Report – Public Version

FPP Corridor Cost Analysis – Response to Submissions, Report 4 (Final)

Prepared for The Commerce Commission (Client)

By Beca Ltd (Beca)

11 December 2015

Revision History

Revision Nº	Prepared By	Description	Date
A	Barry Calvert	Draft issue	11/09/2015
B	Barry Calvert and Warren Perkins	Final draft for approval	21/10/2015
C	Barry Calvert	Final Issue	28/10/2015
D	Barry Calvert	Amendments to Final Issue	24/11/2015
E	Barry Calvert	Amendments to Section 12	01/12/2015
F	Barry Calvert	New section on Arborists plus minor wording changes	09/12/2015
G	Warren Perkins	Minor amendments following review	11/12/2015
H	Barry Calvert	Public Version	11/12/2015

Document Acceptance

Action	Name	Signed	Date
Prepared by	Barry Calvert		11/12/2015
Reviewed by	Warren Perkins		11/12/2015
Approved by	Mike Leddy		11/12/2015
on behalf of	The Wellington Office of Beca Ltd		

Table of Contents

1 Introduction and Scope of Report 1
2 Traffic Management and the Beca Verification Process 1
3 Hydro Excavation 3
4 Ducting Sizes and Types 5
5 Direct Buried Cabling 6
6 Micro Trenching 7
7 Discounting 7
8 Arborist Costs 7
9 Trench and Bore Hole Dimensions 8
10 Chorus and LFC Data 8
11 Laterals 11
12 Trench Reinstatement 12
13 Weightings 12
14 Price Trends 16
15 Summary 17

Appendices

Appendix A: Trenching and Ducting Rates Schedule – Updated 22 October 2015

1 Introduction and Scope of Report

Subsequent to the release of our three previous reports in Nov-14, Mar-15 and Jun-15 relating to the Unbundled Copper Local Loop and Unbundled Bitstream Access services final pricing principle submission process, we have been asked by the Commerce Commission ("the Commission") to respond to further queries from submitters received on or around 13 August 2015 as part of the latest round of consultation.

The following report has been written to address the issues raised in the various submissions. Each section relates to a specific issue or group of related issues and provides a suitable response.

The following issues are covered in this report:

a) Traffic Management and Beca's Verification
b) Hydro Excavation as an acceptable trenching methodology
c) Ducting sizes and types
d) Direct buried cabling
e) Micro trenching
f) Comments on Discounting & Arborist Costs
g) Trench and bore hole dimensioning
h) Chorus and LFC Data
i) Laterals
j) Trench reinstatement
k) Weightings
l) Price Trends

With regards to the rates table *151022 NZ Corridor Cost Analysis for Trenching Rates (Rev 9)* appended to this report, we confirm that the rates remain current for the year 2015.

1.1 Clarification on Footnotes

Where footnotes are used to identify referenced documents, these generally refer to the name of the submission as uploaded on to the Commerce Commission's UCLL and UBA website page http://www.comcom.govt.nz/regulated-industries/telecommunications/regulated-services/standard-terms-determinations/unbundled-copper-local-loop-and-unbundled-bitstream-access-services-final-pricing-principle/

2 Traffic Management and the Beca Verification Process

On page 110 of the WIK submission[1] they make the comment that... "BECA's approach to determine trenching costs still cannot be verified", in particular "regarding traffic management cost the BECA report of 2015, Section 15, is in-transparent regarding the determination of the height of the traffic management cost. Thus, the cost in total cannot be verified fully."

The sources of information used to calculate rates in our previous reports (including Traffic Management) are often contractors, who have either specifically responded to our requests for

[1] WIK-submission-on-behalf-of-Spark-and-Vodafone-on-further-draft-determination-for-UBA-and-UCLL-services-12-August-2015

indicative estimates, or via rates included within various tenders. While we have accepted most of these at face value, our quantity surveyors have also completed all of the reviews, bulk comparisons and sanity checks necessary to give us confidence that the final 'all inclusive' rates are appropriate for the purposes of the report. We would also like to re-emphasise that these rates are 'national averages' and are not comparable to a specific job or location.

Under section 4.4 of our second report dated 17 April 2015[2], we outlined our assumptions regarding location, productivity and daily rates for traffic management ("TM"). Since then our on-going research has confirmed that $1,000 is a suitable average daily rate for TM around New Zealand. We have also confirmed that based on generally accepted productivity constants the TM allowances made for the various different trenching methodologies are adequate.

In terms of Beca's review and verification process, this is firmly established in our company culture. Every job is allocated to a job manager who completes a specific verification plan for each work package or discipline. These reviews are carried out by either our technical directors or other qualified senior staff with the relevant market experience. In this way we are able catch and rectify the majority of errors, providing a robust and reliable deliverable.

Regarding the competency of our people, the cost management team involved in producing this report are all qualified members of the New Zealand Institute of Quantity Surveyors. The co-writer and primary researcher Barry Calvert is a Registered Quantity Surveyor (Reg.No.152) and one of Beca's Senior Associates with over 30 years of experience in the construction industry. Warren Perkins is a Principal and Technical Director based in Auckland with 22 years as a Quantity Surveyor.

