



LINEARPROJECTSOFTWARE.COM

Improving Scheduling outcomes for Linear Infrastructure Projects

PROJECT CONTROLS EXPO 2018

Melbourne, Australia



Overview

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The benefits offered to linear Infrastructure Projects

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Outcomes

- Gain an understanding of what Time Location charts are
- Realise the benefits and apply to your Linear Projects



Presenter Profile

Santosh Bhat

Civil Engineer and certified AACE Planning and Scheduling Professional, member of ACES and RES.

18+ years' experience in project planning and controls in the infrastructure and construction industry

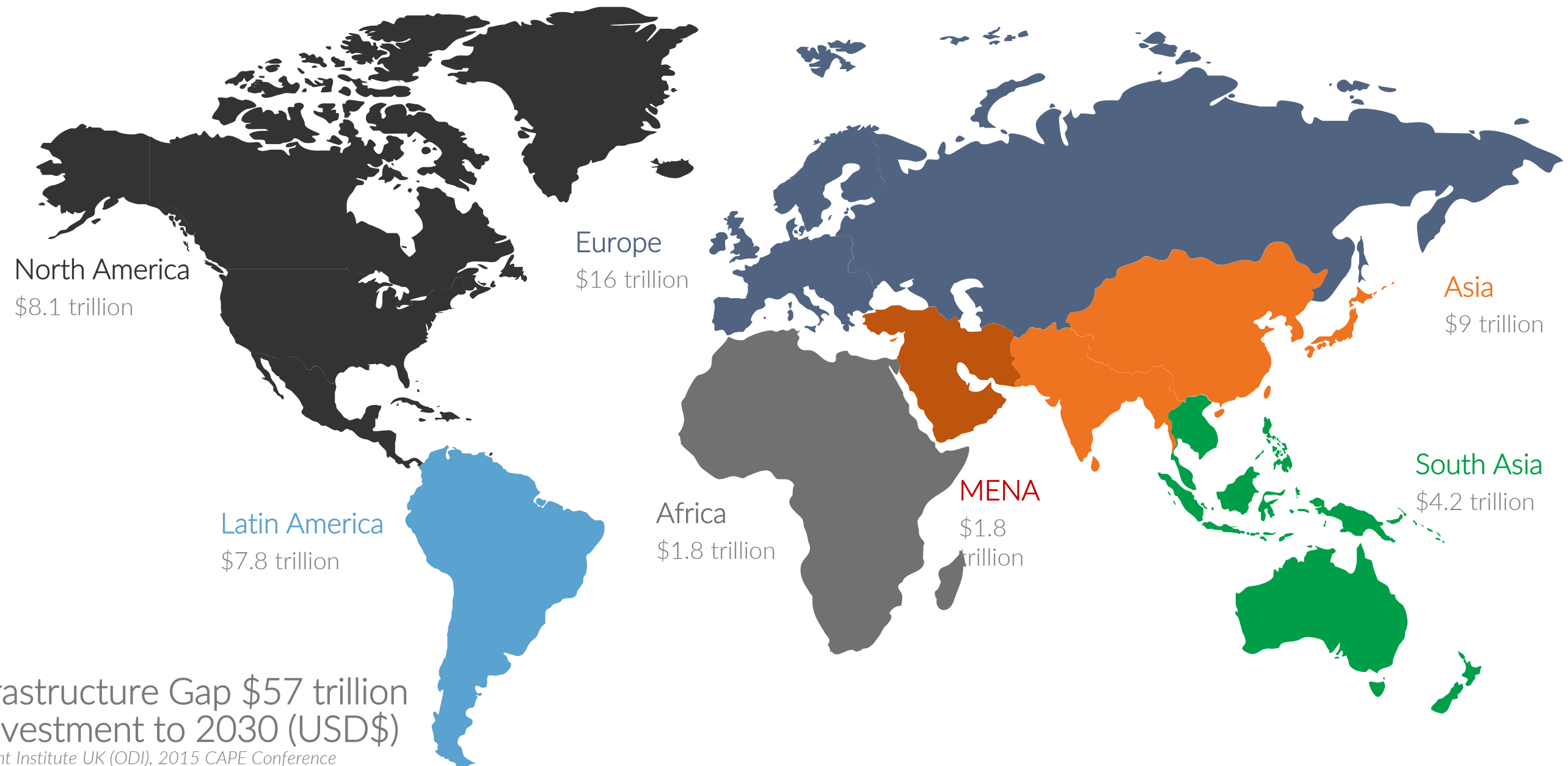
Now an independent consultant offering specialist planning and scheduling services such as

- Time Location Reporting and
- Schedule Risk Analysis
- Graphical Path Planning

Co-founder of Linear Project Software, producing tools to visualise linear project schedules



