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14 November 2018

Dear Joyce,

RE: BLACKTOWN CITY COUNCIL CONTRIBUTION PLAN NO.22 QUANTITY VERIFICATION

Thank you for the opportunity to carry out a Quantity Verification of Blacktown City Council's Contribution Plan No.22. WT has prepared the Quantity Verification Report enclosed below.

Yours sincerely
WT Partnership



KEVIN DAVIS
National Director

BLACKTOWN CITY COUNCIL

CONTRIBUTION PLAN NO.22

QUANTITY VERIFICATION REPORT FOR
INDEPENDENT PRICING AND
REGULATORY TRIBUNAL

14.11.2018

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REPORT TITLE:

BLACKTOWN CITY COUNCIL CP22 QUANTITY VERIFICATION REPORT

PROJECT REFERENCE: 185293

PURPOSE OF ISSUE: FINAL

ISSUE	DESCRIPTION OF AMENDMENT	AUTHOR	CHECKED	APPROVED	DATE
1	Draft	AJ	KD	KD	13/08/2018
2	Final	AJ	KD	KD	21/08/2018
3	Final	AJ	KD	KD	23/08/2018
4	Final	AJ	GM	GM	21/09/2018
5	Final	AJ	KD	KD	26/09/2018
6	Final	AJ	KD	KD	14/11/2018

Previous issues of this document shall be destroyed or marked superseded.



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1 DISCLAIMER

All rights reserved. No part of this report may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of WTP Australia Pty Ltd (WT).

This document is commercial in confidence and contains privileged information. The information contained in the document is not to be given to or discussed with anyone other than relevant the employees of Independent Pricing and Regulatory Tribunal (IPART) acting on this project. Privacy protection control systems designed to ensure the highest security standards and confidentiality are to be implemented.

2 RELIANCE STATEMENT

1. The purpose of our services is to assist IPART in evaluating the estimates provided by Blacktown City Council.
2. We confirm that IPART may rely upon this report for a period of 2 years in connection with the purpose referred to in paragraph 1 above. In giving this confirmation WT is not taken to have assumed any particular duty to advise IPART or to consider their circumstances or position.
3. WT also confirms that it is prepared to answer reasonable queries with respect to our services raised by IPART following conclusion of this service.
4. WT consents to this report being made available to IPART, their employees, directors, offices, affiliates and professional advisers and to disclosure by any Party to the extent required by law or regulation.
5. It is the responsibility of IPART to determine the suitability of the Report for its own purposes.
6. The Report is subject to the qualifications, assumptions and disclaimers expressed in it and the terms and conditions in the engagement letter.
7. The Report has been compiled from information provided to WT by third parties, however WTP does not warrant the accuracy of that information. If the information provided to WT is inaccurate or incomplete, then it may invalidate the conclusions and advice in the Report.
8. Before placing any reliance upon the Report for any purpose, IPART should undertake their own inquiries to ensure that there have been no material changes to the items discussed in the Report.

3 LIMITATIONS OF REVIEW

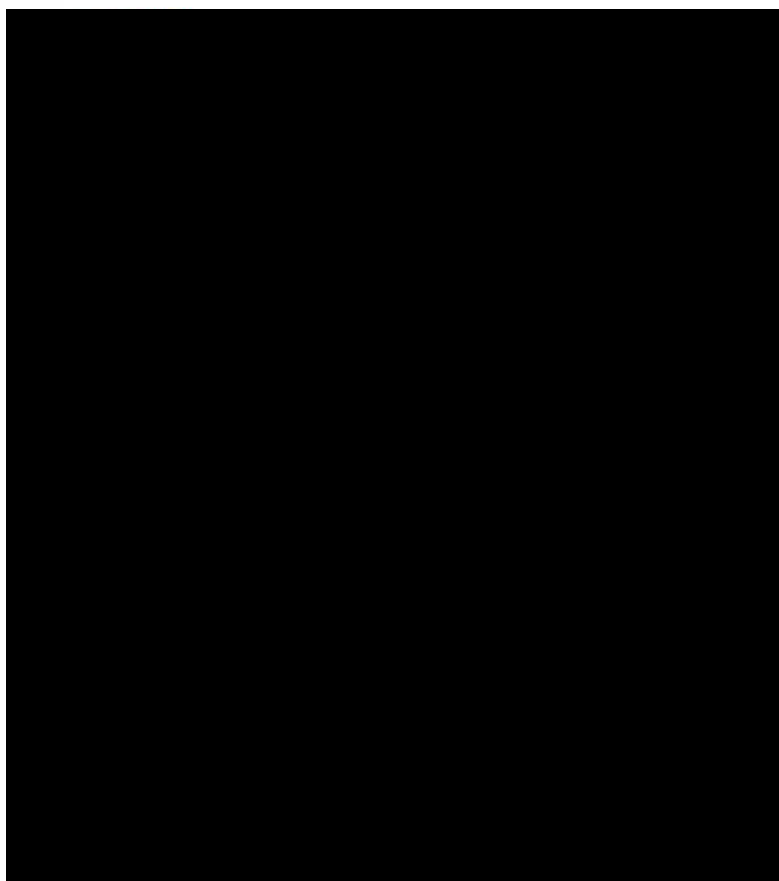
WT have used a benchmark rate for missing scope items to determine the potential cost impact. Therefore, the amounts shown may not provide accurate representation of potential cost impact. A detailed cost estimate for these missing items should be carried out in the design next phase.

4 EXECUTIVE SUMMARY

4.1 SCOPE OF REPORT

WT Partnership (WT) has been engaged by Independent Pricing and Regulatory Tribunal (IPART) to review the accuracy and the scope alignment of the quantities prepared by Blacktown City Council (BCC) for the road infrastructure works in Contribution Plan No. 22W.

4.2 PROJECT BACKGROUND



Blacktown City Council has prepared cost estimates at Concept Design stage to determine the total design and construction cost for the road infrastructure works in the proposed Contribution Plan No.22W.

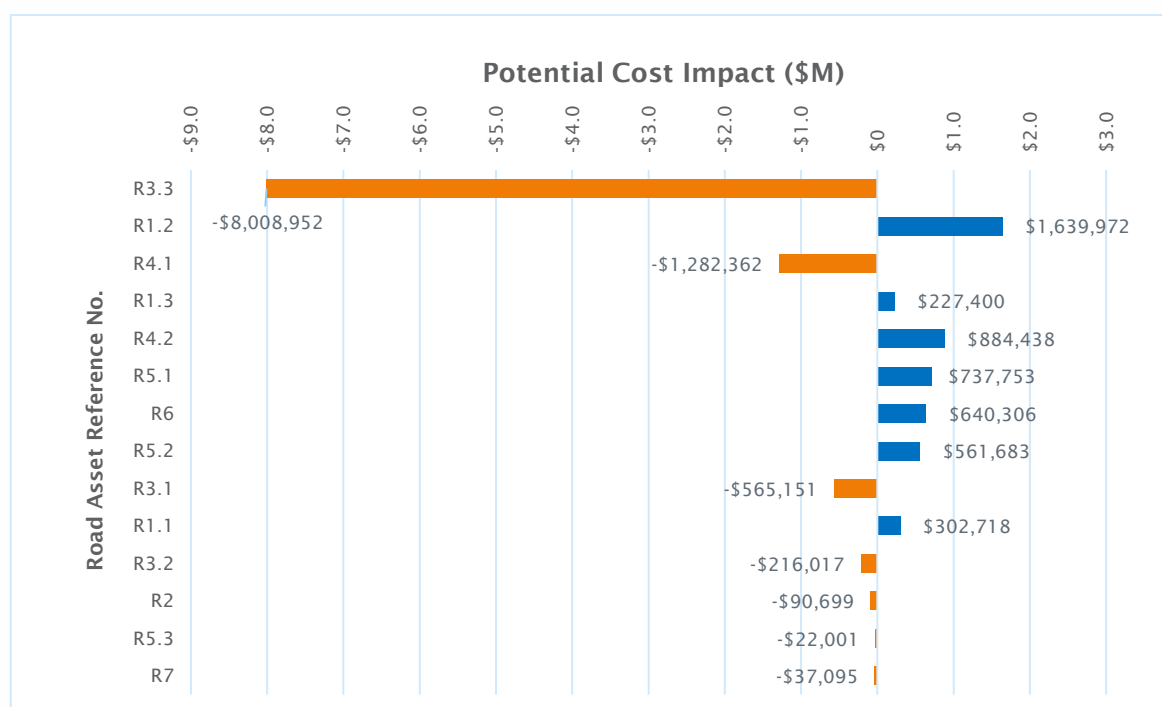
WT's quantity verification scope includes road assets R1.1, R1.2, R1.3, R2, R3.1, R3.2, R3.3, R4.1, R4.2, R5.1, R5.2, R5.3, R6 and R7 as shown in the contribution catchment area shown in the image above.

