WestNet Rail

Report for Review of Unit Prices

for Clause 9 Ceiling Price Review

October 2008

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1. Introduction

WestNet Rail commissioned GHD to undertake an update of the 2006 general review of unit prices that underpin the Floor and Ceiling calculations as prescribed under the provisions of the Railway Access Code in Western Australia. The 2006 review was presented in WorleyParsons Report 501/09515/0.

Track infrastructure costs are required for the typical routes within WestNet Rail network comprising the four primary routes considered in the *Pricing of Rail Infrastructure November 2002* (the *GHD Report*) and *Determination of Floor and Ceiling Costs to apply to WestNet Rail* produced by The Western Australian Independent Rail Access Regulator in September 2003 (the *Initial Determination*).

- Forrestfield to Kalgoorlie
- Kalgoorlie to Leonora
- Kalgoorlie to Esperance
- Kwinana to Bunbury Inner Harbour

Additionally, WestNet's cost model includes unit costs for other routes that typically have lighter load carrying capacity and hence different construction components; these lines are identified as:

- Brunswick to Premier
- Grain line 16 tal
- Grain line 19 tal

2. Scope of Works

The following elements were included in the brief to the previous WorleyParsons commission:-

- Summarise, from previous determinations, the specifications for track, signalling and communications infrastructure
- Identify the cost elements and appropriate unit rate categorisations
- Identify targeted suppliers/contractors and provide brief to allow understanding of the requirements
- Receive the suppliers and contractors quotes/tenders, make any adjustments for identified changes to material supply or availability.
- Misunderstandings or incompleteness in their quotes through consultation with them
- Compile the best offers to provide a "market tested" best result
- Report

Specifications for track, signalling and communications infrastructure remains unchanged from the initial determination approved by the Economic Regulation Authority (ERA) in September 2003.

Assumptions to be adopted during the unit rate review were provided by WestNet as follows:

- Adopt MEERA (Modern Equivalent Replacement Asset), i.e. replacement value of current design standards of existing infrastructure.
- Adopt current best practices for construction
- Adopt a "Greenfield" approach for all infrastructure construction. Work is undertaken free of all rail traffic
- Adopt the most economic construction package to deliver the lowest economical costs and pricing discounts recognising economies of scale
- Allowance for wastage
- Transport of materials to site
- Engineering and construction overheads are to be separately defined

3. Pricing Methodology

3.1 Principles Adopted

WestNet provided copies of previous cost reviews carried out by GHD in November 2002 and recorded in document *Pricing of Rail Infrastructure November 2002* (the *GHD Report*). This document provided some detail of specifications used and identified some of the assumptions that were made.

Additionally the Determination of Floor and Ceiling Costs to apply to WestNet Rail produced by the Western Australian Independent Rail Access Regulator in September 2003 (the *Initial Determination*), was reviewed to note the final unit rates adopted and used in the *Initial Determination.*

Spreadsheets of pricing schedules provided by WestNet Rail identified other unit costs used for lighter load capacity lines not included in the *GHD report* or the *Initial Determination.*

3.2 Methodology

GHD has updated the figures in the pricing schedules prepared by WorleyParsons in 2006. Their methodology is restated below for clarity:

For consistency WestNet requested that minimal changes were made to any specification or parameters agreed in the *Initial Determination*; therefore, WorleyParsons have utilised the specifications and methodologies identified in the *GHD Report* or the *Initial Determination.* Where differences have been noted between the two documents, then the information contained in the *Initial Determination* took precedence. For the items identified on WestNet pricing schedules that do not appear in either the *GHD Report* or *The Initial Determination,* the descriptions from WestNet pricing schedules have been used.

Where items are readily available and specifications well-defined, component suppliers were identified and contacted. Suppliers were briefed on the requirements for the costing exercise and made aware of the potential (theoretical) quantities required; so that current market rates could be obtained and that they reflected the economies of scale for the amounts required. These details are further discussed under individual unit cost section.

Where items or services are not specifically defined, have very site specific issues that have to be considered or where the requirements could be interpreted differently to that discussed in the *GHD Report* or the *Initial Determination*, then suitable uplift escalation factors were researched and applied.

Unless otherwise stated the unit costs stated in this report are March 2006 costs. The unit costs proposed have been confirmed through interaction with suppliers, contractors, industry contacts and with various sources and other projects to give a high level of certainty that the values provided are realistic and accurately reflect the current market rates.

3.3 Unit Costs

3.3.1 Rail

Supply

The specification for rail was taken from the *Initial Determination* approved Modern Equivalent Asset (MEA) table p18.

