Mangakino Wastewater Renewals : An Evidence Driven Approach

Water New Zealand Conference 2017

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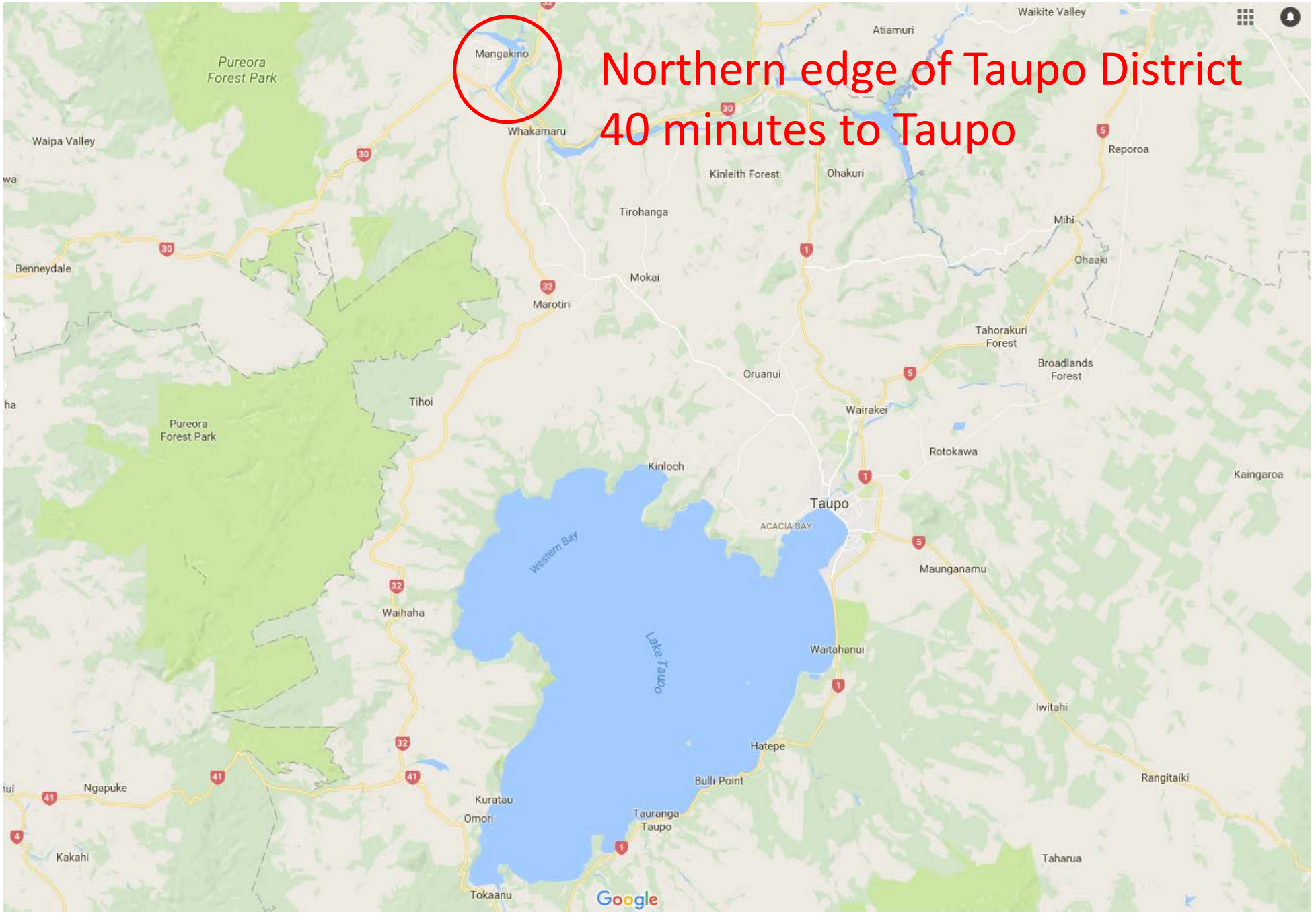
GREAT LAKE TAUPŌ
Taupō District Council

ProjectMax
Optimising Pipeline Renewals


Northern edge of Taupo District
40 minutes to Taupo
Mangakino
Pureora Forest Park
Whakamaru
Waipa Valley
Benneydale
Marotiri
Tirohanga
Mokai
Kinleith Forest
Ohakuri
Atiamuri
Waikite Valley
Reporoa
Mihi
Ohaaki
Tahorakuri Forest
Broadlands Forest
Oruanui
Wairakei
Rotokawa
Kaingaroa
Taupo
ACACIA BAY
Kinloch
Tihoi
Pureora Forest Park
Western Bay
Lake Taupo
Waihaha
Waitahanui
Maunganamu
Iwitahi
Hatepe
Bulli Point
Rangitaiki
Ngapuke
Kuratau
Omori
Tauranga Taupo
Kakahi
Taharua
Tokaanu
Google

A Lovely Location on Lake Maraetai / Waikato River

You Have Probably Never Been To Mangakino

Community of 744 residents (2013 census) - 27% less than previous census

324 occupied dwellings and 342 unoccupied (baches or vacant)

Network Details

- Constructed in 1950s by Ministry of Works for workers on Waikato River dams
- 19 km of mainly earthenware gravity wastewater drains
- Some pipes are under buildings as long term serviceability was not a consideration

However, for this paper, the renewal process is more important than the location


WWTP
Mangakino
Lake Maraetai

The Need for Renewal

Smoke testing

Risks from pipes under buildings

CCTV of 50% of system in 2007- many pipes graded ‘4’ & ‘5’

I/I problems for WWTP

EW pipework all 60 yrs old

The Solution is Obvious !

