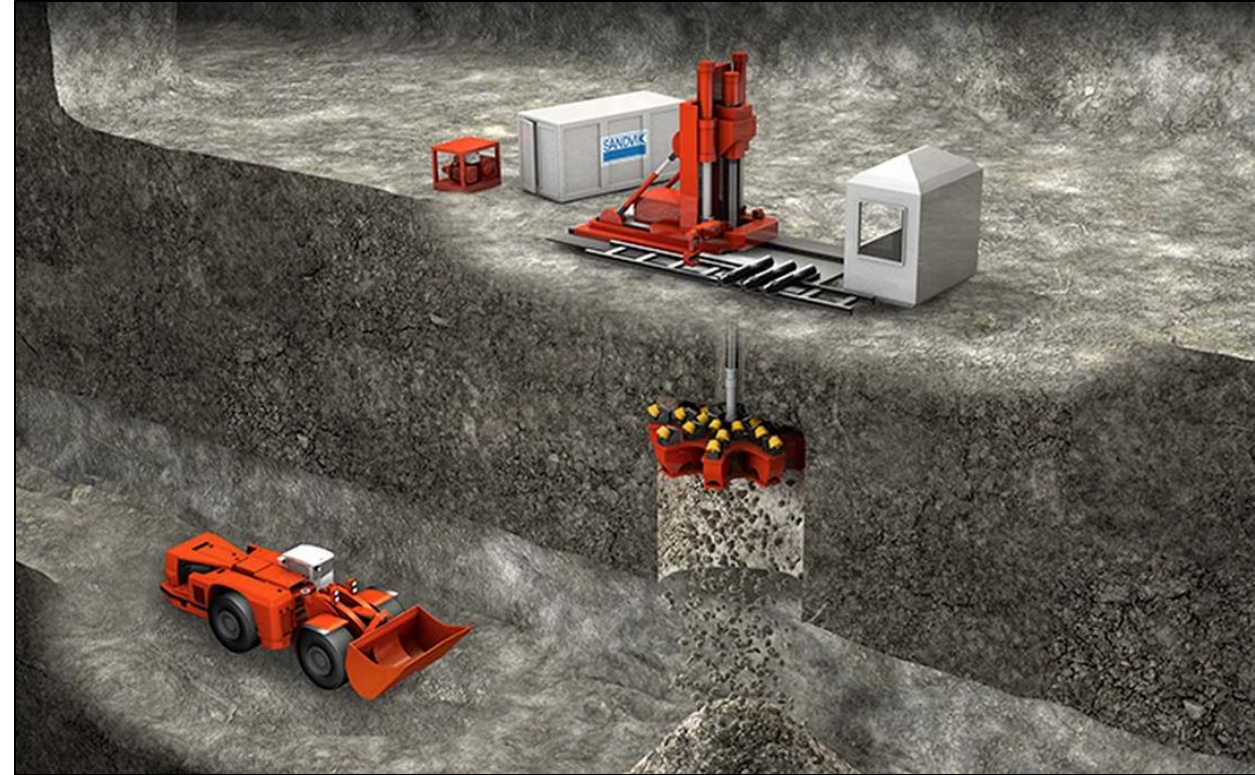
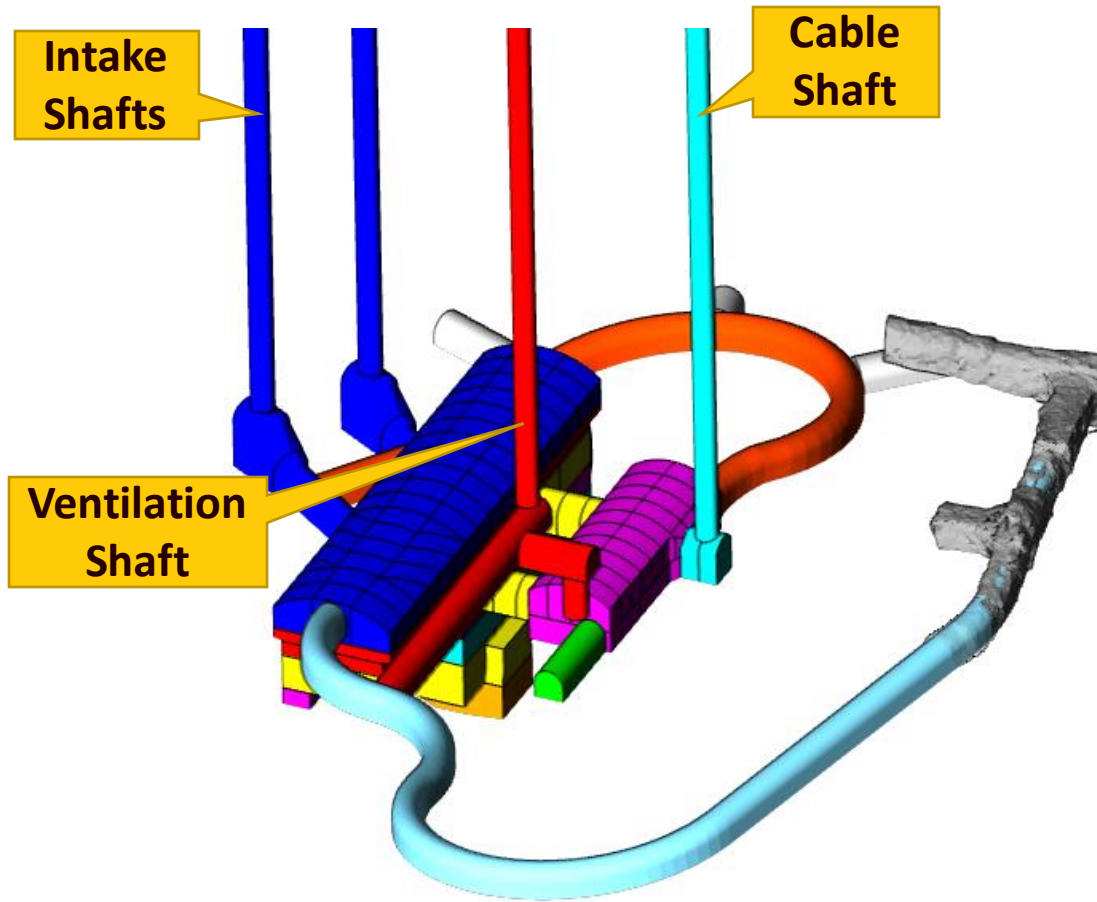