Table 1 MEA Specification

MEA Specification	Line			
	Forrestfield to Kalgoorlie (EGR)	Kalgoorlie to Leonora	Kalgoorlie to Esperance	Kwinana to Bunbury Inner Harbour (SWM)
Rail	60 kg/m	50 kg/m	50 kg/m	50 kg/m

Supply length of 27.5m and delivery to Midland for flashbutt welding into 110m lengths is the same as that identified in the *Initial Determination.*

Unit rates for rail were obtained from OneSteel for AS50 (50kg/m) and AS60 (60kg/m) Plain Carbon Rail have been used. The costs are for 27.5m lengths delivered to the flash butt welding facility at Midland. OneSteel provided the costs for the 2002 review; this therefore gives confidence that this is an accurate reflection of the cost differences between 2002 and 2008. We have also investigated the likelihood of sourcing rail from China. This recently occurred in the construction of the Fortescue Metals Group rail line. An agent of a Chinese supplier, based in Sydney, reported that the market had considerably tightened owing to the amount of Chinese work and the earthquake in Sichuan, and that their supplier "could not beat $1,500" for 50kg/m and 60kg/m rail. In addition, we also understand that while close to the Australian specification, the Chinese supply is not compliant in chemical composition. Therefore we have used the OneSteel rates as the most robustly verifiable rate.

In addition to the rail MEA specifications identified in the *Initial Determination*, costs were obtained for the lighter (41 kg/m) weight rail identified in WestNet's existing pricing schedules.

Table 2 Rail Costs

Description	Unit	Cost
41 kg/m	tonne	$1600
50 kg/m- AS50 Plain Carbon Steel	tonne	$1500
60 kg/m - AS60 Plain Carbon Steel	tonne	$1400

Rail Welding

Rail is supplied from the manufacturer in 27.5m lengths and the railway construction process uses 110m lengths. The construction length rails are produced using flashbutt welding technique, typically at a facility at Midland. Each 110m length requires 3 flashbutt welds. The operator of the flashbutt welding facility at Midland has provided unit rates for this process. Site welds to join the 110m lengths are typically made using the Thermit welding process and these rates have been included in the tracklaying costs. The actual logistics of constructing the network from greenfields were considered to be adequately addressed by this methodology.

Table 3 Flashbutt Weld

Description	Unit	Cost
Flashbutt Weld	Each	$400

3.4 Sleepers

Unit costs for sleepers have been obtained for a number of types of sleeper that may be used on the WestNet infrastructure. It should be noted that the use of timber sleepers is becoming limited in WA due to availability of supply and cost when compared with concrete equivalent; costs for all options have been obtained so that comparisons can be made.

The unit material rates obtained for timber sleepers related to recent orders for relatively small quantities and do not represent an accurate depiction of the rates likely to be obtained for very large orders typically associated with greenfields network construction. Consequently we have discounted those rates by 5%. Further, it is pertinent to highlight that we believe it highly unlikely that timber sleeper supply could meet the "network replacement "criteria" of large track lengths, and that a more relevant MEA would consist of steel or concrete sleepers.

Table 4 Sleepers

MEA Specification from Initial Determination	Line			
	Forrestfield to Kalgoorlie (EGR)	Kalgoorlie to Leonora	Kalgoorlie to Esperance	Kwinana to Bunbury Inner Harbour (SWM)
Gauge	Standard and Dual	Standard	Standard	Narrow
Sleepers	Concrete	Timber and 1 in 4 steel	Timber and 1 in 2 steel	concrete

In addition to the sleeper MEA specifications identified in the *Initial Determination*, costs were obtained for other sleepers identified in WestNet's existing pricing schedules, which include narrow and dual gauge steel and timber.

Concrete and Steel Sleepers

Sleeper costs were obtained from suppliers according to the construction material. Order quantities discussed with suppliers were for minimum 100km of track, in the order of 160,000 to 170,000 sleepers.

Table 5 Sleeper Costs

Description	Unit	Supplier	Cost $	Notes
Concrete NG	each	Hume	$120	Delivered to Perth Metro includes rail fasteners
Concrete SG	each	Hume	$155	Delivered to Perth Metro includes rail fasteners
Concrete DG	each	Rocla	$210	Delivered to Perth Metro includes rail fasteners
Steel NG M7.5 non-insulated system	each	OneSteel	$88	Delivered to Midland includes rail fasteners
Steel NG M8.5 insulated system	each	OneSteel	$110	Delivered to Midland includes rail fasteners
Steel SG M7.5 non-insulated system	each	OneSteel	$102	Delivered to Midland includes rail fasteners
Steel SG M8.5 insulated system	each	OneSteel	$123	Delivered to Midland includes rail fasteners
Steel DG M7.5 non-insulated system	each	OneSteel	$198	Delivered to Midland includes rail fasteners
Steel DG M8.5 insulated system	each	OneSteel	$210	Delivered to Midland includes rail fasteners

We noted a substantial increase in SG concrete sleeper cost and sought clarification from the suppliers – Humes in Perth. The significant increase in concrete sleeper costs from the 2006 Review of Unit Prices has been caused by rapid and large increases in material costs, particularly for the fasteners and reinforcing steel prestressing strands.

