HERITAGE REPORT IN SUPPORT OF

SECTION 38 OF NHRA: SUBMISSION OF NOTICE OF INTENT TO DEVELOP FOR THE DEPLOYMENT OF OPTIC FIBRE LINES TO CONNECT 5G RAIN TOWERS WITHIN THE SOL PLAATJE MUNICIPAL AREA

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For Frogfoot Networks Pty (Ltd)

April 2022

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EXECUTIVE SUMMARY

This report is a Heritage Report in support of the submission of a Notice of Intent to Develop in terms of Section 38 of the National Heritage Resources Act of 1999 (NHRA) for the deployment of eight (8) fibre optic network systems (lines) by Frogfoot Networks Pty (Ltd), an open access fibre network provider, to link eight existing 5G Rain towers within the Sol Plaatje Municipal Area. The application also includes an application in terms of Section Section 38(1)(d) for possible alterations made to structures older than 60 years (some sidewalks within the study area) which is normally regulated by Section 34 of the NHRA. Due to the nature of the activities and the nature of the areas where the fibre lines are proposed, no impact is however foreseen on historical sidewalks and curbstones.

The proposed fibre lines would enable a transmission base that is much more stable than microwave and other wireless technologies currently available within the municipal area and will thus further increase broadband width to users. Currently, these 5G Rain towers are not backhauled on fibre, meaning poor connectivity and lower broadband output for residents of the Sol Plaatje Municipal area especially within areas where residents have limited access to reliable and affordable broadband connectivity.

Frogfoot Networks submitted an application for wayleave approval to the relevant departments within the Directorate Infrastructure and Service of the municipality to enable them to deploy the fibre optic network systems on 15 November 2021. They already obtained most of these approvals from the relevant departments.

It should be noted that the 5G Rain towers are existing and the approval thereof has been dealt with by Rain.

It should also be noted that the local Northern Cape Heritage Authority has no delegation to deal with Section 38 applications in terms of the National Heritage Resources Act, 1999.

The study area includes the areas older than 60 years within the different Sectors. Only a small section of a declared heritage area is affected, while the other areas, although not been

formally accessed, have not been identified as heritage areas or have been identified as such in the relevant heritage and spatial studies for the Municipal area.

The heritage study accompanying the NID submission has assessed these areas and did not find any negative impact on any heritage resources along the proposed routes. It is thus recommended that the deployment of fibre as per the individual route plans submitted with this application be implemented due to the economic advantages thereof for local communities, especially the previously disadvantaged areas which currently have limited access to good quality broadband services. Some mitigation measures are proposed to limit the impact of especially aerial fibre on the streetscapes.

NOTICE OF INTENT TO DEVELOP

DEPLOYMENT OF A FIBRE NETWORK WITHIN THE SOL PLAATJE MUNICIPAL AREA

TABLE OF CONTENTS

SECTION 5
SITE INFORMATION AND ANALYSIS

SECTION 6
CONCLUSIONS AND RECOMMENDATIONS

REFERENCES

ANNEXURES

ANNEXURE 1: **POWER OF ATTORNEY**

ANNEXURE 2: **LOCALITY PLAN OF AREAS WHERE OPTIC FIBRE LINES WOULD BE DEPLOYED**

ANNEXURE 3: **INDIVIDUAL ROUTE PLANS**

ANNEXURE 4: **CONFIRMATION FROM SOL PLAATJE MUNICIPALITY REGARDING MICRO-TRENCHING**

ANNEXURE 5: **FROGFOOT DRAFT FTTH AERIAL LINE CABLE SPECIFICATIONS**

ANNEXURE 6: **TREE PROTECTION GUIDELINE FOR CONSTRUCTION, EXCAVATION & TRENCHING FOR AERIAL AND UNDERGROUND FIBRE OPTIC CABLING**

SECTION 1: INTRODUCTION

1.1 PROJECT AND SITE DESCRIPTION

This project will entail the deployment of eight (8) optic fibre network routes (lines) by Frogfoot Networks Pty (Ltd) to link eight existing 5G Rain towers within certain areas in the Sol Plaatje Municipal Area.

Frogfoot Networks submitted an application for wayleave approval to the relevant Departments within the Directorate Infrastructure and Service of the Sol Plaatje Municipality to allow for the optic fibre deployment on municipal land (within their road reserves and sidewalks) on 15 November 2021. Most of the approvals from the relevant line departments have been obtained and the Municipality confirmed the desirable routes and proposed manner of implementation during a meeting on 6 April 2022.

The proposed optic fibre lines connecting these existing 5G Rain towers would enable a transmission base that is much more stable than microwave and other wireless technologies currently available within the municipal area and will thus further increase broadband width to users. Currently, the 5G Rain towers are not backhauled on fibre, meaning poor connectivity and lower broadband output for residents of the Sol Plaatje Municipal area, especially within areas where residents have limited access to reliable and affordable broadband connectivity.

Rain has launched the African continent's first commercial 5G network in 2019 and one of the first in the world. The intention is bringing ultra-fast broadband connections to homes homes and small businesses at affordable cost. It should be noted that the Rain 5G towers do not form part of this application. Most of the towers have already been erected and Rain is dealing with the relevant application processes in this regard.

Frogfoot Networks Pty Ltd is licenced with ICASA (No 0165/IECNS/JAN/09) in terms of the Electronic Communications Act and strives to fulfil its obligations to supply access to South African communities. With the COVID pandemic and studying and working from home becoming a new reality, most communities can benefit from advanced internet infrastructure such as 5G in their areas. This project will specifically contribute to offer

better quality access to network to people in the different areas of the Galeshewe township area which will have major benefits for these communities.

Some of the benefits of such a combined network for the Sol Plaatje Municipal area, especially for these previously disadvantaged areas where it would be deployed, would be:

- Lower cost of data.
- Improved access to fast broadband encourages economic growth which will assist to alleviate the unemployment crisis in the country.
- As a foundational pillar of the Fourth Industrial Revolution (4IR), 5G networks will support Government's initiatives to ensure South Africans will benefit from these technological advances.
- Frogfoot is aligned with the 2030 Sustainable Development goals of significantly increasing access to information and communications technology and to strive to provide universal and affordable access to the Internet.
- Smarter cities are safer cities. 5G's ability to connect thousands of cameras and other sensors cost effectively can make a city more efficient and safer.
- Education can be revolutionised by streaming classes to students.
- Virtual reality application holds great promise for this sector.
- Critical machine-to-machine communication, together with augmented reality, can create thousands of jobs in SA, servicing international markets cost effectively.
- Low latency
- Increased number of devices connected to network

The study area is thus the routes of the optic fibre lines which will connect the underneath existing 8 Rain towers. Please see the plan, ***Figure* 1**, on the next page, also **Annexure 2**, which depicts the different **Routes within the Municipal Area** (the different lines are indicated in different colours as shown underneath)**:**

i. Kimberley Forklift (red)
ii. Moto Mac (blue)
iii. Greenpoint (green)
iv. Retllameng School (pink)

v. Galeshewe (orange)
vi. Boitumel School (yellow)
vii. Boitshoko Primary (black)
viii. Hoerskool Homevale (purple)

Please note that the Rain towers do not form part of this application. Rain is responsible for obtaining the necessary statutory approvals for the erection of these 5G towers.

Individual Route Plans, attached as **Annexure 3**, were prepared for the wayleave application process also indicating the routes thereof and the proposed/preferred manner to install the fibre optic routes. This was discussed and negotiated with the relevant Departments of the Municipality taking into consideration the location of existing municipal services and soil conditions.

Two types of deployment are possible, namely conventional trenching and aerial fibre. Frogfoot had several discussions with the Sol Plaatje Municipality regarding the possibility of micro-trenching in the road reserves as they have done in other municipal areas. No micro trenching in the road reserve would, however, be allowed as the Municipality's Directorate Infrastructure and Services indicated that there is currently no National Standard for the provision of micro trenching in existence (in compliance with the Standards Act). It was further indicated that they are of the opinion that the current standard for the provision of telecom ducting is SANS 1200LC (Standardised Specification for Civil Engineering Construction) which only makes provision for conventional trenching methods. In an e-mail dated 29 April 2021 (see the attached as **Annexure 4)** the Municipality stated: "*The methodology employed in micro trenching is a machined one which relies on scanning technology which has serious limitation when dealing with older services which tend to have densities beyond the parameters of such devices (scanners). As the Sol Plaatje Municipality we are constantly exposed to these devices and thus, we are in a position to comment on the effectiveness of these devises. Currently, there is a place for these scanners. However, when using these scanners as a means of foresight for a blind mechanised method it would present an infinite risk to our infrastructure*."

Figure 1: ***Optic fibre routes which would connect the eight 5G Rain towers within the Sol Plaatje Municipal Area***

The Wayleave approval thus determines which manner of fibre deployment would be allowed on the different routes. As indicated earlier, the During a meeting on 6 April 2022 the Municipality's Directorate Infrastructure and Services confirmed that they are in support of the proposals for deployment, as indicated on the Individual Route Plans submitted to them, at a meeting on 6 April 2022.

Conventional trenching is proposed in some areas , but in most instances aerial fibre deployment is the preferred manner of deployment by both Frogfoot and the Municipality for the following reasons:

- It is a more cost effective solution to bring the price of broadband services down to an affordable amount especially in previously disadvantaged areas.
- Faster to build and to deploy 5G services to the public.
- Easier methodology in terms of hard ground conditions which decreases implementation costs to make projects feasible.
- Decrease damage to municipal infrastructure within the municipality as inadequate information is available within certain areas to show the position of existing infrastructure within the municipal area and existing infrastructure being old in most areas.

1.2 LEGAL REQUIREMENTS

1.2.1 NATIONAL HERITAGE RESOURCES ACT, 1999

The National Heritage Resources Act, 1999 describes the national estate and what can be considered as heritage resources:

The national estate consists of the following as set out in Section 3 of the NHRA:

Section 3(1):

For the purposes of this Act, those heritage resources of South Africa which are of cultural significance or other special value for the present community and for future

generations must be considered part of the national estate and fall within the sphere of operations of heritage resources authorities.

Section 3(2):

Without limiting the generality of subsection (1), the national estate may include—

(a) places, buildings, structures and equipment of cultural significance;
(b) places to which oral traditions are attached or which are associated with living heritage;
(c) historical settlements and townscapes;
(d) landscapes and natural features of cultural significance;
(e) geological sites of scientific or cultural importance;
(f) archaeological and palaeontological sites;
(g) graves and burial grounds, including—
(i) ancestral graves;
(ii) royal graves and graves of traditional leaders;
(iii) graves of victims of conflict;
(iv) graves of individuals designated by the Minister by notice in the Gazette;
(v) historical graves and cemeteries; and
(vi) other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);
(h) sites of significance relating to the history of slavery in South Africa;
(i) movable objects, including—
(ii) objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens; (ii) objects to which oral traditions are attached or which are associated with living heritage;
(iii) ethnographic art and objects;
(iv) military objects;
(v) objects of decorative or fine art;
(vi) objects of scientific or technological interest; and (vii) books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in

section 1(xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).

The National Heritage Resources Act also makes provision for the grading of local heritage resources if it fulfils one or more of the criteria set out in Section 3(3) of the Act or in the case of a site contributing to the environmental quality or cultural significance of a larger area. Certain heritage resources are considered more valuable than others based on age, symbolic context, architectural merit, uniqueness or associations with significant people and other considerations. This will influence their grading.

Section 3(3):

Without limiting the generality of subsections (1) and (2), a place or object is to be considered part of the national estate if it has cultural significance or other special value because of—

(a) its importance in the community, or pattern of South Africa's history;
(b) its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
(c) its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
(d) its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
(e) its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
(f) its importance in demonstrating a high degree of creative or technical achievement at a particular period;
(g) its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
(h) its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
(i) sites of significance relating to the history of slavery in South Africa

Sections 27 and 30

Some sites and buildings within the Sol Plaatje Municipal area have been identified as Provincial Heritages Sites in terms of Section 27 of the NHRA and are listed on the Northern Cape Heritage Register prepared in terms of Section 30 of the NHRA. None of these sites fall within the study area of the NID except for a veery small area of Klisser.

It can be accepted that the study area has not yet been formally assessed. The NID will, however, do an assessment of possible heritage resources along the proposed optic fibre routes to determine any possible negative impact on heritage resources.

Section 34

Section 34(1) of the NHRA states that "no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority". In terms of the NHRA a structure is defined as "any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith".

No alterations are proposed to any buildings. In terms of this definition a sidewalk could, however, possibly be considered as a structure. Some sidewalks within the study area are older than 60 years and application is thus simultaneously made to allow for a permit in terms of Section 34 to allow for the excavations within these side walk areas. It should be noted that none of the historical curb stones (older than 60 years) are removed during the conventional trenching activities. Where road cuts are done, the contractors tunnel/trench underneath these curb stones.

On the next page, ***Figure 2***, is a map showing the areas older than 60 years within the study area. The boundaries of the areas older than 6o years have been determined by utilising historical aerial photographs and more specifically the 1960, 1964 and 1968 aerial photographs which have been obtained from the website of the National Geo Spatial Information Section of the Department of Rural Development and Land Reform's Geospatial Portal. (http://www.cdngiportal.co.za/cdngiportal/)

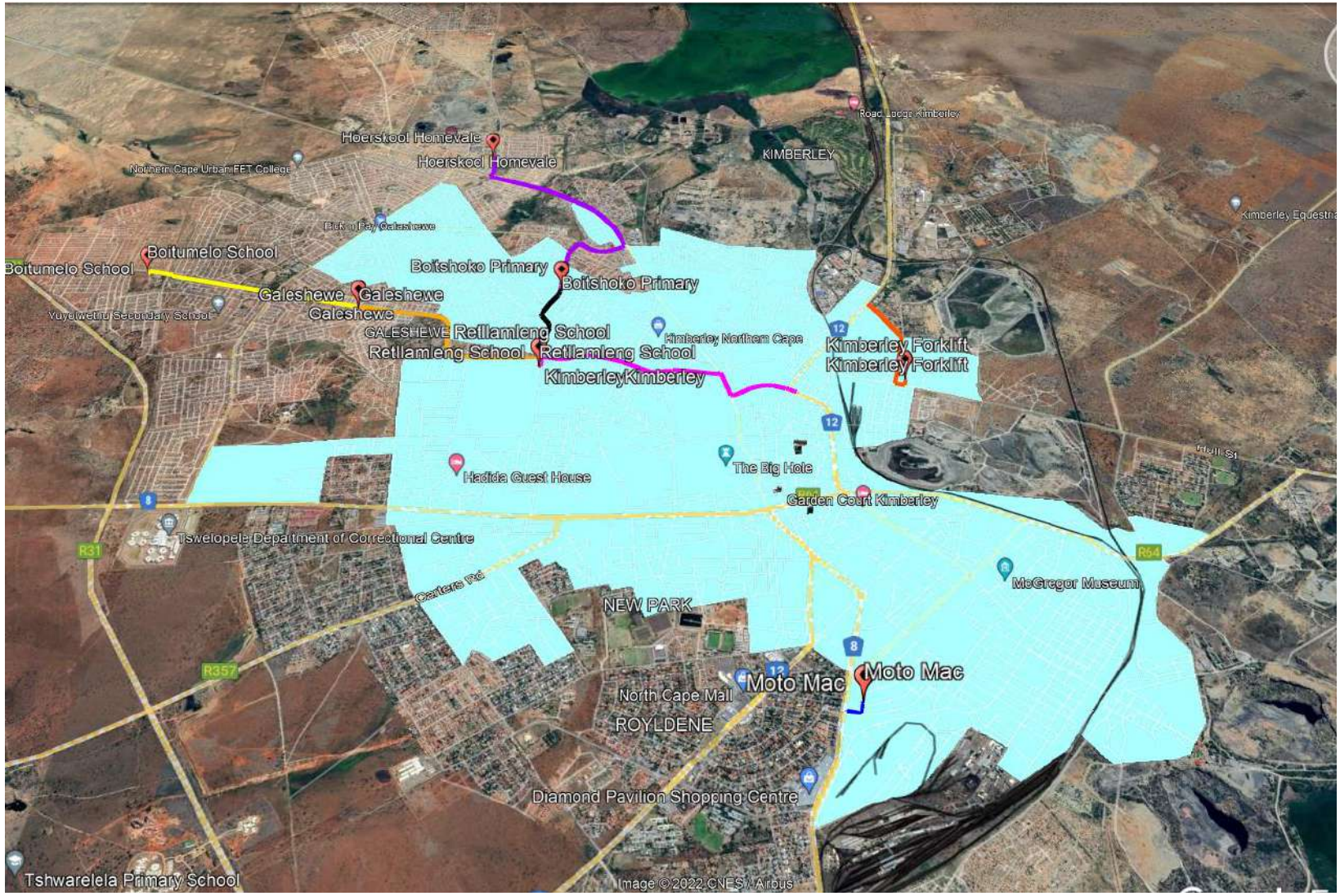


Figure 2: **Areas older than 60 years indicated in light blue**

Section 38

The proposed activities associated with the deployment of the fibre network routes, be it by means of conventional trenching or overhead lines, will include the following development categories as listed in Section 38(1) of NHRA, namely:

Section 38(1)(a): *The construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;*

Section 38(1)(c): *Any development or other activity which will change the character of a site—*

(i) exceeding 5 000 m² in extent.

Section 38(1)(d): Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority – thus e.g. including approvals for any alterations to any structures older than 60 years as required in terms of Section 34 of the NHRA. *(No alterations are proposed to any buildings. In terms of this definition of a structure a sidewalk could, however, possibly be considered as a structure. Some sidewalks within the study area are older than 60 years and application is thus simultaneously made to allow for a permit in terms of Section 34 to allow for the excavations within these side walk areas. It should be noted that there are no historical curb stones within the study area.)*

The installation of the fibre network lines thus requires the submission of a Notice of Intent to Develop in terms of Section 38 – the purpose of this heritage report.

The proposed development does not trigger any of the listed activities as set out in the 2014 Environmental Regulations published in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) and would thus not require environmental authorisation.

1.2.2 THE SOL PLAATJE MUNICIPAL LAND USE MANAGEMENT SCHEME, 2008

The Sol Plaatje Land Use Management Scheme, 2008 does not make provision for any Heritage Overlay Zones. There are specific provisions with regard to the Big Hole area, but the study area is not affected by any HPOZ's.

In Section 17(1) it states that "permission in terms of Clause 28 shall be required for any alteration to or development affecting an erf listed in the heritage register as compiled and gazetted in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999). This provision would not affect any of the proposed routes within the study area for the NID.

1.2.4 MUNICIPAL WAYLEAVE APPROVAL PROCESS

All public land within the Sol Plaatje Municipal Area's road reserves is owned by the municipality. The local Council is therefore responsible to administrate this publicly owned land and need to give permission to all parties before any constractor may install utility services or infrastructure. All parties and their contractors therefore need to obtain permission from the local authority to install their services or infrastructure on the public land.

Normally a department within the municipality acts as the custodian of these permissions, even for council services. For the Sol Plaatje Municipal Area it is done by the Directorate Infrastructure and Services. This enables the responsible use of public assets, by co-ordinating service installation, minimising service clashes, simplifies maintenance of assets, and minimises collateral damage due to new installations or construction.

Using a formalised Wayleave, the Council also has the opportunity to control the installation of services, as well as to specify installation and protection requirements for the installed services, and to verify that the service designs meet the engineering and other standards prescribed by the council.

To allow for the deployment of fibre within the road reserves, a Wayleave Approval was thus submitted to the Directorate Infrastructure and Services for each of the different Sectors. These Wayleave Approvals are subject to certain conditions of approval. As indicated earlier in this report, Frogfoot has applied for the required wayleave approvals. Approval have already been obtained from most of the relevant Departments.

The proposed routes and manner of deployment of the fibre lines, be it conventional trenching of overhead lines, is the result of several discussions with the Municipality and what they would support in terms of their wayleave approvals.

No micro trenching in the road reserve is allowed within the Sol Plaatje Municipal Area as indicated earlier in this report.

1.3 STATEMENT OF INDEPENDENCE

This is to confirm that *Christine Havenga and Associates*, acting as the Heritage Practitioner, Andrew Berman of *Urban Design Services* acting as Urban Designers and Rene Maria Brett of *Viridian Consulting Landscape Architects* acting as the Landscape Architect, are responsible for undertaking the report. They are independent practitioners and have no vested or financial interest in the future development of the study area being either approved or rejected by the relevant authorities.