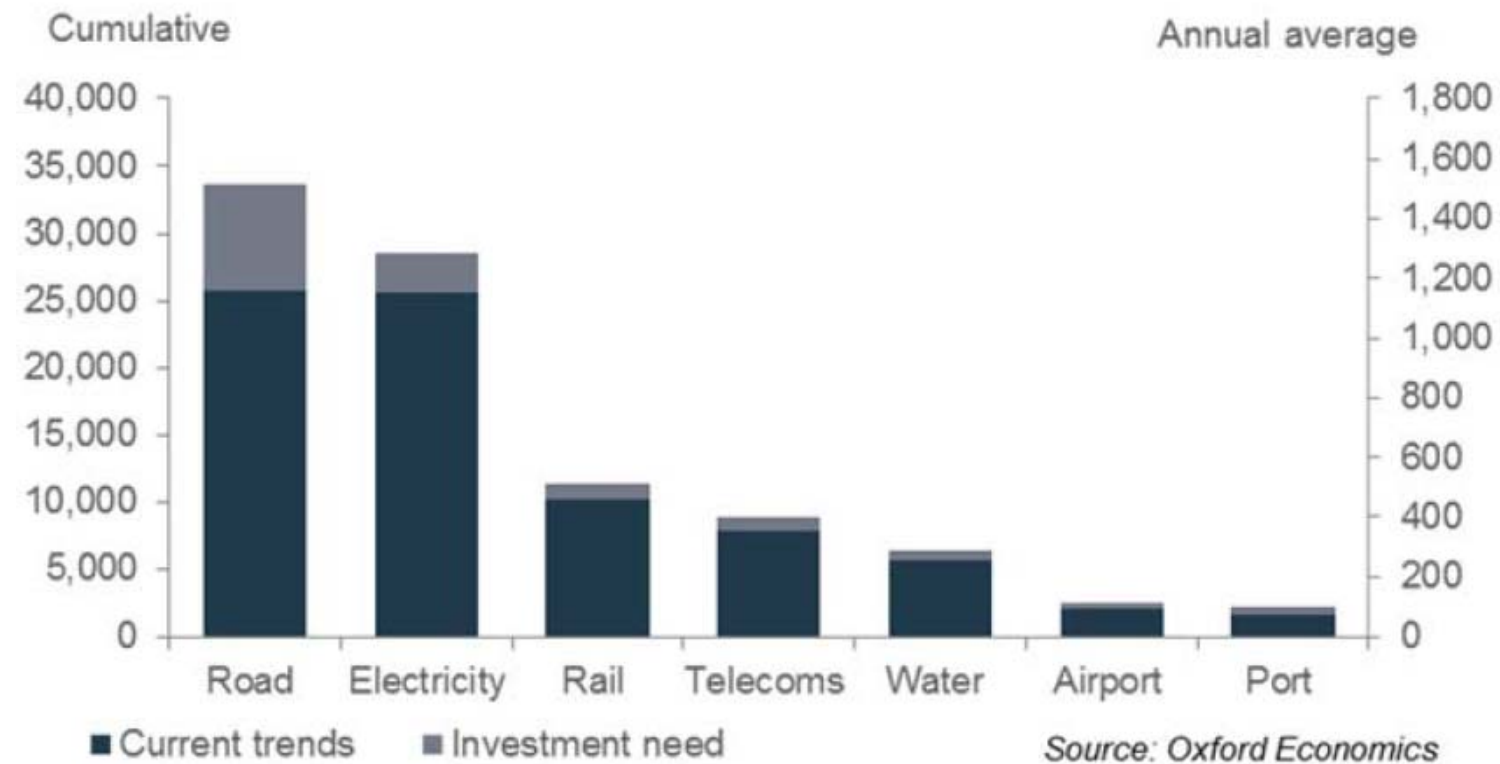
Context | Global Infrastructure Gap



Context | Global Infrastructure Outlook

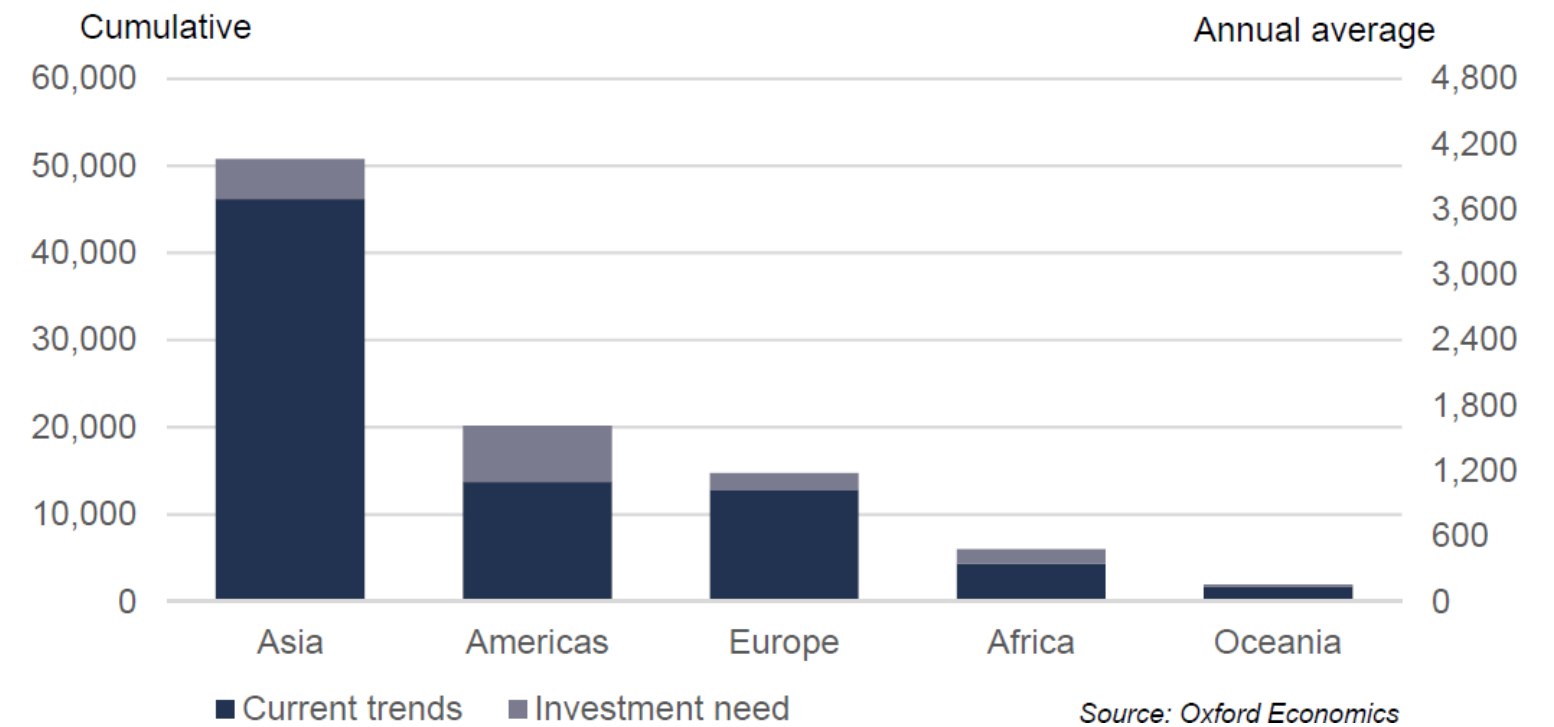
By Sector

Billion US\$, 2015 prices and exchange rates



By Region

Billion US\$, 2015 prices and exchange rates

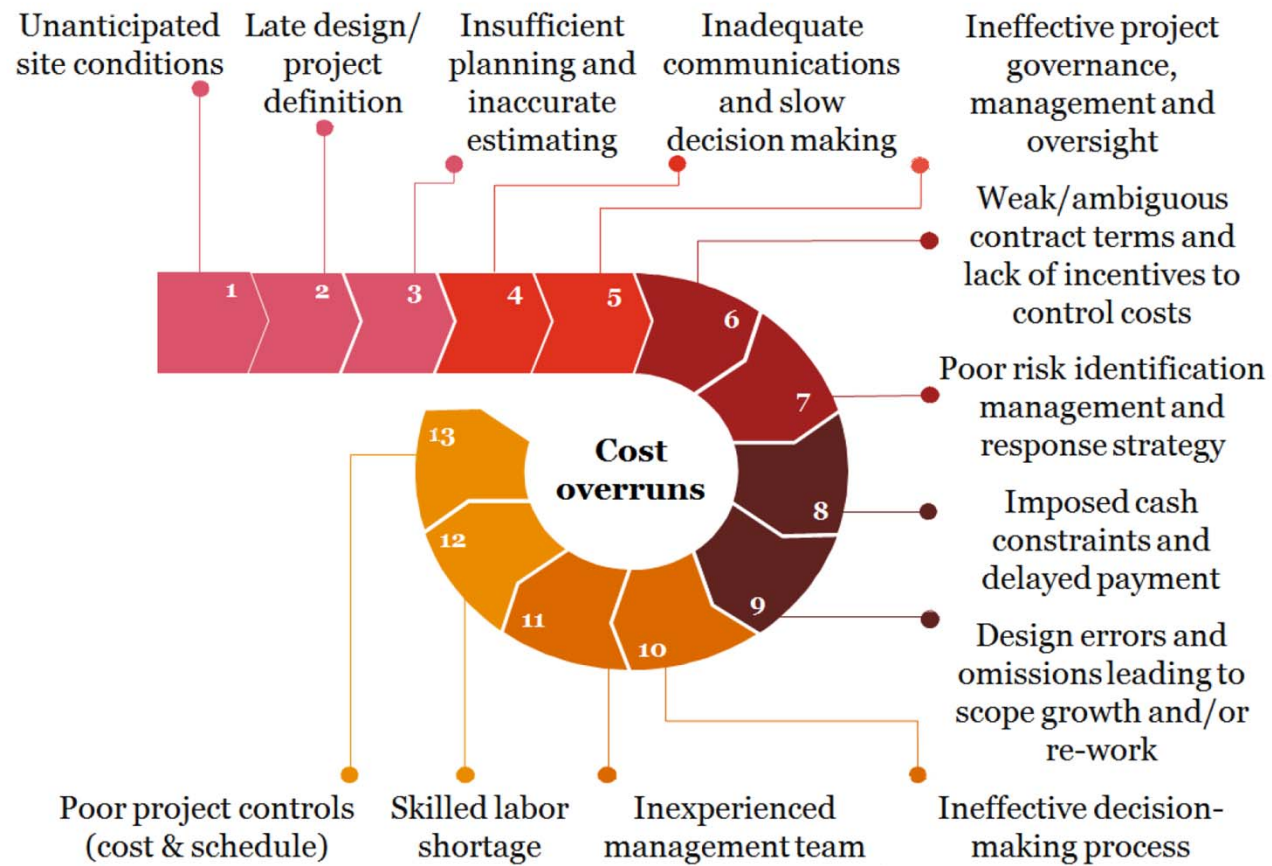


Infrastructure investment forecasts to reach \$94 trillion by 2040

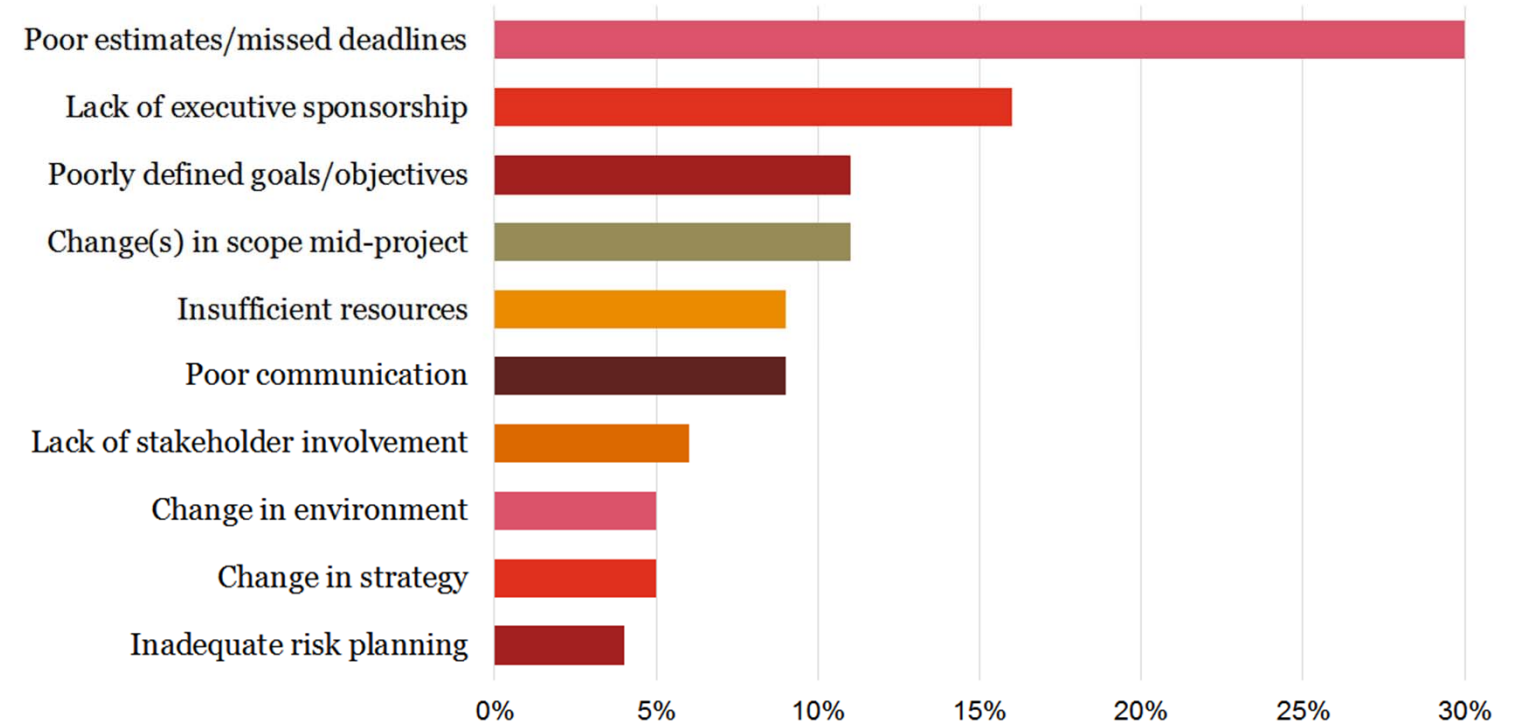
Oxford Economics, Global Infrastructure Outlook (July, 2017)

Context | What Causes Overruns?

Lack of planning and rigorous controls during construction are the biggest misstep that lead to project delays and failure.



Why do projects veer off course?

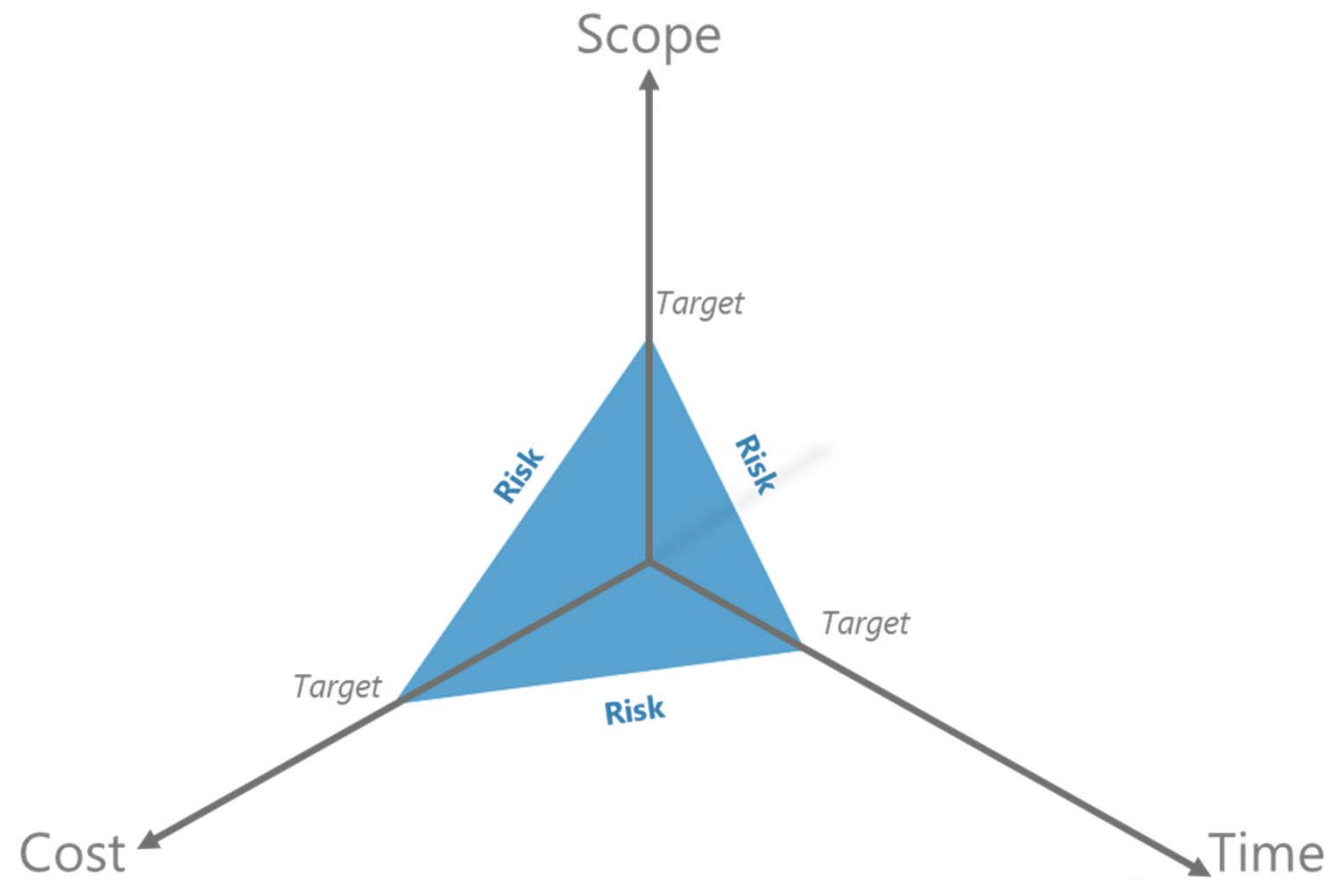


Source: *Insights and Trends: Current portfolio, Program, and Project Management Practices* (Third global survey on the current state of project management, PwC, 2012)

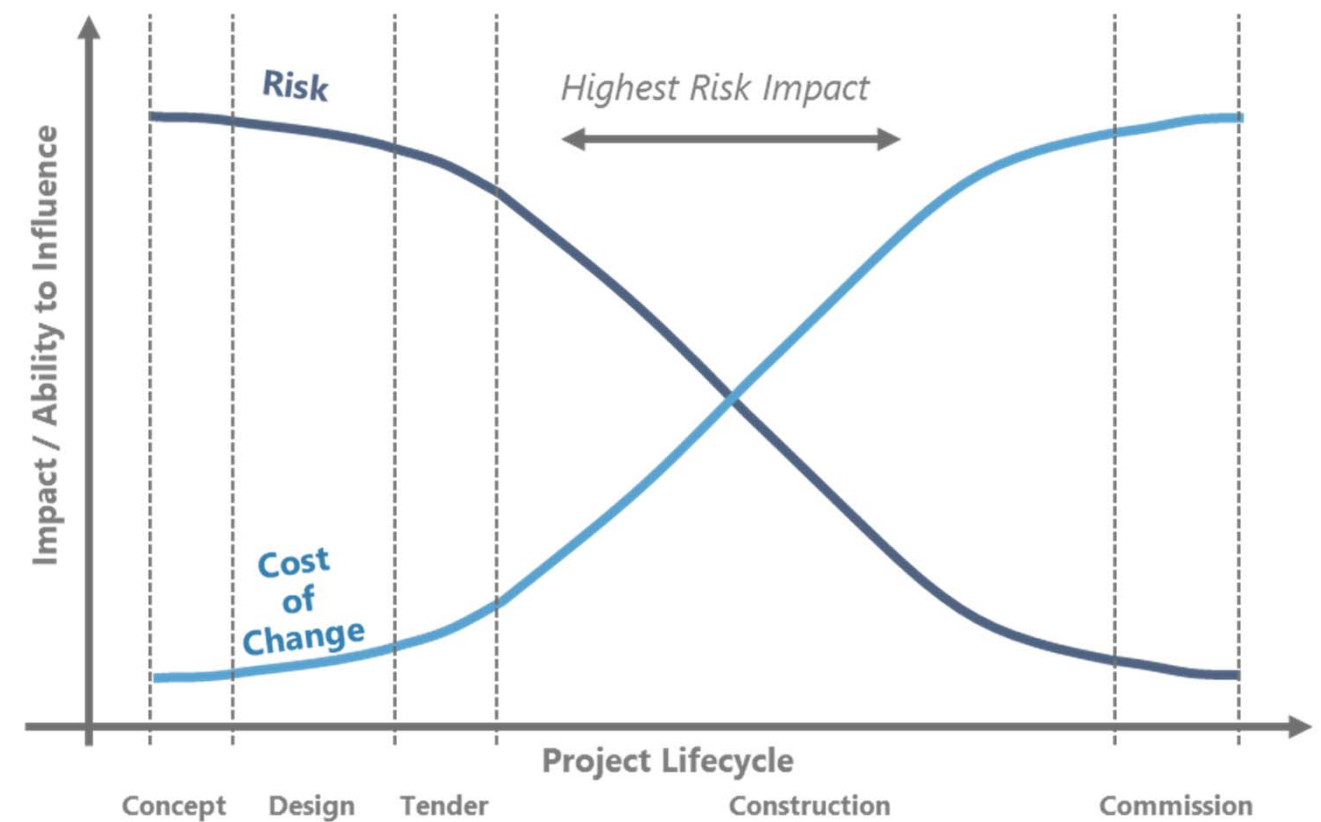
Correcting the course of Capital Projects,
PwC (October, 2013)

Context | Why Improve Schedule Outcomes?

Project Management Triple Constraint



Degree of influence and cost of change through project lifecycle



Context | Problems with scheduling

Scheduling is tough, even for the experienced

- Schedules serve multiple purposes e.g. Planning, communication, reporting, performance management, contract management, cost control, dispute resolution
- Schedules need support, buy-in and acceptance from all project stakeholders (internal + external) and the wider organisation. Meeting their expectations
- Poor scheduling practices, reviews and analysis
- Striking an appropriate balance – Detail vs Summary
- **Is it being used?**



Context | Is There a Better Way?

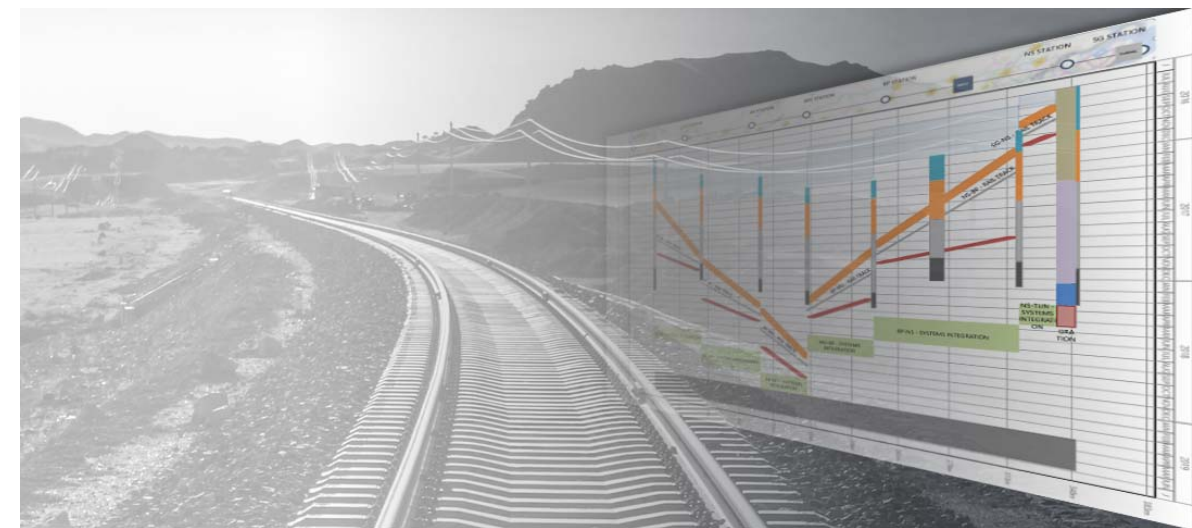
How to solve scheduling issues and improve outcome

- Railway and Metro construction projects share a unique feature, that lets us approach project scheduling with a different approach that

- ✓ Improves schedule communication and analysis
- ✓ Engages and informs wider audiences
- ✓ Can replace traditional Gantt charts with a single page



TIME LOCATION CHARTS



A visual representation of project schedules for linear infrastructure projects

What are Linear Projects?

- Works progress in a repetitive manner and/or in a continuous direction over the project's physical location
- Works occur in a fixed locations but interface with the linear works
- Examples of linear projects include:
 - Roads
 - Railways
 - Tunnels
 - Pipelines
 - High-rise vertical buildings also



Why Time Location Charts?

