

Inventory and Condition Data to support road Asset Management

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- Condition Data
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Asset Data

Management

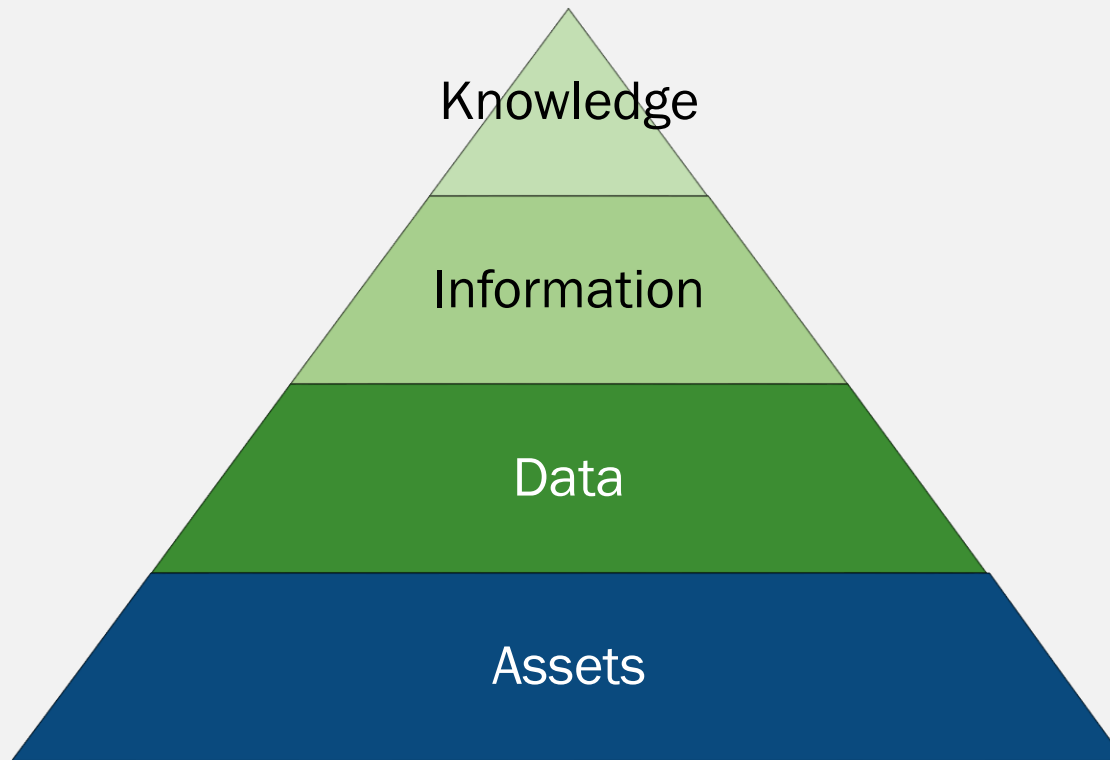
Condition

Data Use

Decisions

Summary

Data is the foundation



What defines an asset?

- An item, thing or entity that has potential or actual value to an organisation
 - e.g. plant, machinery, buildings, facilities, planted areas

Source IIMM

Group Discussion

What is an Asset?

- Your view of what's an Asset?
 - Think about the purpose



Data collection

Asset Register

- Create
 - Field measure
 - As-built drawings
- Maintain
 - Asset modifications (Renewals)
 - New assets
 - Verification
 - Data currency

What should be collected?

- Best practice suggests “only collect what is needed”
 - i.e. don’t collect data for the sake of it
- What determines the data that should be collected. Data to:
 - Inform reporting
 - Inform performance
 - Inform long-term planning
 - Inform asset renewal planning
 - Undertake network level failure mode analysis
 - Allow reliable estimates
 - Help make reliable decisions



Data types

- Inventory
 - What do we have?
- Condition
 - What condition is it in?
- Performance
 - How does the asset contribute to goals and objectives?
 - Its cost to maintain

Inventory, condition and performance data contributes to

- Maintenance and capital works decision making through the knowledge gained; on the location, type, size, quantum and condition of assets
- Identifying areas where costs can be optimised
- Valuation of assets
- Identification of risks
- Predicting future performance, cost and risk
- Determining future maintenance and renewals requirements and the associated costs

Focussing in condition data

- Informing performance i.e.
 - How smooth are our roads? Are targets met?
 - How do they compare to last year?
 - What is the retro-reflectivity of our signs?
 - Do all our signs meet our sign retro-reflectivity standard?
- Determining when to intervene
 - A flag to investigate road segments that no longer meets our minimum standard for smoothness
- Understanding current performance and therefore possible future performance

Asset data strategy

- Data can be relatively expensive to gather
- Data needs to be maintained to sustain its value and relevance
- Data will inform organisation-critical decisions
- Some data will need to be regathered at defined intervals
 - That means being organised and planning ahead
 - E.g. condition data gathered at the same time of year is typically more reliable
- Data collection and management should be a “Business as usual activity”



Maintaining data

- Data has a shelf life...
 - i.e. it goes “out of date”
 - Shelf life depends on the asset and data type
- Inventory data tends to have a longer useful life
- Condition data tends to have a shorter useful life
 - Historic data is very valuable to assessing changes in performance and trends
 - i.e. be sure to keep historic condition data
- Given shelf life of data and the need to support business practices
 - What is a suitable useful life?



Group Discussion

Data recollection/updating

- How often should data be recollection/updated?



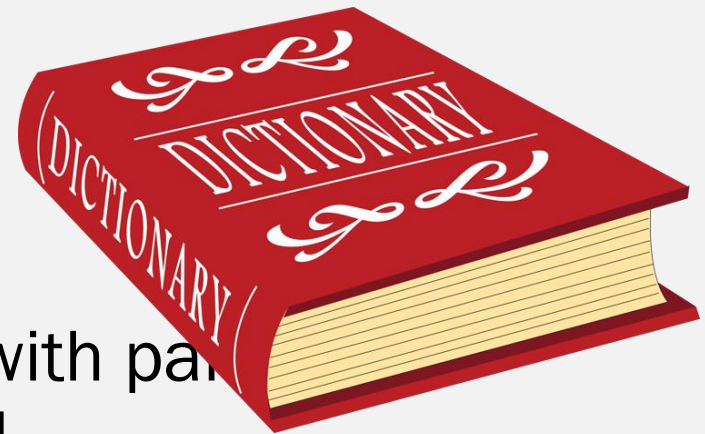
Maintaining data – some considerations

- New Assets – asset creation
 - New roads
 - New developments
 - Potentially through the handover process
- Renewed Assets
 - Assets and renewed
 - i.e. road surfacing, signs, lights,...
 - Through maintenance processes
 - When?
 - Annually?
 - Monthly?