1.4 EXPERTISE AND PROFESSIONAL ACCREDITATIONS OF THE SPECIALISTS

The expertise of the Heritage, Urban Design and Landscape specialists is presented underneath:

Company name	Qualifications and expertise	Professional accreditations
Christine Havenga and Associates (Christine Havenga)	M Phil in the Conservation of the Built Environment – University of Cape Town	Association of Professional Heritage Practitioners (APHP) No. 0083

	M Town and Regional Planning – University of Stellenbosch	South African Council for Professional Planners (SACPLAN) – Reg. No. A/945/1997
Urban Design Services (Andrew Berman)	B.Arch. School of Architecture, University of Cape Town Master of City Planning and Urban Design - University Cape Town, RSA	South African Council for the Architectural Profession (SACAP) - Reg. No. 3518 Urban Design Institute of South Africa (UDISA) - Reg. No. B001 Association of Professional Heritage Practitioners (APHP) No. 0011
Viridian Consulting Landscape Architects (Rene Brett)	B. Landscape Architecture - University of Pretoria, RSA Master of City Planning and Urban Design - University Cape Town Green Star SA Accredited Professional	South African Council for the Landscape Architectural Profession (SACLAP) – Reg. No. 20122 Urban Design Institute of South Africa (UDISA) – Reg No. V002

1.5 METHODOLOGY AND SOURCES OF INFORMATION

A survey of diverse information repositories was made to identify appropriate relevant information sources. These sources were analysed for credibility and relevance. Credible, relevant sources were then critically reviewed. The objectives of the literature review were to gain an understanding of the cultural landscape within which the project is located; and identify any potential fatal flaws, sensitive areas, current social complexities/issues and known or possible tangible heritage. Information was gained through obtaining the following historical and archival documentation:

(i) Diagrams and township plans of the study area.
(ii) Maps and aerial photographs from National Geo-spatial Information.
(iii) SAHRIS, online / electronic journals and platforms, and certain internet sources.
(iv) Heritage surveys done by the former National Monuments Council.
(v) The Northern Cape Heritage Authority Heritage Register
(vi) The Sol Plaatje Integrated Development Plan and Municipal Spatial Development Framework.
(vii) Other relevant resources which are cited and included in the literature review's bibliography.
(viii) Site visits and photographic surveys of the study area.

SECTION 2: KEY POLICY INFORMANTS AND SPATIAL POLICIES

This section briefly outlines key policy informants and Spatial Studies/Policies which informs the future development of the subject block and its immediate surrounds, and includes a brief description of relevant planning and urban design policy for the study area.

2.1 SOL PLAATJE MUNICIPALITY INTEGRATED URBAN DEVELOPMENT FRAMEWORK (2017 – 2022)

The Sol Plaatje Integrated Urban Development Framework (IUDF) is guided by the four principles set out in the National Development Plan (NDP): spatial justice, spatial sustainability, spatial quality, spatial efficiency, and spatial resilience. To achieve this transformative vision, the IUDF introduces four overall strategic goals:

- Spatial Integration: To forge new spatial forms in settlement, transport, social and economic areas.
- Inclusion and Access: To ensure people have access to social and economic services, opportunities and choices.

- Inclusive Growth: To harness urban dynamism for inclusive, sustainable economic growth and development.

- Good Governance: To enhance the capacity of the state and its citizens to work together to achieve spatial and social integration.

The study area falls primarily within the Galeshewe township area. The IDP states that 31.9% of the population in this area is unemployed – a number which is probably much higher at this stage. The youth make up 41.7% of the unemployed population in the area, 14,8% of the households in this township do not have a source of income while 20,4% (highest percentage) has an income between R19,601 and R38,200. The township's formal housing sits at 74,3%. This confirms the need for affordable high quality broadband access for residents.

2.2 SOL PLAATJE LOCAL MUNICIPALITY DRAFT SPATIAL DEVELOPMENT FRAMEWORK 2018-2023 (DRAFT)

The Municipal Spatial Development Framework (MSDF) is a dynamic model of strategic planning that will be reviewed annually, adjusting its focus and direction based on spatial transformation that takes place on the ground. In addition, it is a spatial policy document that identifies the main challenges and opportunities in the Sol Plaatje Local Municipality (SPLM). Fundamentally, it sets a spatial vision for the future and outlines a set of strategies in order to achieve the vision.

The MSDF states that it is imperative that this MSDF ensures spatial transformation that will enhance and preserve the heritage of the Sol Plaatje Local Municipality. The natural and heritage assets, cultural experiences and destinations places identified in this study are considered important structuring elements of the city. The heritage resources within Kimberley have been identified as key assets of the city. A number of areas which are deemed to be heritage conservation worthy areas (inter alia based on a survey of the former National Monument Council) within the city have been identified, namely:

(i) Beaconsfield;
(ii) Belgravia;
(iii) Inner City;

(iv) De Beers;
(v) Open Mine;
(vi) West End;
(vii) Memorial Road area;
(viii) Greater no 2; and
(ix) Herclear.

The heritage value of the "*Inner City Zone*" is also acknowledged in the MSDF.

None of these areas are included within the study area of this fibre network deployment project of Frogfoot

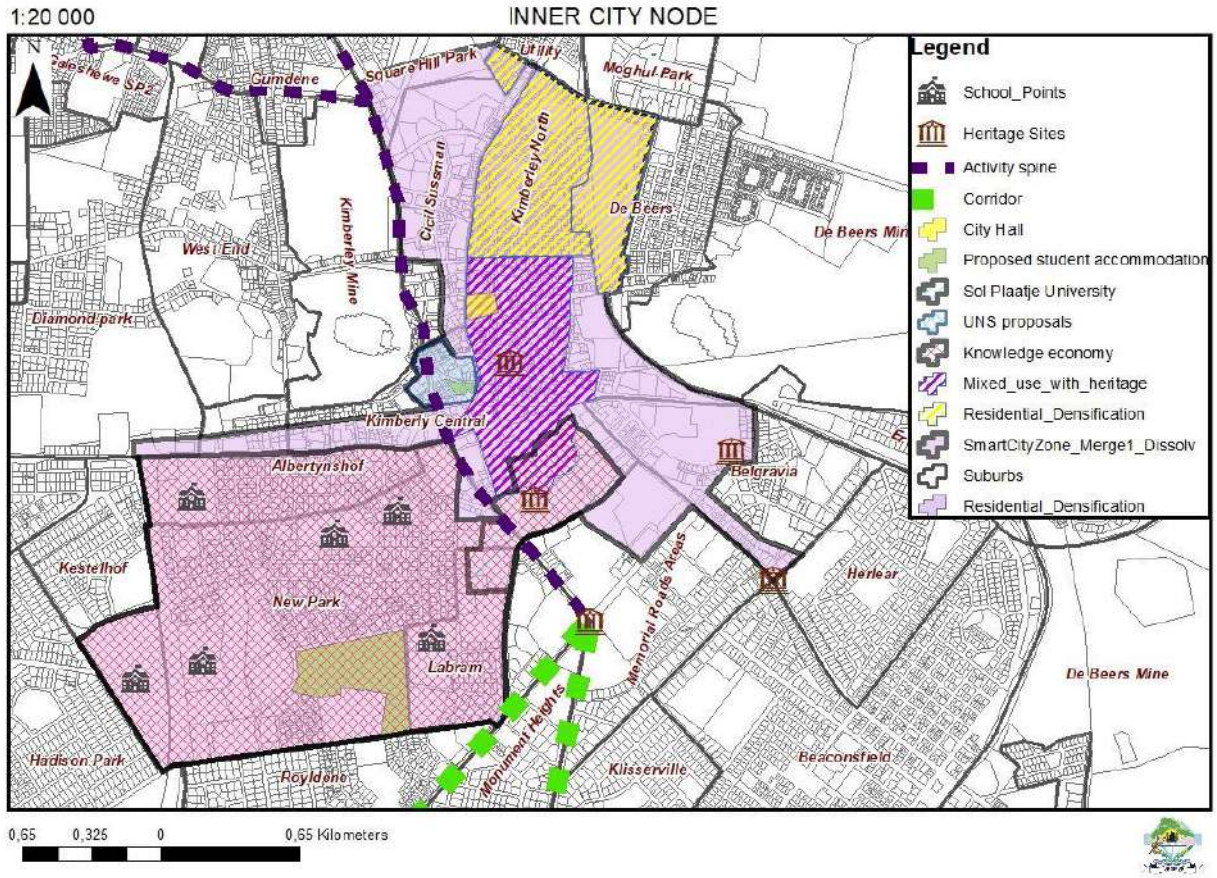


***Figure 3**: Extract from the draft Sol Plaatje Municipal Spatial Development Framework, 2018-2023*

Although the MSDF stresses the importance of protecting heritage resources within the city, it also promotes social and economic development. In this regard it specifically refers to the importance of telecommunication in this regard. It is stated that a 'smart

city' approach to development should be adopted. The MSDF describes a smart city as "*an urban development vision that integrates numerous information and communication technologies and the internet solutions in a secure fashion. This is done in order to better manage and distribute a city's assets. Technologies such as social media, information market places, and the internet of things can support the Sol Plaatje in achieving objectives such as community well-being, social mobility, economic growth, and infrastructure resilience. New housing developments must include fibre optic networks to ensure that an information rich future is secured. Adopting this approach in Sol Plaatje can go a long way in addressing the urban and social ills faced in the municipality. The Sol Plaatje University intends to commence with a pilot to stimulate a safe zone with free Wi-Fi within the CBD linking the university and the FET College through this initiative. This will be the beginnings of the smart city in Sol Plaatje."*

SECTION 3: BRIEF HISTORY OF THE STUDY AREA AND THE BROADER KIMBERLEY AREA

The study area contains a number of residential suburbs located within the Kimberley township area (demarcated municipal area of the Sol Plaatje Municipality) which is the capital and largest city of the Northern Cape Province. The city developed from the diamond mining camp that was formerly known as Vooruitzicht, Colesberg Kopje and De Beers New Rush. It was renamed Kimberly in 1873 in honour of the Earl of Kimberley and attained municipal status in 877, and city status in 1912*. (Richardson, Historic Sites of South Africa, 2001, p 53)* Around 1994 post the apartheid era, the Kimberley City Council was renamed Sol Plaatje Municipality.

The only traces of any precolonial settlement within the city's boundaries are scatters of Stone Age artefacts and there is no record of what the place/s might have been called before the first nineteenth century frontier overlay of farm names. It lay beyond the areas occupied by Tswana people in the pre-colonial period. Sites such as the nearby Wildebeest Kuil testify to a Khoe–San history dating up into the nineteenth century.

The city has considerable historical significance due to its diamond mining past and the siege during the Second Anglo-Boer war. It is further associated with important

business people of this period such as Barney Barnato and Cecil Rhodes who established the De Beers diamond company in the early days of the mining town. It is also associated with some other historical figures such as Sol Plaatje, a prominent writer and activist and Frances Baard as well-known trade unionist.

Founded after the discovery of diamonds on farms in the area in 1869–71, the mining camp of Kimberley grew as a result of the intensive digging of the diamond-bearing pipe at the hill called Colesberg Koppie. The camp was named after John Wodehouse, 1st Earl of Kimberley, who was then British colonial secretary. The town of Kimberley was created in 1878 and incorporated into the Cape Colony in 1880. In 1885 the Cape Town Railway reached Kimberley, and during the South African War the town was besieged by the Boers for 126 days until relieved by Gen. John French on February 15, 1900. City status was granted in 1912 with absorption of the mining town of Beaconsfield.

After 1888 the Kimberley Mine at Colesberg Koppie and most other mines in the area were controlled by a trust organized by Cecil Rhodes, with production placed in the hands of De Beers Consolidated Mines Ltd. Kimberley Mine (now called the Big Hole), long the richest diamond-producing mine in the world, was closed in 1914, but several other mines remain productive, and diamond mining and cutting remain prominent industries.

The oldest residential suburbs such as Belgravia which dates back to the 1870s, bear testament to the success stories of the time, with many of these massive homes built during the peak of diamond trade. It became a fashionable suburb in the 1890's during a building boom which followed the amalgamation of the mines. The wealthier citizens built large, elegant homes of clay-coloured Kimberley brick, with elaborate iron roofs and intricate wooden verandah trim. The area has tree-lined streets, hedges and pleasant gardens which contribute to the historical streetscapes of this area. Large open spaces such as Queens Park and the school sport fields also contribute to the specific character of the area. Some well-known residents, associated with the early mining era history of Kimberley, resided in Belgravia, e.g. J. B. Currey, John Orr, Fritz Hirschhorn and Ernest Oppenheimer as well as Rhodes who financed the Sanatorium Kimberley's former most prestige hotel and health resort. Several declared National

Monuments, Provincial Heritage sites and other sites/structures which have been included in the heritage register of the Province are found in this area.

The Memorial Road area also contains several National Monuments (e.g. the Honoured Dead Memorial designed by Sir Herbert Baker, which commemorates those who fell during the Kimberley siege I 1904) Provincial Heritage sites and other identified sites/structures which have been included in the heritage register of the Province.

The study area falls mainly within the township area of Galeshewe. The first parts of Galeshewe sprung up in the early 1870s to accommodate the migrant labour population in Kimberley. In 1886, the first large compounds for workers known as the Greater No 2 were introduced at the De Beers Mine. Galeshewe started to grow west from the Greater No 2 in the 1930s. The central part of the present Galeshewe was built between 1950s and 1970s. This makes Galeshewe Kimberley's oldest township and one of the oldest in the country.

In 1952 the Native Advisory Committee of Kimberley approved a recommendation from residents to name the township Galeshewe after Kgosi (Chief) Galeshewe of the Batlhaping tribe. On 1 August 1973, the Kimberley Council granted control of Galeshewe township to the then Bantu Administration Board of the Diamond Fields. A May 5, 1976 edition of the Kimberley newspaper "The Diamond Fields Advertiser" reported that "slums" in the township were a problem with at least 9 or 10 people living in a four-roomed house. This problem was because of the lack of suitable housing and the ongoing problem of unemployment. On 2 January 1978, the Community Board took over the control of the township. Galeshewe Municipality was inaugurated on 30 November 1983 making the township the first Black-controlled municipality in South Africa.

A number of important heritage resources are found within Galeshewe such as the old law firm office of Robert Mangaliso Sobukwe, where he spent the last years of his life. Sobukwe, who founded the Pan Africanist Congress in opposition to apartheid, spent nine years in prison, six of them as a political prisoner on Robben Island in near

complete solitary confinement. After his release, Sobukwe was banished to Kimberley, where he was allowed to practise as a lawyer, but was under constant police surveillance. He died in Kimberley in 1978.

A monument to the Mayibuye Uprising in Kimberley is also found in Galeshewe. In November 1952, a local ANC leader, Dr Arthur Letele, encouraged people to sit on “whites only” benches at the Kimberley station and block the whites-only entrance of the post office as part of the ANC’s national Defiance Campaign. Thirteen people were killed and 78 others were wounded by the police on that day, and the Mayibuye Memorial commemorates their bravery and sacrifice.

Some of the older local churches and civic buildings/areas can also be considered as Grade III heritage resources.

None of these heritage resources are negatively affected by the proposed fibre deployment proposed routes in the study area.

SECTION 4: NATURE OF THE ACTIVITIES OF THE DEPLOYMENT OF THE FIBRE NETWORK

As indicated earlier, two options for fibre deployment are possible, namely:

- Conventional trenching
- Overhead lines

There are certain requirements and guidelines in terms of legislation such as the Telecommunications Act 103 of 1996 and National Forest Act 84 of 1998 which guide the deployment of aerial fibre and conventional trenching. Underneath are some basic specifications with regard to the different manners of fibre deployment being allowed in terms of wayleave approval:

Conventional trenching

Underneath are some images which give an indication of the nature of the activities associated with conventional trenching.

***Figures 4 - 6**: Some photographs of conventional trenching within the Sol Plaatje Municipal area*

Deployment of aerial fibre

As indicated earlier, there are certain requirements and guidelines in terms of legislation such as the Telecommunications Act 103 of 1996 and National Forest Act 84 of 1998 which guide the deployment of aerial fibre. These include specific specifications and guidelines with regard to e.g. the number of poles per kilometre (1 pole every 50 metres), determining the most appropriate position of poles, the height and nature of the poles and cables, colours of cables, fixing of boxes to poles and taking cognisance of other overhead lines such as Telkom lines. There are also specific guidelines with regard to tree pruning where required, e.g. liaison with private land owners and authorities and guidelines with regard to the type of trees to be pruned.

Underneath are some images of the manner in which the aerial fibre is deployed, showing the wooden poles and overhead lines. There would be no links to individual households or other facilities at this stage.



***Figures 7 - 10*: Some photographs of aerial fibre deployed elsewhere within the Municipal area**

The considerations which would guide the preferred/most desirable manner of fibre deployment within the Sol Plaatje municipal area would inter alia include the following:

- An assessment of the soil conditions, e.g. if a terrain is very rocky and accordingly difficult to trench.

- The existing utilities infrastructure of the municipality and other service providers such as Eskom are not deployed to the required specifications which has the risk of conventional trenching disrupting the already fragile services which could be difficult to fix.

- The visual impact of aerial fibre on existing structures and streetscapes, e.g. in areas with heritage significance or with scenic qualities.

SECTION 5: SITE AND CONTEXT DESCRIPTION

5.1 SITE DESCRIPTION AND LOCATION

The study area is thus the routes of the optic fibre lines which will connect the underneath eight 5G Rain towers within the Sol Plaatje Municipal area as indicated on ***Figure 1*** and ***Annexure 1*** to this report. The different lines are indicated in different colours on the map for ease of reference.

(i) Kimberley Forklift (red)
(ii) Moto Mac (blue)
(iii) Greenpoint (green)
(iv) Retllameng School (pink)
(v) Galeshewe (orange)
(vi) Boitumel School (yellow)
(vii) Boitshoko Primary (black)
(viii) Homevale High School (purple)

As indicated earlier, the 5G Rain towers do not form part of this application. Rain is responsible for obtaining the necessary statutory approvals for the erection of these towers.

5.2 Assessment of the individual routes and possible impact on the cultural landscape, built environment and heritage resources

As indicated earlier, there are no formally demarcated heritages areas within the study area except for a small section of the Klisser suburb. It is acknowledged that no formal heritage audits have been done within the study area. The NID will, however, identify and describe heritage resources identified along the eight fibre deployment routes. Due to the nature of the activities more focus would be placed on the cultural landscape/streetscapes than the history or significance of individual heritage resources. The visual impact of the proposed aerial fibre on the streetscape will also be assessed.

The different routes within the study area will be addressed individually. The underneath listed factors will be used to analyse the cultural landscape and built environment (townscape and streetscape) and assess the possible impact of fibre deployment on the character and heritage significance of the individual areas. The following criteria will be used to assess the cultural landscape and built environment of the area.

- Urban structure (framework and hierarchy of routes and space, landmarks/features and edge conditions)
- Density and mix (development intensity and range of uses)
- Scale, height and massing
- Architectural character form and appearances
- Landscape setting and character (typography, natural features, vegetation and greenery)
- Street character – spatial qualities and edge conditions, walls, trees, edges and fences.

The visual impact of the fibre line deployment, specifically the proposed aerial fibre lines, will be assessed in accordance with:

- Visibility and Visual Intrusion
- The visual absorption capacity (VAC) of the urban landscape, usually based on vegetation cover or urban fabric in the area.
- Determination of the relative compatibility or conflict of the project with the surroundings.
- Provide information on management and mitigation of potential impacts, as necessary.

The study areas contain primarily residential suburbs which also contain some community/civic facilities such as churches, schools, institutional buildings and public open spaces. It also includes some light industrial areas and small commercial nodes.

Municipal and other infrastructure includes road reserves (black top and sidewalks as well as underground municipal services), street lightning poles, telecommunication infrastructure (Telkom poles/cables, cellular masts and satellite discs), electrical substations and Eskom overhead lines.

The domestic scale prevalent is primarily single storey. Massing is commensurate with single residential dwellings. Edge conditions include a combination of more traditional fences and modern type of fences. The architectural character form and appearances of the study area is primarily domestic and is a mixture of 20th century architectural styles. The streetscapes consist of primarily dwelling houses (formal as well as informal) which are relatively ordinarily architectural examples with ordinary or minor aesthetic merit. The streetscapes in the older areas can be considered 3C's heritage resources – being typical/representative of a certain period within the establishment of the Galeshewe township and not having a high architectural or streetscape significance.

The study area is flat and there is a combination of avenue trees and pockets of garden trees. Mature tree lanes are found on some of the sidewalks within the study area, although in general much less than elsewhere in the City. There is little other greenery on the sidewalks. Certain undeveloped areas have quite a rural character to it.

