NETWORK

Annex U

(Confidential) Worley Parsons – Comments on Service Level Specifications for Rail Infrastructure Maintenance: Central Queensland Coal Region, 18 August 2008

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TTCI Transportation Technology Center, Inc.

UT3 Parallel Active Comparison Exercise

Supporting Document

Comments on Service Level Specification for Rail Infrastructure Maintenance

Central Queensland Coal Region

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SYNOPSIS

As part of UT3 parallel active comparison exercise Queensland Rail Network commissioned WorleyParsons and Transportation Technology Center Inc (the Consultants) to carry out a desktop assessment and comment on the current Key Performance Indicators.

This document which was submitted as a 'commentary' during the review process is now included as part of the support documentation to the final review comments and recommendations.

Disclaimer

[redacted]

CONTENTS

1. INTRODUCTION

1.1 This report provides comments on the discussion paper published by QR Network Access on the service level specification for the rail maintenance on Central Queensland Coal Region to be used in UT3 [Ref. 1].

1.2 The current access undertaking (UT2) ends after four years on 30 June 2009. The service level agreement described in Ref. 1 will be applied to UT3, which begins on 1 July 2009.

2. EXISTING SERVICE LEVEL MEASURES

2.1 There are 41 existing Key Performance Indicators (KPIs). It is intended that these will continue to be monitored in UT3.

Definitions

2.2 Short titles for the existing KPIs are given in Ref 1. The Consultant recommends that full definitions are provided in an appendix or a separate document. Some key questions for clarification are:

- Are the trespass incidents all those that are reported or just those that result in damage or accidents?
- Are Major Maintenance Cost controls the unit costs of the activities that are listed (e.g. tamping cost per km) or the total cost for a line?
- How are Transit Time Delays calculated when there is no timetable? Are all delays counted or just those greater than a threshold number of minutes?
- Track Condition Index (TCI) is defined in a fact sheet [2]. There are several details that need to be clarified:
    - Is the recorded track geometry filtered in any way before TCI is calculated?
    - What is the sampling distance for the track geometry recordings?
    - Is the parameter for top calculated for the left and right rail or the average of the two?
    - Is the parameter for alignment calculated for the left and right rail or the average of the two?
- Is the fault response the time to respond or the time to fix? How are “no fault found” incidents handled?
- Are broken rails included in Rail Defects?
- How are “Transformers” measured?
- Does “Production Against Program” mean the difference between actual and planned production?

Overall Track Condition Index

2.3 The Track Condition Index is calculated from the mean plus three standard deviation points of the distribution of each Parameter Index over a track section. This means it is a measure of the quality of the very worst track locations. While this can be used to ensure no section of track exceeds an allowable maximum roughness it is not a good indicator of overall track condition.

Monitoring the condition of only the very worst track locations can cause problems. It can cause the track maintainer to focus effort on a small number of difficult locations. Lack of attention to other locations can cause the overall track condition to deteriorate.

The Consultant recommends that track condition indices are also calculated for the mean and mean plus two standard deviation points on the distribution. This would introduce two new KPIs.

TCI is calculated by summing the PCIs for top, twist, gauge and alignment without weighting. This implies that each parameter has the same order of magnitude and a similar weighting. It may be possible that PCIs for alignment, for example, may be large and those for twist, for example, small. This should be investigated and, if found to be true, KPIs should be used for each track parameter.

Asset Condition

2.4 Table 1 (Table 2 of Ref 1)) claims to cover asset condition. However, Track Condition Index is the only direct measure of asset condition. The other KPIs measure the results of poor asset condition (e.g. delays and buckles). It is also important to measure the actual condition of the asset.

Table 1 Existing Alliance Agreement KPI's – Asset Reliability and Maintenance Performance[1]

Asset Reliability / Condition	Maintenance Performance
Transit Time Delay	**Fault Response**
Track and Structures	Traction Power (High Priority)
Trackside Systems (Signal)	Signal (High Priority)
Trackside Systems (OHL)	**Production Against Program - infrastructure**
Track	Resleepering

[1] QR Network Access (2007), "Service Level Specification for Rail Infrastructure Maintenance Central Queensland Coal Region" Discussion Paper

