Hunter Valley Coal Network Access Undertaking
2018 Annual Compliance Assessment

ATTACHMENT 1: Hunter Valley Network Operating Costs

Submission To

Australian Competition & Consumer Commission

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PUBLIC VERSION

ARTC

TABLE OF CONTENTS

1. INTRODUCTION

This document contains additional information and analysis relating to ARTC's Network operating costs for the 2018 calendar year. It is intended to supplement the information contained in ARTC's submission to the ACCC for the assessment of compliance with ARTC's Hunter Valley Access Undertaking (**HVAU**) during 2018.

During 2018, the Hunter Valley network achieved a total coal transportation volume (including domestic) of 173.1 million tonnes (Mt), a small increase from total tonnage volumes for 2017 of 171.3Mt. The Gross Tonne Kilometres (GTKs) for the coal network increased 1.8% between 2017 and 2018, sustaining the significant increase from previous years. At a zonal level, Pricing Zone 1 increased by 2.4% and Pricing Zone 2 increased by 14.9%, which was partially offset by a decrease in Pricing Zone 3 of 9.6%. The decline in Pricing Zone 3 was representative of a return to contracted levels from a peak experienced in 2017.

The cumulative effect of the sustained increase in GTKs over time has a material influence on cyclic maintenance requirements.

Table 1: Hunter Valley Network Coal Gross Tonne Kilometres (GTK)

Pricing Zone	CY15 GTK ,000	CY16 GTK ,000	CY17 GTK ,000	CY18 GTK ,000	% Variance 2015 - 2018	% Variance 2016 - 2018	% Variance 2017 - 2018
Pricing Zone 1	25,700,939	26,745,352	26,660,336	27,296,875	6.2%	2.1%	2.4%
Pricing Zone 2	[redacted]	[redacted]	[redacted]	[redacted]	29.2%	15.3%	14.9%
Pricing Zone 3	[redacted]	[redacted]	[redacted]	[redacted]	5.7%	-7.7%	-9.6%
Total GTKs	**41,145,902**	**44,270,699**	**44,417,900**	**45,207,383**	**9.9%**	**2.1%**	**1.8%**

Coal prices remained at high levels with thermal coal prices sustaining above US$100/mt for most of the year. The bullish market continued to fuel Customer interest in additional throughput opportunities and increased capacity particularly from the single line Ulan and Gunnedah extremities of the Network.

Early in the year it was recognised that Customers west of Muswellbrook were seeking to deliver throughput volumes (circa 4Mtpa in aggregate) above contracted paths in 2018 and likely higher volumes again in 2019. ARTC acknowledged that achieving this would require structured improvement focused objectives to increase effective utilisation of the asset. Stakeholders, particularly rail haulage providers, were heavily engaged and contributed a diverse range of options on what solutions should be recommended. Stakeholders widely agreed that that practical operational improvements that focussed on improving efficiency, that could be delivered in the short-term ahead of longer term more capital intensive projects would be supported to deliver the volume within required timeframes. In response, the Capacity Fast Track initiative was introduced at the February Rail Capacity Group (RCG) meeting and set out several operational and capital activities that would provide pathways for increased throughput/capacity. These objectives were classified into three streams of focus:

- **Exploit:** latent capacity in the existing network infrastructure;
- **Extend** network capacity through incremental improvements in the near term; and
- **Build** step changes in capacity through construction of additional network infrastructure or technology alternatives.

Whilst initially focussed on exploiting operational efficiency through engagement with rail operators, activities ultimately expanded to the scoping of future projects. Stakeholders met regularly throughout the calendar year to define, review and prioritise the scope and cost of activities of each work stream and provided continual reporting to the wider group via the monthly RCG process. Outcomes from these work streams subsequently led to both capital projects being submitted for endorsement and operating costs being incurred to deliver the throughput opportunities targeted. Actions identified from this continuous improvement program continue to be implemented.

Customers remained focused on network availability, reliability and operational efficiency. The 2018 calendar year saw an improvement in Infrastructure reliability loss outcomes, with the 2018 annual losses reported as 1.23% against a 2017 result of 1.81%. The two key areas of improvement since 2017 were rail break and bridge defect reliability losses. Targeted initiatives to address these areas were introduced in the prior year and continued in 2018 to maintain this progress.

Signalling and Points failure impacts increased slightly since 2017 making it the largest infrastructure loss in 2018. The program of implementation of points condition monitoring devices to allow early detection and intervention prior to points failures continued this year. There was a severe weather event in March which caused flooding in multiple areas of the lower hunter causing disruption on the network. Signalling was severely impacted and in response a trial of waterproof point machine motors was commenced in flood risk areas to improve future operational recovery times.

The focus on structures continued. Gowrie Gates and Farley Bridge renewal projects were completed and intensive bridge strengthening maintenance works were conducted at the Glennies Creek location. Live monitoring equipment was installed across the network for priority locations to enable real time indication of faults and data gathering to support ongoing maintenance planning. Concept and feasibility planning were completed for the complex replacement of the three critical bridge structures at Muswellbrook. Stakeholders were provided with ongoing reporting on project status, costing and planning activities given the criticality of these works on train operations and the wider Muswellbrook community.

Ongoing implementation of ARTC's Network Control Optimisation (ANCO) project continued with focus on deployment of dynamic scheduling software platform "Movement Planner' (a US based off the shelf product), modifying software to operate in ARTC's specific Australian server environments, integration with critical data sources in and out of the program and initial testing of the system capabilities. Operational readiness and change management activities involved ongoing stakeholder information sessions with customers, above rail providers, coal terminals and Hunter Valley Coal Chain Coordinator (HVCCC) as to the planning and execution of training requirements needed to ready personnel across the supply chain for live system operation.

In September a major incident occurred where a train travelling near Newdell Junction collided with derailed wagons from a train travelling in the opposite direction. Approximately 10km of track was damaged in the incident, given location, all rail traffic was stopped causing major disruption to the whole network. Incident costs in relation to this event were recovered from the party at fault.