The following paragraphs taken from our website speak to Beca's reputation in the market and the experience of our people.

> *Beca Cost Management has provided specialist services to the industrial, infrastructure and building market for over 40 years and in that time has established a reputation within the industry for assisting with the delivery of quality projects for a wide range of private companies, public companies, local authority and central government organisations, within budget and to programme.*
>
> *Beca's Cost Management team has delivered a high standard of cost leadership based on our extensive knowledge and understanding of cost management principles and a proven track record for cost certainty. Beca offer full project services in cost management, from feasibility and concept design through to completion of construction. Beca has a substantial team of professional quantity surveyors and cost managers located throughout New Zealand and Australia, who provide services across a wide range of market sectors in Australasia, South East Asia and the Pacific.*
>
> *Being an integral part of a successful and respected multi-disciplinary engineering practice enables our team to draw upon expertise within the fields of design, engineering, construction and management throughout the project's life cycle, from inception to completion. We strive to provide tangible benefits when looking at design options and business case solutions for a project's development.*

[2] Beca-report-FPP-Corridor-Cost-Analysis-Response-to-Submissions-17-April-2015

3 Hydro Excavation

Beca, in its report to the Commission in November 2014 entitled FPP Corridor Analysis of Trenching and Ducting Rates in NZ – Final Issue Nov14 published on the Commissions website[3], made general assumptions regarding the common types of trenching technologies (methods) that could or typically would be used in differing soil types and in urban environments throughout New Zealand.

A second piece of research entitled FPP Corridor Cost Analysis – Report 3, New Rates and General Recommendations[4] was undertaken in May 2015 which included a brief study of the various trenching methodologies and their recommended applications to further inform TERA on the suitability of each option. Up to this point TERA had needed rates for multiple ducts of 110mm in size, requiring wider and deeper trenches. At that stage Hydro Excavation was not considered for modelling purposes.

However in one or two of the most recent submissions it has been suggested that Hydro Excavation has become one of the more widely used trenching methods in New Zealand and that many locations only require a narrow, shallow trench for the purposes of burying a single duct. The Commission has therefore asked Beca to consider the relevance of Hydro Excavation, whether or not it should be included as a trenching option in the TERA model and what the likely national average rate per metre would be.

Sometimes called hydro trenching or hydro vacuum excavation, this technology uses high pressure water jets to loosen the soil within the trench producing a watery slurry which is then removed using suction from powerful vacuum equipment. The use of water helps reduce the soil's holding strength thus helping to break the soil and suction them easily. When excavating frozen ground, hot water can be used to thaw the frozen ground and dig through.

[3] Beca-FPP-Corridor-Cost-Analysis-Full-Report-Nov-2014

[4] Beca-Report-on-FPP-Corridor-Cost-Analysis-Report-3-New-Rates-and-General-Recommendations-5-June-2015

3.1 Advantages and Disadvantages of This Method

Hydro vacuum has certain advantages over more traditional trenching methods. It works on most soil types including frozen ground and wet heavy clay. Though not gentle to use it does not produce any dust which may cause environmental issues or discomfort to the operators. If the water jet pressure is adjusted properly there is a much lower risk of damaging existing services and a much narrower trench can be dug, reducing surface reinstatement costs where excavation occurs within grass berms or in open, un-paved areas.

Generally hydro excavation is used in suburban situations where only thinner, shallower trenches maybe needed and where there is a high likelihood of coming across other buried services such as power cables and sewer or water pipes. It is especially useful in ‘pot holing’ to locate the position of underground services and when trenching alongside other services (especially in congested, or confined, utility corridors). Hydro excavation has the following benefits;

1. Improved health and safety operation. The chances of serious injury, particularly from striking gas or power services, is reduced,

2. Reduced likelihood of damaging services and incurring costly repair bills, services disruptions and environmental clean-ups.

3. The water blast jet allows a trench, just wider than the duct, to be excavated.

4. One other area where Hydro Excavation would be particularly useful is for the installation of laterals. We note that the Downer submission makes reference to these in item 1(e), page 2, as do items 86.1 and 112 of the Chorus submission[5]. Beca agrees with Downer and Chorus in this regard and recommends that these be included in the TERA model. Beca has provided additional information on Laterals under Section 10 (page 10) of this report.

We note that the NZTA Minimum Standard for Utility Identification and Protection on Road Projects ZHMS-03 requires hydro excavation to be used as the default method of locating existing services.

There are also some disadvantages and limitations for the use of hydro excavation. It cannot be carried out without a ready water source. If the suction excavator runs out of water, the operator has to either find a readily available water source, or leave the site to re-fill their tanks. It should also be noted that the waste slurry produced by this method is not suitable for backfill and must be taken off-site for disposal, to be replaced with new imported fill.

Vacuum units cannot extract stones over a certain size from the trench, so additional labour is required where these types of stones are present. It is generally accepted that hydro excavation is not suitable in loose or hard rock situations.