Building frontages and roof outlines are mostly nearer to the street and are very visible due to smaller front garden areas and lack of mature trees in front gardens. Roof lines are visible from the street. Some frontages are often obscured by high solid boundary walls and other security measures.

On the next pages, more detail will be provided regarding the location of the different routes such as the areas where it will run, the streetscape characteristics of these areas and any heritage resources within the areas.

In each case a plan will be provided with the individual route (as attached in **Annexure 3**) which also contains a legend which shows the manner in which the fibre would be deployed – namely a red line for aerial fibre and dots indicating the position of the poles while a pink line indicates conventional trenching.

(i) **Kimberley Forklift (red)**

This line will start at an existing 5G Rain tower at the Kimberley Forklift site within the Turner Road Industrial area towards the north-east of the municipal area. This route is located along Kenilworth, Hull and Merriman Streets within the Turner Road Industrial Area. The fibre optic cable line will thus run from the existing 5G tower in Merriman Street, around the corner into Hull Street and then northwards along Kenilworth Road into Stadium Road whereafter it eventually link into the N12 (Transvaal Road). Aerial fibre is proposed along this route.

Figure 11: ***Kimberley Forklist 5G Rain tower line***

Figure 12: ***First section of the Kimberley Forklist 5G Rain tower line***

The first section of this route is a combination of industrial buildings and some remaining residential dwelling houses. Most of the original dwelling houses in this area were demolished. The remaining houses are older than 60 years, but many have been extensively altered over the years. The sidewalks are hard surfaces with little vegetation on the street verges.

Figure 13: ***Industrial site in Hull Street where the 5G Rain tower is located***

Figure 14: ***Semi-industrial sites within Hull Street and a few of the remaining dwelling houses***

Figure 15: ***Semi-industrial sites within Merriman Street***

Figure 16: ***Mixed-use character along Kenilworth Road. In some areas some of the original dwelling houses remained, but few are still utilised for SR purposes***

Figure 17: ***Mixed-use character along Kenilworth Road – commercial and industrial with little greenery along road verges***

Figure 18: ***Second section of line along Kenilworth Road.***

Figure 19: ***Section along Kenilworth Road where the De Beers Athletic Track is located. A structure older than 60 years with some local heritage significance.***

Figure 20: ***South African Police Services buildings along Kenilworth Road opposite the athletic stadium.***

Figure 21: ***Portion of route where Kenilworth Road connects with Stadium Road.***

Figure 22: ***Corner of Kenilworth and Stadium Roads***

Figure 23: ***Northern section of Stadium Road up to N12 (Transvaal Road)***

Figure 24: ***Streetscape along Stadium Road***

Figure 25: ***Some greenery in road verges of the residential areas of Stadium Road***

Figure 26: ***Northern section of Stadium Road***

Figure 27: ***Northern section of Stadium Road on the corner with N12 (Transvaal Road)***

Analysis of the area and possible impact on heritage resources

The starting point of this route is at the existing 5G Rain tower at the Kimberley Forklift site in Merriman Street within the Turner Road Industrial area. This area is a mixture of light industrial land uses and some remaining residential dwellings. The dwelling houses in this area are mostly older than 60 years. The streetscapes in general, however, lost their earlier historical character as many of the housing have been extensively altered over the years or being used for non-residential land uses.

As the route moved towards the north-east along Kenilworth/Staium Street Section it passes the De Beers Athletic Track and associated buildings. These buildings are older than 60 years and have some local heritage significance – a 3C grading would be considered appropriate. At the opposite side of the stadium is the local police headquarter buildings of the City. The aerial fibre is proposed along the stadium side. Although there might be some visual impact on the stadium building, the position of this line/route was prescribed by the Municipality due to their existing municipal services and the services associated with the police on the other side of the road. The existing trees (with some visual absorbing capacity) and the fact that the distance between the poles would be 50 m would also assist to lessen the visual impact.

Further to the north Stadium Street contains more residential dwellings and the tree lanes which is characteristic of the older residential areas within the Municipal area. These dwelling houses are however of a more recent nature and don not have any

historical or architectural significance. The last section where Stadium Street connects with Transvaal Road is a mixed use area with modern storage units and recent residential dwellings.

None of these areas are declared historical areas or proposed heritage areas or indicated as a future Heritage Protection Overlay Zone. It is thus not foreseen that the proposed aerial fibre will have a negative impact on any heritage resources or on the streetscape character of this area. In the primarily residential areas the tree lanes would be able to absorb most of the possible visual impact of the poles and cables.

(ii) **Moto Mac (blue line)**

This line is a small section within the Klisser area connecting the existing Moto Mac 5G Rain tower towards Oliver Road.

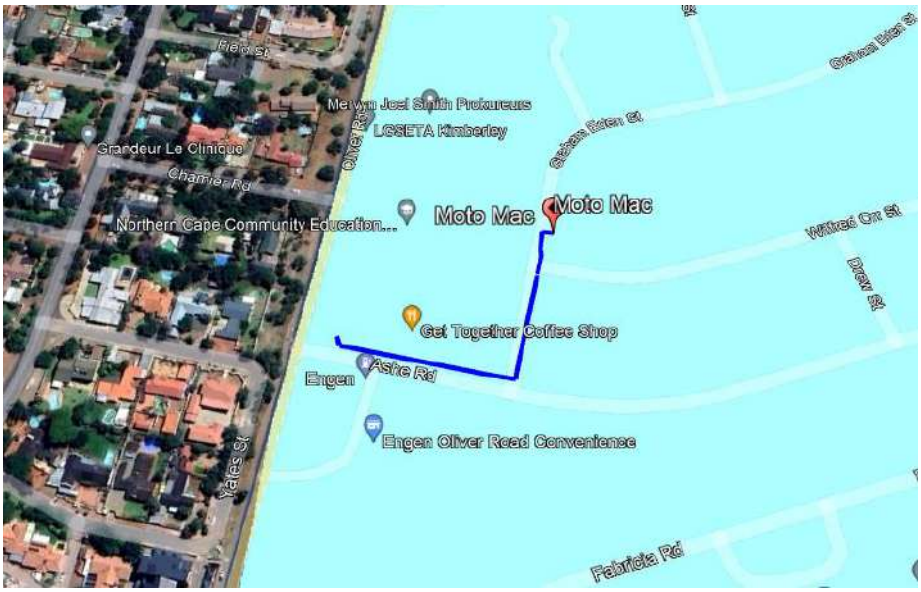


Figure 28: ***Section of optic fibre line connecting Moto Mac 5 G Rain Tower towards Oliver Road***

Figure 29: ***Section of optic fibre line connecting Moto Mac 5 G Rain Tower towards Oliver Road***

Figure 30: ***Streetscape in Graham Eden Street***

Figure 31: ***Streetscape in Ashe Road***

Figure 32: ***Garage on corner of Ashe and Oliver Roads***

Analysis of the area and possible impact on heritage resources

The Klisser area is a demarcated heritage area and most of the dwelling houses are older than 60 years. A heritage audit was done for this area and none of the individual structures within this small section have been identified as heritage resources. These dwelling houses are very ordinary suburban houses being represented of certain period within the Kimberley township development with no specific heritage or architectural

significance. The sidewalks have gravel sufaces with some tree lanes in Graham Eden Street. Little greenery is found on the verges in Ashe Road and more recently a modern garage was developed on the corner of Ashe and Oliver Road. This line would be deployed by means of conventional trenching to protect the heritage character of the area. No negative impact on any historical streetscapes or individual dwelling houses is thus foreseen.

(iii) **Greenpoint (green line)**

The third line is connecting a 5G Rain tower at the Greenpoint High School in the Greenpoint area via Greenpoint Drive to Oliver Road. The Greenpoint area is a relatively new, primarily residential suburb to the south east of the city. The first section would be aerial fibre and the last section conventional trenching.

Figure 33: ***Optic fibre line connecting Green Point with Oliver Road***

Figure 34: ***Optic fibre line connecting 5G tower at Green Point High School to Oliver Road***

Figure 35: ***Green Point High School site along Greenpoint Road***

Figure 36: ***Green Point Primary School site along Greenpoint Road***

Figure 37: ***Residential dwellings along Greenpoint Road***

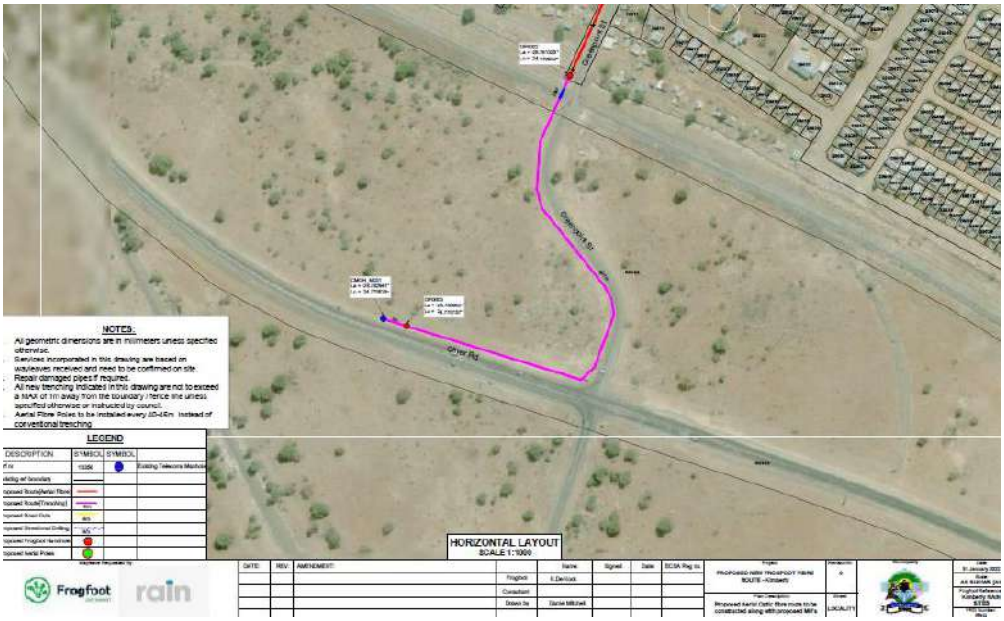


Figure 38: ***Southern section of optic fibre line along Greenpoint Road connecting with Oliver Road***

Figure 39: ***Southern section of Greenpoint Road crossing railway line***

Figure 40: ***Southern undeveloped area along Greenpoint Road***

Analysis of the area and possible impact on heritage resources

This route runs from the existing 5G Rain tower at the Greenpoint High School in the Greenpoint area via Greenpoint Drive to Oliver Road. The Greenpoint area is a relatively new, primarily residential suburb to the south east of the city. The first section would be aerial fibre and the last section conventional trenching. The area is characterised by overhead cables e.g. overhead high mast lightning and Eskom power line and a portion is still undeveloped.

No heritage resources have been identified. Any possible visual impact of the proposed aerial fibre would be trumped by the economic advantages of better quality access and connectivity to broadband services.

(iv) ***Re Tlameng School (pink line)***

This section of optic fibre cables will connect an existing 5G Rain tower located at the Re Tlameng School in Galeshewe township along the main road running through this area towards Kimberley North, namely an extension of John Daka Road becoming

Corless Road/Royal Road/Galeshewe Road respectively as it runs towards the east via Pniel Road and eventually up to Cecil Sussman Road. This road is an activity road with a mixed-use nature. Aerial fibre is proposed along this route.

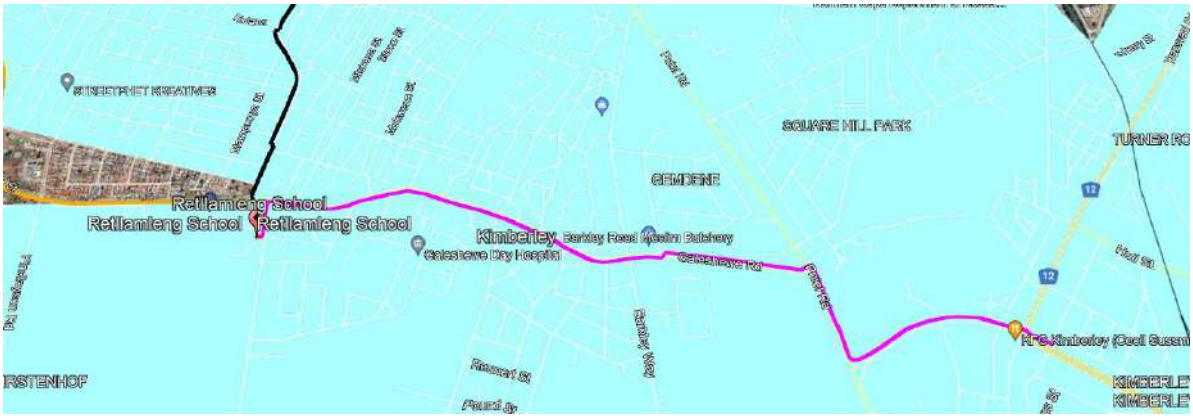


Figure 41: ***Corless Road/Royal Road/Galeshewe Road via Pniel Road and eventually up to Cecil Sussman Road.***

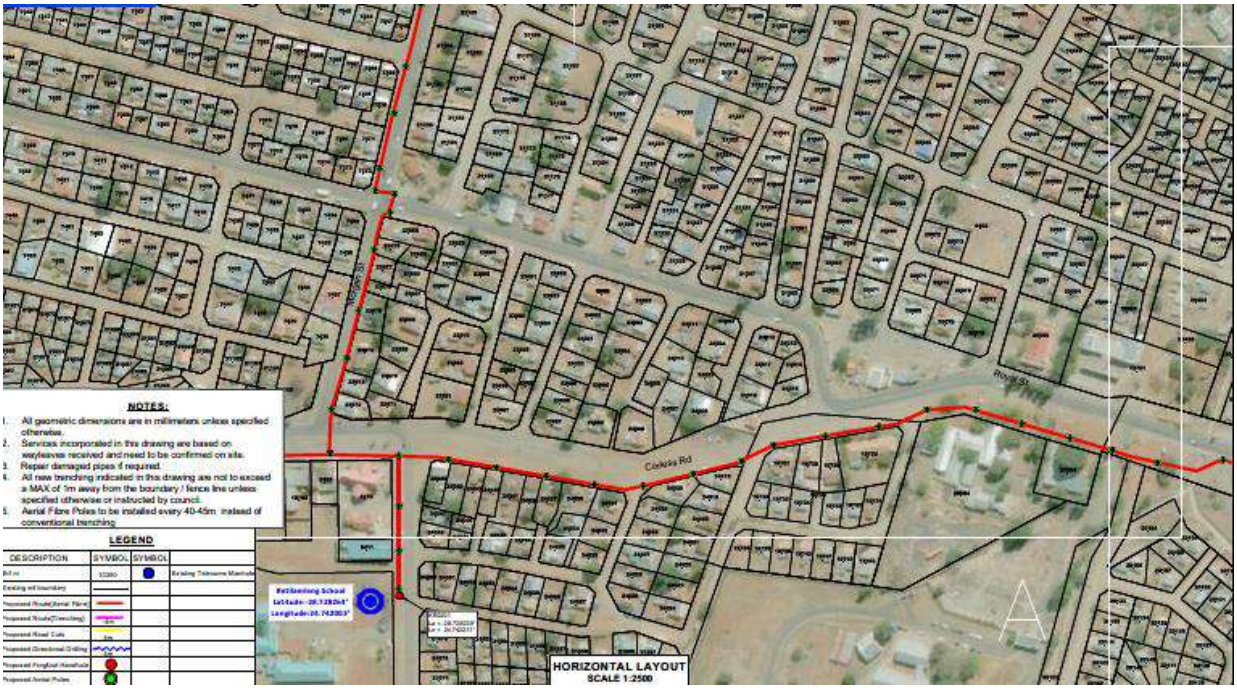


Figure 42: ***Corless Road becoming Royal Road within Galeshewe***

Figure 43: ***Re Tlameng School site in Reserve Road where 5G Rain tower is located***

Figure 44: ***Reserve Road streetscape***

Figure 45: ***Corless Road becoming Royal Street streetscape***

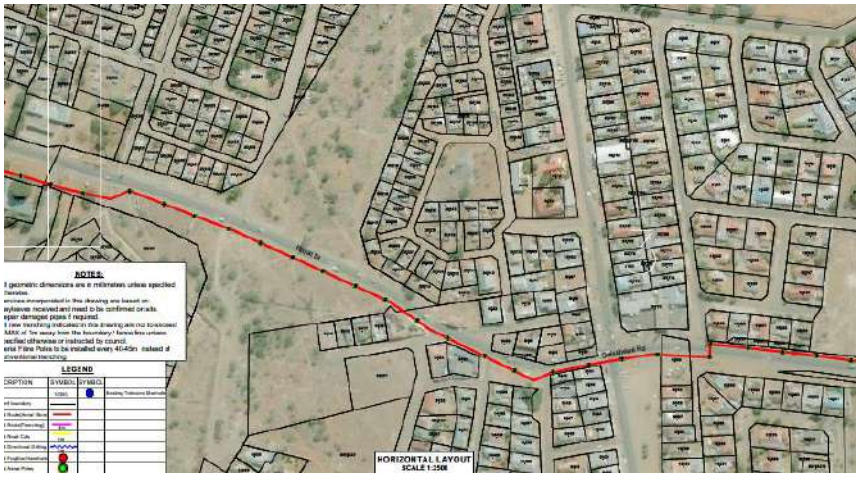


Figure 46: ***Section along Royal Street becoming Galeshewe Road***

Figure 47: ***Outdoor adverting in Galeshewe Road***

Figures 48 and 49: ***Undeveloped areas along Galeshewe Road***

Analysis of the area and possible impact on heritage resources

This section of optic fibre cables will connect an existing 5G Rain tower located at the Re Tlameng School in Galeshewe township along the main road running through this area towards Kimberley North, namely an extension of John Daka Road becoming Corless Road/Royal Road/Galeshewe Road respectively as it runs towards the east via Pniel Road and eventually up to Cecil Sussman Road. This road is an activity road with a mixed-use nature. Aerial fibre is proposed along this route.

This area is older than 60 years, but many of the structures along the road are of a more recent nature. Some of the dwelling houses are respresentative of the development of the Galeshewe township over time (e.g. along Reserve and Royal Streets), but are ordinary examples of this type of architecture and do not have any specific historical or architectural significance. Galeshewe Street is a main connector road in this area with vacant areas along this section of the route.

No heritage resources have thus been identified. Although the aerial fibre would have a visual impact it can be argued that in these areas this would be trumped by the economic advantages of better quality access and connectivity to broadband services.

(v) Galeshewe (orange line)

This section of optic fibre cables will connect an existing 5G Rain tower located at the Will of God Ministry Church site on the intersection of John Daka and Lathi Mabido Street in Galeshewe towards the Re Tlameng School site. The whole route runs along John Daka Road. The first section along Johan Daka Road finds the Galeshewe Cemetery towards the north whereafter this route runs through a primarily single residential area which also has some undeveloped areas. Aerial fibre is proposed.