Data rules

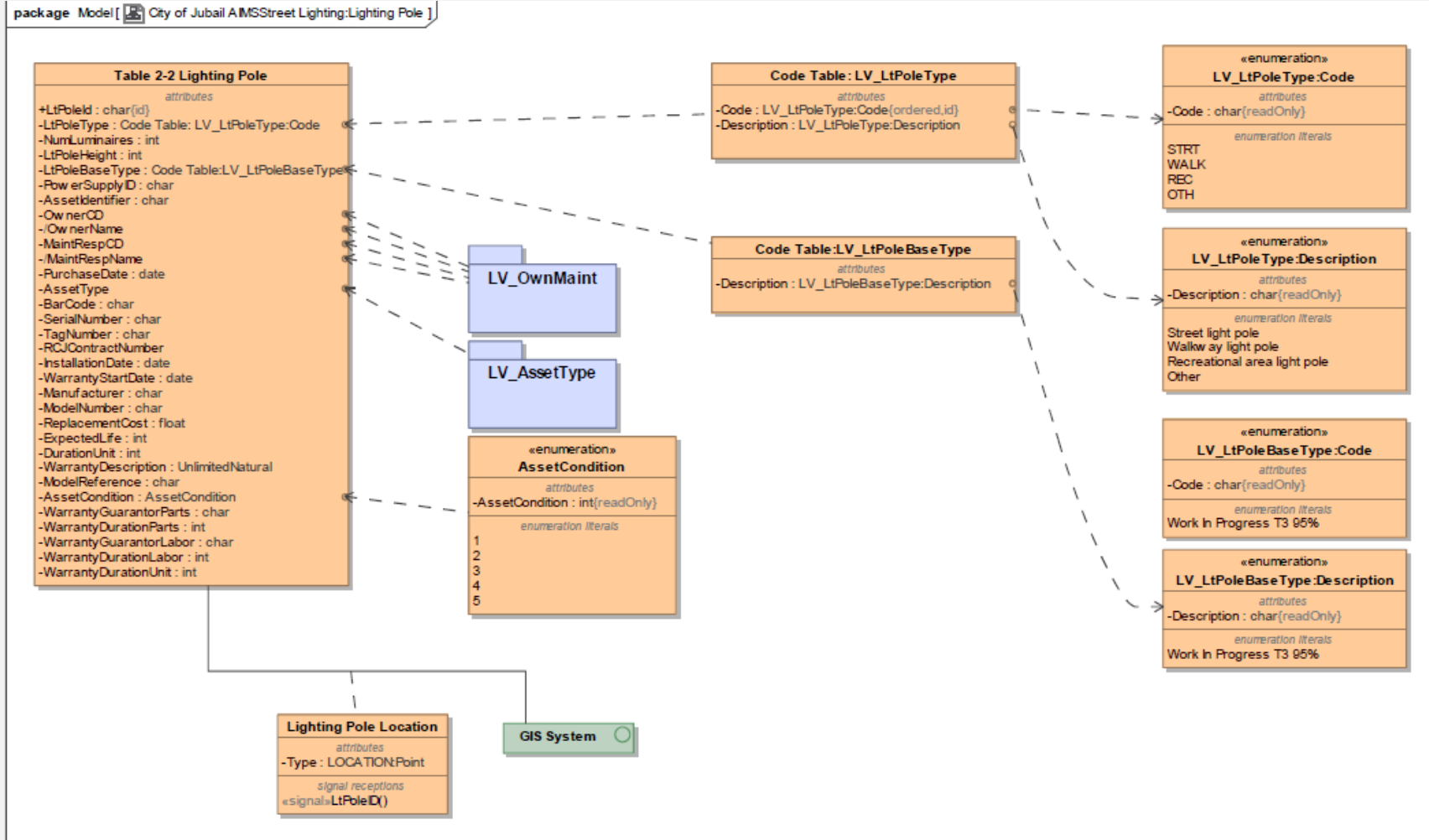
- Data standards are defined as Metadata
 - Or Data Dictionaries
- Tables
- Attributes/Fields
- Attribute types
- Attribute properties
- Lookups
- Often relational databases with part of the assets being geo-referenced



Example data dictionary

Field Name	Unit	Type	Description	Column Name	Visible in App
Purchase Date		Date	The date at which the asset was purchased	purchasedate	No
Installation Date		Date	The date that the manufactured item was installed (per instance).	installationdate	No
Warranty Start Date		Date	The date on which the warranty commences.	warrantystartdate	No
Owner Name		Dropdown	Owner name – populated from the code table description	ownername	No
Maintenance Responsibility Name		Dropdown	Name of the RCJ department responsible for maintaining the asset – populated from the code table description	maintrespname	No
Fixed Asset		Dropdown	An indication of whether the object is fixed or movable.	assettype	No
Asset Identifier		Text	RCJ identification assigned to an asset that enables its differentiation from other assets.	assetidentifier	No
Bar Code		Text	The identity of the bar code (or RFID) given to an occurrence of the product (per instance).	barcode	No
Serial Number		Text	The serial number assigned to an occurrence of a product by the manufacturer (per instance).	serialnumber	Yes
Tag Number		Text	The tag number assigned to an occurrence of a product by the occupier (per instance).	tagnumber	Yes
RCJ Contract Number		Text	RCJ Contract Number of original installation	rcjcontractnumber	No

Example data dictionary



Condition data requirements

What is condition data

- Condition data describes the current **state** of the asset
 - Or the state when it was measured...
- We can then use condition data to compare the definitions of good, fair, poor to assess how good our assets are
 - Either individually or as a network of assets

Condition measurement

- Condition data can be measured
 - A. Objectively
 - Machine
 - B. Subjectively
 - i. by a person
 - Usually on an objective scale say 1 to 5
 - ii. By using another measure i.e. maintenance repairs as a measure of condition



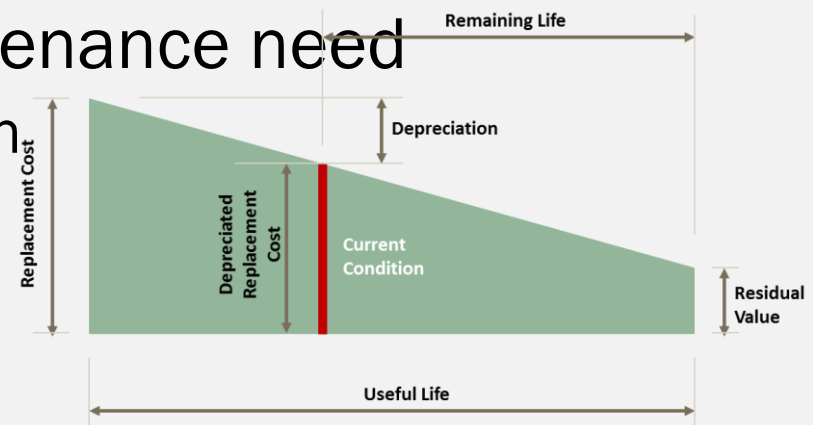
What is condition data used for?

