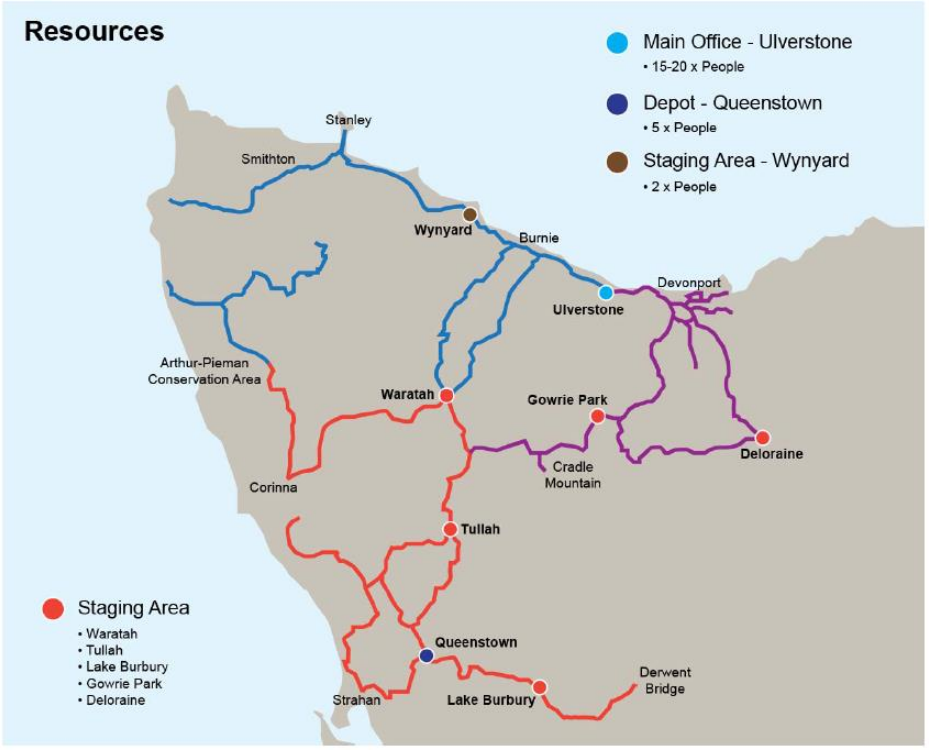
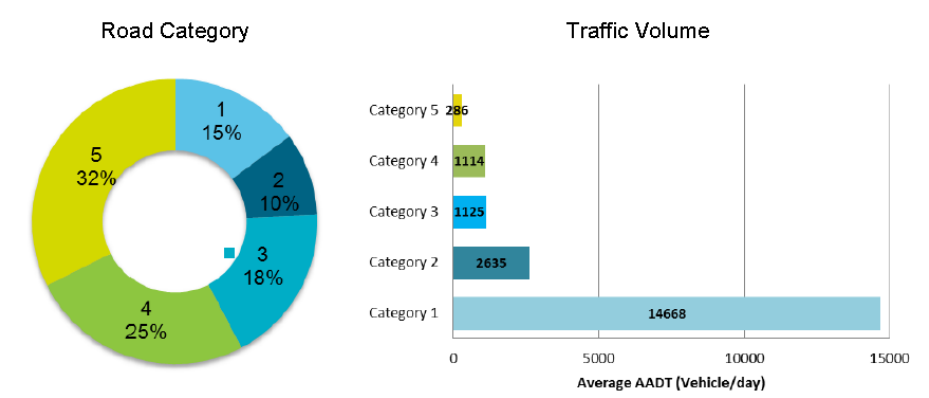
Background	This form is required to be used to propose a suitable Base Case which can be used for the purposes of relevant credits in the Energy & Carbon, Water and Materials categories, and should be used in conjunction with the Base Case Establishment Procedure. Please fill out this form as completely as possible. Text in the light blue boxes is for explanation only and can be typed over. Use as much space as needed. Refer to and provide attachments as necessary.		
General Project/Asset Information			
Rating Number	171	**Project/Asset Name**	Tasmanian State Road Network Maintenance Services – North West Region
Asset and Operational Scope Description	Provide the scope of Base and Actual Case relevant scope and operations. Please note that this must align with the Scope Proposal Form. The State road network is one of our biggest Tasmanian infrastructure assets consisting of over 3 700 kilometres of roads and 13 000 bridges and major structures that link our major population centres and facilitate movement of people and freight. The Department of State Growth is responsible for managing Tasmania's road network on behalf of the Minister for Infrastructure. The asset is the State road network in North West Tasmania, and includes the pavement, signage, verge and drainage. Downer will program and deliver a combination of Base Service, Minor Works and Periodic Works through an annual works program.  Below I have provided categories of road and the traffic use that will be maintained across the network. Category 1 – Duel carriageway highway Category 2 – large arterials		

Category 3 & 4 Single carriageway road

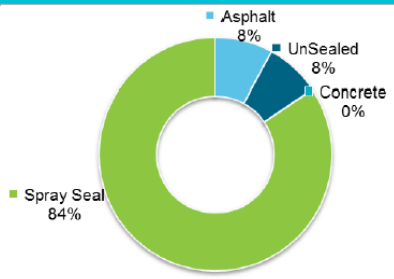
Category 5 – Unsealed/sealed country road



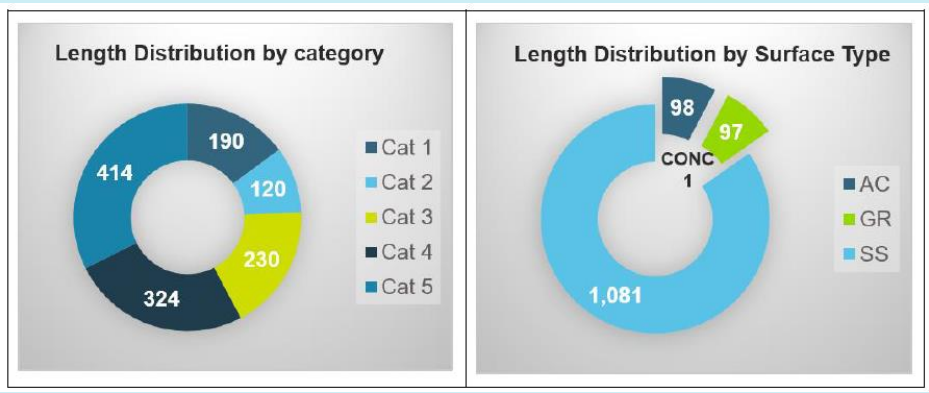
I have provided the following diagram as an indication of the distribution of pavement types across the network.