Asset Reliability / Condition	Maintenance Performance
Derailments (due to Infra.)	Resurfacing
Track Condition Index	Rail Grinding
Buckles/Pull Aparts	Ballast Undercutting
Rail Defects	Track Recording
Trackside Systems - signals	Non Destructive Testing
Faults	*Trackside (traction)*
Wrong side Failure	Routine Maintenance
Restored in face of train (RIFOTS)	Major Maintenance
Signals passed at danger (SPADS)	*Trackside (signal)*
Trackside Systems – Traction Power	Routine Maintenance
Dewirements (due to Infra. Equip.)	Major Maintenance
Transformers	
Faults (non-resetable trips)	

2.5 Consider the stress free temperature in rails for example. At the start of an access undertaking there will be a distribution of stress free temperature across the network as shown in Figure 1. At the end of the access undertaking the distribution may have changed as shown in Figure 2. This could be caused by track maintenance and rail repairs without adequate restressing. All the rail on the network is still within the tolerances on stress free temperature, and there may have been no buckles. However, the track asset is clearly in a worse condition than it was at the start of the access undertaking

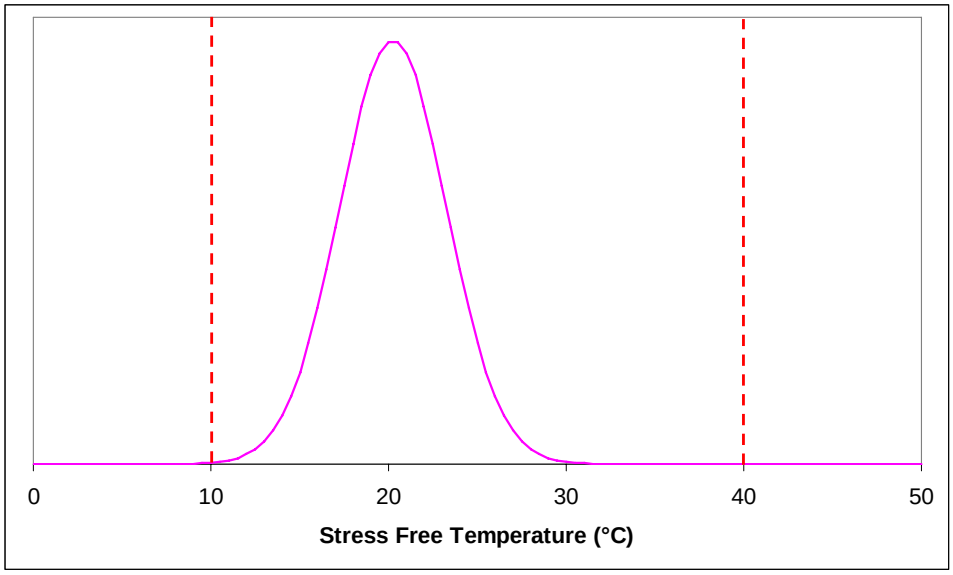

Figure 1. Stress Free Temperature Distribution – Start of Undertaking

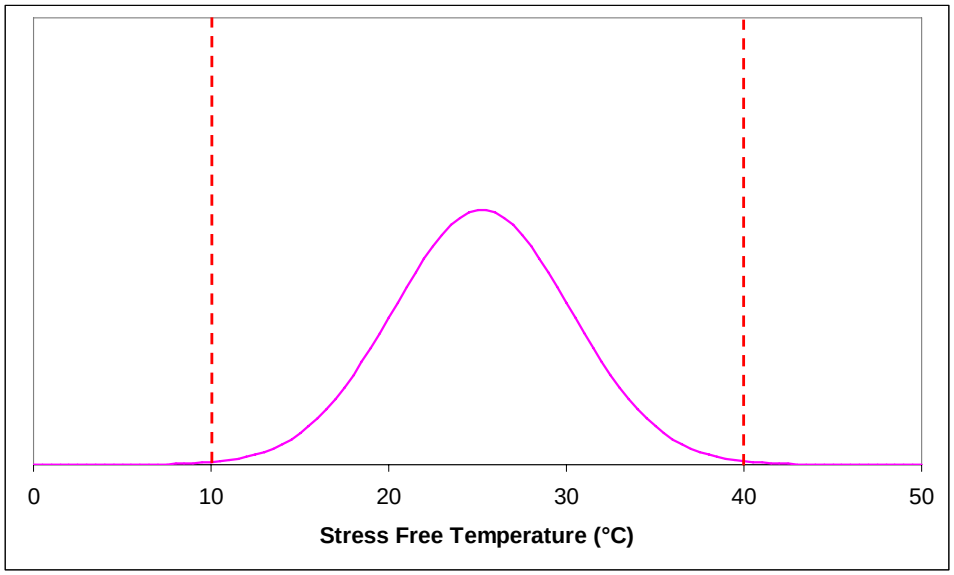

Figure 2. Stress Free Temperature Distribution – End of Undertaking

Similar arguments could be made for other aspects of asset condition. Another example is rail wear. Although, over the whole network, rail wear may be within the limits, it could be much closer to the limit at the end of the access undertaking than it was at the beginning. This means the track manager and maintainer are going to have to renew extra rail in the next access undertaking.