The considerable difference in cost between single gauge and dual gauge steel sleepers was discussed with the supplier, who confirmed that the dual gauge version requires a significant amount of different manufacturing techniques to complete the fabrication; particularly due to the welding of rail support plates. Prices for dual gauge have reduced from that previously supplied.

Timber Sleepers

Concrete and steel sleeper systems are supplied with fastening components and track fixing jewellery; as part of this assembly is incorporated in the sleeper manufacturing process. For timber sleepers, costs for fastening system have been obtained separately and applied to the timber sleepers to produce an all inclusive cost.

Table 6 Timber Sleepers

Description	Unit	Supplier	Cost	Notes
Assemblies				
Timber NG	each	Recent WestNet purchase for timber + fasteners from Pandrol	$98.00	16 TAL assumes x2 baseplates, x4 lockspikes and x4 rail clips
Timber SG	each	Recent John Holland purchase for timber + fasteners from Pandrol	$108.00	19 TAL assumes x2 baseplates, x4 lockspikes and x4 rail clips
Timber DG	each	Recent John Holland purchase for timber + fasteners from Pandrol	$144.50	19 TAL assumes x3 baseplates, x6 lockspikes and x6 rail clips
Components				
Timber NG	each	Recent John Holland purchase for timber	$55.00	16 TAL
Timber SG	each	Recent WestNet purchase for timber	$65.00	19 TAL
Baseplate	each	Pandrol	$19.00	Usually x2 per sleeper
Lockspike	each	Pandrol	$1.15	Usually x4 per sleeper
Rail Clip	each	Pandrol	$2.60	Usually x4 per sleeper

3.5 Ballast

The MEA specification for ballast depth is as shown in the table and the depths were used to estimate ballast quantities.

Table 7 Ballast

Ballast MEA Specification	Line			
	Forrestfield to Kalgoorlie (EGR)	Kalgoorlie to Leonora	Kalgoorlie to Esperance	Kwinana to Bunbury Inner Harbour (SWM)
Ballast depth (mm)	300	200	250	250

Ballast suppliers were contacted to obtain market rates for supply of ballast, assuming that the minimum order would be 300,000t. All suppliers queried the delivery arrangements, as this could have a significant impact on the cost of their product. As specific delivery locations for construction sites could vary considerably, costs were obtained for supply rates at the quarry. A number of quarry locations were contacted to obtain strategic location points across the network; assuming that ballast would be transported up 250km (assumed average 150km) from the supply point to the construction worksite.

Table 8 Ballast

Quarry Location	Unit	Ex Quarry Cost $	Assumed Construction Sites Supplied
Perth metro	per tonne	34.00	SWM and EGR (part)
Bunbury	per tonne	32.00	SWM
Kalgoorlie	per tonne	27.00	EGR (part), Leonora
Esperance	per tonne	50.00	Esperance

For the purposes of haulage; **$0.09 per tonne per km** is considered a reasonable and acceptable value to adopt, given that the assumed average transport distance would be 150km from the nearest supply quarry, this equates to an average **$12/t** haulage cost.

3.5.1 Turnouts

The specification for turnouts has been taken from the *GHD report,* as the *Initial Determination* does not specifically identify a MEA for these components. Assuming the *GHD report* configuration for turnouts also provides consistency for comparing unit costs changes between 2002 and 2008.

Table 9 Turnout

Turnout Specification (GHD Report Section 8	Line			
	Forrestfield to Kalgoorlie (EGR)	Kalgoorlie to Leonora	Kalgoorlie to Esperance	Kwinana to Bunbury Inner Harbour (SWM)
Narrow gauge 1:12 60 kg rail tangential switch blades on concrete sleeper	✘	✘	✓	✓
Standard gauge 1:12 60 kg rail tangential switch blades on concrete sleeper	✓	✓	✓	✘
Dual gauge 1:16 60 kg rail tangential switch blades on concrete sleeper	✓	✘	✘	✘

Using the same suppliers as referenced in the *GHD Report,* costs for manufacture and delivery of turnouts to Perth were obtained. Installation costs were also supplied from the same source as the *GHD Report.*

Table 10 Turnout Type

Turnout Type	Unit	Supply Cost Delivered to Perth	Installation Cost
Narrow gauge 1:12 60 kg rail tangential switch blades on concrete sleeper	each	Vossloh 146,650.00	John Holland $115,000
Standard gauge 1:12 60 kg rail tangential switch blades on concrete sleeper	each	Vossloh $166,250.00	John Holland $115,000
Dual gauge 1:16 60 kg rail tangential switch blades on concrete sleeper	each	Vossloh $359,950.00	John Holland $130,000

In addition to the turnout MEA specifications identified in the *GHD Report*, costs were obtained for other turnout combinations identified in WestNet's existing pricing schedules.