Surface Type Distribution

Surface Type	Length in KM
Asphalt	102
Un-Sealed	97
Concrete	1
Spray Seal	1077



Below is the length of road per category and surface type.



Contractual Restrictions

Provide a description of the boundaries of the contract/scope, i.e. areas of total control, influence and no control or influence.

Downer has total control over the following:

- Base Services
- Minor Works
- Periodic Works

Description of Operational Activities	What activities will be undertaken as a part of the maintenance and operation of the asset (e.g. road profiling, vehicle cleaning, vegetation clearing/management, fleet patrols, lubrication of equipment etc)? This provides information to the verifier of what energy, water and materials will be used during the operation and maintenance of the asset.

Base Services

Non-discretionary services associated with management of the network and contract and the provision of reactive routine maintenance work.

Pavements:

- Pot hole repair
- Delamination repair
- Edge Break repair
- Temporary shoving repair
- Pavement sweeping, including trafficable areas of pavements, sealed shoulders and cycleways
- Maintenance of unsealed shoulders
- Maintenance grading on unsealed shoulders including supply of granular sheeting material.

Drainage:

- Table drain, open drain and channel maintenance
- Kerb and gutter maintenance
- Cleaning of kerb and gutter pits
- Clear and inspect culverts
- Clear stormwater drainage
- Clear Inlets and Outlets to culverts and subsoil drains

Traffic Facilities:

- Clean guide posts
- Reset guide posts
- Delineator replacement
- Sign straightening/ repositioning
- Sign cleaning
- Detailed night inspections

Road Maintenance

- Mowing
- Verge maintenance
- Management of sight distance to signs
- Management of sight distances at accesses and intersections
- Management of overtaking sight distance

- Management of rest areas
- Landscaped area maintenance
- Vegetation and loose material on paved areas, concrete barriers, retaining walls and footpaths
- Pampas grass management
- Collection of litter and debris
- Road kill management
- Annual overtaking sight distance and portal inspections
- Annual Risk Based Tree Management Framework Inspections
- Tarkine Forest Drive - Roadkill Collection

Bridge Maintenance

- Annual level 1 bridge inspections and reporting
- Quarterly level 1 Timber Bridge inspections and reporting
- Annual deck and footway clean plus clean and flush of scuppers and deck drainage systems
- Cleaning and flushing of scuppers and deck drainage systems at other times
- Bridge deck and footway cleaning at other times
- Timber bridges general maintenance - deck spikes
- Under and around bridges remove litter and debris (including underpasses and overpasses)
- Pedestrian underpasses - general repairs
- Vegetation control - bridges

Miscellaneous

- Emergency Management
- Frost, Ice and Snow
- Removal/Storage/Disposal of Abandoned Vehicles
- Removal of illegal temporary advertising signs.

Exclusions:

- Lighting
- Traffic Signals

Pavement – Sealed and Unsealed

- Reconstruction Patches
- Primer sealing or final sealing of reinstatement patches, public utility trenches and other road openings
- Crack repairs
- Resheeting of Unsealed Roads
- Asphalt Patches

- Deformation Repair
- Edgebreak Repair
- Sealing bleeding (gritting)
- Unsealed Roads - General Defects
- Maintenance grading on unsealed roads

Unsealed Shoulders and Verges

- Resheeting of unsealed shoulders on sealed roads
- Grading and shaping of unsealed shoulders on sealed roads

Drainage

- Supply and installation of new subsoil drainage
- Rock lining open drains and channels
- Clear and reshape existing open drains and channels
- Identification of unknown transverse culverts (not listed on Culvert Register) and the provision of details for the location, diameter, condition of barrel/s, and condition of headwalls

Traffic Facilities

- W Beam safety barrier repairs
- Post and cable delineation fence repairs
- Tensioned wire rope safety barrier repair
- Removal of existing safety barrier and delineation
- Supply and installation of new steel W Beam safety barrier
- Supply and erection of "Standard Post(s)"
- Fabrication and installation of Sign Panel
- Removal of Sign Panel (Sign Panel Area)
- Removal of Sign Post(s) and footings
- Graffiti Removal from sign face or back of sign
- Supply and install pavement marking
- Supply and application of Chevrons
- Supply and install pavement arrows
- Supply and application of raised retroflective pavement markers
- Audio tactile line marking
- Rail crossing and intersection marking
- Pavement Marking Removal
- Guide post and snow marker cleaning
- Supply and installation of new delineators and/or delineator plates

	• Supply and Installation of guide posts and snow markers at new locations • Removal of existing signs **Roadside Maintenance** • Additional Mowing and litter collection • Boom Spraying of Shoulders and Verges **Miscellaneous** • Snow Clearing **Periodic Works** Pavement resurfacing, line marking and renewals subject to a periodic works order to be carried out as part of Periodic Works Order. **Pavement Resurfacing** • Spray Seal • Dense Grade Asphalt • There are no concrete surfaces under this contract **Pavement Marking** • White Paint Pavement marking • Chevrons • Pavement Arrows **Minor Works – Preparation for Periodic Works** Resurfacing preparation works as part of periodic maintenance to be carried out as part of Minor Works program. **Minor Works – Response to Periodic Works KPIs** Localised pavement repairs triggered by Network Intervention Levels using road condition data to be carried out as part of Minor Works program. **Minor Works – General** Balance of scope of Minor Works to be carried out as part of Minor Works program.
Calculation Methods	