Benefits of Using Time Location Charts

- Time Location charts are a much better method of visualising, communicating and analysing project schedules
- Offer an alternative to using the traditional bar chart format used for critical path networks
- Benefits of using Time Location Charts for Linear Projects include:
 - Location & time of work visually represented
 - Work/crew sequences
 - Clashes, schedule logic errors
 - Resource analysis
 - Performance measurement comparisons



Linear Project Solution

Time Location Charts

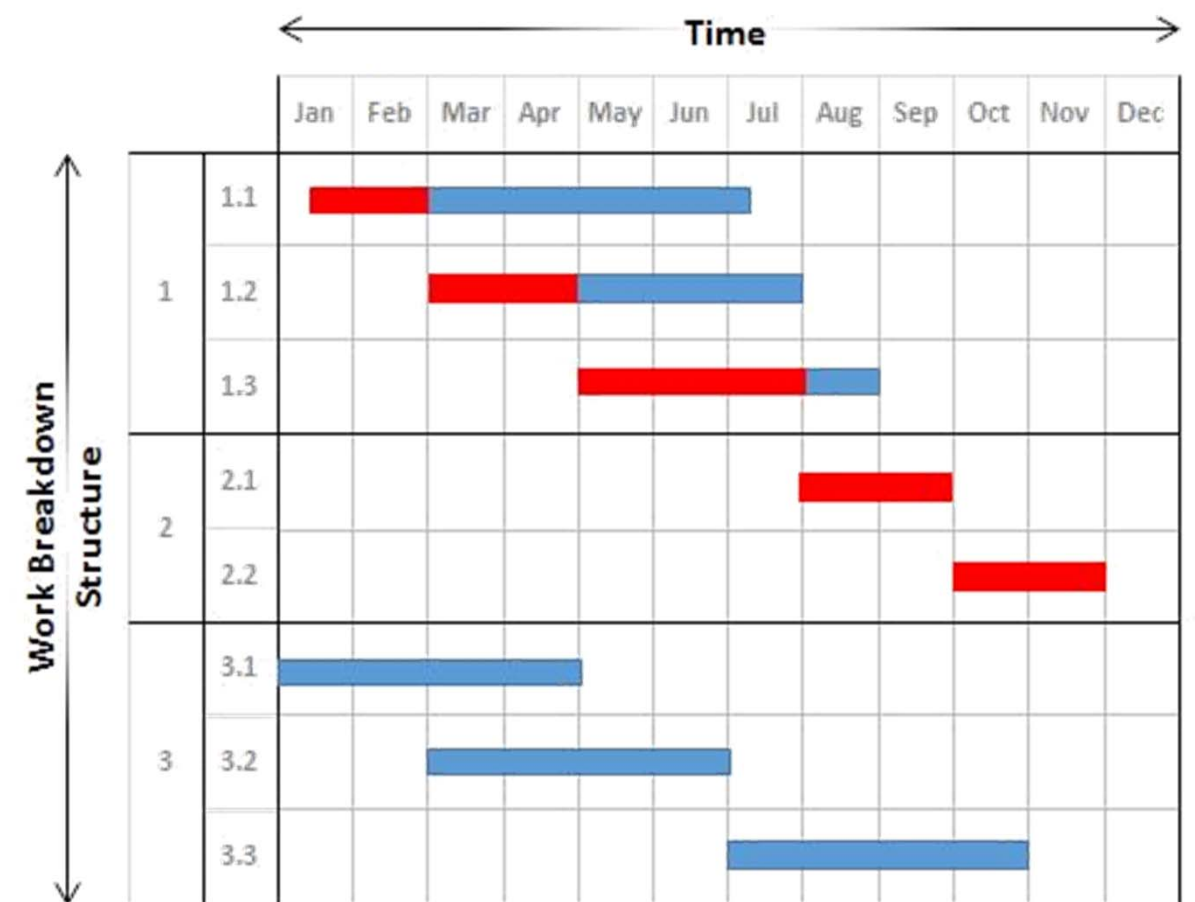
- Ideally suited to Linear Construction Projects
- Other names such as:
 - Time Distance (TD) charts
 - Time Chainage charts
 - Line of Balance
 - March Charts
 - Flow Lines
 - Linear Schedules



Traditional Project Schedule Output

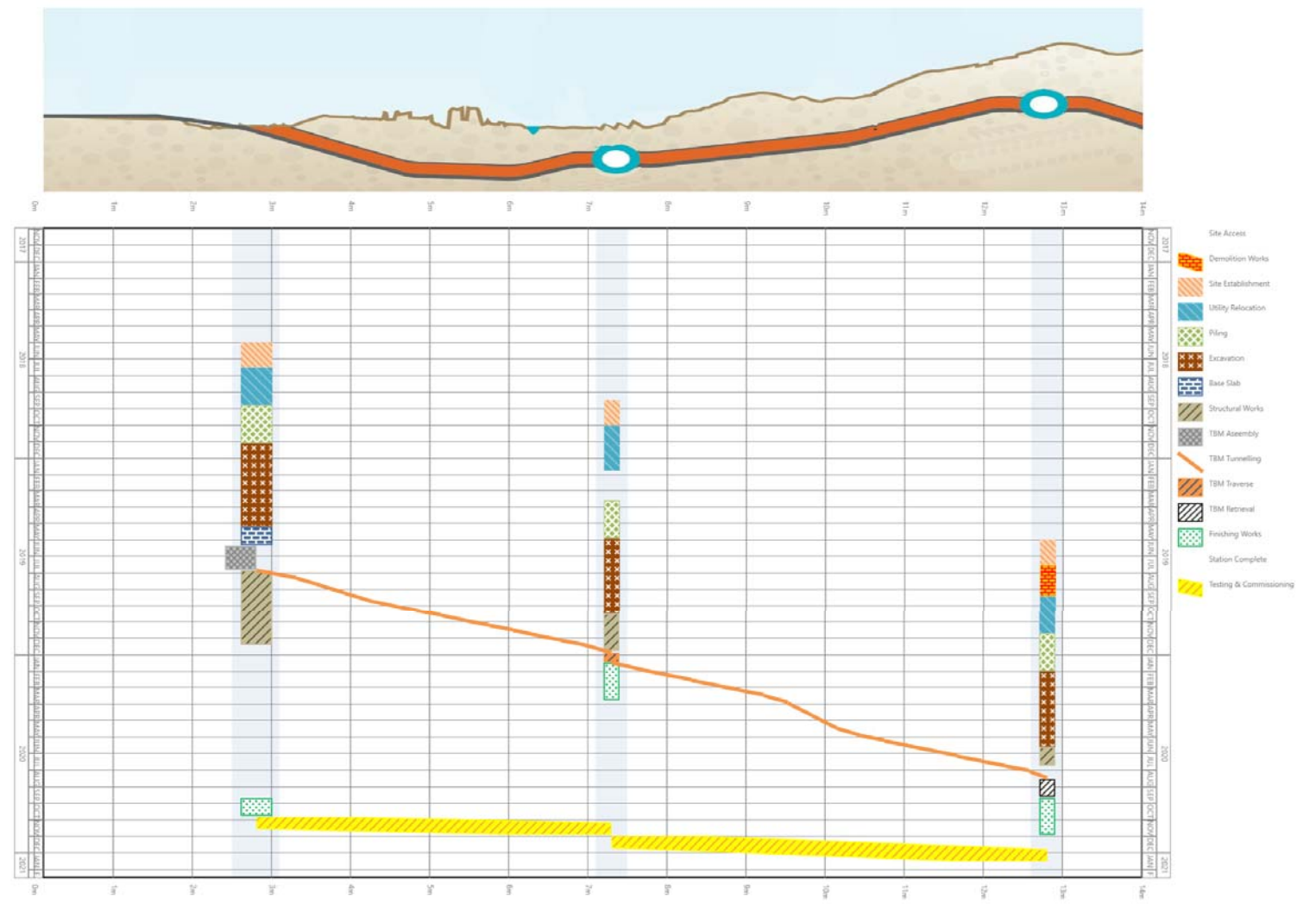
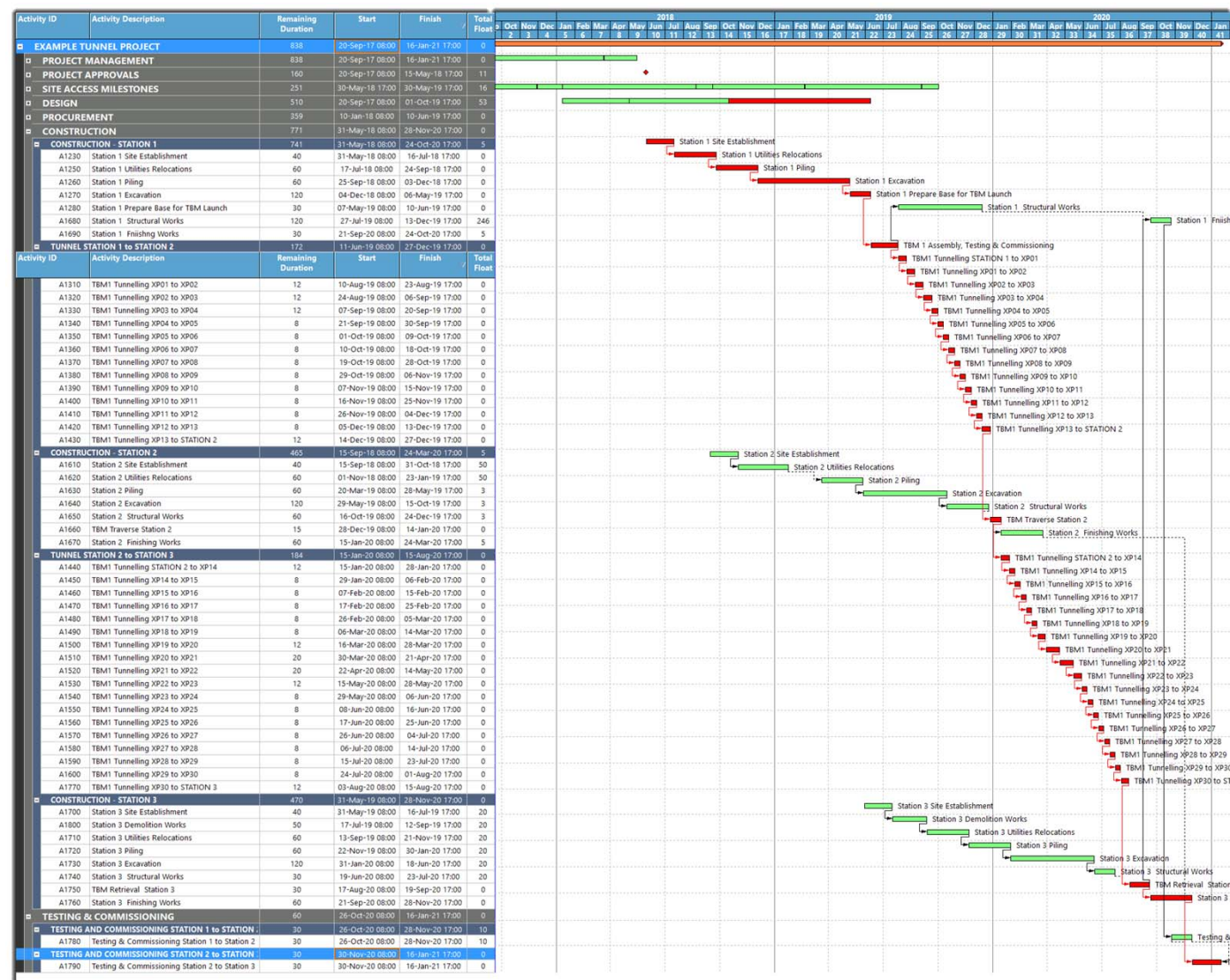
Bar or Gantt Charts

- Horizontal time axis, units of hours, days, weeks etc...
- Vertical axis uses a work breakdown structure that can be:
 - A static hierarchical structure (e.g. P6 WBS feature)
 - Develop a flexible flat or hierarchical structure using coding, user defined fields (eg. Phase, discipline)
- Single task per row
- When used for location, requires defined discrete values