The network requires renewal in relatively near future

$ 7 million

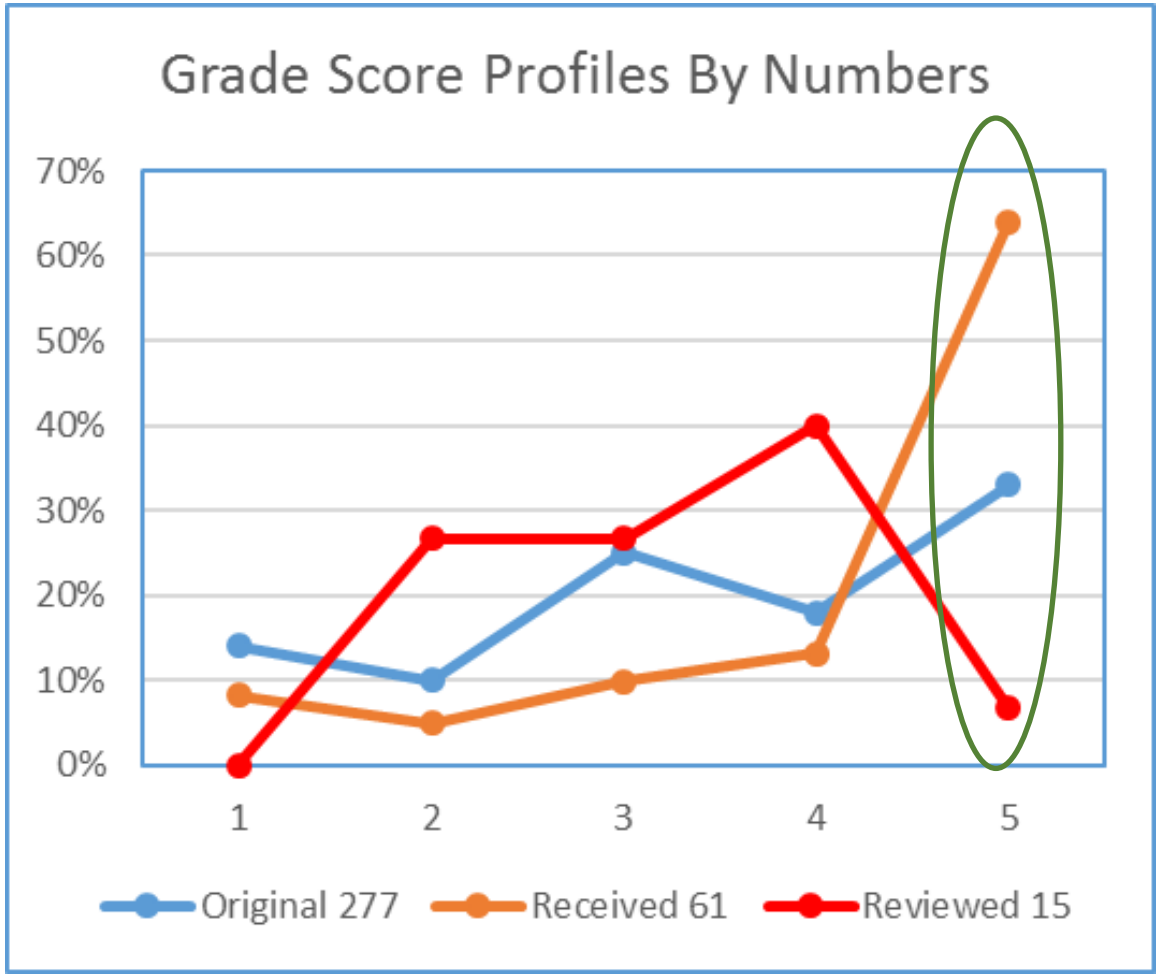
But – does Taupo District Council really need to spend all this money now or is there a way of optimising any remaining life ?

Using an Evidence Based Approach

- What information do we have ?
- Can it be relied on ?
- What gaps exist ?
- ProjectMax engaged to explore these questions

Primary Target – The 2007 CCTV Inspections

- 230 of 430 lines had been inspected
- 61 records could be located
- 15 reviewed
- Original scoring was pessimistic
- But it is 10 years old



The TDC Dilemma - the $7m Question!

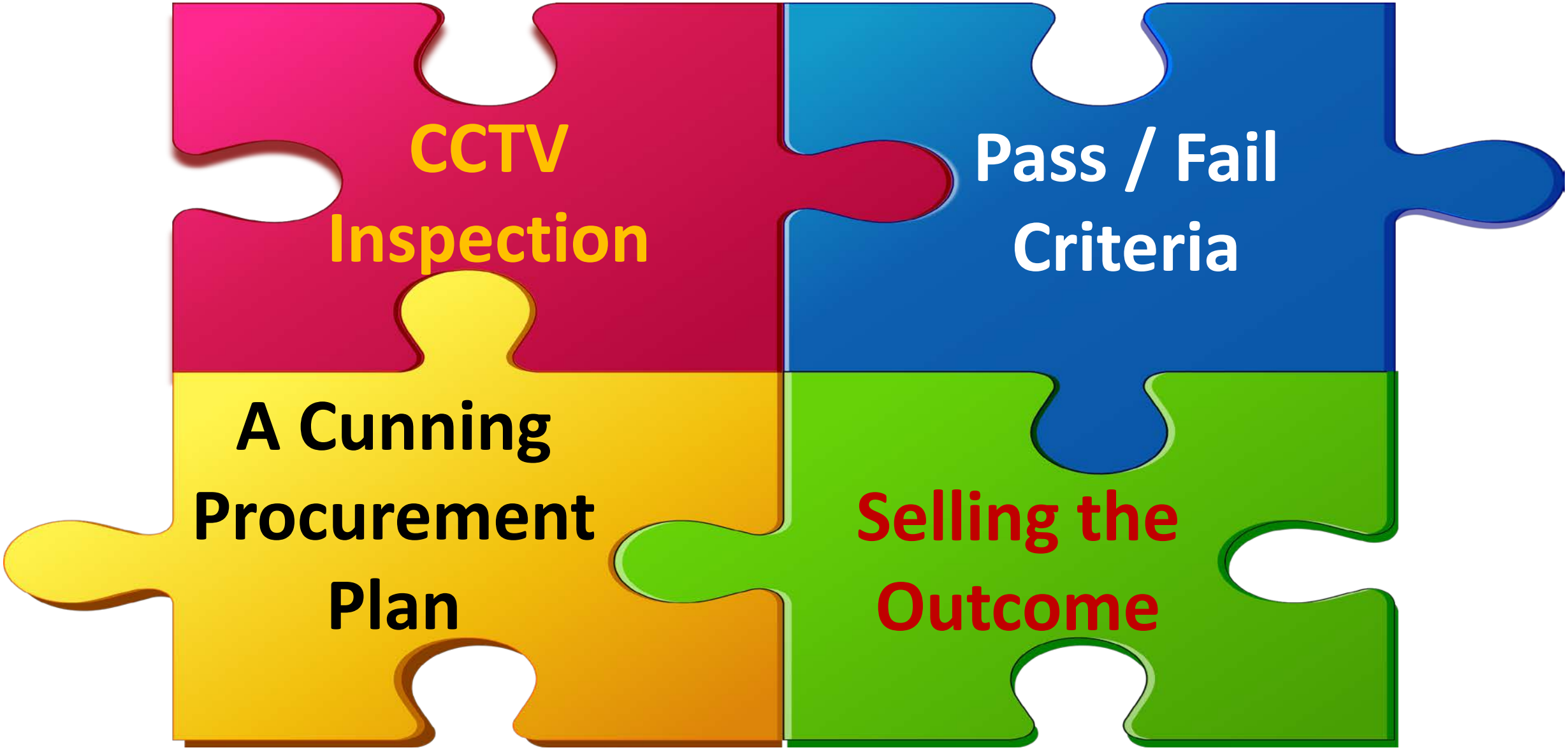
What was known

- The pipes are old and will not last forever
- Some deterioration was obvious
- The renewal cost will be significant

What was not known

- Which pipes were seriously deteriorated and **needed renewal now**
- Which pipes **could continue** to provide service for a ‘reasonable’ time

The Solution



CCTV Inspection of Entire Network

- Nothing unusual
- Enhanced NZPIM specification
- Manhole inspections included
- Had to avoid Christmas busy season
- Initial and ongoing audits, by ProjectMax, to confirm and maintain quality of inspections