Base Case Calculation Approach	The BAU assumptions were developed via:
	• a desktop review of current industry standards and guidelines to understand the minimum level of compliance including:
	  ○ Downer standard practices across the country.
	  ○ Department of State Growth (DSG) guidelines and specifications (*see attached document "BC-1 f. DSG Standards"*)

- VicRoads guidelines and specifications where DSG specifications were not available
- RMS Specifications where DSG and Vicroads specifications were not available
- Austroads guidelines
- Reference to a number of Downer projects completed in recent years
- the Department of Health and Human Services – Tasmanian Drinking Water Quality Guidelines (2015) containing legal requirements for drinking water suppliers in Tasmania. (*see attached document "BC-1 g. Drinking Water Guidelines"*)
- the Department of the Environment - National Greenhouse Accounts Factors (July 2018) (NGA) (*See attached document BC-1 e. "National GHG Account Factors"*)
- ISCA IS Materials Guidelines (2017)
- the Transport Authorities Greenhouse Group (2013) Carbon Gauge Calculator (Australian greenhouse gas calculator for road projects)

- consultation with Downer Asset Management Team, DSG, Operational Sub-Contractors and Downer maintenance and surfacing personnel in the roads business, to obtain:
  - input on the interpretation of standards and the practices observed or applied by industry on road maintenance contracts
  - consensus on what BAU means for industry in the context of NWTas Maintenance Network.

Methodology for base case of constant activities.

In regards to the approach of the base case, the previous incumbent was responsible for the asset for the last 10 years and the budget and KPI's were not equivalent. Therefore this means that the previous years and this year are not like for like comparable.

Therefore, **as outlined below**, Downer will use actual data from the operations as the base case for activities that are not equivalent to previous contractors. This will exclude the results of any initiatives that Downer have implemented in order to reduce impacts (the inclusion of these results will form the actual savings that will be compared to the base case).

Where activities are equivalent to the previous incumbent, such as linemarking, Downer will use the operations of the previous contractors as the Base Case.

1.1.1 Asset inspections

Each week the asset is inspected by an employee driving a standard 4x4 ute. A 4x4 is used to ensure safe passage in snow. As no historic data exists for this activity, Downer will use the actual data from the operation, to establish the basecase. Fuel savings resulting from vehicle/plant upgrades which occurred towards the end of year 1, or other initiatives will be excluded.

From the first 2 years of asset inspection activity, the below data has been gathered to show fuel usage of the individual light vehicles used for asset inspections across the network. It is worth mentioning that during the first months of the contract, less work was being conducted and therefore less inspections were being undertaken. This is due to Downer taking time to establish itself onsite and develop appropriate maintenance schedules and programs.

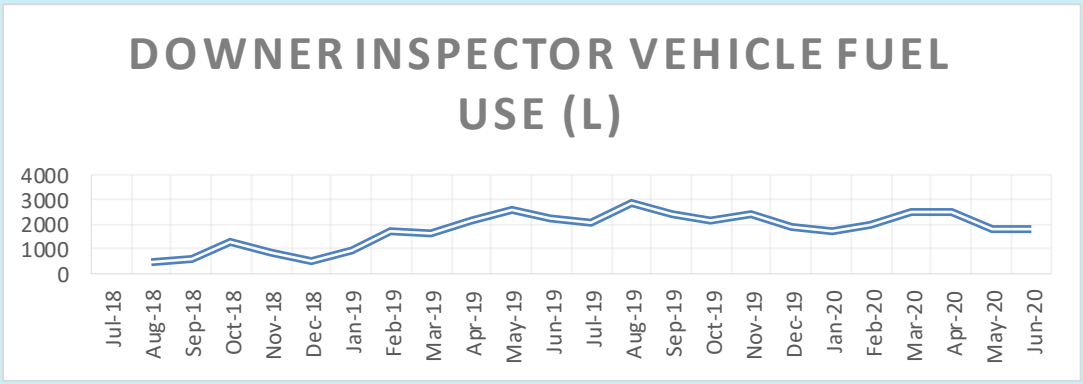


Figure 1 Fuel use during inspections

1.1.2 Mowing

Upon being awarded the mowing contract for mowing works under this contract, the subcontractor responsible purchased a range of new mowers that would be more energy efficient. The new mowers purchased are two ventrac 4500Y mower units. These units are diesel, rather than the previous petrol mowers, and following feedback from the mowing subcontractor it is estimated that these mowers are approximately 30% more efficient than the original Toro mowers (Toro 74930, Toro ZS4200TF, Toro Z Master and Toro side discharge tractor)) that were previously used. The Ventrac mowers are also wider and therefore are able to mow a larger area in each pass.

Further to the improved fuel efficiency and increased cutting capacity, the Ventrac is rated to operate safely at an angle some 10˚ greater than the Toro machine. Consequently the Ventrac machine reduces the need to brush cut steeper topography; this alone represent an increase in time efficiency, costs and effectiveness.

As per the above summary, the basecase for the mowing program will be estimated from the actual fuel usage, with the assumption that the older, less efficient mowers would still be in use. This will be calculated across the useful life of the asset.

The actual case will be actual usage which includes use of the upgraded equipment. This will also be calculated across the useful life of the asset.

From the first 12 months of mowing activity completed across the road network, the below data has been gathered showing the fuel used to complete this activity. This will continue to be tracked throughout the certification period.