Another drawback for hydro is that if pressurized water is not adjusted appropriately, it can cut through underground cables and damage pipelines. The method has to be performed with caution by suitably trained operators. The trucks are also fairly large and would not be able to physically gain access to some areas.

As plant costs are so high, on-site productivity must also be high for hydro excavation to be cost effective. We have updated our rates table to include for the hydro option for narrow trench widths 500mm deep.

[5] Chorus-submission-on-further-draft-determination-for-UBA-and-UCLL-services-13-August-2015

3.2 Recommended Application

Downer New Zealand Limited in their 12 August submission[6] ("the Downer Submission") state in item 2(e) that "Hydro-trenching is more suited for urban outside boundary trenching, especially in grass berms where high productivity can be achieved". Our research confirms the above view. We also consider that because of health and safety concerns hydro is also very effective in urban areas where a significant amount of existing utility services are present underground.

For paved areas hydro trenching requires the hard surface to be saw-cut, removed and reinstated. In this situation directional drilling, with its lower cost of reinstatement, would be the preferred option. Overall Beca is comfortable in recommending Hydro Excavation as an effective option when used in the appropriate location.

3.3 Hydro Excavation Rates

In **Appendix A** we have attached an updated Trenching and Ducting Rates Schedule which includes the option of Hydro Trenching. In all cases these rates are built up using productivity figures provided to us by a reputable operator (specialist contractor) which formed the basis of our assumption that hydro excavation can be undertaken at an average of [redacted] per hour. This is roughly in line with the Downers submission which notes a forecast productivity of [redacted] of trench per day. The calculation [redacted] (per day) is therefore a reasonable expectation.

In order to provide national average rates we have also assumed a reinstatement weighting of 60% paved surfaces and 40% grass. Figures are provided for up to 8 no. ducts of 50mm and 110mm diameter.

4 Ducting Sizes and Types

4.1 PE Ducting

Item 1(g) of the Downer New Zealand Limited submission[7] they state that PE ducting is being laid in smaller diameters (40-50mm) with internal microducts containing the new fibre.

TERA have requested that Beca provide pricing for smaller duct sizes. The following rates are therefore provided for the supply and installation of PE ducting, including an allowance for fittings such as welded joints where necessary.

National average supply & installation rate for 32mm OD is **$10.00 + GST**

National average supply & installation rate for 40mm OD is **$12.00 + GST**

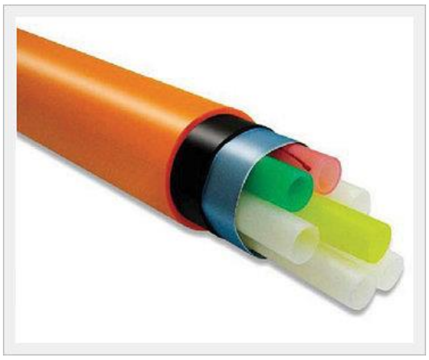
Note OD = Outside Diameter (of duct)

[6] Downer-New-Zealand-submission-on-further-draft-determination-for-UBA-and-UCLL-services-12-August-2015, page 3

[7] Downer-New-Zealand-submission-on-further-draft-determination-for-UBA-and-UCLL-services-12-August-2015, page 2

4.2 Microducts

In the context of this report microduct is assumed to be small diameter PE duct (between 5 and 12mm OD) , often in different colours and usually in groupings encased within a thin sleeve and outer wall or sheathing. The image below shows the red, green, yellow, white and clear plastic microducts with a blue sleeve and black outer sheathing.



An outer ducting is an integral part in the protection system for microducting. These outer PE ducts are often orange or green in colour (a typical example is shown in the adjacent image).

Once the sheathed microducts have been installed within the PE ducting the fibre is then feed through the microducts using a specialist technique known as “blowing”.

Beca has not been asked by the Commission to provide any pricing for supply or installation of microducts.

5 Direct Buried Cabling

Direct buried is a term used to describe the technique of burying cable directly into a trench without ducting. This method is widely used for power cables or multi-core, heavily sheathed (armoured) data cable. These copper or aluminium conductors have adequate crush strength and are not so easily damaged by sharp rocks present in the backfill, although there is always the risk of being hit by subsequent excavation machinery.

Network Strategies in their most recent submission[8] assert that a significant percentage of the existing network is direct buried and that to not consider this option for fibre” does not reflect the costs of an efficient operator.” The existing network is primarily in copper.

We disagree with Network Strategies on this point. As discussed in section 4.2 above the proprietary sheathing used to encase the microduct typically used in New Zealand is not durable enough to properly protect the fibre. Armoured alternatives used overseas are available in New Zealand, however these are rarely used, primarily due to cost.

There is also the issue of trench life and future-proofing. Ducting provides cost effective, long term protection from digger strikes and water ingress along with a greater degree of flexibility for fibre replacement and upgrades.

In summary, we do not believe contractors or service providers would opt for direct burying any fibre cabling for the UFB and RBI deployment.