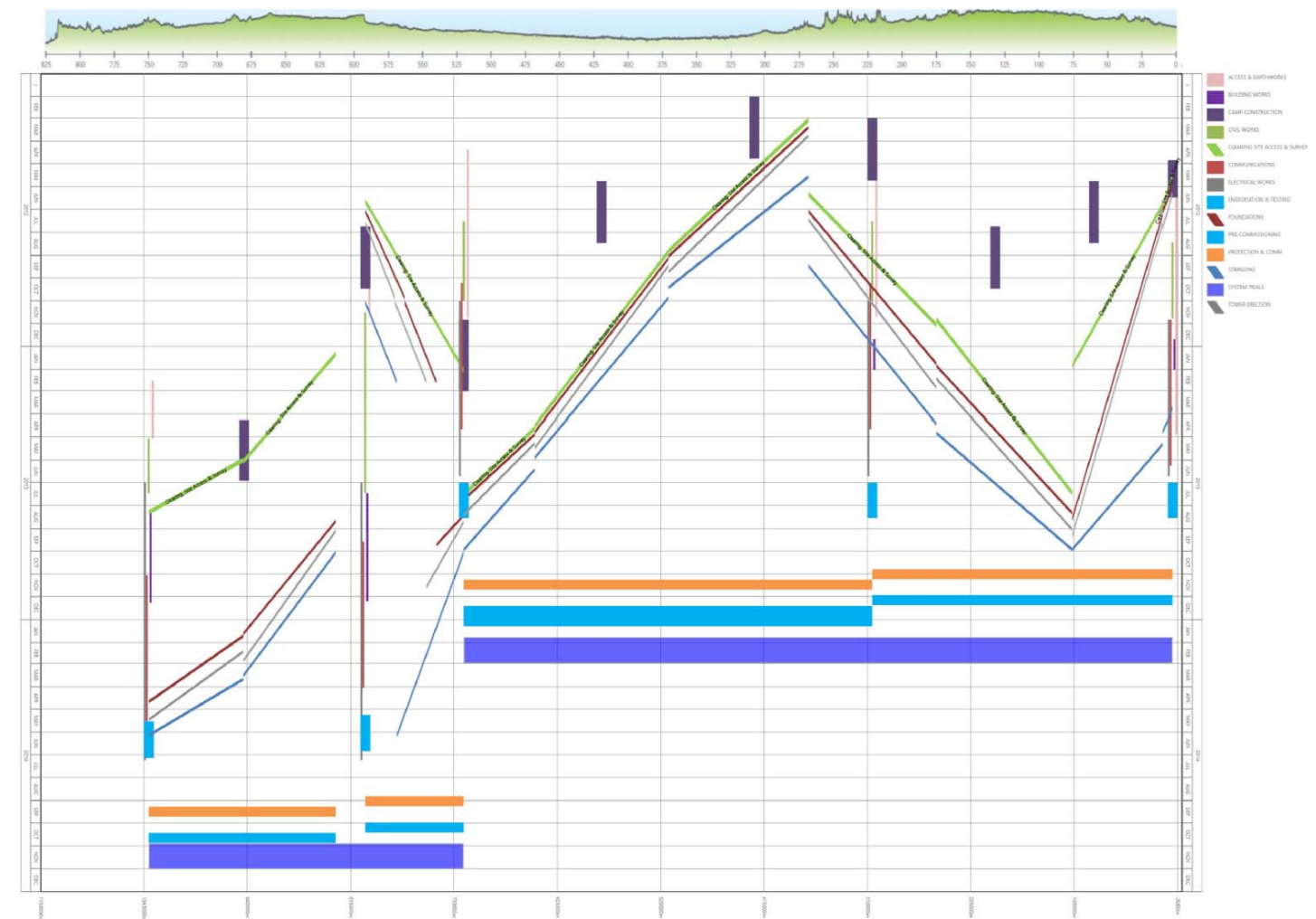
Time Location Charts | Visual

Compare the two schedule outputs – Simple Example



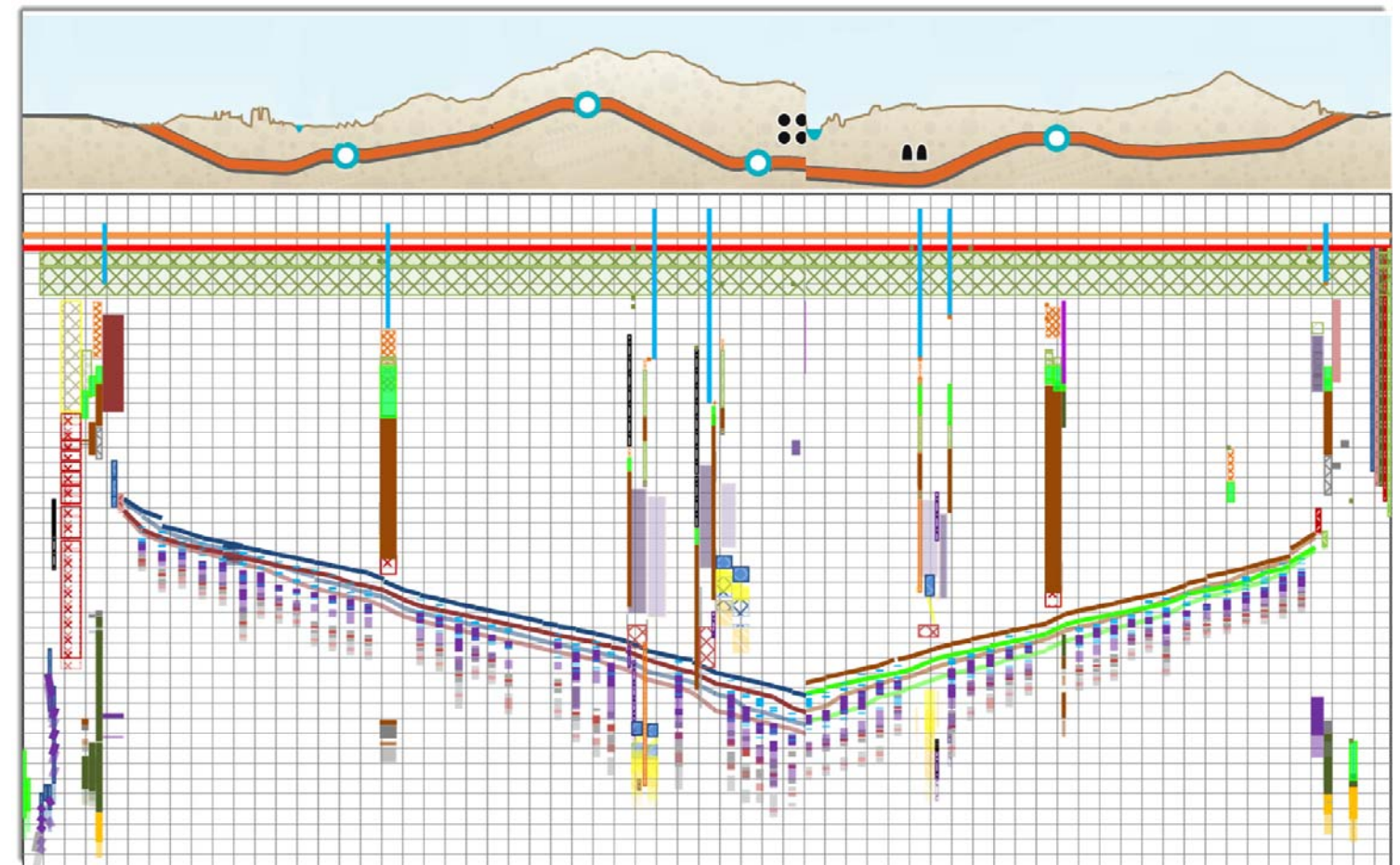
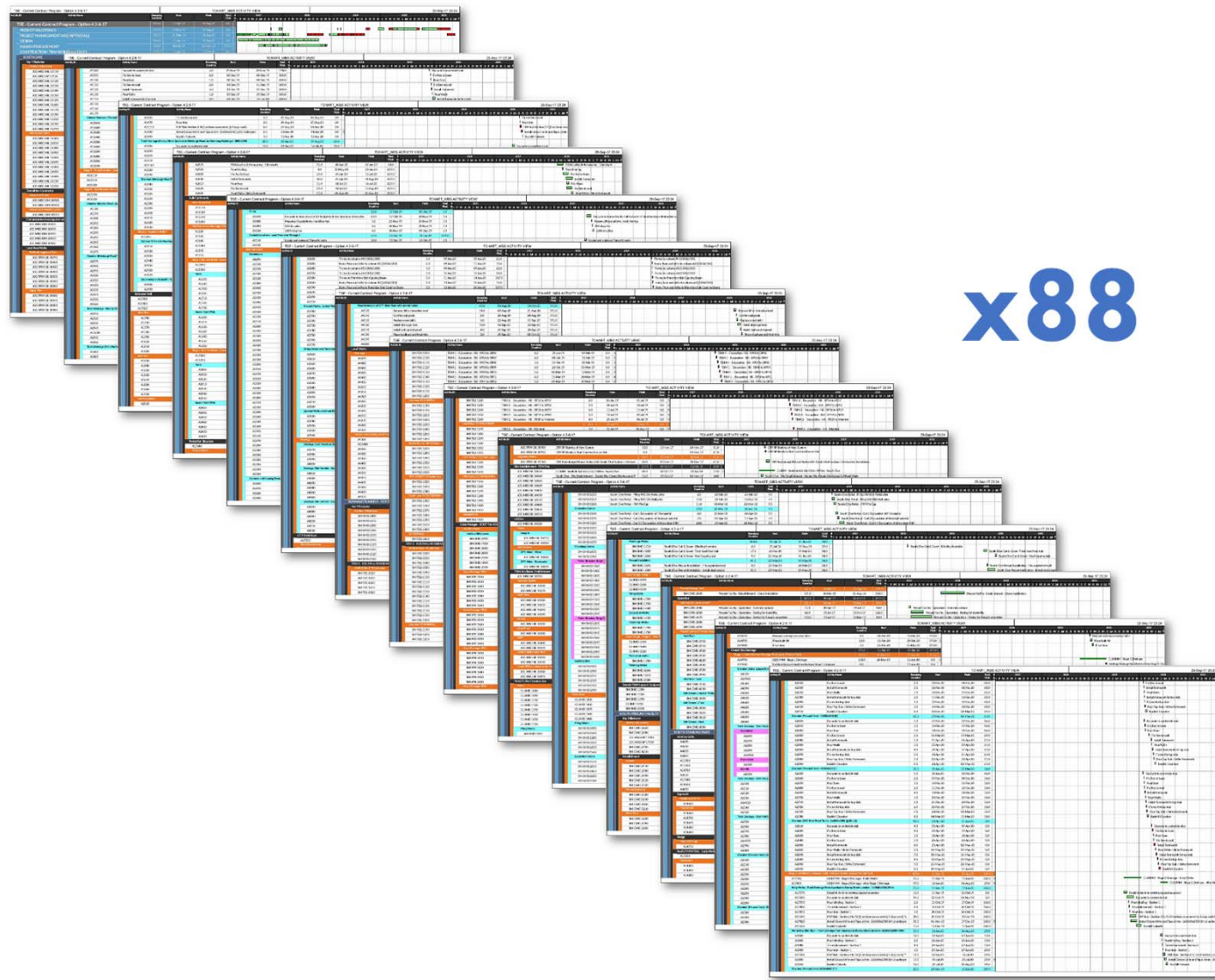
Time Location Charts | Visual

Compare the two schedule outputs – More Complex Example



Time Location Charts | Visual

Compare the two schedule outputs – Very Complex Example



Time Location Charts | Visual

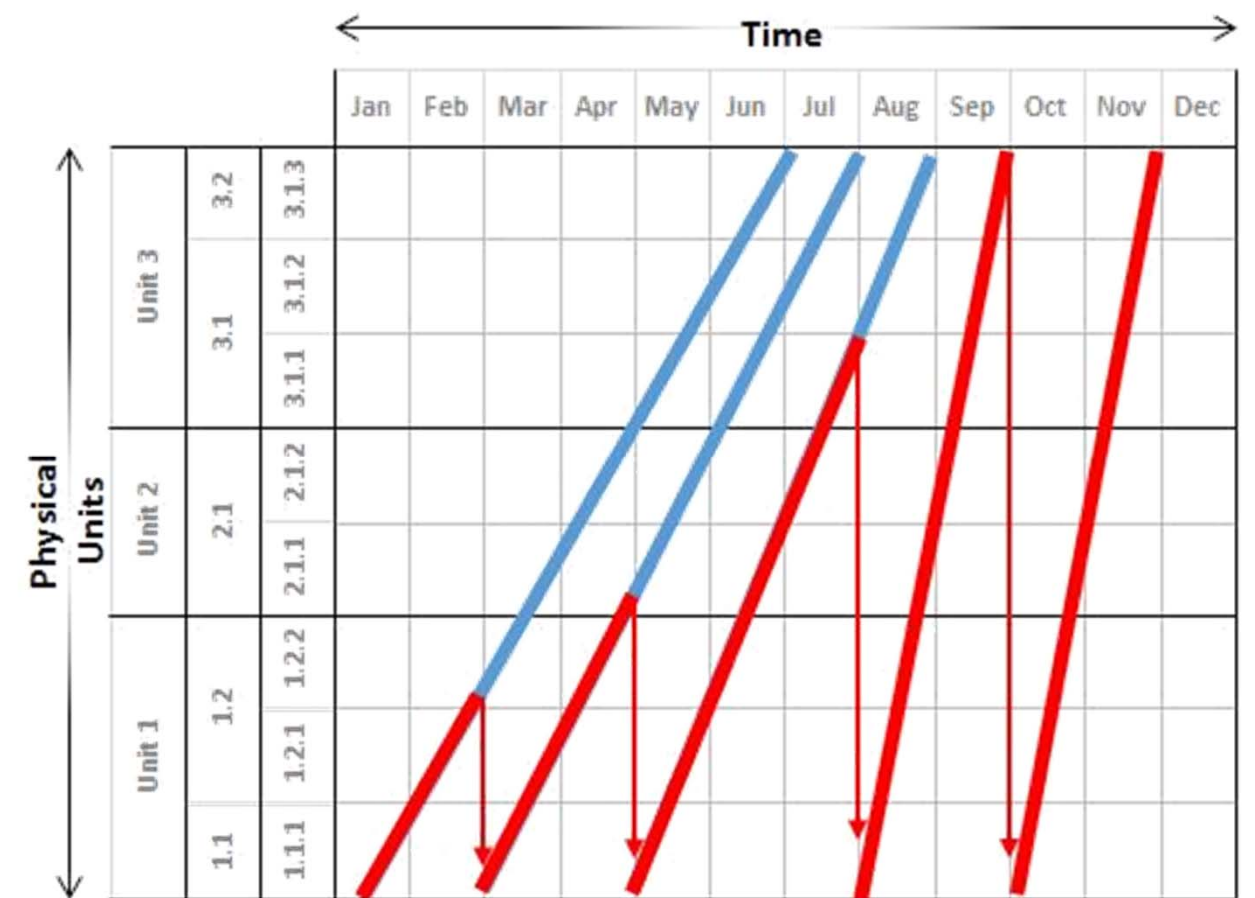
Spot the difference(s)



Alternative Project Schedule Output

Consider the following representation

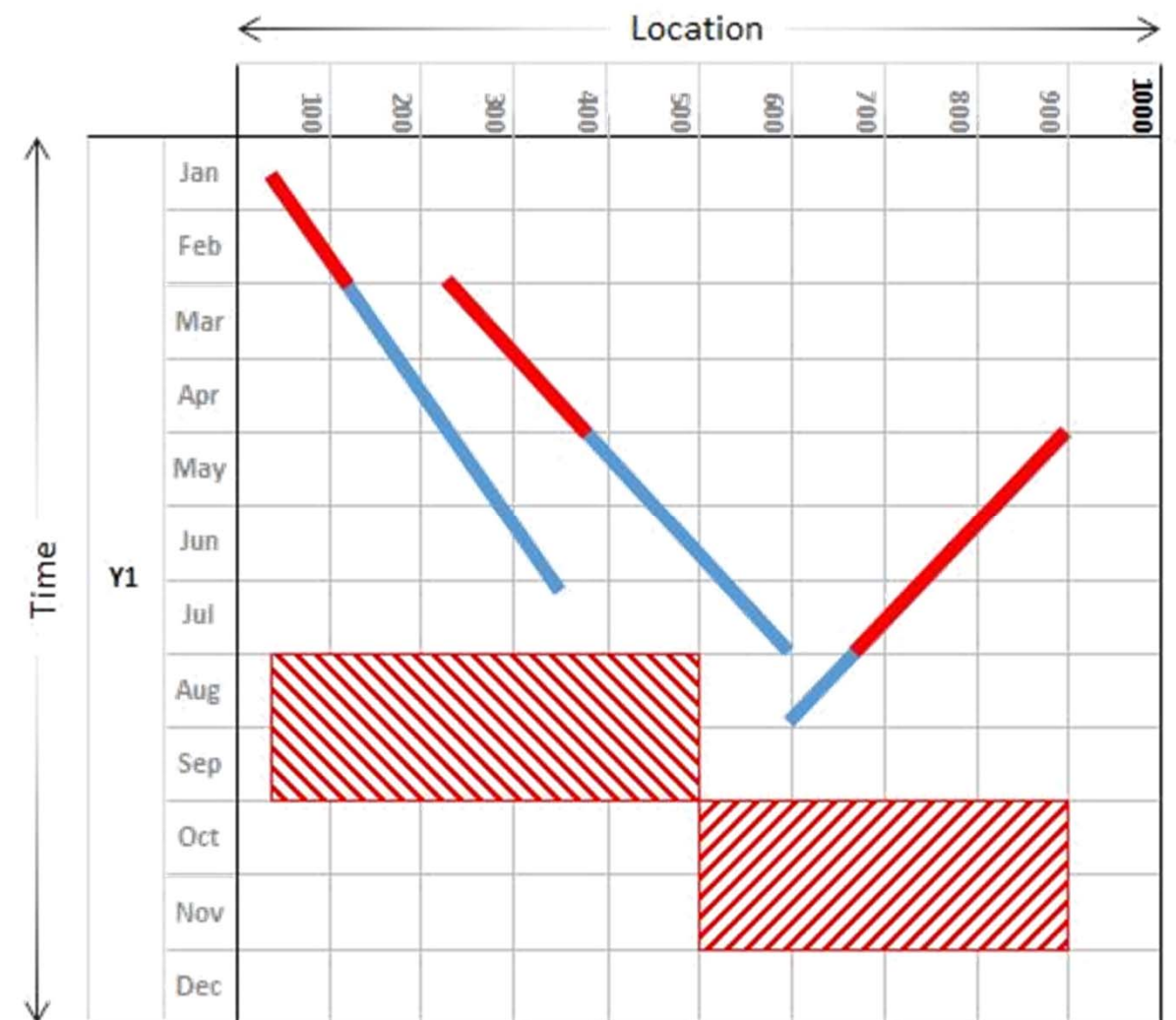
- Horizontal axis remains as time
- Vertical axis represents physical work areas, rather than a work breakdown structure
 - Specific levels, areas, zones etc...
 - Possibly use a hierarchical structure for locations, such as building, floor, area
- Schedule activities are shown progressing through the physical locations



Alternative Project Schedule Output

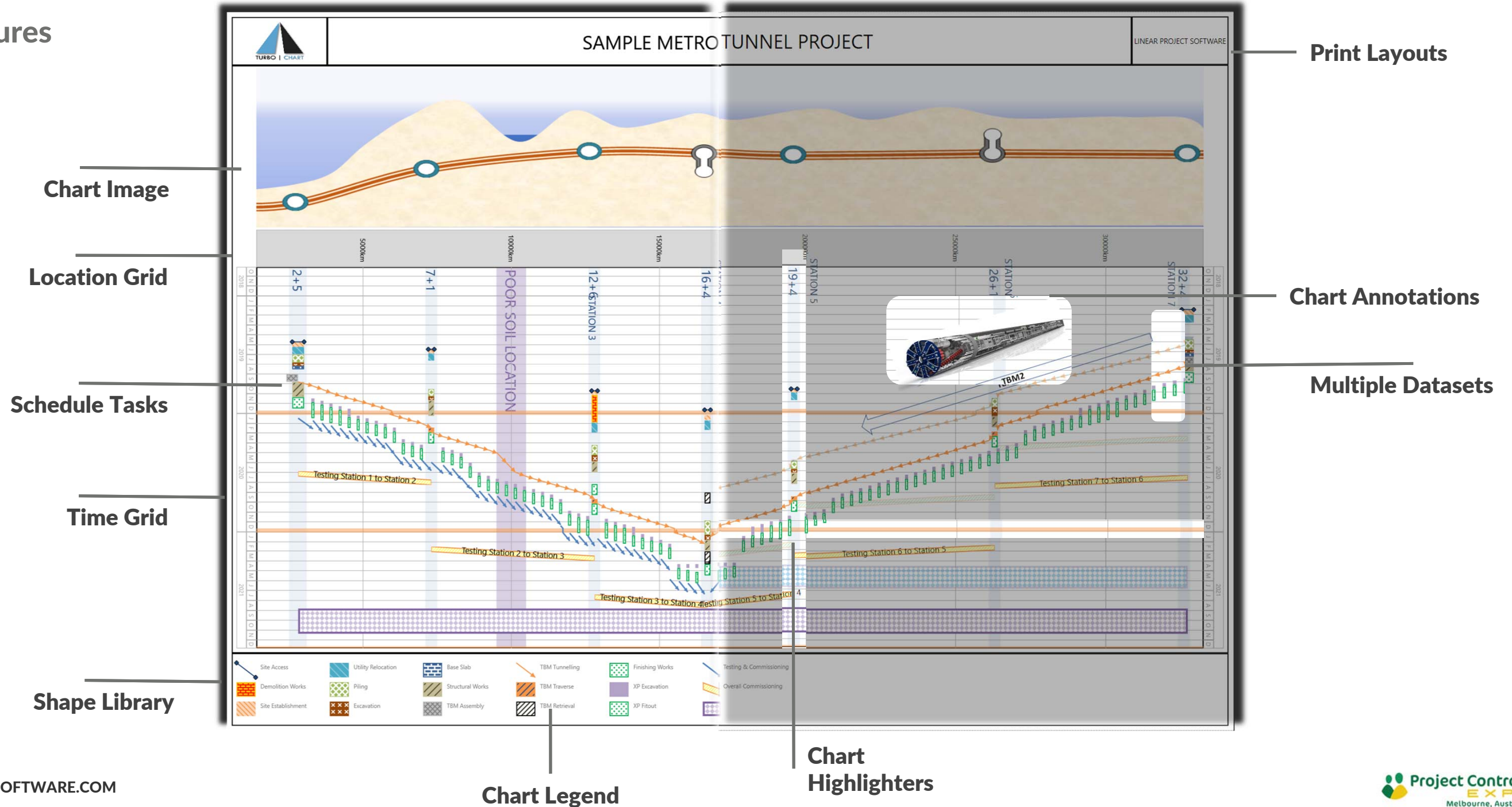
Switch axes

- Vertical axis now represents time
- Horizontal axis represents physical work areas, using a continuous range from a defined start point to an end point
- Schedule activities are shown progressing through the physical locations