4.3 KEY FINDINGS

The following table summarises the findings into the key cost categories defined in the scope brief prepared by IPART.

KEY COST CATEGORY	KEY FINDINGS
SITE PREPARATION (50%)	Site preparation includes all work in relation to stormwater drainage and earthworks. Based on the review undertaken by WT, there is a significant difference in earthworks quantities. WT recommends that BCC revisit the quantification of earthworks, cartage and tip fees.
ROAD PAVEMENT CONSTRUCTION (20%)	BCC to check that the width of pavement allowed in the estimate is consistent with the design. The width of pavement is either 9 or 11 metres on the designs provided.
SERVICE ADJUSTMENTS (15%)	The pipe sizes are not consistent with DBYD information and the number of HV poles to be relocated should be checked.

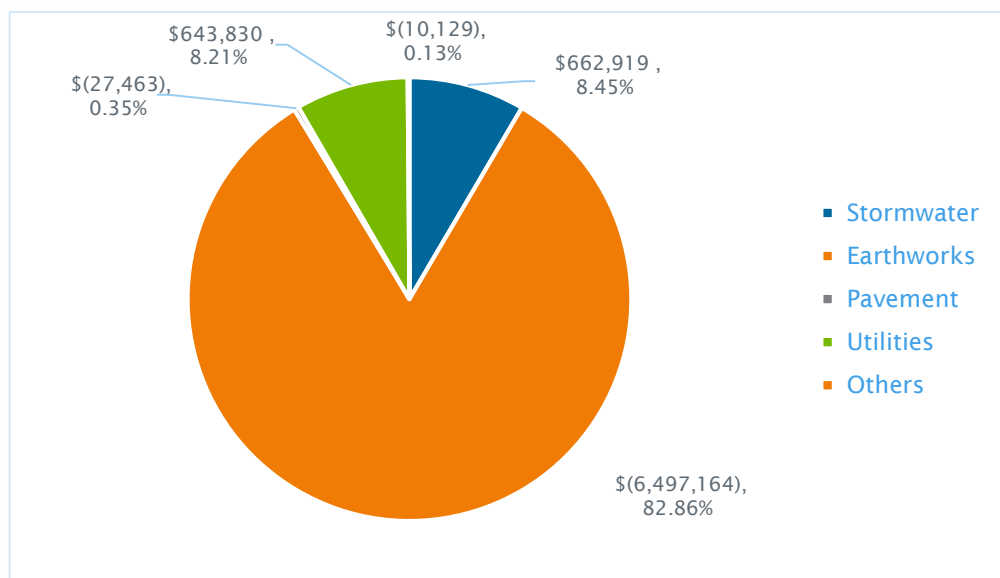
WT reviewed the quantities using the documents shown in Appendix B. The graph below shows the magnitude of the potential cost impact driven by the difference between the quantities prepared by WT and BCC.



As shown in the graph above, R3.3 has the largest variance. This is due to an incorrect earthworks quantity. This is further discussed in Section 7.1.7 of this report.

Based on the quantities prepared by WT, the overall design and construction cost of road upgrade works in CP22 should decrease by approximately \$5.2 million (6% of total design and construct estimate proposed by BCC).

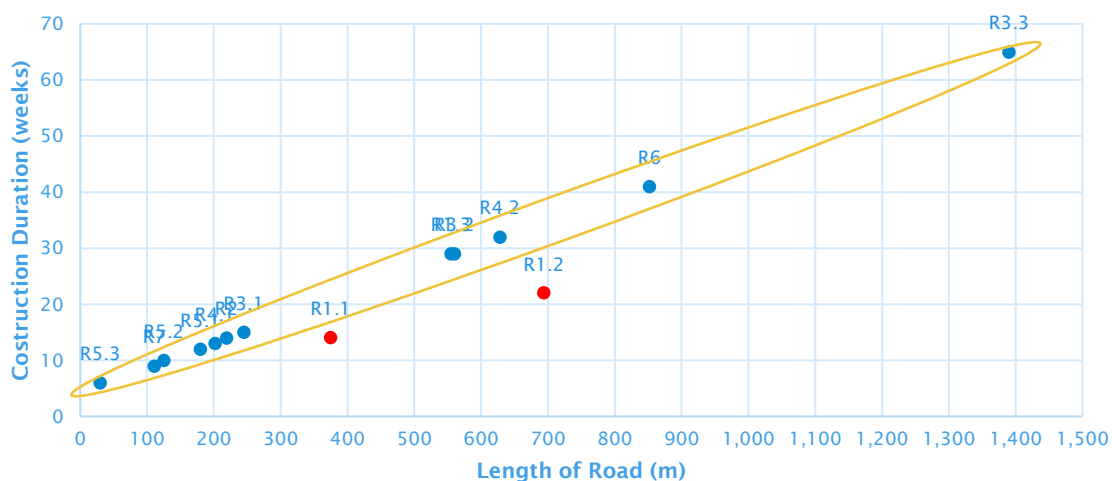
The differences in quantity are not equally distributed throughout all construction elements. The chart below highlights the significance in contribution to the cost impact and the relativity of magnitude (shown in percentages) on an elemental basis.



The majority of identified variance in quantities have significant cost impact. The following are findings from the review which should be read in conjunction with our review methodology in Section 5 of this report.

4.3.1 CONSTRUCTION DURATION

The construction duration for each road is generally proportional to the length of road. The graph below plots the construction duration against the length of road.



The two outliers in the graph suggests that the assumed construction duration for R1.1 and R1.2 may be too optimistic and the cost may be under estimated for site establishments and amenities. WT have adjusted the duration to be consistent with the trend shown in the graph above.

4.3.2 ROAD LENGTH

The length of road R3.1 Kensington Park Road is incorrect. The correct length as per the chainages on the drawing should be 155 metres.

4.3.3 BEDDING AND BACKFILLING

BCC has assumed that a new longitudinal stormwater pipe will be on both side of the road. However, the backfill quantity is only for one side of the road.

4.3.4 CLEARING

The number of significant trees to be removed is lower than what is visible on Google Street View. The estimate schedule is also missing item reference numbers for Clearing and its sub-items.

4.3.5 EARTHWORKS

The total cut volume from Existing Surface Level to the Subgrade level should include all earthworks including removal of existing pavement, pavement boxout, all excavation/filling to subgrade level including rock cutting (if any).

BCC has used the bulk excavation quantity for Item 6.0.3 *Excavation of clay material* which means that the quantity for excavation of existing pavement and rock are duplicated.

WT have separated the quantity for clay material, asphalt/roadbase material and rock. This is a major cost driver and therefore should be carefully reviewed.

