

Maintenance Rating Program Monroe Expressway

Quarter 2 MRP Assessment



August 2022

CONSULTANT CERTIFICATION OF COMPLETION

August 4, 2022

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NCTA Monroe By-Pass Roadway Maintenance Performance Rating Program; Q2, FY 2022 Rating

This is to certify that I, Ken M. McEntire, PE am an authorized official representative of the company Mott MacDonald I&E, LLC, a subconsultant to HNTB North Carolina, P.C. Collaboratively; we are working as the Monroe By-Pass Roadway and Facility Maintenance Performance Rating Program Consultants.

I know of my own personal knowledge, and do hereby certify, that the work of the contract described above has been independently performed in accordance with, and in conformity to, the *NCTA Roadway and Facility Maintenance Performance Standards*.

Sincerely,

Mott MacDonald I&E, LLC

A handwritten signature in blue ink that reads "Ken M. McEntire". The signature is written in a cursive style with a large initial "K" and "M".

Ken M. McEntire, PE

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1.0 Executive Summary

The North Carolina Turnpike Authority (NCTA) Maintenance Rating Program (MRP) is a maintenance evaluation program for all roadway features and toll facilities on the Monroe Expressway. This report presents results from the 2022 Second Quarter Assessment of the Monroe Expressway.

The overall 2022 second quarter rating of the Monroe Expressway was 95.4. This score is above the target rating score of 90 for the overall system. As shown in **Table 1**, all five elements assessed achieved a rating greater than the target rating of 85.

Table 1: MRP Element Results for the 2022 Second Quarter Assessment

Element	MRP Rating	Target Rating
Road Surface	94.5	85.0
Unpaved Shoulders and Ditches	98.4	85.0
Drainage	98.8	85.0
Roadside	92.9	85.0
Traffic Control Devices	94.4	85.0
Overall MRP Performance Rating	95.4	90.0

This report also provides a rolling rating of the latest three quarterly inspections of the Monroe Expressway. As presented in **Table 2**, the rolling maintenance rating of the Monroe Expressway was 96.3.

Table 2: MRP Rolling Element Results

Element	Q3 2021 Rating	Q4 2021 Rating	Q1 2022 Rating	Q2 2022 Rating	Rolling Rating
Road Surface	100.0	97.5	94.3	94.5	97.2
Unpaved Shoulders and Ditches	96.4	99.1	99.3	98.4	97.6
Drainage	94.7	94.7	100.0	98.8	97.5
Roadside	96.8	96.0	95.0	92.9	95.2
Traffic Control Devices	94.9	93.7	96.7	94.4	94.9
Overall MRP Performance Rating	96.7	95.9	96.6	95.4	96.3

All the element ratings were above the desired rating of 85, and one characteristic scored below the minimum 80 rating. It is important to note that these results are only representative of the second quarter sample, one of four quarterly surveys annually that provide an intermediate snapshot of seasonal conditions. Therefore, these results are not yet a statistically valid representation of the assets; only the total of all four quarterly inspections reported as a rolling rating, provides a 95% confidence level in statistical sampling.

2.0 Introduction

The North Carolina Turnpike Authority (NCTA) Maintenance Rating Program (MRP) is a maintenance evaluation program for roadway features and toll facilities on the NCTA system. It is a comprehensive planning, measuring, and managing process that provides a means for communicating to managers, stakeholders, and key customers the impacts of policy and budget decisions on program service delivery.

Using outcome-based performance measures and the service level scale (0 through 100), the survey results are rated against established threshold criteria. The program analysis is accomplished by implementing sampling procedures that capture the level of service being provided for individual asset features. Over time, these ratings will be charted to identify work needs and subsequent necessary actions. The evaluations are based on the establishment of "threshold" conditions that quantify the maximum defect allowed to exist for a characteristic before it is considered unacceptable.