Figure 50: ***Line between existing 5G Rain Tower at God Ministry Church site towards the Re Tlameng School site***

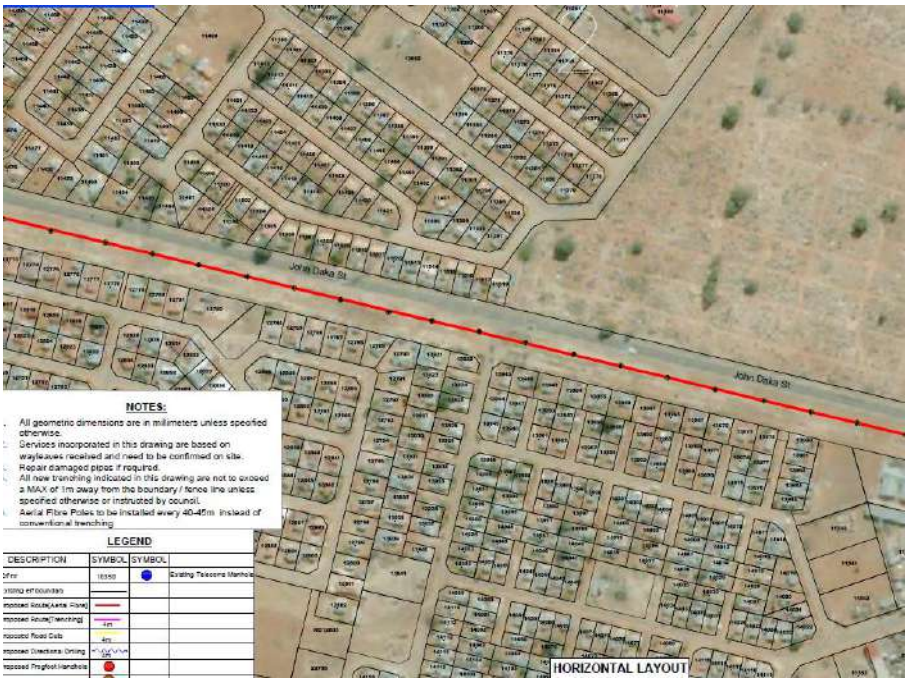
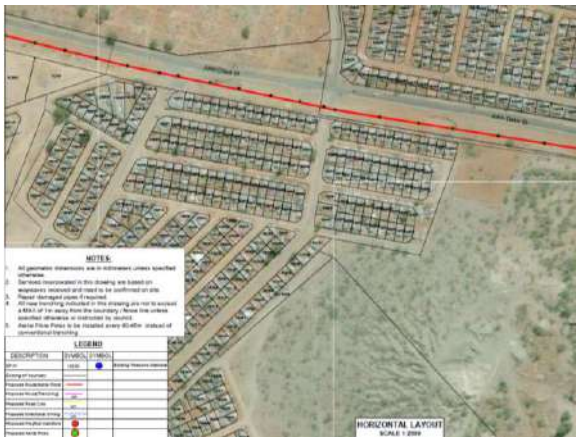


Figure 51: ***First section of the line along Johan Daka Road with Galeshewe Cemetery towards the north. Aerial fibre is proposed at the opposite side of the road.***

Figure 52: ***First section along Johan Daka Road with the Galeshewe Cemetery towards the north***



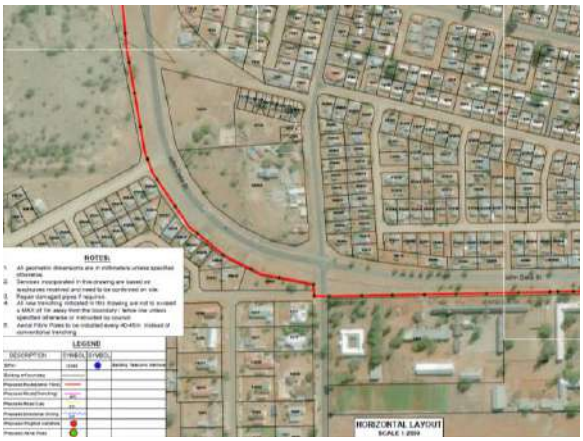


Figure 53 and 54: ***Remainder of this line along John Daka Road towards the west***

Figure 55: ***Streetscape along John Daka Road – combination of residential and undeveloped***

Figure 56: ***Streetscape along John Daka Road***

Figures 57 and 58: ***Streetscape along St Boniface School on the far east of this route***

Accessment of area and possible impact on heritage resources

This section of optic fibre cables will connect an existing 5G Rain tower located at the Will of God Ministry Church site on the intersection of John Daka and Lathi Mabido Street in Galeshewe towards the Re Tlameng School site. The whole route runs along John Daka Road a major local connector road in the area.

The first section along Johan Daka Road finds the Galeshewe Cemetery towards the north. The cemetery is considered either a 3B or 3C heritage resource. The aerial fibre route runs along the opposite side of road and thus not along the boundary of the cemetery site. There would thus be no visual impact on the cemetery or on any archaeological or paleontological heritage resources.

Thereafter this route runs through a primarily single residential area with some undeveloped areas. Some sections of the route is located along an area older than 60 years, but these are not heritage areas and the dwelling houses are ordinary examples of suburban township dwellings.

Any visual impact of the proposed aerial fibre is considered to be trumped by the economic advantages the deployment of these lines for the local communities in these areas by offering them much improved broadband connectivity, especially for the community facilities such as the school at the starting and ending point of the route.

(vi) Boitumel School (yellow)

This section of optic fibre cables will connect an existing 5G Rain tower located at the Boitumel School at the far west of John Daka Road towards the God Ministry Church site on the intersection of John Daka and Lathi Mabido Street in Galeshewe. This area is primarily residential with some community facilities such as school and churches next to the road. Aerial fibre is proposed along this route with small sections of conventional trenching.

Figure 59: ***Line from Boitumelo School to God Ministry Church site***

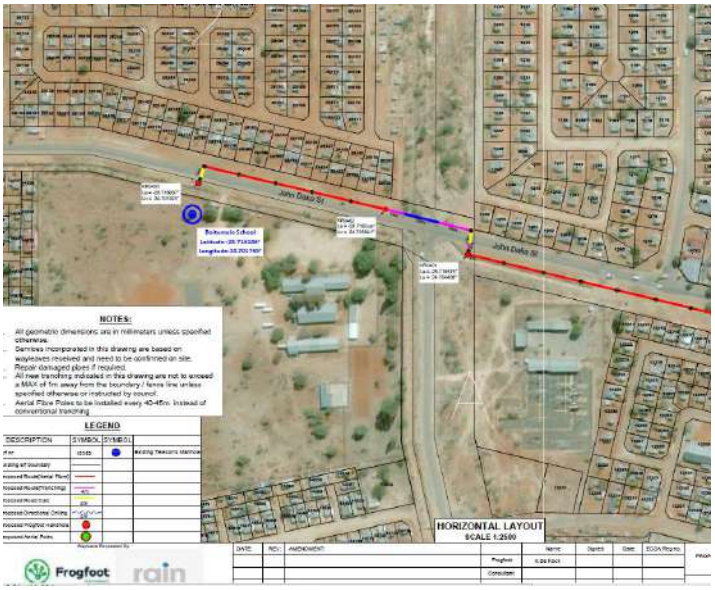


Figure 60: ***Beginning of line at 5G Rain Tower at Boitumelo School***

Figure 62: ***5G Rain Tower at Boitumelo School***

Figures 63 and 64: ***Western section of this line along John Daka Road***

Figures 65 and 66: ***Second section of this line along John Daka Road. Note the tree lanes.***

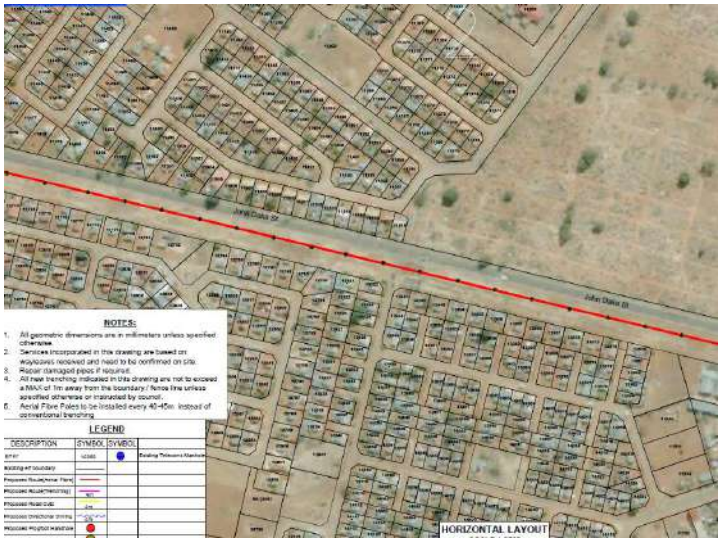


Figure 67: ***Last section of this line towards the east***

Figure 68: ***Last section of this line towards the east containing residential units***

Figure 69: ***Last section of this line towards the east (line at opposite side of the road)***

Assessment of area and possible impact on heritage resources

This section of optic fibre cables will connect an existing 5G Rain tower located at the Will of God Ministry Church site on the intersection of John Daka and Lathi Mabido Street in Galeshewe towards the Re Tlameng School site. The whole route runs along John Daka Road a major local connector road in the area with a mixed use nature. .

This is a relatively newer area of the Galeshewe township and no heritage resources would be affected. The last section passes the Galeshewe cemetery (a local heritage resource), but the aerial fibre line will be installed at the opposite side of the road.

In this area it can also be argued that the possible negative visual impact of the proposed aerial fibre would be trumped by the economic advantages the deployment of these lines for the local communities in these areas by offering them much improved broadband connectivity, especially for the community facilities such as the school at the starting and ending point of the route.

(vii) Boitshoko Primary (black line)

This section of optic fibre cables will connect an existing 5G Rain tower located at the Boitshoko Primary School in Galeshewe towards the south via Montlahla Street, becoming Morgan Street towards Corless Road. This area is primarily residential (formal and less formal) with some community facilities such as schools and churches next to the road. Aerial fibre is proposed along this route.

Figure 70 ***Line running from Boitshoko Primary School in Galeshewe***

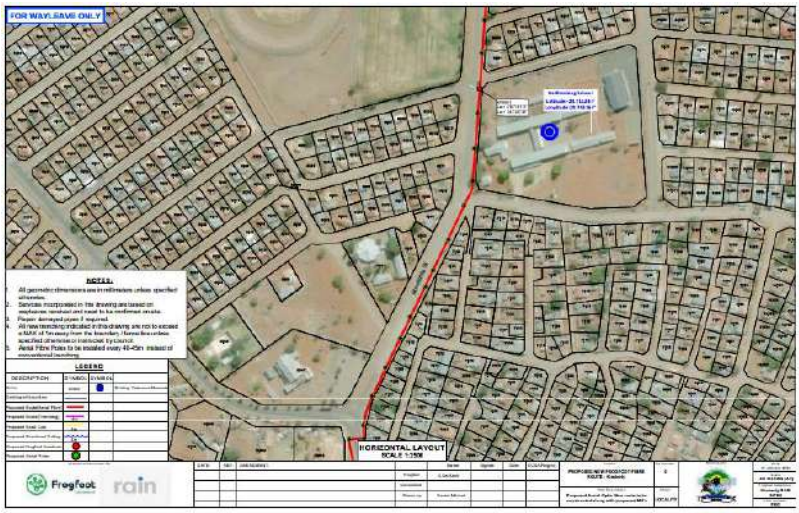


Figure 71 ***First section of line running from Boitshoko Primary School in Galeshewe towards the south in Montlahla Street***

Figures 72 and 73 ***Boitshoko Primary School and adjacent residential area***

Figures 74 and 75: ***Residential developments along Montlahla Street***

Figures 76 and 77: ***Portion of line along the Galeshewe Social Centre and Sport Fields***

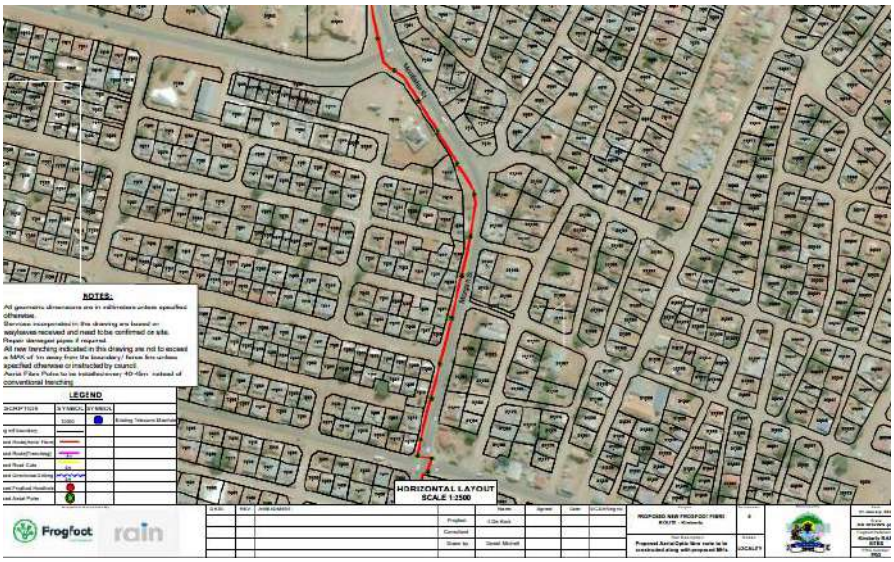


Figure 78: ***Portion of line along Montshala Street becoming Morgan Street***

Figures 79 - 82: ***Residential dwellings along Morgan Street***

Assessment of area and possible impact on heritage resources

The is route is primarily residential in nature – both formal and informal housing – with some community facilities such as school, churches and sportfields. This is an older area of Galeshewe, but the dwelling houses along this route are ordinary suburban township houses without historical or architectural significance. In some areas tree lines can absorb and thus lessen the visual impact of the proposed aerial fibre lines. These tree lines are considered a heritage resource and care should be taken to not harm the root systems thereof during excavations.

Any negative visual impact of the proposed aerial fibre is trumped by the economic advantages the deployment of these lines for the local communities in these areas by offering them much improved broadband connectivity, especially for the community facilities such as the school at the starting and ending point of the route.

(viii) Homevale High School (purple line)

This section of optic fibre cables will connect an existing 5G Rain tower located at the Homevale High School with the tower at Boitshoko Primary School in Galeshewe. The first section along Midlands Road is primarily residential except for the school site. Further along Barkly Road more mixed land uses are found – residential, institutional buildings and commercial. On the corner of Barkly Road and Seochoareng Road a commercial node if found. When the line moved into Seochoareng Road it becomes primarily residential – formal and less formal structures. Aerial fibre is proposed along this route.

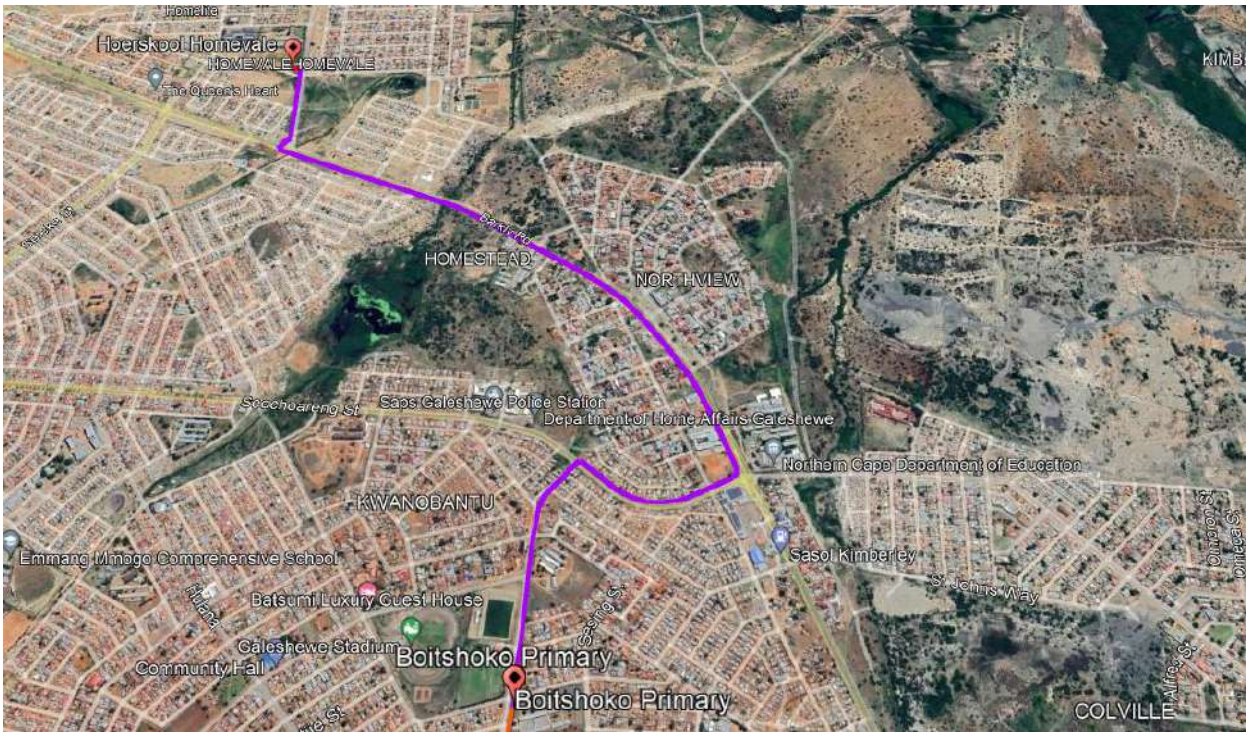


Figure 83: ***Optic fibre line connecting 5 G tower at Homevale High School to Boitshoko Primary School tower***

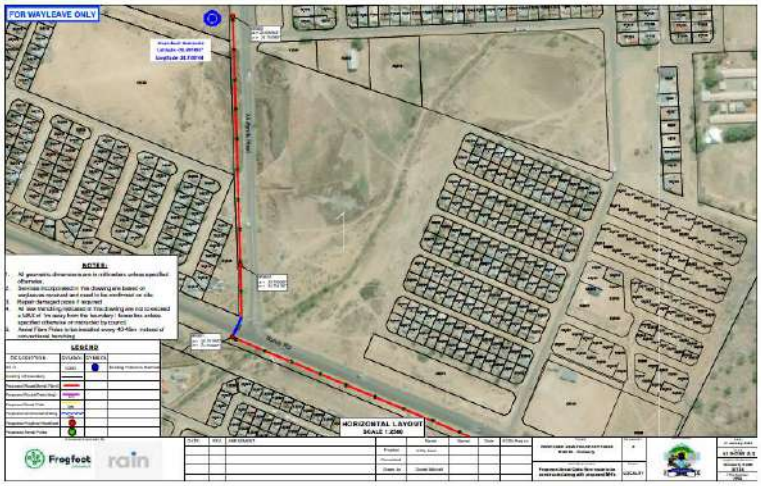


Figure 84: ***First section of optic fibre line running along Midlands Road***

Figures 85 and 86: ***Homevale High School along Midlands Road where 5 G Rain tower is located***

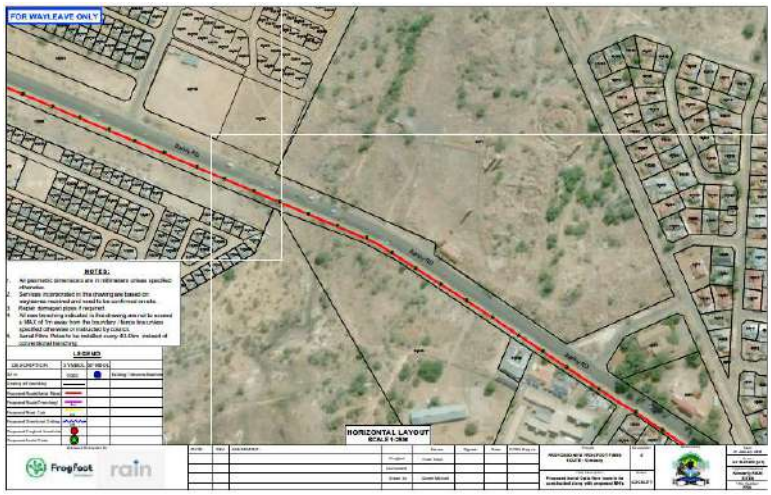


Figure 87: ***Second stretch of the line running along Barkly Road***

Figures 88 -91: ***Streetscape along Barkly Road***

Figures 92 and 93: ***Lower stretch of Barkly Road line***

Figures 94 and 95: ***Lower stretch of Barkly Road streetscapes***

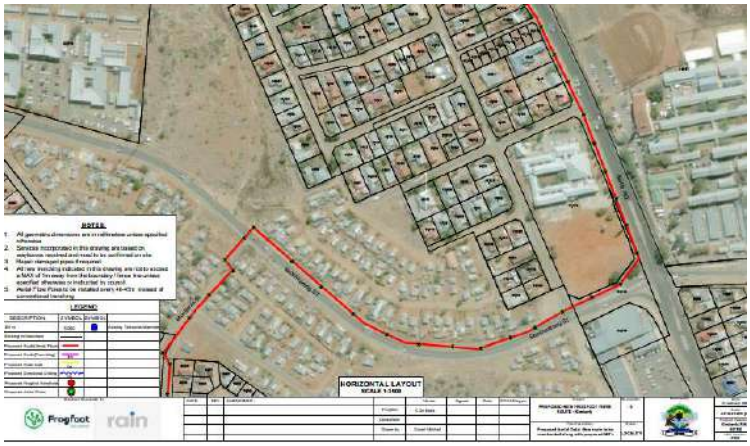


Figure 96: ***Line move into Seochoareng Street***

Figures 97 and 98: ***Commercial node on corner of Barkly Road and Seochoareng Street***

Figures 99 and 100: ***Streetscape along Seochoareng Street***

Figures 101 and 102: ***Last section of line runs along Montlasha Street***

Figure 103: ***Galeshewe Stadium background and view towards Yorkshire Cricket Field in Montlasha Street***

Assessment of area and possible impact on heritage resources

This route is primarily a residential area with some community facilities. Some mixed use nodes are found at road intersections. This is a relatively new area with no heritage significance. There is little greenery on the road verges and other examples of overhead lines.