The Hunter Valley business unit structure was largely consistent with the structure implemented through ARTC's transformation program in 2015/2016. In the prior year ARTC had initiated trials to improve the coordination and synchronisation between ARTC's asset and operations teams so there was a holistic Network view when planning for work and track access authorities, focussing on a 14-day planning period as an improved input to the HVCCC for whole of Coal Chain planning. It was demonstrated that

this coordination facilitated more efficient use of short-term windows leading to improved completion of planned activities. In response to the increasing need to balance throughput demand with asset maintenance requirements, the Network Integration team was established in November 2018 to make this coordination and efficiency permanent and more sustainable. A change in management accountabilities for the General Managers was also implemented at the same time to provide a central interface point for customers and supply chain stakeholders and streamline reporting lines for asset and train operation management. This revised structure did not impact headcount or costs.

ARTC continued its assessment and implementation of technological improvements to support asset condition data collection, asset reliability outcomes and efficient maintenance delivery. Instrumented Coal Wagons (ICW's) commenced running in Zone 2 meaning that this predictive intervention capability now extended network wide. Investigation and procurement of high-speed grinding technology to reduce the overall unit rate of rail grinding delivery also commenced.

ARTC remained committed to significant key improvements of the systems used to develop the annual maintenance program with a view to transforming the fundamental processes used to derive the maintenance strategy. The targeted improvements are aimed at extracting further value for money for our customers, improving workflow process and sustained network reliability. Most notably these initiatives include:

- Rationalisation of the systems used to manage the asset through the Asset Management Improvement Project (AMIP);

- The development of a Decision Support Platform (DSP) to visualise asset condition and support risk-condition based maintenance planning; and

- Challenging the underlying standards and process that generate work on the asset.

Whilst some of these focus areas manifest in the cost movements for 2018, they also highlight where effort of the teams within the Business Unit was expended to improve outcomes and create value for Customers through ARTC's service offering in the Hunter Valley.

Table 2 sets out a comparison of the total operating costs in 2018 against 2017 for the Hunter Valley Coal Network. An explanation for the movement in costs is the following sections.

Table 2: Hunter Valley Coal Network Operating Expenditure $'000

	2017 (a)	2018 (b)	% Variance (b)/(a)-1
Infrastructure Maintenance	111,790	114,378	2.3%
Loss on Disposals	7,606	12,031	58.2%
Expensed Project Costs	-	-	n/a
Network Control	14,149	15,778	11.5%
Business Unit Management	29,781	34,145	14.7%
Corporate Overheads	18,291	22,589	23.5%
Less Non-Coal Allocation	(5,238)	(2,736)	(47.8%)
Total Operating Expenditure	**176,378**	**196,185**	**11.2%**

2. INFRASTRUCTURE MAINTENANCE

Infrastructure Maintenance includes Major Periodic Maintenance (MPM) and Routine Corrective and Reactive Maintenance (RCRM) work programs.

MPM are typically major cyclical or planned activities that maintain the operating performance and asset life of operational infrastructure and aim to reduce the level of defects and corrective maintenance. These activities are largely delivered within the network closedowns and are predominantly outsourced.

RCRM are typically minor scheduled activities used to inspect or service asset condition on a routine basis. RCRM extends to include reactive and corrective activities that are required as a result of inspections or defect identification that, because of their nature, are dealt with on the spot or as soon as is reasonably practical thereafter.

Infrastructure maintenance expenditure was heavily influenced by the heating contract labour market during the period. Increased demand for specialist resources especially in the civil and signalling disciplines brought about by the large volume of major rail and road infrastructure projects across the east coast of Australia resulted in both decreased tender responses and increased tender pricing across the network. This impact was also compounded by ARTC's need for additional contract labour to meet on call requirements due to Protected Industrial Action at the Hunter Valley Provisioning centres during the year. The impact of the higher contract labour rates is most reflected in the increase in RCRM costs where there is a requirement for a shortened response time to rectify defects and minimise network disruption. ARTC engaged frequently with stakeholders through the RCG process on the status of the contract labour market and its impact on costs throughout the year. Increased demand for skilled labour and the resulting impact on tender pricing is expected to continue and ARTC is implementing strategies to mitigate the impact for customers such as repackaging of works into multiyear contracts and bringing resources in house where possible.

ARTC has provided details of the top 10 maintenance activities by value in 2018 at a Network level in Table 3A. A zonal break down of these top 10 maintenance activities is provided in Table 3B to Table 3D below. The required maintenance activities can vary year to year, particularly where there are discrete projects, and cost variations are to be expected. Commentary has been provided on the key drivers for the movement in costs for the top 10 maintenance activities.

The amounts reflect the underlying maintenance costs for each activity before allocating a share of incremental maintenance to the non-coal traffics.

Table 3A: Top 10 Hunter Valley Maintenance Activities $'000

Activity	MPM/RCRM	2017 (a)	2018 (b)	% Variance (b)/(a)-1
Ballast Cleaning	MPM	[redacted]		13.5%
Rail Grinding	MPM			6.0%
Maintenance Resurfacing	MPM	8,513	7,512	-11.8%
Mudholes Full Track Reconditioning	MPM	10,211	7,095	-30.5%
Turnout Steel Component Replacement	MPM	5,897	5,886	-0.2%
Rail Defect Removal	RCRM	4,294	4,771	11.1%
Steel Underbridge Repairs	MPM	3,117	4,049	29.9%
Turnout Resurfacing	MPM	4,701	3,338	-29.0%
Ballast Undercutting	MPM	4,366	3,181	-27.1%
Turnout Grinding	MPM	3,081	3,056	-0.8%
Top 10 Total		**67,878**	**65,004**	-4.2%
Top 10%		**60.7%**	**56.8%**	
Other Activities	MPM/RCRM	43,912	49,374	12.4%
Total Maintenance		**111,790**	**114,378**	**2.3%**

Infrastructure Maintenance Summary $'000

Activity	2017 (a)	2018 (b)	% Variance (b)/(a)-1
Major Periodic Maintenance	85,582	80,147	-6.4%
Routine Corrective and Reactive Maintenance	26,208	34,231	30.6%
Total Maintenance	**111,790**	**114,378**	**2.3%**

