Appendix K: Asset Management Strategy and Related Shadow Performance Framework

Road Asset Management Contract (RAMC) – Gen 2

January 2020

Queensland Government

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1 Introduction

The Contract is focused on creating Asset Sustainability.

2 Definition of Terms

The terms used in this Appendix are defined in Table 1.1.

Table 1.1 Definition of Terms

Term	Definition
Asset Management Strategy	The long-term optimised approach to the management of the Road Infrastructure.
Asset Sustainability	Maximising the level of service which can be delivered from the current assets within funding limits, delivered through a whole of life cycle, best for network approach under the guidance of the Asset Management Group as set out in Appendix J.
Preservation Strategy	Where appropriate, the minimum work required to complete repairs to distressed sections of Road Infrastructure and full coverage surface treatments, whilst meeting commitments on short-term operational performance as required under the Compensation and Performance Framework in Appendix B.
Shadow Performance Framework (SPF)	The model implemented to monitor the long term performance of the Road Infrastructure and trends in the performance of a wider range of road-related assets.

3 Project Environment

The project environment will enhance Asset Sustainability. The project environment will include:

a) guaranteed minimum funding allocation for the duration of the Contract

b) the ability to propose and negotiate adjustments to the funding allocations for the Planned Routine Maintenance, Programmed Maintenance and Rehabilitation Maintenance Works within the total allocation, and

c) the development of a SPF.

4 Interaction with Asset Management Policy

In line with the Principal's Transport Infrastructure Asset Management Policy, the Asset Management Strategy will:

a) adopt best practices by the development and operation of a comprehensive Contractor's Tactical Asset Management Plan as defined in Appendix J

b) deliver a 'fix it first' approach by using the full potential of existing assets and proactively repairing or rehabilitating networks rather than replacing them to ensure Asset Sustainability

c) maintain existing assets to a 'fit for purpose' condition that is sustainable, and

d) apply appropriate, affordable levels of service which balance performance, costs and risks over the asset's life to ensure the transport network is sustainable.

5 Shadow Performance Targets

Specific shadow performance targets will be set by the AMG under Appendix J and reported for each network on an annual basis, taking into account funding allocations and the condition of the network.

6 Shadow Performance Framework Principles

The SPF will:

a) help inform the Asset Management Strategy, delivery model of the next generation of RAMCs, and the continuous improvement of the Principal's asset management capability, and

b) not impact contract payments and will supplement the Contract's payment-related Compensation and Performance Framework set out in Appendix B.

7 Recording Information

An important feature of the Principal's Asset Management Strategy is capturing asset information, including specific data on:

a) inputs to the network, including:

   i.) a comprehensive record of the Road Infrastructure maintenance work under the Contract performed, including the activity type, quantity and location of Routine Maintenance Work and any preparatory works, and

   ii.) the location and scope of Asset Management for which accurate as-built information is essential.

b) all Road Infrastructure, with the knowledge that data is currently lacking for many assets, including drains, culverts, shoulders, slopes, and lines and signs

c) the condition of the pavement assets, before and after any treatments is applied, to better define input conditions in order to optimise the selection of treatments and to evaluate their subsequent performance. Examples include additional information on pavement layer types and composition and deflection characteristics particularly for the asphalt surfaced network, and

d) adoption of best practice in treatment selection, including the use of surfacing types and pre-treatments which can extend surfacing and pavement life at optimum cost, with full scale application and selective trials encouraged as soon as possible.

The above data is intended to complement the Principal's network level annual condition surveys, and lead to the progressive improvement in performance predictions and the identification of sustainable funding needs.

8 Approach to Long-Term Performance Management

8.1 General

Long-term performance management will be achieved through:

a) adopting a Preservation Strategy

b) making best use of the combined allocations to Planned Routine Maintenance, and Asset Management Work to maximise the Level of Service for pavement assets, and

c) addressing deficiencies in non-pavement assets, for example through improved maintenance and restoration or provision of drainage assets to reduce the whole of life cycle costs.

To assess and monitor the life cycle costs of the pavement assets, dTIMS software will be used. The outcomes from the dTIMS analysis will be applied to generate an optimised program of Projects which maximises the Level of Service from the available funding.