- Informing performance
 - How smooth are the roads?
 - How do they compare to last year?
 - Do all signs meet retro-reflectivity standards?
- Determining when to intervene
 - A road section no longer meets the minimum standard for smoothness - investigate for renewal
- Contractor payment
 - The road is rutted more than average 10mm therefore a penalty will be applied
- Understanding current performance and therefore future performance

Data uses

What is inventory data used for

- Quantify the asset
 - i.e. statistics
 - More detail allows greater degree of componentisation
- Valuation
 - i.e. replacement cost, depreciated replacement cost
- Estimating
 - i.e. estimates of renewal cost
- Forecasting long-term maintenance need
 - i.e. assessing future condition and performance



Data mining

- Definition

“The practice of examining large pre-existing databases in order to generate new information.”

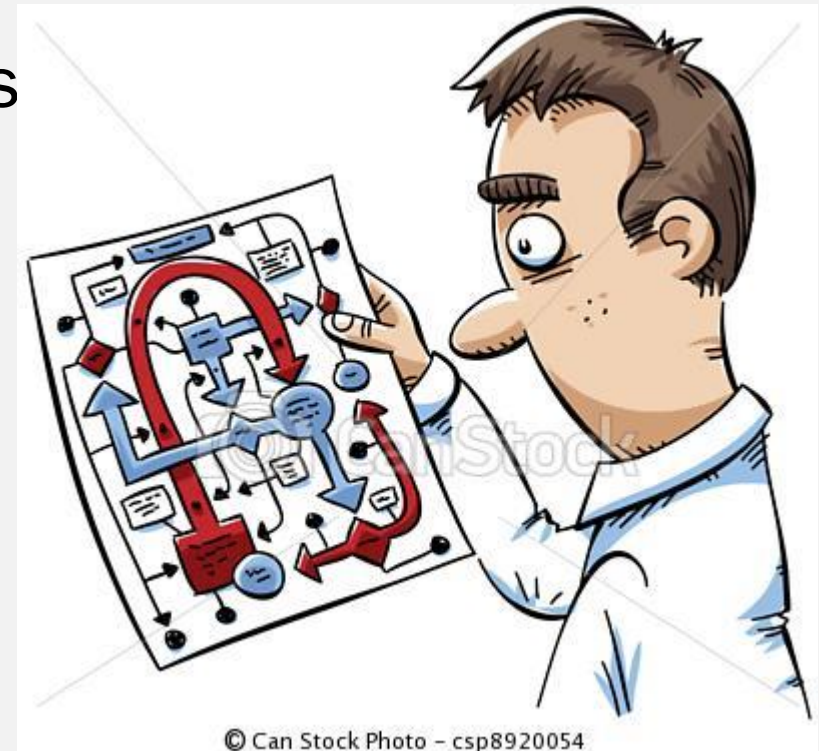


We display information to

- 1. Get the information out
 - Understand the story
- 2. Get the message across
 - Tell the story to others

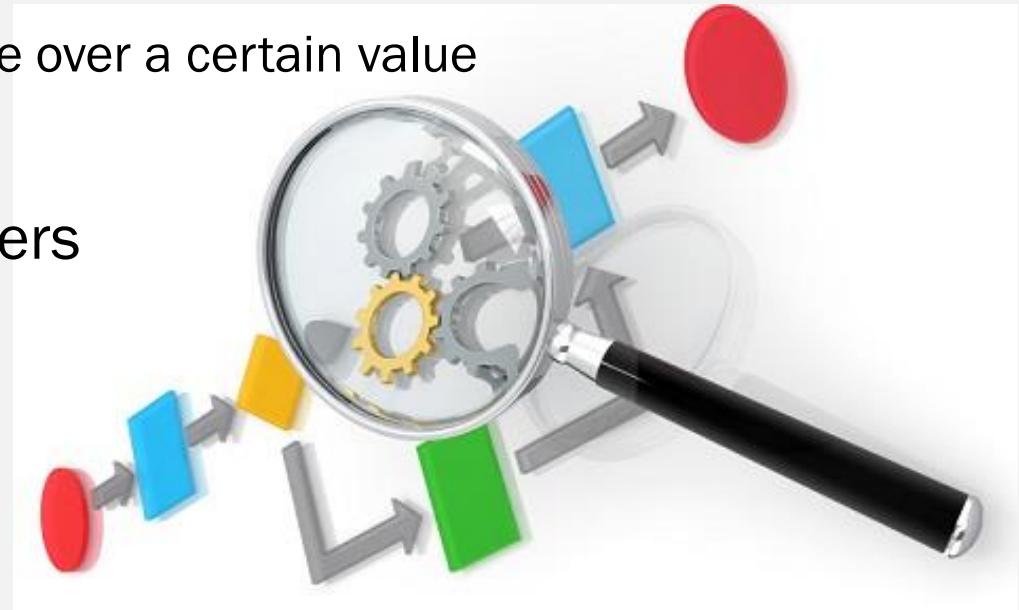
Important to understand your **audience**

- Self / Peers / Others ?



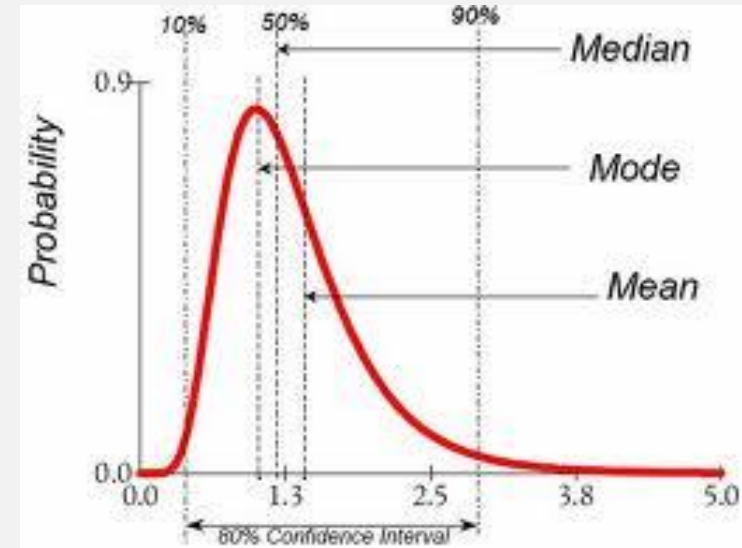
Techniques

- Data Analysis
 - Produce numeric answers
 - Average of sample
 - Percentage of sample over a certain value
- Information Graphics
 - Produce image answers
 - Charts
 - Maps
 - GIS



Data analysis statistics

- Minimum
- Maximum
- Median
- Mean
- Mode
- Standard Deviation
- Percentage of readings over a threshold
- Quartile
- Percentile



Tables

- Good for displaying results
 - Tends to be summary of more complex data or reams of data

	Hawke's Bay	National Totals	Percentage of National
PAVEMENT			
Unsealed granular	20.7km	12,061.6km	4.2%
Sealed granular	400.6km		
Recycled	107.5km		
SAC	1km		
SURFACING			
Chip seal	473.8km	10,839.2km	4.4%
Asphaltic Concrete	11.8km	1,222.4km	1.0%
BRIDGES (incl large culverts)	154	4,546	3.4%
CULVERTS	3,505	64,150	5.5%
RETAINING WALLS	240	3,381	7.1%
LIGHTING	396	16,894	2.3%
ITS ASSETS (incl traffic count stations)	43	various	N/A
WEIGHT STATIONS	5	28	17.9%
GUARDRAILS & MEDIAN BARRIERS	61.3km	1,388.4km	4.4%
SIGNS	7334	122,200	6.0%

Information graphics

Carte Figurative des pertes successives en hommes de l'Armée Française dans la campagne de Russie 1812-1813.
 Dessiné par M. Minard, Inspecteur Général des Ponts et Chaussées en retraite, Paris, le 20 Novembre 1869.