Anatomy of a Time Location Chart

Key Features



Location Grid | Multiple Linear Controls

Determine how to present varying control lines

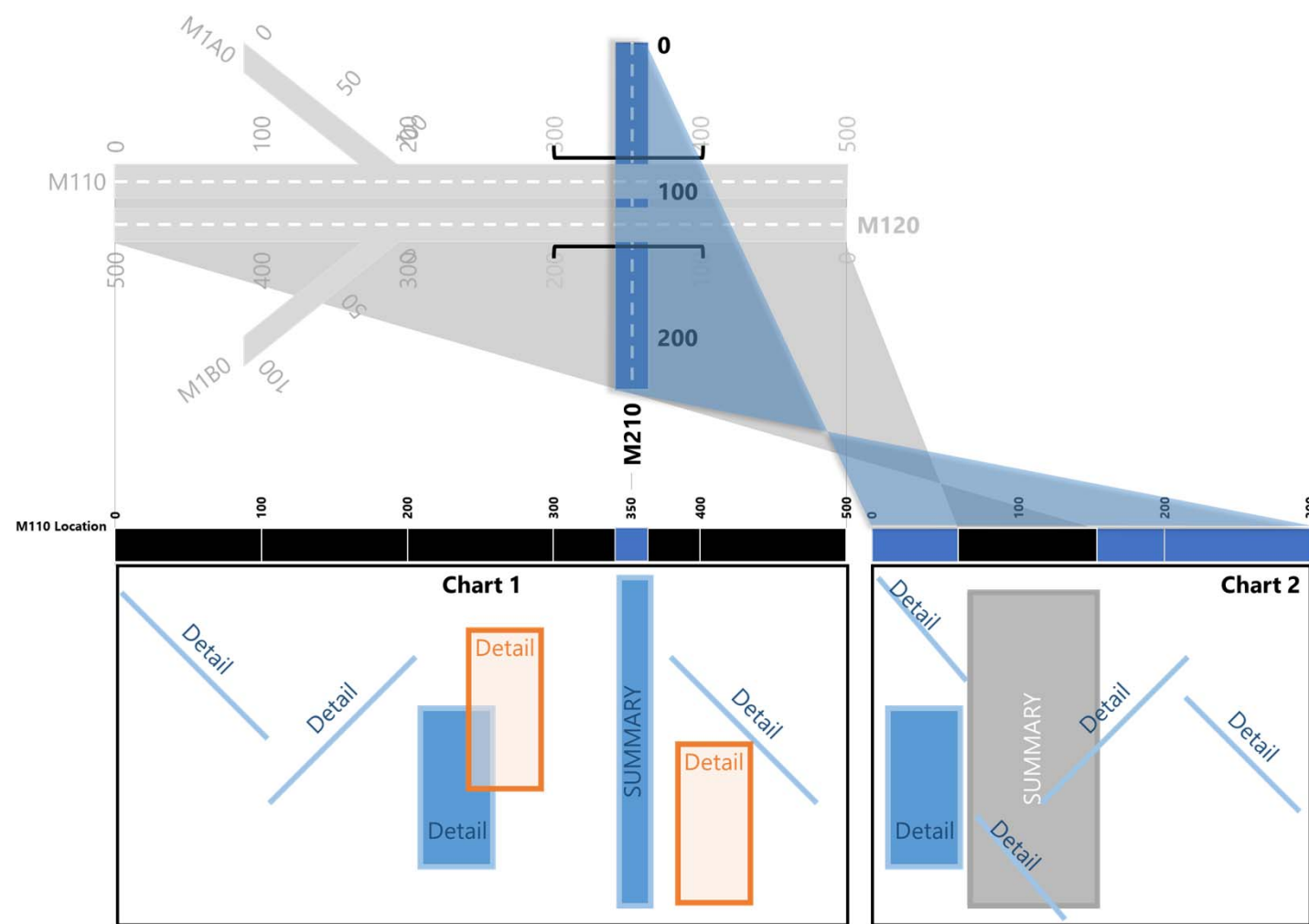


Chart Shapes

Shapes represent the type of work

- Shapes are the core element in interpreting chart
 - Shapes with a gradient, such as **lines** represent a rate of progress for the schedule activity being represented. Shallow equals fast, steep equals slow e.g. track laying
 - Shapes such as milestones represent events at a **point in time**, and can also indicate a range of locations over which this event occurs e.g. access to site
 - Polygons such as rectangles can be used to represent activities that occur over a given location span for a period of time, e.g. earthworks
- Shape colour, thickness, patterns to represent differing scope of work

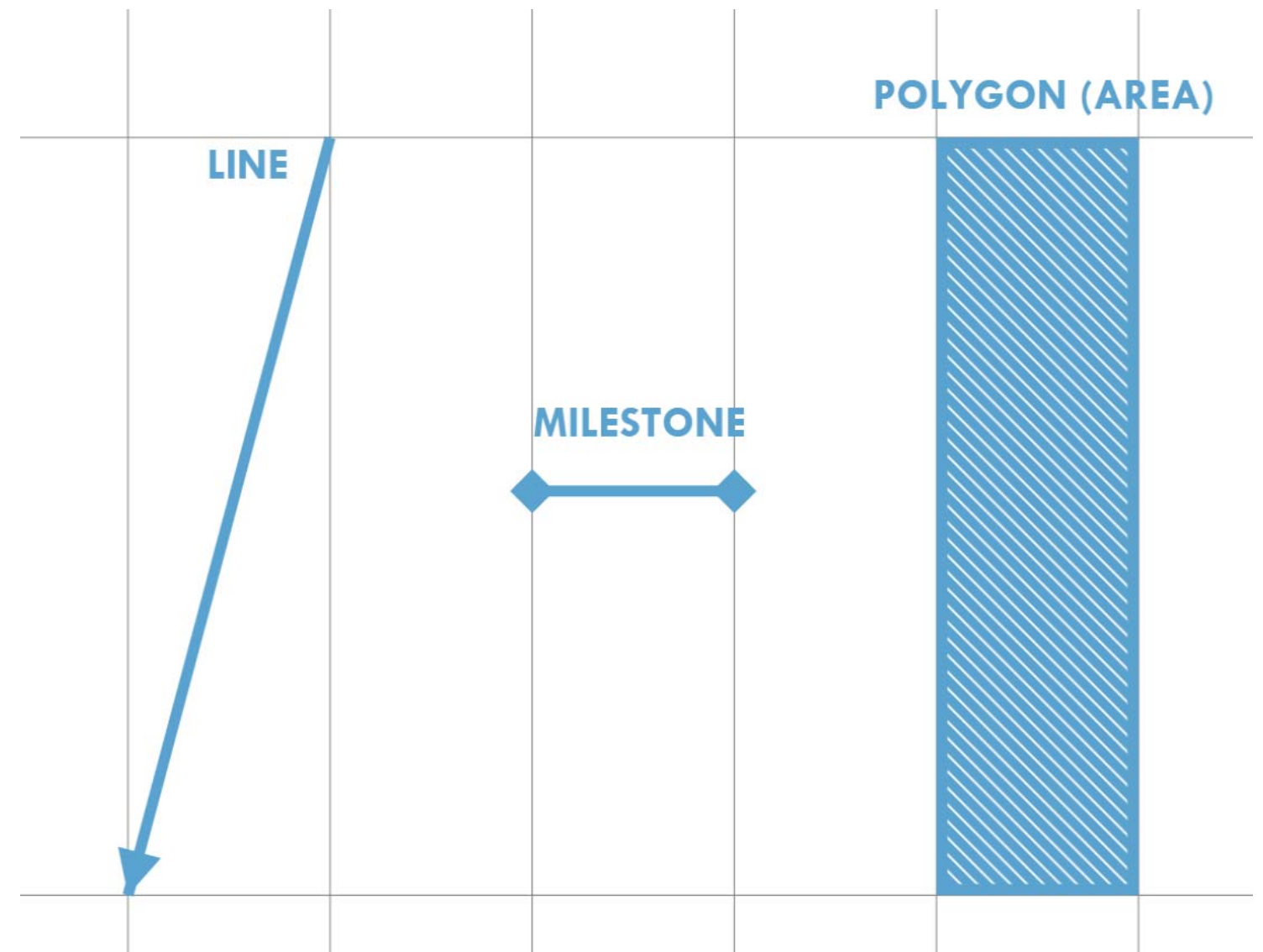


Chart Shapes | Parallel bars

Can represent linear tasks progressing along locations

- Parallel bar shapes can be used to represent tasks that progress along a project location
- Time offsets can represent the task occupying a fixed amount of time as work progresses, e.g. concrete curing
- Location offsets can represent physical space (location) occupied by the task as it progresses, e.g. Work train or limited spacing between tasks
- Shapes can also combine both offsets

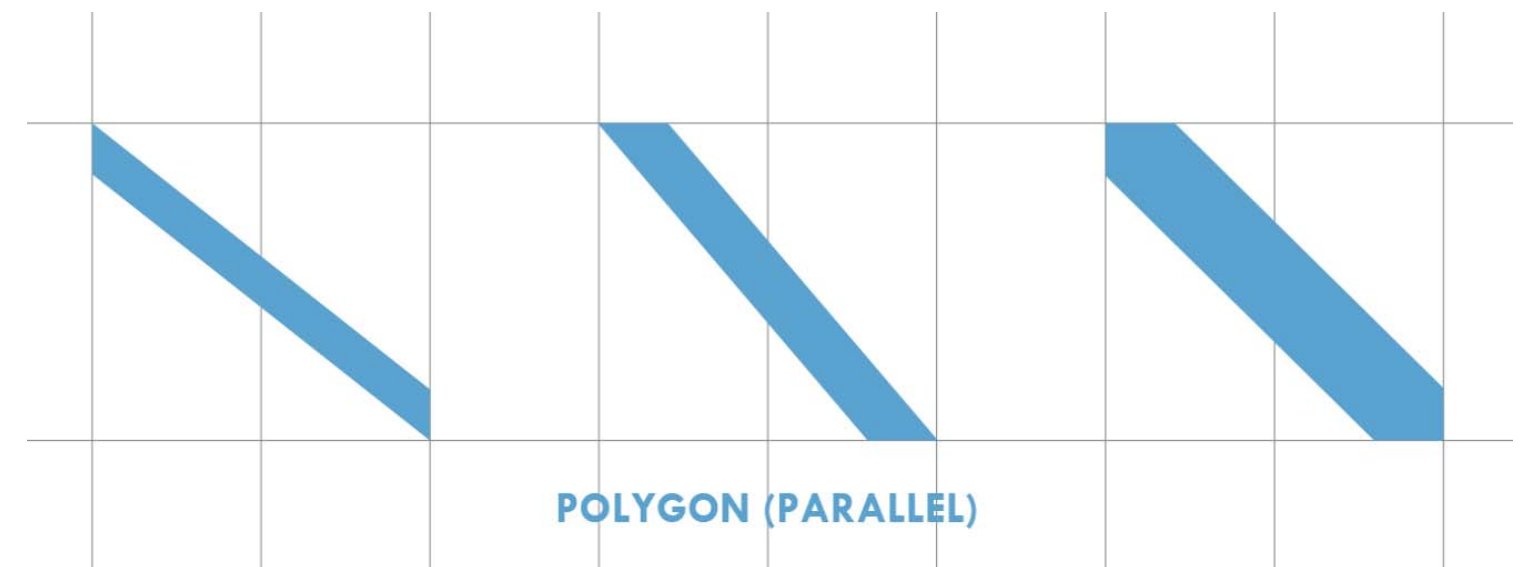
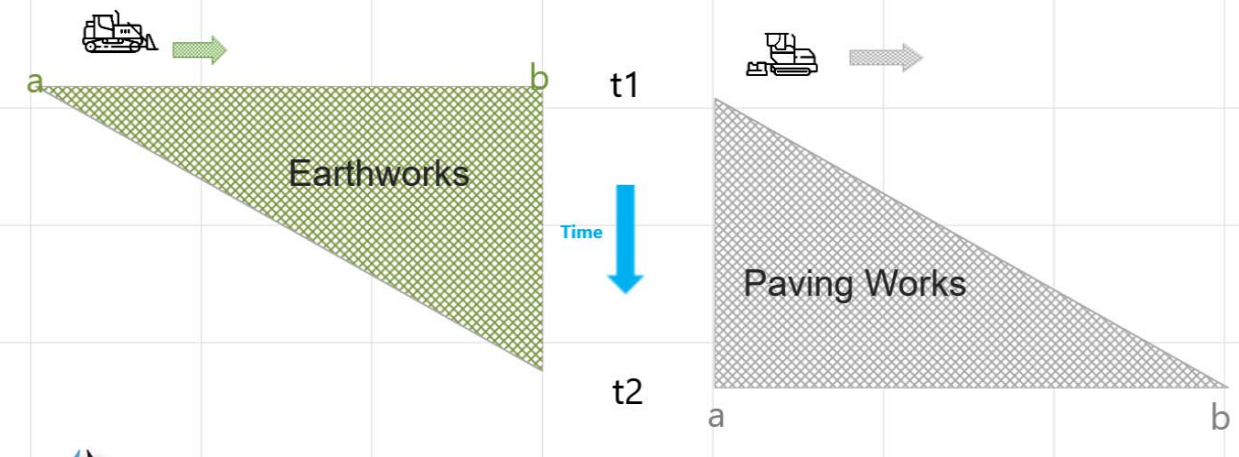