Table 3B: Top 10 Hunter Valley Maintenance Activities Pricing Zone 1 $'000

Activity	MPM/RCRM	2017 (a)	2018 (b)	% Variance (b)/(a)-1
Ballast Cleaning	MPM	[redacted]		n/a
Rail Grinding	MPM			15.7%
Maintenance Resurfacing	MPM	3,313	2,822	-14.8%
Mudholes Full Track Reconditioning	MPM	5,234	2,513	-52.0%
Turnout Steel Component Replacement	MPM	3,793	4,480	18.1%
Rail Defect Removal	RCRM	3,117	3,119	0.1%
Steel Underbridge Repairs	MPM	794	3,668	361.9%
Turnout Resurfacing	MPM	3,382	2,567	-24.1%
Ballast Undercutting	MPM	3,492	1,509	-56.8%
Turnout Grinding	MPM	2,408	2,095	-13.0%
Top 10 Total		**30,524**	**28,547**	**-6.5%**
Top 10%		**58.1%**	**52.4%**	
Other Activities	MPM/RCRM	22,013	25,981	18.0%
Total Maintenance		**52,537**	**54,528**	**3.8%**

Infrastructure Maintenance Pricing Zone 1 $'000

Activity	2017 (a)	2018 (b)	% Variance (b)/(a)-1
Major Periodic Maintenance	37,869	34,189	-9.7%
Routine Corrective and Reactive Maintenance	14,668	20,339	38.7%
Total Maintenance	**52,537**	**54,528**	**3.8%**

Table 3C: Top 10 Hunter Valley Maintenance Activities Pricing Zone 2 $'000

Activity	MPM/RCRM	2017 (a)	2018 (b)	% Variance (b)/(a)-1
Ballast Cleaning	MPM	[redacted]		n/a
Rail Grinding	MPM			5.6%
Maintenance Resurfacing	MPM	1,865	1,153	-38.2%
Mudholes Full Track Reconditioning	MPM	1,113	2,155	93.6%
Turnout Steel Component Replacement	MPM	177	52	-70.4%
Rail Defect Removal	RCRM	412	555	34.7%
Steel Underbridge Repairs	MPM	116	122	4.4%
Turnout Resurfacing	MPM	468	317	-32.3%
Ballast Undercutting	MPM	291	532	82.6%
Turnout Grinding	MPM	190	205	7.9%
Top 10 Total		**7,627**	**8,252**	**8.2%**
Top 10%		**53.6%**	**52.0%**	
Other Activities	MPM/RCRM	6,595	7,603	15.3%
Total Maintenance		**14,222**	**15,854**	**11.5%**

Infrastructure Maintenance Pricing Zone 2 $'000

Activity	2017 (a)	2018 (b)	% Variance (b)/(a)-1
Major Periodic Maintenance	11,033	11,909	7.9%
Routine Corrective and Reactive Maintenance	3,189	3,945	23.7%
Total Maintenance	**14,222**	**15,854**	**11.5%**

Table 3D: Top 10 Hunter Valley Maintenance Activities Pricing Zone 3 $'000

Activity	MPM/RCRM	2017 (a)	2018 (b)	% Variance (b)/(a)-1
Ballast Cleaning	MPM	[redacted]		13.5%
Rail Grinding	MPM			-12.7%
Maintenance Resurfacing	MPM	3,334	3,537	6.1%
Mudholes Full Track Reconditioning	MPM	3,864	2,427	-37.2%
Turnout Steel Component Replacement	MPM	1,927	1,353	-29.8%
Rail Defect Removal	RCRM	766	1,097	43.2%
Steel Underbridge Repairs	MPM	2,207	260	-88.2%
Turnout Resurfacing	MPM	851	453	-46.7%
Ballast Undercutting	MPM	583	1,141	95.8%
Turnout Grinding	MPM	482	756	56.7%
Top 10 Total		**29,727**	**28,205**	**-5.1%**
Top 10%		**66.0%**	**64.1%**	
Other Activities	MPM/RCRM	15,303	15,791	3.2%
Total Maintenance		**45,031**	**43,996**	**-2.3%**

Infrastructure Maintenance Pricing Zone 3 $'000

Activity	2017 (a)	2018 (b)	% Variance (b)/(a)-1
Major Periodic Maintenance	36,680	34,049	-7.2%
Routine Corrective and Reactive Maintenance	8,351	9,947	19.1%
Total Maintenance	**45,031**	**43,996**	**-2.3%**

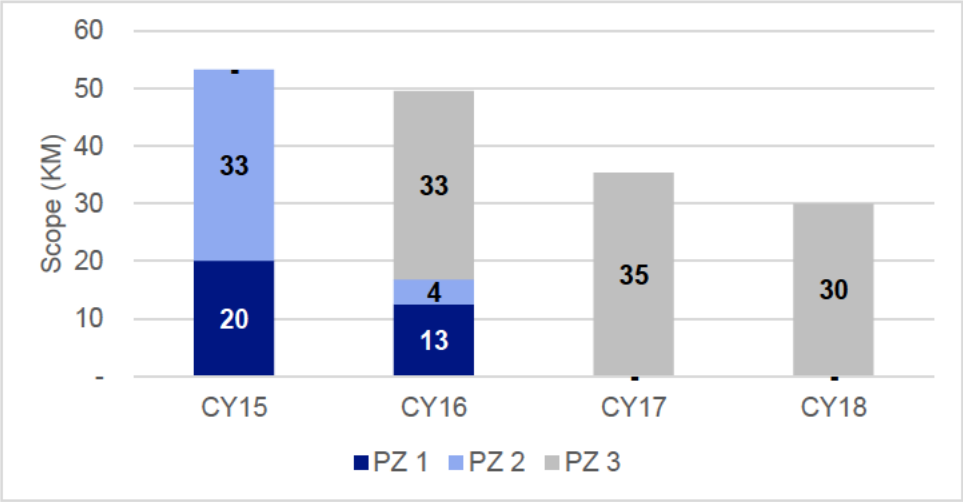
The following sections provide an explanation for the key drivers for the movements in maintenance activities across the network.