Les nombres d'hommes présents sont représentés par les largeurs des zones colorées à raison d'un millimètre pour dix mille hommes; ils sont de plus écrits en travers des zones. Le rouge désigne les hommes qui entrent en Russie; le noir ceux qui en sortent. Les renseignements qui ont servi à dresser la carte ont été puisés dans les ouvrages de M. M. Chiers, de Legur, de Fezensac, de Chambrey et le journal inédit de Jacob, pharmacien de l'Armée depuis le 28 Octobre. Pour mieux faire juger à l'œil la diminution de l'armée, j'ai supposé que les corps du Prince Jérôme et du Maréchal Davout, qui avaiem été détachés sur Minsk et Mohilew et qui se rejoindrent Orscha et Witebsk, avaient toujours marché avec l'armée.

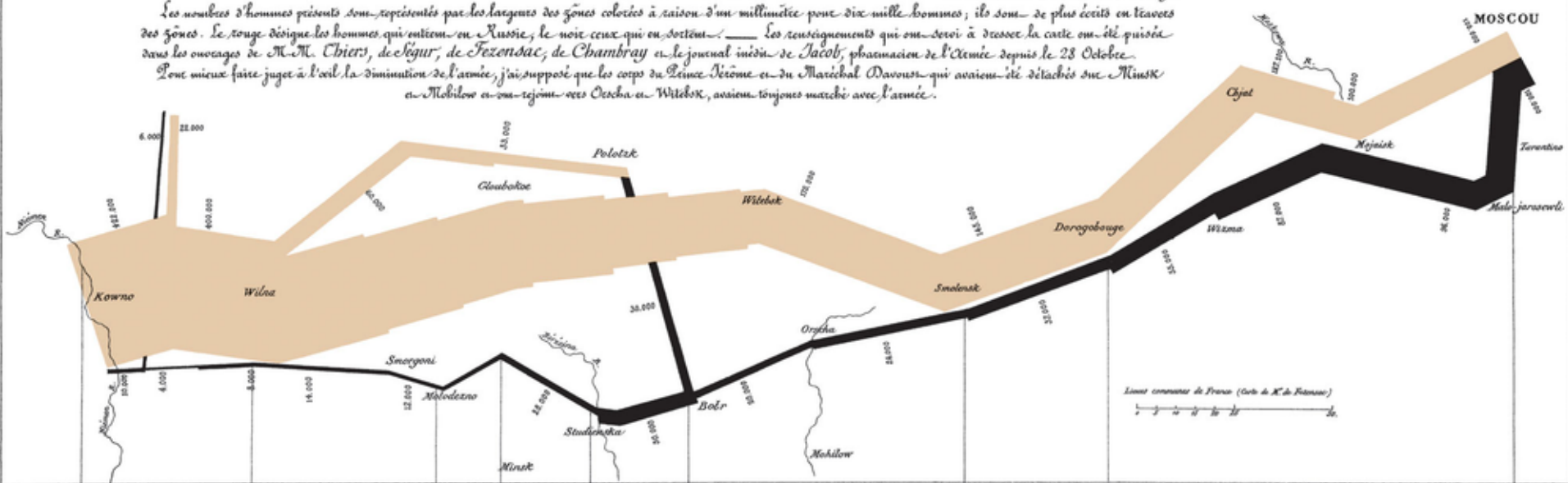
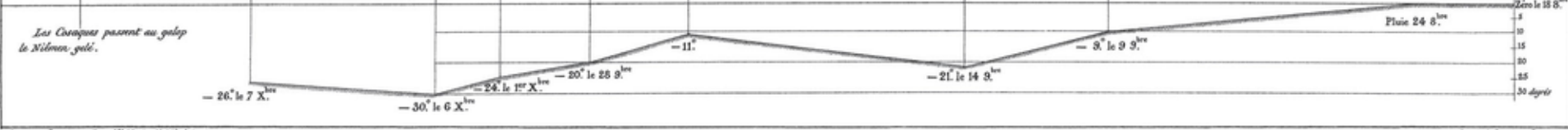


TABLEAU GRAPHIQUE de la température en degrés du thermomètre de Réaumur au dessous de zéro.



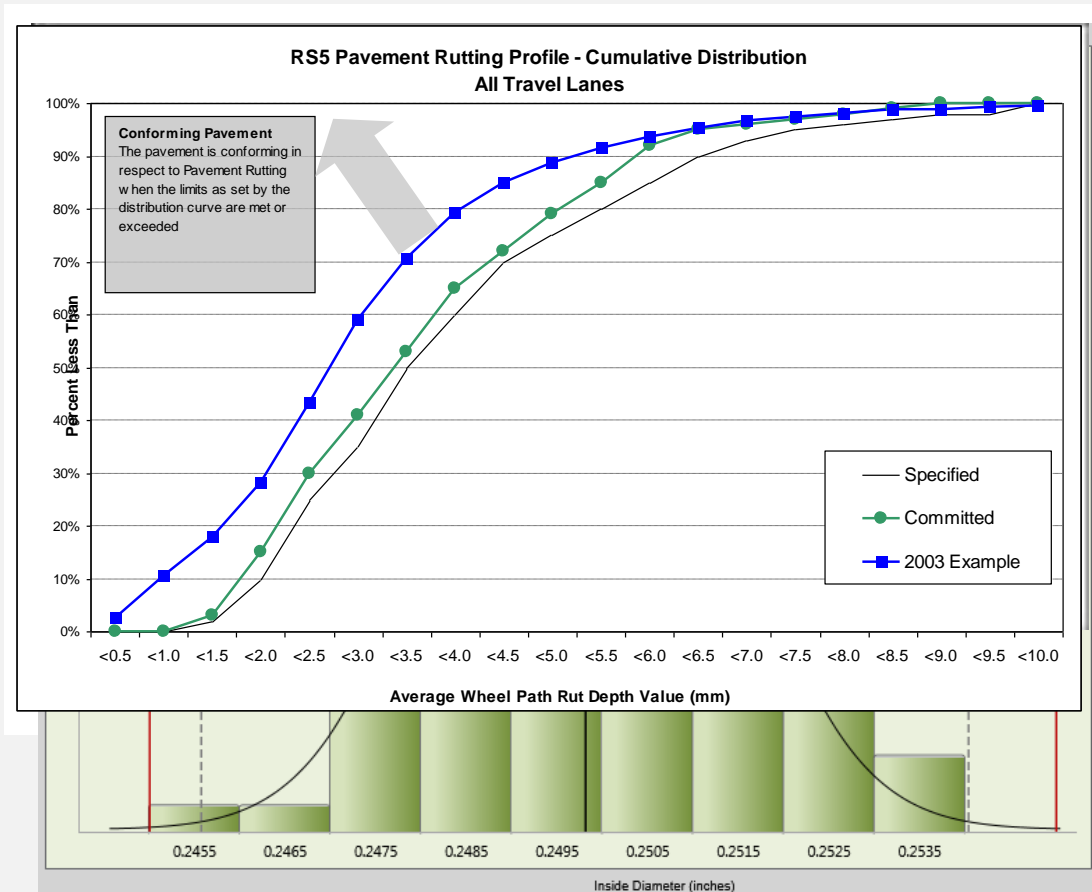
Les Cosaques passent au galop le Nilmen gelé.