Table 11 Other Turnout Combinations

Turnout Type	Unit	Supply Cost Delivered to Perth	Installation
Narrow gauge 1:12 60 kg rail tangential switch blades on timber sleeper	each	$146,650.00	$115,000
Standard gauge 1:12 60 kg rail tangential switch blades on timber sleeper	each	$166,250.00	$115,000
Dual gauge 1:16 60 kg rail tangential switch blades on timber sleeper	each	$359,500	$130,000
Narrow gauge 1:12 50 kg rail tangential switch blades on timber sleeper	each	$131,700	$115,000
Standard gauge 1:12 50 kg rail tangential switch blades on timber sleeper	each	$139,800	$115,000
Dual gauge 1:16 50 kg rail tangential switch blades on timber sleeper	each	$372,500	$115,000

3.5.2 Tracklaying

For this costing exercise the contractor that provided costs that were used in the *GHD report* was contacted again and asked to review and uplift the costs to reflect 2008 prices.

Costs were provided assuming the following extent of track laying works, to arrive at a per metre cost for each of the 4 primary routes under review. A greenfields site was assumed.

Extent of works:

- Transport rail and unload
- Place bottom ballast from stockpile
- Distribute sleepers from site stockpile
- Place and align sleepers
- Place rail from train and clip up sleepers
- Top Ballasting
- Tamping and regulating
- Welding and De-stressing
- Survey from control points

Table 12 Tracklaying

Track Laying – Cost per Single Track km	**Line**			
	Forrestfield to Kalgoorlie (EGR)	**Kalgoorlie to Leonora**	**Kalgoorlie to Esperance**	**Kwinana to Bunbury Inner Harbour (SWM)**
Narrow gauge cost per m	N/A	N/A	N/A	$132.45
Standard gauge cost per m	$146.20	$112.30	$112.30	N/A
Dual gauge cost per m	$168.55	N/A	N/A	N/A

3.5.3 Bridges

Bridges fall into the category identified in section 3.2 methodology, as being items that have individual site specific influences such as ground conditions, piling requirements, hydrology and geotechnical factors that significantly affect construction costs.

The method noted in the *GHD report* and adopted in the *Initial Determination,* created categories of bridge dependant on span and widths according to the number of tracks and gauge. The categorisation of bridges identified in the *GHD report* has been retained and an appropriate escalation factor investigated and applied to obtain 2008 cost rates.

A cost escalation factor was obtained from indexes published by the Australian Bureau of Statistics (ABS). The particular index that was utilised is contained in the ABS Producer Price Index; specifically *Index 6427 table 15 & 16 Road and Bridge construction (4121) Western Australia.* The percentage increase from March 2006 to June 2008 is **15.4%.**

Table 13 Bridge Construction

Bridge Category (from GHD Report)	**Rate per m² (WorleyParsons 2006 rate x 115.4%)**		
	Span	**SG and DG**	**NG**
		Single track 4 m wide	Twin track 8 m wide	Single track 3.6 wide
Simple	Up to 12 m	$3,116.03	$2,980.55	$2,980.55
Medium	12m to 20m	$3,793.43	$3,657.95	$3,522.47
Complex	Exceeds 20m	$4,606.31	$4,470.83	$4,335.35

3.5.4 Culverts

Supply Costs

The *GHD Report* identified a large number of culvert sizes for both Reinforced Concrete Boxes (RCB) and Reinforced Concrete Pipes (RCP). These tables of culvert sizes were adopted in the *Initial Determination.* This 2008 review has simplified the calculations in accordance with the Regulator's requirements and considers unit rates for three sizes – small, medium and large.

End Treatments

The *GHD Report* developed a model for determining end treatment quantities based on a function of culvert size and it calculates a volume of concrete required in m^3; this calculation is considered appropriate and reasonable and still applies and can be updated for 2008 costs by adjusting the value used for supply of in-situ reinforced concrete; *GHD Report* in 2002 arrived at a value of $1000/m. The indexed cost adopted in the 2006 Report was $1,174/m[1].

For consistency it is considered appropriate to adopt an escalation factor to arrive at 2008 costs. The particular index that was utilised is contained in the ABS Producer Price Index; *Index 6427 table 15 & 16 Non Building Construction (412) Western Australia*, The percentage increase from March 2006 to June 2008 is **15.4%.**

The cost that should be adopted for culvert end treatments in 2008 is **$1,354.80/m (dia/height of culvert)**.