Pass / Fail Criteria

- This is the heart of the process
- Depends on access to high quality and reliable CCTV outputs

Initially uses ‘Peak Score’ based on NZPIM scoring to classify into Type 1, 2 and 3 Assessments

Convert to LOF 1-5 grading (Equivalent to IIMM)

Pass / Fail criteria applied

‘Fails’ then assessed to determine appropriate response

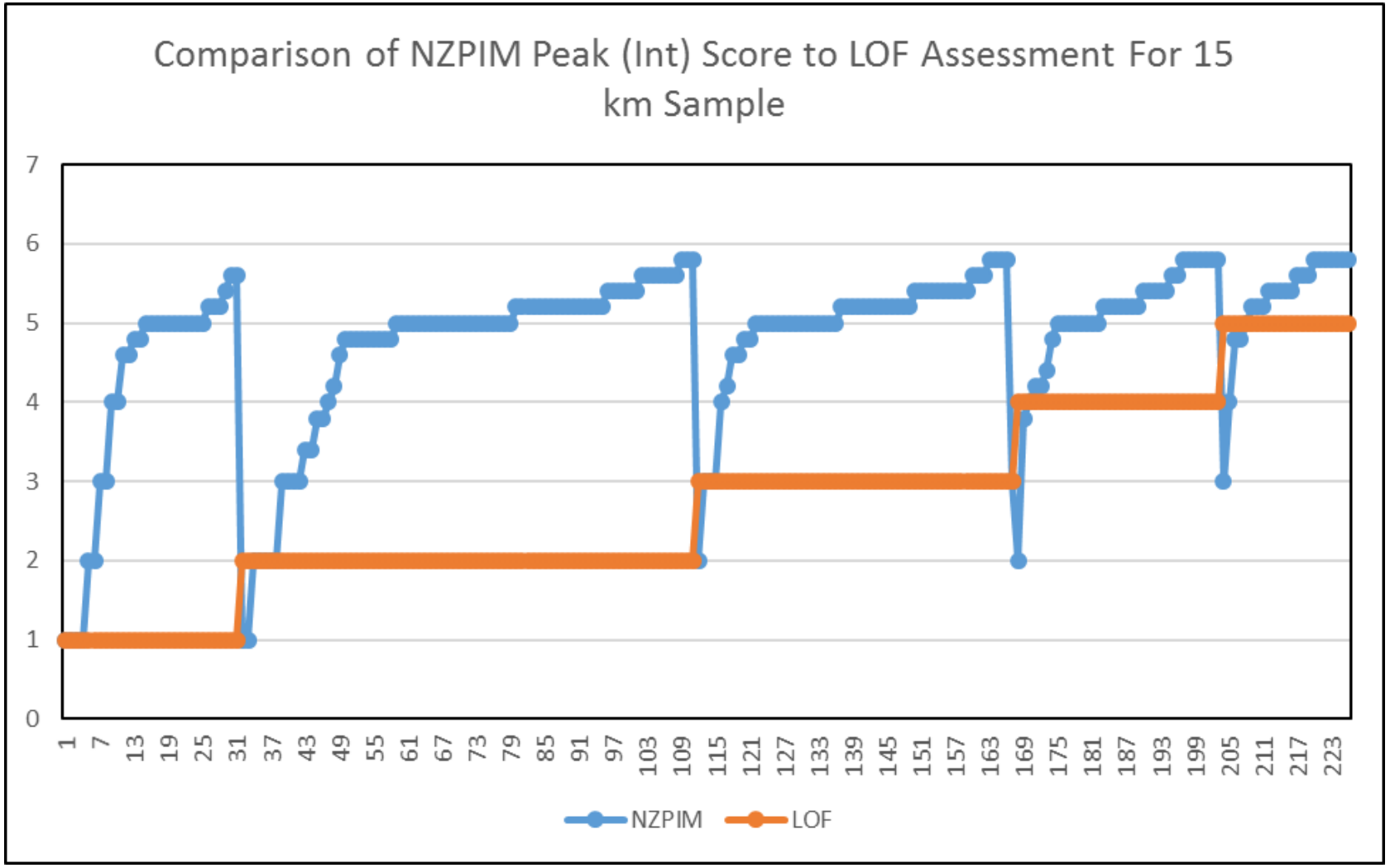
Why the CCTV ‘Peak Score’ ?

- ‘Likelihood of Failure’ (LOF) is typically driven by the worst fault and the Peak Score focuses on worst ‘1m’
- Other faults will influence long term performance and the optimum rehabilitation required
- ‘Mean Score’ is not a useful measure as it is heavily influenced by the number of faults, continuous defects and the length of the line

Why LOF Rather Than NZPIM Grade ?

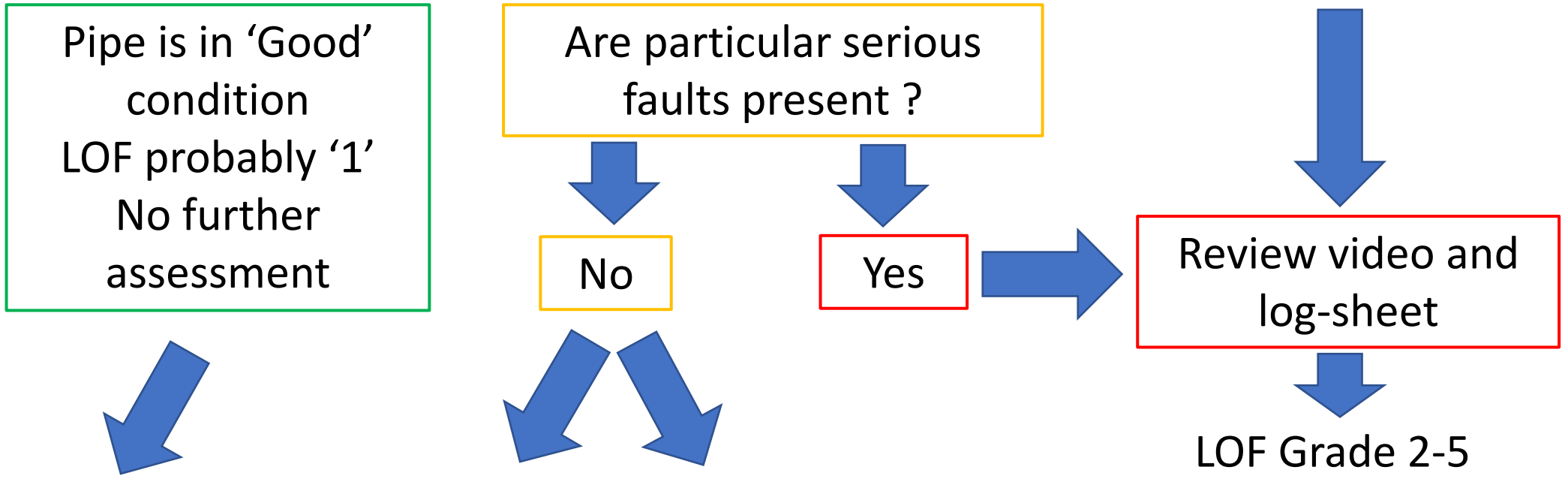
- The NZPIM converts faults detected into Peak Score, or Mean Score, on a 1-5.8 scale, often summarised to 1-5
- The mean score has a range of issues
- NZPIM Peak Score is not the same as the IIMM condition grade of 1-5
- ProjectMax experience is that NZPIM score will typically overstate the degree of deterioration, and understate the useful remaining life – but is still useful as a coarse filter
- This will be addressed in the review of the NZPIM