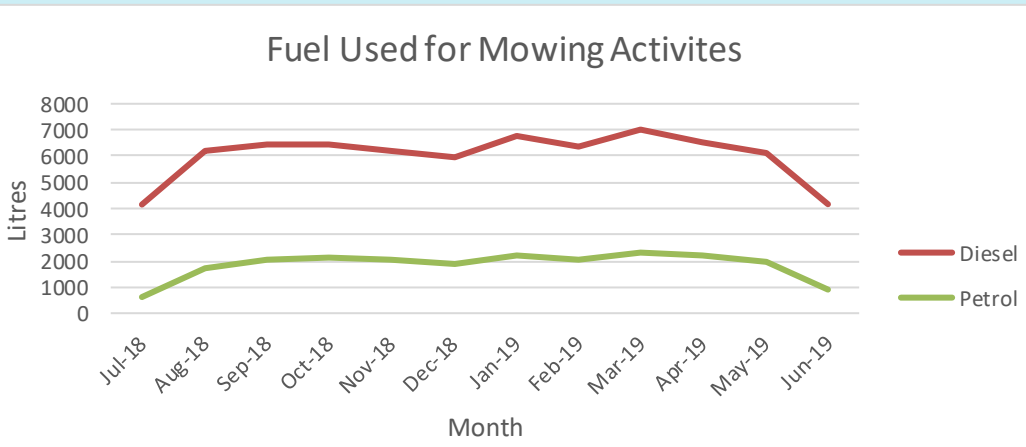


Figure 2 Fuel use from mowing activities during first 11 months of operation

1.1.3 Linemarking

Line marking has historically been completed using individual's knowledge of the deterioration rates of line marking reflectivity. This knowledge was previously placed into a linemarking plan, which was carried out regardless of deterioration of the lines (see Figures on the following page).

Downer have changed this approach and developed a more targeted linemarking program. Downer undertook extensive reflectivity condition monitoring of the network which involved testing every 25m on longitudinal lines. This data was then used to determine the reflectivity of the longitudinal lines, the priority areas and those areas that could be delayed. The outcome has been the development of a data driven maintenance schedule for the next 3 years.

Downer expects that this approach will require a greater work effort in the first year as the monitoring program across the whole network will be undertaken to gather data and therefore more virgin material use, greenhouse gas emissions and community disruption through road maintenance works will occur. However, the short-term effort will result in a greater reduction in years 2 and 3 of the maintenance program and most importantly, should result in a significant reduction in work effort, virgin material use, greenhouse gas emissions and community disruption compared to the traditional method over a 40-year road life.

The exact historic energy and materials associated with the historic scope of linemarking works is not available. However, Downer have calculated this usage from the frequency of the program outlined in figure 3 on the following page, and from the fuel usage specifications of the linemarking and inspection vehicles. Expert advice on materials required to paint lines has also been provided by the SME 'State-wide Linemarking Pty Ltd'. These figures have been provided in Attachment '**BC-1 i. Linemarking Figures'**. This data will be used to calculate how much fuel/material usage would have occurred using BAU over the 40 year life of the road.

Actual data – Actual data collected for the first 3 years will be used to verify the base case predictions for energy and material use outlined above.

State & National Road Networks Pavement Marking Frequency Description

Colour	Maintenance Frequency	Comment
	N/A	No line marking
	Every 12 Months	
	Every 12-24 Months	
	Every 24-36 Months	
	Every 36-60 Months & Subject to visual inspection	Long life marking (Thermoplastic) Require annual visual inspection
	Every 60-96 Months & Subject to visual inspection	National Highway Long life marking (Thermoplastic, Type B Audio) Require annual visual inspection

***Note**
This frequency methodology only cover the majority of centre and edge lines. For other markings especially transverse markings (e.g junction holding lines, Chevron, Arrow) the maintenance frequency should be justified by visual inspection.

Figure 3 Linemarking Frequency during previous Road Maintenance Contract

Figure 4 Map of Road Network outlining Linemarking frequency

1.1.4 Annual Works Program

To understand the full benefits of the annual works program, compared to BAU, a strong knowledge of road maintenance practices and the life expectancy of a road surface is required. To aid in this understanding, Downer have provided an attachment which summarises the essentials of road maintenance, see attachment '**BC-1j. Background Information**'.

The Annual works program is a detailed works schedule that has been created by Downer to improve the road condition for the public. To develop this works program, the entire road network under the contract was tested and modelled for performance every 100m to better understand the current condition of the network. Various road quality information is gathered in these 100m intervals is modelled using a Multi Criteria Assessment to determine which 100m section of the road is to be upgraded, within a fixed budget, to meet the contractual KPI's and commitments of the contract sustainability policy.

It is expected that this undertaking to test the entire road network every 100m will cause use of fuel and materials to be higher in the first year of operations, however it is expected that large savings in these areas will be realised across the life of the road. The life of the road is considered to be 40 years, as outlined within the Austroads Manual (refer to '**BC-1j. Background information**' for more detail).

Whilst called an annual works program in the Contract, Downer's Annual Works program extends for 3 years.

The Annual Works program and the MCA used to develop the annual works program are provided in the attached document *"***BC-1 a. Annual Works Program***"*.

For the Basecase development, historic data was not readily available and cannot be used as a simple like for like comparison anyway due to the highly variable contract models, KPI's and budgets, which all influences a varied output. However, historic data will be used as a guide for the Basecase as explained below:

1. Downer have analysed the previous Annual works program for the asset over the last 5 years prior to the commencement of the contract and have found that the previous road maintenance works consisted of 6.72% Rehabilitation works, and 93.28% resurfacing works (*see attached document* ***"BC-1 b. History of Annual Works"***). **<u>This will be treated as Business as Usual for comparison.</u>**
2. Using data collected within the first 10 months of the contract, Downer has determined quite a number of historical resurfacing works occurring on failed base and/or subbase leading to premature failure. Downer have determined these sites have on average 19.7% (area) defects within 10 years and an average surface failure of 6 years compared to the expected 10-year life (*see attached document* ***"BC-1 c. ISCA Costing Summary"***).
3. Downer have developed an annual works program as described above, with a necessary 11% rehabilitations and 89% resurfacing. This is a 5% increase on business as usual for rehabilitation treatments. This increase aims to reduce ineffective treatments and improving pavement structural capacity (*see attached document* ***"BC-1 a. Annual Works Program"***). **<u>It is expected that this will cause an initial increase in material and energy usage, however over the life of the road, it will amount to a significant saving.</u>**
4. Downer will estimate the total energy and material use for 40 years to ensure improved performance of pavement is captured. As outlined above, the life of the road is considered to be 40 years, as outlined within the Austroads Manual.