4.3.6 CARTAGE

BCC quantity for cartage assumed haulage distance of 20km which is acceptable. However, the calculation of the quantity includes site won material. This has been subtracted in quantity prepared by WT.

4.3.7 TIP FEES

The spoil generated from excavation for stormwater structures has been excluded in this section. The quantity prepared by WT includes disposal of surplus material and spoil generated from excavation for stormwater structures.

CLAY MATERIAL (VENM)

BCC quantity assumes that the entire excavated clay material is disposed off-site. This quantity should exclude the recovered fill quantity in Item 8.0.1(a) Recovered fill from site.

DEMOLITION WASTE & ASPHALT/ROADBASE

The quantity for these waste classifications are both from Item 6.0.2(a) Excavation of roadbase type material. This is a duplication and therefore should be split.

The profile of the existing pavement is unknown. Therefore, WT have assumed 50:50 split in quantity for Demolition Waste and Asphalt/Roadbase.

4.3.8 MISCELLANEOUS

WT assumed that all verge areas, excluding cycle paths and pedestrian footpaths, should be turfed.

4.3.9 TRAFFIC SIGNALS

BCC's allowance for traffic signals in R3.3 appears to be excessive at \$3 million, although within an acceptable tolerance relative to the stage in design. We would assume this will be refined as the design develops.

4.3.10 EXISTING SERVICE ADJUSTMENTS

SYDNEY WATER

Generally, the relocation of Sydney Water asset is shown as DN100 pipe in BCC estimate. WT have adjusted the pipe sizes and lengths as shown on Sydney Water DBYD drawings with respect to the project extents shown on the design drawings prepared by BCC.

ENDEAVOUR ENERGY

The quantity for HV and LV pole relocation could not be determined using the DBYD information provided. WT quantity was determined using Google Street View.

4.4 RECOMMENDATIONS

WT recommends that the key findings highlighted in the section above are reviewed for all road assets considered under PC22.

OPPORTUNITIES

BCC has used imported fill on a few sites. The cost of imported fill (16,231 m³) can be saved by using surplus clay material from other sites. The summary below shows the amount of surplus material available on each site.

Asset No.	Total Cut		Total Fill		Surplus Clay Material
	OTSR	Rock/Shale	Site Won	Imported	
R1.1	2,274	50	1,020		1,254
R1.2	3,881	93	1,006		2,875
R1.3	9,445		1,560		7,885
R2	381	19		2,740	381
R3.1	133			8,763	133
R3.2	17,708	3,704	685		17,023
R3.3	48,941		2,635		46,306
R4.1	261	12	73	4,728	188
R4.2	9,294	2,017	2,482		6,812
R5.1	3,552		720		2,832
R5.2	6,943		100		6,843
R5.3	612		48		564
R6	13,672	4,456	1,451		12,221
R7	3,100		25		3,075
Subtotal	120,197	10,351	11,805	16,231	108,392

The largest cost driver of this project is earthworks and disposal of excess material offsite. WT recommends that an opportunity to spread and compact clean fill at a nearby location is investigated.

5 REVIEW METHODOLOGY

In carrying out this review we have:

- Taken receipt of project documentation
- Reviewed the project documentation and raised queries and issues to be clarified
- Reviewed the quantities by:
 - Measuring and calculating quantities using information listed in Appendix B
 - Checking BCC's assumption on the items where design information is not available
 - Construction duration
 - Checked excel formula errors
- Conducted internal peer reviews of all WT deliverables
- Prepared this Draft Quantity Verification Report

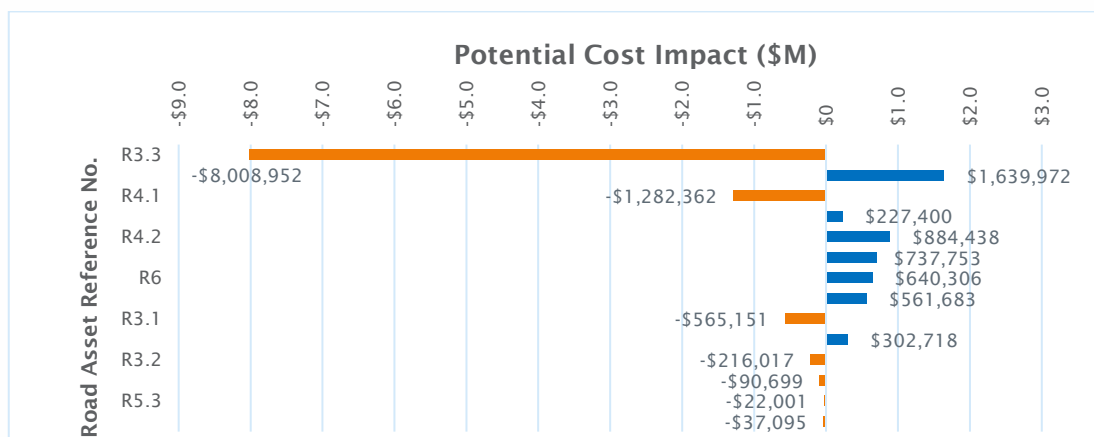
During the review process, WT have made the following assumptions:

- Excavation for stormwater structures were as quantified using RMS standard drawing, R0240-01 Installation of Buried Concrete Pipes Support Type HS3
- Stormwater pipe to be on both sides of the road
- Assumed that the proposed pavement is suitable

6 REVIEW SUMMARY

WT reviewed the scope alignment and the quantities using the documents shown in Appendix B. The following are the key findings from the review process which should be read in conjunction with our review methodology and assumptions in Section 2 of this report.

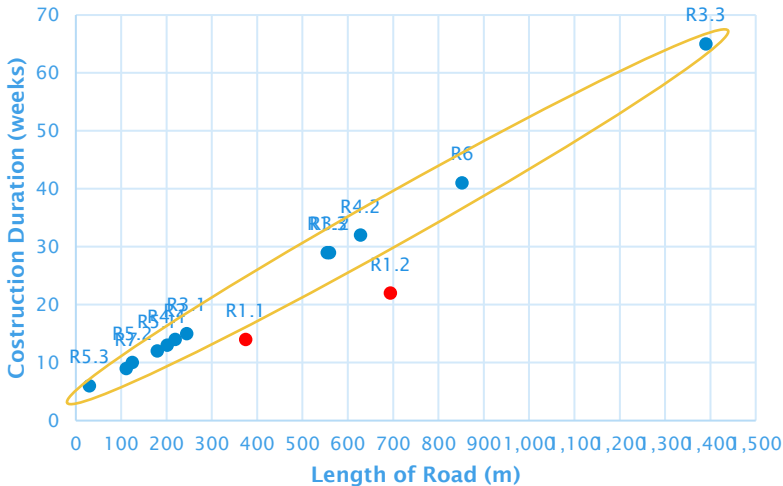
The graph below shows the magnitude of cost impact driven by the difference in quantities prepared by WT against the quantities in the Transport Works Schedule prepared by BCC.



7 DETAILED REVIEW

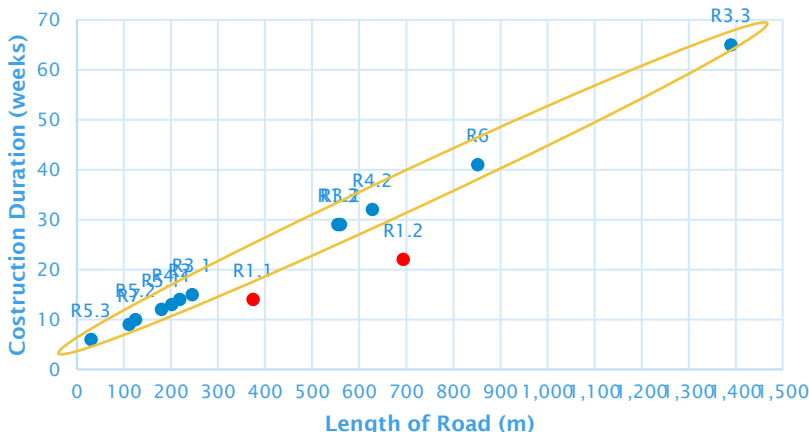
This section of the report details the findings in each road assets. The detailed variance in quantum and the cost impacts can be found in Appendix A: Bill of Quantities.