[1] Incorrectly identified as cubic metres in the WorleyParsons report

Table 14 Culverts Unit Rates

Designation	Size height or diameter	Unit Rate 2008	End Treatments
Small	< 1000	$288.98	$880.62 (650mm ave.)
Medium	1000 - 2000	$1,255.27	$1,964.46 (1450mm ave.)
Large	> 2000	$2,853.21	$3,861.18 (2850mm ave.)

3.5.5 Level Crossings

Protection

Level crossing protection treatments have been costed separately from the overall signalling and communications supply and installation costs. Level crossing protection is a significant cost element and can be identified as a unit rate and applied through the costing model using identified population numbers.

For this costing review, the 4 typical level crossing protection configurations appearing in the last review have been uplifted from individual component costs and labour costs obtained from a number of organisation around Australia. On average, signal equipment costs and labour costs have escalated by 17.5% over the 2 year period since 2006.

Table 15 Level Crossing Protection

DC Westrak controlled with 2 flashing light masts with 2 pairs of back to back	$124,773.80
DC Westrak controlled with 2 flashing light masts with 2 pairs of back to back flashing lights with pair of boom gates	$175,773.40
Predictor controlled with 2 flashing light masts with 2 pairs of back to back flashing lights	$156,892.30
Predictor controlled with 2 flashing light masts with 2 pairs of back to back flashing lights with pair of boom gates	$226,612.70

Surfacing

Enquiries with WestNet staff noted that the level crossing surfacing recently has only utilised bitumen treatments, and that this is now the preferred treatment for all level crossing surfacing works. A current rate for bitumen was available for recent level crossing works; for the other surface treatment identified in the *GHD report*, an escalation factor has been used to arrive at equivalent 2006 costs. The escalation factor has been derived from ABS published indexes specifically; *Index 6427 table 15 & 16 Road and Bridge construction (4121) Western Australia*, The percentage increase from December 2002 to March 2006 is **17.4%.**

Table 16 Level Crossing Surfacing

	Unit	Rate	Comment
Bitumen	m^2	$85.00	2006 prices uplifted by 15.4%
Concrete	m^2	$101.61	2006 prices uplifted by 15.4%
Gravel	m^2	$81.29	2006 prices uplifted by 15.4%
Metal dust	m^2	$33.87	2006 prices uplifted by 15.4%
Where not available	m^2	$33.87	2006 prices uplifted by 15.4%
Rock ballast	m^2	$27.10	2006 prices uplifted by 15.4%
Timbered	m^2	$47.42	2006 prices uplifted by 15.4%

3.5.6 Earthworks

Significant work was carried out during the 2002 review to agree the MEA for earthworks and has been used for the 2008 assessment of earthworks costs.

It was noted that the *GHD report* discusses different rates for embankment ($17/$m^3$) and formation capping ($8.50/$m^2$) whilst the *Initial Determination* has adopted a single rate ($17/$m^3$) for earthworks including the formation-capping layer.

For the basis of the 2008 costing review the *GHD report* principles for earthworks costing were adopted to arrive at a rate for formation earthworks and rate for formation capping.

Typical specification supplied to contractor for costing:

- Height 1.5m (includes capping)
- Capping layer 0.23m
- Batters 1.5V to 1H

Table 17 Earthworks

Example (single track) earthworks volumes from *Initial Determination*	Equivalent 2006 rate	Equivalent per m^3 2006 rates	2008 costing per metre	Equivalent 2008 rate	Equivalent per m^3 2008 rates
$10m^3/m$ for formation	$19.23/$m^3$	$19.23/$m^3$	$207.11	$20.71/$m^3$	**$20.71/$m^3$**
$6m^2/m$ for capping	$9.62/$m^2$	$41.80/$m^3$	$62.16	$10.36/$m^2$	**$45.04/$m^3$**
Total per linear metre			**$269.27**		

It is proposed that the equivalent 2008 value is $\$20.71/m^3$ for formation earthworks and $\$45.04/m^3$ for capping layer and that these values are adopted for use in the 2008 calculations. The growth rates in earthworks are reflected by the CPI values from Rawlinsons Australian Construction Handbook 2008.

3.5.7 Miscellaneous Unit Costs

Signs

The *Initial Determination* accepted a nominal figure of $2000 per km for provision and installation of trackside signage. The actual specification for the signs is not clear and would be open to interpretation if actual costs were sought for the 2008 review. For consistency with the *Initial Determination* it is proposed to apply an escalation factor to the 2006 rate to arrive at an equivalent rate for use in 2008. On the basis that the work to install signs is equivalent to non building construction work the escalation factor has been derived from ABS published indexes specifically, *Index 6427 table 15 & 16 Non Building Construction (412) Western Australia*, The percentage increase from March 2006 to June 2008 is **15.4%.**

Table 18 Signs

	Unit	Rate	Comment
Trackside signage	km	$2709.60	2006 rate uplifted by 15.4%

Fencing

The *Initial Determination* accepted a nominal figure of $70,000 per track km for provision and installation of trackside fencing, where required for security or public safety. WestNet advise that the specification for the fencing is 1.8m chainlink with 3 strands barbed wire.

