

# Why your linear project needs linear schedules

and how to create from your CPM Schedules

## Contents

- The problem today
- What are Linear Schedules?
- The benefits of using Linear Schedules
- Methods of creating Linear Schedules
- Using CPM schedules to create Linear Schedules
- Hints and Tips





## **Context - Infrastructure**

- Modern infrastructure is central to economic development and to quality of life.
- From the roads and railways needed to transport people and goods, to the power plants and communications networks that underpin economic and household activity, to the basic human need for clean water and sanitation

(Oxford Ecnomics, Global Infrastructure Outlook (July, 2017)









## Why worry about Infrastructure projects?



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# **Project Risk!**



#### Approvals

Environmental, Planning and Regulatory Approvals Site Access / Land Acquisition Financing



#### Design

Review and Approval periods Design Scope Growth (time for design) Sustainable design



#### Procurement

Equipment Availability Production / Manufacturing Lead times Shipping / Transit



#### Site Establishment / Enabling Works

Land Acquisitions and access to Sites Utilities Demolition / Contamination



#### Operations

Productivity Resource Availability Material Supply Access Restrictions Interfacing and Interferences from other operations Plant & Equipment Failure



#### **Project Wide Issues**

Weather Industrial Safety Community Environmental Multi-Project Interfaces



#### Systemic Risks

Company Culture Maturity Complexity Political



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# What causes problems?





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## **Schedule Preparation**





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# The End Result





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## What are Linear Projects?

- Works progress in a repetitive manner and/or in continuous linear directions over the project's physical location
- Works occur in a fixed locations that interface with the linear works
- Classic examples of linear projects include:









RAILWAYS





## What are Linear Schedules

- An alternative method of presenting schedules
- One axis represents time, second axis represents physical locations

#### Other names include:

- Time Distance (TD) charts,
- Time Chainage charts,
- Line of Balance,
- March Charts,
- Flow Lines,
- Location Based Schedules,
- Velocity Diagrams





## **Key features of Linear Schedules**

#### LINEAR SCHEDULE MR STATER BP STATION NS SLALKIN SS-SEALKIN Location GLADALKIN. ST SLALKIN AKSIALKIN. 0 0 Graphic Schedule Tasks Time Axis Critical Tasks · Legend LEGEND ALC VOLUME - 10000 prist KNIN LARK AMPRICAS. James years





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### **Representing Tasks - Milestones**

- Milestones for specific points in time
- But can also cover a specified linear range









#### **Representing Tasks - Areas**

- Represent tasks that occupy specified region over a time range.
- No direction or rate of progress
- Production rate is implied by duration







### **Representing Tasks - Gradients**

- Lines, Parallelograms, Tringles
- Angle of the gradient represents rate of production
- Directional







### **Representing Tasks - Gradients**

 Can also represent non-work periods







# Why Use Linear Schedules?

- Improve schedule communication and analysis
- Engage and inform wider audiences
- Replace traditional Gantt chart reports with a single page





# Why Use Linear Schedules?







#### Work and Crew Sequence are clear and readily identified

- Sequencing and direction of works/crews
- Rates of Progress







#### **Clashes and Schedule Errors**

- Intersection of tasks can this physically occur?
- Identify issues and errors with durations, logic or methodology







**Visual Resource Analysis** 

- Assess works performed through any given period
- Identify the location of resources







Schedule Comparisons

#### Compare scenarios







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#### Linear Schedule Examples (# of Tasks displayed)

#### • Vertical High Rise Building (455)



#### Motorway Construction (930)







#### Linear Schedule Examples (# of Tasks displayed)

#### • Fibre Optic Network (3,605)



#### • Segmental Bridge (248)







#### Linear Schedule Examples





## How to Create Linear Schedules

#### **Bespoke Tools**

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

#### **Specialised Tools**

- Ideal for Location Based or Linear elements of project
- Manipulate Linear Schedule to re-calculate schedule
- Expensive
- Complex
- Difficult to learn
- May duplicate schedule