7.1.1 R1.1 – ROUSE RD BRIDGE TO APPROACH OF WINDSOR RD INTERSECTION

ELEMENT	FINDINGS
CONSTRUCTION DURATION	<p>All roads have construction duration that is proportional to its length other than R1.1 and R1.2. The chart below shows construction duration of each road against its length.</p>  <p>WT have adjusted the construction duration in Site Establishment & Amenities to 22 weeks (including the additional period).</p>
STORMWATER DRAINAGE	Drawing set was not provided for R1.1, R1.2 and R1.3. The excavation volume for stormwater structures has been calculated using the same trench dimension used in other roads.
BEDDING AND BACKFILLING	The assumption for trench dimensions mentioned above affects this quantity.
CARTAGE	Cartage of spoil generated from stormwater excavation has not been included in the estimate.
TIPPING FEES	Tipping of spoil generated from stormwater excavation has not been included in the estimate. Tipping cost of Shale/Rock is missing in BCC's estimate
SUBSOIL DRAINS	WT have assumed that a trench drain will exist on both sides along the entire length of road whereas BCC estimate allows for one side only.
PAVEMENT CONSTRUCTION	<p>1. The subbase layer has been assumed to extend to the rear side of kerb.</p> <p>2. For the width of wearing course and base course, WT concurs with BCC's approach to deduct 0.45m of concrete gutter on both sides of pavement (hence 0.9m in total) from the full width of carriageway. As such, the width used in WT's measurement is 10.1m for 11m wide carriageway and 8.1m for 9m wide carriageway respectively.</p>

	<p>3. For sub-base, WT concurs with BCC's approach to extend the sub-base layer by 0.15m behind the 0.19m wide kerb on both sides of the pavement. With this, total width used in WT's measurement of sub-base layer is 9.68m for 9m wide carriageway and 11.68m for 11m wide carriageway respectively.</p> <p>4. BCC estimate was missing the quantity for 7mm seal.</p>
KERB & GUTTER AND OTHER WORKS	BCC estimate is missing kerb ramps.
EXISTING SERVICE ADJUSTMENTS	<p>1. WT have counted less numbers required to be relocated.</p> <p>2. WT have assumed that overhead telecom distribution line is required to be relocated.</p>

7.1.2 R1.2 CUDGEGONG RD TO ROUSE RD BRIDGE & WORCESTER RD INTERSECTION

ELEMENT	FINDINGS
CONSTRUCTION DURATION	<p>All roads have construction duration that is proportional to its length other than R1.1 and R1.2. The chart below shows construction duration against its length.</p>  <p>WT have adjusted the construction duration in Site Establishment & Amenities to 33 weeks (including the additional period).</p>
STORMWATER DRAINAGE	BCC has used a cross sectional area of 1.4 m ² for trenching throughout. This is incorrect as the pavement construction in fill condition requires less excavation. WT have used a trench depth of 0.323 metres in fill condition.
BEDDING AND BACKFILLING	The assumption for trench depth discussed above affects this quantity.
CARTAGE	Quantity was missing in this section of the estimate.
TIPPING FEES	Quantities were missing in this section of the estimate.
SUBGRADE	WT have measured the subgrade treatment areas between the toe of cut and fill batters.
SUBSOIL DRAINS	WT have assumed that a trench drain will exist on both sides along the entire length of road whereas BCC estimate allows for one side only.

PAVEMENT CONSTRUCTION	<p>1. The subbase layer has been assumed to extend to the rear side of kerb.</p> <p>2. For the width of wearing course and base course, WT concurs with BCC's approach to deduct 0.45m of concrete gutter on both sides of pavement (hence 0.9m in total) from the full width of carriageway. As such, the width used in WT's measurement is 10.1m for 11m wide carriageway and 8.1m for 9m wide carriageway respectively.</p> <p>3. For sub-base, WT concurs with BCC's approach to extend the sub-base layer by 0.15m behind the 0.19m wide kerb on both sides of the pavement. With this, total width used in WT's measurement of sub-base layer is 9.68m for 9m wide carriageway and 11.68m for 11m wide carriageway respectively.</p> <p>4. BCC estimate was missing the quantity for 7mm seal.</p>
KERB & GUTTER AND OTHER WORKS	<p>1. WT's length for kerb and gutter is 2 x the length of the road. BCC quantity is 100 metres higher.</p> <p>2. BCC estimate is missing kerb ramps.</p>
LINEMARKING	BCC estimate is missing edge lines.
MISCELLANEOUS	BCC's allowance for turfing is 300mm width along both sides of the road. WT's assumption is that the turfing is required on all verge areas excluding cycle path and pedestrian footpath.
EXISTING SERVICE ADJUSTMENTS	<p>WT have identified that the following items were missing:</p> <ul style="list-style-type: none"> - Relocation of existing DN500 potable water pipe - Relocation of transformer - Relocation of optic fibre

7.1.3 R1.3 – ROUSE RD

ELEMENT	FINDINGS
STORMWATER DRAINAGE	BCC has captured excavation on one side of the road only.
BEDDING AND BACKFILLING	BCC has captured backfilling on one side of the road only.
CLEARING	<p>1. BCC quantity for removal of significant trees is lower than what is visible on Google Street View.</p> <p>2. There are two affected properties.</p>
CARTAGE	<p>BCC has included imported fill in the quantity for cartage. This has been corrected in WT quantity.</p> <p>Cartage of spoil generated from excavation for stormwater structures has been excluded. WT have included this quantity.</p>
TIPPING FEES	Tipping of spoil generated from excavation for stormwater structures has been excluded. WT have included the quantities into the correct waste classifications.
PAVEMENT CONSTRUCTION	<p>1. The subbase layer has been assumed to extend to the rear side of kerb.</p> <p>2. For the width of wearing course and base course, WT concurs with BCC's approach to deduct 0.45m of concrete gutter on both sides of pavement (hence 0.9m in total) from the full width of carriageway. As such, the width used in WT's measurement is 10.1m for 11m wide carriageway and 8.1m for 9m wide carriageway respectively.</p> <p>3. For sub-base, WT concurs with BCC's approach to extend the sub-base layer by 0.15m behind the 0.19m wide kerb on both sides of the</p>

	pavement. With this, total width used in WT's measurement of sub-base layer is 9.68m for 9m wide carriageway and 11.68m for 11m wide carriageway respectively.
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7.1.4 R2 – GORDON RD