**Kidston**

Pumped Storage Hydro Project



# OPTIONEERING – RAISEBORING

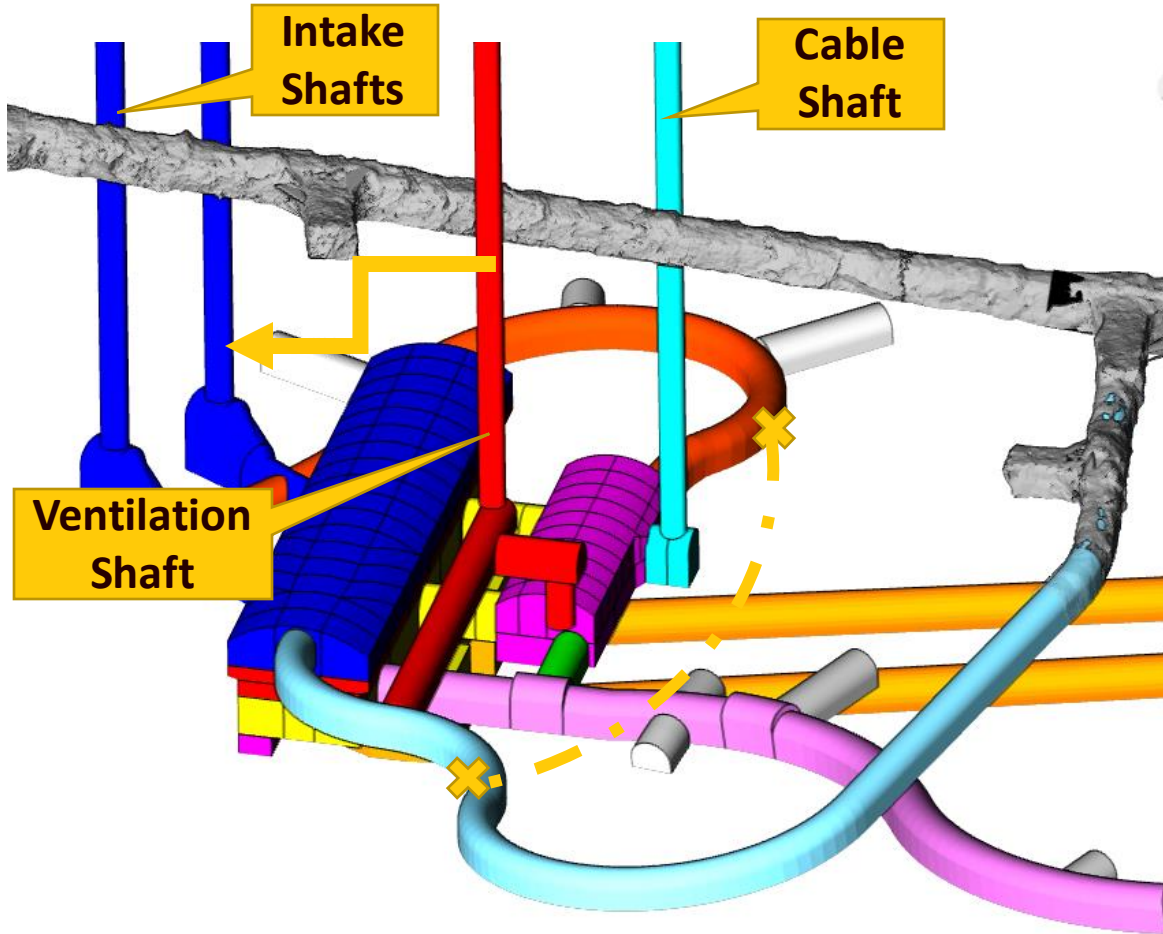


**Kidston**  
Pumped Storage Hydro Project

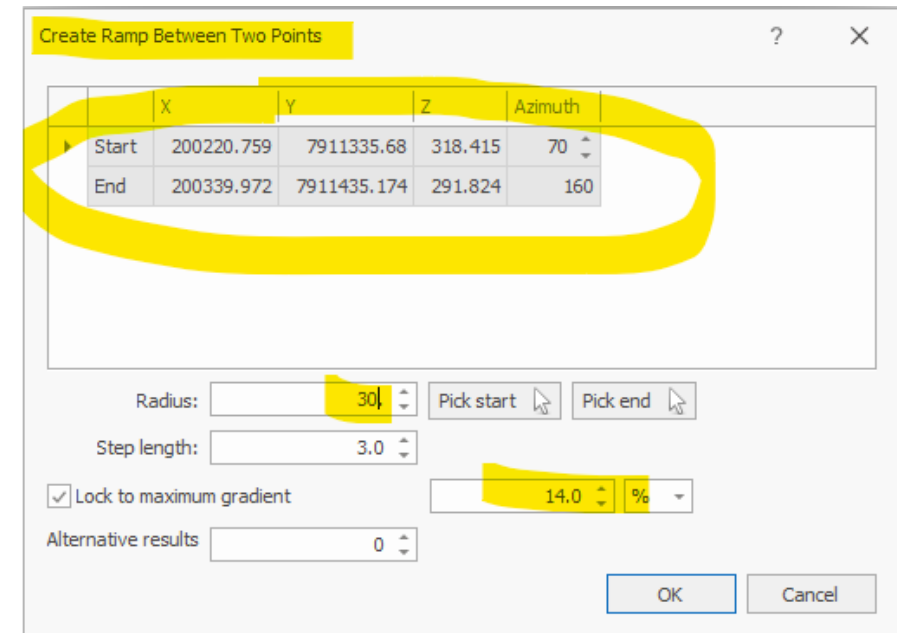




# OPTIONEERING

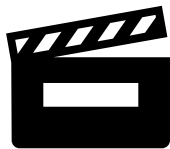
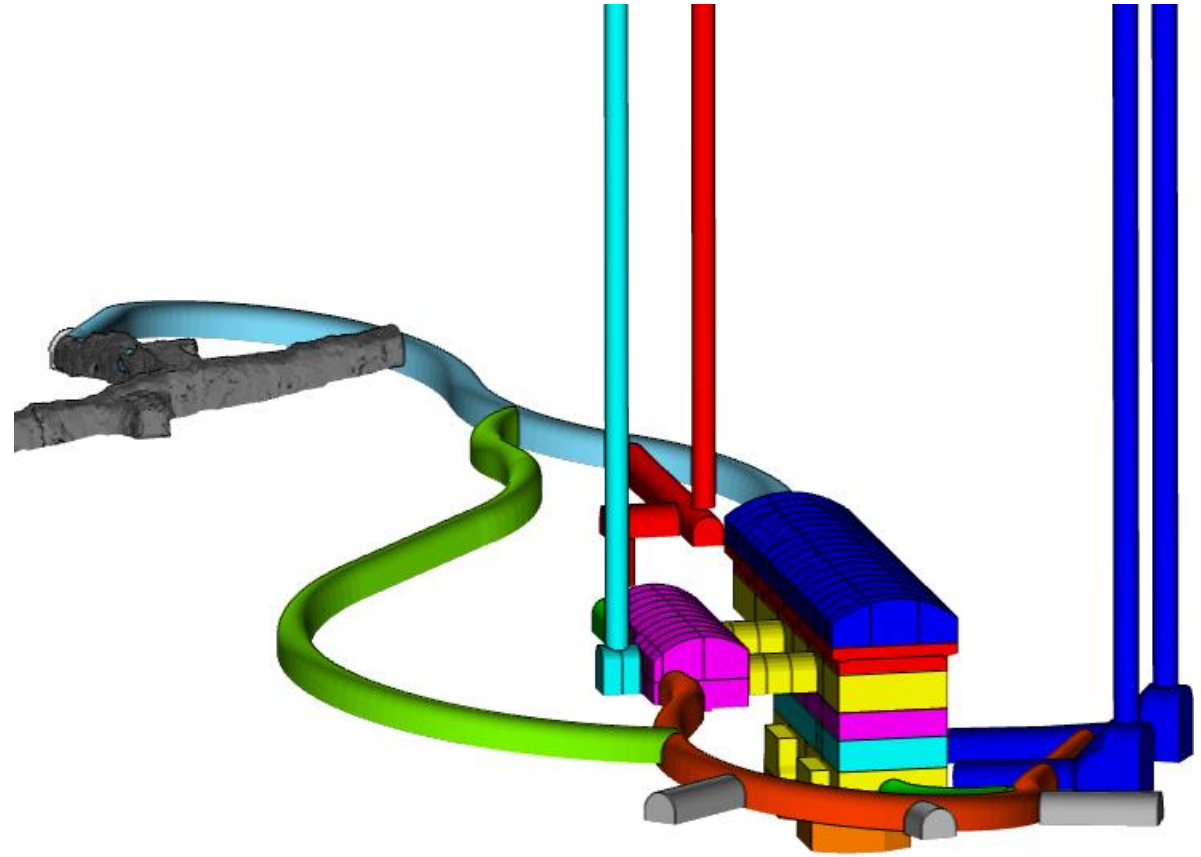
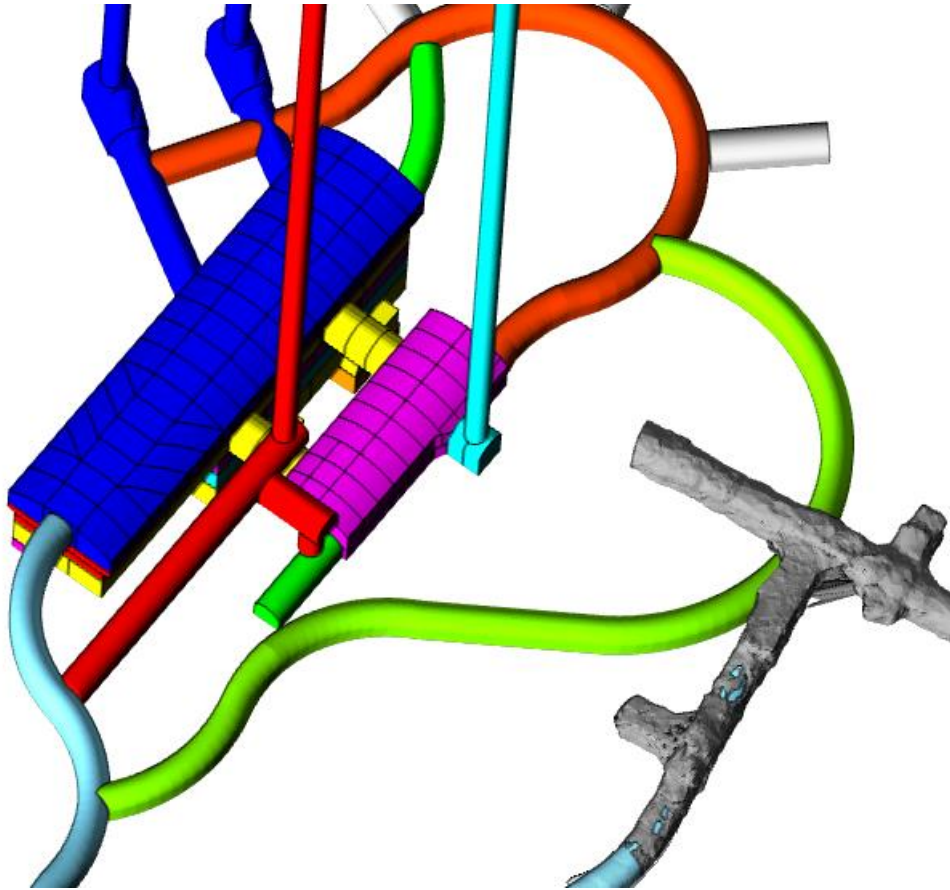


- Access required to base of subsequent shaft excavation
- Deswik ramp builder tool used to automatically generate alignment



**Kidston**  
Pumped Storage Hydro Project

# OPTIONEERING



**Kidston**  
Pumped Storage Hydro Project



# OPTIONEERING

- Allows alignments to be work-shopped on-site 24/7 if need be
- Able to provide designers seemingly workable solutions with minimal delay
- Reduces overall downtime to production



**Kidston**  
Pumped Storage Hydro Project





Document 1 - Deswik.CAD - 2022.2.6

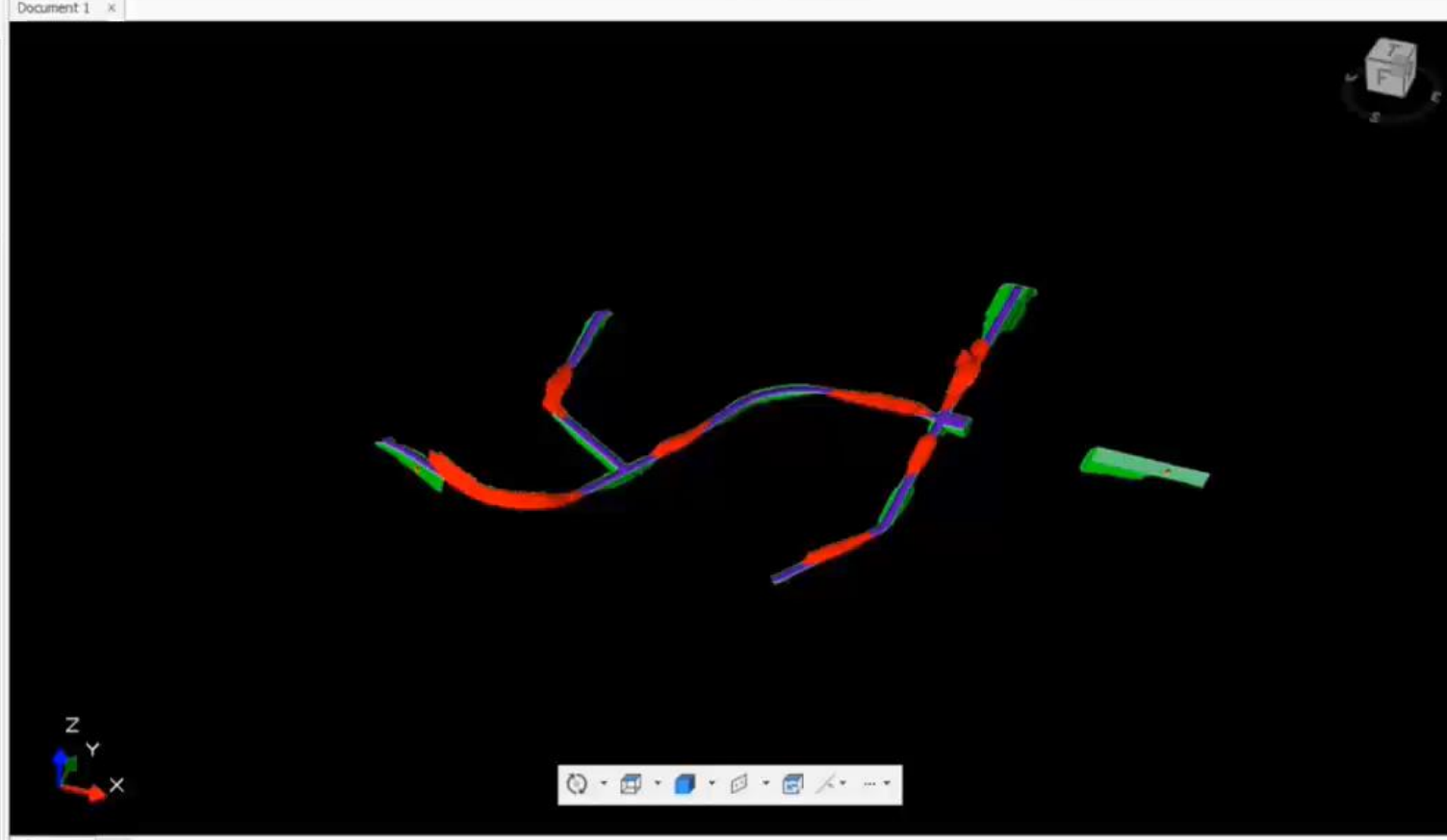
File General Polylines Solids Surfaces View Layers Format Drafting Plotting Geology Survey Underground Open Pit Development Search (Control+Q)