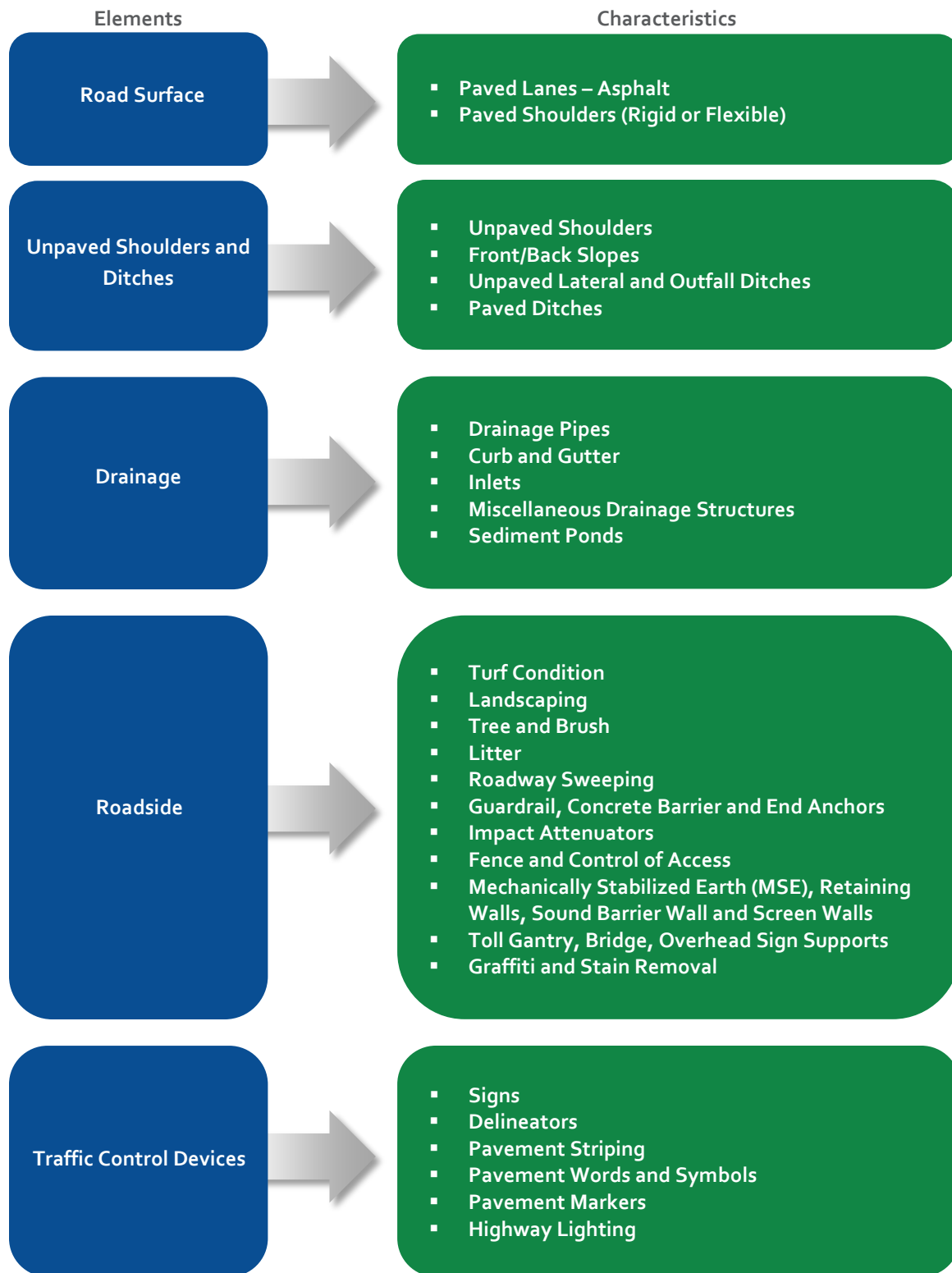
The NCTA performance standards, threshold criteria, and maintenance rating program were developed through a collaborative effort by NCTA managers, NCDOT maintenance staff, and consultants.