Aerial fibre is proposed along this route. Any negative visual impact of the proposed aerial fibre on this urban landscape is trumped by the economic advantages the deployment of these lines for the local communities in these areas by offering them much improved broadband connectivity, especially for the community facilities such as the schools at the starting and ending point of the route.

SECTION 6. RECOMMENDATIONS AND CONCLUSIONS

The argument is often made is that it is necessary to make some sacrifices for the economic advantages which new technology can bring to a local community especially disadvantaged communities, be it electrical infrastructure, telephone poles, wind towers, sun panels, telecommunication masts or in this case the aerial fibre structures (wooden poles and cables). Other may argue that it is essential to retain intact sites with a specific sense of place due to the significance of certain rural and urban landscapes. There thus remain a number of areas when assessing the visual impact of new structures within a landscape which are heavily dependent on subjective opinions. Opinions of the receptors and the assessor could also differ. One person may see the aerial fibre structures (poles and cables) as very invasive in the urban landscape while

other will argue that it is not that visible and that the economic advantages the deployment of fibre has for local communities outweigh any visual impact it may have.

The individual assessments of the different routes in Section 5 confirmed that there would be no detrimental impact on any individual heritage resources. It would be difficult to argue that the poles and cables would have no visual impact on the streetscapes. The assessment of other areas within the Sol Plaatje Municipal Area where aerial fibre has already been deployed, however, shown that although it is visible from certain vantage points, e.g. on street corners and street intersections it is much less visible when people walk or commute (drive) through streets as the visual impact of these poles are not on eye level and the poles in many streets within the study area are will be absorbed or concealed by the mature trees and tree lanes. In other areas within the study area there are already a number of overhead structures such as high light masts, electrical power lines and telephone lines which would also assist to absorb the visual impact of the aerial fibre.

It is also important to consider that the project will offer many socio-economic advantages for local residents, especially within certain disadvantaged areas, and the proposed manner of fibre deployment to ensure linkages with the existing 5G Rain towers will speed up access to higher quality more affordable broadband access to them.

No further heritage studies are thus recommended.

The following is recommended to lessen the impact of the deployment of the fibre lines along the different routes within the study area:

(i) The excavations for poles should comply Compliance with **Frogfoot Draft FTTH Aerial Line Cable Specifications** (e.g. compliance with guidelines with regard to tree/bush cutting, survey preparation, excavation of pole holes and the erection of poles, the fitting of stays and struts, construction of overhead routes with wooden poles and erection of overhead optical fibre cable) attached as **Annexure 4**. Any subcontractors should be trained by Frogfoot Networks regarding these protocols.

(ii) The excavations for poles should also comply with the **Tree Protection Guideline for Construction, Excavation & Trenching for Aerial and Underground Fibre Optic Cabling** (**Annexure 5**) to prevent any damage to root systems of mature trees which are considered a heritage resource within certain area within the study area. Any subcontractors should be trained by Frogfoot Networks regarding these protocols.

(iii) Care should be taken to not harm any of the historical curb stones. Trenching underneath the curb stones is proposed.

(iv) Archaeological monitoring of all excavation activities by a suitably qualified and registered archaeologist.

(v) A Close-Up Report be prepared by Frogfoot Networks within 30 days of completion of the project.

SECTION 7 REFERENCES

PRIMARY SOURCES

Google Earth images and Google Pro images

National Geo-Spatial Information (NGI): Historic aerial photographs

Photographs: Christine Havenga

Surveyor general: Survey diagrams and maps

Survey of Buildings and Sites of Architectural, Historical and Contextual Importance in Kimberly done by the Division of Professional and Technical Services of the former National Monuments Council in 1986

Northern Cape Heritage Register

Survey of Buildings and Sites of Architectural, Historical and Contextual Importance in Kimberly done by the Division of Professional and Technical Services of the former National Monuments Council in 1986

Frogfoot Draft FTTH Aerial Line Cable Specifications

ACTS, POLICIES AND GUIDELINES

Sol Plaatje Local Municipality Draft Spatial Development Framework 2018-2023

National Heritage Resources Act (Act No.25 of 1999). Government Gazette Vol: 406, Cape Town. 28 April 1999. No. 19974.

Sol Plaatje Municipal Planning By-Law (2015) and Development Management Scheme

BOOKS AND PUBLICATIONS

Anderson, Tania (2001). *A Beginner's Guide to the Plants of Kimberley and Surrounds.*

Beet, George and others (10996). *Knights of the Shovel. Glimpses of Life on the Diamond Fields 1869 – 1914.*

McNish, J. T. (1969) *Graves and Guineas. Adventures in Diamond Country, Kimberley 1871 – 1873*. Struik.

McNish, J. T. The Glittering Road. (1970) *Adventures in Diamond Country, Kimberley 187*4 – 1876, Struik

Oberholzer, B. (2005). *Guideline for involving visual & aesthetic specialists in EIA processes.* CSIR Report No ENV-S-C 2005 053 F, Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town.

Resistance in Northern Cape in the nineteenth century: history and commemoration: Proceedings of a mini-conference held at the McGregor Museum, Kimberly 14- 16 September 2011.

Richardson, Deirdré (2001) *Historic Sites of South Africa*. Struik Publishers.

Roberts, Brian (1972) *The Diamond Magnates*. Hamish Hamilton, London.

ANNEXURE 1

POWER OF ATTORNEY

Frogfoot
Just connect

Special Power of Attorney

I, the undersigned, **Abraham Albertus Cilliers van der Merwe**, with identity number 7804215013085, Chief Executive Officer of Frogfoot Networks (Pty) Ltd (company registration number 2006/011693/07) do hereby nominate and appoint **Christine Havenga,** with identity number 6610010119089 of **Christine Havenga and Associates (a sole proprietor)** in her capacity as **a Professional Planner and Heritage Practitioner** to represent Frogfoot Networks (Pty) Ltd and exercise all powers as agents as fully and effectually as I might or could do if personally present and acting in person without in any way detracting from the powers aforesaid, I hereby authorise our said Agent:

to do such things, sign and submit such documents as are required with regard to preparing and submitting an application for a Notice of Intent to Develop in terms of section 38 of the National Heritage Resources Act of 1999 with regard to the proposed deployment of a fibre optic telecommunications network within the **Sol Plaatje Local Municipality area.**

THUS DONE and SIGNED at Cape Town on the 22 day of April 2022 in the presence of the undersigned witnesses.

As witnesses:

1 Amy Miseer (Apr 22, 2022 08:40 GMT+2) .....

2 Tracy Juul (Apr 22, 2022 08:46 GMT+2) .....

Signatures of witnesses

.....

Signature of the CEO
of Frogfoot Networks (Pty) Ltd

Suite 302, Building 20
The Waverley Business Park
Kotzee Road, Mowbray
Cape Town, South Africa

PO Box 23618
Claremont
Cape Town
7735

Tel: +27 21 448 7225
Sales/Enquiries: ftth@frogfoot.com
Support: support@frogfoot.com

frogfoot.com

Frogfoot Networks (Pty) Ltd, Reg No. 2006/011693/07

ANNEXURE 2

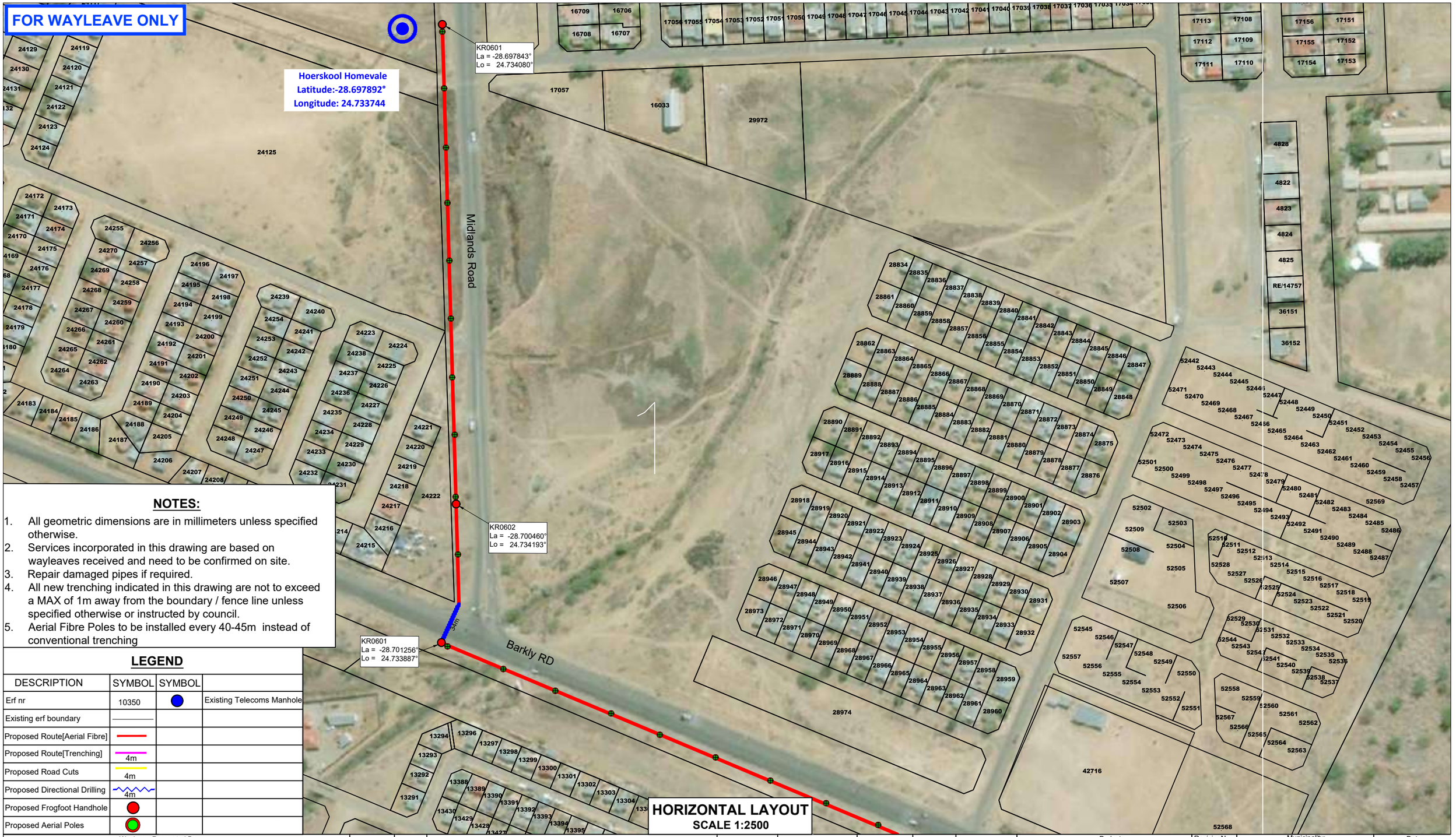
LOCALITY PLAN OF AREAS WHERE OPTIC FIBRE LINES WOULD BE DEPLOYED

PROPOSED FROGFOOT NETWORK LINES

ANNEXURE 3

INDIVIDUAL ROUTE PLANS

FOR WAYLEAVE ONLY



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Proposed Route[Aerial Fibre]			
Proposed Route[Trenching]	4m		
Proposed Road Cuts	4m		
Proposed Directional Drilling	4m		
Proposed Frogfoot Handhole			
Proposed Aerial Poles			

Wayleave Requested By:

Frogfoot | rain

DATE:	REV:	AMENDMENT:		Name:	Signed:	Date:	ECSA Reg no.
			Frogfoot	K.De Kock			
			Consultant				
			Drawn by	Daniel Mitchell			

Project:
PROPOSED NEW FROGFOOT FIBRE ROUTE - Kimberly

RevisionNr: **0**

Municipality:

Date: **31 January 2022**

Scale: **AS SHOWN [A3]**

Frogfoot Reference: **Kimberly RAIN SITES**

FRG Number: **FRG**

Plan Description:
Proposed Aerial Optic fibre route to be constructed along with proposed MH's

Sheet: **LOCALITY**

FOR WAYLEAVE ONLY

Barkly RD

Barkly RD

Barkly RD

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Proposed Directional Drilling	4m		
Proposed Frogfoot Handhole			
Proposed Aerial Poles			

HORIZONTAL LAYOUT
SCALE 1:2500

Wayleave Requested By:

Frogfoot

rain

DATE:	REV:	AMENDMENT:		Name:	Signed:	Date:	ECSA Reg no.
			Frogfoot	K.De Kock			
			Consultant				
			Drawn by	Daniel Mitchell			

Project:
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RevisionNr: **0**

Municipality:

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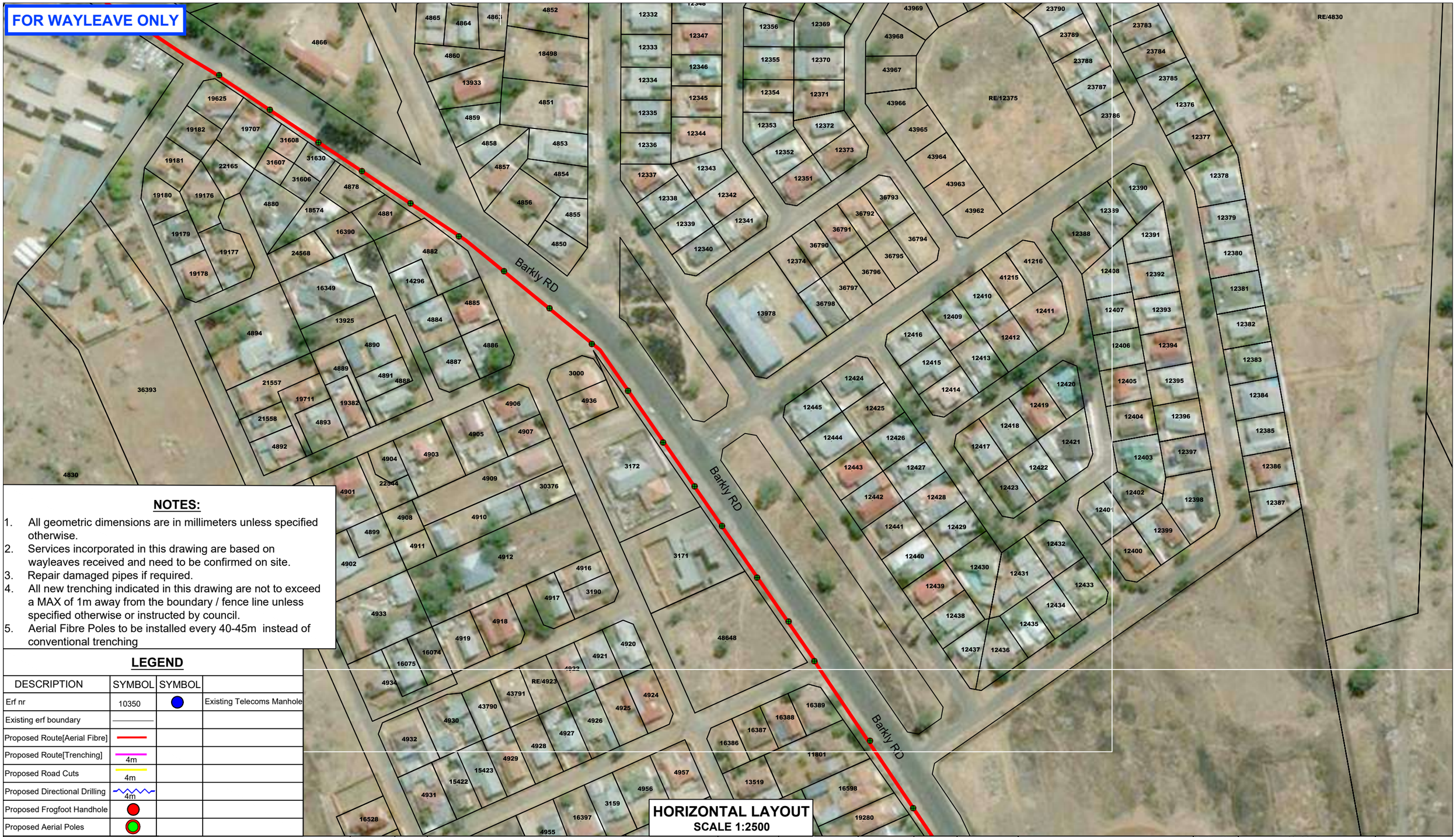

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Wayleave Requested By:

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Proposed Aerial Poles			

Barkly RD

Montlahla St

Seochoareng ST

Seochoareng ST

HORIZONTAL LAYOUT
SCALE 1:2500

Wayleave Requested By:

Frogfoot rain

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Municipality:

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FOR WAYLEAVE ONLY

Montlahla St

RE/1318

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HORIZONTAL LAYOUT
SCALE 1:2500

Wayleave Requested By:

Frogfoot | rain

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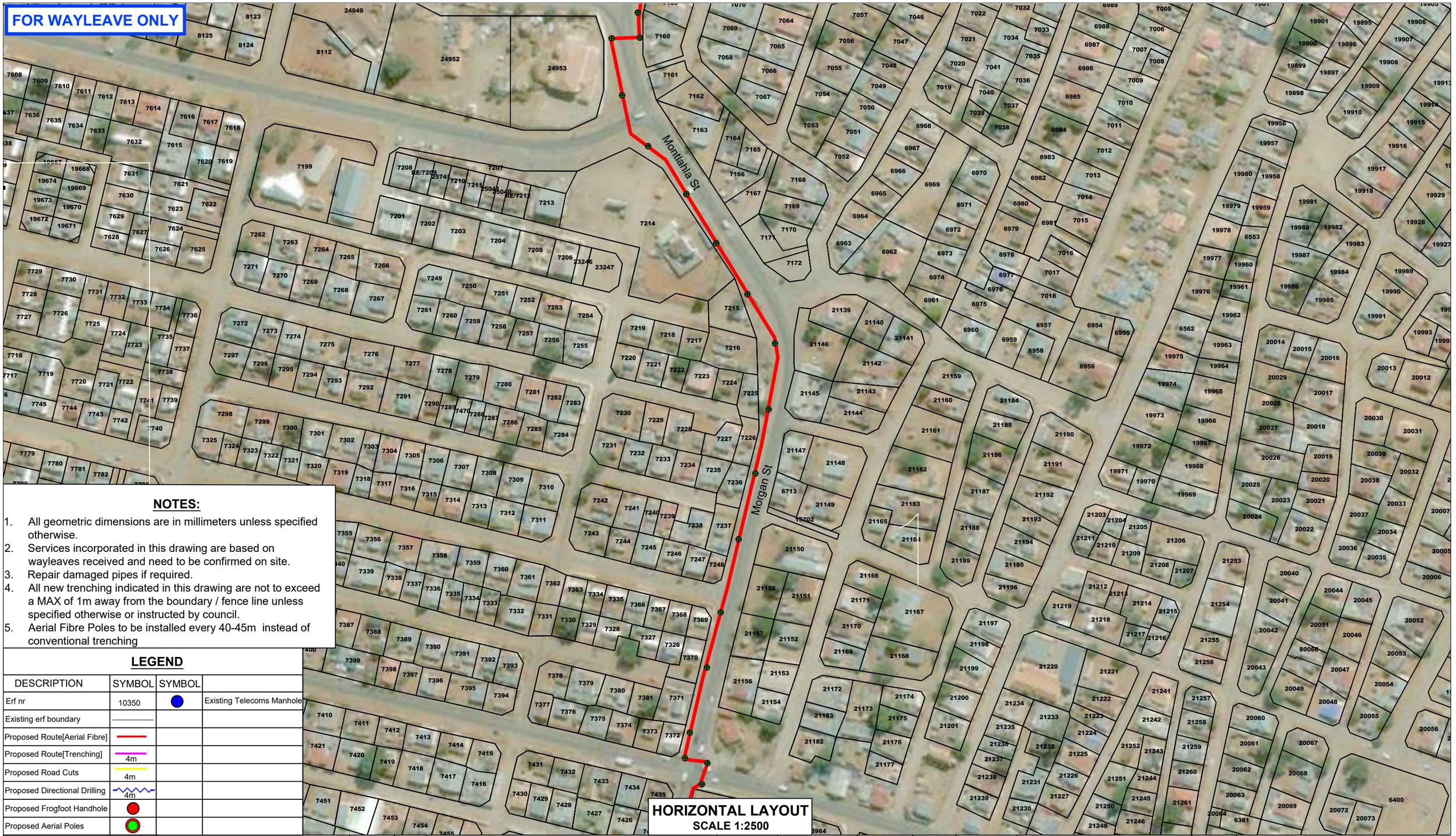