Link Polylines Tessellate Extrude Between Around Objects Combine Union Cut First Cut Rest Bulk Keep Above Keep Below Resolve Overlaps Intersect First Intersect Rest Boolean Relative Split Separate Cut Expand Crop by Thickness Decimate Triangle Slope Markers Features Remove Insert Remove Extract by Orientation Subdivide Validate Close and Repair

Draw Boolean Modify Features Vertices Faces Validate

Layer Control

- 1.2.1 RAW DATA
  - 00 REFERENCE
    - OPENSTREETMAP
  - 01 TOPO DATA
    - TOPO SURFACE
    - CONTOURS\_1\_METRE\_SHP
  - 02 DESIGN DATA
    - 01 ALIGNMENTS
      - ROAD BOUNDARY
      - 02 DESIGN LINES
    - 03 DESIGN SURFACE
      - TRIMMED
      - BOY
    - 03 LOWER SURFACE DATA
      - 01 SUBBASE SURFACE
        - DESIGN LINES
      - 02 SUBGRADE SURFACE
        - DESIGN LINES
      - 03 BEDROCK SURFACE
  - 1.2.2 BOUNDARY POLYGONS
    - 1.2.2.1 AREA BOUNDARY
    - 1.2.2.2 SURFACE BOUNDARY
    - 1.2.2.3 TOPSOIL BOUNDARY
    - BY AREA
    - 1.2.2.4 CLEARING BOUNDARY
  - 1.2.3 CENTRELINE
  - 1.2.4 TOP SURFACE
    - UNCUT
  - 1.2.5 LOWER SURFACES
    - UNCUT
  - 2.0.0 VOLUME PROCESSING
    - 2.1.0 ENABLING
      - 2.1.0.1 TOPSOIL
    - 2.2.0 TOP
      - 2.2.1 EXTRUDED UP
      - 2.2.2 EXTRUDED DOWN
      - 2.2.3 BELOW TOPO
      - 2.2.4 ABOVE TOPO
      - 2.2.5 VALIDATION
    - 2.3.0 LOWER
      - 2.3.1 EXTRUDED UP
      - 2.3.2 CUT
      - 2.3.3 INTERSECTION
      - 2.3.4 BELOW TOPO
      - 2.3.5 ABOVE TOPO
    - 2.4.0 COMBINATION
      - 2.4.1 GRID
      - INPUTS
      - 2.4.2 COMBINED SOLIDS



MODEL +

Output

Command: Rotation Coordinate Relative rotation Relative coordinate Set working plane Z: 0.0

Workflow command Cut Above and Below Topo finished. Processing Time = 8s  
 Workflow command Generate Grid >> started.  
 Started executing Display Process Map Layer - Item 1 of 1  
 Finished executing Display Process Map Layer - Item 1 of 1 in 13ms with Success.  
 Workflow command Generate Grid >> finished. Processing Time = 304ms

Process Map

^MASS HAUL

Deswik  
 Mass Haul Process (beta)

Multiple Grid Alignment

Design Data Project Boundary Topsoil Clearing Boundary Process Grid

Grid Creation:

```

  graph TD
    A[Select Inputs] --> B[Automatic Method: Validate Inputs]
    A --> C[Manual Method: Draw Chainage Line]
    B --> D[Generate Grids]
    C --> E[Copy Chainage Line at Interval]
    E --> F[Create Chainage Polygons]
    D --> G[Remove scrap polygons]
    F --> G
    G --> H[Attribute Chainage Polygons]
    H --> I[Keep Generated Grid]
    H --> J[Reset]
    I --> K[Cut solids to grid]
    J --> K
    K --> L[Collect solids]
  
```

NOTE: Review output grid and select an option below.

Deswik.Mercury Properties Process Map

File General Polylines Solids Surfaces View Layers Format Drafting Plotting Geology Survey Underground Open Pit Development Search (Control+Q)

Clipboard Selection Snapping Layers Modify Duplicate Erase Arrange Appearance Attributes Measure Analyze Constants and Lookups Deswik.MDM

Layer Control

- DESIGN LINES
- 03 BEDROCK SURFACE
- 1.2.2 BOUNDARY POLYGONS
  - 1.2.2.1 AREA BOUNDARY
  - 1.2.2.2 SURFACE BOUNDARY
  - 1.2.2.3 TOPSOIL BOUNDARY
  - 1.2.2.4 CLEARING BOUNDARY
- 1.2.3 CENTRELINE
- 1.2.4 TOP SURFACE
- UNCUT
- 1.2.5 LOWER SURFACES
- UNCUT
- 2.0.0 VOLUME PROCESSING
  - 2.1.0 ENABLING
    - 2.1.0.1 TOPSOIL
  - 2.2.0 TOP
    - 2.2.1 EXTRUDED UP
    - 2.2.2 EXTRUDED DOWN
    - 2.2.3 BELOW TOPO
    - 2.2.4 ABOVE TOPO
    - 2.2.5 VALIDATION
  - 2.3.0 LOWER
    - 2.3.1 EXTRUDED UP
    - 2.3.2 CUT
    - 2.3.3 INTERSECTION
    - 2.3.4 BELOW TOPO
    - 2.3.5 ABOVE TOPO
  - 2.4.0 COMBINATION
    - 2.4.1 GRID
      - INPUTS
      - WORKING
        - CLINE
        - GRID
    - 2.4.1.1 WKT EXPORT
    - 2.4.2 COMBINED SOLIDS
      - 2.4.2.1 CLEARING
      - 2.4.2.2 TOPSOIL
      - 2.4.2.3 CUT SOLIDS
      - ROCK SURFACE
      - 2.4.2.4 FILL SOLIDS
    - 2.4.3 CUT TO GRID
      - 2.4.3.1 CLEARING
      - 2.4.3.2 TOPSOIL
      - 2.4.3.3 CUT SOLIDS
      - 2.4.3.4 FILL SOLIDS
  - 4.0.0 HAULAGE



Deswik.Mercury

Import / Export

- Import 12d
- Auto clean surfaces
- Generate debug files
- Import LandXML

Working Plane / View

- View along polyline
- Step along
- Step back

Tools

- Clean surfaces
- Material distribution

MODEL +

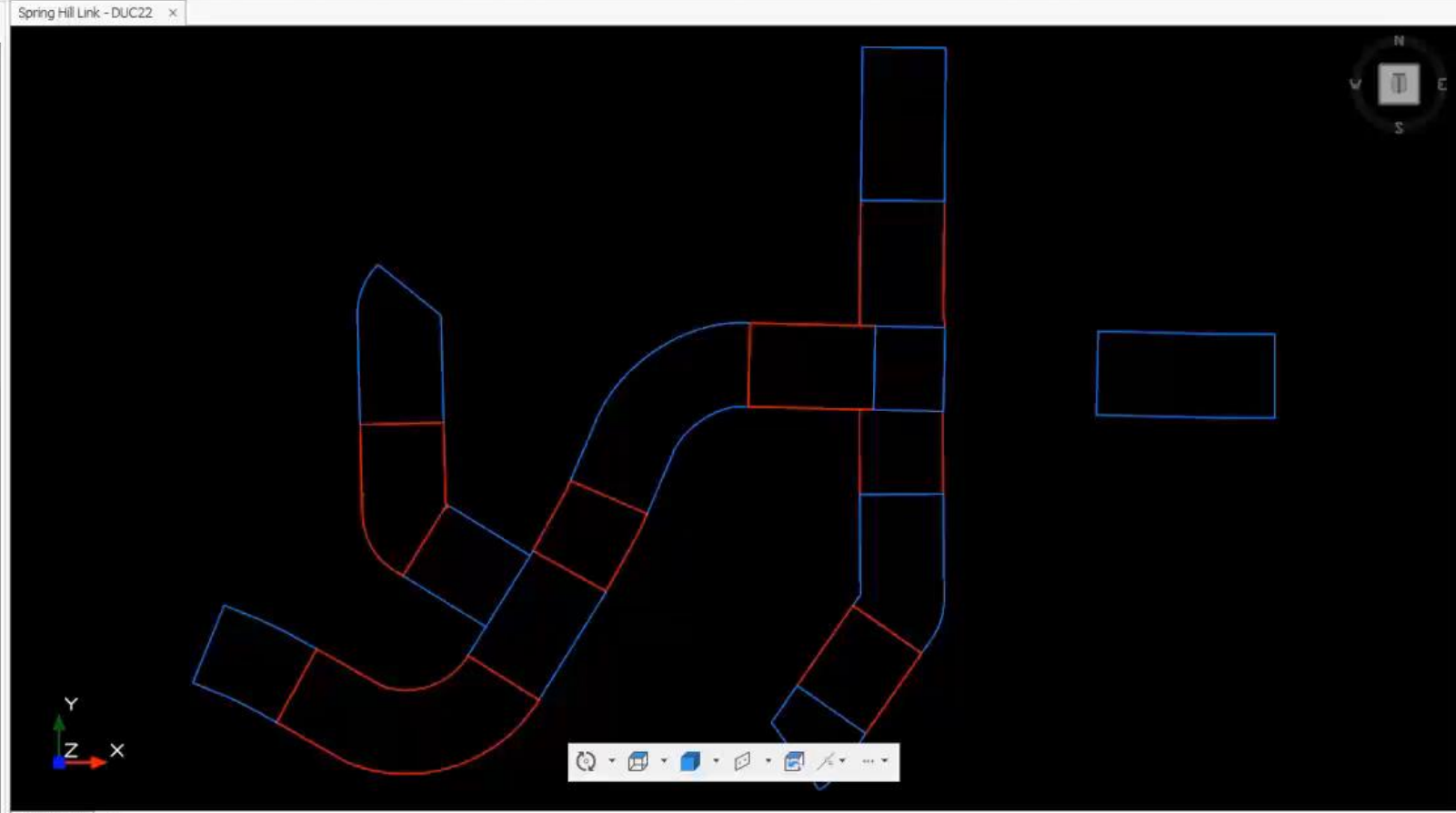
Output

Command: Rotation Coordinate Relative rotation Relative coordinate Set working plane Z: 0.0