2.1 Ballast Cleaning

Ballast cleaning is the mechanical excavation of deteriorated track ballast up to 500mm below the bottom of the sleeper across the entire track cross-section. The activity's purpose is to reinstate the function of the ballast as a free-draining medium, holding the track to its correct geometry under the passage of trains. Ballast cleaning is a cyclical maintenance activity across the network, with timing driven by the cumulative tonnages over specific segments of track. It is a large component of the recurrent operating costs at an aggregate level, recognising that the activity will move through the zones across a number of years. The ballast cleaning activity is outsourced. Unit rates fluctuate year on year dependent on contract rates, ballast reclamation levels, ballast age and maintenance possession scheduling.

The ballast cleaner continued its' initial ballast cleaning cycle in Price Zone 3 in 2018 from 2017. In 2018 30km in scope was achieved throughout the year with an increase in the Ballast Cleaning rate from [redacted] in 2018 to [redacted] per metre in the current period. The increase in unit cost was driven by the severely degraded condition of the ballast in the section being cleaned which resulted in extremely low ballast return, high rates of ballast replacement and lower rates of productivity.

Figure 1: Ballast Cleaning Work Scope – CAL 15-18 in KM



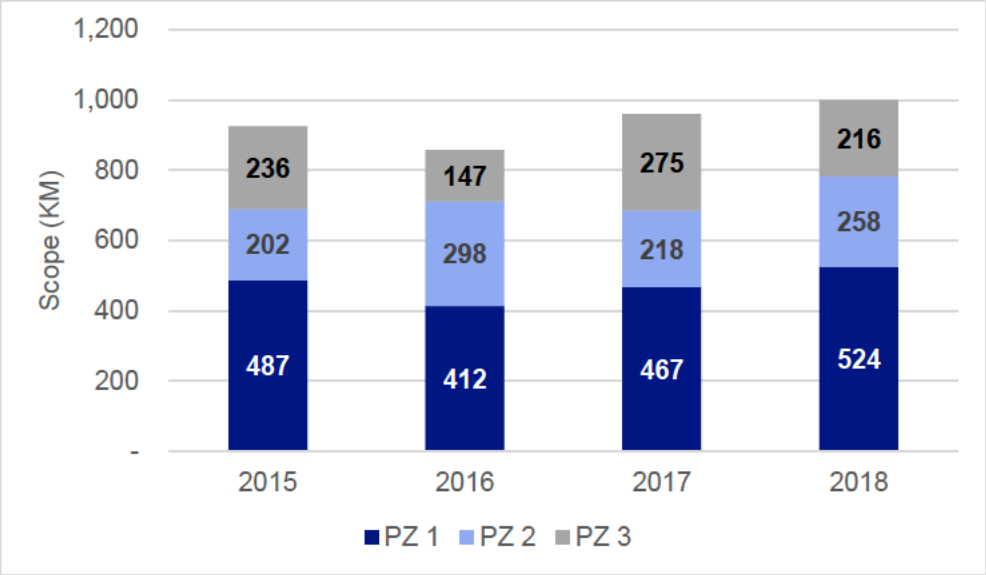
2.2 Rail Grinding

Rail grinding is the periodic grinding of rail to manage its profile and stress-related defect growth. Grinding improves wheel and rail interface to reduce rail and wheel wear and propagation of rail defects. The frequency of rail grinding is dependent upon rail and traffic type, tonnages (in Million Gross Tonnes (MGT)) and track curvature. In determining the optimal rail grinding frequency, a detailed analysis of rail performance is undertaken to maximise rail life and minimise the development of rail defects.

Rail grinding costs increased [redacted] in 2018 compared with 2017, due to an increase in the scope of rail grinding delivered. Due to the cyclic nature of the activity, rail grinding may not be comparable year on year but will be driven by sustained increases in tonnage over time. During 2018, costs in Pricing Zone 1 and Pricing Zone 2 increased by [redacted] and [redacted] respectively. Pricing Zone 3 decreased by [redacted]. The movement in costs between 2018 and 2017 for each Pricing Zone aligns to the fluctuations in the level of scope delivered within each zone.

This activity was entirely outsourced during the calendar year.

Figure 2: Rail Grinding Work Scope – CAL 15-18 in KM



2.3 Maintenance Resurfacing

Track resurfacing (tamping) restores the track geometric parameters of top, line, superelevation and curvature by mechanised on-track machinery. Similar to ballast cleaning, the accumulated gross tonnage over the line segment determines the initial resurfacing scope. Frequency is also influenced by the environment, track structure and condition, train axle loads and speeds.

Track conditions have been favourable in 2018 due to a reduction in rain events and the presence of drought like conditions. This has resulted in a reduced requirement for tamping in Pricing Zones 1 and 2 leading to a combined reduction in resurfacing costs in these zones totalling $1.2m compared to 2017.

In Pricing Zone 3 there was a continued focus on Temporary Speed Restrictions (TSR) removal at specific locations. Particularly Dartbrook to Murulla; Gap to Watermark and Whitehaven Gunnedah Junction to Boggabri Junction. This focussed approach resulted in a lower overall scope being completed with small increase in costs.