An Illustration of the Difference



Initial Assessment Using Peak Score

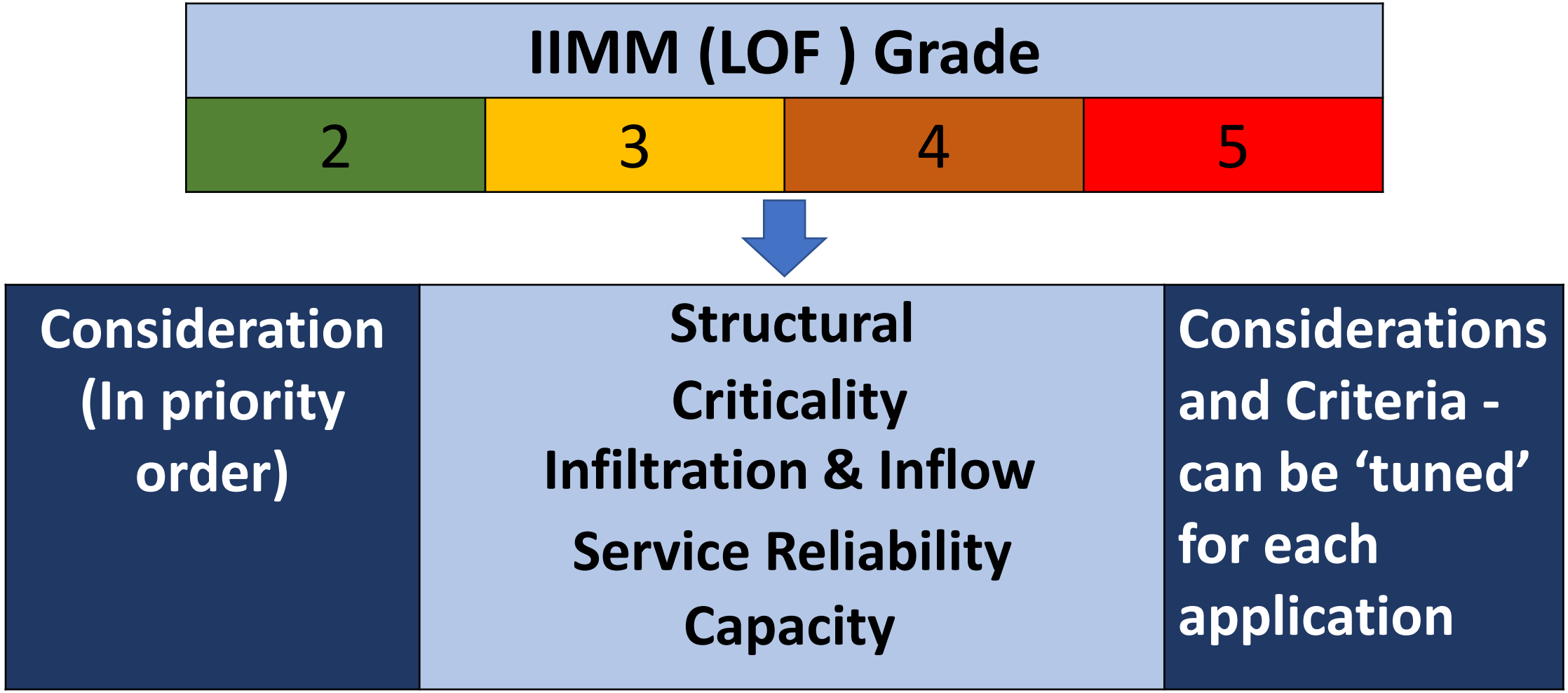
Type 1 Peak < 10	Type 2 10 ≤ Peak ≤ 30	Type 3 Peak > 30



1	2	3	4	5
Excellent		Some deterioration		Urgent intervention

Likelihood of Failure (LOF) or IIMM Condition Grade

Apply Pass/Fail Criteria



Choose Your Weapon For the 'Fails'

- Have viewed the video and log sheet and assigned LOF
- Know the worst faults, overall condition of line, its criticality, location, number of laterals, etc

Maintenance

No structural intervention required – root-cutting, flushing

Repair

Isolated defects – otherwise pipe has useful life and cost-effective to repair

Relining *(if possible)*

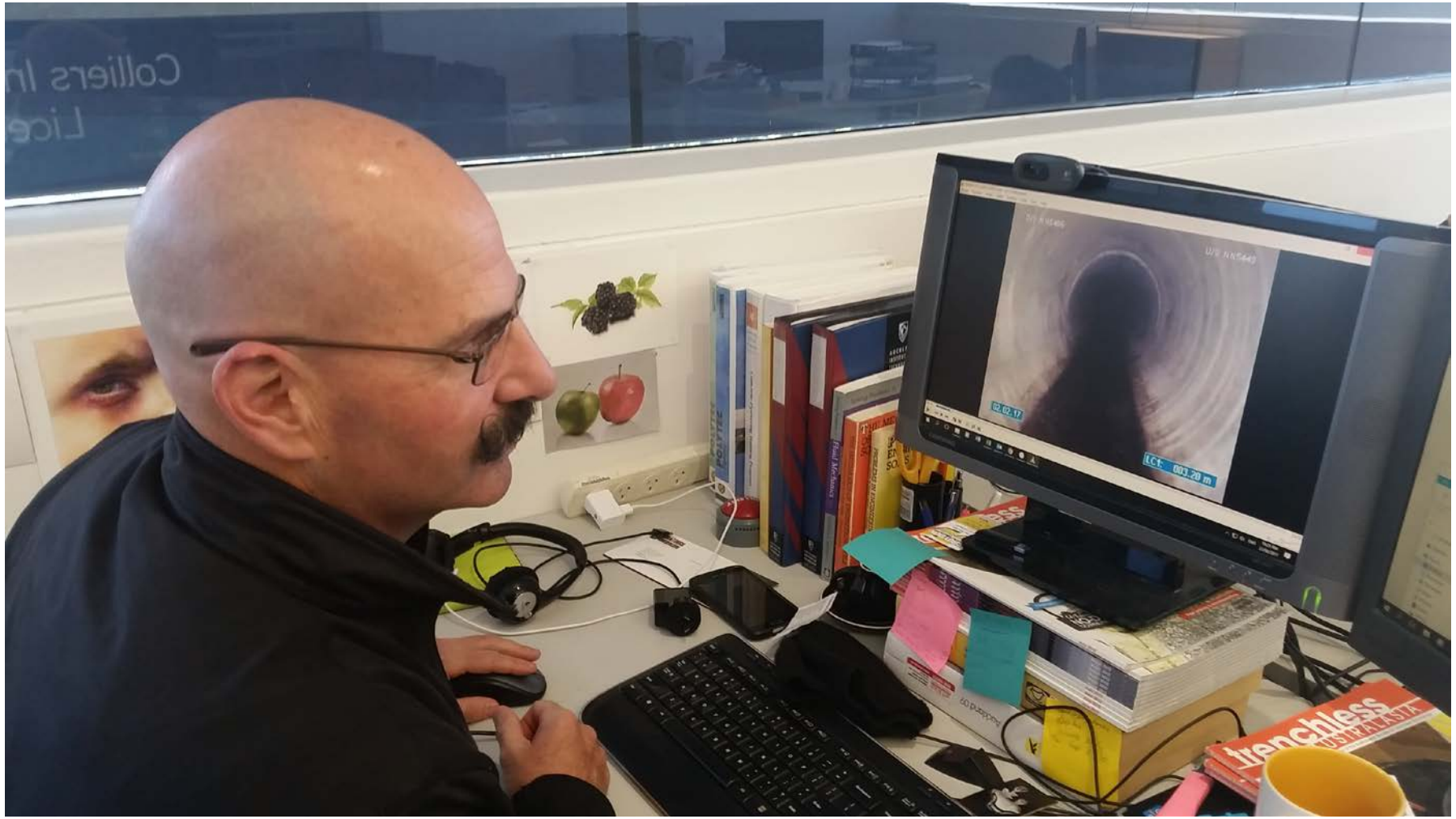
Multiple defects. Any minor dips present are acceptable. Not cost-effective to repair