[8] Network-Strategies-submission-on-behalf-of-Spark-and-Vodafone-on-further-draft-determination-for-UBA-and-UCLL-services-13-August-2015

6 Micro Trenching

Micro Trenching has once again come up, this time in the Vodafone submission[9]. On page 54 under H7.1(b) Vodafone state ..."Modern trenching techniques which are already in use in New Zealand, such as mini and micro-trenching are ignored." Micro[10] trenching was considered by Beca in the initial stages of our research last year. While it is used in New Zealand, the applications are limited. The following is an excerpt from page 7 of our April 2015 report[11].

> *On their website Network Strategies note that micro-trenching does have significant limitations and cannot be used in situations where the pavement surface is less than 100mm thick or where there is risk of surface compaction by heavy traffic. The fibre cabling must also be removed and reinstated whenever the road needs resurfacing. And due to its relatively shallow location (often only 100mm below the surface) the fibre network would be susceptible to damage by general contractors cutting into the road. All of these potential issues rule it out as a serious option for use in the nation-wide rollout.*

No doubt there will be a few situations where this technology can be used cost effectively with little or no risk to the customer, however in our view these will be so limited that the cost savings will make virtually no difference to the overall outcome. Therefore we do not recommend that Micro Trenching be included in the TERA model.

7 Discounting

With reference to our June 2015 report[12], we have no reason to change our position on contractor discounting and note Downers agreement with the Beca view that there is unlikely to be any discount available on large scale projects such as the network build, given the widespread use of smaller subcontractors across the regions.[13].

8 Arborist Costs

In our April 2015 report we also discussed the Aurecon and Analysys Mason comments regarding the use of arborists for dealing with tree root obstructions. Our position at the time was that the costs associated with arborist costs were allowed for within the "cover-all" rates received from

[9] Vodafone-NZ-submission-on-further-draft-determination-for-UBA-and-UCLL-services-13-August-2015

[10] Mini and micro trenching are considered to be the same

[11] Beca-report-FPP-Corridor-Cost-Analysis-Response-to-Submissions-17-April-2015

[12] Beca-Report-on-FPP-Corridor-Cost-Analysis-Report-3-New-Rates-and-General-Recommendations-5-June-2015, page 12, section 10

[13] Downer-New-Zealand-submission-on-further-draft-determination-for-UBA-and-UCLL-services-12-August-2015, page 4, section 10

directional drilling contractors. However Analysys Mason have raised the issue again in their August 2015 submission[14] referring to the TERA exclusion and the supply of data.

In response to these comments and the other concerns relating to underground congestion, we have added Hydro Excavation to our revised range of urban trenching options and have recommended that this technology be incorporated into weighted national average rates for trenching in urban areas – see Section 13 on Weightings (page 12).

9 Trench and Bore Hole Dimensions

Analysis Mason have queried our trench dimensions in their submission dated 11 August 2015[15]. Under 3.3 on page 18 they are concerned about inconsistencies in the excavation widths for open trenching in Soft Cohesion-less soils. We wish to clarify that in soils with less cohesion the sides of the trench are not stable and often collapse. Most operators will batter sides resulting in a trench of larger size than the design width. Our figures have tried to reflect this ‘over excavation’ cost. Practically, it also means that more ducts can be placed lower down in the trench due to its increased width.

On page 19 of its submission Analysis Mason have provided what they believe are more accurate bore diameters for directional drilling. This information is supplied in the form of a table with current bore diameters and revised (suggested) bore diameters.

It is important to understand that our calculation tables are influenced heavily by indicative boring and duct install rates received from local contractors. In most cases we ended up with a range of possible all inclusive rates within a single area, which is typical in a competitive market.

Our boring calculations are designed to mimic the data received from contractors and we have generally been quite pragmatic, balancing our own rate build-up calculations with market averages. We have no way of knowing how the contractors built up their boring rate. All we know is that their results align fairly well with ours. Attempting to manipulate the boring data (increasing the volume) would only necessitate a reduction elsewhere.

We will therefore not be making any changes to our ‘overall’ rates.

10 Chorus and LFC Data

10.1 Chorus Data

In item 5 on page 18 of the Chorus submission[16] they expressed concern that the Commission had not adequately considered the comprehensive pricing data supplied by them for actual trenching work on the UFB and RBI deployment to date. Beca has received from the Commission a copy of

[14] Analysys-Mason-on-behalf-of-Chorus-on-further-draft-determination-for-UBA-and-UCLL-services-11-August-2015

[15] Analysys-Mason-on-behalf-of-Chorus-on-further-draft-determination-for-UBA-and-UCLL-services-11-August-2015

[16] Chorus-submission-on-further-draft-determination-for-UBA-and-UCLL-services-13-August-2015

the Chorus/Analysys Mason RBI and UFB dataset files[17] obtained under Sections 98(a) and 98(b) of the Commerce Act 1986. Beca has summarised the results of their pricing data in the following tables, however it should be noted that a detailed examination of and response to the Chorus/Analysis Mason model is out-side of the Beca expertise;