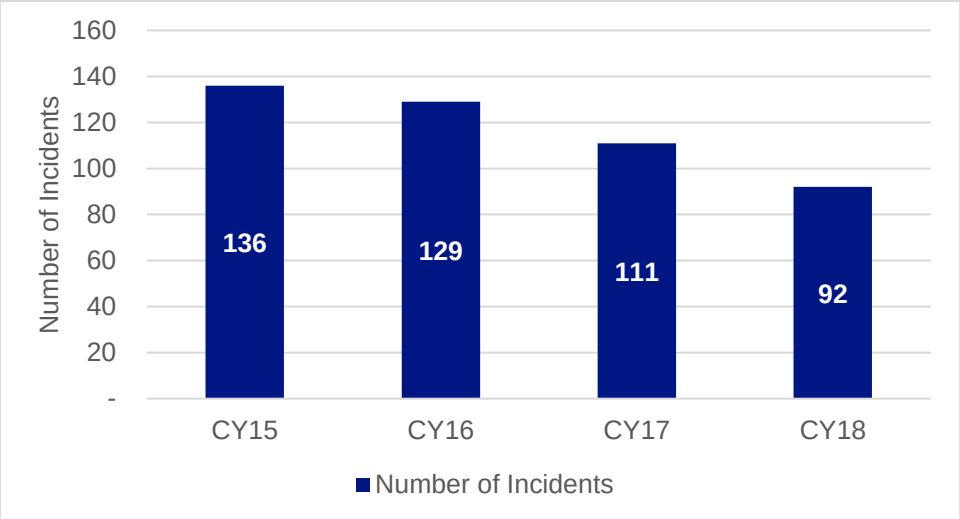
2.4 Mudholes Full Track Reconditioning

Track reconditioning is the reconstruction of the track formation (track bed) arising from a failure related to long term water ingress. Track reconditioning includes subgrade treatment, the installation of structural earthworks, a capping layer and new ballast, followed by track and drainage restoration. The purpose being to effectively manage the risk to rail operations from track geometry deterioration. Key drivers of reconditioning include track failure rates and type of failure; track performance; maintenance effectiveness intervals; and formation and subgrade configuration. This consists of formation reconstruction work on short track sections, which are in response to immediate/localised problem areas. It should be noted that sites that are 200m or more in length are treated as capital track upgrades.

Expenditure on track reconditioning for 2018 decreased by $3.1m overall compared to 2017, with variation at a zonal level due to asset condition and the size and scope of the required work to rectify the underlying issues identified. Pricing Zone 1 decreased by $2.7m when compared to the prior year as significant works were undertaken during 2017 throughout the zone to address poor track performance resulting from poor ballast, significant flooding events and failed formation. Pricing Zone 2 increased by $1.0m from 2017 as works at Coggan Creek were prioritised following onsite inspections that revealed deteriorating track formation conditions which had a high risk of impacting track reliability. Expenditure in Pricing Zone 3 decreased $1.4M as there was a focus on completing capital focused track reconditioning projects (>200 metres) particularly in the Gap to Watermark and Whitehaven Gunnedah Junction to Boggabri Junction areas.

Track conditions were also favourable in 2018 due to a reduction in rain events and the presence of drought like conditions reducing the prevalence of mud hole development. The benefit of the track reconditioning works is evidenced in the overall decreasing trend in incidence of TSR.

Figure 3: Track Geometry Related TSRs – All Pricing Zones[1]



[1] *Coal Up Direction Only with TSR PZ1 <80km; PZ2 <60km; PZ3 <60km*

2.5 Turnout Steel Component Replacement

Replacement of worn and defective turnout rail components reduces the risk of turnout rail component failure and therefore potential derailment. Sites are identified through inspection by field staff based on a condition assessment. Data for the upcoming year is submitted showing individual turnout component requirements. Individual component performance varies due to track formation, design issues, drainage and tonnage. The scope of this activity is not steady from year to year and correlates to various rates of asset wear and the complexity of the particular location. Unit costs of turnout components also vary considerably creating unit rate anomalies in the delivery of this activity.

Pricing Zone 1 2018 costs increased $0.7m compared to 2017. ARTC is now undertaking component grinding at the time of replacement in order to extend the life of the Turnout steel components and subsequently reduce the frequency of replacement. Pricing Zone 3 costs decreased by $0.6m compared to 2017 due to the timing of the maintenance cycle for turnout components that were replaced as part of the 30TAL project.

2.6 Rail Defect Removal

Rail defect removal is the removal of surface or internal defects through replacing and welding in a new length of rail, generally 6-8 metres in length. Defects are identified through visual or ultrasonic inspections. Increased tonnage, which the Hunter Valley (HV) Network has experienced over the past few years, has an adverse impact on track formation and consequently results in additional track defects requiring attention to maintain track reliability.

Rail defect removal costs in 2018 increased $0.5m compared with 2017 across the network. This increase was largely impacted by a $0.3m increase in Pricing Zone 3 arising from track alignment issues between Ardglen and Kankool.

2.7 Steel Bridge Maintenance

Steel bridge maintenance relates to a range of repair and maintenance activities designed to maintain the operation and safety of steel bridge structures. Steel bridge maintenance does not have a steady year on year spend rate as it is dependent on condition and scope specific to the site requiring work. These works can range from minor to significant projects depending on the componentry being repaired.

The overall cost increase of $0.9m in 2018 in steel bridge maintenance related primarily to works in Pricing Zone 1 which saw an increase of $2.9m compared to 2017. Major maintenance works were undertaken on the Glennies Creek Bridge to maintain safety of the structure following the identification of cracks in the steel girders known as “stringers”. The replacement of the Steel stringers is an ongoing focus for maintenance which is planned to be completed in 2020. Pricing Zones 2 and 3 experienced a combined fall in costs of $2m impacted by the completion of works at The Gap, Quirindi and Jacob & Joseph Bridges in Pricing Zone 3 in 2017.

2.8 Turnout Resurfacing

Turnout resurfacing (tamping) restores the geometric parameters of top, line and superelevation by mechanised on-track machinery. Turnouts are generally tamped on a cycle which are derived from tonnage and turnout performance, with factors such as ineffective drainage and turnout geometric design also having an impact. Some turnouts have a high tamping requirement, for example three times a year for high traffic areas around Hexham, while other turnouts may only require a tamp every two years.

Decreased scope was performed during 2018 leading to a $1.4m decrease in cost compared to 2017. This decrease was primarily attributable to Pricing Zone 1 where 220 tamps where performed compared to 313 tamps in 2017, with a decrease in cost of $0.8m for this zone. Pricing Zone 2 remained consistent with the prior year, whilst Pricing Zone 3 costs decreased $0.4m following completion of turnout resurfacing works in the Chilcotts Creek and Kankool areas in 2017.

2.9 Ballast Undercutting

Ballast undercutting addresses localised ballast defects on track sections (typically less than 100m in length), and involves a small crew using an excavator and cutter bar to remove a mud-hole and/or area of highly fouled ballast which impedes drainage. Ballast undercutting provides a short-term solution to mud hole removal where the track condition does not require a full track reconditioning.