5. Within the Austroads Manual (see *AustRoads 2018 Guide to Pavement Technology Part 2: Pavement Structural Design* (*Table 7.2 Typical Pavement Design Periods*) in atached document ***"BC-1 d. AGPT02-17 Guide to Pavement Technology Part 2 PSD"***), the life expectancy for base and sub-base life is only 20 years. During this 20-year period, deterioration is predicted to occur at approximately 2% per annum. Following the 20-year life expectancy, it is predicted deterioration will increase to approximately 5% per annum. As Downer are proposing to increase amount of base/sub-base rehabilitation from 6.72% to 11% as part of their program, the additional works will ensure that deterioration of the treated areas will remain at only 2% across the 40-year life of the road being modelled (rather than increase to 5% which will cause additional maintenance requirements). Therefore, within the basecase, Downer will model a 5% deterioration of the road for years 21-40 compared to 2% actual case for treated areas (as outlined in **Figure 9** in attached document "***BC-1j Background Information***").
6. Downer will also account for general surface deterioration across the road design life. As outlined in **Section 3.6** as in attached document "***BC-1j Background Information"***, following rehabilitation, we will assume a 2% per year maintenance requirement of the surface in modelling.
7. The Materials and energy used will be tracked throughout the implementation of Downers annual works program. This usage will be compared to what would have been used if the historic approach to annual works was continued – **this is considered BAU and Basecase**.

The below table summarises the above key differences between BAU approach and actual approach (by increasing rehabilitation maintenance being completed, less deterioration will occur across the asset meaning over the life of the road, less overall maintenance work is required):

Difference in Approach	**BAU**	**Actual**	**Comments**
% of Rehabilitation Works being completed	6.72	11	As outlined in (Bc. 1j), rehabilitation prolongs the life of the road by 20 years. Resurfacing prolongs the life of the road for up to 10 years.
% annual road surface deterioration rate	2	2	See Bc. 1j, section 3.6 for explanation. This is relevant for the first 20 years of expected road life.
% annual road base/sub-base deterioration rate	5	5	See Bc. 1j, section 3.6 for explanation. This is relevant for the second 20 years of expected road life.
% deterioration rate following rehabilitation works	5	2	See Bc. 1j, section 3.6 for explanation. This is relevant for the 20 years following completion of rehabilitation works.

1.1.5 Constant Fixed Site Energy Usage

The operation of the asset requires Downer to have multiple depots established to effectively attend callouts and complete maintenance activities. Therefore, upon contract commencement, Downer

were handed a series of depots by the client that the previous contractor operated out of and Downer were permitted to use. The depots handed to Downer were at the following locations across the network.

- Queenstown
- Waratah
- Ulverstone
- Spreyton

Energy usage at all depots will form part of the base case. Savings from any initiatives, such as site upgrades or combining sites in order to conserve energy, will be included as actual case.

1.1.6 Base case Methodology for Variable/Reactive Activities

Downer have confined variable activities to responding to routine maintenance and emergency response. Whilst routine maintenance is unpredictable month on month (see graphs below), Downer will use the base case adjustment method to attempt to normalise the measured energy and material demand.

Downer will use actual case data excluding initiatives and improvements as the base case.

Savings from any initiatives, such as plant upgrades, will be included as actual case.

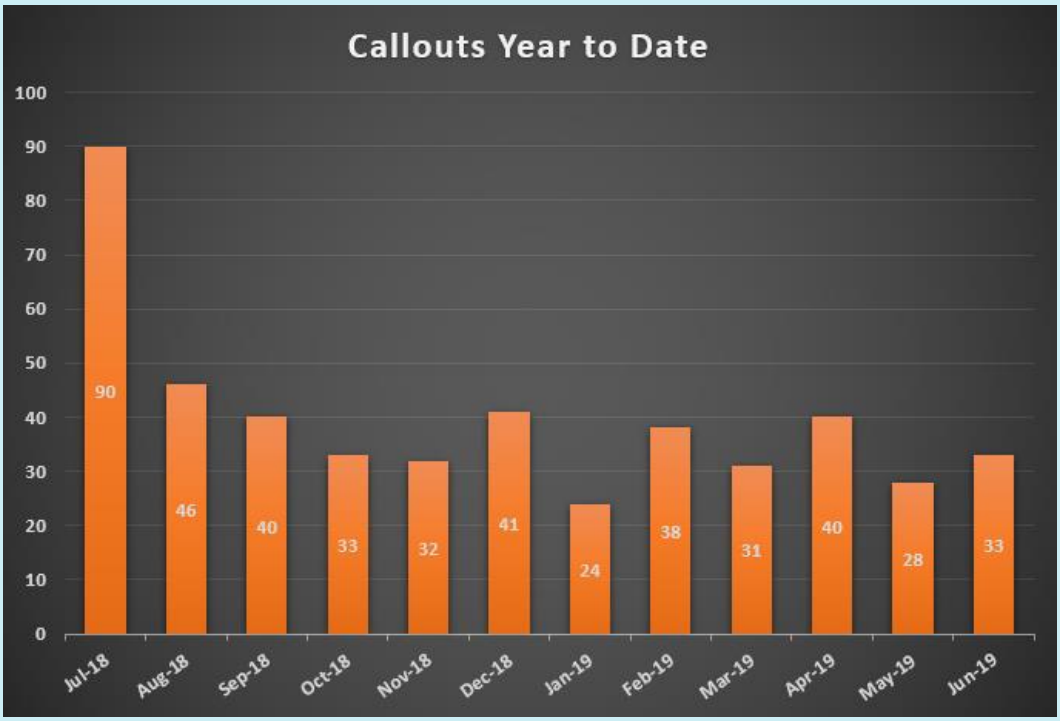
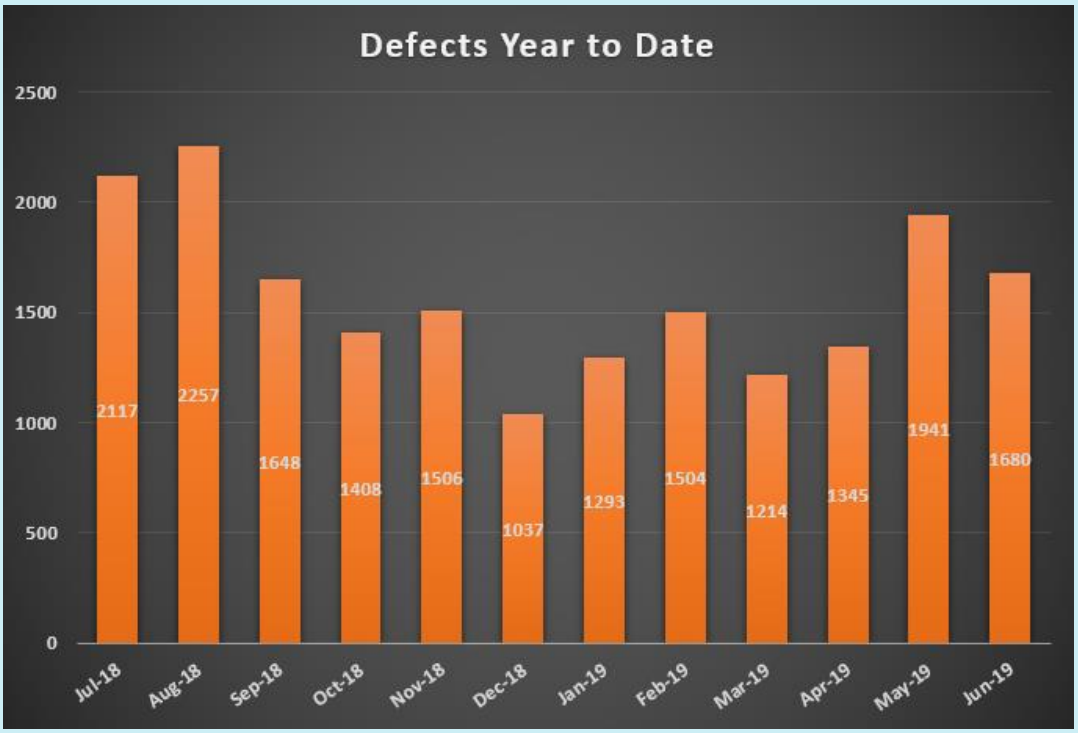