Renewal

Multiple defects. Dips / defects are unacceptable for relining. Current location not acceptable or practical

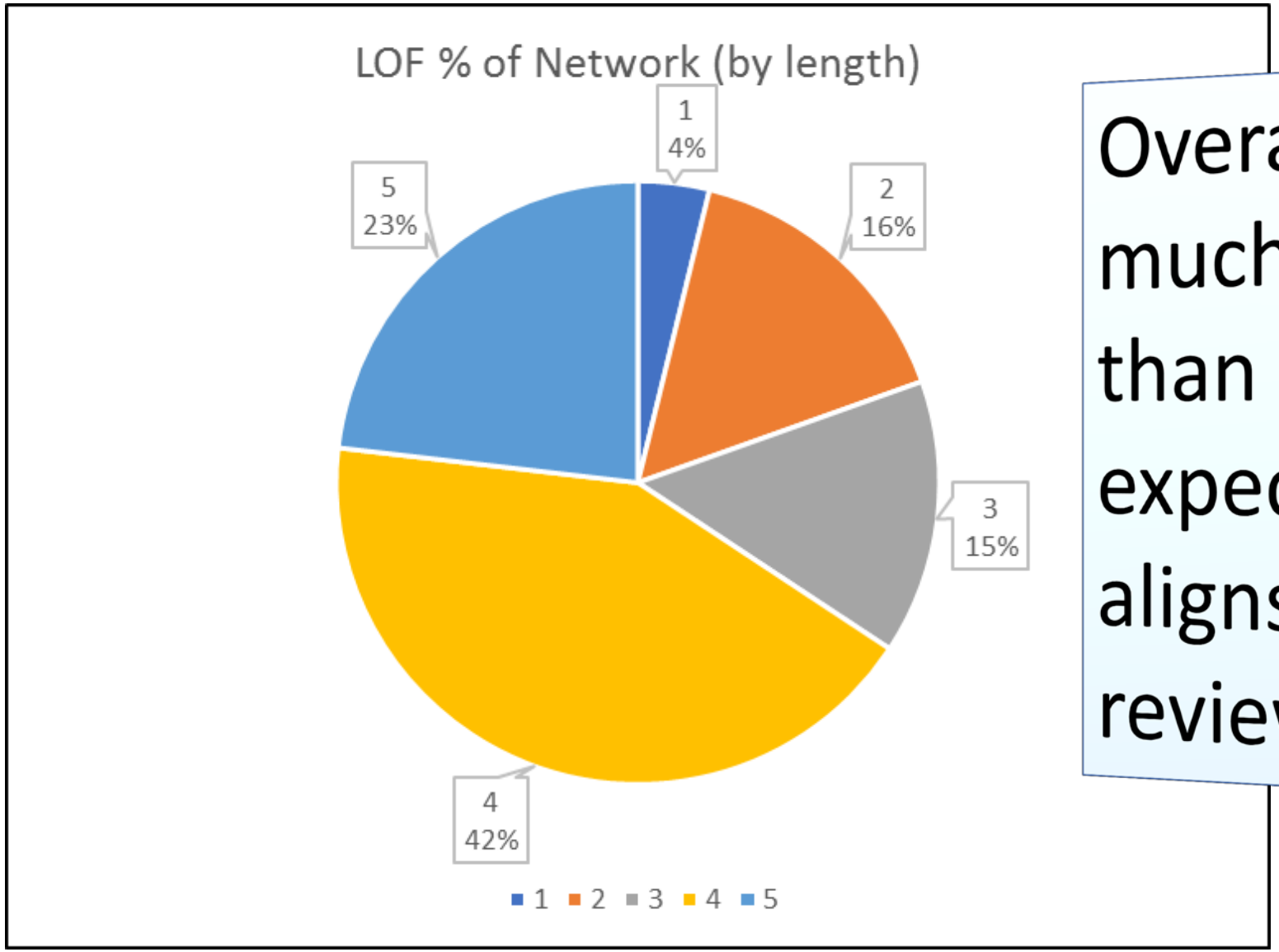
Mangakino Progress to Date

- 18 km (of 19km) of 1950s main CCTV'd and reviewed