Along par Requin, à Par. 5^{me} Mars 5^{me} O^{me} à Paris.

Imp. Lél. Requin et Doucet.

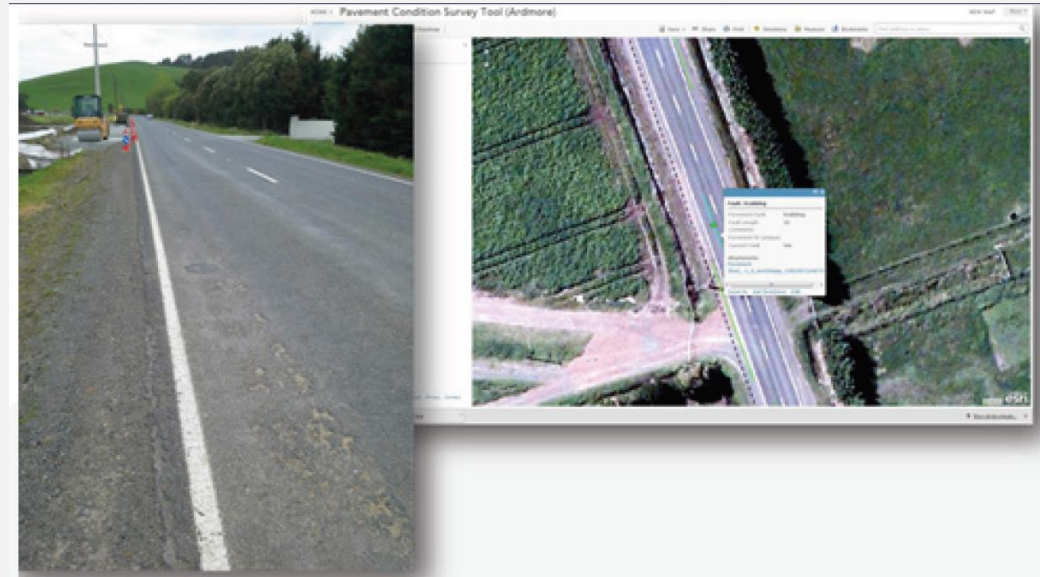
Charts

- Scatter Charts
- Histogram / Bar Charts
- Pie Charts
- Cumulative Distribution Charts



Maps & GIS

- Picture of information
 - Usually shown with a recognisable background
 - Can combine / layer data into a map
 - i.e. Trees shading road and crashes
 - Very hard without a map
- If selling a message keep it simple
- Markers and legend need to be clear



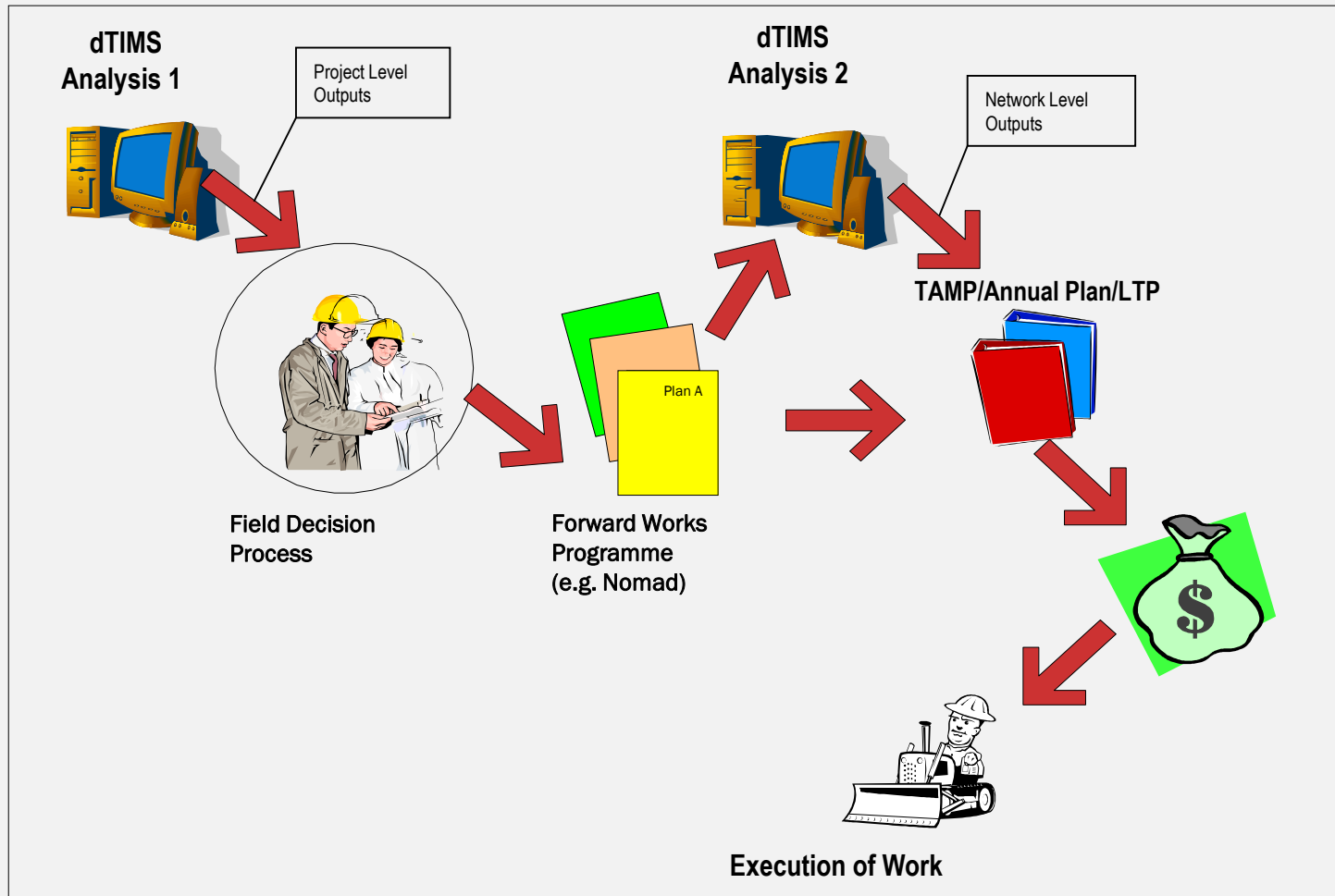
Group Discussion Stories?