Table 1

RBI TRENCHING		**TRENCH LENGTH - all types (m)**	**COST ($)**	**AVERAGE TRENCH COST ($/m)**	**Comments**
Trench >1,000m long	[redacted]	[redacted]	[redacted]	[redacted]	
Trench < 1,000m long	[redacted]	[redacted]	[redacted]	[redacted]	
Items with zero trench length		[redacted]	[redacted]	N/A	Zero trench length - is this is an actual trench cost?
TOTALS		[redacted]	[redacted] (excluding items with zero trench length) OR [redacted] (including items with zero trench length)	[redacted] (excluding items with zero trench length) OR [redacted] (including items with zero trench length)	

Table 2

UFB TRENCHING		**TRENCH LENGTH - all types (m)**	**COST ($)**	**AVERAGE TRENCH COST ($/m)**	**Comments**
Trench >1,000m long	[redacted]	[redacted]	[redacted]	[redacted]	
Trench < 1,000m long	[redacted]	[redacted]	[redacted]	[redacted]	
Items with zero trench length		[redacted]	[redacted]	N/A	Zero trench length, but has negligible effect on overall trench rate
TOTALS		[redacted]	[redacted]	[redacted]	

From the Chorus/Analysys Mason data it should be noted that the trenching lengths (approx. [redacted] for RBI and [redacted] for UFB) should provide a good statistical sample of both trenching types and costs. However the Chorus/Analysys Mason data has not been used for the following reasons;

[17] Chorus Q-6-14-1 (j) RBI costs with calculations, received in confidence

1. The type of trenching methodology is not specifically identified and so average costs, using a variety of methodologies has to be assumed,

2. The number, size and type of duct used is not identified,

3. The RBI data contains [redacted] of cost with a zero trench length, which potentially adds [redacted] to the trench rate. Beca has not been able to clarify whether or not this is a cost that affects the trenching rate specifically. Note that the UFB costs against zero trench length has an almost negligible effect on the trench rate and this has been ignored,

4. The cost of installing trenches less than 1,000m long is a factor of [redacted] (for RBI) and a factor of [redacted] (for UFB) more expensive than installing trenches greater than 1,000m long. This highlights the cost benefits that can be gained by having substantially long trenches, where efficiencies can be achieved, versus the inefficiencies of smaller works,

5. Beca unit rates exclude Chorus project management and design costs.

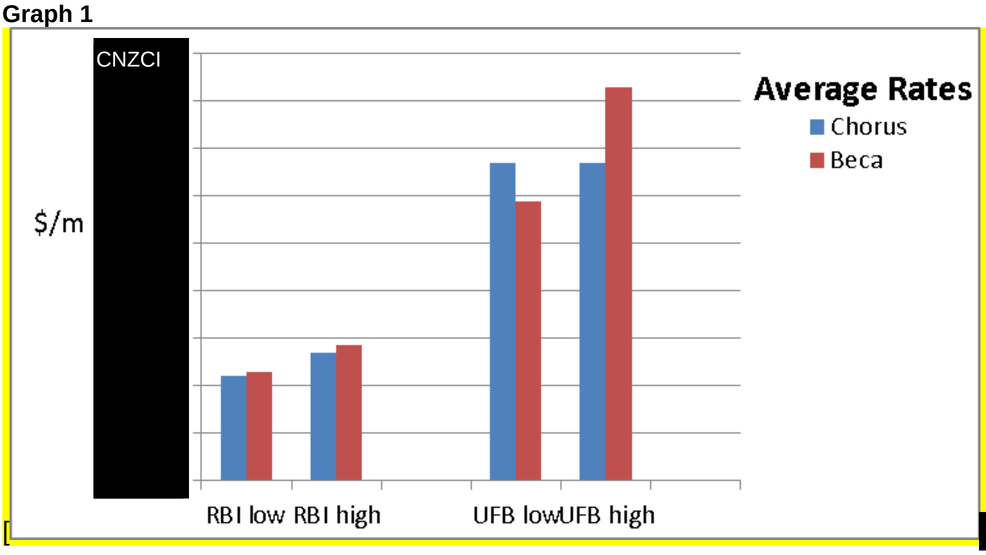
A direct ‘like for like’ comparison between the Chorus/Analysys Mason data and the Beca unit rates for trenching is not possible, however in general terms;

1. The Beca rural trenching rates range from [redacted] to [redacted] (average of [redacted] for single 50mm ducts and [redacted] to [redacted] (average of [redacted] for single 110mm ducts in soil types 1 to 4 (i.e. Excluding rock/soil type 5). This can be compared to the Chorus/Analysys Mason average range of between [redacted] and [redacted] (dependent on length of trench and whether or not ‘zero’ trench length items are included). Essentially the average rate will be determined by the mix of trenching methodologies that is adopted.