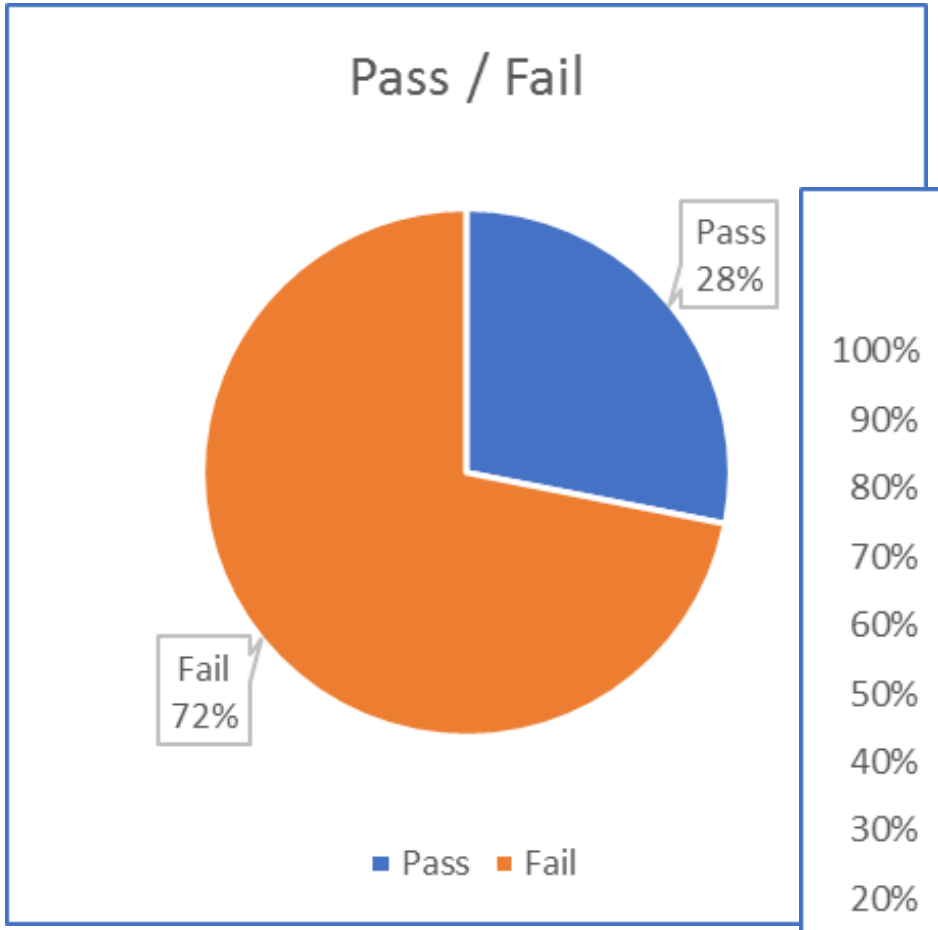
Some Examples of Condition

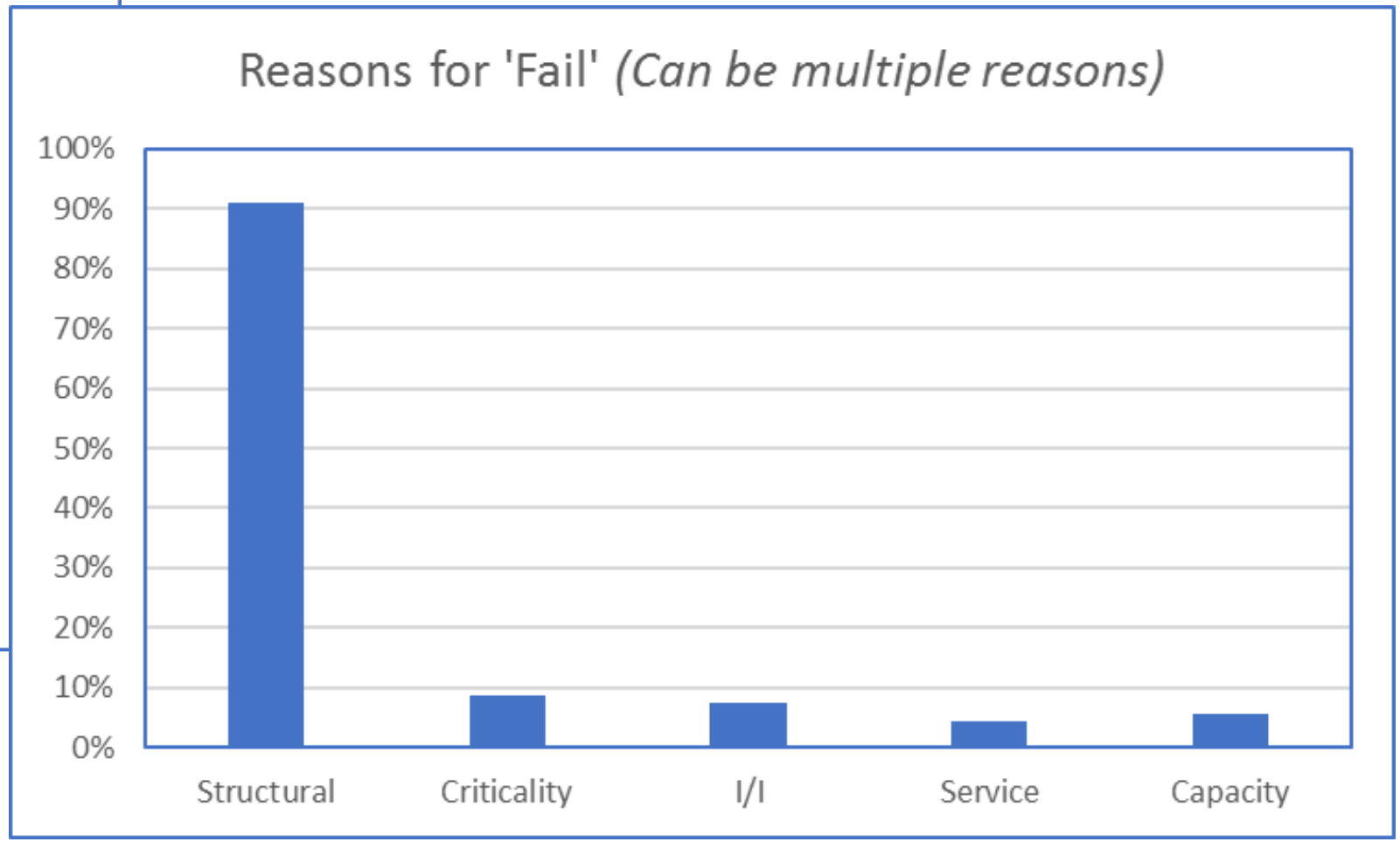
Overall LOF Allocation



Overall this is much better than expected and aligns with review!