Table 19 Fencing

	Unit	Rate	Comment
1.8m chainlink with 3 strands barbed wire	Metre of fence	$39.50	$79,000 per track km.
Rawlinson Australian Construction Handbook 2008			

It is proposed that the published rate in Rawlinson Construction Handbook 2008 is a consistent, transparent and reliable source and it is proposed that this figure is adopted for the 2008 assessment.

Shunter's Walkway

The *Initial Determination* accepted a nominal figure of $3,150 per km for provision of shunter's walkways. As the detailed specification and dimensions that were used for the 2002 costing are unknown and for consistency with the *Initial Determination* it is proposed to apply an escalation factor the 2006 rate to arrive at an equivalent rate for use in 2008. On the basis that the work to construct shunter's walkway is equivalent to road construction work, the escalation factor has been derived from ABS published indexes specifically *Index 6427 table 15 & 16 Road and Bridge construction (4121) Western Australia*, The percentage increase from March 2006 to June 2008 is **15.4%.**

Table 20 Shunter's Walkway

	Unit	Rate	Comment
Shunter's walkway	Km	$4,270.00	2006 rate uplifted by 15.4%

Access Roads

The *Initial Determination* accepted a nominal figure of $5,000 per km for provision of access roads. As the detailed specification and dimensions that were used for the 2002 costing are unknown and for consistency with the *Initial Determination* it is proposed to apply an escalation factor to the 2006 rate to arrive at an equivalent rate for use in 2008. On the basis that the work to construct rail access road is equivalent to general road construction work, the escalation factor has been derived from ABS published indexes specifically *Index 6427 table 15 & 16 Road and Bridge construction (4121) Western Australia*, The percentage increase from March 2006 to June 2008 is **15.4%.**

Table 21 Access Roads

	Unit	Rate	Comment
Access roads	Km	$6774.00	2006 rate uplifted by 15.4%

3.5.8 Signalling and Communications

The signalling and communications system is a complex arrangement comprising many specialised components. The original approach by GHD in 2002 identified individual component items of the signalling and communications systems and carried out a bottom up assessment to arrive at the total replacement costs. The total costs were presented for a number of sections for each of the primary routes identified in the *Initial Determination.*

In 2006, WestNet proposed the existing 2002 costs be reviewed and an escalation factor determined and applied to arrive at 2006 signalling costs. Worley Parsons then identified Ansaldo STS Australia Pty Ltd (formerly Union Switch & Signal Pty Ltd) as a suitable contractor to provide the information and advice required. Union Switch & Signal was provided with details of the routes identified in the *Initial Determination* and the 2002 cost figures. Based on expertise and local knowledge, Union Switch & Signal supplied a breakdown of how costs had changed for each major activity in signalling and communications projects. As a matter of background these breakdowns and escalations were applied to the 2002 figures to obtain the equivalent 2006 costs.

For the 2008 assessment of signalling costs, GHD identified a series of major signalling contractors in Victoria, NSW and Queensland to provide the information and advice required. These contactors provided information on the current breakdown of the major activities in signalling and communications projects. With the increase of computer based technology, it was highlighted the engineering activity is 25% of the total cost, and materials being decreased to 35% of the total cost. The revised breakdown of total cost for current signalling and communications projects is provided in Table 22.

In terms of escalation factors, the labour (both engineering and trade) factor was the most significant escalation between 2006 and 2008. Signalling staff shortages have led to an 8% increase per annum in the engineering and installation costs between 2006 and 2008.

The escalation factors for materials, at 6% per annum, is influenced by fluctuations in the raw commodity market, as well as the fluctuations in the exchange rate for the Australian dollar. These factors were observed to have day-to-day variations, which had a major impact on the total project costs.

A summary of the escalation factors between 2006 and 2008 is provided in Table 23.

Table 22 Signalling and Communications – Breakdown of Total Cost

Area	Percentage
Engineering	25
Materials	35
Installation	30
Management	10
Total	**100**

Table 23 Signalling and Communications – Escalation Factors

Area	2006-2008
Engineering	16%
Materials	12%
Installation	16%
Management	12%

Applying these escalation factors to the 2006 costs arrives at the following results for equivalent 2008 costs for signalling and communications.