Using this field survey information, a maintenance matrix can be developed to show ties between maintenance activities and the characteristics of various roadway features. The purpose of this evaluation is to provide information that will be used to schedule and prioritize routine maintenance activities and provide uniform maintenance conditions that meet established objectives.

3.0 MRP Survey Procedure

Per the NCTA Roadway and Facility Maintenance Performance Standards, roadway assets on NCTA facilities have been grouped into characteristics which are categorized into 5 elements. These elements and their characteristics can be seen in *Figure 1* below:

Figure 1: Maintenance Elements and Characteristics



Because some roadway characteristics are of greater importance than others, a weighting system is applied to enable rational calculation of an overall level of service rating. Although one set of weighting factors for all characteristics could serve this purpose, a more useful system consists of two sets of weighting factors: one set that accounts for the importance of individual characteristics within a given maintenance element (1-9), and another set that accounts for the importance of the maintenance elements to the total rating (by % of score). This two-set system reveals deficiencies among characteristics and shows which maintenance elements are deficient.

The program analysis is accomplished using statistically valid, random sampling procedures that capture the level of service for individual assets with a 95% confidence level in sampling. Inspections are performed during the months of February, May, August, and November to account for dynamic changes in assets during the various seasons, such as vegetation growth. Each maintenance characteristic is evaluated and recorded according to the criteria developed by the NCTA performance standards. This inventory was completed with electronic data collection tablets and programs for accurate GPS coordinates of each transportation asset.

The evaluations are based on established "threshold" conditions that quantify the maximum defect allowed to exist for a characteristic before it is considered unacceptable. The ratings are done by comparing existing field conditions to the "threshold" value. If the characteristic meets or exceeds the "threshold", it is coded as YES to meeting the criteria. If it does not meet the criteria, it is coded as a NO. When the survey is complete, the number of YES's and NO's are totaled, and a composite number (using from 1 to 100 scale) is produced, which represents the level of maintenance currently being provided.

For any given asset, the number assigned as the target level of service represents the percentage of random samples in which the maintenance condition standard corresponding to the activity is to be met or exceeded. For instance, an activity with a level of service rating of 83 means that 83 percent of the sites met the condition standards.

The NCTA's overall target rating score is 90, with each element level scoring at or above 85 and every characteristic at or above 80.

4.0 Monroe Expressway Description

The Monroe Expressway extends for approximately 18.5 miles between the U.S. 74 interchange to the west and U.S. 74 near Marshville to the east. The Monroe Expressway consists of eight interchanges and seven all-electronic toll collection zones. A map of the Monroe Expressway can be seen in *Figure 2* below:

Figure 2: Monroe Expressway Map



5.0 Survey Results

The overall Q2 2022 MRP rating for the Monroe Expressway is 95.4. This score is above the target rating score of 90 for the overall system. All the element ratings were above the desired rating of 85, and one characteristic scored below the minimum 80 rating. Individual characteristic ratings will be discussed in detail in the analysis section of this report.

Appendix A shows each of the individual assets that failed the MRP criteria. **Appendix B** includes maps of each of the individual asset locations that failed to meet the criteria displayed in the tables below. The MRP rating value designated to each element and feature refers to the percentage of elements or features that pass the asset’s particular threshold criteria. After developing an inventory by recording the total number of instances of a particular feature, each feature is analyzed based on threshold criteria and a pass/fail result is designated and recorded for each to determine the percentage of the sample passed. The passing samples and sample totals are then multiplied by their weighted value, which are designated to each element based on importance to determine the actual and available rating points. Lastly, an MRP Performance Rating is calculated for each asset and element group based on the ratio of the actual points over the available points.

The overall MRP Performance rating results of the survey are presented in **Tables 3 and 4**.