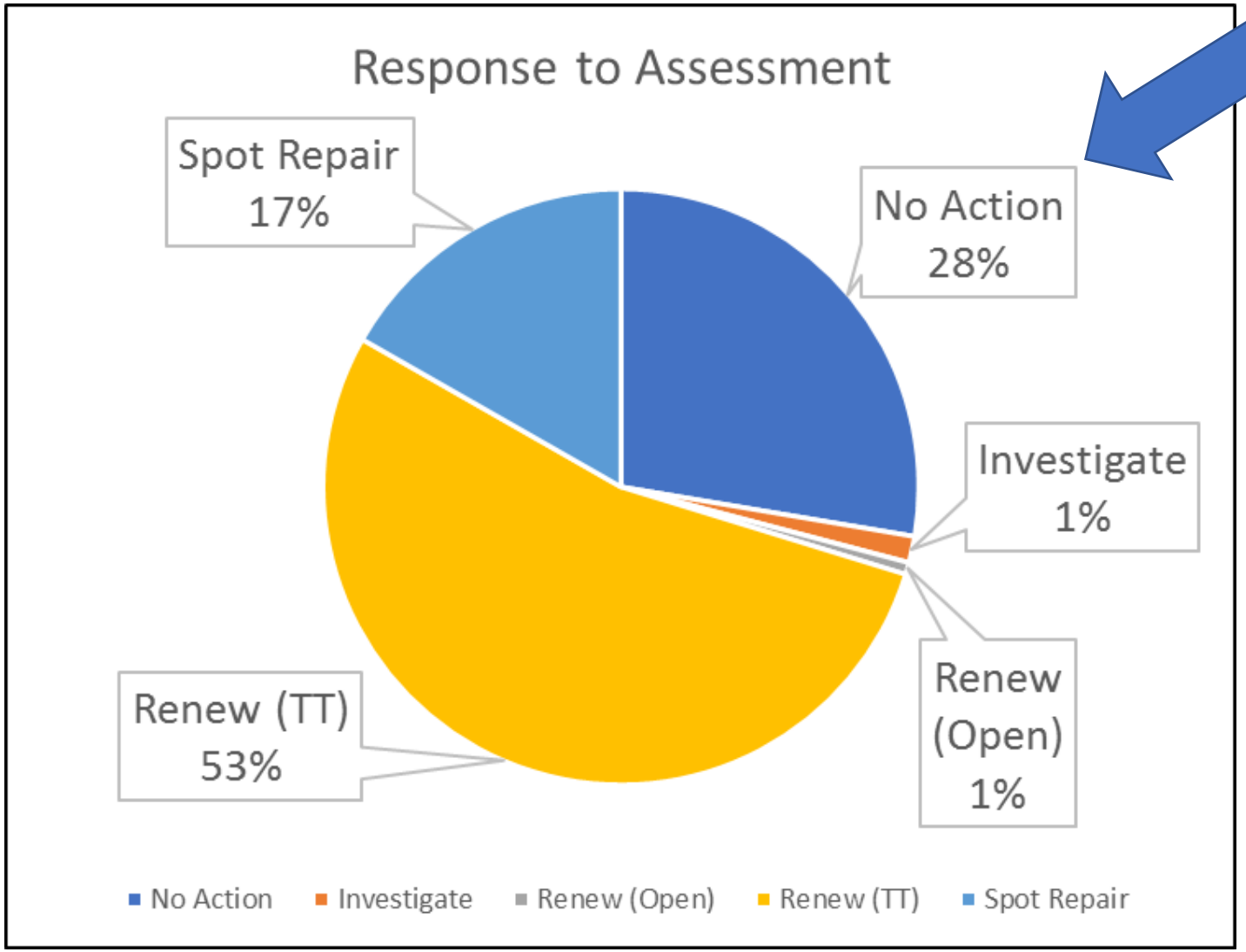
Pass / Fail


Pass / Fail
Pass
28%
Fail
72%
Pass
Fail


Reasons for 'Fail' (Can be multiple reasons)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Structural
Criticality
I/I
Service
Capacity

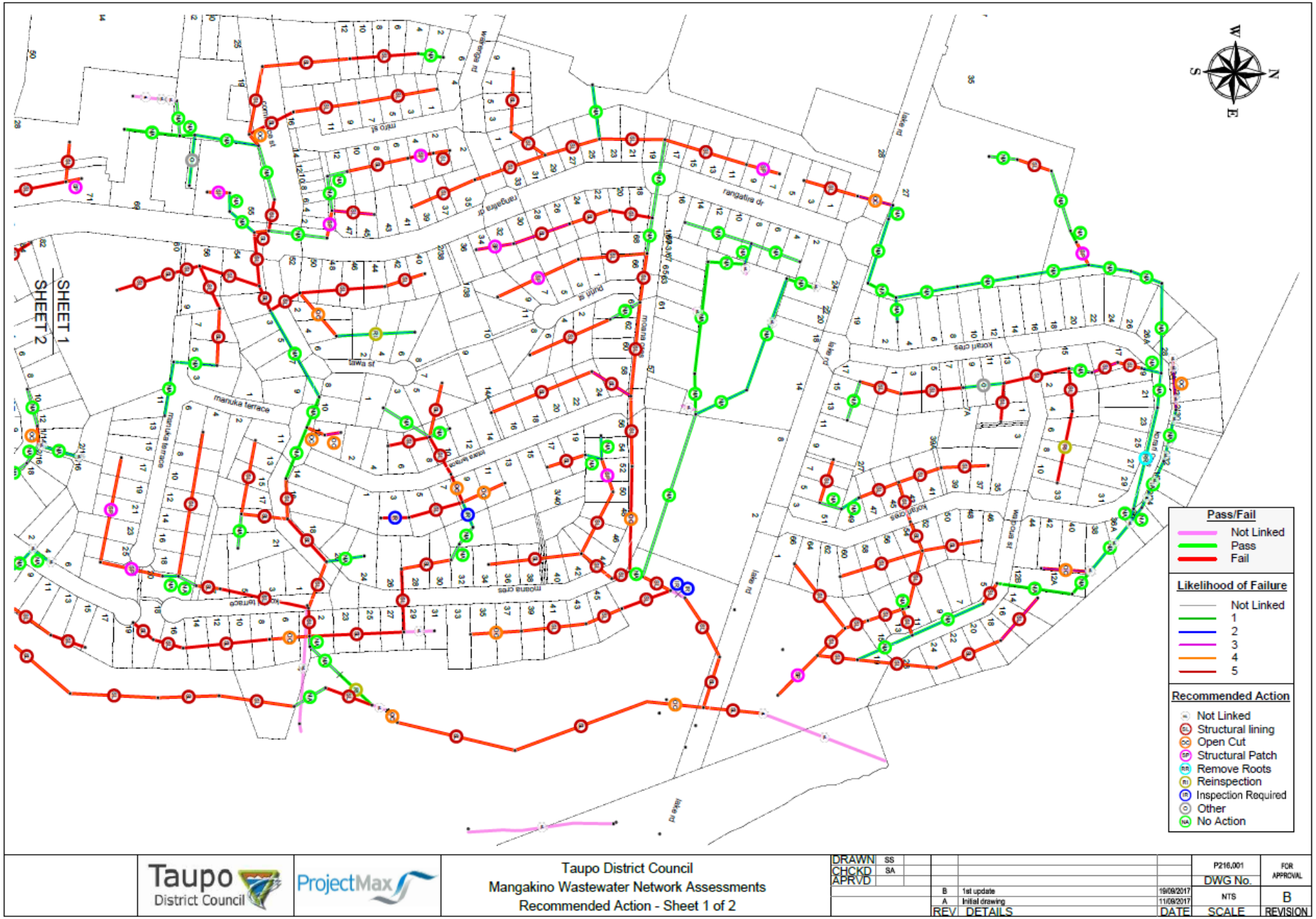
Recommendations from Pass/Fail

Passes

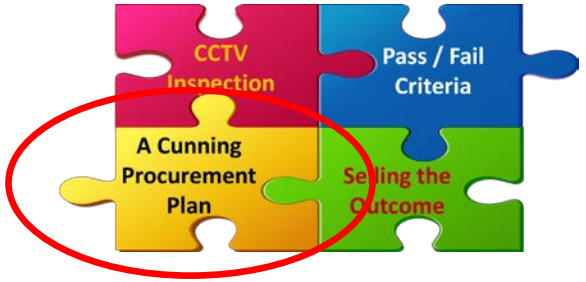


Note : This outcome is specific to Mangakino but illustrates process

How It Actually Looks



A Cunning (Procurement) Plan



We know
mix of rep
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require

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of what is
driving the
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priorities

Elements of the Cunning Plan

Engineering

- Complete & robust information
- Accurate (low risk) estimates
- Realistic time lines
- Risk assessment