Chart Shapes | Triangles

Can represent linear tasks that occupy space/time around them

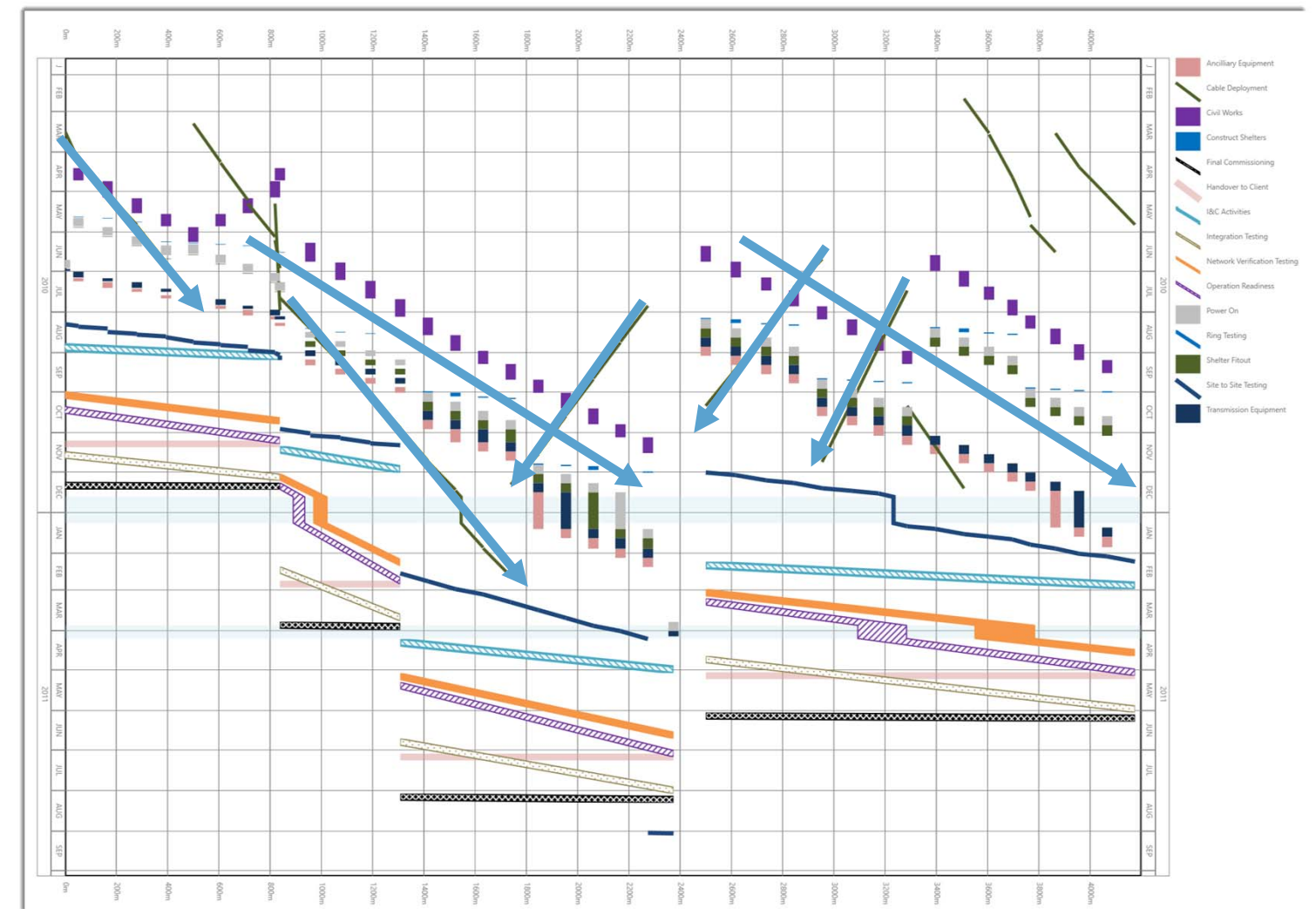
- Triangle shapes can be used to represent tasks that progress along a project location and that occupy time and/or locations in front or behind them, meaning other works will interfere if they are planned in the same area/time
- Consider examples shown. Task moves from a to b in time from t1 to t2



Benefits of Time Location Charts

Work and Crew Sequences

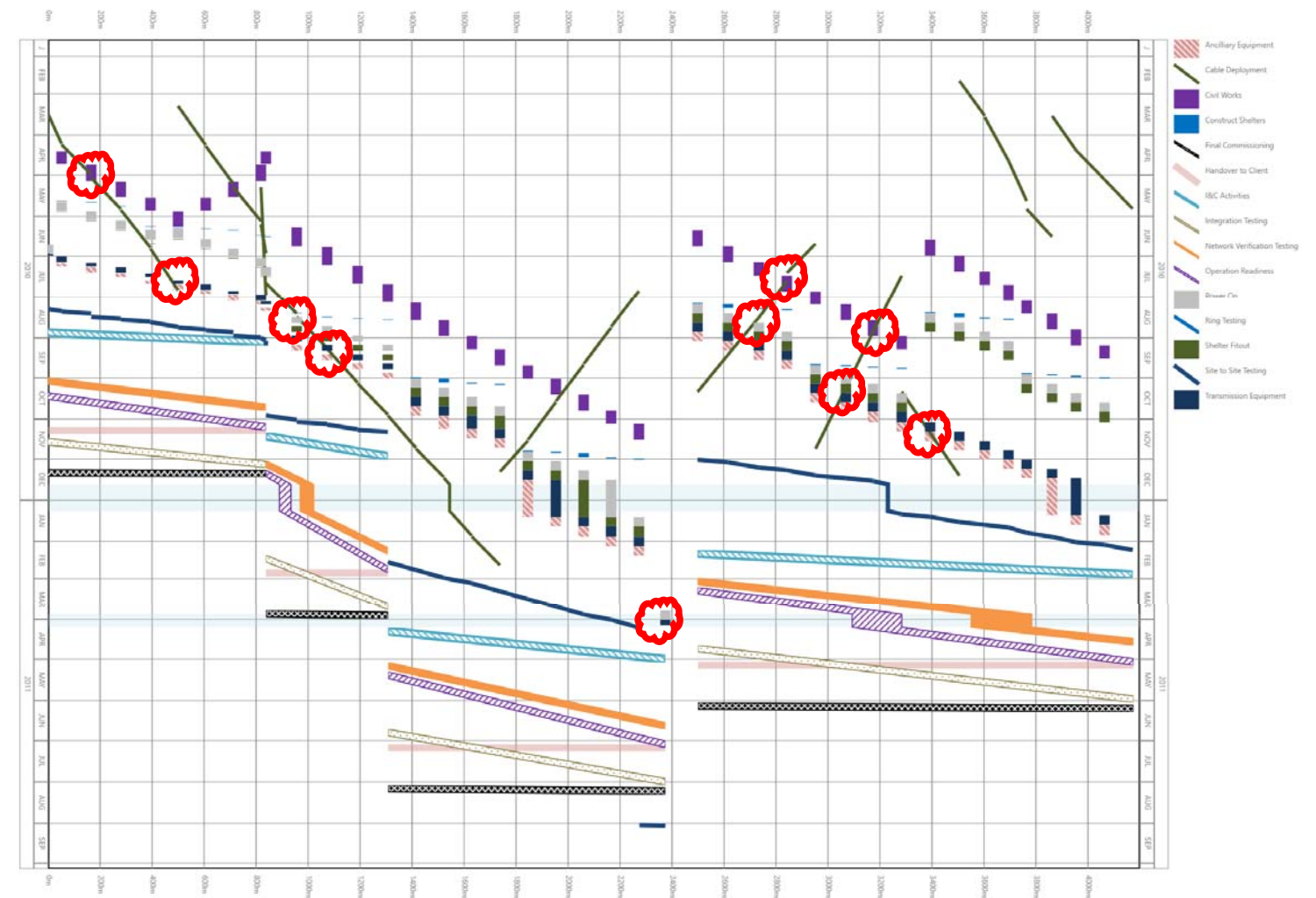
- Linear sequence and direction of work crews are clear and readily identified



Benefits of Time Location Charts

Clashes and Schedule Errors

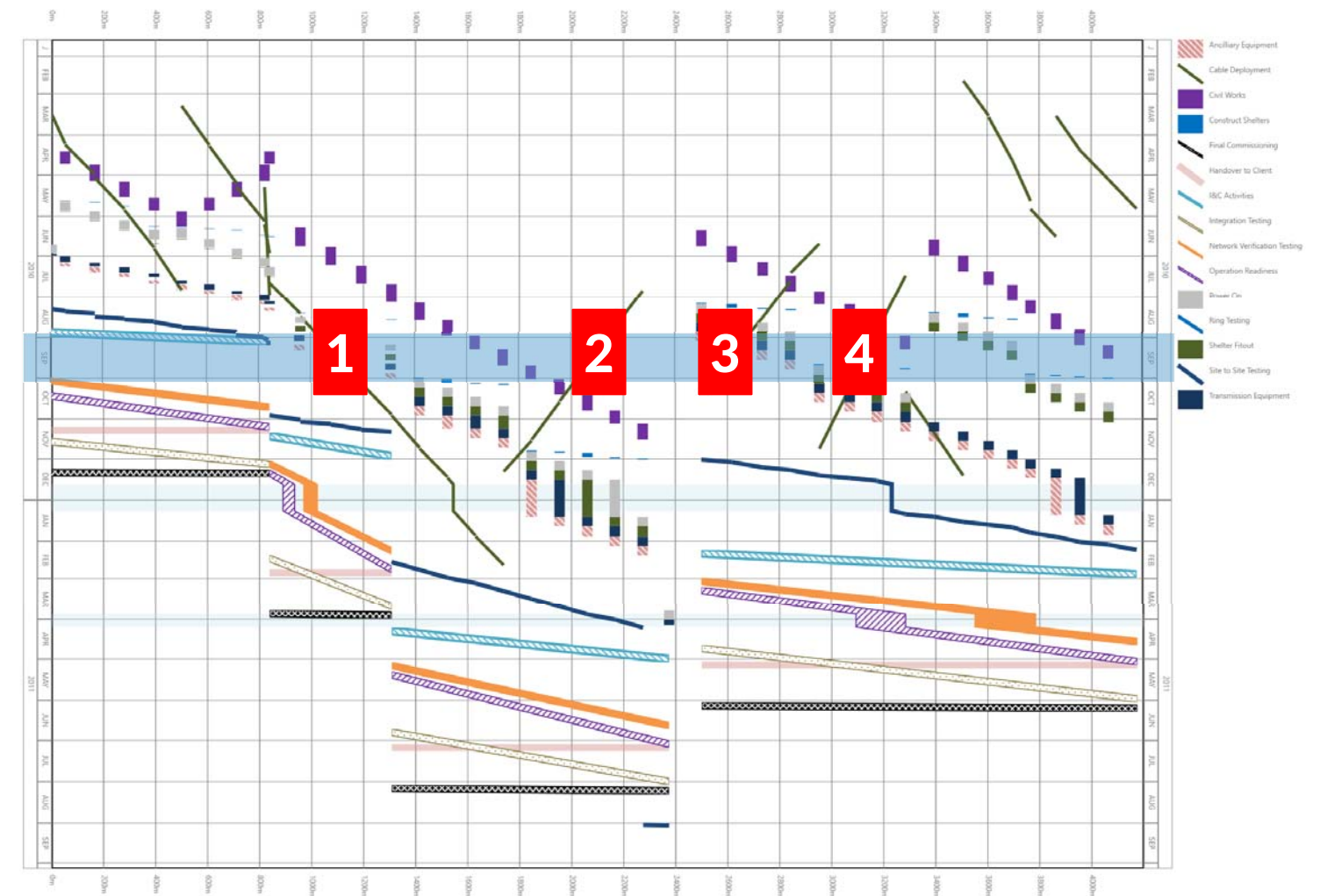
- Identify issues with scheduling logic or errors in schedules



Benefits of Time Location Charts

Resource Analysis

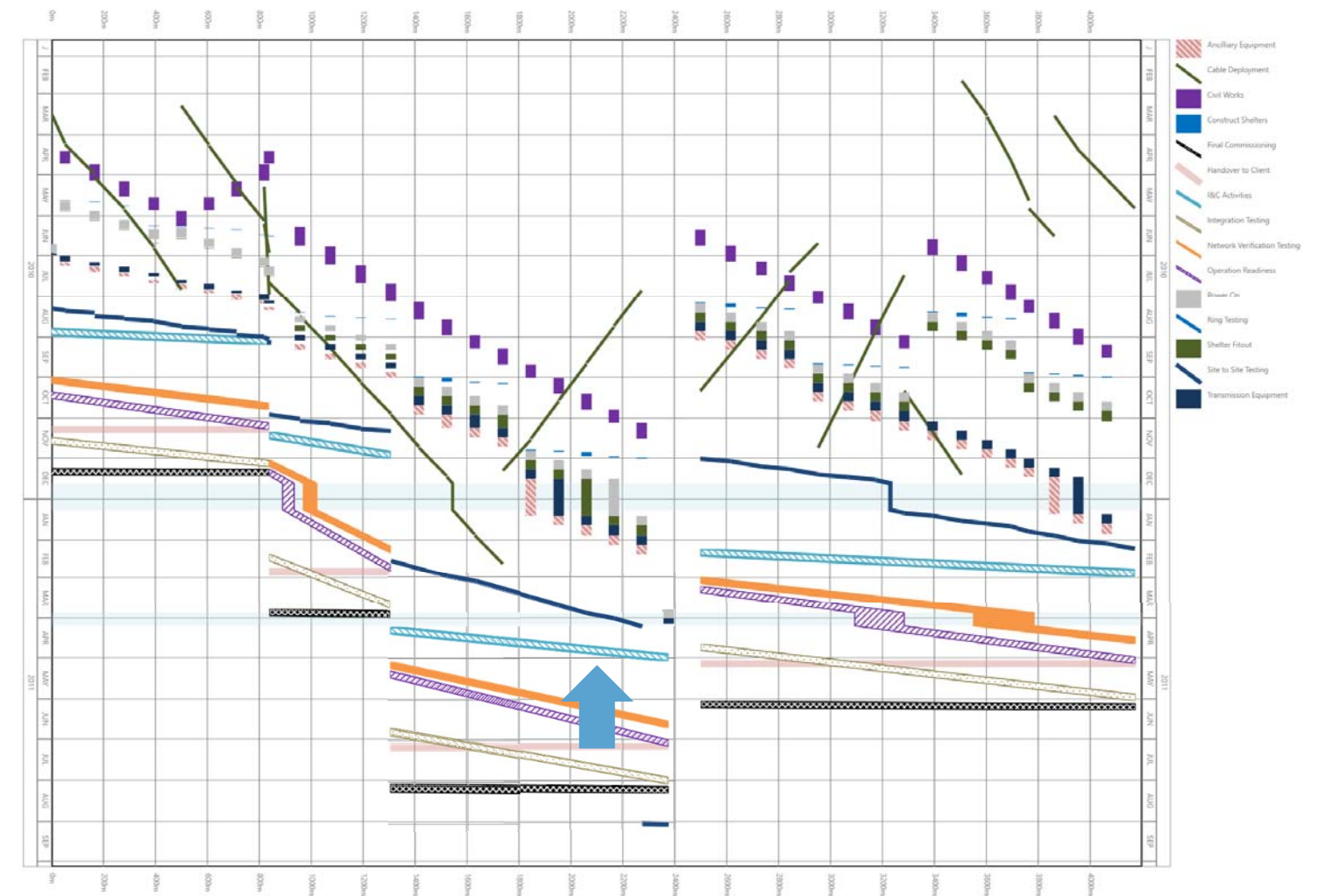
- Assess works performed through any given period “*across the page*”