Table 3: Element Results for Q2 2022

Element	MRP Rating
Road Surface	94.5
Unpaved Shoulders	98.4
Drainage	98.8
Roadside	92.9
Traffic Control Devices	94.4
Overall MRP Performance Rating	95.4

The overall score is determined by summing the elements multiplied by weighted factors as follows: Road Surface (25%), Unpaved Shoulders (13%), Drainage (15%), Roadside (17%), Traffic Control Devices (30%).

Table 4: Characteristic Results for Q2 2022

Road Surface	Sample Passed	Sample Total	Weighted Values	Actual PTS	Available PTS	Quarter Rating
Paved Lanes Asphalt	28	30	9	252	270	93
Paved Shoulder	29	30	5	145	150	97
Element Total				397	420	94.5
Unpaved Shoulders & Ditches	Sample Passed	Sample Total	Weighted Values	Actual PTS	Available PTS	Quarter Rating
Unpaved Shoulder	30	30	9	270	270	100
Front/Back Slopes	29	30	6	174	180	97
Lateral and Outfall Ditches, Unpaved	30	30	6	180	180	100
Ditches, Paved	12	13	5	60	65	92
Element Total				684	695	98.4
Drainage	Sample Passed	Sample Total	Weighted Values	Actual PTS	Available PTS	Quarter Rating
Drainage Pipes	32	32	7	224	224	100
Curb and Gutter	24	24	6	144	144	100
Inlets	33	33	7	231	231	100
Misc. Drainage Structure	16	18	4	64	72	89
Sediment Pond	2	2	7	14	14	100
Element Total				677	685	98.8
Roadside	Sample Passed	Sample Total	Weighted Values	Actual PTS	Available PTS	Quarter Rating
Turf Condition	32	43	7	224	301	74
Landscaping	13	13	4	52	52	100
Trees and Brush	15	15	4	60	60	100
Litter	30	30	4	120	120	100
Roadway Sweeping	30	30	5	150	150	100

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Guardrail, Concrete Barrier and End Anchors	30	30	9	270	270	100
Impact Attenuators	6	6	9	54	54	100
Fence, Control Access	23	25	7	161	175	92
Retaining Walls and Sound Barrier Walls	12	14	5	60	70	86
Decorative Supports	10	10	5	50	50	100
Graffiti and Stain Removal	30	30	4	120	120	100
Element Total				1321	1422	92.9
Traffic Control Devices	Sample Passed	Sample Total	Weighted Values	Actual PTS	Available PTS	Quarter Rating
Signs	57	63	7	399	441	90
Object Markers and Delineators	28	30	3	84	90	93
Pavement Striping/Marking	28	30	8	224	240	93
Words and Symbols	33	33	7	231	231	100
Pavement Markers	29	30	9	261	270	97
Highway Lighting	4	4	6	24	24	100
Element Total				1223	1296	94.4

6.0 Analysis & Recommendations

MRP Elements

All elements exceeded the NCTA minimum threshold criteria of 85.

MRP Characteristics

Most characteristics exceeded the NCTA minimum threshold criteria of 80. This section identifies characteristics that did not achieve the minimum targeted score.

Turf

Turf scored a 74 in the survey. Deficiencies of the turf were directly related to bare ground. The MRP Maintenance and Evaluation Standards V7 are below.

Roadside Mowing – This characteristic is the control of planted or natural grasses and vegetation for protection of soil shoulders and slopes, safety, and aesthetics purposes.

Turf Condition – Turf is grass or other vegetation considered desirable for the particular roadside location. Properly maintained and desired vegetation provides a pleasing appearance but primarily presents less chance of shoulder and slope defects (ruts, washouts, wash boarding), providing a safe recovery area for motoring traffic.

Undesirable Vegetation - The presence of broadleaf weeds in roadside turfgrass can be aesthetically undesirable and can also prevent the desired turfgrass from becoming readily established.