2. In the urban situation the number of ducts installed has a critical impact on the average unit rate. Assuming that in general a pair of ducts (on average) are installed in the urban situation Beca’s urban trenching rates range from [redacted] to [redacted] (average of [redacted] for 50mm ducts and [redacted] to [redacted] (average of [redacted] for 110mm ducts in soil types 2, 3 or hardfill. This compares with Chorus/Analysys Mason rates which range from [redacted] (lengths over 1,000m) to [redacted] (for lengths less than 1,000m) with an average of [redacted]

The above information has been expressed graphically below:

Graph 1



[redacted]

We find nothing within this information that would influence us to change any of the national average rates provided to the commission. Although no direct comparison with Chorus/Analysys Mason is possible, and in spite of the large number of variables (trench excavation methodology, number and size of ducts, soil types etc.), Beca considers that the unit rates it has derived from Contractor's and its own in-house sources are not dissimilar (on average) to the available Chorus/Analysys Mason data and are appropriate for the intended use.

10.2 Local Fibre Company (LFC) Data

The Commission requested cost information from Local Fibre Companies Enable, WEL and Northpower via a Section 98 notice. Beca has reviewed the data received from these LFC's and finds nothing within this information that would influence a decision to change any of the national average rates provided by us, nor is there any reason for us to modify any advice that we have given the Commission to date.

Our position on this matter is based on the following observations:

a. Enable rates for duct + open trenching ECI [redacted] and duct + directional drilling ECI [redacted] are comparable to Beca's for 50mm duct size CNZCI [redacted]

b. Enable's estimate of ECI [redacted] for drilling work in Christchurch is comparable to the TERA model results

c. Northpower reinstatement rates per m2 NCI [redacted] are comparable to the Beca rates of $70-$100

d. Northpower drill/thrust rates NCI [redacted] are comparable to the Beca rates CNZCI [redacted]

e. Northpower open trenching rate of NCI [redacted] is slightly higher but comparable to the Beca rate of CNZCI [redacted]

f. Northpower 40dia duct supply rate of NCI [redacted] is NCI [redacted] higher than the Beca rate for 50dia of $10/m

g. WEL have only provided hourly rates with no material costs or productivity figures

11 Laterals

The cost of laterals (between the main horizontal ducting to the property boundary) is included in the latest TERA model. The Commission has asked Beca to comment on the potential average length of lateral trenching. From our enquiries we have ascertained that the lengths of these trenches can be highly variable, ranging anywhere from 500mm to 3.5m in some cases. Beca therefore suggests a suitable trench length for modelling purposes of 1.75m.

The following factors contributed to the recommendation above;

1. Where trenching activity is close to a residential property there needs to be sufficient working space for small excavators and directional drilling machines to work alongside (but outside of) the property boundary.

2. The trench needs to be far enough away from any structure such as boundary fences or retaining walls (and power poles) so that the trench does not compromise their structural integrity.

3. Many existing subdivisions or general housing areas have the footpath located close to (or boarding on) property boundaries with a grass berm suitable for trenching closer to kerb – refer image above.

It is important to note that the recommended length above relates only to trenching. The actual length of the lateral may be longer due to vertical rises and connection details.

12 Trench Reinstatement

Downers raise the issue of reinstatement on page 5, section 12 of their submission[18]. We respond as follows.

The logic of the overall Downers argument regarding reinstatement is not consistent with their assertion that the vast majority of trenching work being undertaken by them is either Hydro trenching in grass berms or directional drilling which requires almost no hard surface reinstatement. We refer to their Appendix 1 table which clearly notes only DCI [redacted] of their forecasted work will be open trenched.

The point made under section 12, point J "we estimate the rates (for reinstatement) supplied by Beca are at least 50% under-priced." seems to imply that any under-valuing of hard surface reinstatement will make a significant difference to the outcome of the TERA model. However we note that the table in Appendix 1 of the Downer submission (Confidential Version) relates only to work in urban areas. The Beca rates for urban reinstatement are national averages that assume a mix of both (expensive) hard pavement and (cheaper) grass reinstatement. On review Beca considers that our rates for reinstatement are appropriate.

Downers also mention the Beca rates do not allow for a number of items which may or may not be required by councils, such as over-reinstatement, slightly thicker asphalt and temporary reinstatement. They also mention specialised surfaces such as cobbles and road related items such as kerbs, crossings and manholes. The incidence of these items occurring in the context of a nationwide rollout is so small that we are confident these costs would easily be covered within the 'all inclusive' rates provided.

13 Weightings

The last release of our Rates Schedule was on 28 May 2015. Recently Beca has become aware of the implications of the use of these rates in the TERA model which used only the cheapest rate per soil type for each duct quantity. This, in our view, is not indicative of the mix of trenching

[18] Downer-New-Zealand-submission-on-further-draft-determination-for-UBA-and-UCLL-services-12-August-2015

methodologies that we would expect to see in the New Zealand situation. We concur with the Analysys Mason view[19] on this point.