ELEMENT	FINDINGS
BEDDING AND BACKFILLING	BCC has assumed that a new longitudinal stormwater pipe would be on both side of the road. However, the backfill quantity is only for one side of the road.
DRAINAGE PITS AND HEADWALLS	BCC has allowed for pits on one side of the road. WT quantity is based on the same spacing but on both sides of the road.
CLEARING	The number of significant trees to be removed is lower than what is visible on Google Street View.
CARTAGE	BCC has included imported fill in the quantity for cartage. This has been corrected in WT quantity. Cartage of spoil generated from excavation for stormwater structures has been excluded. WT have included this quantity.
TIPPING FEES	BCC's quantities in this section do not include tipping of spoil generated from excavation for stormwater structures. There is also a duplication of quantities in Items 11(b) and 11(e). WT have split the quantity on a 50:50 basis. Tipping of spoil generated from excavation for stormwater structures has been excluded. WT have included the quantities into the correct waste classifications.
SUBGRADE	WT have measured the subgrade treatment areas between the toe of cut and fill batters.
SUBSOIL DRAINS	WT have assumed that a trench drain will exist on both sides along the entire length of road.
PAVEMENT CONSTRUCTION	1. The subbase layer has been assumed to extend to the rear side of kerb. 2. For the width of wearing course and base course, WT concurs with BCC's approach to deduct 0.45m of concrete gutter on both sides of pavement (hence 0.9m in total) from the full width of carriageway. As such, the width used in WT's measurement is 10.1m for 11m wide carriageway and 8.1m for 9m wide carriageway respectively. 3. For sub-base, WT concurs with BCC's approach to extend the sub-base layer by 0.15m behind the 0.19m wide kerb on both sides of the pavement. With this, total width used in WT's measurement of sub-base layer is 9.68m for 9m wide carriageway and 11.68m for 11m wide carriageway respectively.
MISCELLANEOUS	BCC's allowance for turfing is 300mm width along both sides of the road. WT's assumption is that the turfing is required on all verge areas excluding cycle path and pedestrian footpath.
EXISTING SERVICE ADJUSTMENTS	WT have identified a clash with existing sewer main on the DBYD survey.

7.1.5 R3.1 – KENSINGTON PARK ROAD

ELEMENT	FINDINGS
LENGTH OF ROAD	The length of road based on Chainage 2030 to Hambledon Road Extension is approximately 155 metres.
STORMWATER DRAINAGE	BCC has used a cross sectional area of 1.4 m ² for trenching. This is incorrect as the pavement construction is in fill condition. WT's assumed trench depth is 0.323 metres. The length of road affects the length of stormwater pipe. WT's length of stormwater pipe is 180 metres less.
BEDDING AND BACKFILLING	The length of road affects the backfill volume. WT's backfill volume is 154m ³ metres less.
DRAINAGE PITS & HEADWALLS	BCC has allowed for pits on one side of the road. WT quantity is based on the same spacing but on both sides of the road.
CLEARING	The number of significant trees to be removed is lower than what is visible on Google Street View.
CARTAGE	BCC has included imported fill in the quantity for cartage. This has been corrected in WT quantity. Cartage of spoil generated from excavation for stormwater structures has been excluded. WT have included this quantity.
TIPPING FEES	BCC has not included the spoil generated from excavation for stormwater structures.
SUBGRADE	WT have measured the subgrade treatment areas between the toe of cut and fill batters.
PAVEMENT CONSTRUCTION	1. The subbase layer has been assumed to extend to the rear side of kerb. 2. For the width of wearing course and base course, WT concurs with BCC's approach to deduct 0.45m of concrete gutter on both sides of pavement (hence 0.9m in total) from the full width of carriageway. As such, the width used in WT's measurement is 10.1m for 11m wide carriageway and 8.1m for 9m wide carriageway respectively. 3. For sub-base, WT concurs with BCC's approach to extend the sub-base layer by 0.15m behind the 0.19m wide kerb on both sides of the pavement. With this, total width used in WT's measurement of sub-base layer is 9.68m for 9m wide carriageway and 11.68m for 11m wide carriageway respectively.
KERB & GUTTER AND OTHER WORKS	The length of road affects this section.
BICYCLE PATH	The length of road affects this section.
STREET LIGHTING	The length of road affects this section.
MISCELLANEOUS	BCC's allowance for turfing is 300mm width along both sides of the road. WT's assumption is that the turfing is required on all verge areas excluding cycle path and pedestrian footpath.

7.1.6 R3.2 – GUNTAWONG ROAD

ELEMENT	FINDINGS
BEDDING AND BACKFILLING	BCC has assumed that a new longitudinal stormwater pipe would be on both side of the road. However, the backfill quantity is only for one side of the road.
CLEARING	The number of significant trees to be removed is lower than what is visible on Google Street View.
ROADWORKS	Bulk earthworks quantity from 12D report captures all earthworks from Existing Surface Level to Subgrade Level. The only additional earthworks should be for stormwater structure which is captured separate to this item. WT have adjusted the quantity for <i>Item 6.0.3 – Excavation of clay material</i> so that the total excavation quantity is equivalent to the 'cut volume' shown in 12D report.
TIPPING FEES	BCC's quantities in this section do not include tipping of spoil generated from excavation for stormwater structures. There is also a duplication of quantities in Items 11(b) and 11(e). WT have split the quantity on a 50:50 basis.
PAVEMENT CONSTRUCTION	<p>1. For the width of wearing course and base course, WT concurs with BCC's approach to deduct 0.45m of concrete gutter on both sides of pavement (hence 0.9m in total) from the full width of carriageway. As such, the width used in WT's measurement is 10.1m for 11m wide carriageway and 8.1m for 9m wide carriageway respectively.</p> <p>2. For sub-base, WT concurs with BCC's approach to extend the sub-base layer by 0.15m behind the 0.19m wide kerb on both sides of the pavement. With this, total width used in WT's measurement of sub-base layer is 9.68m for 9m wide carriageway and 11.68m for 11m wide carriageway respectively.</p>
EROSION AND SEDIMENT CONTROL	BCC's quantity for sediment fencing is the length of road with 5% wastage. WT has assumed that the sediment fencing is required along both sides of the road.
MISCELLANEOUS	BCC's allowance for turfing is 300mm width along both sides of the road. WT's assumption is that the turfing is required on all verge areas excluding cycle path and pedestrian footpath.
EXISTING SERVICE ADJUSTMENTS	BCC has used an incorrect pipe size. According to DBYD survey, the existing Sydney Water pipe which clashes with the proposed design is DN750 and DN800. WT has inserted new lines in the estimate for these pipes.

7.1.7 R3.3 – GUNTAWONG ROAD

ELEMENT	FINDINGS
BEDDING AND BACKFILLING	BCC has assumed that a new longitudinal stormwater pipe would be on both side of the road. However, the backfill quantity is only for one side of the road.
CLEARING	The number of significant trees to be removed is lower than what is visible on Google Street View.
ROADWORKS	Bulk earthworks quantity from 12D report captures all earthworks from Existing Surface Level to Subgrade Level. The only additional earthworks should be for stormwater structure which is captured separate to this item. WT have adjusted the quantity for <i>Item 6.0.3 – Excavation of clay</i>

	<i>material</i> so that the total excavation quantity is equivalent to the 'cut volume' shown in 12D report.
CARTAGE	BCC has included site won fill material in the quantity for cartage. This has been corrected in WT quantity. Cartage of spoil generated from excavation for stormwater structures has been excluded. WT have included this quantity.
TIPPING FEES	BCC's quantities in this section do not include tipping of spoil generated from excavation for stormwater structures. There is also a duplication of quantities in Items 11(b) and 11(e). WT have split the quantity on a 50:50 basis.
SUBGRADE	WT have measured the subgrade treatment areas between the toe of cut and fill batters.
PAVEMENT CONSTRUCTION	1. For the width of wearing course and base course, WT concurs with BCC's approach to deduct 0.45m of concrete gutter on both sides of pavement (hence 0.9m in total) from the full width of carriageway. As such, the width used in WT's measurement is 10.1m for 11m wide carriageway and 8.1m for 9m wide carriageway respectively. 2. For sub-base, WT concurs with BCC's approach to extend the sub-base layer by 0.15m behind the 0.19m wide kerb on both sides of the pavement. With this, total width used in WT's measurement of sub-base layer is 9.68m for 9m wide carriageway and 11.68m for 11m wide carriageway respectively.
EROSION AND SEDIMENT CONTROL	BCC's quantity for sediment fencing is the length of road with 5% wastage. WT has assumed that the sediment fencing is required along both sides of the road.
MISCELLANEOUS	BCC's allowance for turfing is 300mm width along both sides of the road. WT's assumption is that the turfing is required on all verge areas excluding cycle path and pedestrian footpath.
EXISTING SERVICE ADJUSTMENTS	1. WT have measured 60 metres for underground HV relocation on Endeavour Energy DBYD drawings. (40m on Page 5 and 20m on Page 4 of drawing Sequence No. 66250645) 2. The 32mm NY and 50mm NY gas mains were missing in BCC estimate. WT have added them into the estimate.