Noxious Weeds – Noxious weeds can be any plant in any stage of development, including parasitic plants, whose presence, whether direct or indirect, is detrimental to crops or other desirable plants, livestock, land, or other property, or is injurious to the public health. The top noxious weeds are as follows:

- 1) Blessed Thistle Cornflower (Ragged Robin)
- 2) Cocklebur Texas Panicum
- 3) Spurred Anoda Bracted Plantain
- 4) Velvetleaf Buckhorn Plantain
- 5) Corn Cockle Curly Dock
- 6) Wild Radish Dodder
- 7) Purple Nutsedge Giant Foxtail
- 8) Yellow Nutsedge Horsenettle
- 9) Canada Thistle Quackgrass
- 10) Field Bindweed Wild Mustard
- 11) Hedge Bindweed

Maintenance and Evaluation Standards: Turf Grass does not meet the maintenance standards when any of the following criteria is observed:

- 1) More than 2% of the vegetation exceeds a uniform height of 12 inches. Minimum height of no less than 4 inches. (Performance standard may not apply once the mowing frequency and patterns have been established as meeting the threshold condition on a routine basis)
- 2) Noxious weeds are present.

- 3) More than 50 continuous square feet (SF) of any one area or 10% of the cumulative turf evaluation area has bare ground.

Seeding and fertilizing efforts were last performed in the Spring of 2022. Seeding and fertilizer applications are conducted biannually in both the spring and fall months. Consistent application of this schedule will continue to improve turf conditions on a quarterly basis.

7.0 Current Rolling MRP Rating

The rolling maintenance rating of the Monroe Expressway was 96.3, exceeding NCTA’s overall target rating of 90. All elements exceeded NCTA’s rolling rating threshold criteria of 85. All characteristic ratings met or exceeded the target rating of 80.

The 2021/2022 results are presented in *Exhibit 1* and *Table 5*. These results are a collection of the baseline assessment conducted in 2020 and the three quarterly inspections conducted in the last year.