The following table summarises the TERA model 'un-weighted' output in approximate percentages for each technology when the lowest cost is used;

Table 3

Technology	Rural	Urban
Mole Ploughing	81%	0%
Chain Digger	0%	0%
Open trench 400 wide	12%	4%
Directional Drilling	3%	94%
Rock Sawing	4%	2%
Thrusting	0%	0%
Hydro	0%	0%
TOTAL	**100%**	**100%**

The surface and sub-surface characteristics of New Zealand's topography is such that within any given length of road or berm it is likely that trenching contractors will encounter a variety of situations and conditions that requires a mix of trenching technologies to be used. Contractors will encounter different soil types (including volcanic rock or hardfill), buried services, hidden debris, obstructions, dangerous working conditions and the like, which will influence the required trenching methodology.

Based on our experience in the Civils market and various discussions with contractors in both North and South Islands we would expect to see a higher percentage of drilling in rural areas and a broader range of technologies being used in urban.

For this reason we believe that the model outputs summarised in Table 3 above are not reflective of the mix of trenching methodologies currently used in this sector. This could possibly lead to an under-valuing of the work on a national scale.

In parallel to this view we note the comment in the Downer submission that "No indication is given of the mix/weighting given to various methodologies. Our experience indicates mole-plough and drill are used predominantly."[20] This was referring to Beca's rural price tables.

As one potential means of overcoming this issue we suggest The Commission considers directing TERA to use a mix of trenching technologies with weighted national average rates in their model. Although it is likely there will be no definitive data on which to base any specific weightings, we believe that a reasonably proportioned mix is better than no weighting at all.

Responding to Beca's recommendation above The Commission has requested that Beca provide them with indicative weightings and weighted rates. As part of this rates review we wish to highlight the following points which we have taken into consideration (in no particular order);

---

[19] Analysys-Mason-on-behalf-of-Chorus-on-further-draft-determination-for-UBA-and-UCLL-services-11-August-2015, page 16, 3.2, Use of cheapest trenching method

[20] Downer-New-Zealand-submission-on-further-draft-determination-for-UBA-and-UCLL-services-12-August-2015, page 7, bullet point 1

1. Beca has no definitive data on which to base weighted average trench rates. We have relied on anecdotal information from a small cross-section of trenching contractors across the country. Therefore any proposed weighted average rates would be a subjective opinion only.
2. The mix of trenching options available to individual contractors is limited and dictates their range of choice. Within the rural sector this has resulted in only three different methodologies being adopted. There is also the issue that contractors have their preferred options and have invested significant capital in only those technologies.
3. We have attempted to select methodologies that a 'hypothetical efficient operator' (contractor) would adopt. Essentially this centres on the appropriateness and cost effectiveness of the trenching methodology for a specific situation e.g. hydro-trenching or directional drilling is used in areas of known utility services congestion.
4. The most appropriate trenching methodology will, in many cases, be dictated by soil type, surface reinstatement costs and on-site safety requirements.
5. Productivity and cost effectiveness will be a driver wherever possible.

Based on anecdotal information and our subjective opinion we propose the weightings outlined in Table 4 below as a possible alternative for rural (RBI) areas.

Table 4

Soil Type →	Type 1	Type 2	Type 3	Type 4	Type 5
Mole Ploughing	70%	70%	0%	0%	0%
Chain Digger	0%	0%	0%	0%	0%
Open trench 400 wide	5%	5%	35%	100%	0%
Directional Drilling	25%	25%	65%	0%	0%
Rock Sawing	0%	0%	0%	0%	100%
TOTAL	**100%**	**100%**	**100%**	**100%**	**100%**

Table 5 below provides what we believe to be more suitable weighted averages for urban (UFB) areas:

Table 5

	Urban
Open trench 400 wide	10%
Directional Drilling	70%
Thrusting	10%
Hydro Excavation	10%
Rock Sawing	0%
TOTAL	**100%**

Attached to this report in Appendix A is the finalised table of national average rates currently being used in the non-weighted TERA model.

The following Tables of national average rates incorporate the weighted average calculations above for each soil type including urban. These averaged rates are provided for use in any future weighted model.

Table 6

Proposed Weightings for National Average Rates		1 duct	2 ducts	3 ducts	4 ducts	5 ducts	6 ducts	7 ducts	8 ducts
50mm dia Duct		NZD per metre excluding GST							
7.1.1	Rural Soil Type 1	29	43	57	71	88	106	119	133
7.1.2	Rural Soil Type 2	29	43	57	71	89	106	120	134
7.1.3	Rural Soil Type 3	64	94	123	153	182	224	253	283
7.1.4	Rural Soil Type 4	68	90	112	134	156	178	199	224
7.1.5	Rural Soil Type 5	138	160	184	206	360	382	407	429
7.1.6	Urban	72	106	140	172	208	253	290	323

Table 7

Proposed Weightings for National Average Rates		1 duct	2 ducts	3 ducts	4 ducts	5 ducts	6 ducts	7 ducts	8 ducts
110mm dia Duct		NZD per metre excluding GST							
7.2.1	Rural Soil Type 1	37	67	92	121	149	176	202	233
7.2.2	Rural Soil Type 2	37	67	93	122	150	178	203	235
7.2.3	Rural Soil Type 3	72	124	162	214	261	305	344	403
7.2.4	Rural Soil Type 4	88	117	147	185	214	244	282	311
7.2.5	Rural Soil Type 5	148	178	351	381	553	583	751	781
7.2.6	Urban	85	149	195	253	313	364	414	479

We have been advised by the Commission that TERA have re-run their model using the Beca weightings above. With permission from the Commission and based on the information received from them, we reproduce the results in Table 8 below.