The Consultant recommends including more KPIs on general asset condition. These could be based on asset condition information that is recorded currently.

Production Quality

2.6 For the items under the heading “Production Against Program” there should be some measure of the quality achieved. Since track possessions for maintenance work have a direct effect on revenue train movements it is not sufficient to record that the planned work was completed. In addition, there should be a measure of the benefits of that work.

For example, the programmed kilometres of tamping may have been completed but the quality of the work may have been poor. This may result in additional track possessions being required to achieve the desired track quality.

If the only KPI being monitored is production against the program then the maintainer is incentivised to complete the work even if the quality of the work is poor.

KPI Targets

2.7 To date, KPI data has been reviewed at monthly Alliance Team management meetings. In places Ref 1 refers to an existing "service level specification". It is not clear to us where the service level is specified. It does not appear that targets exist for the existing KPIs. Thus, The Consultant concludes that KPIs are not used currently to judge whether a desired service level has been achieved or not.

2.8 It is anticipated that KPI targets may be introduced for UT3. Historical KPI data has been provided for the period from July 2001 to December 2007. The Consultant has analysed this to determine if sensible targets could be set for UT3. Several examples of this analysis follow.

2.9 Figure 3 shows the history of resurfacing (tamping) production against program. The horizontal line through 166 is the average production against program. Clearly production has varied about this average for the last six years without indication of any reason for the increase or decrease.

The horizontal dashed lines in Figure 3 at 280 and 52 are at plus and minus two standard deviations from the average. Over the last six years resurfacing production against plan has varied between these limits.

In the terminology of Statistical Process Control one would say that resurfacing production is in control with large variation. Future production will be expected to vary between 280 and 52 around a mean of 166 unless a change is made to the process. With this amount of variation it will be difficult to determine if any change has made a difference to production. If, for example, next month's production is 250 one will not know if that is just part of the typical variation or due to some change that has been made.

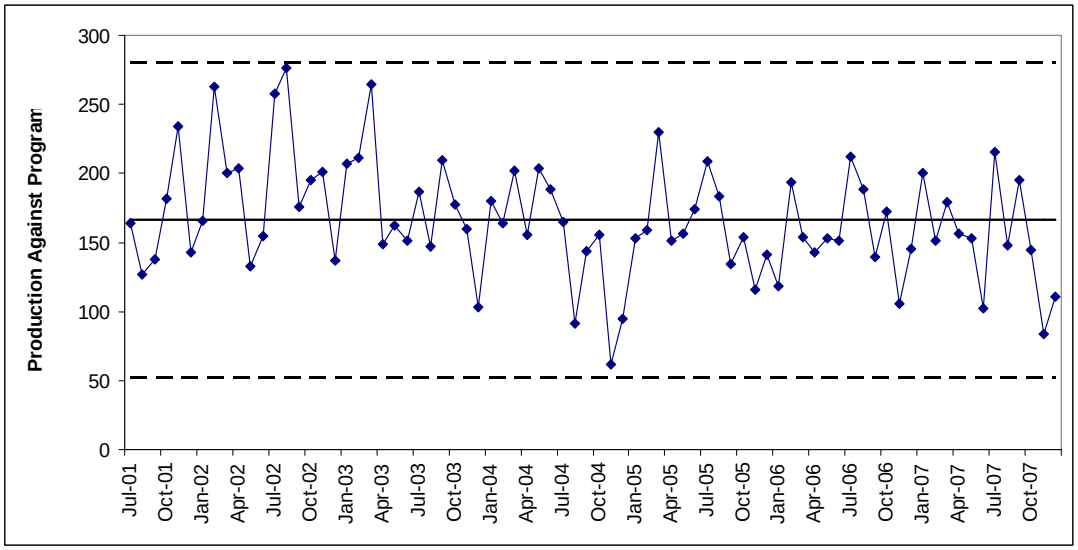

Figure 3. History of Resurfacing Production Against Program

2.10 Figure 3 demonstrates how difficult it would be to set a meaningful performance target for resurfacing production. Performance would have to change at least 70% from the current average to be noticeable. It is unlikely that any asset manager would accept such a target.