Exhibit 1: MRP Element Results for 2021/2022

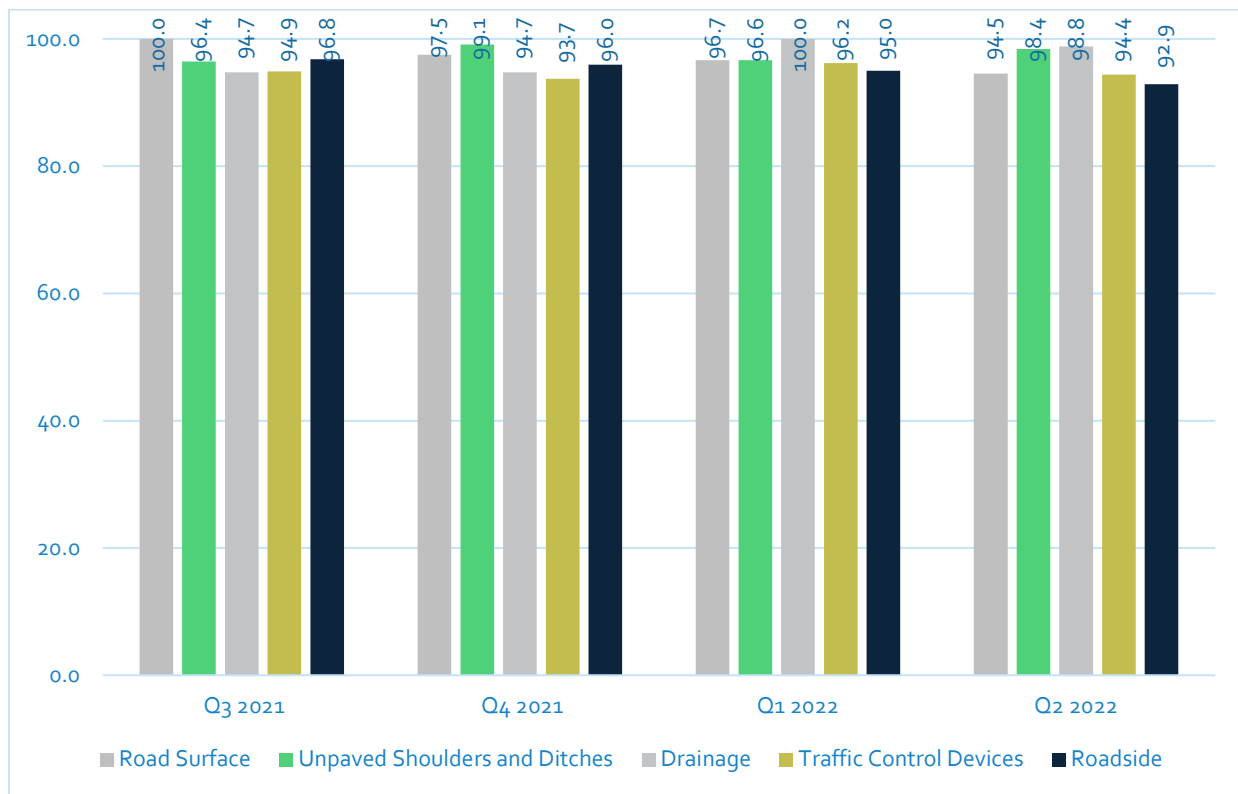


Table 5: MRP Rolling Element Results

Road Surface	Q3 2021 Rating	Q4 2021 Rating	Q1 2022 Rating	Q2 2022 Rating	Rolling Rating
Paved Lanes Asphalt	100	96	97	93	97
Paved Shoulder	100	100	97	97	98
Element Total					97.2
Unpaved Shoulders and Ditches	Q3 2021 Rating	Q4 2021 Rating	Q1 2022 Rating	Q2 2022 Rating	Rolling Rating
Unpaved Shoulder	100	100	93	100	98
Front/Back Slopes	100	100	100	97	99
Lateral and Outfall Ditches, Unpaved	100	100	100	100	100
Ditches, Paved	50	86	91	92	80
Element Total					97.6
Drainage	Q3 2021 Rating	Q4 2021 Rating	Q1 2022 Rating	Q2 2022 Rating	Rolling Rating
Drainage Pipes	100	100	100	100	100
Curb and Gutter	100	91	100	100	98
Inlets	87	94	100	100	96
Sediment Basins	100	100	100	100	100
Misc. Drainage Structure	95	93	100	89	94
Element Total					97.5
Roadside	Q3 2021 Rating	Q4 2021 Rating	Q1 2022 Rating	Q2 2022 Rating	Rolling Rating
Turf Condition	90	89	77	74	83
Landscaping	100	93	100	100	98
Trees and Brush	100	100	100	100	100
Litter	100	100	100	100	100
Roadway Sweeping	100	100	100	100	100
Guardrail, Concrete Barrier, and End Anchors	100	100	100	100	100
Impact Attenuators	100	100	100	100	100
Fence, Control Access	97	96	97	92	95
Retaining Walls and Sound Barrier Walls	94	92	100	86	93
Decorative Supports	100	100	100	100	100
Graffiti and Stain Removal	100	100	100	100	100
Element Total					95.2
Traffic Control Devices	Q3 2021 Rating	Q4 2021 Rating	Q1 2022 Rating	Q2 2022 Rating	Rolling Rating
Signs	76	65	90	90	85
Delineators	100	100	100	93	98
Pavement Striping/Marking	100	100	100	93	98
Words and Symbols	98	97	97	100	98
Pavement Markers	100	100	100	97	99
Highway Lighting	100	100	100	100	100
Element Total					94.9

8.0 Conclusion

This report presents the 2022 second quarter assessment of the Monroe Expressway. The NCTA's target ratings are 90 for the rolling rating, 90 for the overall quarter rating, 85 for elements, and 80 for characteristics. The second quarter 2022 overall rating was 95.4 and the rolling rating was 96.3, both ratings met the target rating of 90.

All element ratings were above the target ratings for the quarter and rolling assessment. During the second quarter assessment, all but one characteristic met or exceeded the target rating of 80.

The maintenance provider is encouraged to continue using asset management principles and a performance management approach to work planning.