Finance

- Known impact on overall finances & rates

Community

- Assessment of Stakeholder impacts
- Awareness of likely issues & responses
- Management & political awareness

Response Thinking at This Time

Pass	Repair	Renew	Rehabilitation

Re-inspect in approx. 5 yrs. Expect to get at least 10 yrs

Generally high priori and done by Mtce Contractor

Only a few lines. Prioritised and done by M contractor

Prioritised and tendered over several years

Application Outside Mangakino

- Approach used 3 times in Taupo District with varying outcomes (as expected)
- Mangakino is unusual having been entirely constructed at same time
- Other communities around the country are similar, particularly those that converted to public system
- Even in large systems there a ‘groups’ of pipes that require the same focussed approach

General Application to Renewal Planning

- Process will provide insight into overall condition and deterioration rates of assets
- LOF 1-3 pipes => medium to long term planning (5-30 yrs)
- LOF 4-5 pipes => short to medium term renewal planning (0-5 yrs)
- With limited exceptions, all pipes should have condition confirmed before renewal
- Criticality and prioritisation are important tools in defining actual renewal programme

A Few Words From the Accountants & Management

- Where spending is involved always looking for *'As little as possible, as late as possible'*
- From a management perspective *'A robust process enables sound decision making'*

Selling the Outcome

Have all the information needed to justify what is required and/understand the risks

Senior Management fully briefed and understand the issue in context of ‘whole of council

Yet to present to Council and community

Summary

Incomplete

Out of Date

Dubious

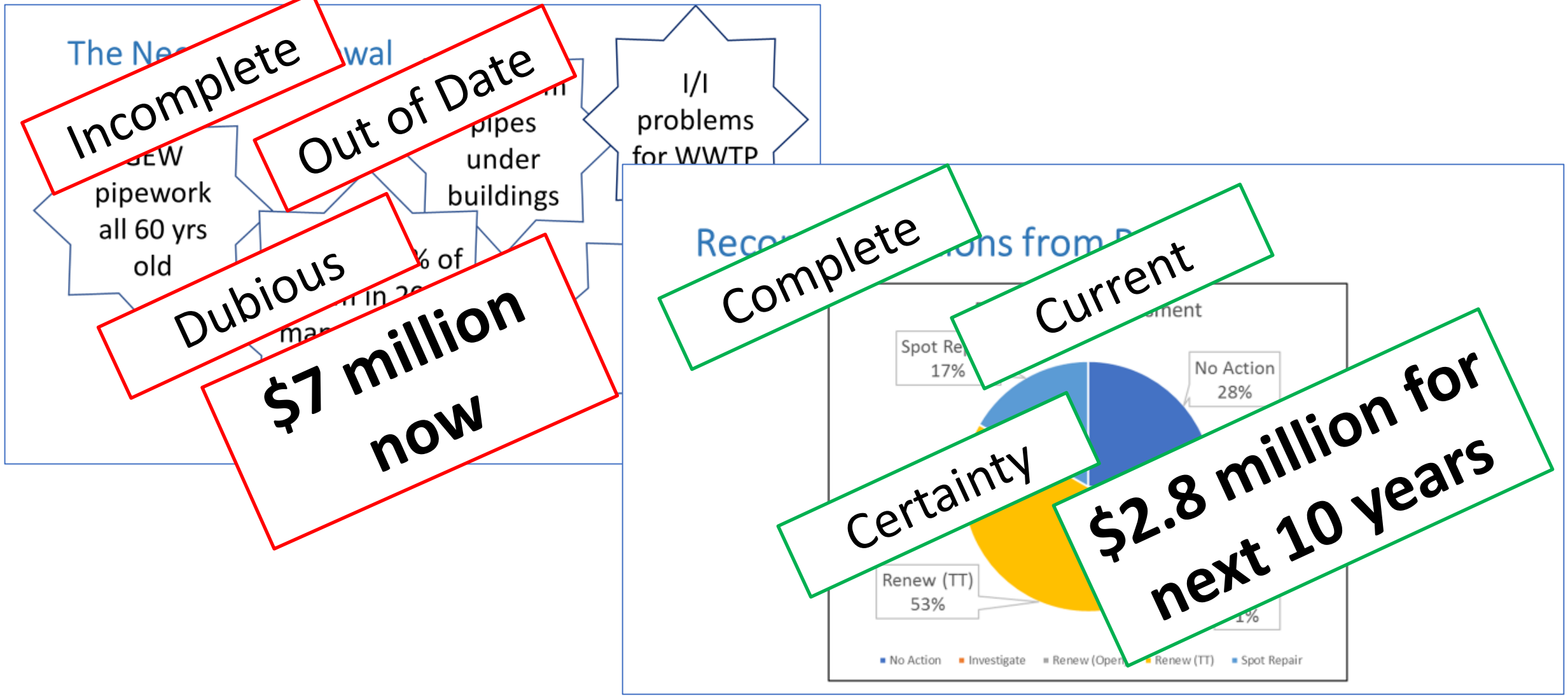
$7 million now

Complete

Current

Certainty

$2.8 million for next 10 years



It's so easy to move from incomplete and dubious information to complete information and certainty – why would you do anything else !

Conclusions

- Taupo knew it had a $7 million problem
- Deferral was risky and problem inescapable
- Wholesale renewal risked spending money un-necessarily

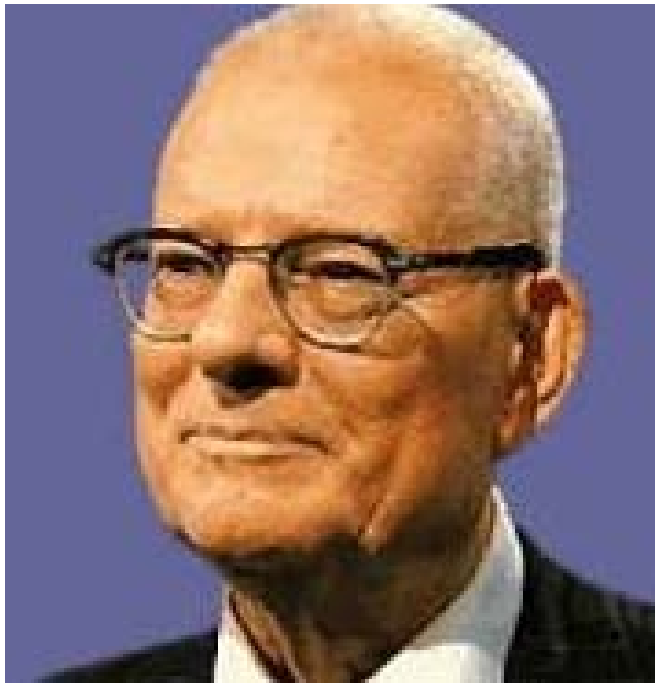
Conclusions

- An **evidence based approach** combined with robust **decision making framework** turned a $7m problem into a $2.8m solution
- Overall cost benefit will vary depending on what is found but value of information is undeniable

Parting Shot

Without data, you're just another person with an opinion !

W Edwards Deming



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