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SCALE 1:2500

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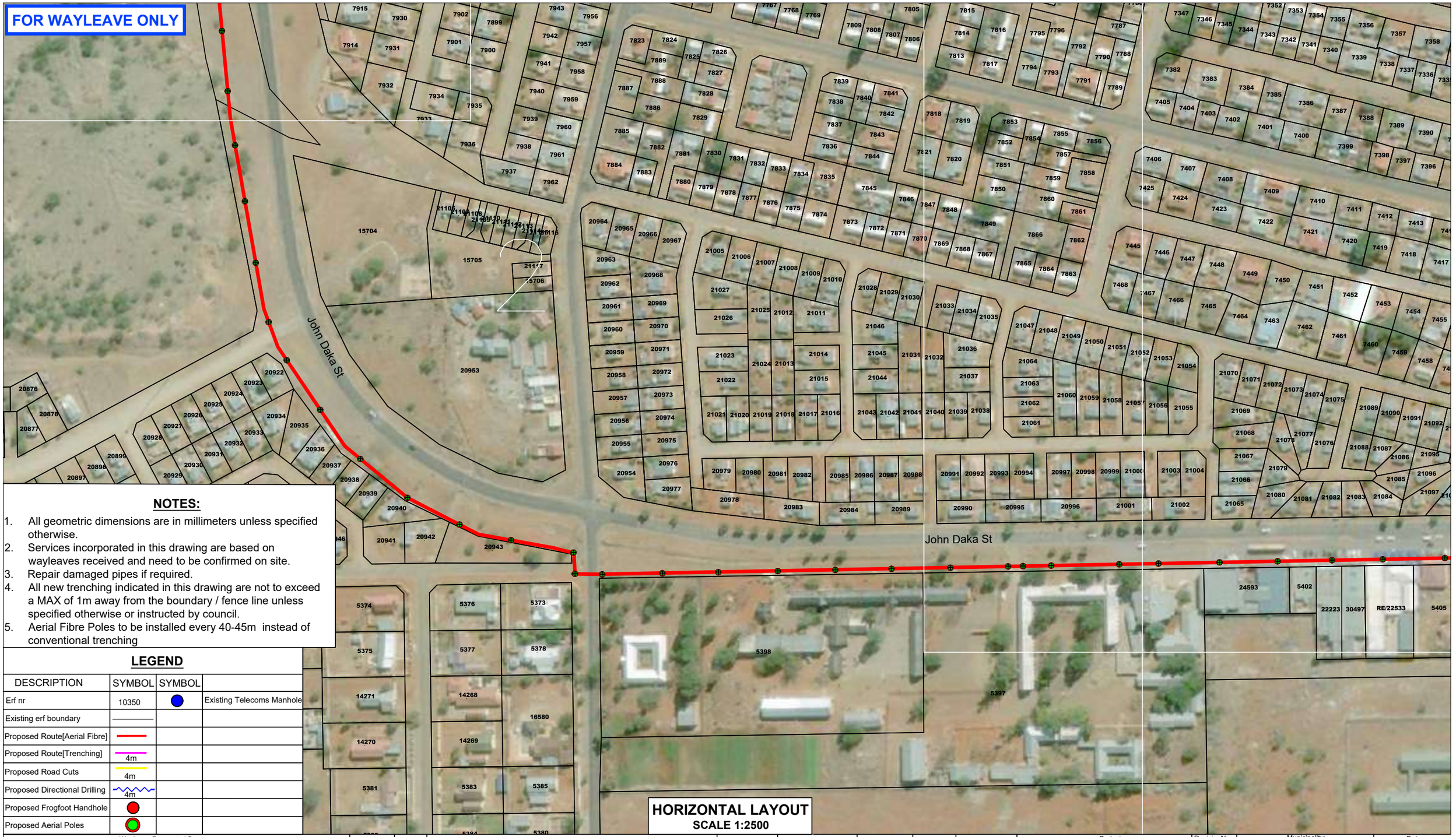

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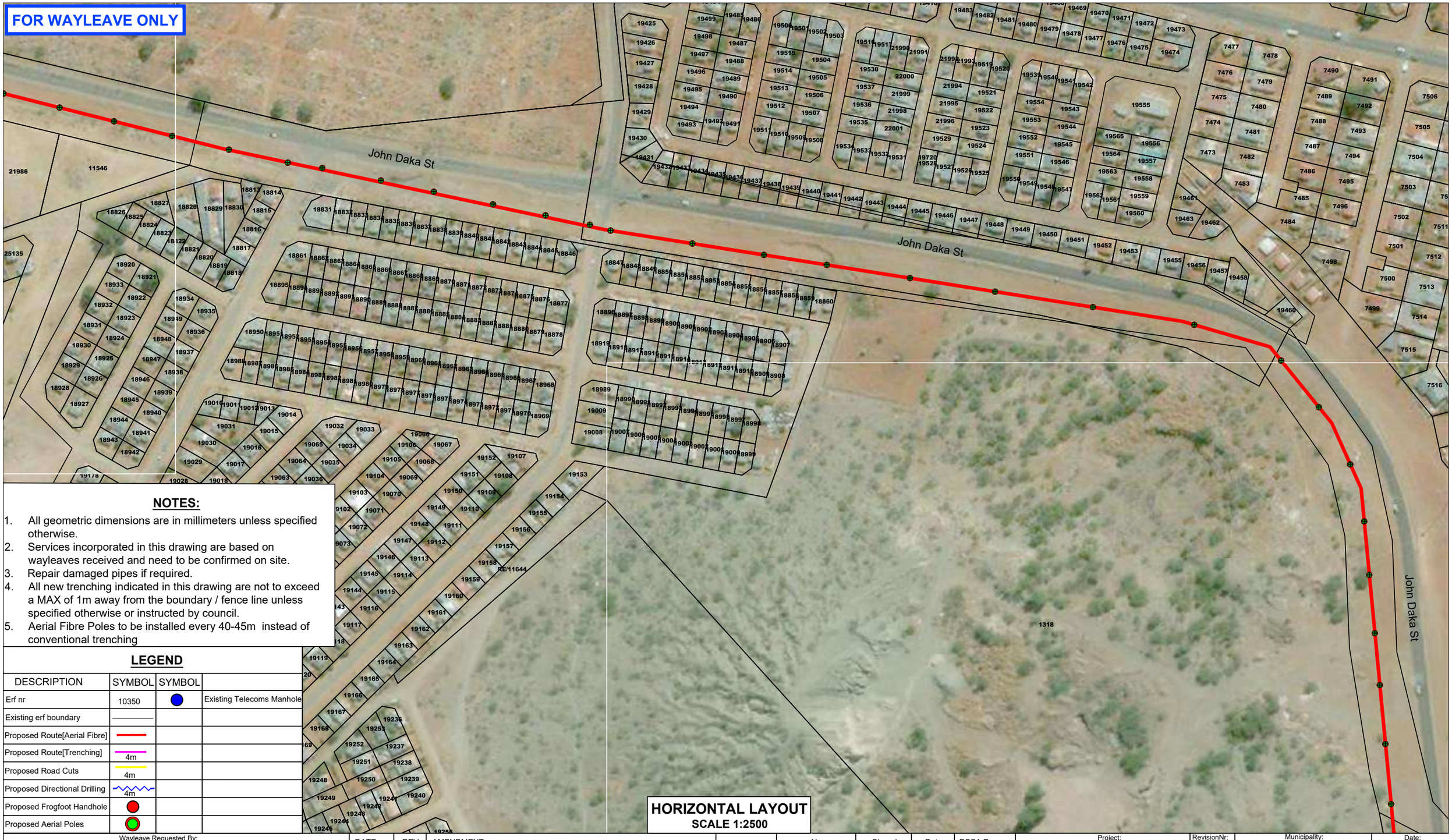

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John Daka St

KR0301
La = -28.720714°
Lo = 24.723918°

Galeshewe
Latitude:-28.720923°
Longitude:24.723859°°

HORIZONTAL LAYOUT
SCALE 1:2500

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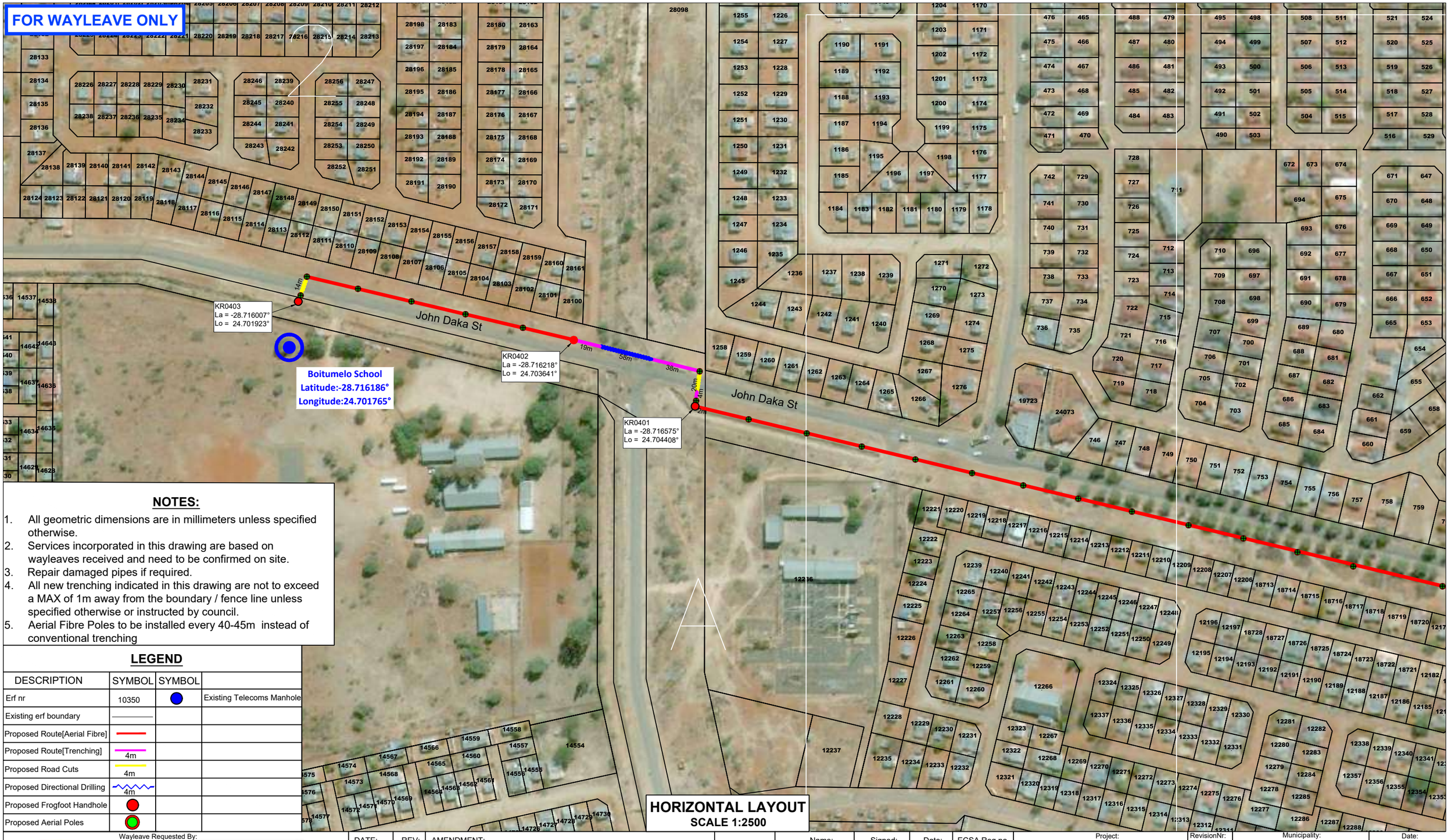

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LEGEND

DESCRIPTION	SYMBOL	SYMBOL	
Erf nr	10350		Existing Telecoms Manhole
Existing erf boundary			
Proposed Route[Aerial Fibre]			
Proposed Route[Trenching]	4m		
Proposed Road Cuts	4m		
Proposed Directional Drilling	4m		
Proposed Frogfoot Handhole			
Proposed Aerial Poles			

HORIZONTAL LAYOUT
SCALE 1:2500

Wayleave Requested By:

Frogfoot | rain

DATE:	REV:	AMENDMENT:		Name:	Signed:	Date:	ECSA Reg no.
			Frogfoot	K.De Kock			
			Consultant				
			Drawn by	Daniel Mitchell			

Project: **PROPOSED NEW FROGFOOT FIBRE ROUTE - Kimberly**

RevisionNr: **0**

Plan Description: **Proposed Aerial Optic fibre route to be constructed along with proposed MH's**

Sheet: **LOCALITY**

Municipality:

Date: **31 January 2022**

Scale: **AS SHOWN [A3]**

Frogfoot Reference: **Kimberly RAIN SITES**

FRG Number: **FRG**

FOR WAYLEAVE ONLY

Morgan St

Corless Rd

Royal St

Retllamleng School
Latitude:-28.728264°
Longitude:24.742003°

KR0201
La = -28.728239°
Lo = 24.742231°

HORIZONTAL LAYOUT
SCALE 1:2500

NOTES:

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4. All new trenching indicated in this drawing are not to exceed a MAX of 1m away from the boundary / fence line unless specified otherwise or instructed by council.
5. Aerial Fibre Poles to be installed every 40-45m instead of conventional trenching

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Erf nr	10350		Existing Telecoms Manhole
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Proposed Route[Aerial Fibre]			
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Proposed Road Cuts	4m		
Proposed Directional Drilling	4m		
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Proposed Aerial Poles			

Wayleave Requested By:

Frogfoot | rain

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			Frogfoot	K.De Kock			
			Consultant				
			Drawn by	Daniel Mitchell			

Project:
PROPOSED NEW FROGFOOT FIBRE ROUTE - Kimberly

RevisionNr: **0**

Plan Description:
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Sheet: **LOCALITY**

Municipality:

Date: **31 January 2022**

Scale: **AS SHOWN [A3]**

Frogfoot Reference: **Kimberly RAIN SITES**

FRG Number: **FRG**

FOR WAYLEAVE ONLY

Royal St

Galeshewe Rd

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Proposed Directional Drilling	4m		
Proposed Frogfoot Handhole			
Proposed Aerial Poles			

HORIZONTAL LAYOUT
SCALE 1:2500

Wayleave Requested By:

Frogfoot

rain

DATE:	REV:	AMENDMENT:		Name:	Signed:	Date:	ECSA Reg no.
			Frogfoot	K.De Kock			
			Consultant				
			Drawn by	Daniel Mitchell			

Project:
PROPOSED NEW FROGFOOT FIBRE ROUTE - Kimberly

RevisionNr: **0**

Municipality:

Date: **31 January 2022**

Scale: **AS SHOWN [A3]**

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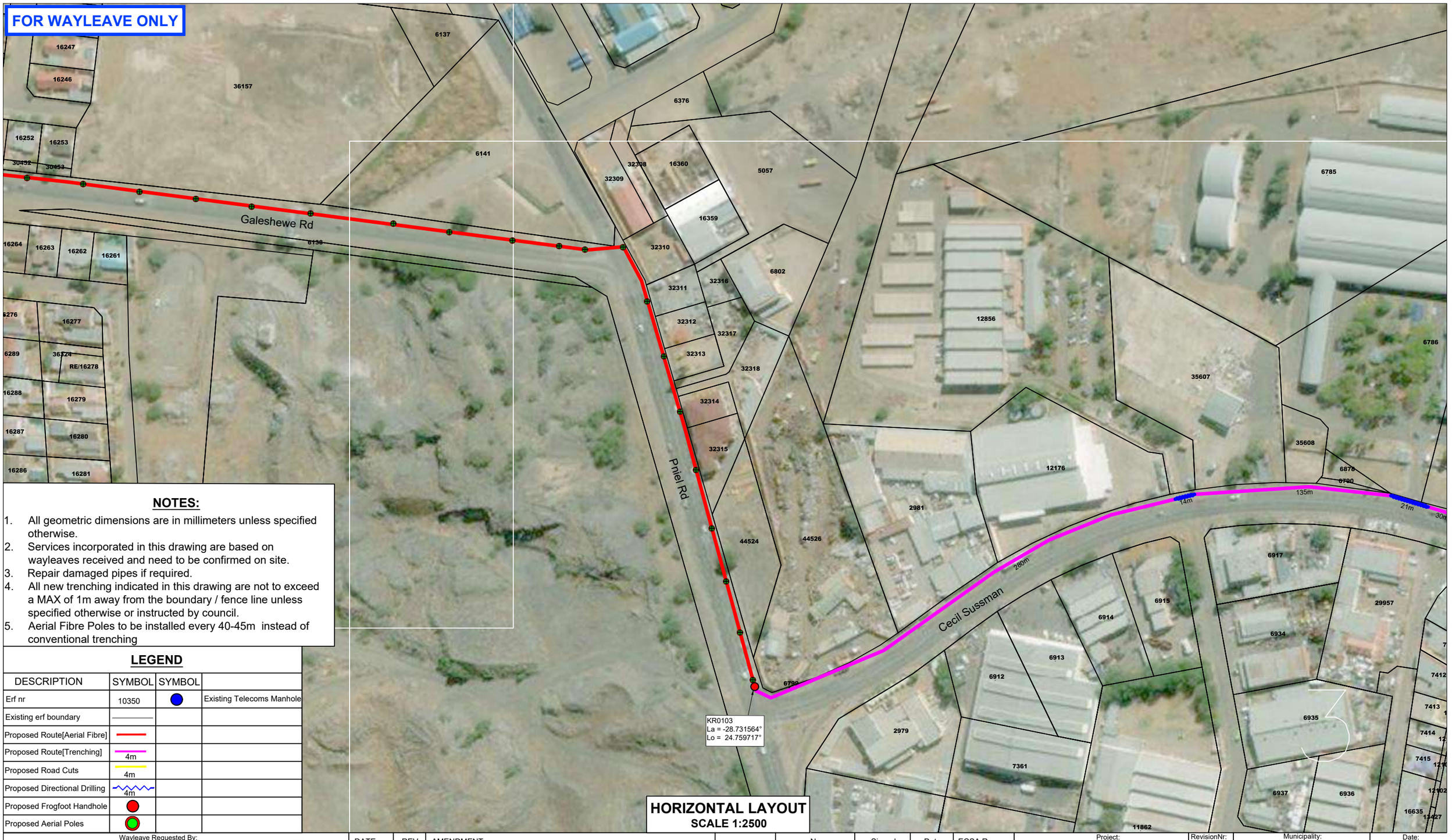
FRG Number: **FRG**

Plan Description:
Proposed Aerial Optic fibre route to be constructed along with proposed MH's

Sheet: **LOCALITY**

FOR WAYLEAVE ONLY



HORIZONTAL LAYOUT
SCALE 1:2500

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Proposed Route[Trenching]	4m		
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Proposed Directional Drilling	4m		
Proposed Frogfoot Handhole			
Proposed Aerial Poles			

Wayleave Requested By:

Frogfoot | rain

DATE:	REV:	AMENDMENT:		Name:	Signed:	Date:	ECSA Reg no.
			Frogfoot	K.De Kock			
			Consultant				
			Drawn by	Daniel Mitchell			

Project:
PROPOSED NEW FROGFOOT FIBRE ROUTE - Kimberly

RevisionNr: **0**

Municipality:

Date: **31 January 2022**

Scale: **AS SHOWN [A3]**

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FRG Number: **FRG**

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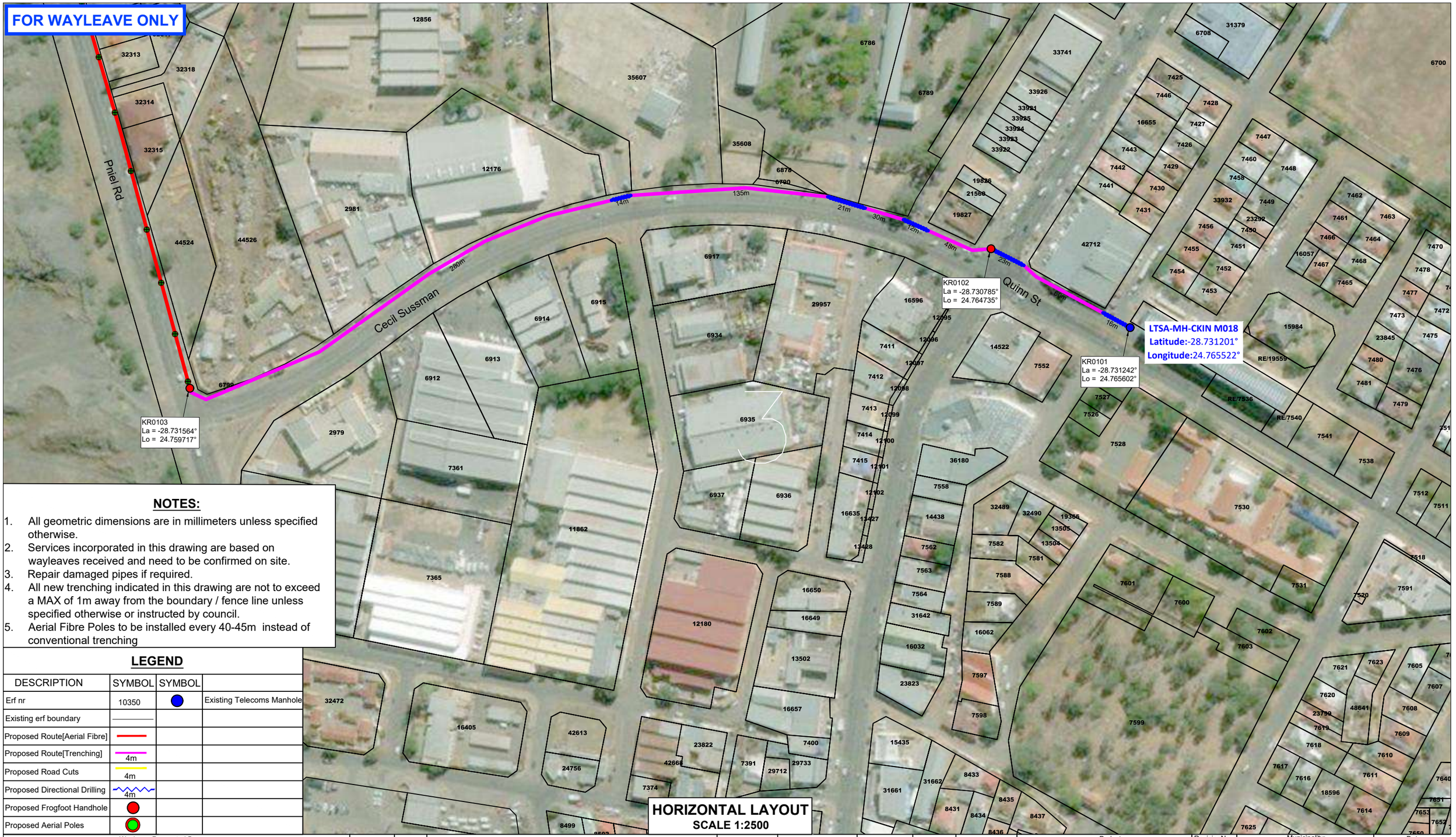
FOR WAYLEAVE ONLY



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Proposed Frogfoot Handhole			
Proposed Aerial Poles			

Wayleave Requested By:

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			Consultant				
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Project:
PROPOSED NEW FROGFOOT FIBRE ROUTE - Kimberly

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Municipality:

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Scale: **AS SHOWN [A3]**

Frogfoot Reference: **Kimberly RAIN SITES**

FRG Number: **FRG**

Plan Description:
Proposed Aerial Optic fibre route to be constructed along with proposed MH's

Sheet: **LOCALITY**

FOR WAYLEAVE ONLY

6526
6528
29566
47763
36328
34409
6503
6509
42640
6499
6501
6491
Kenilworth Road
Merriman St
Hull St

Kimberly Forklift
Latitude:-28.729797°
Longitude:24.775479°

KF0001
La = -28.729760°
Lo = 24.775614°

KF0002
La = -28.729843°
Lo = 24.775600°

HORIZONTAL LAYOUT
SCALE 1:1500

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Proposed Directional Drilling	4m		
Proposed Frogfoot Handhole			
Proposed Aerial Poles			

Wayleave Requested By:

Frogfoot

rain

DATE:	REV:	AMENDMENT:		Name:	Signed:	Date:	ECSA Reg no.
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			Consultant				
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Date:
31 January 2022

Scale:
AS SHOWN [A3]

Frogfoot Reference:
Kimberly RAIN SITES

FRG Number:
FRG

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HORIZONTAL LAYOUT
SCALE 1:1500

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DESCRIPTION	SYMBOL	SYMBOL	
Erf nr	10350	●	Existing Telecoms Manhole
Existing erf boundary	———		
Proposed Route[Aerial Fibre]	———		
Proposed Route[Trenching]	4m		
Proposed Road Cuts	4m		
Proposed Directional Drilling	4m		
Proposed Frogfoot Handhole	●		
Proposed Aerial Poles	●		

Wayleave Requested By:

Frogfoot rain

DATE:	REV:	AMENDMENT:		Name:	Signed:	Date:	ECSA Reg no.
			Frogfoot	K.De Kock			
			Consultant				
			Drawn by	Daniel Mitchell			

Project:
PROPOSED NEW FROGFOOT FIBRE ROUTE - Kimberly

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Municipality:

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31 January 2022

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Proposed Frogfoot Handhole			
Proposed Aerial Poles			

HORIZONTAL LAYOUT
SCALE 1:1500

Wayleave Requested By:

Frogfoot | rain

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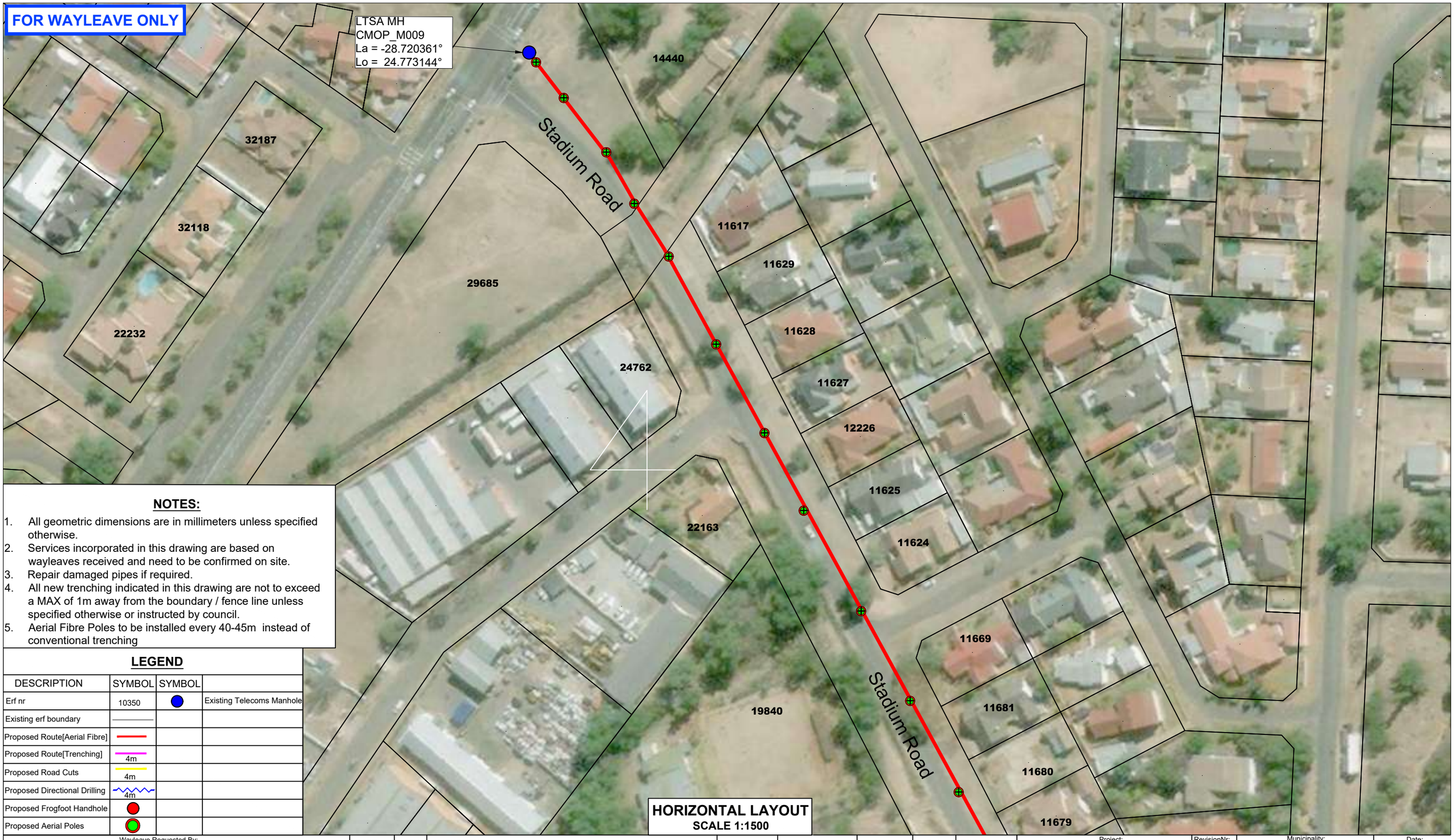

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Proposed Frogfoot Handhole			
Proposed Aerial Poles			

HORIZONTAL LAYOUT
SCALE 1:1500

Wayleave Requested By:

Frogfoot rain

DATE:	REV:	AMENDMENT:		Name:	Signed:	Date:	ECSA Reg no.
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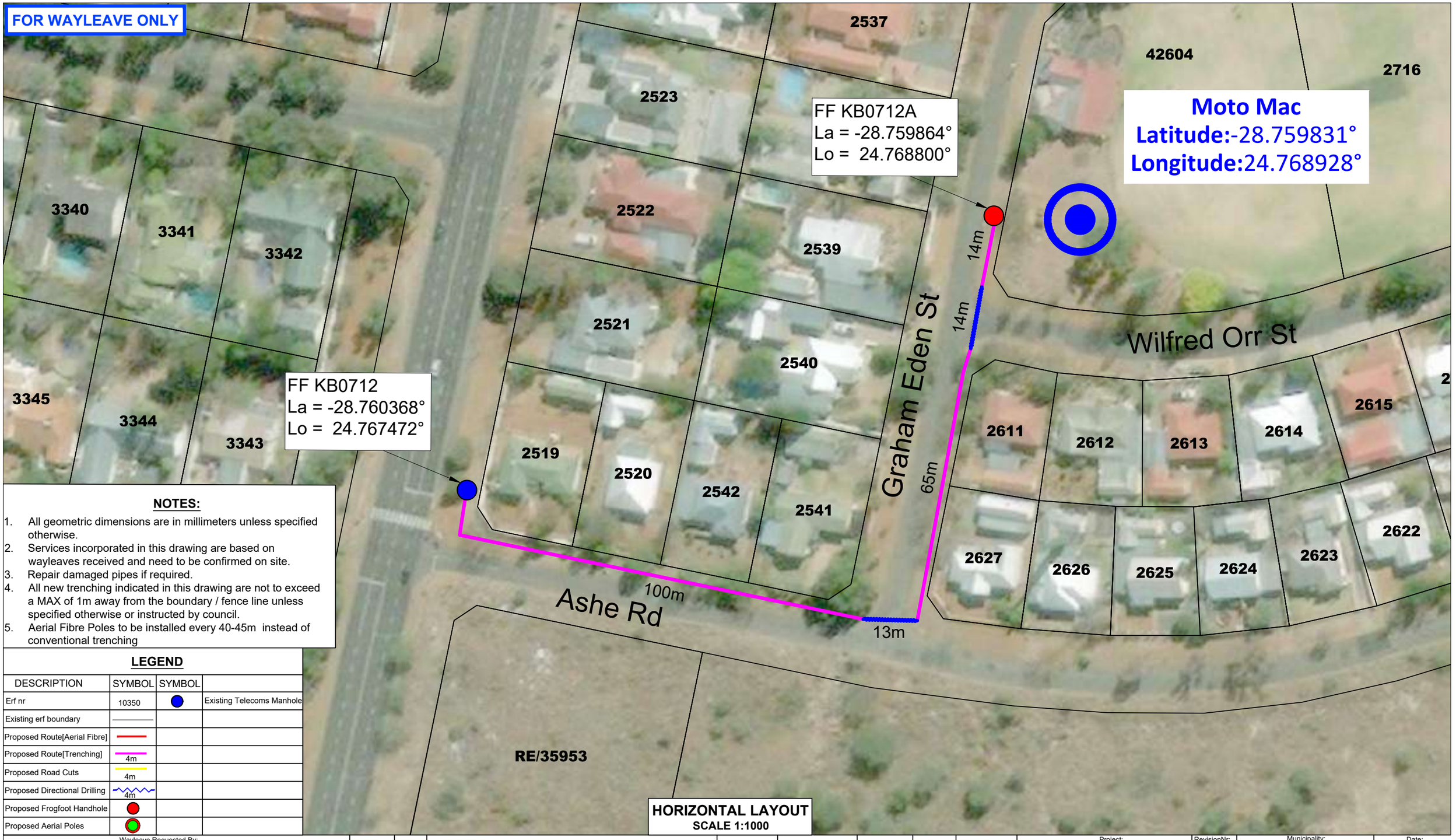

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Proposed Road Cuts	4m		
Proposed Directional Drilling	4m		
Proposed Frogfoot Handhole			
Proposed Aerial Poles			

HORIZONTAL LAYOUT
SCALE 1:1000

Wayleave Requested By:

Frogfoot | rain

DATE:	REV:	AMENDMENT:		Name:	Signed:	Date:	ECSA Reg no.
			Frogfoot	K.De Kock			
			Consultant				
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Frogfoot Reference: **Kimberly RAIN SITES**

FRG Number: **FRG**

FOR WAYLEAVE ONLY

GP0001
La = -28.778341°
Lo = 24.774591°

Greenpoint
Latitude:-28.778372°
Longitude:24.774486°

GP0002
La = -28.781325°
Lo = 24.772934°

Redwood St

Greenpoint St

Greenpoint St

50m

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HORIZONTAL LAYOUT
SCALE 1:1000

Wayleave Requested By:

Frogfoot

rain

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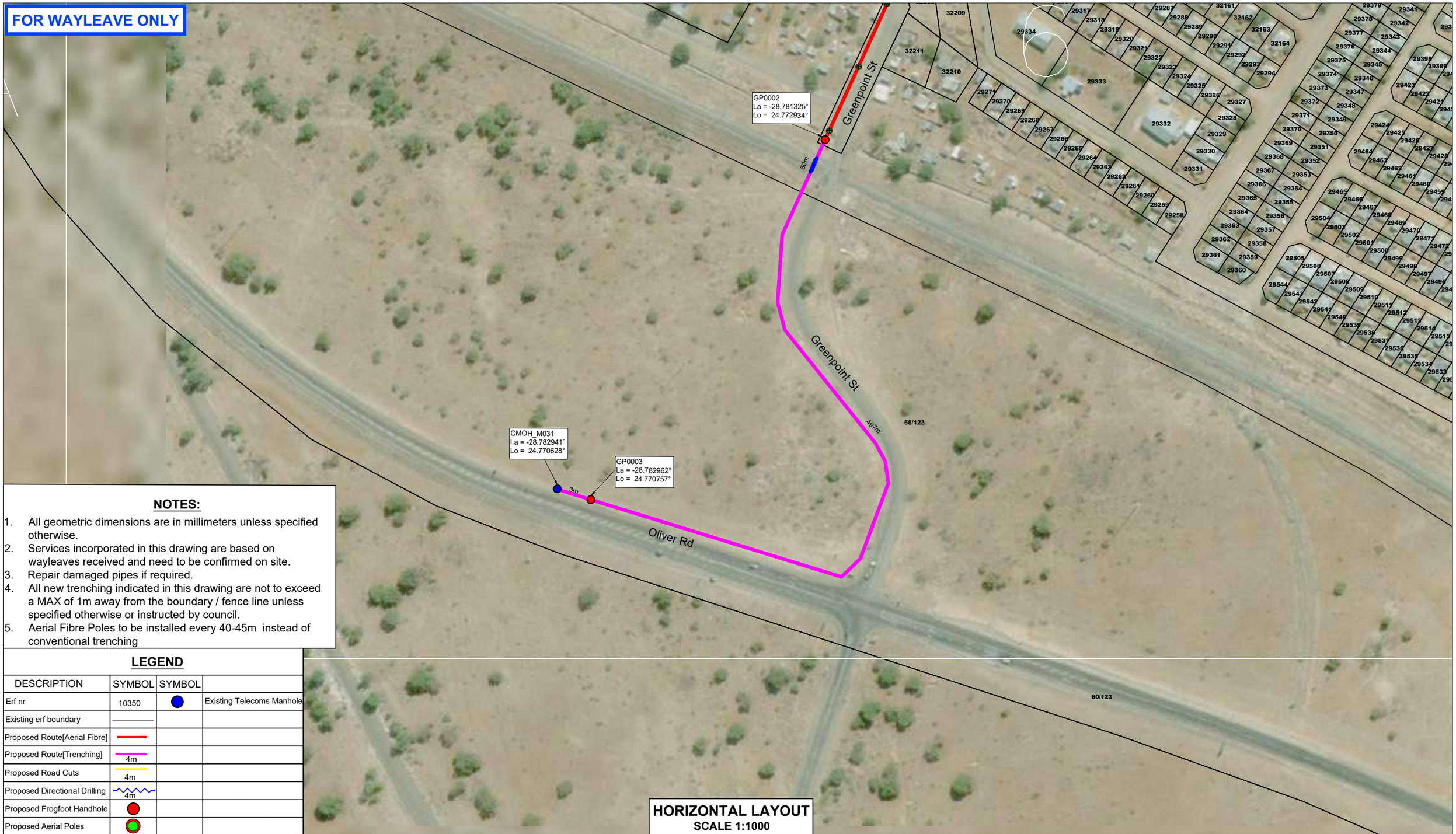

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HORIZONTAL LAYOUT
SCALE 1:1000

Wayleave Requested By:

Frogfoot rain

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Sheet: **LOCALITY**

Municipality:

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FRG Number: **FRG**

ANNEXURE 4

CONFIRMATION FROM SOL PLAATJE MUNICIPALITY REGARDING MICRO-TRENCHING

From: Moghamad Abrahams <MAbrahams@solplaatje.org.za>

Sent: Thursday, 29 April 2021 15:24

To: Renier Meyer <renier@frogfoot.com>

Cc: Zughdi Adikary <ZAdikary@solplaatje.org.za>; Dean Appels <DAppels@solplaatje.org.za>

Subject: RE: Micro Trenching Kimberley

Good day Renier

As I have explained prior to the telecommunication sector. There is currently no National Standard for the provision of micro trenching currently in existence (in compliance with the Standards Act). The only current standard for the provision of telecom ducting is SANS 1200LC, which makes provision for conventional trenching methods. The methodology employed in micro trenching is a machined one which rely on scanning technology which has serious limitation when dealing with older services which tend to have densities beyond the parameters of such devices (scanners). As the Sol Plaatje Municipality we are constantly exposed to these devices and thus, we are in a position to comment on the effectiveness of these devises. Currently, there is a place for these scanners. However, when using these scanners as a means of foresight for a blind mechanised method it would present an infinite risk to our infrastructure.

Hope you find all in order.

Kind regards

Moghamad-N Abrahams
Roads and Stormwater
Sol Plaatje Municipality
(053) 8306309
(053) 8316308
MAbrahams@solplaatje.org.za

From: Renier Meyer [mailto:renier@frogfoot.com]

Sent: 29 April 2021 08:01 AM

To: Moghamad Abrahams <MAbrahams@solplaatje.org.za>

Subject: Micro Trenching Kimberley

Good morning Moghamad.

Trust you are well. My apologies for once again asking for your input.

Can you please send a email giving your reasons for not allowing micro trenching in Kimberley?

Christine the Heritage Practitioner wants to add it to the HIA and submit it to Kimberley Heritage. We all know why you do not allow it, this will just be to allow others to see and understand it as well.

Kind regards

Renier Meyer | Site Manager

Frogfoot Networks (Pty) Ltd.