- Are asset managers only as good as the stories they tell?



Informed decision-making

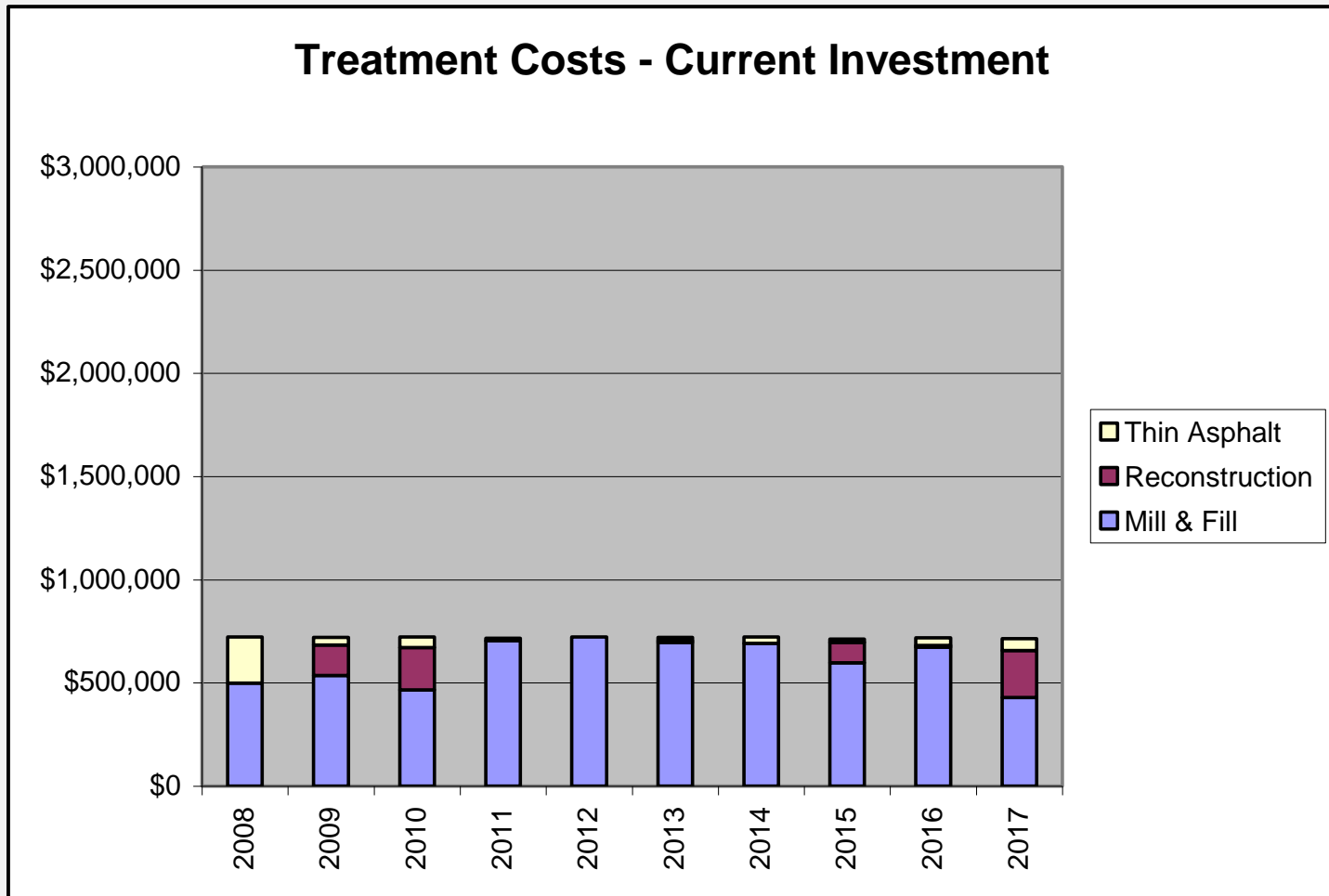
Informed decision making



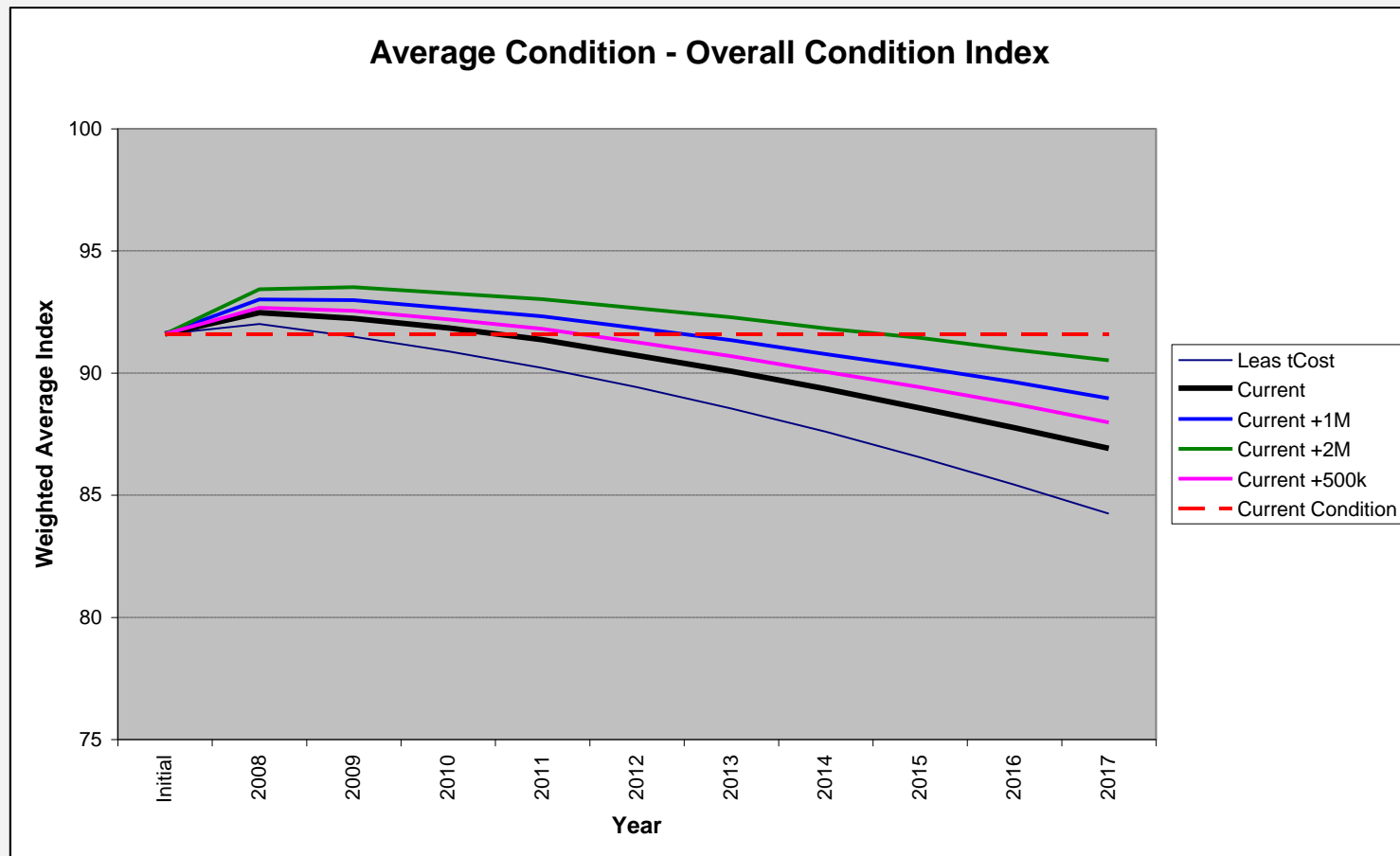