3.5.9 Table 24 2008 Costs for Signalling and Communications

Signalling					
Forrestfield to Kalgoorlie	**Section Length**	**2006 Signalling Cost**	**2008 Signalling Cost**	**Rate / km**	**Total % Change**
Forrestfield South Points to Midland	11	$3,909,713.71	$4,484,832.60	$407,712.05	14.71%
No 723 Points Midland to No 3 Points Millendon Junction	14	$6,404,342.97	$7,346,421.82	$524,744.42	14.71%
No 3 Points Millendon Junction to No 9 Points Tooday West	61	$8,799,007.59	$10,093,341.61	$165,464.62	14.71%
No 9 Points Tooday West to No 203 Points Avon Yard	26	$5,880,479.09	$6,745,497.56	$259,442.21	14.71%
No 203 Points Avon Yard to No 115 Points West Merredin	167	$25,356,506.76	$29,086,448.90	$174,170.35	14.71%
No 115 Points West Merredin to No 13 Points Koolyanobbing East	176	$22,400,968.80	$25,696,151.31	$146,000.86	14.71%
No 13 Points Koolyanobbing East to No 59 Points West Kalgoorlie	192	$15,886,563.36	$18,223,476.83	$94,913.94	14.71%
No 59 Points West Kalgoorlie to Network Boundary	6	$5,902,913.42	$6,771,231.98	$1,128,538.66	14.71%
Kalgoorlie to Leonora	**Section Length**	**Dec 2006 Signalling Cost**	**2008 Signalling Cost**	**Rate / km**	**Total % Change**
No 87 Points Kalgoorlie to Malcolm North Points	236	$1,742,875.74	$1,999,252.76	$8,471.41	14.71%
Malcolm North Points to Leonora WMC2	23	$802,105.06	$920,094.71	$40,004.12	14.71%
Kalgoorlie to Esperance	**Section Length**	**2006 Signalling Cost**	**2008 Signalling Cost**	**Rate / km**	**Total % Change**
West Kalgoorlie West to Hampton South Points	17	$3,948,188.39	$4,528,966.90	$266,409.82	14.71%
Hampton South Points to Kambalda South Points	38	$659,617.74	$756,647.51	$19,911.78	14.71%
Kambalda South Points to Salmon Gums North Points	227	$3,369,839.82	$3,865,543.26	$17,028.82	14.71%
Salmon Gums North Points to Esperance Start Esperance Port Siding	106	$1,963,922.28	$2,252,815.25	$21,252.97	14.71%
Kwinana to Bunbury Inner Harbour	**Section Length**	**2006 Signalling Cost**	**2008 Signalling Cost**	**Rate / km**	**Total % Change**
Kwinana (No 3 Facing Points) to Mundijong Junction Points	26	$8,049,527.72	$9,233,613.25	$355,138.97	14.71%
Mundijong Junction Points to Pinjarra (No 25 points)	43	$7,137,604.00	$8,187,545.55	$190,408.04	14.71%
Pinjarra to Pinjarra East	1	$488,468.94	$560,322.72	$560,322.72	14.71%

Kwinana to Bunbury Inner Harbour	Section Length	2006 Signalling Cost	2008 Signalling Cost	Rate / km	Total % Change
Pinjarra East to Alumina Junction	1.7	$672,109.38	$770,976.67	$453,515.69	14.71%
Pinjarra East to Pinjarra South	1	$183,640.44	$210,653.95	$210,653.95	14.71%
Pinjarra to Wagerup	33	$2,974,728.05	$3,412,310.55	$103,403.35	14.71%
Wagerup to Brunswick Junction	39	$9,863,151.32	$11,314,020.88	$290,103.10	14.71%
Brunswick Junction to Picton Junction	17	$4,000,717.91	$4,589,223.51	$269,954.32	14.71%
Picton Junction to Inner Harbour	4	$2,901,102.26	$3,327,854.40	$831,963.60	14.71%
Communications					
Forrestfield to Kalgoorlie	**Section Length**	**2006 Communications Cost**	**2008 Communications Cost**	**Rate / km**	**Total % Change**
Forrestfield South Points to Midland	11	$383,111.25	$439,466.91	$39,951.54	14.71%
No 723 Points Midland to No 3 Points Millendon Junction	14	$669,432.10	$767,905.56	$54,850.40	14.71%
No 3 Points Millendon Junction to No 9 Points Tooday West	61	$2,683,030.47	$3,077,704.25	$50,454.17	14.71%
No 9 Points Tooday West to No 203 Points Avon Yard	26	$1,131,125.91	$1,297,514.53	$49,904.41	14.71%
No 203 Points Avon Yard to No 115 Points West Merredin	167	$5,623,885.97	$6,451,159.60	$38,629.70	14.71%
No 115 Points West Merredin to No 13 Points Koolyanobbing East	176	$5,131,492.68	$5,886,335.25	$33,445.09	14.71%
No 13 Points Koolyanobbing East to No 59 Points West Kalgoorlie	192	$9,366,271.40	$10,744,049.92	$55,958.59	14.71%
No 59 Points West Kalgoorlie to Network Boundary	6	$116,080.81	$133,156.30	$22,192.72	14.71%
Kalgoorlie to Leonora	**Section Length**	**2006 Communications Cost**	**2008 Communications Cost**	**Rate / km**	**Total % Change**
No 87 Points Kalgoorlie to Malcolm North Points	236	$6,193,135.29	$7,104,145.49	$30,102.31	14.71%
Malcolm North Points to Leonora WMC2	23	$355,450.68	$407,737.48	$17,727.72	14.71%