Combined Ballast Undercutting costs decreased $1.2m as compared to 2017. Pricing Zone 1 costs decreased $2.0m as significant works were undertaken in the prior year to address track geometry issues and remove TSR at Port Waratah, Kooragang, Sandgate and Maitland. This decrease was partially offset by a $0.2m increase in Pricing Zone 2 and a $0.6m increase in Pricing Zone 3.

2.10 Turnout Grinding

Turnout grinding is the periodic grinding of turnouts to manage the wheel/rail interface and minimise whole of life costs. Turnout components interface closely with signalling assets and can impact network reliability if left in poor condition. In determining the optimal grinding frequency, a detailed assessment and review of turnout performance is undertaken annually for all turnouts. Frequency is determined by consideration of factors including tonnage, location and condition.

Turnout grinding costs in 2018 remained consistent with 2017 at the network level. Pricing Zone 1 experienced a reduction in cost of $0.3m reflecting significant works undertaken in the prior year at Sandgate to Thornton and Drayton Junctions. Pricing Zone 3 saw an increase of $0.3m arising from works undertaken in the Chillcotts Creek to Kankool and Gunnedah regions.

3. LOSS ON DISPOSALS

Section 6 of the 2018 Compliance Submission sets out the process for determining the loss on disposal for assets being removed from the regulated asset base (RAB). Table 4 below summarises the loss on disposal amounts by zone relating to Major Project works and Corridor Capital projects.

Table 4: 2018 Disposals $

Major Projects	Written Down RAB Value	Net Disposal Proceeds	Net Loss on Disposal
Pricing Zone 1	-	-	-
Pricing Zone 2	-	-	-
Pricing Zone 3	-	-	-
Total	**-**	**-**	**-**

Corridor Capital	Written Down RAB Value	Net Disposal Proceeds	Net Loss on Disposal
Pricing Zone 1	8,847,179	387,710	8,459,468
Pricing Zone 2	2,269,924	216,835	2,053,090
Pricing Zone 3	1,559,047	40,945	1,518,102
Total	**12,676,150**	**645,490**	**12,030,660**

All Disposals	Written Down RAB Value	Net Disposal Proceeds	Net Loss on Disposal
Pricing Zone 1	8,847,179	387,710	8,459,468
Pricing Zone 2	2,269,924	216,835	2,053,090
Pricing Zone 3	1,559,047	40,945	1,518,102
Total	**12,676,150**	**645,490**	**12,030,660**

Disposals increased by $4.5m on prior year, primarily due to weighbridge disposals, track strengthening and rerailing activity in Pricing Zones 1 and 2.

In Zone 1, three weighbridges were removed at Tarro, Port Waratah Storage Road No. 2 and Scholey Street Junction under the HV Weighbridge Strategy and track strengthening activity was undertaken to address formation failures. These activities accounted for $2.6m of Zone 1 disposal costs.

Overall network rerailing scope decreased compared to 2017 as the Pricing Zone 3 30TAL rerailing program was largely completed in the prior year. This $1.2m decrease in disposals in Pricing Zone 3 was partially offset by an increase of $1.4m in Pricing Zone 2 where rerailing scope increased. In Pricing Zone 1 rerailing scope decreased compared to 2017, however higher written down values reflecting the more frequent replacement of rail required in these areas drove an increase in disposal value. Increase in the frequency of rerailing is mainly due to the track geometry and formation in some locations, or increased volumes and heavier rail traffic causing higher wear rates. Higher wear rates cause rail to reach condemning limits in a shorter period resulting in the need to rerail more frequently. In 2018, rerailing accounted for $4.2m of disposals in Zone 1.

Disposal proceeds and asset recovery rates vary across years and Pricing Zones due to several factors including:

- The location and nature of the RAB asset being disposed and the RAB written down value attached to the applicable Segment;
- The nature of the capital projects/activities and scope being undertaken in each year;
- The nature of the asset or material being disposed of (e.g. rerailing and turnout projects have scrap rail, whilst concrete culverts have unsaleable and non-reusable scrap materials); and
- The market value for the scrap material.

For the 2018 calendar year, the overall asset recovery rate slightly decreased by 1.5% on the prior year. This was largely due to the nature of the capital projects and activities undertaken during the year, with the overall scope of network rerailing activities, the driver of scrap rail recovery, decreasing compared to 2017. While arm's length market scrap steel price per tonne increased from an average of $250 in 2017 to $266 in 2018, the quantity of scrap steel disposed decreased from approximately 3,058 tonnes in 2017 to 2,422 tonnes in 2018.

4. EXPENSED PROJECT COSTS

Expensed projects reflect the development cost of projects (as approved by the RCG) that have since been determined will no longer be required. There were no projects expensed during 2018.

5. NON-MAINTENANCE OPERATING ACTIVITIES

Non-maintenance operating activities are categorised as Network Control, Business Unit Management or Corporate Overheads.

In 2018 the basis for the allocation of Non-Segment Specific costs was Schedule I. However, Schedule I was introduced on 1 July 2017. Accordingly, the allocation method for 2017 falls into two periods:

- 1 January 2017 to 30 June 2017 (2017 H1) applied according to the cost allocation method set out in section 4.6 of the HVAU as varied 23 November 2016; and
- 1 July 2017 to 31 December 2017 (2017 H2) applied according to the cost allocation methodology prescribed in section 4.6 and Schedule I of the 2017 HVAU Variation.

Table 5 sets out a comparison of the costs for each of the non-maintenance operating cost categories. To allow for a like for like comparison with prior year information, ARTC has also restated 2017 non-maintenance cost figures on the basis that Schedule I allocators were applied for the full year period from 1 January 2017 to 31 December 2017.