7.1.8 R4.1 – RIVERSTONE ROAD

ELEMENT	FINDINGS
STORMWATER DRAINAGE	BCC has used a cross sectional area of 1.4 m ² for trenching throughout. This is incorrect as the pavement construction in fill condition requires less excavation. WT have used a trench depth of 0.323 metres in fill condition.
BEDDING AND BACKFILLING	The assumption for trench depth discussed above affects this quantity.
DRAINAGE PITS & HEADWALLS	BCC has allowed for pits on one side of the road. WT quantity is based on the same spacing but on both sides of the road.
CLEARING	WT have measured the clearing area to the batter extents.
ROADWORKS	BCC estimate is missing excavation quantities.
CARTAGE	BCC has used fill quantity for cartage. Item 8.0.1 should include transportation cost from the supplier to the site.

TIPPING FEES	Quantities for the following waste classifications were missing in this section of the estimate: <ul style="list-style-type: none"> - Demolition waste - Asphalt/roadbase - Shale/Rock
SUBGRADE	WT have measured the subgrade treatment areas between the toe of cut and fill batters.
SUBSOIL DRAINS	WT have assumed that a trench drain will exist on both sides along the entire length of road whereas BCC estimate allows for 1.25 x the length of road
PAVEMENT CONSTRUCTION	<p>1. For the width of wearing course and base course, WT concurs with BCC's approach to deduct 0.45m of concrete gutter on both sides of pavement (hence 0.9m in total) from the full width of carriageway. As such, the width used in WT's measurement is 10.1m for 11m wide carriageway and 8.1m for 9m wide carriageway respectively.</p> <p>2. For sub-base, WT concurs with BCC's approach to extend the sub-base layer by 0.15m behind the 0.19m wide kerb on both sides of the pavement. With this, total width used in WT's measurement of sub-base layer is 9.68m for 9m wide carriageway and 11.68m for 11m wide carriageway respectively.</p>
EROSION AND SEDIMENT CONTROL	BCC's quantity for sediment fencing is the length of road with 5% wastage. WT has assumed that the sediment fencing is required along both sides of the road.
MISCELLANEOUS	BCC's allowance for turfing is 300mm width along both sides of the road. WT's assumption is that the turfing is required on all verge areas excluding cycle path and pedestrian footpath.
EXISTING SERVICE ADJUSTMENTS	<p>WT have identified duplication in the following items:</p> <ul style="list-style-type: none"> - Relocation of Telstra (Item 37.1) - Relocation of Sydney Water (Item 37.6) <p>BCC estimate is missing the following items:</p> <ul style="list-style-type: none"> - Relocation of Sydney Water DN500 pipe - Relocation of Sydney Water DN800 pipe - Relocation of Jemena 100 PVC 50NY pipe

7.1.9 R4.2 – RIVERSTONE ROAD

ELEMENT	FINDINGS
STORMWATER DRAINAGE	<p>1. BCC have not allowed excavation for the full length of pipe.</p> <p>2. BCC have used a cross sectional area of 1.4 m² for trenching throughout. This is incorrect as some segments of pavement construction are in fill condition which requires less excavation. WT have used a trench depth of 0.323 metres in fill condition.</p>
BEDDING AND BACKFILLING	The assumption for trench depth discussed above affects this quantity.
DRAINAGE PITS & HEADWALLS	BCC has allowed for pits on one side of the road. WT quantity is based on the same spacing but on both sides of the road.
CLEARING	WT have measured the clearing area to the batter extents.
ROADWORKS	1. BCC estimate is missing excavation in existing road.

	2. Total cut volume in 12D is 9,778m ³ but BCC quantities add up to 9,221m ³ .
CARTAGE	BCC has included site won fill material in cartage quantity.
TIPPING FEES	<p>1. BCC's quantities in this section do not include tipping of spoil generated from excavation for stormwater structures.</p> <p>2. Quantities for the following waste classifications were missing in this section of the estimate:</p> <ul style="list-style-type: none"> - Demolition waste - Asphalt/roadbase
SUBGRADE	WT have measured the subgrade treatment areas between the toe of cut and fill batters.
SUBSOIL DRAINS	WT have assumed that a trench drain will exist on both sides along the entire length of road whereas BCC estimate allows for 1.25 x the length of road
PAVEMENT CONSTRUCTION	<p>1. For the width of wearing course and base course, WT concurs with BCC's approach to deduct 0.45m of concrete gutter on both sides of pavement (hence 0.9m in total) from the full width of carriageway. As such, the width used in WT's measurement is 10.1m for 11m wide carriageway and 8.1m for 9m wide carriageway respectively.</p> <p>2. For sub-base, WT concurs with BCC's approach to extend the sub-base layer by 0.15m behind the 0.19m wide kerb on both sides of the pavement. With this, total width used in WT's measurement of sub-base layer is 9.68m for 9m wide carriageway and 11.68m for 11m wide carriageway respectively.</p>
MISCELLANEOUS	BCC's allowance for turfing is 300mm width along both sides of the road. WT's assumption is that the turfing is required on all verge areas excluding cycle path and pedestrian footpath.
EXISTING SERVICE ADJUSTMENTS	According to DBYD information provided, relocation of watermain is not required in the area of interest. WT have excluded all quantities for adjustment of Sydney Water assets.

7.1.10 R5.1 – TALLAWONG ROAD

ELEMENT	FINDINGS
STORMWATER DRAINAGE	<p>1. BCC have not allowed excavation for the full length of pipe.</p> <p>2. BCC have used a cross sectional area of 1.4 m² for trenching throughout. This is incorrect as some segments of pavement construction are in fill condition which requires less excavation. WT have used a trench depth of 0.323 metres in fill condition.</p>
BEDDING AND BACKFILLING	The assumption for trench depth discussed above affects this quantity.
DRAINAGE PITS & HEADWALLS	BCC has allowed for pits on one side of the road. WT quantity is based on the same spacing but on both sides of the road.
CLEARING	<p>1. WT have measured the clearing area to the batter extents.</p> <p>2. The number of significant trees to be removed is lower than what is visible on Google Street View.</p>
CARTAGE	BCC has included site won fill material in cartage quantity. In the calculation for cartage quantity, the fill quantity has been subtracted from excavated clay material in Item 6.0.3.

TIPPING FEES	<p>BCC's quantities in this section do not include tipping of spoil generated from excavation for stormwater structures. There is also a duplication of quantities in Items 11(b) and 11(e). WT have split the quantity on a 50:50 basis.</p> <p>Tipping of spoil generated from excavation for stormwater structures has been excluded. WT have included the quantities into the correct waste classifications.</p>
SUBGRADE	WT have measured the subgrade treatment areas between the toe of cut and fill batters.
SUBSOIL DRAINS	WT have assumed that a trench drain will exist on both sides along the entire length of road whereas BCC estimate allows for 1.25 x the length of road
PAVEMENT CONSTRUCTION	<p>1. For the width of wearing course and base course, WT concurs with BCC's approach to deduct 0.45m of concrete gutter on both sides of pavement (hence 0.9m in total) from the full width of carriageway. As such, the width used in WT's measurement is 10.1m for 11m wide carriageway and 8.1m for 9m wide carriageway respectively.</p> <p>2. For sub-base, WT concurs with BCC's approach to extend the sub-base layer by 0.15m behind the 0.19m wide kerb on both sides of the pavement. With this, total width used in WT's measurement of sub-base layer is 9.68m for 9m wide carriageway and 11.68m for 11m wide carriageway respectively.</p>
MISCELLANEOUS	BCC's allowance for turfing is 300mm width along both sides of the road. WT's assumption is that the turfing is required on all verge areas excluding cycle path and pedestrian footpath.
EXISTING SERVICE ADJUSTMENTS	BCC's quantity for watermain relocation has been allocated to an incorrect pipe size. According to the DBYD information provided, the pipe required to be relocated is DN750.