Informed decision making



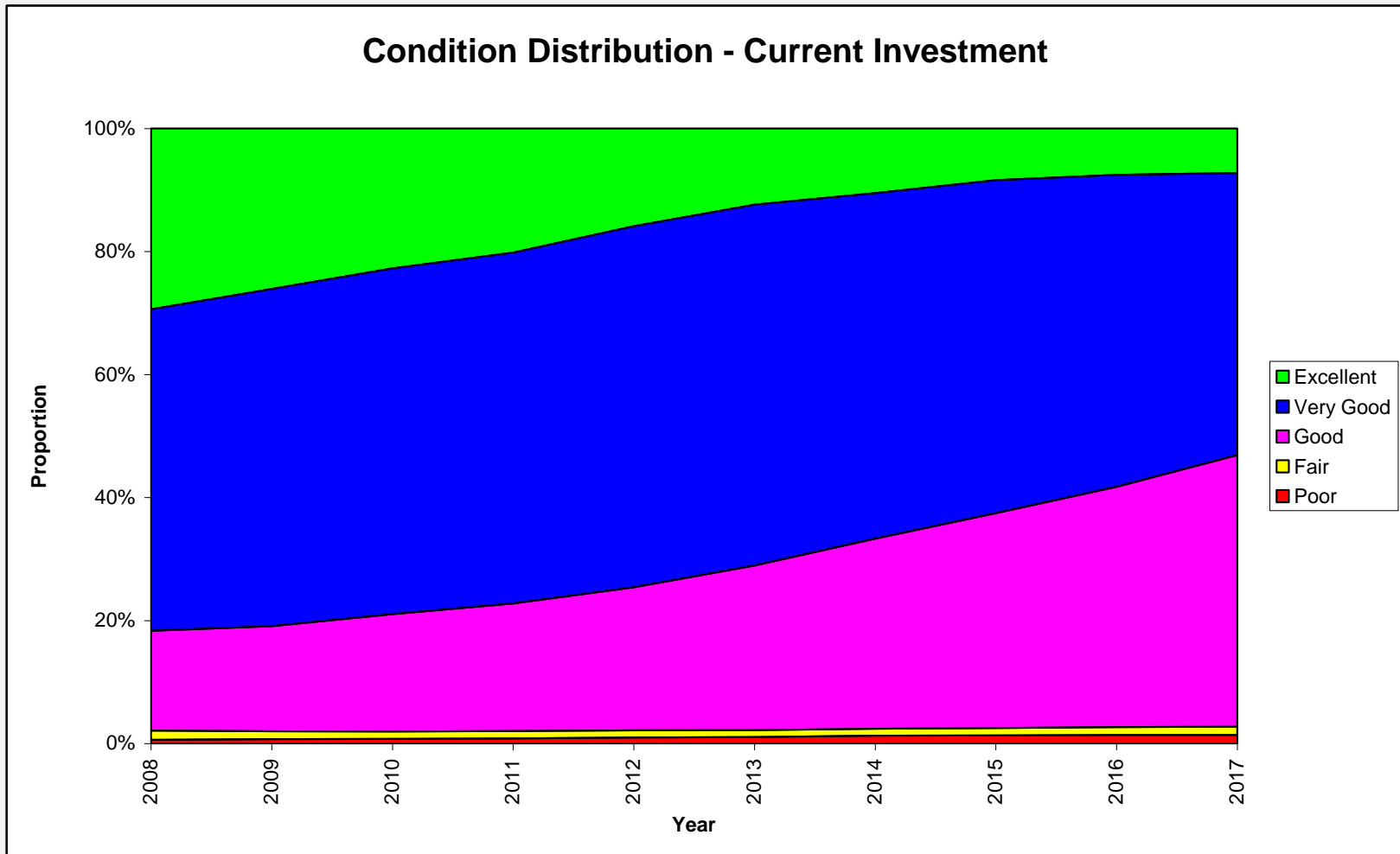
Performance modelling example – programme cost



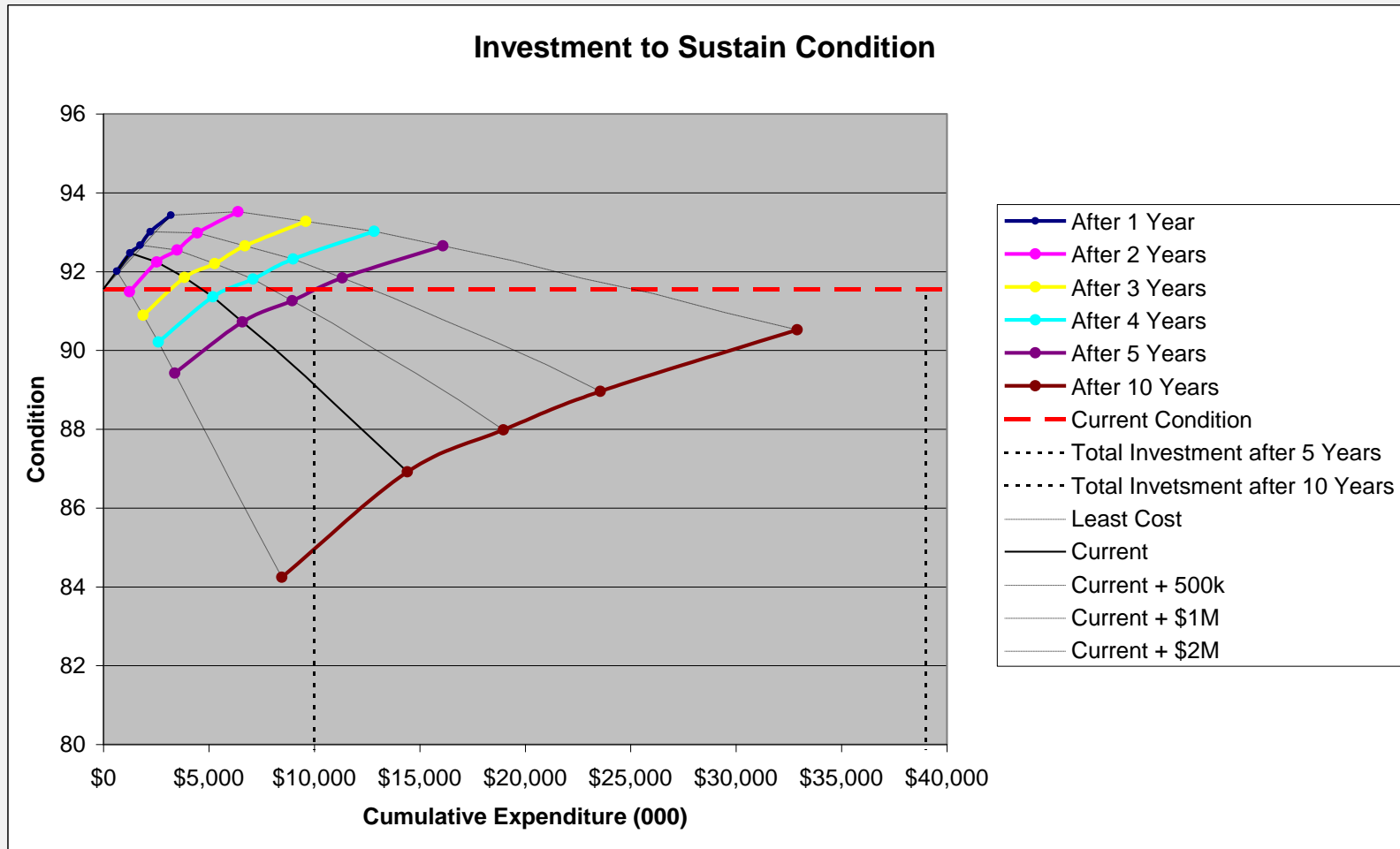
Performance modelling example – Average condition