Table 8

Technology (Weighted)	**Rural**	**Urban**
Mole Ploughing	56.6%	0%
Chain Digger	0%	0%
Open trench 400 wide	14.0%	14.6%
Directional Drilling	24.8%	71.8%
Rock Sawing	4.0%	1.6%
Thrusting	0.3%	6.0%
Hydro	0.3%	6.0%
TOTAL	**100%**	**100%**

It is Beca's opinion that the outcomes in table 8 above are closer to reality and to actual contractor experience than the un-weighted percentages. We therefore support TERA's use of the Beca weightings for both rural and urban areas.

At this point it is pertinent to make reference to the weightings proposed by Analysys Mason in their submission[21]. They suggest a CNZCI split between 'cheapest trench cost' and 'open trench cost', which in our view is un-workable. Their definitions are not specific, there is no clarity around how soil types might affect the model and they have excluded 'trenchless' technologies altogether.

A simple two-option weighting such as the one proposed by Analysys Mason does not reflect the mix of trenching technologies that we would expect to see being used in each of the different areas and soil types throughout New Zealand.

14 Price Trends

The Commission has received a number of submissions and cross submissions speaking to the issue of Price Trends. These include the following:

- Vodafone Submission dated 13 August 2015
- Network Strategies Submission on behalf of Spark and Vodafone, dated 13 August 2015
- Chorus Submission dated 13 August 2015
- CEG Submission dated August 2015
- Downer Submission dated 12 August 2015
- Vodafone Cross-Submission dated 24 September 2015
- Network Strategies Cross-Submission on behalf of Spark and Vodafone, dated 24 September 2015
- Chorus Cross-Submission dated 24 September
- CEG Cross-Submission dated September

The position of Vodafone and Network Strategies is that neither NZIER nor Beca have taken into consideration the technological developments in the telecommunications sector which they claim will result in a reduction in construction costs over time. They are also of the opinion that both CGPI and PPI are imperfect statistical indices, the former excluding operational and labour costs and the latter being affected by trends in infrastructure prices outside of the telecommunications sector.

Chorus and CEG are also critical of the PPI series Heavy and Engineering Civil Construction used by NZIER. CEG have developed their own bespoke "weighted" PPI series tailored to the cost of trenching. The resulting view is that an acceptable range for trenching price trends is 1.99% to 2.77% per annum (pa), with the preferred estimate being at the lower end of the range.

As Beca is a multi-disciplinary consulting firm specialising in project design and management, our expertise does not extend to scientific analysis of statistical data and we therefore do not feel qualified to review and comment on either the NZIER or CEG reports. However Beca does have a strong interest in future price trends and we do monitor the construction sector with regards to trends in tender pricing.

[21] Analysys-Mason-on-behalf-of-Chorus-on-further-draft-determination-for-UBA-and-UCLL-services-11-August-2015, page 17, first sentence

In their report NZIER estimate a long term price trend of 3.3% pa. Beca has had the opportunity to meet with them to discuss the comments made in the various submissions (above). We agree with the NZIER position that future price trends for telecommunications trenching and trenchless technologies should not be very different to those experienced generally in civil infrastructure projects. Our view is based on the observation that most of this type of work is done by specialist subcontractors who during the course of a year may also be working across a number of other sectors, for example roading, airports and other civil type projects.

We also note the stable trend in private sector construction Salary and Wage rates as clearly indicated in Statistics NZ's Jun15 Labour Market Statistics – Labour Cost Index series EE Construction, which shows that salaries and wages have increased at between 2.1% and 2.4% per annum for each of the last 4 quarters. We assume that the Construction index series includes the civil infrastructure sector.

We concur with Downers comments that "pricing has now reached a sustainable baseline level due to the current market environment and long term contracts", and "..further reductions are unlikely."[22] It is therefore our view that in the absence of new technologies entering the market existing practices have improved as far as they can and rates are now as low as we could expect.

For the reasons above we will not be amending our June 2015 future price trends forecast increase of **2.63%** per annum.

15 Summary

All the above information has been researched and complied for the sole purpose of advising the Commerce Commission and its contractor TERA. Only reliable sources have been used to calculate the rates and forecasts, which have then been subjected to robust review and verification.

We believe the recommendations and rates contained the in the preceding sections will provide TERA with appropriate information to complete their modelling.

[22] Downer-New-Zealand-submission-on-further-draft-determination-for-UBA-and-UCLL-services-12-August-2015, Appendix 3 (Confidential Version)

Appendix A

Trenching and Ducting Rates Schedule - Updated 22 October 2015