Figure 5 Emergency Callouts for year 1 of asset operation

Figure 6 Response to routine Maintenance for year 1 of operation



Actual Case Calculation Approach

For planned works, as outlined above, the actual case approach will be the actual data recorded including the reductions from any initiatives implemented during the course of the contract.

- **Annual works Program**

As outlined in the base case approach section, Downer's actual Annual Works Program covers 3 years of periodic works and the usage of energy and materials will be captured to allow the following calculations for the actual case:

- The estimated the energy and material use across the 40-year road lifecycle.

Downer will then compare the base case BAU annual works program to Downers actual case annual works program over a 40-year road lifecycle. The whole lifecycle needs to be considered as it is likely Downer's energy and material usage in the first 3 years will be high to fix several underlying pavement issues. This will however ultimately result in a decrease usage across the whole of life.

The predicted split (as outlined in base case approach section) between rehabilitation and resurfacing will be confirmed by monitoring the annual works program for the asset over the years 2 and 3 of the certification period.

- **Line marking:**

As outlined in the 'Basecase approach' section, for the actual case, Downer will undertake extensive reflectivity condition monitoring of the network which involved testing every 25m on longitudinal lines (this will result in an increase in energy usage in year 1). The data will then be used to determine the reflectivity of the longitudinal lines, the priority areas and those areas that could be delayed. The outcome has then been used to develop a data driven maintenance schedule for the next 3

	years, and it is expected to result in a reduction in energy and material use over a 40-year road lifecycle. This process will be considered a State First. The fuel and paint usage per km have been provided by the Linemarking sub-contractor and will allow comparisons with BAU to be completed (see Attachment '**BC-1 i. Linemarking Figures'**). **For further details regarding what is being tracked and how calculations are undertaken, refer to *'BC-1 k. Basecase Assumptions and calculation methods'* for additional actual case approach methods.**
Dates/period of the Base Case	The Base case period is both the previous 10 years of asset operations (where budget and KPI's were equivalent), and the actual data collected across the rating period excluding any initiatives implemented, where budget and KPI's were not equivalent (July 2018 to June 2021).
Dates/period of the Actual Case	Data for the actual case will be gathered over aa years of the certification period (July 2018 to June 2021) and will include reductions from implemented initiatives. This data will be used to estimate usage across the 40-year life cycle of the asset.
Description of Exclusions	The following elements of the operation will be excluded from the assessment boundary: • Energy use and carbon/GHG emissions from public vehicle movement across the asset (Calculations will be made however for public vehicle energy use and GHG emissions and these will be submitted separately under an innovation credit as it is expected that Downers non-BAU approach to conducting works will generate savings). • Impacts generated from any works or movement across the asset that are not related to Downer's contract scope. Other key assumptions and Exclusions can be found within the Resource Use Framework outlined in ***'BC-1 k. Basecase Assumptions and calculation methods'***. This shows the proposed operational wide BAU standards and assumptions for calculating the base case, each item within a resource category is numbered to enable cross referencing of assumptions or sources. A description of the justification, source, and data quantities to collect for the development of the base has also been provided here. Should works or a project within the operation use different assumptions they will be required to justify why the assumptions contained in this document are not applicable to their works/project or are incorrect. As a guide, an overview of the asset resource use and impact categories has been provided below: **Resource Use Resource Use** **Energy use** • Stationary & off-road fuel (plant & equipment) (Scope 1) • Transport fuel from company owned/leased vehicles (Scope 1) • Electricity (grid & renewables) (Scope 2) • Transport fuel (for delivery of products, water, etc.) to site (note this is Scope 3 - and only required for ENE1 Level 3) • Transport fuel (for delivery of materials) to site (note this is also Scope 3, but required for MAT1) **Water use** • Potable • Non-potable **Materials used** • Hot Mix Asphalt • Bitumen • Aggregates (various types) • Glass beads for Linemarking • Paint for Linemarking → **Project Components** Constant Consumption • Annual works program – major maintenance • Asset inspections • Mowing • Linemarking • Miscellaneous Base Services Variable Consumption • Signage replacement • Unsealed Shoulders and Verge maintenance • Drainage maintenance • Routine surface maintenance • Miscellaneous Minor Works Constant Consumption • Depot amenities • Public amenities • Office amenities • Maintenance activities → **Resource Outputs (Impacts)** **Carbon/Greenhouse Gas Emissions** • Scope 1 stationary and transport fuel • Scope 2 electricity use • Scope 3 transport fuel and electricity use • Land and vegetation clearing* **Waste produced** • Spoil • Inert and non-hazardous • Office • Recycled • Dead animals Table 1 Overview of resource use and impact categories * Land and vegetation clearing will not include vegetation disturbance from mowing, weed spraying, existing shoulder clearing, existing drain clearing, existing road envelope clearing and removal of fallen trees from the network as these are activities that are completed periodically/ annually and already considered disturbed.