8.2 Level of Service Indicators

The Level of Service Indicators are divided into seven KRAs (LOS1). LOS1 covers:

a) rural journey reliability

b) road condition

c) structures condition

d) freight reliability

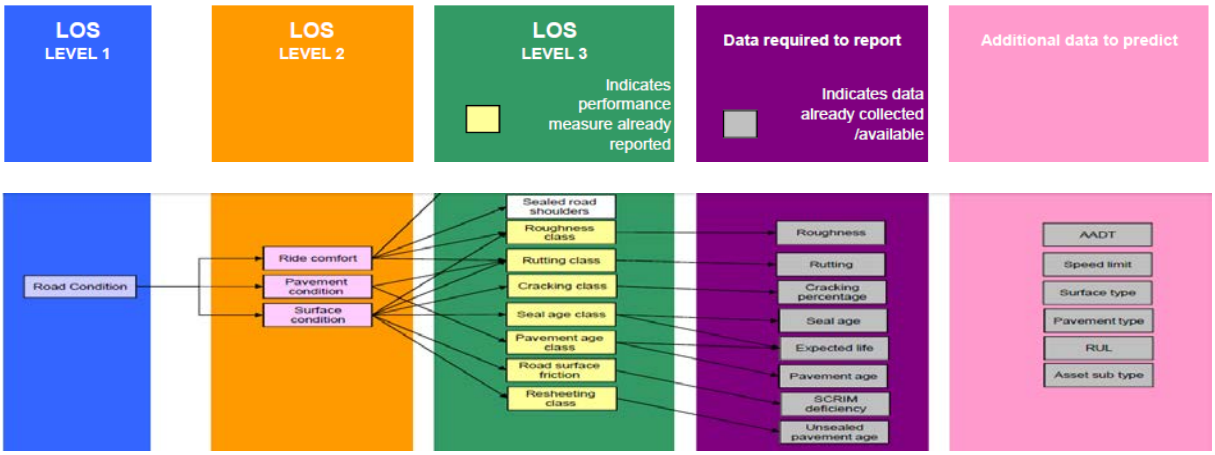
e) environment

f) urban journey reliability, and

g) road safety.

Of these, road condition is the only KRA which is likely to be substantially influenced by the actions of this Contract. The structure of the corresponding indicators is illustrated in Figure 1.

Figure 1: Level of Service indicators - Road Condition



A selection of the LOS1 indicators above, supplemented by a few specially developed indicators, has been chosen to be applied in developing optimised program of Projects and for reporting purposes under the Shadow Performance Framework. These are shown in Table 1.2.

Table 1.2: Shadow Performance Framework - Road Condition Indicators for Sealed Roads

LOS Level 3 Indicator	Attribute	Method(s) and additional data	Application		
			Treatment selection	Budget optimisation	Performance reporting
Roughness class	Roughness (NRM)	Table of values, Road Function, AADT and Speed Limit	✓	✓	✓
Rutting class	Rut depth (mm)	Table of values, Road Function, AADT and Speed Limit	✓	✓	✓
Cracking class	Cracking (%)	Table of values, Road Function, AADT and Surface Type and Pavement Type	✓	✓	✓
Seal Age class	Seal Age (Years)	Table of values, and Surface Type	✓	✓	✓
	Remaining Useful Life (Years)	Lesser of: • Oxidation based life • Time to crack initiation	✓	✓	✓
Pavement Age class	Pavement Age (Years)	Table of Values, and Pavement Type and Road Hierarchy	-	-	✓
	Remaining Useful Life (Years)	Lesser of: • Time to minimum structural overlay • Time to rehabilitation or reconstruction based on work program, by Road Function, AADT and Surface Type and Pavement Type	✓	✓	✓
Road surface friction	SCRIM deficiency (SFC)	Difference between measured value and Investigatory Level, by Site Category/Road Function, AADT, Surface type	✓	-	✓
	Texture Depth (mm)	Difference between measured value and Investigatory Level, by Site Category/Road Function, AADT, Surface type	✓	-	✓

The LOS structure, incorporating individual road pavement condition indicators, is linked to a set of triggers and limiting criteria of specific condition attributes, e.g. roughness, cracking and rut depth, used for treatment selection purposes. The individual indicators are combined into a composite Pavement Condition Index (PCI) for optimisation and reporting purposes as described below. Reporting of any attribute is also possible.

8.3 Definition of Road Condition Indicators

Individual and combined road condition indicators have been formulated on the basis that:

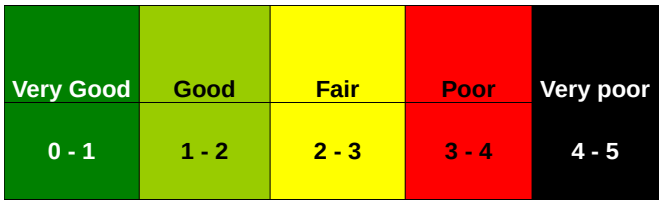
a) individual condition indicators: by assigning measured or calculated values within a five-point scale, ranging from Very Good (0 - 1) to Very Poor (4 - 5) as shown in Figure 2, and

b) various combined condition indicators (CCI), including an overall PCI: these are through a defined formula which employs the Advanced Maximum Method[1] , as follows:

CCI = Maximum (all individual indexes) + p * [SUM (all indexes) – MAX (all indexes) divided by the (SUM (all weights) – Average (all weights))

where, p = an overall weighting factor (0.1 < p < 0.2)

Figure 2: Condition indicator ranges



Examples of a number of condition indices, and the scale adopted for each in relation to the ranges in Figure 2, are shown in Figure 3. The full set of condition indices is described in the dTIMS study reports which will be made available by the Principal to the Contractor after the Date of Award.