One way forward is to set a target for reduction in variation. If the month-to-month performance has less variation, then changes will be easier to detect and targets can be set. Another way forward is to search for KPIs that have less variation.

2.11 When KPIs are concerned with rare events such as trespass it is better to analyse the time between incidents rather than the number of incidents in a period. Figure 4 shows the results of this type of analysis on the trespass data from July 2001 to December 2007. There were five trespass incidents in this period.

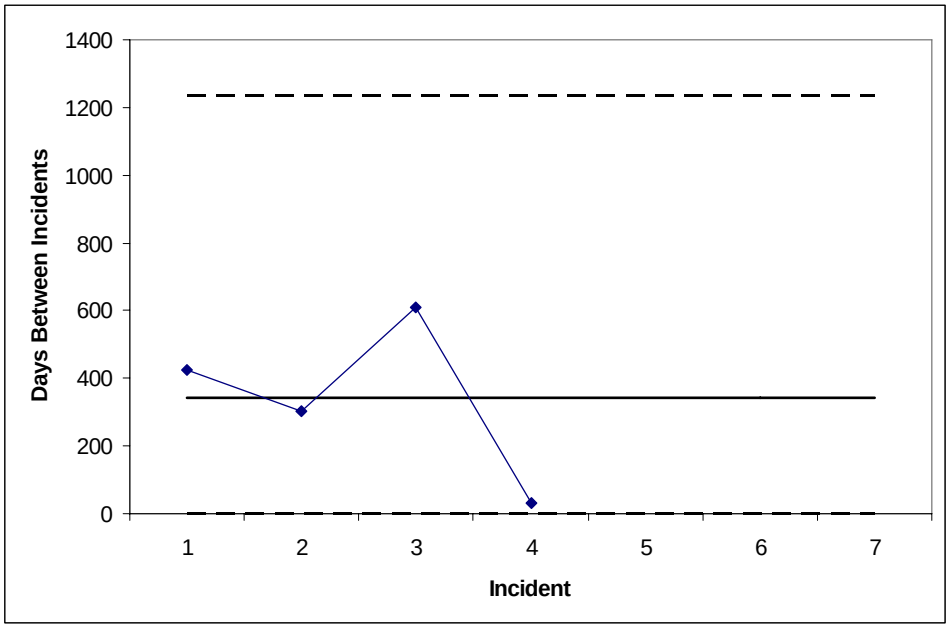

Figure 4. History of Time Between Trespass Incidents

Figure 4 shows that the mean time between trespass incidents is 340 days. There is a large variation in the time between trespass incidents. Unless something is done to affect trespass incidents one can expect the next incident to occur any time up to 1230 days from the last incident.

2.12 These statements may seem very general, but they are all that can be legitimately derived from the historical data. They illustrate the difficulty in setting targets for KPIs such as reductions in trespass incidents. Even if there were no further trespass incidents for three years one could not be sure if this was just part of the normal variation or a definite sign of improvement.

Safety & Cost

2.13 Safety and Cost Control measures are included in the existing 41 KPIs used in UT2. Care has to be taken when mixing safety and cost measures. Safety is measured in fatalities, injuries, lost time, and the like. These cannot be compared with dollars unless a value has been placed on them.

Costs and safety clearly interact. For example, maintenance costs may be saved by including more than one job in the same possession. As a result there will be more interfaces between different teams at the worksite and a greater chance of accidents.

2.14 We understand that QR requires risk assessments of certain activities, but it is not clear how the trade-off between cost and safety is made in day-to-day decisions. The Consultant recommends that some thought is given to avoiding the focus on reducing costs having a negative impact on safety.

Passenger Train Requirements

2.15 A small number of passenger trains operate on some of the lines included in the undertaking. Passenger trains require higher standards of track geometry and signalling than freight trains. These requirements have to be met even if passenger train operation is intended for a line, regardless of how many such trains actually run. Passenger trains may also have different requirements for punctuality compared to freight trains.

The Consultant recommends that the impact of passenger train requirements on QR Network Access's infrastructure management is recognised in some way.

3. PROPOSED NEW SERVICE LEVEL MEASURES

Train Paths

3.1 Numerous references are made to paths not being available to revenue trains. A better measure would be paths not being available when a revenue train is ready to be dispatched. Who cares if a path is lost when no one wanted to use it?