7.1.11 R5.2 – TALLAWONG ROAD

ELEMENT	FINDINGS
STORMWATER DRAINAGE	BCC has not allowed excavation for the full length of pipe. WT quantity reflects trenching entire length of proposed stormwater pipe.
BEDDING AND BACKFILLING	The assumption for the length of trench outlined above affects this quantity.
CLEARING	<p>1. WT have measured the clearing area to the batter extents.</p> <p>2. The number of significant trees to be removed is lower than what is visible on Google Street View.</p>
ROADWORKS	Bulk earthworks quantity from 12D report captures all earthworks from Existing Surface Level to Subgrade Level. The only additional earthworks should be for stormwater structure which is captured separate to this item. WT have adjusted the quantity for <i>Item 6.0.3 – Excavation of clay material</i> so that the total excavation quantity is equivalent to the 'cut volume' shown in 12D report.
CARTAGE	BCC has included site won fill material in cartage quantity. In the calculation for cartage quantity, the fill quantity has been subtracted from excavated clay material in Item 6.0.3.
TIPPING FEES	1. BCC's quantities in this section do not include tipping of spoil generated from excavation for stormwater structures. There is also a

	<p>duplication of quantities in Items 11(b) and 11(e). WT have split the quantity on a 50:50 basis.</p> <p>2. The disposal quantity of clay material is incorrect as some of it is being re-used for fill.</p> <p>3. Tipping of spoil generated from excavation for stormwater structures has been excluded. WT have included the quantities into the correct waste classifications.</p>
SUBGRADE	WT have measured the subgrade treatment areas between the toe of cut and fill batters.
SUBSOIL DRAINS	WT have assumed that a trench drain will exist on both sides along the entire length of road whereas BCC estimate allows for 1.25 x the length of road
PAVEMENT CONSTRUCTION	<p>1. For the width of wearing course and base course, WT concurs with BCC's approach to deduct 0.45m of concrete gutter on both sides of pavement (hence 0.9m in total) from the full width of carriageway. As such, the width used in WT's measurement is 10.1m for 11m wide carriageway and 8.1m for 9m wide carriageway respectively.</p> <p>2. For sub-base, WT concurs with BCC's approach to extend the sub-base layer by 0.15m behind the 0.19m wide kerb on both sides of the pavement. With this, total width used in WT's measurement of sub-base layer is 9.68m for 9m wide carriageway and 11.68m for 11m wide carriageway respectively.</p>
MISCELLANEOUS	BCC's allowance for turfing is 300mm width along both sides of the road. WT's assumption is that the turfing is required on all verge areas excluding cycle path and pedestrian footpath.
EXISTING SERVICE ADJUSTMENTS	BCC's quantity for watermain relocation has been allocated to an incorrect pipe size. According to the DBYD information provided, the pipe required to be relocated is DN750 and DN800.

7.1.12 R5.3 – TALLAWONG ROAD

ELEMENT	FINDINGS
CLEARING	WT have measured the clearing area to the batter extents.
CARTAGE	BCC has included site won fill material in cartage quantity. In the calculation for cartage quantity, the fill quantity has been subtracted from excavated clay material in Item 6.0.3.
TIPPING FEES	<p>BCC's quantities in this section do not include tipping of spoil generated from excavation for stormwater structures. There is also a duplication of quantities in Items 11(b) and 11(e). WT have split the quantity on a 50:50 basis.</p> <p>Tipping of spoil generated from excavation for stormwater structures has been excluded. WT have included the quantities into the correct waste classifications.</p>
SUBGRADE	WT have measured the subgrade treatment areas between the toe of cut and fill batters.
SUBSOIL DRAINS	WT have assumed that a trench drain will exist on both sides along the entire length of road whereas BCC estimate allows for 1.25 x the length of road

PAVEMENT CONSTRUCTION	<p>1. For the width of wearing course and base course, WT concurs with BCC's approach to deduct 0.45m of concrete gutter on both sides of pavement (hence 0.9m in total) from the full width of carriageway. As such, the width used in WT's measurement is 10.1m for 11m wide carriageway and 8.1m for 9m wide carriageway respectively.</p> <p>2. For sub-base, WT concurs with BCC's approach to extend the sub-base layer by 0.15m behind the 0.19m wide kerb on both sides of the pavement. With this, total width used in WT's measurement of sub-base layer is 9.68m for 9m wide carriageway and 11.68m for 11m wide carriageway respectively.</p>
MISCELLANEOUS	BCC's allowance for turfing is 300mm width along both sides of the road. WT's assumption is that the turfing is required on all verge areas excluding cycle path and pedestrian footpath.

7.1.13 R6 – WORCHESTER ROAD

ELEMENT	FINDINGS
STORMWATER DRAINAGE	<p>1. BCC have not allowed excavation for the full length of pipe.</p> <p>2. BCC have used a cross sectional area of 1.4 m² for trenching throughout. This is incorrect as some segments of pavement construction are in fill condition which requires less excavation. WT have used a trench depth of 0.323 metres in fill condition.</p>
BEDDING AND BACKFILLING	The assumption for trench depth discussed above affects this quantity.
DRAINAGE PITS & HEADWALLS	BCC has allowed for pits on one side of the road. WT quantity is based on the same spacing but on both sides of the road.
CLEARING	WT have measured the clearing area to the batter extents.
ROADWORKS	Bulk earthworks quantity from 12D report captures all earthworks from Existing Surface Level to Subgrade Level. The only additional earthworks should be for stormwater structure which is captured separate to this item. WT have adjusted the quantity for <i>Item 6.0.3 – Excavation of clay material</i> so that the total excavation quantity is equivalent to the 'cut volume' shown in 12D report.
CARTAGE	BCC has included site won fill material in cartage quantity. In the calculation for cartage quantity, the fill quantity has been subtracted from excavated clay material in Item 6.0.3.
TIPPING FEES	<p>1. BCC's quantities in this section do not include tipping of spoil generated from excavation for stormwater structures. There is also a duplication of quantities in Items 11(b) and 11(e). WT have split the quantity on a 50:50 basis.</p> <p>2. The disposal quantity of clay material is incorrect as some of it is being re-used for fill.</p> <p>3. Tipping of spoil generated from excavation for stormwater structures has been excluded. WT have included the quantities into the correct waste classifications.</p>
SUBGRADE	WT have measured the subgrade treatment areas between the toe of cut and fill batters.
SUBSOIL DRAINS	WT have assumed that a trench drain will exist on both sides along the entire length of road whereas BCC estimate allows for 1.25 x the length of road

PAVEMENT CONSTRUCTION	<p>1. For the width of wearing course and base course, WT concurs with BCC's approach to deduct 0.45m of concrete gutter on both sides of pavement (hence 0.9m in total) from the full width of carriageway. As such, the width used in WT's measurement is 10.1m for 11m wide carriageway and 8.1m for 9m wide carriageway respectively.</p> <p>2. For sub-base, WT concurs with BCC's approach to extend the sub-base layer by 0.15m behind the 0.19m wide kerb on both sides of the pavement. With this, total width used in WT's measurement of sub-base layer is 9.68m for 9m wide carriageway and 11.68m for 11m wide carriageway respectively.</p>
MISCELLANEOUS	BCC's allowance for turfing is 300mm width along both sides of the road. WT's assumption is that the turfing is required on all verge areas excluding cycle path and pedestrian footpath.