Benefits of Time Location Charts

Schedule Optimisation

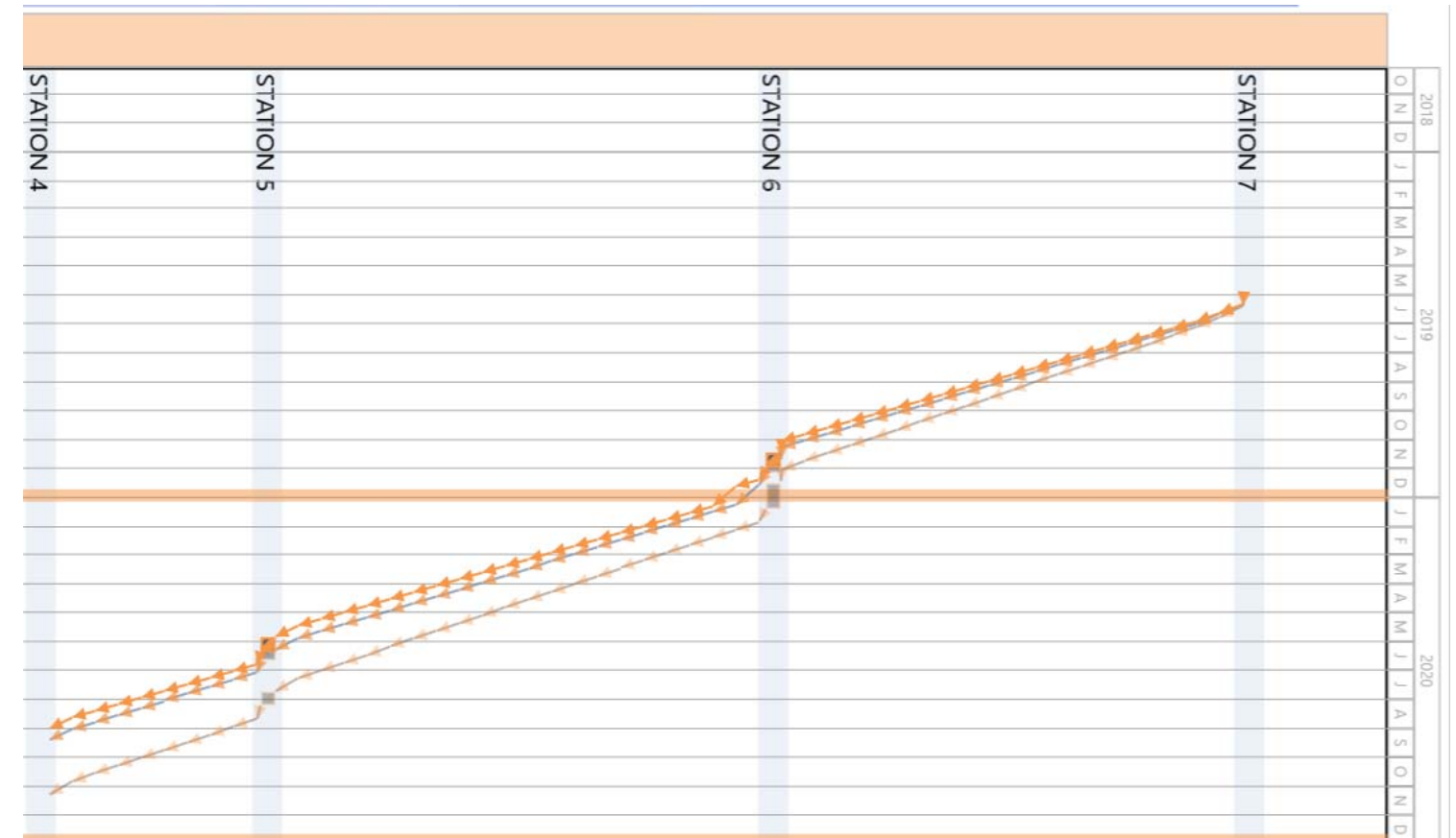
- Opportunities to improve schedule



Benefits of Time Location Charts

Comparison of schedule data

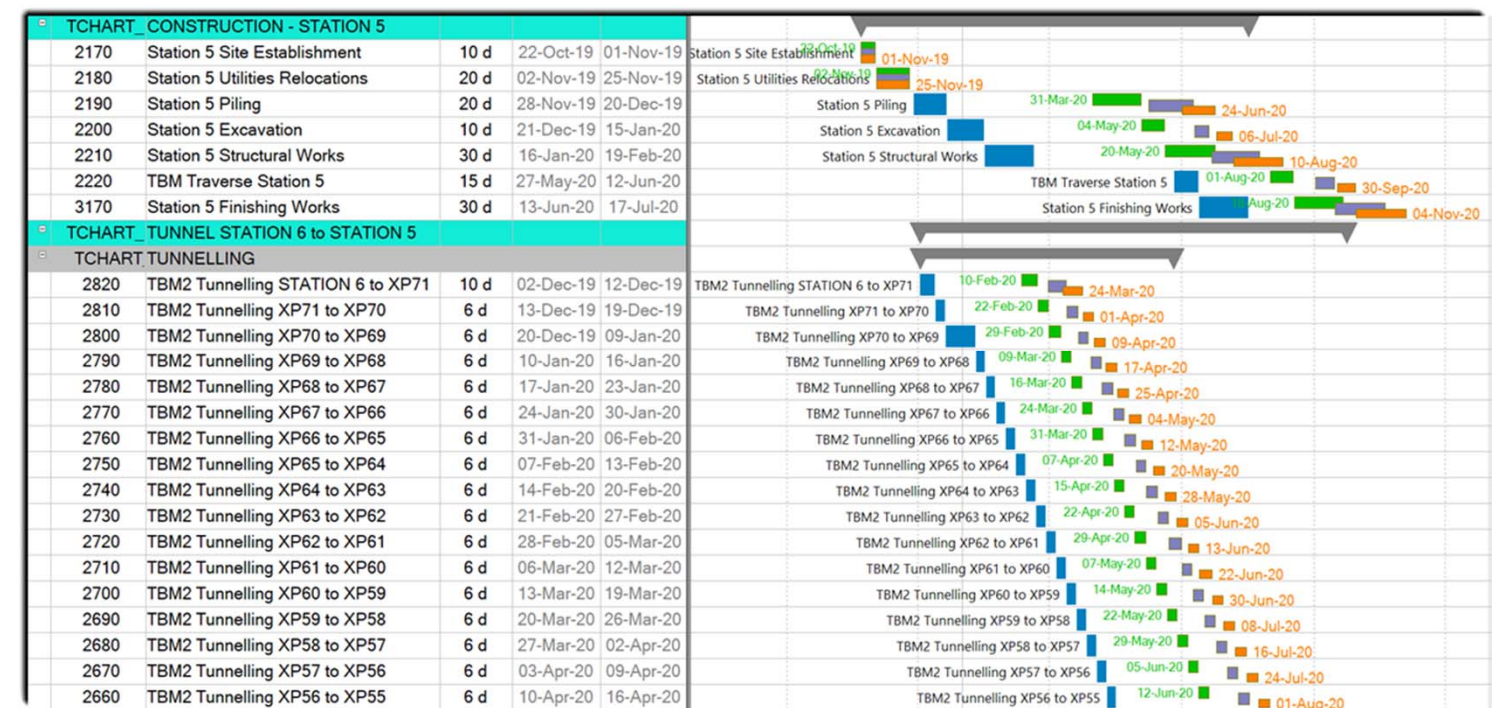
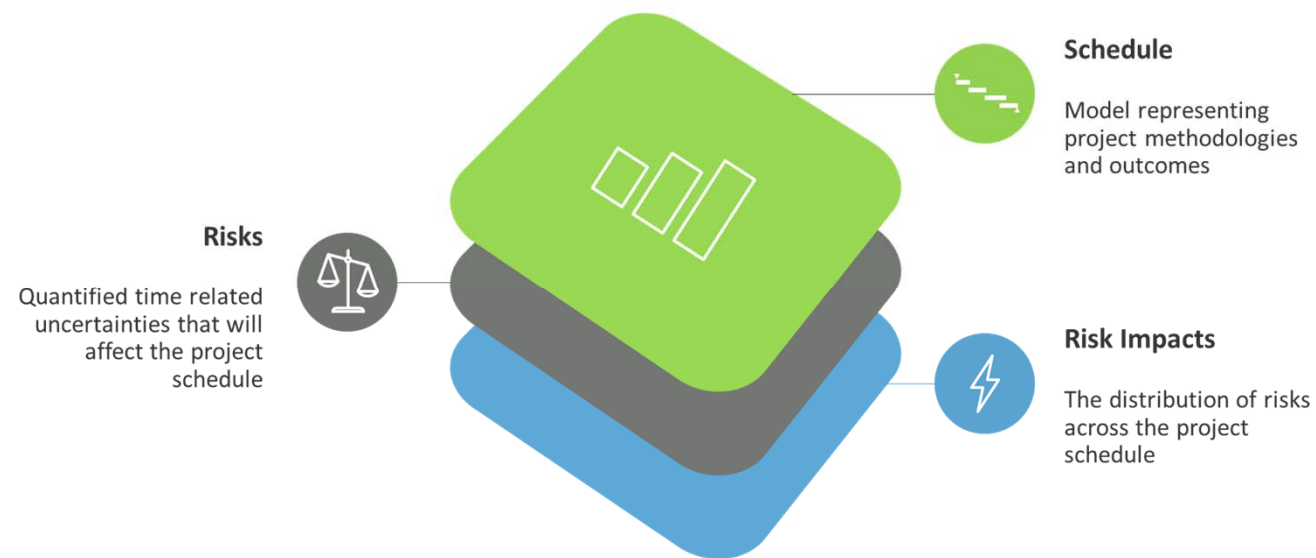
- Compare different sets of tasks
- Actual vs Planned, baseline comparisons
- Scenarios
- Monthly progress
- Claims/Delays/Forensics
- Schedule Risk Adjusted Time Location Charts



Use for Schedule Risk Analysis

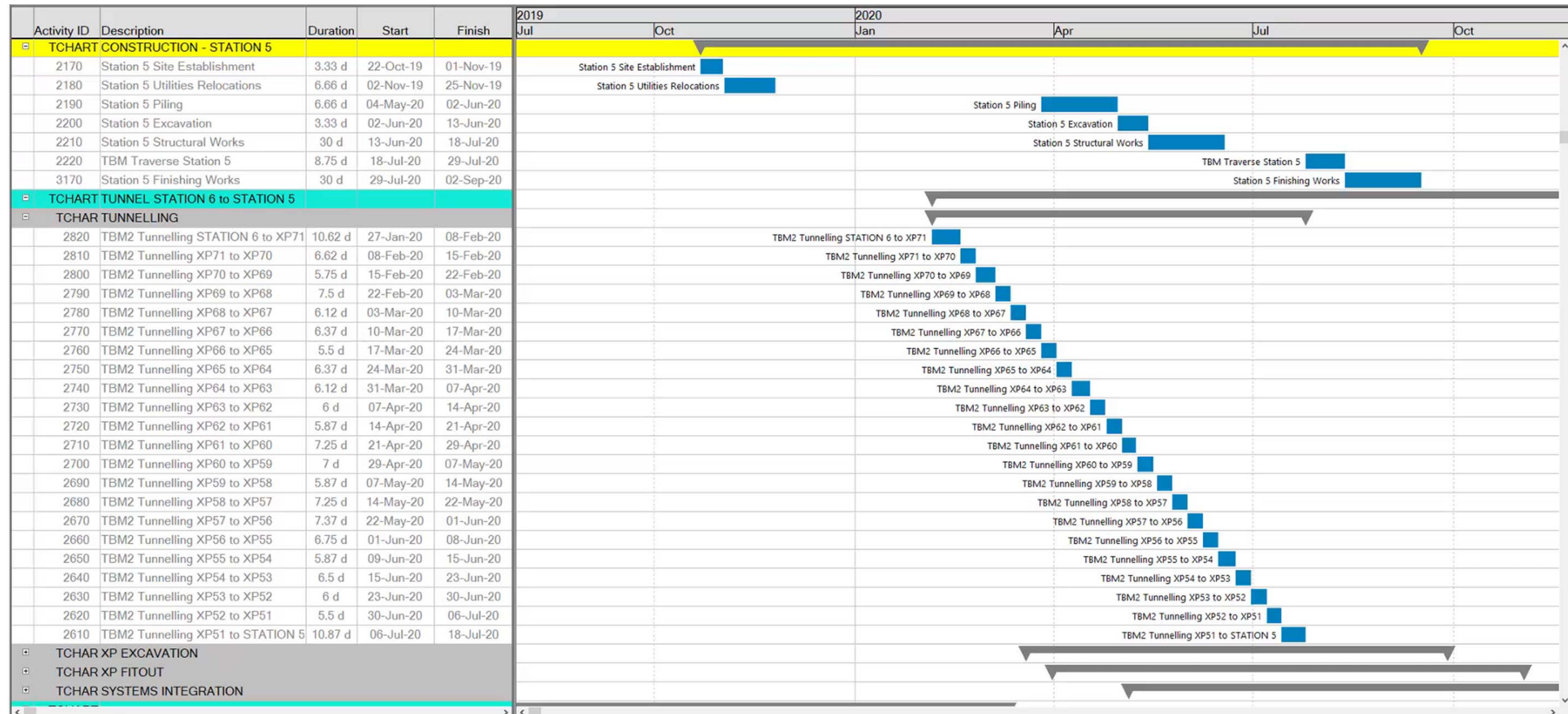
Schedule Risk Analysis produces Risk Adjusted Schedules