Above Rail Operator

3.2 Several important issues are not included in the analysis of the impact of infrastructure maintenance on the performance of the above rail operator. Table 2 gives some examples. The Consultant recommends that these are also considered for possible use as KPIs in UT3.

Table 2 Additional Impacts of Infrastructure Maintenance on the Above Rail Operator

Impact	Effect	Measure
Single line working	Reduces the impact of possessions. Not appropriate for all types of maintenance work.	
Quality of track maintenance	Poor quality of work performed requires follow-on work sooner than would otherwise be required.	Comparison between track quality index before and after work.
Choice of the type of maintenance	The wrong choice of maintenance (e.g. continued tamping rather than ballast cleaning) means more possessions are required in the long run.	
Balance between “interval tamping” and “chase tamping”.	The correct balance will result in the minimum possession requirement while delivering the required track standards.	
Efficient use of possession time	Too much time spent setting up and shutting down the work site will leave insufficient time to get the work done and require a further possession.	% of possession time spent actually working.

Supply Chain Impact

3.3 Table 3 shows three further impacts of the supply chain on the track maintainer’s ability to perform the required maintenance tasks. The Consultant recommends that these are also considered for possible use as KPIs in UT3.

Table 3 Further Supply Chain Impacts on the Track Maintainer

Impact	Effect	Measure
Inflexibility in the possession plan	Greater flexibility would allow campaign maintenance to be performed and ultimately increase track availability.	
Train failures and derailments	These prevent access for planned possessions and may divert resources.	Number of incidents
Train speed restrictions due to train condition	Trains having wheels with flats, for example, may be required to complete their journey at reduced speed. This puts pressure on the timetable and may lead to possessions being cancelled.	

Proposed Service Specification

3.4 A modest increase in the number of KPIs is proposed by QR Network Access. Three new KPIs are to be added to the existing 41. The Consultant considers it is better to have more KPIs that are specific than a few KPIs that are general. When a KPI that is specific shows a significant change it will be relatively easy to discover the reason.

We anticipate that the existing and new KPIs will be reviewed at the monthly Alliance Team management meetings. KPIs that show no significant change from previous values would not be discussed. Time would only be spent on KPIs that showed a significant change in value. Thus, it should not matter if the total set of KPIs is large.

The Consultant recommends that the new KPIs discussed in Ref. 1 and those additional KPIs listed above are reconsidered. All those that are readily measured should be included in UT3.

Defining the KPIs is a step towards defining a service level specification. The specification should set targets for each KPI and describe the actions that will be taken if the targets are not met or are exceeded.

If historical data is available for the proposed new KPIs it should be analysed to determine if meaningful targets can be set. Targets, penalties and rewards should not be set for KPIs that historically have a large variance.

4. CONCLUSIONS

4.1 Queensland Rail Network Access is proposing to add three more KPIs to the service level agreement for UT3. These new KPIs address the availability and management of possessions and the impact of speed restrictions.

4.2 The Consultant recommends two further changes to the service level specification:

1) Improved definitions of all KPIs.

2) Addition of many more than three new KPIs

3) Changes to KPI monitoring methods

4.3 This report gives examples of KPIs that need to be defined more clearly. The Consultant recommends that clear and unambiguous definitions of all KPIs are included in an appendix to the service level specification or published in a separate document.

4.4 Some of the existing KPIs are combinations of several, more specific performance indicators. Overall Track Condition Index, for example, combines track top, twist, gauge and alignment parameters. The Consultant recommends that KPIs for the detailed parameters are included in the service level specification.

4.5 An attempt has been made to condense the proposed new service level measures into just three new KPIs. The Consultant recommends that all the new KPIs that are readily measured are included.

4.6 KPIs are essential if someone wants to follow the principal “you can’t manage what you don’t measure”. However, care has to be taken in using KPI measurements to make management decisions. Considerable care is also necessary when setting KPI targets and incentives. The Consultant recommends the following principles:

- Monitor a large number of KPIs that each cover specific details of the undertaking.
- Use statistical methods to focus attention on KPIs that exhibit noteworthy changes.
- Understand and act on the causes of noteworthy changes in performance.
- Do not spend time and effort looking at KPIs that continue to follow historical behaviour.
- Do not set targets for KPIs that have large variance.
- View reduction in variance as a performance improvement.

4.7 QR Network has advised the Consultant that currently a comprehensive review of the KPI structure is being undertaken in readiness for the commencement of the UT3 undertaking. Where considered appropriate, the previous recommendations will be considered as part of this review.