Figure 3: Example individual Road Pavement Condition Indicator ranges[2]

Class number	1.0	2.0	3.0	4.0	5.0	6.0
Index starts	0.0	1.0	2.0	3.0	4.0	5.0
class name	Very Good	Good	Fair	Poor	Very poor	Worst
Index range of class	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	
combined code	the lowest index value (starting point) of the class					maximum
T7Fast	0.0	60.0	70.0	80.0	95.0	300.0
T7Slow	0.0	60.0	70.0	80.0	95.0	300.0
T6Fast	0.0	60.0	80.0	95.0	110.0	300.0
T6Slow	0.0	60.0	80.0	95.0	110.0	300.0
T5Fast	0.0	60.0	80.0	95.0	110.0	300.0
T5Slow	0.0	60.0	80.0	95.0	110.0	300.0
T4Fast	0.0	60.0	80.0	95.0	110.0	300.0
T4Slow	0.0	60.0	80.0	95.0	110.0	300.0
T3Fast	0.0	60.0	95.0	110.0	130.0	300.0
T3Slow	0.0	60.0	95.0	110.0	130.0	300.0
T2Fast	0.0	80.0	105.0	130.0	180.0	300.0
T2Slow	0.0	80.0	105.0	130.0	180.0	300.0
T1Fast	0.0	80.0	105.0	130.0	180.0	300.0
T1Slow	0.0	80.0	105.0	130.0	180.0	300.0

[1] The Advanced Maximum Method is based on studies by the COST 354 research program concluded in Europe in 2008.

[2] Where AC = Asphalt Concrete (or other asphalt surface), SS – Sprayed seal and CC – Cement Concrete.

a) Roughness (in NRM)						
Class number	1.0	2.0	3.0	4.0	5.0	
Index starts	0.0	1.0	2.0	3.0	4.0	5.0
class name	Very Good	Good	Fair	Poor	Very poor	Worst value
Index range of class	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	
combined code	the lowest index value (starting point) of the class					maximum
AC	0.0	7.0	10.0	13.0	15.0	25.0
SS	0.0	3.0	6.0	10.0	15.0	25.0
CC	0.0	3.0	6.0	10.0	15.0	25.0
b) Cracking (%)						

Applicable Traffic and Speed Ranges are described below:

AADT	Traffic Class
0-500	T1
500-1500	T2
1501-3000	T3
3001-5000	T4
5001-10000	T5
10000-30000	T6
> 30000	T7

Speed range	code
<=80 Km/hr	SLOW
>80 Km/hr	FAST

8.4 Example Performance Trends

Figure 4 sets out example performance trend charts produced from the dTIMS analysis for two different budget scenarios for the pavement works, being:

a) an unlimited budget, and

b) a constrained budget equal to a $60m per year.

The results in Figure 4 illustrate that the performance of the Road Conditions Indicators will differ depending on budget availability.

The following abbreviations are used for the purposes of Figure 4 (e.g. condition distribution_TSEQ_60M_PCI_DN_INDX_CI_IRI):

i. TSEQ – Total SEQ network

ii. 60M or Unlimited, denotes the annual budget constraint (in millions $) for pavement works

iii. PCI, identifies the combined PCI as the optimisation target, where the PCI is minimised within the available budget. An alternative optimisation target of minimising total transport costs (TTC) was also investigated but is not illustrated in Figure 4

iv. DN or noDN, denoting ‘do nothing’ or ‘no do nothing’ where DN allows patching only as a sole treatment strategy, and noDN involves patching and re-surfacing as a minimum set of treatments, and

v. INDX_CI_IRI, which represents the individual Condition Index for roughness.

Figure 4 shows that the performance outcome is related to the budget available. Treatment strategies will also impact the performance outcome, therefore selecting an optimum combination of treatments is desirable provided operational performance measures are met.

Figure 4: Example outputs showing predicted network condition

9 Example Performance Indicators and Targets

Example performance indicators and targets are available at a number of levels, including:

a) KRAs and KPIs (defined in Appendix B) including the following indicators related to Asset Sustainability:

   i. improving base line condition (KRA),

   ii. improved asset whole of life cost (KRA),

   iii. defect progression (KPI),

   iv. hazard reduction / reduction in reactive treatments (KPI), and

   v. reseal / rehabilitation cycles (as % network coverage) (KPI).

b) PCI and CI trends based on the dTIMS analysis and subject to optimisation under budget constraint using the approved CI and PCI and treatment triggers and limits, includes targets such as:

   i. achievement of predicted performance as the % length of carriageway within cracking, rutting and roughness targets, and

   ii. achievement of predicted PCI as the % length of carriageway within overall target.