Base Case Time Coverage (to use for forecasting	This is generally based on the master plan for the asset and must be longer than 10 years. The contract period is not a sufficient forecast timeframe. As a road design life is generally considered to be 40 years, this will be used as the base case time coverage (road design life definition is outlined in *AustRoads. (2018). Guide to Pavement Technology Part 2: Pavement Structural Design. NSW: AustRoads – Table 7.2 Typical Pavement Design Periods – page 96* – this has been provided in attachement ***BC-1 d. AGPT02-17_Guide_to_Pavement_Technology_Part_2_PSD*** and is also provided below). **Table 7.2: Typical pavement design periods** Flexible pavements: 20–40 years Rigid pavements: 30–40 years
Specified Design Life for Renewals/ upgrades	What is the design life expected from standard renewals (e.g. resurfacing, line marking, component asset replacements)? This is used to forecast predicted renewals in the footprint forecast. A Road base and subbase are generally designed to last for 40 years and a rehabilitation lasts for 20 years (*AustRoads. (2018). Guide to Pavement Technology Part 2: Pavement Structural Design. NSW: AustRoads – Table 7.2 Typical Pavement Design Periods – page 96* – this has been provided in attachement ***BC-1 d. AGPT02-17_Guide_to_Pavement_Technology_Part_2_PSD*** and is also provided below). **Table 7.2: Typical pavement design periods** Flexible pavements: 20–40 years Rigid pavements: 30–40 years As outlined in the *attached document "**BC-1 h. AGPT03 09 Guide to Pavement Technology Part 3 PS***), it is generally acknowledged that; • A Sprayed Seal surface will last for 10 years on a good base and subbase.
Standard reactive Maintenance Activity Periods	What is the frequency of common operation and maintenance activities (e.g. asset inspections, train wash, drain cleaning, road kill removal)? As outlined in the above 'base case calculation approach' section, Downer have confined variable activities to responding to routine maintenance and emergency response. Reactive Maintenance is undertaken consistently throughout the course of the operation and can be during either day or night. The frequency of occurrence varies depending on external events. Whilst the type of activities required for reactive maintenance varies, the main types of reactive maintenance activities include: • Small pavement/pothole repairs • Shoulder grading • Roadkill removal • Guide Post Realignment • Emergency response callouts

- Vegetation removal

The number of completed reactive maintenance jobs for year 1 of asset operation can be seen below:

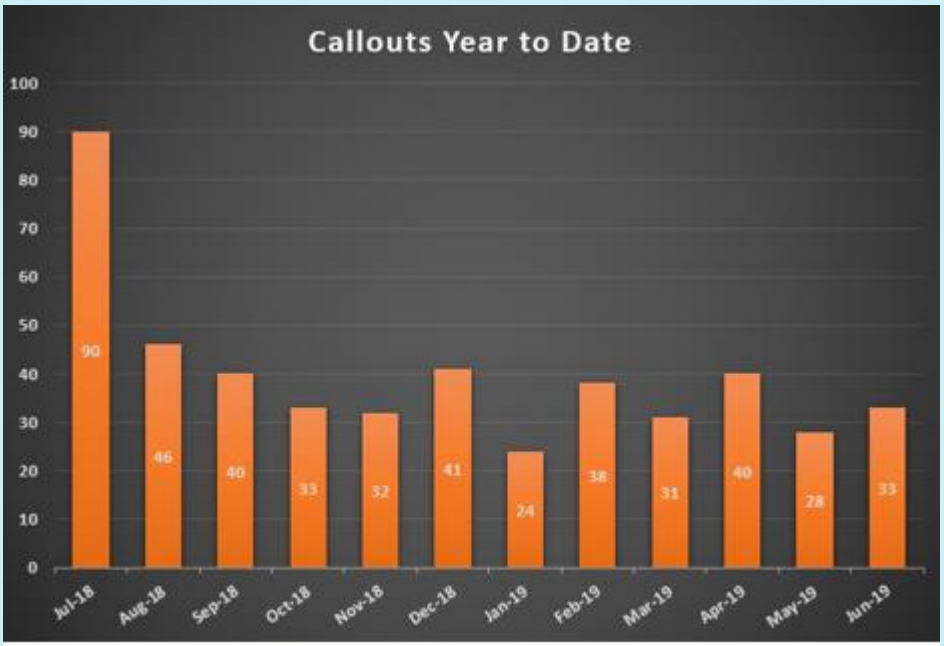


Figure 1 Emergency Callouts for year 1 of asset operation

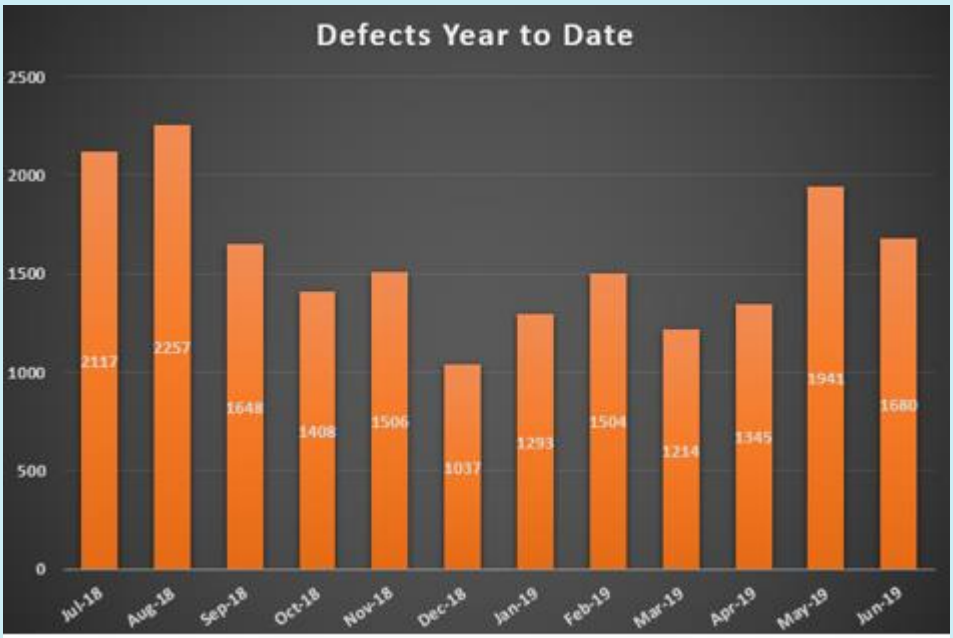


Figure 2 Response to routine Maintenance for year 1 of operation

Base Case Qualities – Please explain how the Base Case demonstrates each of the following qualities:	
Business as Usual Benchmarks for Assets	This may be provided as a detailed appendix per activity/operational asset if required Refer to ***BC-1 k. 'Basecase Assumptions and calculation methods'*** for detailed Benchmark Assumptions.

Transparency	Explain how this operational resource usage information is communicated/visible to the Owner/Key Stakeholders. This information is collected as a team, discussed at meetings, and regularly reviewed by the operational team and client in a monthly report. The asset management team provide reports containing much of this information to the key stakeholder and client monthly. These are reviewed together in monthly meetings with the client. Quarterly meetings are also completed between the asset management team and wider Downer stakeholders to review base case progress and track success/failure.
Approach to Scope Changes/ Variations	Any variation to the scope which requires a change in the basecase will be communicated to ISCA at the first available opportunity. An update to the basecase will be submitted to the verifier prior to the end of year verification.
Accuracy and Detail	Explain how accurate the estimations, assumptions, modelling and monitoring data is. Refer to ***BC-1 k. 'Basecase Assumptions and calculation methods'*** and ***'BC-1 l. Resource Consumption Overview'*** for detailed usage calculation methods. This outlines the accuracy of the data as it details what will be tracked and captured during the asset operation and to what detail.
Key Initiatives being Targeted/ Claimed	Provide a list of the key reduction initiatives with their assumptions. - Annual works program (detailed above) - Line marking program (detailed above) - Various recycling initiatives (waste re-use in projects and in material design)
Credits for which the Base Case is intended to be used	Check all that are targeted: ☒Ene-1 (Level 2 or 3) ☒Wat-1 (Level 2 or 3) ☒Wat-3 (Level 1 or 2) ☒Mat-1 (Level 2 or 3)
Energy Usage Considered as Constant (Ene-1)	Refer to ***BC-1 k. 'Basecase Assumptions and calculation methods'*** and ***'BC-1 l. Resource Consumption Overview'*** for detailed usage calculation methods. Energy usage from constant activities and from fixed site usage as defined in the 'base case calculation approach' row.
Energy Usage Considered as Variable (Ene-2)	Refer to ***BC-1 k. 'Basecase Assumptions and calculation methods'*** and ***'BC-1 l. Resource Consumption Overview'*** for detailed usage calculation methods. Energy usage from variable activities as defined in the 'base case calculation approach' row.
Water Usage Considered as Constant (Wat-1)	Refer to ***BC-1 k. 'Basecase Assumptions and calculation methods'*** and ***'BC-1 l. Resource Consumption Overview'*** for detailed usage calculation methods. Water usage from constant activities and from fixed site and amenities as defined in the 'base case calculation approach' row.

Water Usage Considered as Variable (Wat-2)	Refer to ***BC-1 k. 'Basecase Assumptions and calculation methods'*** and ***'BC-1 l. Resource Consumption Overview'*** for detailed usage calculation methods. Water usage from variable activities as defined in the 'base case calculation approach' row.		
Materials Usage Considered as Constant (Mat-1)	Refer to ***BC-1 k. 'Basecase Assumptions and calculation methods'*** and ***'BC-1 l. Resource Consumption Overview'*** for detailed usage calculation methods. Constant material use is considered to be materials used in the carrying out of planned and periodic maintenance works, as well as the normal functioning of offices and depot locations.		
Materials Usage Considered as Variable (Mat-2)	Refer to ***BC-1 k. 'Basecase Assumptions and calculation methods'*** and ***'BC-1 l. Resource Consumption Overview'*** for detailed usage calculation methods. Variable material usage is considered to be materials used in works involving responding to routine maintenance activities and emergency callouts (see 'Standard reactive Maintenance Activity Periods' section.		
Assessor		**Date**	

ISCA Case Manager		**Date**	
Case Manager Comments			

IS Verifier(s)	[redacted]	**Verifier recommendation**	[redacted]
Verifier(s) Comments	[redacted]		
Date Verified			

Document History

Version	Date of Approval	Author	Summary of Change
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	

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