Command: Executed command ID=CID\_MODIFY\_ATTRIBUTES\_USINGFORMULA with shortcuts (None)

### Layer Control

- DESIGN LINES
  - 02 SUBGRADE SURFACE
  - DESIGN LINES
  - 03 BEDROCK SURFACE
- 1.2.2 BOUNDARY POLYGONS
  - 1.2.2.1 AREA BOUNDARY
  - 1.2.2.2 SURFACE BOUNDARY
  - 1.2.2.3 TOPSOIL BOUNDARY
  - BY AREA
  - 1.2.2.4 CLEARING BOUNDARY
- 1.2.3 CENTRELINE
- 1.2.4 TOP SURFACE
  - UNCUT
- 1.2.5 LOWER SURFACES
  - UNCUT
- 2.0.0 VOLUME PROCESSING
  - 2.1.0 ENABLING
    - 2.1.0.1 TOPSOIL
  - 2.2.0 TOP
    - 2.2.1 EXTRUDED UP
    - 2.2.2 EXTRUDED DOWN
    - 2.2.3 BELOW TOPO
    - 2.2.4 ABOVE TOPO
    - 2.2.5 VALIDATION
  - 2.3.0 LOWER
    - 2.3.1 EXTRUDED UP
    - 2.3.2 CUT
    - 2.3.3 INTERSECTION
    - 2.3.4 BELOW TOPO
    - 2.3.5 ABOVE TOPO
  - 2.4.0 COMBINATION
    - 2.4.1 GRID
      - INPUTS
      - WORKING
        - CLINE
        - GRID
      - 2.4.1.1 WKT EXPORT
    - 2.4.2 COMBINED SOLIDS
      - 2.4.2.1 CLEARING
      - 2.4.2.2 TOPSOIL
      - 2.4.2.3 CUT SOLIDS
      - ROCK SURFACE
      - 2.4.2.4 FILL SOLIDS
    - 2.4.3 CUT TO GRID
  - 4.0.0 HAULAGE
    - 4.1.0 HAUL GROUPS
- TEMP WORKING



MODEL +

Output

Command: Rotation Coordinate Relative rotation Relative coordinate Set working plane Z: 0.0

Workflow command Reset Node Statuses finished. Processing Time = 426ms  
 Workflow command started.  
 Started executing Display Process Map Layer - Item 1 of 1  
 Finished executing Display Process Map Layer - Item 1 of 1 in 2ms with Success.  
 Workflow command finished. Processing Time = 317ms

### Process Map

^MASS HAUL

Deswik  
 Delivering smart efficiency

Mass Haul Process (beta)

Mass Haul - Schedule

Task Solids Dependency Schedule Controls

#### INTERACTIVE NETWORK DIAGRAM

Project Configuration:

Setup **RUN ONCE ONLY**

NOTE: This only needs to be run initially when setting up the Interactive Schedule. Once the CAD and SCHED file have been linked this node should no longer be run.

Tasks from solids

Schedule Tasks:

Open Interactive Scheduler

Manage Tasks:

Import Additional Task Solids

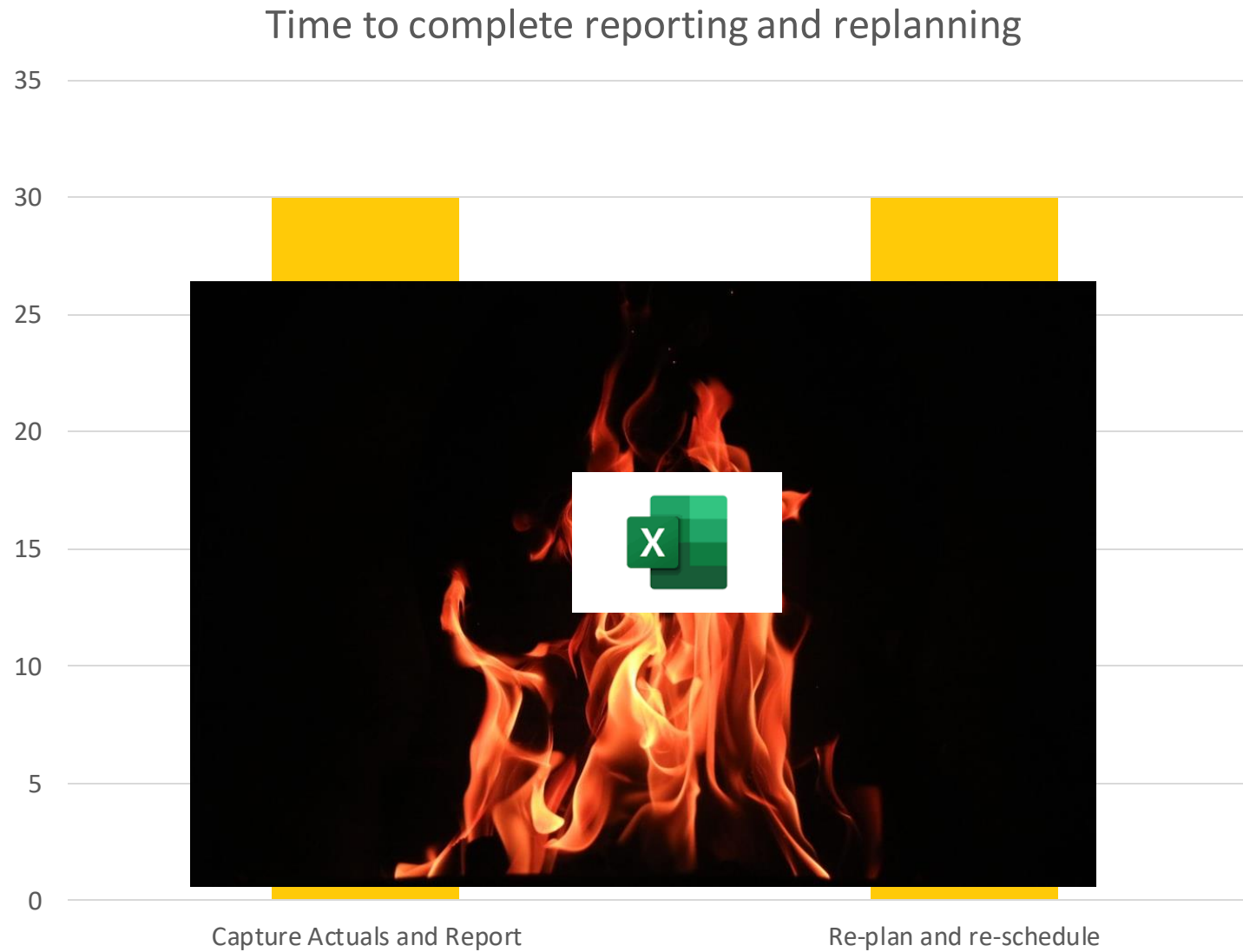
Tasks From Additional Solids

Remove Tasks from Schedule

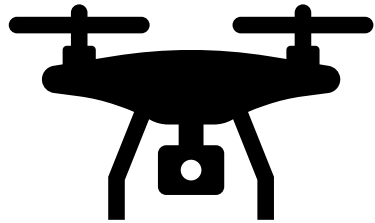
Deswik.Mercury Properties Process Map



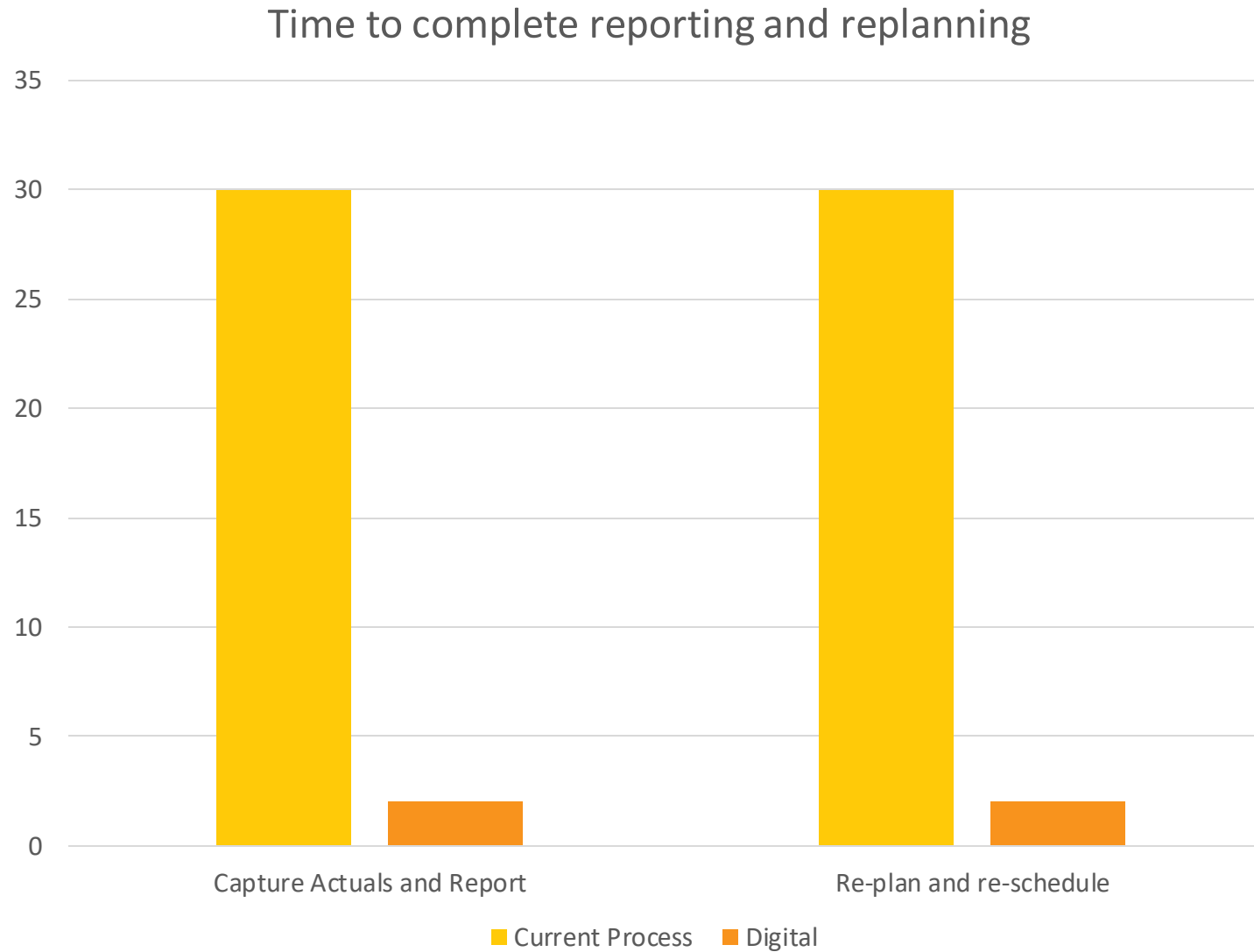
# Progress Reporting and replanning



# Progress Process

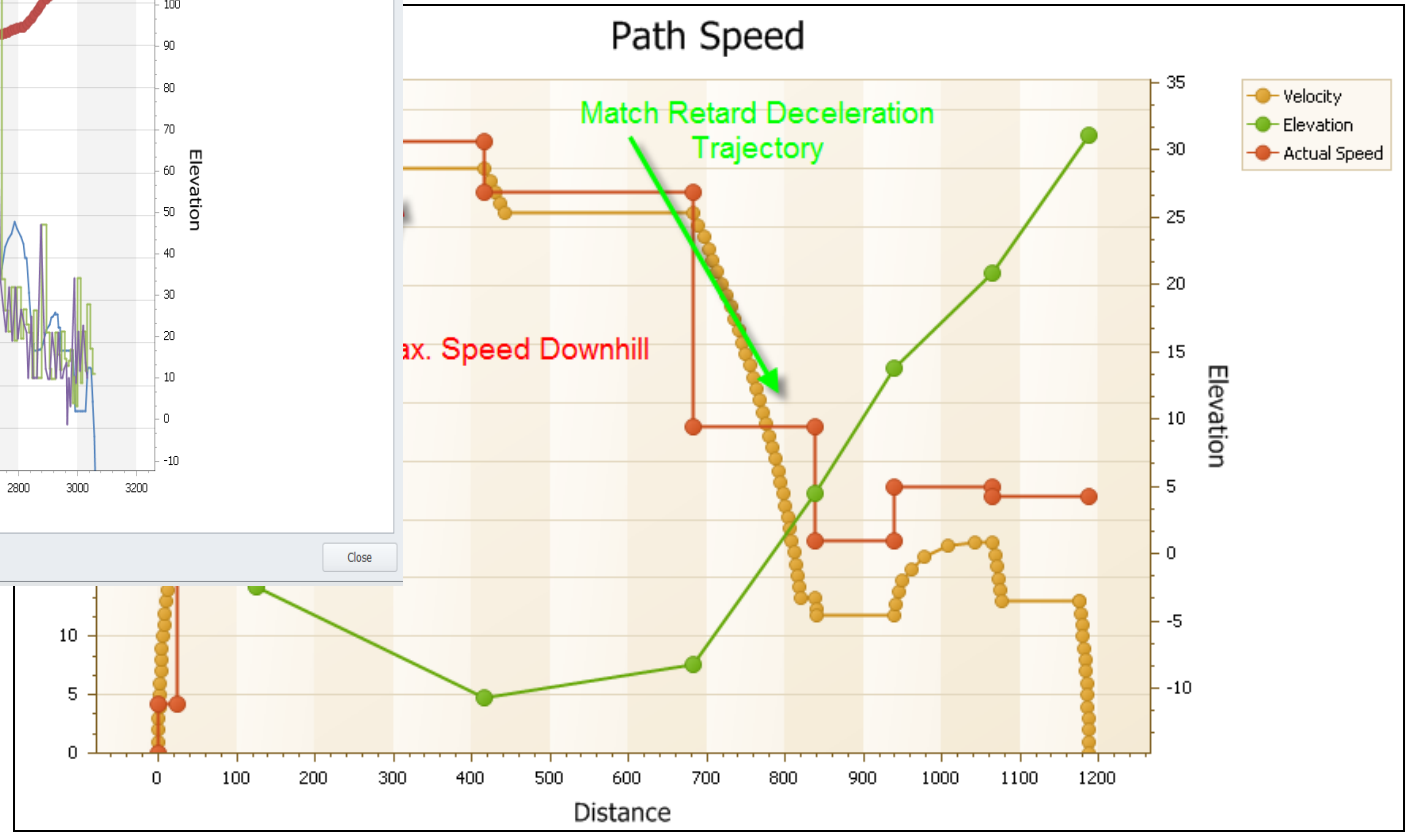
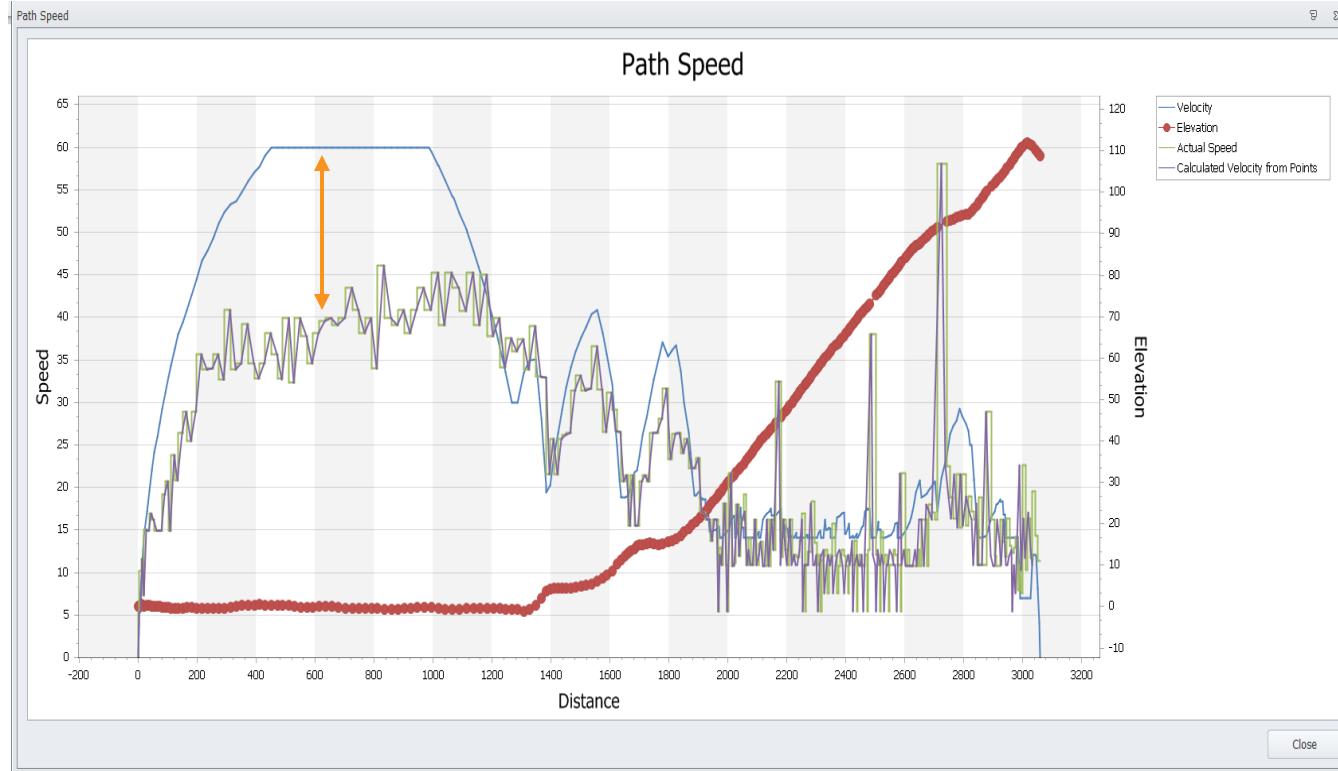


# Progress Reporting and replanning





# Model-based environment enables granular reporting



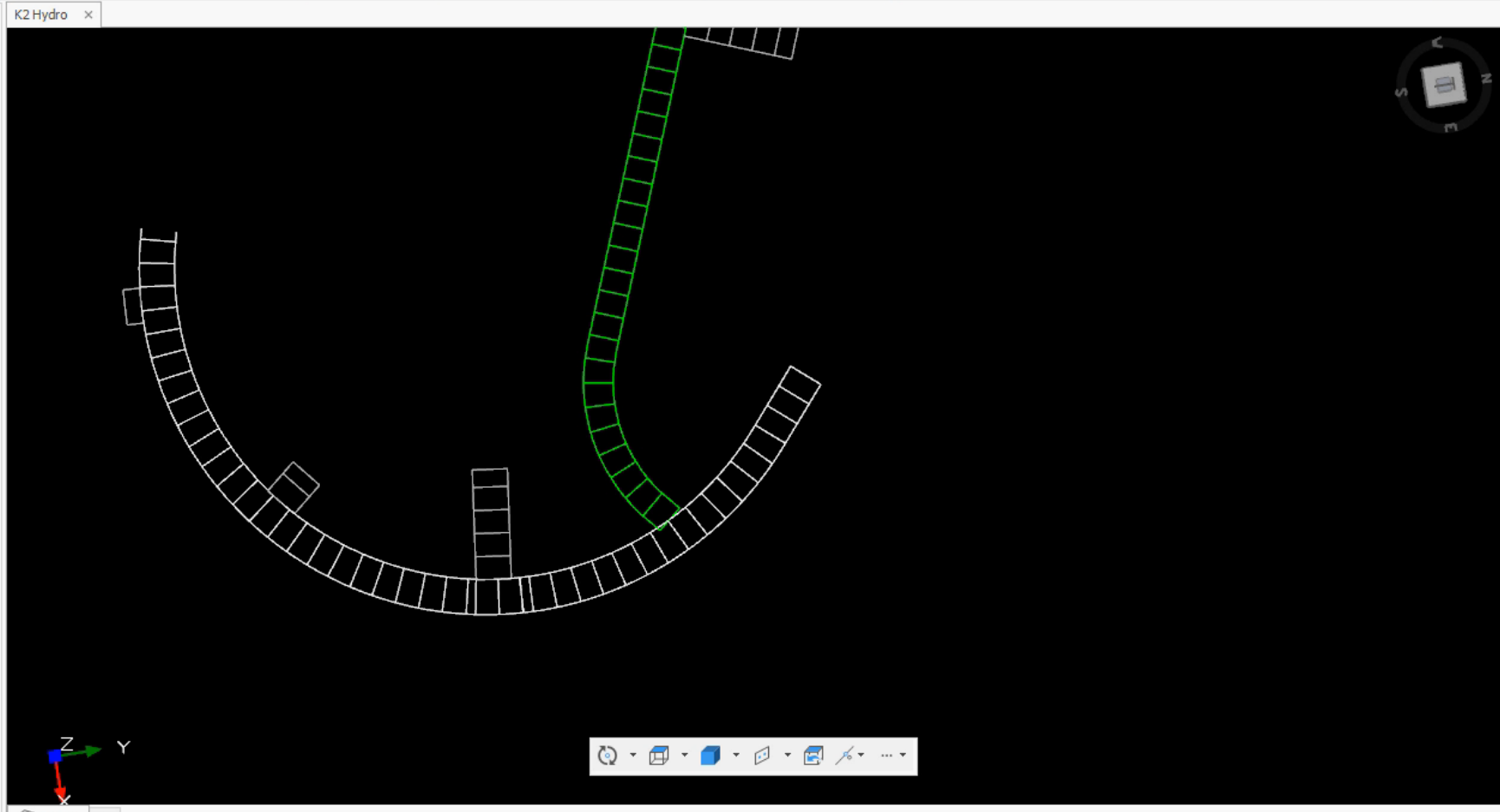
File General Polylines Solids Surfaces View Layers Format Drafting Plotting Geology Survey Underground Open Pit Development Search (Control+Q)

Paste Copy Cut Screenshot Clipboard Selection Snapping Layers Modify Duplicate Erase Move Translate Rotate Arrange Appearance Attributes Measure Analyze Constants and Lookups Deswik.MDM Add...