# Hybrid method for Linear Schedules

- Append Data to existing CPM Schedules
- Exchange Data from CPM schedule to Linear Schedule (one way)
- Modifications/Updates are made in CPM schedules
- Linear Schedule is updated to reflect changes





# **CPM Logic in Linear Schedule Format**



# **CPM Logic in Linear Schedule Format**



# **CPM Logic in Linear Schedule Format**



#### Worked Example Traditional CPM Schedule



- Construct Schedule as normal
- Works are divided into Area A + Area B
- Area B is 50% greater effort than A
- Includes one task that spans both areas





# Worked Example

**Determine Start and End Dates** 



 Durations + Logic determine Dates





# Linear Alignment

- Use Project Alignment details to location values/codes for activities
- May use Zones or Areas of work to define the start + End locations
- Can also use any values along the continuous alignment





### **Worked Example**



- Location values for schedule tasks are known
- Add additional data for:
  - Start Location Value
  - Finish Location Value
- Note: order of start/finish is determined by the direction of the linear work





#### Worked Example



### **Worked Example Optimised**

#### 50d vs 85d



# **About Turbo-Chart**

#### LINEAR PROJECT SOFTWARE Pty Ltd



Santosh Bhat CEO/Co-Founder Sydney, Australia



20+ years Infrastructure Planning / Scheduling & Project Controls Russell "Rusty" Johnson CTO/Co-Founder London, United Kingdom

20+ years Software Development CTO / Co-Founder of Sharp Cloud and Pertmaster





# "User Friendly"

#### Work with existing tools

Turbo-Chart is designed to work side-by-side with existing scheduling tools, not to replace them, without complicated import processes, allowing the data to be in a single source schedule



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#### Quick to Learn, Easy 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









#### **Turbo-Chart Features**

# Demo Video





<u>File Edit View Project Enterprise Tools Admin Help</u>

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Activities CR.

#### Activities Projects

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NSDES	NS - STATION DESIGN	45	14-Oct-16 08:00 AM	15-Dec-16 05:00 PM	20		STDES	318.00	322.00	STATION DESIGN
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BPDES	BP - STATION DESIGN	45	27-Jan-17 08:00 AM	30-Mar-17 05:00 PM	20		STDES	223.00	227.00	BP - STATION DESIGN
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NSCIV	NS - STATION CIVIL WORKS	90	16-Dec-16 08:00 AM	11-May-17 05:00 PM	80		STCIV	318.00	322.00	NS - STATION CIVIL WORKS
AKCIV	AK - STATION CIVIL WORKS	90	17-Feb-17 08:00 AM	22-Jun-17 05:00 PM	65		STCIV	123.00	127.00	AK - STATION CIVIL WORKS
DPCIV	DP - STATION CIVIL WORKS	90	17-Feb-17 08:00 AM	22-Jun-17 05:00 PM	260		STCIV	265.00	275.00	DP - STATION CIVIL WORKS
MUCIV	MU - STATION CIVIL WORKS	90	31-Mar-17 08:00 AM	03-Aug-17 05:00 PM	80		STCIV	168.00	172.00	MU- STATION CIVIL WORKS
BPCIV	BP - STATION CIVIL WORKS	90	31-Mar-17 08:00 AM	03-Aug-17 05:00 PM	20		STCIV	223.00	227.00	BP - STATION CIVIL WORKS
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Portfolio: All Projects Access Mode: Shared Data Date: 01-Jul-16 12:00 AM Baseline: TURBO CHART- Railway Demo - no TC Values User: admin DB: TCHART\_OLD (Professional)





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# Hints and Tips

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#### • Use patterns, colours, line styles to distinguish tasks









# Hints and Tips

#### Summary











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# **Location Exaggeration**

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# **Multiple Control Lines**





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# **Multiple Control Lines**







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#### Other uses







# Thank you!

#### Download Trial http://www.turbo-chart.com



#### Questions support@linearprojectsoftware.com