The movements in non-maintenance operating costs between 2017 and 2018 are driven by a combination of:

- The change in the relative values for each allocator between Hunter Valley and Interstate;
- Increases or decreases in the underlying costs associated with Network Control, Business Unit Management or Corporate Overhead activities

Table 5: Non-Maintenance Operating Costs $'000

	2017 as lodged (a)	2017 restated (b)	2018 (c)	Variance % (c)/(b)-1
Network Control	14,149	14,239	15,778	10.8%
Business Unit Management	29,781	29,982	34,145	13.9%
Corporate Overheads	18,291	20,181	22,589	11.9%
Total	**62,221**	**64,402**	**72,512**	**12.6%**

The drivers for the cost movements are considered further in the following sections.

6. NETWORK CONTROL

Network control includes costs associated with ARTC's Network Control Centre North (located at Broadmeadow). The control centre controls the train movements for the entire Hunter Valley business unit including the coal network and non-coal segments that adjoin the coal network. The network is controlled by a series of 'Network Control Boards' (NC Boards) which manage defined areas. Twelve of the thirteen NC Boards are required to be operationally staffed 24 hours per day, 365 days a year.

Network control expenses include labour and materials associated with the delivery of the following functions:

- train control and signalling both on the main line and within the coal terminals;
- train planning and programming;
- operations and operational customer interface;
- incident management; and
- communication costs.

Network Control costs increased $1.6m compared to 2017 (as lodged) and $1.5m against 2017 restated.

The movement in Network Control costs are primarily driven by:

- $1.1m in new operating costs relating to the ongoing ARTC Network Control Optimisation (ANCO) Project. As project implementation progressed in 2018, licence fees to support the hosting and integration of external data sources needed to support the live ANCO dynamic operating environment within the existing ARTC IT system began to be incurred. As mentioned in prior submissions, new operating costs related to the execution of the ANCO project will continue, costs to date are in line with project progress reporting.

- $0.4m increase in labour costs. In January 2017 a 4 team 12-hour staff roster was implemented for Network Controllers. Following feedback from employees and the Office of the National Rail Safety Regulator (ONRSR) since implementation and throughout 2018, in January 2019 the roster was amended to a 5 team 8-hour roster addressing key safety and fatigue concerns. During consultation and implementation of the new roster, additional staff were employed in preparation for the new roster implementation. Costs of this additional headcount was offset by reduction in overtime and sick leave in the same period resulting in an overall $0.4mil increase in labour costs.

7. BUSINESS UNIT MANAGEMENT

Business unit management costs comprise Hunter Valley direct costs and encompasses four functions:

- Hunter Valley Customer Service and Operations;
- Hunter Valley Asset Delivery, including the Provisioning Centres;
- Hunter Valley Asset Development; and
- Hunter Valley Management and Support.

A change in management accountabilities for the General Managers was implemented in November 2018 to provide a central interface point for customers and supply chain stakeholders and to streamline reporting lines for asset and train operation management. The Network Integration team was formed at the same time, post a successful trial of the function in 2017, to permanently embed the optimised integrated planning of maintenance activities with train operations. This revised structure did not impact headcount, costs or change the core functional activities of the business unit.

Business Unit Management costs increased $4.4m compared to 2017 (as lodged) and $4.2m against 2017 restated.

The major drivers of the cost movements are:

- $1.2m of costs relating to activities to support the identification and implementation of operational and capital projects identified through the Capacity Fastrack Initiative. The program was separated into 3 phases; Exploit, Extend, Build, with each phase focused on defining pathways to exploit existing capacity in tandem with further capacity development options to enable the immediate, near and longer term growth of network capacity west of Muswellbrook to meet the forecasted demand.

  To support the process ARTC procured, analysed and provided tailored feedback on individual network performance to each rain haulage operator during the period. This feedback resulted in agreed operational improvements to be implemented by rail haulage operators within agreed timeframes. Professional consultants were engaged to scope and develop project plans to support the Exploit phase. Numerous idea generation sessions were held with rail haulage operators and coal chain stakeholders which resulted in 25 prioritised elements being identified that would provide the potential for ~4mtpa improvement in the coal chain throughput. Following consultation with the oversight committee and RCG these were narrowed to three key improvement projects:

• Improve response times to failures on the network – development of response plan

• Improving sectional run times – Improved Train Performance through minor network improvements

• Muswellbrook Junction Train Flow – Improved inter arrival time of trains leading into and through Muswellbrook Junction

Activities for the Extend and Build phases focused on analysis, investigation and pre-feasibility work to identify the ability of existing infrastructure to allow increases in train speed and the running of alternate longer heavier train configurations that could haul more tonnage per path, as well as the capacity projects that would be required to enable the longer term uplift in volumes being forecasted by customers. This work resulted in a mix of both operational and capital projects being put to RCG for consideration and a program of implementation that continued into future periods.

- $0.2m increase in additional resourcing to assist with possession planning. Given the increased volumes forecasted additional focus was given to planning adequate maintenance windows without compromising track availability and throughput opportunities.

- $0.7m of costs were incurred in 2018 relating to professional fees for the continual implementation of the Asset Management Improvement Project (AMIP). The work involves the incorporation of existing data and workflows to a centralised enterprise asset management system which will enable improved ability to view infrastructure condition and plan, schedule, monitor and record required maintenance activities. This project will continue to roll out across multiple years and contribute to improved reliability outcomes over time.

- $0.5m of professional costs to secure long term outsourced rail grinding contract. ARTC sought input from the market for a step change in rail grinding productivity in order to minimise track time, maximise quality and reduce operational costs. By securing the 120 Stone machine technology, ARTC has made the move towards a single pass grinding strategy (where possible) in order to reduce network capacity consumed by this infrastructure maintenance activity. The upgraded technology is anticipated to result in a 30% increase in productivity with fewer passes and an improved surface finish which reduces wheel / rail noise. The flexibility and power available in the new grinder results in a higher quality finished product at a lower unit cost per KM ground. ARTC also implemented a mix of fixed and variable costs within the services contract to maximise savings as productivity increases (via reduced grinding shifts).

- $0.3m increase in costs to resource the ongoing monitoring and response to community engagement activities. In the prior year a 24/7 Enviroline community enquiry service commenced and improved guidelines were enacted targeting community notifications required for closedown works. This change opened the line of communication between ARTC and the wider Hunter Valley community improving the responsiveness to community concerns raised. During 2018 this process evolved, systems were enhanced to support the sustainable management and response to the enquiries now being received. Given ARTC's footprint across these communities, it plays a key role as a representative of the Hunter Valley coal industry, and community engagement is a key component in supporting ARTC's social licence to operate and therefore the licence of the wider Hunter Valley coal chain.