- Series of dates for schedule tasks at specific confidence level. eg P80



Schedule Risk Analysis

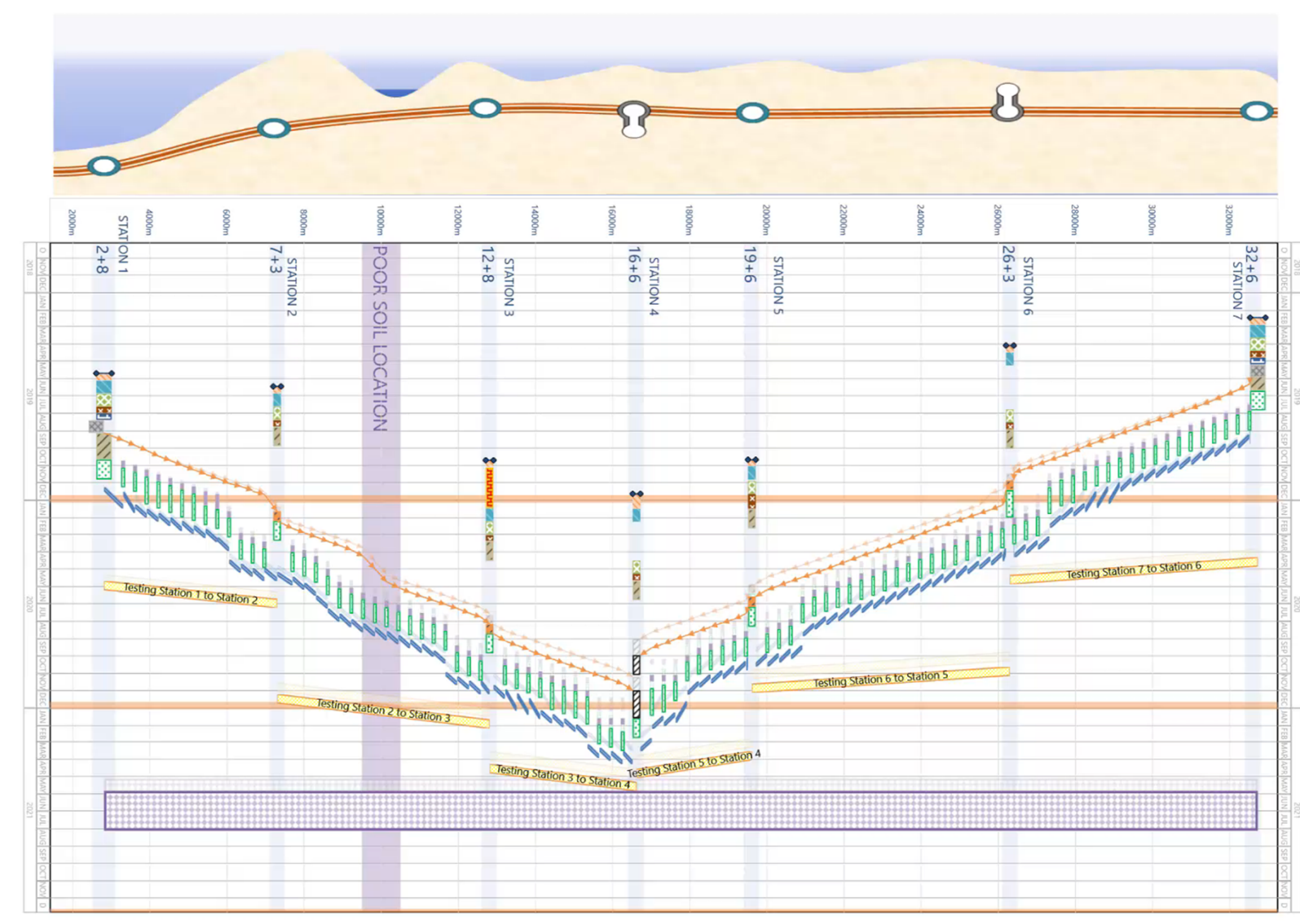
Monte Carlo for Schedules



Schedule Risk Analysis

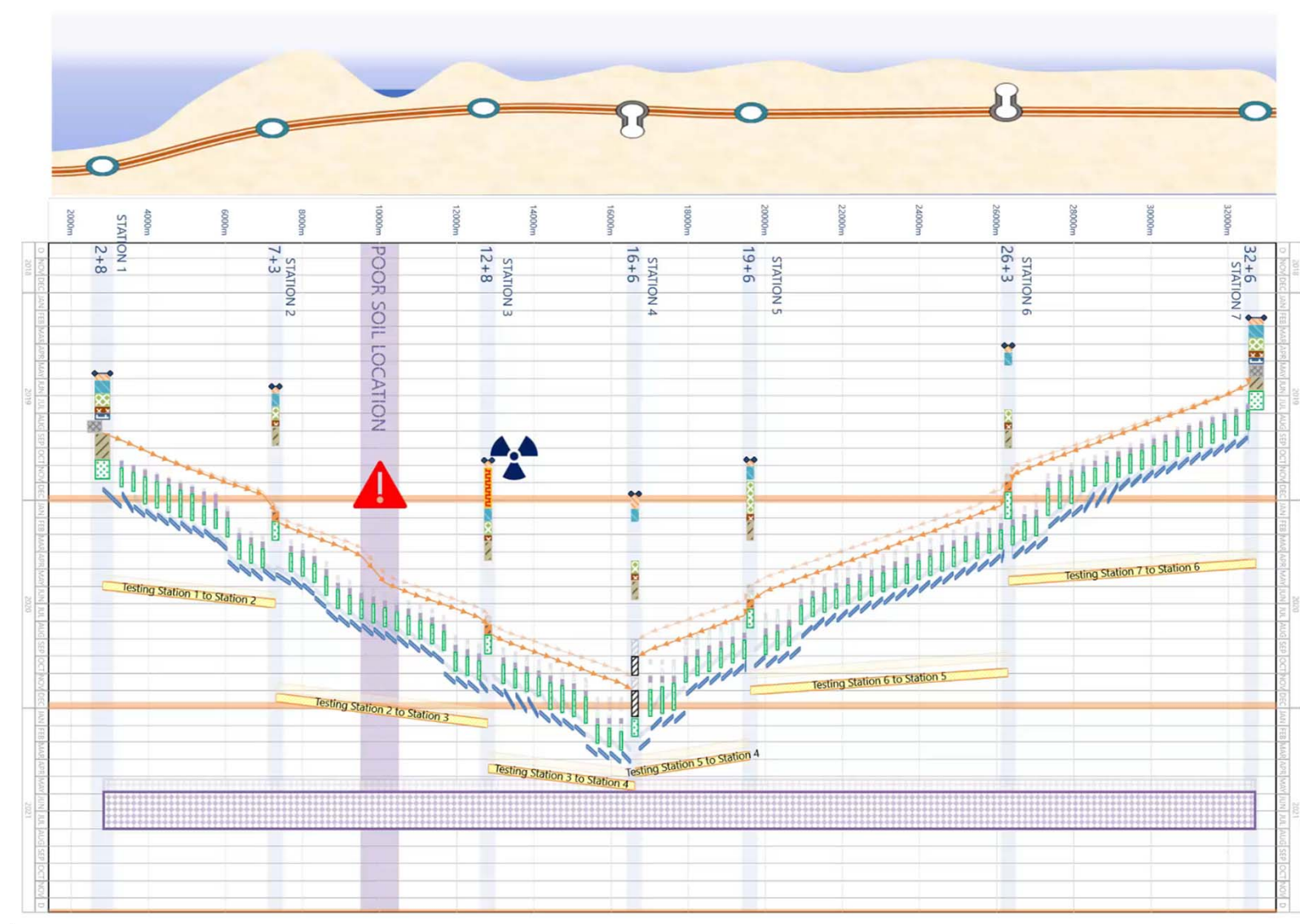
Monte Carlo Results in Time Location Format

Duration Uncertainty Only



Schedule Risk Analysis

Monte Carlo Results in Time Location Format
Including Discrete Risks



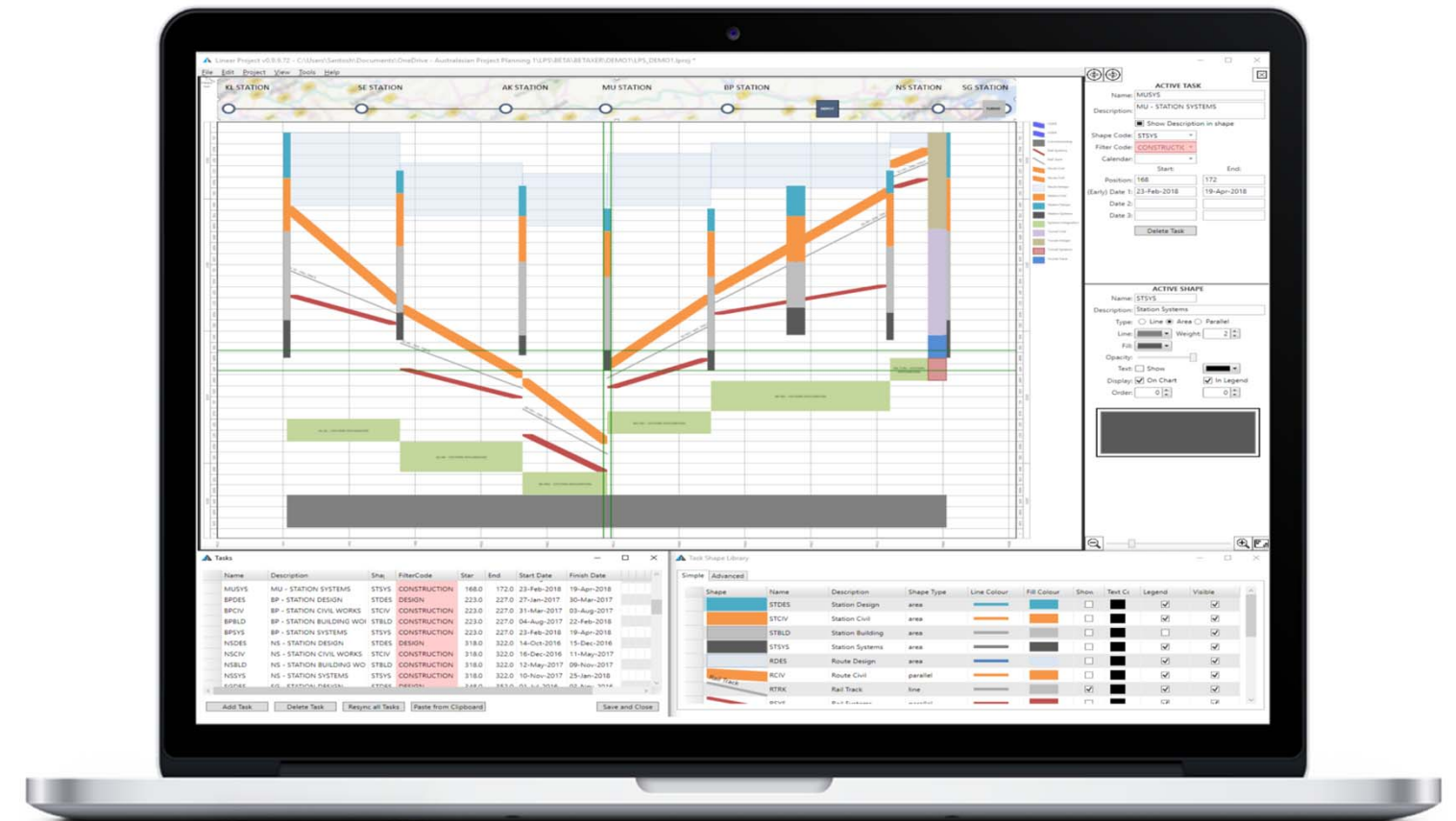
Methods of Producing Time Location Charts

Specialised Planning/Scheduling Tools

- Expensive
- Complex
- Difficult to learn
- Duplicates Schedule

Bespoke Tools

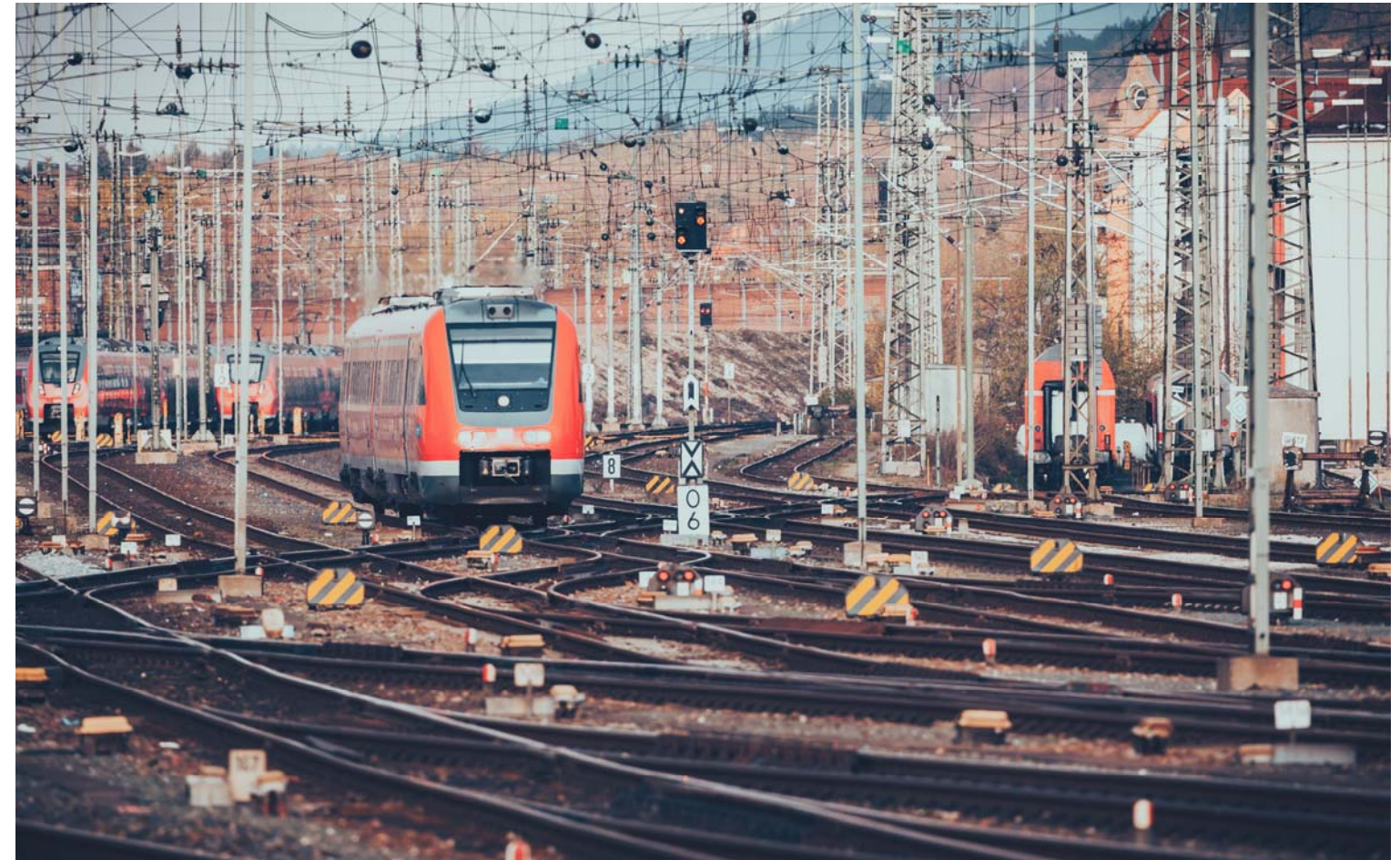
- AutoCad, Graphical Tools, Spreadsheets
- Manual interpretation of schedule data, can be prone to translation errors,
- Limited capabilities on presentation
- Non-scaleable solution



The Problem

Project Planners and Schedulers

- Want a Simpler and Easier Tool for visualising their linear project schedule in Time Location format, and
- Are already using scheduling tools like Primavera P6 or MS Project for their linear project schedules



The Solution

01 Work with existing tools

Turbo-Chart is designed to work side-by-side with existing scheduling tools, such as Primavera P6, MS Project, Safran or even Excel without complicated import processes

02 Quicker to Learn, Easier to Use

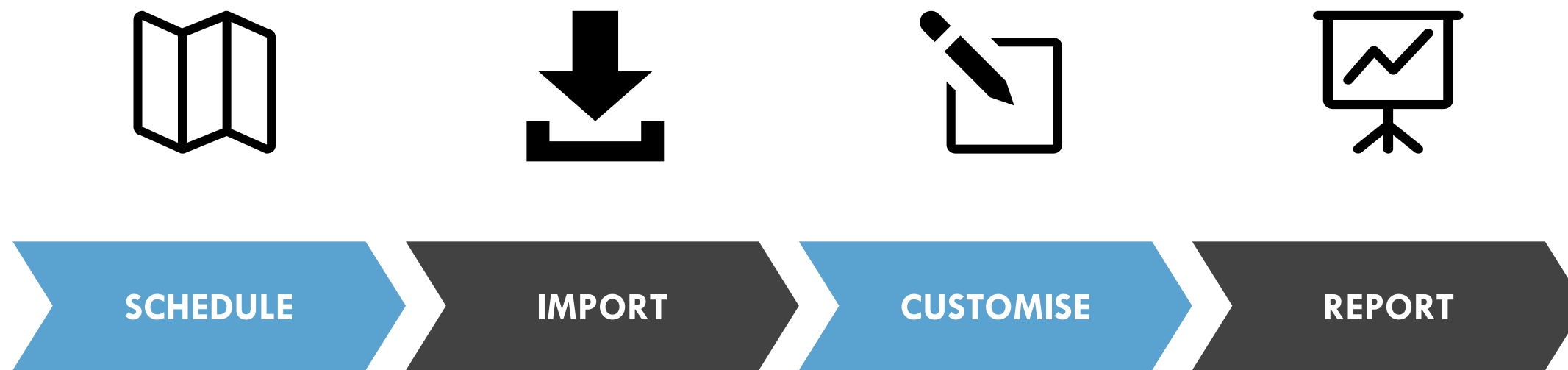
Avoid training and learning complicated new scheduling tools, focus on Planning and Scheduling rather than spending time and effort in preparing and checking charts

03 Single Source of Truth

By using the schedule dates in P6 (or any spreadsheet data capable tool) there is a single source of the truth without any duplicated scheduling data.



How Does Turbo Chart Work?



DEMONSTRATION





TURBO-CHART
www.turbo-chart.com

Free 14 day
Trial Download

THE **EASIEST** AND **FASTEST** WAY TO
CREATE TIME LOCATION CHARTS
FOR LINEAR PROJECTS



**TIME LOCATION
CHARTS**

A visual representation of project schedules
for linear infrastructure projects

- ✓ Improve schedule communication and analysis
- ✓ Engage and inform wider audiences
- ✓ Single chart replaces traditional Gantt charts



Questions

santosh@linearprojectsoftware.com

Conclusion