Kalgoorlie to Esperance	Section Length	2006 Communications Cost	2008 Communications Cost	Rate / km	Total % Change
West Kalgoorlie West to Hampton South Points	17	$614,814.41	$705,253.61	$41,485.51	14.71%
Hampton South Points to Kambalda South Points	38	$1,305,418.61	$1,497,445.69	$39,406.47	14.71%
Kambalda South Points to Salmon Gums North Points	227	$7,328,888.98	$8,406,968.55	$37,035.10	14.71%
Salmon Gums North Points to Esperance Start Esperance Port Siding	106	$3,335,638.29	$3,826,310.68	$36,097.27	14.71%

Kwinana to Bunbury Inner Harbour	Section Length	2006 Communications Cost	2008 Communications Cost	Rate / km	Total % Change
Kwinana (No 3 Facing Points) to Mundijong Junction Points	26	$1,493,198.05	$1,712,847.48	$65,878.75	14.71%
Mundijong Junction Points to Pinjarra (No 25 points)	43	$2,593,862.45	$2,975,419.62	$69,195.81	14.71%
Pinjarra to Pinjarra East	1	$28,695.31	$32,916.39	$32,916.39	14.71%
Pinjarra East to Alumina Junction	1.7	$9,037.43	$10,366.84	$6,098.14	14.71%
Pinjarra East to Pinjarra South	1	$20,438.32	$23,444.80	$23,444.80	14.71%
Pinjarra to Wagerup	33	$788,480.67	$904,466.18	$27,408.07	14.71%
Wagerup to Brunswick Junction	39	$1,673,166.12	$1,919,288.86	$49,212.53	14.71%
Brunswick Junction to Picton Junction	17	$960,430.90	$1,101,710.29	$64,806.49	14.71%
Picton Junction to Inner Harbour	4	$259,028.92	$297,132.07	$74,283.02	14.71%

3.5.10 Maintenance

WestNet has requested GHD to adopt a unit cost approach to arrive at figures for 2008 maintenance costs.

The major aspects of railway maintenance are associated with the track and civil elements of the infrastructure; it is this fact that influenced the selection of escalation factor that could be applied to historical costs. Typically the equipment, skills and methodology required to maintain the railway are similar the skills, equipment and methodology required for other civil construction infrastructure.

It was assumed that other civil construction work is similar to railway maintenance, and we have made use of readily available cost indexes to apply to the *initial determination and 2006 update* to arrive at the equivalent 2008 cost.

In support of using escalation factors for determining cost movement over a number of years, it is known that other Rail Access Regulators around Australia (Queensland and Victoria) have accepted or are in the process of accepting the use of escalation factors to demonstrate increases in maintenance costs.

It was considered preferable to use escalation factors from a source that has the ability to be used in future reviews and can provide consistency in the basis of the calculated increase; for this purpose GHD made reference to Australian Bureau of Statistics (ABS) to obtain suitable cost escalation factors.

The relevant indices which have been utilised are *Non Building Construction* and *Road and Bridge Construction in Western Australia*, both of which show cost increases where the index for Mar 2006 was 134.7 and the index for June 2008 is 155.4 (an increase of 15.4%; it is this figure that has been applied to the 2006 costs to arrive at equivalent 2008 costs.

Table 25 Maintenance – Ceiling Price Schedule

	Axle Load	Maintenance Rate 2006 ($/km)	Maintenance Rate 2008 ($/km)
Section			
Southwest Main Line	21	17,610	20,322
Southwest Main Line Terminal	21	9,392	10,838
Eastern Goldfields Railway	24	18,784	21,677
Eastern Goldfields Railway Co-Op Book Handle	24	18,784	21,677
Standard Gauge Leonora	23	9,392	10,838
Standard Gauge Esperance	20.5	11,740	13,548
East Collie to Premier	21	17,610	20,322
Grain Line	16	9,392	10,838
Grain Line	19	5,400	6,232

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