- $0.3m increase being the full year impact of the transfer of HV property costs to the business unit in December 17 as noted in 2017 Compliance submission.

- Lower non-coal GTK allocator values driven by lower grain volumes as a result of the drought saw an $0.7m increase in the share of costs being allocated to the Network.

The balance of the cost movements is attributed to minor cost movements and annual salary increases across various business unit activities.

8. CORPORATE OVERHEADS

Corporate overheads include costs associated with the following ARTC wide functions:

- Executive;
- Finance;
- People;
- Corporate Services and Safety; and
- Strategy.

Corporate Overhead costs increased by $4.3M compared to 2017 (as lodged) and increased by $2.4M against 2017 restated.

Major drivers for the cost movement included:

- $0.9m of costs relating to Procurement. In April 2018 ARTC implemented a new procurement manual and associated procedures company wide. The updated manual documented refreshed guidelines for the engagement of suppliers, established a Procurement Threshold Matrix which set out delegations and approval pathways based on anticipated contract values, and set a renewed standard for articulating and demonstrating value for money throughout the procurement process. In addition to the manual, a suite of process maps and reference guides were developed to assist with the implementation and detailed personnel training was undertaken throughout the year to embed the new processes across the business.

  Further to this work in June 2018 ARTC also commenced a further extensive Procurement Transformation Project (PTP), a multiyear large-scale functional transformation covering end to end supply chain management across the organisation. As part of this, a disaggregation of the corporate Procurement function into specialist functional teams was enacted in December 2018 and recruiting commenced in new year. ARTC has always had significant expenditure requirements to support its primary objective of ensuring the safe and effective operation of the network and delivery of infrastructure projects that meet the capacity requirements of customers. The PTP focus is to improve current systems, documentation and compliance monitoring to centralise procurement activities to capitalise on economies of scale and value for money outcomes for stakeholders. Activities in this area will be ongoing over the next few years.

- $0.3m increase in Information Technology (IT) related costs. ARTC's IT delivery units which sit within the Corporate Services and Safety function were restructured during the year. The reorganisation was triggered to respond to the heightened risk of ARTC's critical infrastructure and systems being subject to critical incidents (cyber-attack, weather/fire incidents, catastrophic failure etc) and to build the capability and resilience of the entity to respond, manage and recover to business as usual operations in the occurrence of such an event. This focus and spend will be ongoing as the needs of the business are assessed and strategies implemented to manage the ongoing risk profile.
- $0.3m increase in Risk and Safety spend. In 2017 ARTC launched its three year "Pathway to Zero" Safety Strategy as part of its continued focus on the core organisation value of No Harm. As part of this a reorganisation of the structure and processes of the corporate team was embedded to better support the management of ARTC's safety management system and coordination of the internal safety audit program to sustain the ongoing implementation of the overall strategy within the individual business units.
- $0.4m of Marketing and Communication costs relating to ARTC's corporate branding and promotional activities to favourably position ARTC reputationally in wider community context. ARTC's standing within the Hunter Valley community is a key consideration of our licence to operate, and by extension, our customers.
- $0.2m increase in Plant Charges due to the timing difference between financial and calendar year plant recoveries.
- $0.3m decrease in Hunter Valley insurance costs due to favourable insurance market conditions at the time of reassessment and renegotiation of insurance.
- $0.3m decrease being the full year impact of the transfer of HV property costs to the business unit in December 17 as noted in 2017 Compliance submission.
- $0.5m increase due to the impact of lower non-Hunter Valley allocator values which has the effect of increasing the share of costs being allocated to the Network.

The balance of the cost movements is attributed to minor cost movements and annual salary increases across various business unit activities.

9. INCREMENTAL COSTS

Incremental costs have been calculated on the basis set out by WIK Consult[1] as approved by the ACCC in its 2013 Final Determinations and subsequent Compliance Assessment decisions. Table 6 sets out the incremental charges attracted by various groups of traffic within the Hunter Valley network.

Table 6: 2018 Incremental Costs $'000

	Maintenance and Loss on Disposal	Capital Charges	Total
Constrained Group of Mines	37,049	70,892	107,942
Pricing Zone 3 Traffics	34,095	16,362	50,457
Other Unconstrained Coal	809	-	809
Non-Coal Traffics	2,736	-	2,736
Total	**74,689**	**87,254**	**161,943**

9.1 Pricing Zone 3 Incremental Costs in Pricing Zone 1

In the interests of transparency, Table 7 sets out the Pricing Zone 3 incremental costs in Pricing Zones 1 and 3. Note that under the ACCC approved methodology, incremental capital charges are not applied in Pricing Zones 2 or 3.

Table 7: Pricing Zone 3 Incremental Costs $'000

	Maintenance and Loss on Disposal	Capital Charges	Total
Pricing Zone 1	6,504	16,362	22,866
Pricing Zone 3	27,591	-	27,591
Total	**34,095**	**16,362**	**50,457**

10. NON-COAL ALLOCATION

Under the HVAU, all traffic including non-coal traffics are required to contribute revenue sufficient to meet the Floor Limit. The Floor Limit as applies to non-coal traffics is the incremental maintenance cost attributable to them based on GTK or Train Km, as applicable to each maintenance activity.

For 2018 the non-coal incremental maintenance cost attributed to non-coal traffics was $2.7m. This amount is deducted from the costs that are allocated between coal traffics in the Hunter Valley Network, as shown in Table 2. The non-coal allocation has declined 48% from the prior year due to the reduction in non-coal GTKs driven by drought conditions in the region that saw volumes of grain traffic on the network dramatically decline during this period.

[1] Report available as a download from the ACCC website at https://www.accc.gov.au/system/files/WIK-Consult%20T%C3%9CV%20-%20Consultant%20report%20for%202015%20Annual%20Compliance%20%28PUBLIC%29.pdf