50% Transparent Apply Ghosting Remove Ghosting Set from Formula Copy from Figure Audit Distance Strike / Dip Point Area Query Pivot Dashboards Chart Global Constants Parameters Tables Deswik.MDM

Deswik.IS

- Settings
  - Project Options
  - Activity Types
- Design And Attributes
  - Design Tools
  - Attribute Assignment
- Create Activities
  - Create Bench Blocks
  - Create Tunnels
  - Create Stopes
  - Create From Solids
  - Create From Outlines
  - Manage Activities
- Scheduling
  - Dependency Creation
  - Mining Path Sequencing
  - Resource Paths
  - Update Survey Actuals
- Tools
  - Batch Updates
  - Reporting



Properties

Selected Entities

Deswik.Mercury Properties Process Map

Layer Control Deswik.IS

MODEL +

Output

Command: [ ]

Opening layer SCHEDULER\TASK POLYGONS\CRANE CONSTRUCTION PART 3 : Load Time = 19ms  
 Opening layer SCHEDULER\TASK SOLIDS : Load Time = 325ms  
 Opening layer SCHEDULER\TASK SOLIDS\CRANE CONSTRUCTION PART 1 : Load Time = 46ms  
 Opening layer SCHEDULER\TASK SOLIDS\CRANE CONSTRUCTION PART 2 : Load Time = 20ms  
 Opening layer SCHEDULER\TASK SOLIDS\CRANE CONSTRUCTION PART 3 : Load Time = 19ms

Rule based  
scheduling



Power BI



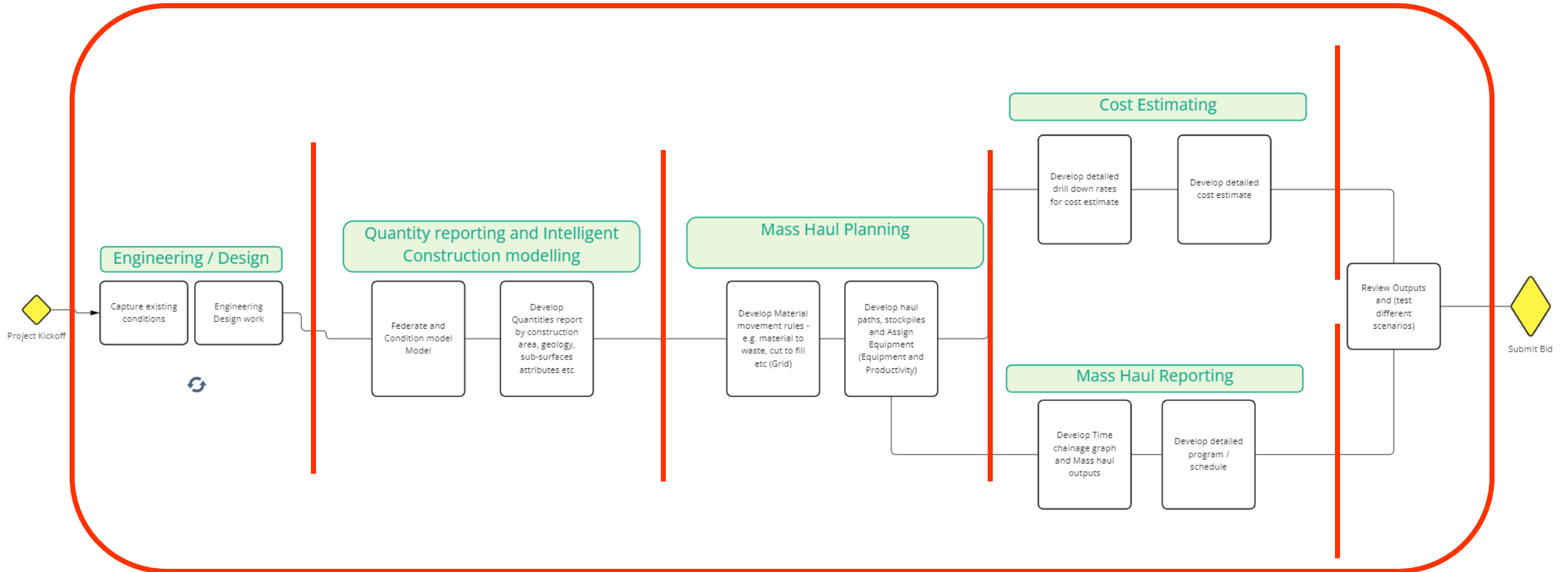
**JUST LIKE  
PEAS AND CARROTS**







# The integrated approach to planning and scheduling using BIM (Solids/attributes) data, knowledge and computational power



A long-exposure photograph of a city street at night. The image shows light trails from cars and buildings, creating a sense of motion and energy. The colors are vibrant, with blues, oranges, and yellows. In the background, a city skyline is visible under a dark sky. The text is overlaid in the center of the image.

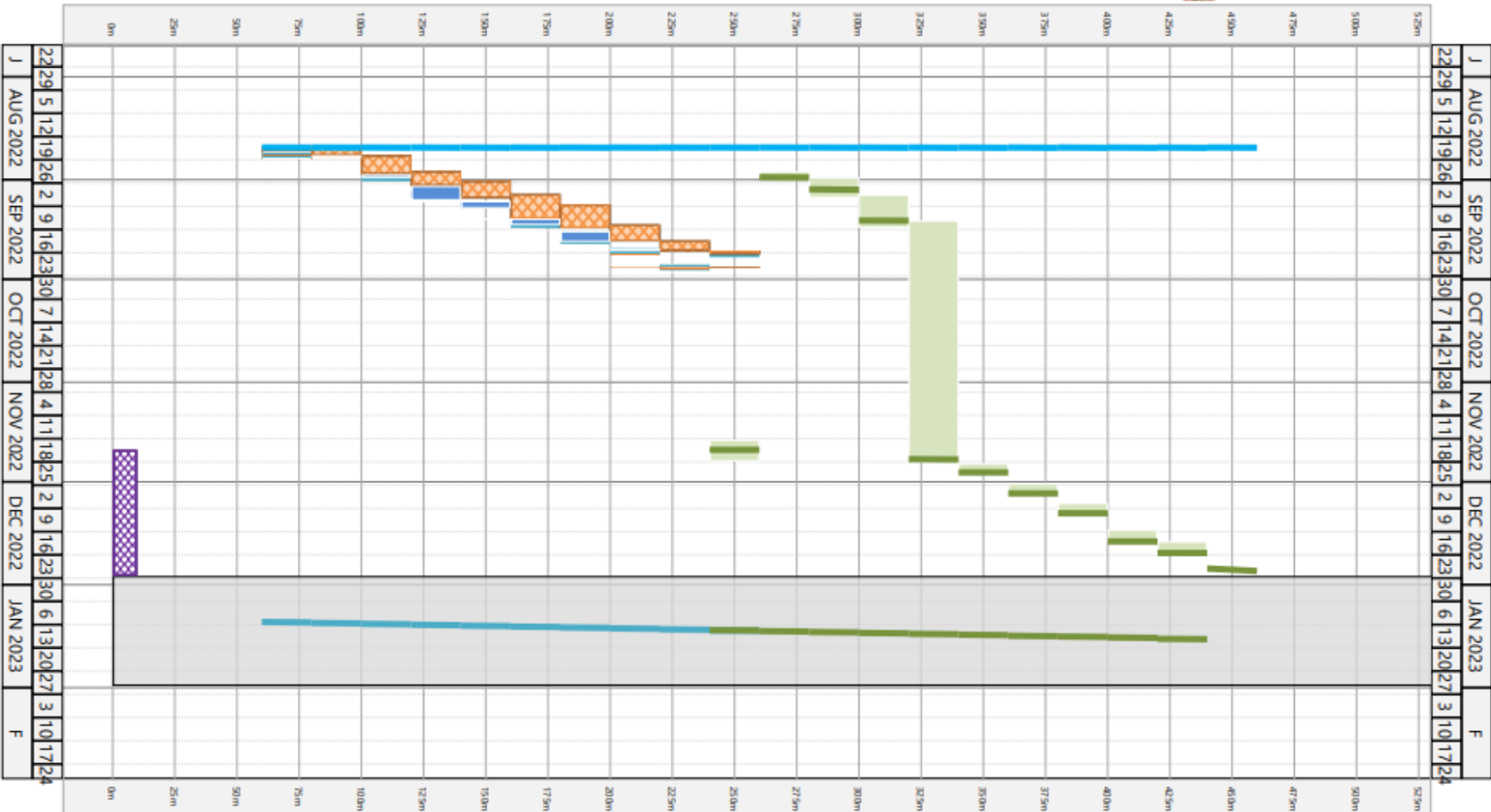
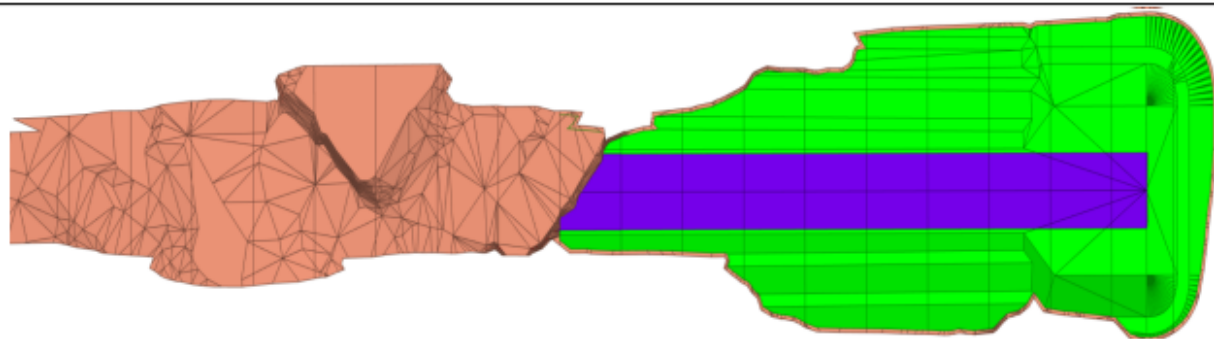
When we break these silos the  
opportunities are endless