Performance modelling example - Condition distribution



Performance modelling example – Return on investment



Performance modelling example – project level

HERTFORDSHIRES HIGHWAYS 10 YEAR FORWARD WORK PROGRAMME

UNITID	ROAD NAME	TOWN	District	MIS	Year Number							
					1 2003/04	2 2004/05	3 2005/06	4 2006/07	5 2007/08	6 2008/09	7 2009	
0U10/10	ALDOCK	WELWYN GARDEN CITY	WH	A		LSD-LSD112						SURT
0U10/20	ALDOCK	WELWYN GARDEN CITY	WH	A		LSD-LSD112						
0U13/10	ALDYKES	HATFIELD	WH	A		RESURF						
0U16/10	ARCHERS RIDE	WELWYN GARDEN CITY	WH	B			LSD-LSD113					SURT
0U20/40	WOODSIDE LANE	HATFIELD	WH	N					SURTRE			
0U21/10	CUCUMBER LANE	HATFIELD	WH	N					SURTRE			
0U23/20	ATHELSTAN WALK NORTH	WELWYN GARDEN CITY	WH	N								RESU
0U26/30	WOODCOCK HILL	HATFIELD	WH	A		LSD-LSD111						
0U27/10	BULLENS GREEN LANE	NORTH MYMMS	WH	N	LDR-LDR018							SURT
0U27/20	BULLENS GREEN LANE	COLNEY HEATH	WH	N	LDR-LDR018							
0U28/10	WILDHILL ROAD	HATFIELD	WH	N								SURT
0U30/20	BACONS DRIVE	NORTHAW	WH	N					SURTRE			
0U30/30	BACONS DRIVE	NORTHAW	WH	N					SURTRE			
0U35/10	BARFOLDS	NORTH MYMMS	WH	N					SURTRE			
0U38/10	WEST END LANE	HATFIELD	WH	B	LDR-LDR019			LSD-LSD110				
0U38/20	WEST END LANE	ESSENDON	WH	A	LDR-LDR019		LSD-LSD110			SURTRE		
0U38/30	WEST END LANE	ESSENDON	WH	A	LDR-LDR019		RESURF	LSD-LSD110				
0U41/10	HILL FARM LANE	AYOT ST LAWRENCE	WH	N				LSD-LSD096				
0U42/10	BARNFIELD ROAD	WELWYN GARDEN CITY	WH	A			RESURF					
0U43/30	BRIDE HALL LANE	WHEATHAMPSTEAD	WH	A				LSD-LSD046		SURTRE		
0U44/30	HAMMONDS LANE	SANDRIDGE	WH	A				LSD-LSD053			SURTRE	
0U46/10	BATTERDALE	HATFIELD	WH	N	LLS-LLS151							
0U46/20	BATTERDALE	HATFIELD	WH	N	LLS-LLS151							
0U48/10	BEACONSFIELD ROAD	HATFIELD	WH	A			LSD-LSD090					
0U51/10	BEECHFIELD ROAD	WELWYN GARDEN CITY	WH	B				RESURF				
0U53/20	BEEHIVE GREEN	WELWYN GARDEN CITY	WH	N								SURT
0U54/20	BEEHIVE LANE	WELWYN GARDEN CITY	WH	N					SURTRE			
0U55/20	HARMER GREEN LANE	WELWYN	WH	N	LDR-LDR266							SURT
0U55/30	HARMER GREEN LANE	WELWYN	WH	N						SURTRE		
0U59/10	BIRCHWOOD AVENUE	HATFIELD	WH	S	LFH-LFH013	LLS-LLS152						
0U59/20	BIRCHWOOD AVENUE	HATFIELD	WH	S	LFH-LFH013	LLS-LLS152						
0U59/30	BIRCHWOOD AVENUE	HATFIELD	WH	S	LFH-LFH013	LLS-LLS152						
0U59/40	BIRCHWOOD AVENUE	HATFIELD	WH	N	LFH-LFH013							
0U62/10	BIRDS CLOSE	WELWYN GARDEN CITY	WH	B					LSD-LSD115			
0U62/20	BIRDS CLOSE	WELWYN GARDEN CITY	WH	B					LSD-LSD115			
0U64/10	BISHOPS RISE	HATFIELD	WH	S	SRA-SRA017	LLS-LLS153						
0U64/10	BISHOPS RISE	HATFIELD	WH	S	TMH-TSR007	LLS-LLS153						
0U64/20	BISHOPS RISE	HATFIELD	WH	S	SRA-SRA017	LLS-LLS153						
0U64/30	BISHOPS RISE	HATFIELD	WH	S	SRA-SRA017	LLS-LLS153						
0U64/40	BISHOPS RISE	HATFIELD	WH	S	SRA-SRA017	LLS-LLS153						
0U64/50	BISHOPS RISE	HATFIELD	WH	S	SRA-SRA017	LLS-LLS153						

Summary

Summary

- Need to define “Assets”
 - Asset componentisation
- Having an asset data strategy is important to define
 - What data is collected and when
- Having data systems means we can start to do data mining
 - Keeping historic data in an accessible format adds considerable value

Summary

- Condition data helps us to understand performance
 - And can help us identify where work should be undertaken
 - Consistent location referencing is critical though
- Data mining requires some software skills to take advantage of the data
- Informed decision making is simply making decisions using all the information available to us

Thank you

Questions?

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