7.1.14 R7 – CUDGEGONG ROAD

ELEMENT	FINDINGS
STORMWATER DRAINAGE	BCC has not allowed excavation for the full length of pipe.
BEDDING AND BACKFILLING	The assumption for trench depth discussed above affects this quantity.
CLEARING	The number of significant trees to be removed is lower than what is visible on Google Street View.
ROADWORKS	Bulk earthworks quantity from 12D report captures all earthworks from Existing Surface Level to Subgrade Level. The only additional earthworks should be for stormwater structure which is captured separate to this item. WT have adjusted the quantity for <i>Item 6.0.3 – Excavation of clay material</i> so that the total excavation quantity is equivalent to the 'cut volume' shown in 12D report.
TIPPING FEES	<p>1. BCC's quantities in this section do not include tipping of spoil generated from excavation for stormwater structures. There is also a duplication of quantities in Items 11(b) and 11(e). WT have split the quantity on a 50:50 basis.</p> <p>2. The disposal quantity of clay material is incorrect as some of it is being re-used for fill.</p> <p>3. Tipping of spoil generated from excavation for stormwater structures has been excluded. WT have included the quantities into the correct waste classifications.</p>
SUBGRADE	WT have measured the subgrade treatment areas between the toe of cut and fill batters.
SUBSOIL DRAINS	WT have assumed that a trench drain will exist on both sides along the entire length of road whereas BCC estimate allows for 1.25 x the length of road
PAVEMENT CONSTRUCTION	<p>1. For the width of wearing course and base course, WT concurs with BCC's approach to deduct 0.45m of concrete gutter on both sides of pavement (hence 0.9m in total) from the full width of carriageway. As such, the width used in WT's measurement is 10.1m for 11m wide carriageway and 8.1m for 9m wide carriageway respectively.</p> <p>2. For sub-base, WT concurs with BCC's approach to extend the sub-base layer by 0.15m behind the 0.19m wide kerb on both sides of the pavement. With this, total width used in WT's measurement of sub-base</p>

	layer is 9.68m for 9m wide carriageway and 11.68m for 11m wide carriageway respectively.
MISCELLANEOUS	BCC's allowance for turfing is 300mm width along both sides of the road. WT's assumption is that the turfing is required on all verge areas excluding cycle path and pedestrian footpath.

8 SUMMARY OF POTENTIAL COST IMPACT

Ref No.	Cost Category	R1.1	R1.2	R1.3	R2	R3.1	R3.2	R3.3	R4.1	R4.2	R5.1	R5.2	R5.3	R6	R7	Total
1	Site establishment and amenities	\$3,762.48	\$5,082.08	\$8,074.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$5,714.43	\$22,633.00
2	Stormwater drainage and works	(\$20,714.28)	(\$38,244.41)	\$96,543.41	\$27,406.38	(\$31,897.21)	\$64,171.00	\$158,267.61	\$11,788.70	\$132,774.19	\$23,911.18	\$18,345.46	(\$27.51)	\$205,451.96	\$15,142.12	\$662,918.61
3	Excavation/backfill	\$0.00	\$0.00	\$66,037.81	\$19,452.05	(\$5,036.14)	(\$47,347.66)	(\$661,803.00)	\$34,343.05	\$107,791.16	\$3,428.33	(\$53,460.02)	(\$3,123.77)	(\$4,380.95)	\$4,936.16	(\$539,162.97)
4	Cartage	\$50,602	\$176,249	(\$39,298)	(\$78,531)	(\$289,323)	(\$148,952)	(\$1,034,618)	(\$134,472)	(\$1,843)	(\$6,352)	(\$103,758)	(\$1,709)	(\$196,617)	\$1,006	(\$1,807,617)
5	Tipping fees	\$112,391	\$312,139	\$76,203	(\$98,498)	\$5,210	(\$391,015)	(\$5,810,230)	\$113,416	\$539,623	(\$31,506)	\$558,155	(\$16,168)	\$505,380	(\$61,713)	(\$4,246,611)
6	Subgrade treatment	\$473	\$874	\$0	\$7,149	\$7,045	\$12,106	\$30,427	\$8,852	\$11,748	\$4,348	\$3,624	\$89	\$8,022	\$1,470	\$96,227
7	Subsoil drainage	\$19,519	\$36,123	\$0	\$8,549	\$195	\$14,573	\$0	\$7,885	\$24,514	\$7,026	\$4,879	\$0	\$33,258	\$0	\$156,523
8	Pavement construction	\$33,907	\$62,645	\$59	\$8	(\$137,547)	\$7	(\$7)	(\$3)	\$21	\$3	\$52	\$3	(\$17)	(\$0)	(\$40,867)
9	Concrete, K&G and other works	\$2,719	(\$513)	\$0	\$0	(\$47,317)	\$7,714	\$18,978	\$3,664	\$0	\$2,458	\$1,707	\$0	\$0	\$0	(\$10,590)
10	Other	(\$2,219)	\$99	(\$892)	\$12,638	\$4,680	\$18,714	\$40,575	\$9,581	\$15,913	\$6,367	\$4,421	\$935	\$30,136	(\$281)	\$140,665
11	Traffic management	\$294	\$349	\$0	\$0	(\$3,585)	\$0	\$6	\$6	\$0	\$0	\$6	\$0	\$0	\$3	(\$2,924)
12	Street lighting	\$0	\$0	\$0	\$0	(\$16,200)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$16,200)
13	Traffic signals	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
14	Roundabouts	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
15	Service adjustments	\$62,500	\$871,260	\$0	\$18,800	\$0	\$273,650	(\$22,460)	(\$1,271,370)	(\$70,000)	\$721,000	\$76,650	\$0	\$0	\$0	\$660,030
	Contingencies	\$26,323	\$142,606	\$10,336	(\$3,836)	(\$25,689)	(\$9,819)	(\$364,043)	(\$33,026)	\$61,948	\$33,534	\$25,531	(\$1,000)	\$29,536	(\$1,686)	(\$109,283)
	Design Fee	\$13,162	\$71,303	\$10,336	(\$3,836)	(\$25,689)	(\$9,819)	(\$364,043)	(\$33,026)	\$61,948	\$33,534	\$25,531	(\$1,000)	\$29,536	(\$1,686)	(\$193,748)
	Total Cost Impact	\$302,718	\$1,639,372	\$227,400	(\$90,699)	(\$565,151)	(\$216,017)	(\$8,008,952)	(\$1,282,362)	\$884,438	\$737,753	\$561,683	(\$22,001)	\$640,306	(\$37,095)	(\$5,228,008)
	% Cost Impact to BCC Estimate	12%	38%	6%	-6%	-33%	-2%	-22%	-46%	20%	57%	22%	-4%	8%	-3%	-6%

APPENDIX B

SCHEDULE OF DOCUMENTS USED

DOCUMENTS USED

PROVIDED BY	FILE NAME	DATE RECEIVED
IPART	Area20 RiverstoneEast_Traffic_WithoutMask (4) (002).PDF	25/07/2018
IPART	BCC CP22 transport.ZIP	03/08/2018
IPART	technical studies.ZIP	03/08/2018
BCC	cudgegong DBYD.ZIP	07/08/2018
BCC	Gordon DBYD.ZIP	07/08/2018
BCC	Guntawong DBYD.ZIP	07/08/2018
BCC	Riverstone rd DBYD.ZIP	07/08/2018
BCC	road pdfs.ZIP	07/08/2018
BCC	ROAD volumes.ZIP	07/08/2018
BCC	Rouse rd DBYD.ZIP	07/08/2018
BCC	Tallawong DBYD.ZIP	07/08/2018
BCC	Worcester DBYD.ZIP	07/08/2018

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