# SPRING HILL LINK - Alignment SHL 04 Time Location Chart

Legend









- TOPSOIL
- CUT
- CUT - OTR
- CUT - ROCK
- FILL
- FILL
- BORROW PIT
- PAVEMENT

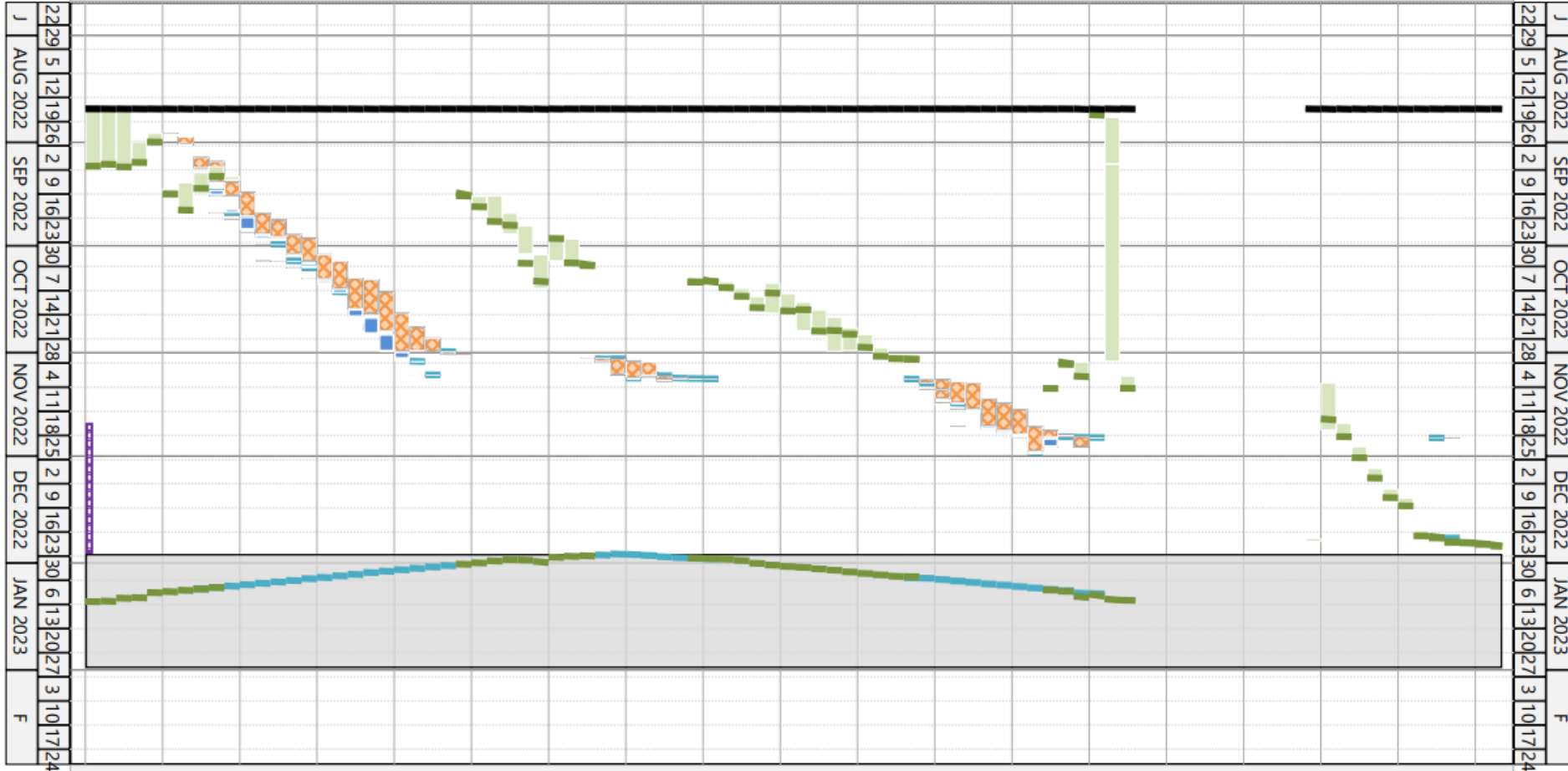
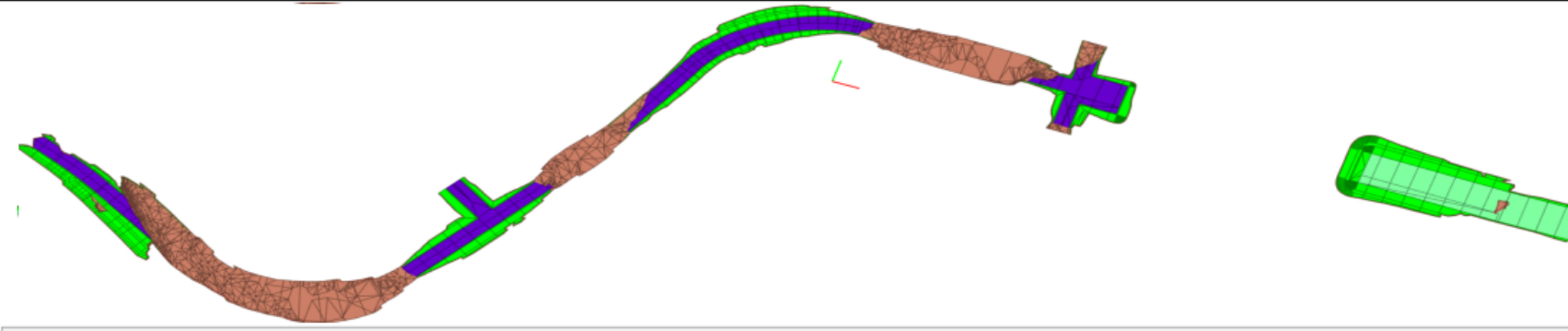




# SPRING HILL LINK - Alignment SHL 01 Time Location Chart









Legend

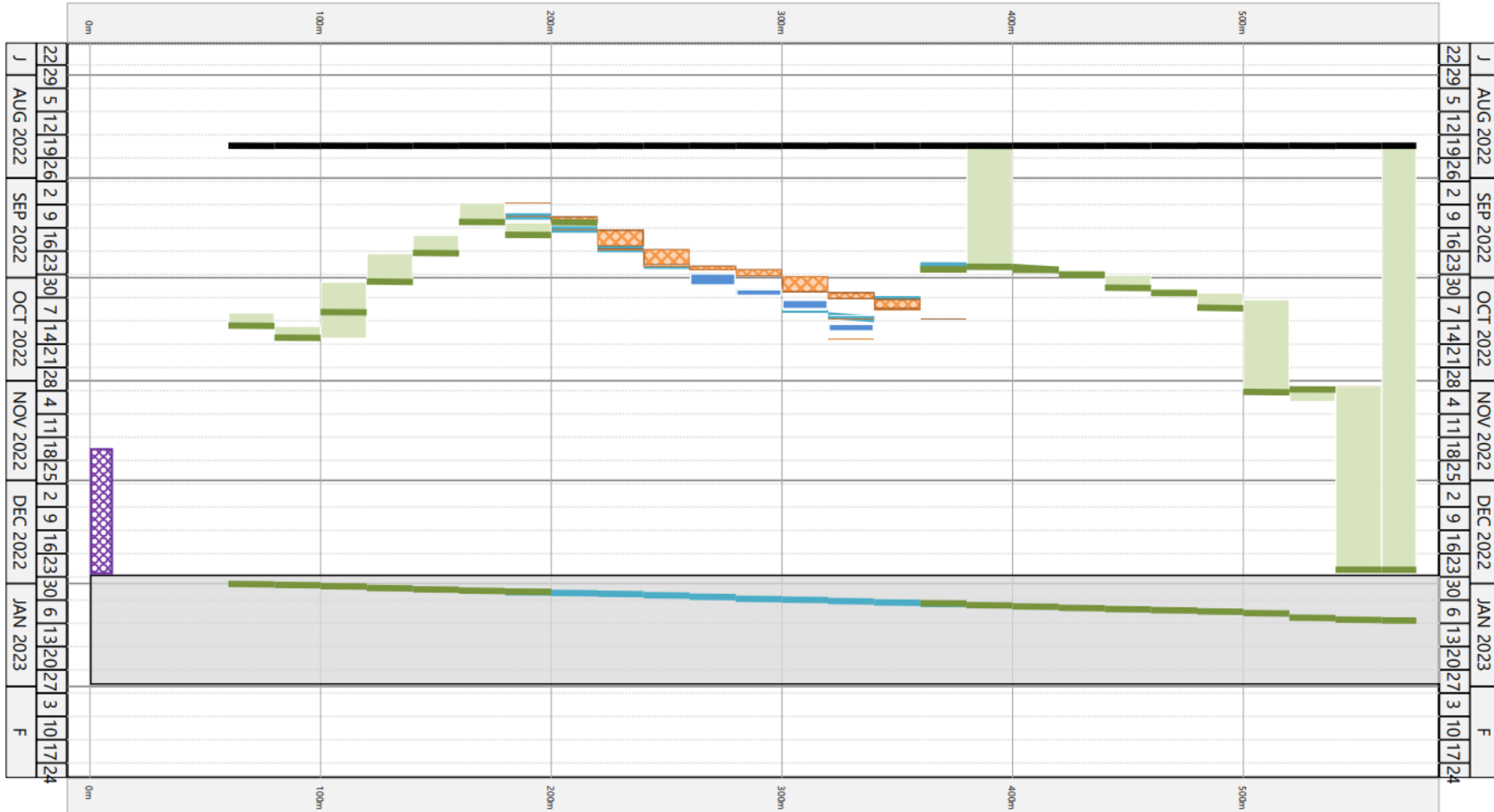
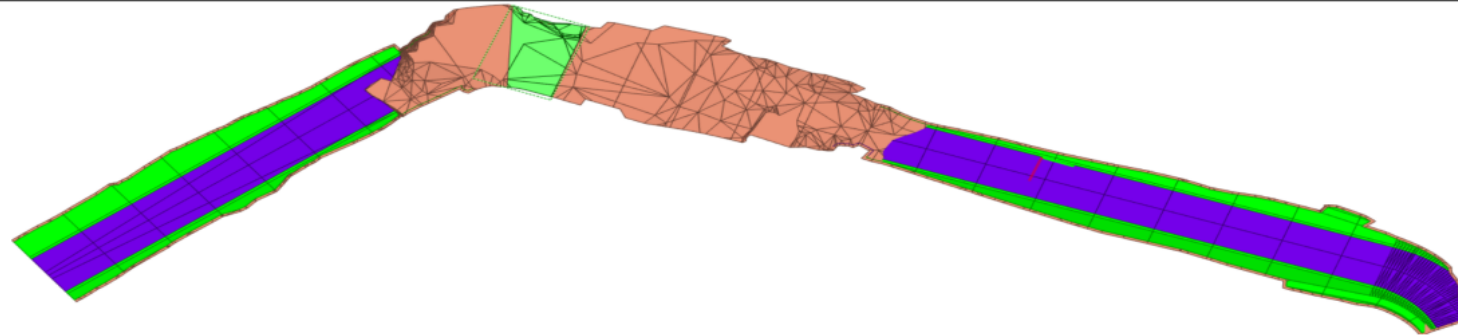
-  TOPSOIL
-  CUT
-  CUT - OTR
-  CUT - ROCK
-  FILL
-  FILL
-  BORROW PIT
-  PAVEMENT



# SPRING HILL LINK - Alignment SHL 02 Time Location Chart

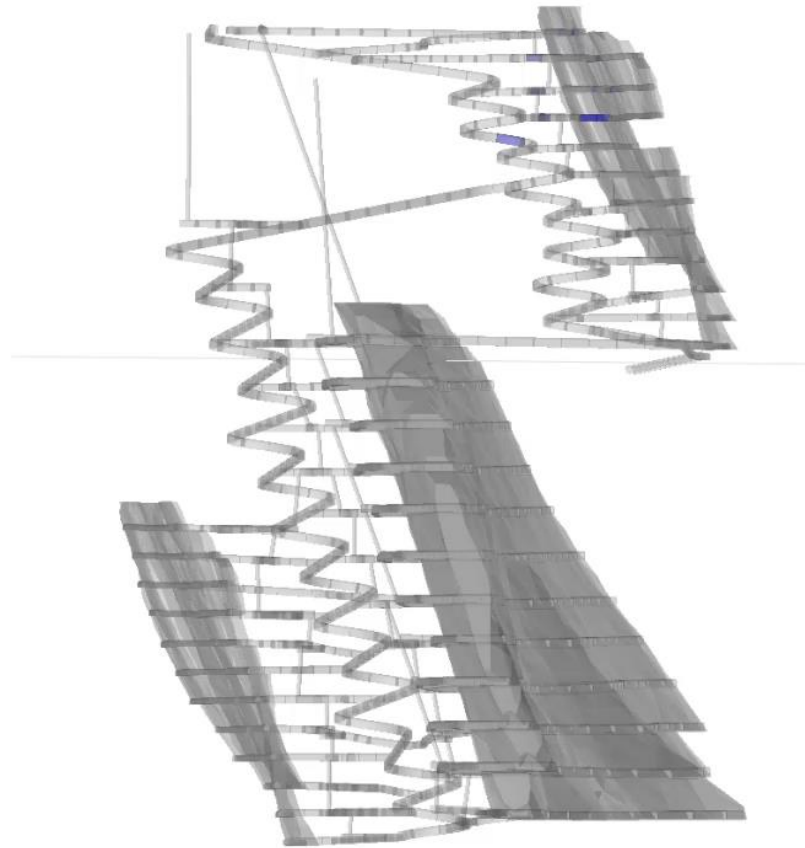
Legend

-  TOPSOIL
-  CUT
-  CUT - OTR
-  CUT - ROCK
-  FILL
-  FILL
-  BORROW PIT
-  PAVEMENT

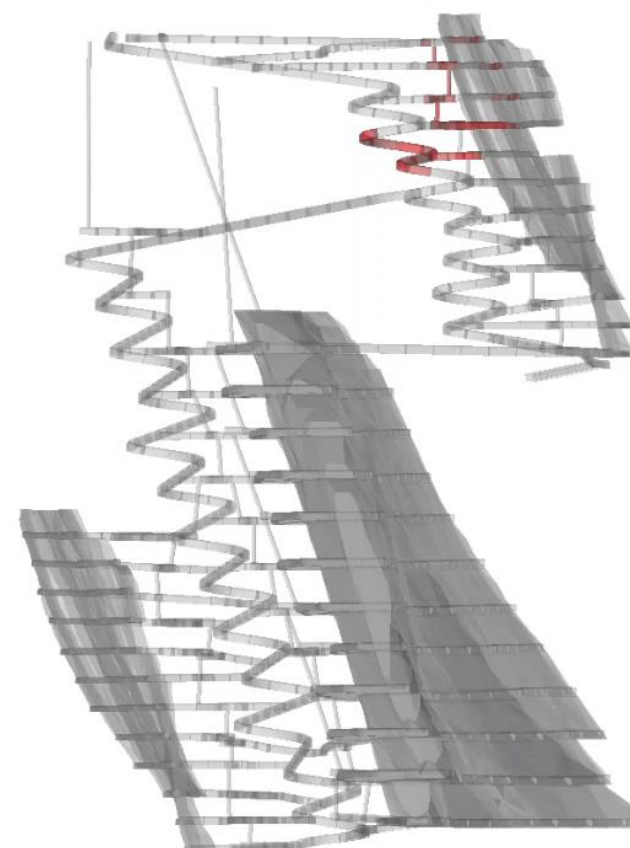


# SCRA Driven from model - POTENTIAL ACTIVE LOCATIONS

## BASE CASE – DETERMINISTIC ACTIVE MINING LOCATIONS



## STOCHASTIC POTENTIAL ACTIVE MINING LOCATIONS



13-Feb-23 to 20-Feb-23



BACK





# Call to action

- We can add significant value through our design (BIM) models combined with our knowledge when we integrate them into the optioneering, planning and estimating process.
- The earlier we do this the better
- We need to be brave, leave our comfort zones and break down our silos if we want BIM to have a real impact on how we deliver projects





# THANK YOU



File General PolyLines Solids Surfaces View Layers Format Drafting Plotting Geology Survey Underground Open Pit Development

Deswik.MDM Deswik.MDM Add Int...

### Deswik.IS

Settings  
 Project Options  
 Activity Types  
 Design And Attributes  
 Design Tools  
 Attribute Assignment  
 Create Activities  
 Create Bench Blocks  
 Create Tunnels  
 Create Slopes  
 Create From Solids  
 Create From Outlines  
 Manage Activities  
 Scheduling  
 Dependency Creation  
 Mining Path Sequencing  
 Resource Paths  
 Update Survey Actuals  
 Tools  
 Batch Updates  
 Reporting

☆ ADIT 1 COMPLETION ☆ MAT COMPLETED  
 ☆ ADIT 3 COMPLETION ☆ ADIT 3 to TRANSFORMER HALL  
 ☆ VENT DRIVE COMPLETE ☆ START RAISEBORE PROGRAM  
 ☆ PIT DEWATER COMPLETE ☆ PH CRANE COMPLETE  
 ☆ THIRD HEADING AVAILABLE

MODEL  
 Output  
 Command: Rotation Coordinate Relative rotation Relative coordinate Set working plane Z: 0.0

Deswik.FM Layer Control Deswik.IS

File Home View Filtering Setup Tasks Resources Rules Scheduling Blend Schedule Overrides Tools Optimization Quick Launch

Resources Production Rate Tables Resource Types Resource Production Fields Multiple Assignment Assign Resources Unassign Resources

Task Filter: Milestone Task Group: <No Grouping> Task Sort: <No Sorting>  
 Resource Filter: <No Filtering> Resource Sort: <No Sorting>

### K2 Hydro

	Description	Finish (BILT Start point)	Finish	Delay date	Rate	2022				2023								
						Oct	Nov 2	Dec 22	Jan 23	Feb 2	Mar 23	Apr 23	May 2	Jun 23	Jul 23	Aug 23	Sep 23	Oct 23
1	START RAISEBORE PROGRAM	8/11/2022 3:4	8/11/2022 3:48 PM		0m/d													
2	THIRD HEADING AVAILABLE	12/11/2022 4:	12/11/2022 4:21 AM		0W/d													
3	ADIT 1 COMPLETION	27/11/2022 2:	27/11/2022 2:48 AM		0m/d													
4	VENT DRIVE COMPLETE	5/12/2022 6:1	5/12/2022 6:12 AM		0m/d													
5	ADIT 3 to TRANSFORMER HALL	9/01/2023 4:3	9/01/2023 4:36 AM		0m/d													
6	MAT COMPLETED	12/01/2023 2:	12/01/2023 2:24 AM		0m/d													
7	ADIT 3 COMPLETION	23/04/2023 3:	23/04/2023 3:14 PM		0m/d													
8	PH CRANE COMPLETE	31/08/2023 1:	31/08/2023 12:25 PM		0m/d													
9	PIT DEWATER COMPLETE	17/12/2023 1:	17/12/2023 12:00 AM	17/12/2023 1	0m/d													

	Name	Description	Field	Filter	Ro	2022				2023								
						Oct	Nov 2	Dec 22	Jan 23	Feb 2	Mar 23	Apr 23	May 2	Jun 23	Jul 23	Aug 23	Sep 23	Oct 23
2	Summary																	
3	Lateral Development																	
4	Lateral (m)	Design Meter	LAT DEV		2577	308.2	286.1	192.1	200.7	231.4	121.8	159.7	167.6	170.1	1.4	46.2		
5	# Lateral Headings	Jumbo tasks			28	2.0	2.5	2.8	3.6	4.0	2.4	2.0	2.0	1.7	0.0	0.4		
6	Remaining MAT Dev	Remaining D	MAT		500	296	185	105	29									
7	Remaining ADIT 1 Dev	Remaining D	ADIT 1		219	214	84											
9	Vertical Development																	
10	Vertical (m)	Design Meter	VERTICAL		1901	160	204	230	127	204	214	204	214	204	142			
12	Mass Ex Development																	
13	Transformer Cavern	Volume	ACTIVITY TYPE: TRANSFOR		7169				3,037	4,132								
14	Powehouse Cavern	Volume	ACTIVITY TYPE: POWERHOU		53732	517	4,080	4,127	3,707	1,422	6,463	8,711	8,430	8,711	7,564			
16	Total Mass Ex (BCM)	Volume	MASS EX		62289	517	4,080	7,164	8,383	2,137	6,463	8,841	8,430	8,711	7,564			
18	TOTALS																	
19	Total Volume	Volume			161683	###	9,261	11,850	15,160	###	8,219	13,669	17,246	15,481	10,442	11,589		
20	Equipment																	
21	Work - Jumbo	Boomer M2C	Work		15	1.0	1.3	1.4	1.8	2.0	1.2	1.0	1.0	0.9	0.0	0.2		

Development Summary Jumbos Under construction

Log Entries

Deswik.Sched 2022.2.8.0 Start: 31/08/2023 12:25 PM Finish: 31/08/2023 12:25 PM Sum: 0 Zoom