E-mail: renier@frogfoot.com

Tel: 021 448 7225 | Cell: 083 438 1537

Physical address : Suite 302, Building 20, The Waverley Business Park,

Kotzee Road, Mowbray, Cape Town

www.frogfootfibre.com

ISP Faults can be logged at: support@frogfoot.com

Civil issues can be logged at: ftth@frogfoot.com

For wayleaves please see below email address.

wayleaves@frogfoot.com

ANNEXURE 5

FROGFOOT DRAFT FTTH AERIAL LINE CABLE SPECIFICATIONS

Frogfoot FTTH Aerial Line Cable Specifications

Procedure Number (CMT-AER-P02-Rev 2)

Document number	CMT-AER-P02
Document category	Procedure
Author	FF
Approver (owner)	HOD Planning
Status	Approved
Issue date	17 February 2021
Revision number	2

	Document Information	
	Issue Number:	1.0
	Revision:	2
	Effective Date:	17 February 2021
	Print Date:	

Document History

Rev	Date	Sections Amended
2	17 February 2021	As per table

The signatures below certify that this Document has been reviewed and approved and demonstrates that the signatories are aware of all the requirements contained herein and are committed to ensuring their provision.			
Document Owner			
Name:	Sheldon Mackridge		
Position:	HOD Planning		
Company:	Frogfoot Networks	Signature:	Date:
Sign-Off.:			
Name:			
Position:			
Company:		Signature:	Date:
Name:			
Position:			
Company:		Signature:	Date:
Authorized By:			
Name:			
Position:			
Company:		Signature:	Date:

Revision Table

Date:	Revision	Author	Changes
4/09/2020	0	Johan	First Draft
03/12/2020	1	Brian	Add in photos, pole installation, fibre work, EHS
17/02/2021	2	Johan	Comment and updates on revisions

Table of Contents

Suite 302, Building 20
The Waverley Business Park
Kotzee Road, Mowbray
Cape Town, South Africa

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Mowbray
Cape Town
7705

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Sales/Enquiries: ftth@frogfoot.com
Support: support@frogfoot.com

frogfoot.co.za

Frogfoot Networks (Pty) Ltd, Reg No. 2006/011693/07

Suite 302, Building 20
The Waverley Business Park
Kotzee Road, Mowbray
Cape Town, South Africa

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Mowbray
Cape Town
7705

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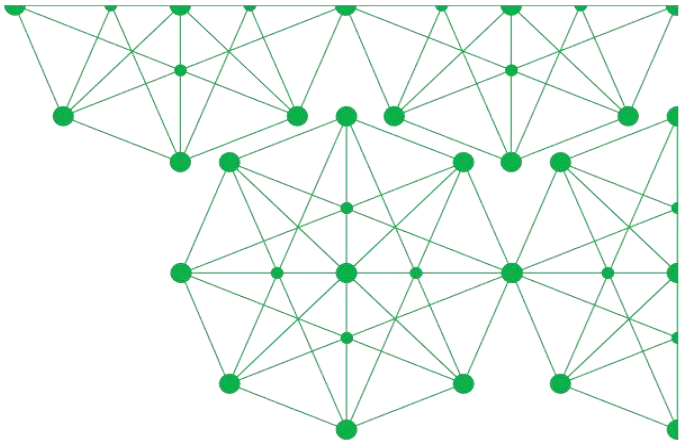
Frogfoot
Just connect



1. Purpose

1.1 The purpose of this document is to provide a guideline for the deployment and connection of FTTH Aerial Line Cable projects on the Frogfoot network. It should be noted that this document is to serve as a guideline and not purport to address all best practices and techniques.

1.2 It is advised that this document be read in its entirety before commencement of any works to gain a clear and complete understanding of the requirements.

1.3 Whilst every step has been taken to ensure the accuracy and completeness of this information, it should be noted that recommended prescribed installation specifications should not be overlooked whilst using this document.

2. Scope

2.1 All elements and the proposed configurations for FTTH ALC are enclosed in this document.

2.2 This document will address the deployment of FTTH OSP, ACB installations and best practices as far as possible.

3. Reference documents

3.1 Frogfoot FTTH Civil Specifications
3.2 Frogfoot Micro Trenching Specification
3.3 Frogfoot Labelling Specification Guideline - Underground Networks
3.4 Frogfoot Traffic Management Plan rev 1
3.5 Frogfoot HSE Plan 12 April 2016 rev 0
3.6 Frogfoot Waste Management Plan rev 0
3.7 Frogfoot DIT Results
3.8 Frogfoot OTDR Results
3.9 OHS Act 85 of 1993
3.10 COID ACT 130 of 1993
3.11 NEMA Act 107 of 1998
3.12 Construction Regulations 2014
3.13 South African National Road Traffic Act.
3.14 South African Roads Traffic Signs Manual, Volume 2, Chapter 13.
3.15 Construction Regulations 2014.
3.16 Occupational Health and Safety Act 85 of 1993.

Definition	Definition Precise Meaning
Contractor	Company appointed to conduct construction work
Wall Termination Box	In building termination box connecting multiple fibre cores to the main feeder.

4. Definitions and Acronyms

4.1 Definitions

4.2 Acronyms

Acronym	Acronym in Full
e.g.	exempli gratia "for example"
mm	Millimetre
GPON	Gigabit Passive Optical Network
ONT	Optical Network Terminal
OLT	Optical Line Terminal
SDU	Single Dwelling Unit
MH	Manhole
HH	Hand Hole
ACB	Access Build
FTTH	Fibre to the Home
OSP	Outside Plant
BB	Boundary Box
MDU	Multi Dwelling Unit
DIT	Duct Integrity Test
DCP	Dynamic Cone Penetrometer
ID	Inside Diameter
OD	Outside Diameter
PON	Passive Optical Networks
ODF	Optical Distribution Frame
HDD	Horizontal Directional Drilling
ALC	Aerial Line Construction
FJ	Feeder Joint
DJ	Distribution Joint
AFC	Aerial Feeder Cable
ADC	Aerial Distribution cable
ALC	Aerial Line Cable

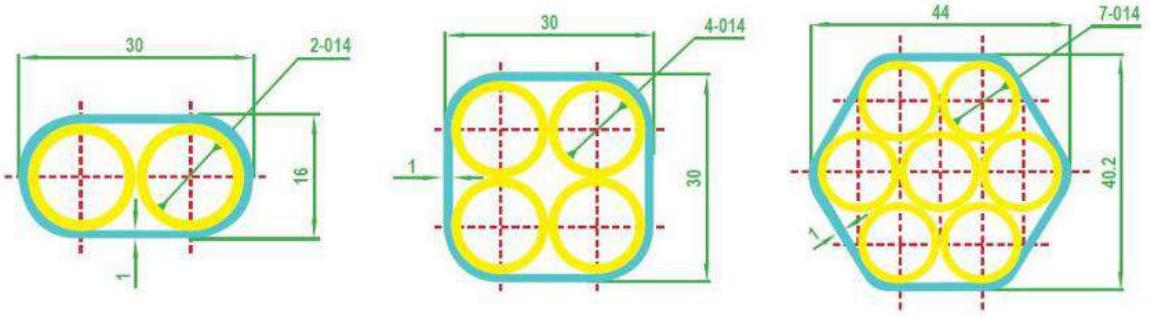
5. Introduction to Frogfoot FTTH

5.1 Introduction to Frogfoot FTTX

- A node will be hosted at a designated location as central to the project area as possible.
- This node will host the respective active and passive equipment. This will include but not be limited to:
- OLT
- EDFA's
- ODF/'s
- Patch Panels
- 1:4 Splitter Cards
- Slack Trays
- Cable Guides
- 42U Cabinet
- Power and Backup Power Equipment
- Active Monitoring and Security Equipment.
- The Network is designed with a cascading splitter configuration. 1:4 splitters in the node and 1:16 way splitters in the field. Refer to MDU specifications for variations of the above.
- For the successful deployment of an aerial network, there will be a requirement for conventional trenching particularly when there are more than two aerial cables used for the Core, Feeder or Distribution (only for multiple feeder cables) fibre. In this instance, direct buried ducts and micro cables are to be used.
- The suburb will be broken down into multiple sectors or projects with separate Core cables running to each. Should the design call for a conventional deployment of these routes, this will comprise of a 2 way 14/10mm, 4 way 14/10mm or a 7 14/10mm duct. Specification may differ based on the requirements. Refer to Figure 1.1 – Duct Sizes & FTTX Specification.
- Wherever possible, under the constraint of at most two core or feeder or a combination thereof, the routes will be run aerially.
- Road crossing are to be done overhead wherever possible and based on the wayleave conditions.
- The fibre will route from the aggregation node to a series of fibre splice closures situated on poles or within HHs along the various core, feeder and distribution routes.

- The deployment of an FTTX ACB installation will connect the residence to an OFDC- A4 Splice/Patch Closure which will be located on a pole in the road reserve and in line with the boundary between two properties. Refer to Figure 1.2 – OFDC-A4 Splice/Patch Closure Box
- Each OFDC-A4 Splice/Patch closure will serve four households, unless otherwise indicated on the drawings.
- The distribution aerial cable will loop through each OFDC-A4 Splice/Patch closure, and only the number of required fibres will be expressed and spliced onto pigtails.
- Whilst only 1 core per ACB will be spliced, the remaining cores will be reserved for future implementation.
- When standing at a pole that houses an OFDC-A4 Splice/Patch closure, facing the two properties, the residences on the left will be known as ACB1 and ACB2 and the ones on the right will be referred to as ACB3 and ACB4.
- In the case of an MDU, a distribution cable will be brought downwards along the pole by means of a PVC or galvanised pipe, floated in a 2 way 8/5mm duct, and expressed in an EBB by the entrance gate of the estate. In this scenario the ACB will be done from the EBB to the lead point within the estate. Refer to Figure 1.3 – Boundary Box
- The design for the routing of the cables may differ with each premises. A design will need to be made based on the notes, photographs and sketches made during the site survey.

Figure 1.1 – Duct Sizes & FTTX Specification

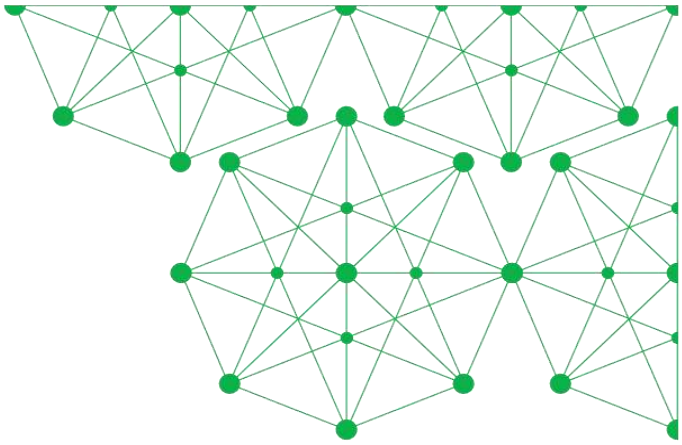


Tube Colours (TIA/EIA Standards)					
BLUE	ORANGE	GREEN	BROWN	GREY	WHITE
BLACK	YELLOW	VIOLET	PINK	TURQUISE	RED

- *Figure 1.2 – OFDC-A4 Splice/Patch Closure*

- *Figure 1.3 – 320T Boundary Box*

-
  - An ODF will be hosted at the nearest designated node feeding the GPON within the suburb.
  - The suburb will be broken down into multiple parts with separate feeder fibres running to each. The main feeder routes, with multiple feeder cables going in the same direction, will be done employing standard underground practices. Typically, this will comprise of 1 x 7-way (14/10) duct. Specification may differ based on the requirements. Also called the feeder duct bank
  - The fibre will route from the aggregation node to a series of distribution HH's



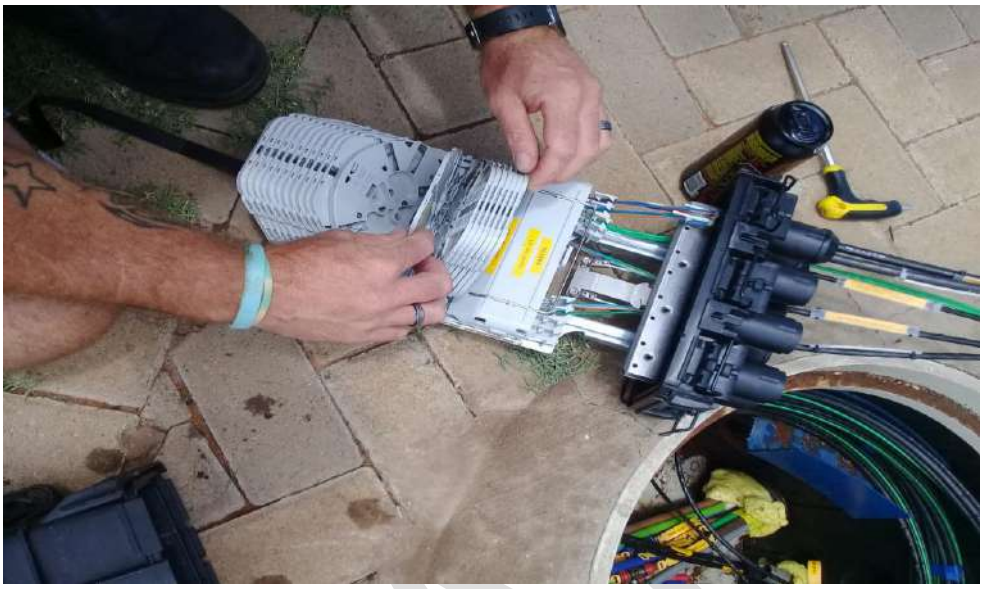
situated along the various core and feeder routes. This will in turn feed fibre cores to the FJ's situated in HH's along the route and the FJ's on the terminal poles at the transition from underground to overhead deployment.

- The FJ's will house the splitters and serve as origin for the distribution cables feeding the DJ's.
- Each DJ will serve up to four households, unless otherwise indicated on the drawings.
- The deployment of an FTTH ACB installation will connect the residence to an DJ which will be located in the road reserve, in line with the boundary between two of the properties.
- The DJ will house a total of 6 cores (1 per residence with 2 spare cores).
- Whilst only 1 core per ACB will be spliced, the remaining cores will be reserved for future implementation.
- When standing at a DJ, facing the properties, the residence on the left - of a cluster of up to 4 residences, will be known as ACB1 and the one on the right will be referred to as ACB4.
- The design for the routing of the cables may differ with each premises. A design will need to be made based on the notes, photographs and sketches made during the site survey.

Demarcation of Work Area

- Should any person be working on or have equipment on the sidewalk, the work area must be demarcated when excavation or planting of poles are in progress

- If any person will be entering the road, the correct demarcations need to be established according to the Frogfoot Traffic Management Plan rev 1.

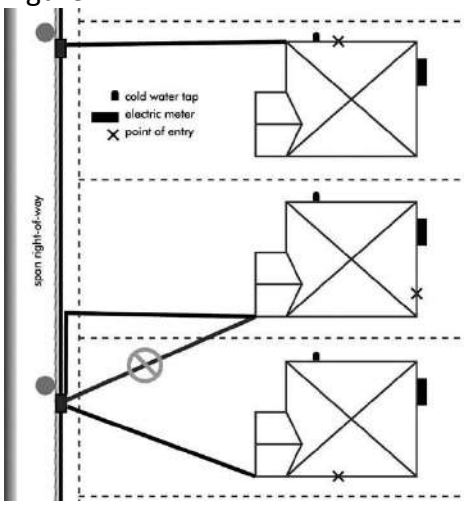


ACB – Fibre to the X

6.1 ACB Planning

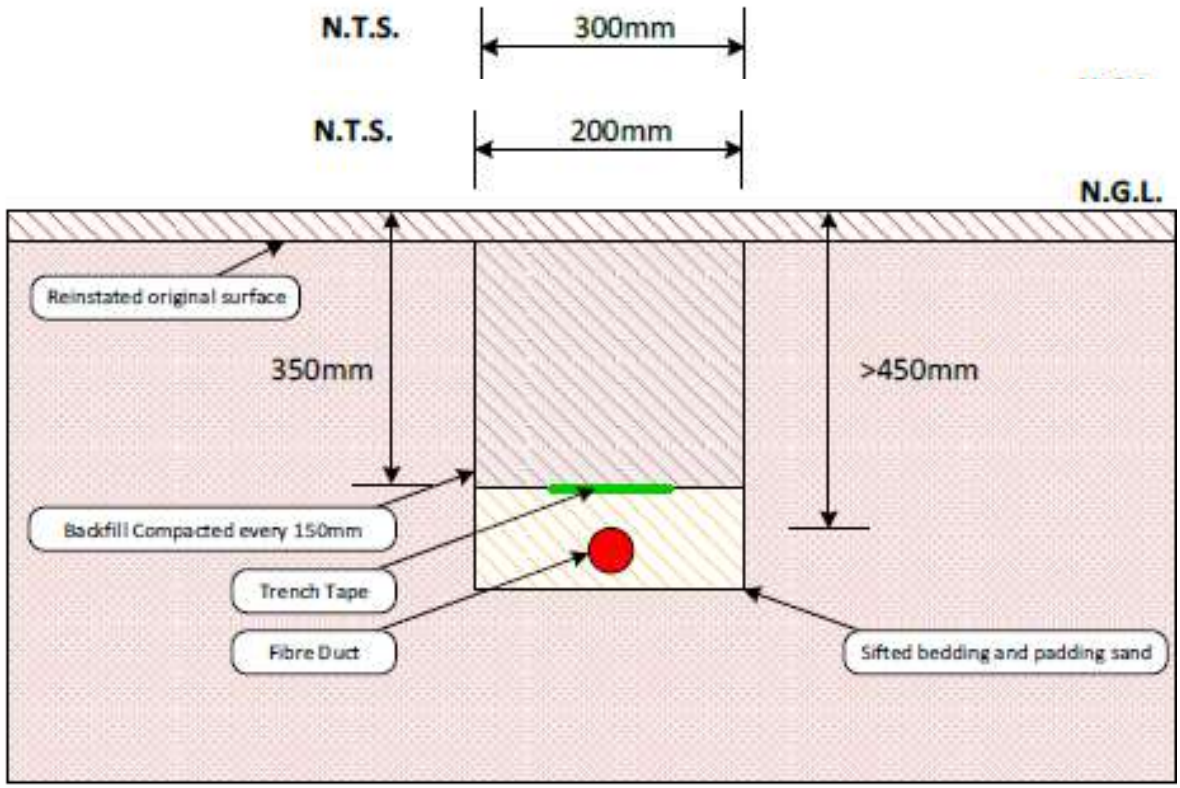
- Listed below are the requirements which must be determined, planned and authorized by the relevant parties.
- The build requirements will be determined and noted during a site survey, paying particular attention to obstacles and existing third-party services along the way.
- Photos will be taken for future reference.
- The nearest OFDC-A4 Splice/Patch closure located on a distribution pole will be used with reference to the plan.
- The access route and an entry into the home through home ducting / cable routing to the termination point.
- Termination equipment to be used and the location thereof.
- Acquiring permission and an entry time into the home for deployment.
- An agreement between the contractor and the resident must be made to cover any additional cost that may occur.
- In the case where a pole cannot be planted at the boundary of two erfs, the access build drop fibre may not cross the erf of the neighbour and installation should be done as per figure 1.4.

Figure 1.4



6. Civil Works

A. Feeder Core Network | 600mm Duct coverage
B. Distribution Network | 450mm Duct coverage
C. Access Network | 450mm Duct coverage



6.1 Pilot Holes

6.1.1 Pilot holes needs to be excavated before any trenching work starts
6.1.2 The pilot holes should be excavated 30m apart to determine a trench line
6.1.3 Pilot holes also need to be excavated where there are other visible services that need to be crossed.
6.1.4 The size of the Pilot Holes needs to be 200mm deeper than the required trench depth
6.1.5 The Pilot Hole must be opened diagonally from the route, starting on the Boundary Wall up towards 1m from the Boundary wall.
6.1.6 If there is no space within the 1m to install the Frogfoot infrastructure the Pilot hole may be widened to a max width up to 300mm to the curb.
6.1.7 Great care needs to be taken when exposing other services not to damage them.

6.2 Scanning & Cable Locator

6.2.1 Ground penetrating scanning must be done on the section to be trenched before any trenching may commence
6.2.2 The scanning results need to be saved so that it can be verified later in the event of an incident.
6.2.3 Cable locators to be used on the day of the trenching, the electrical cables need to be marked so that the trenching team is aware where the service is.

6.3 Trenching

6.3.1 Trenching shall be done by hand excavation only.
6.3.2 The trench line must be inside the 1m from the Boundary wall and follow as straight as possible a route.
6.3.3 All grass and general plantation requiring to be uprooted shall be removed and placed along the trench for easy reinstatement.
6.3.4 Any tree roots encountered during excavation will not be cut unless absolutely unavoidable.
6.3.5 The minimum depth to the bottom of the trench must be 650mm in areas where bedding isn't required. according to Wayleave conditions
6.3.6 Where services are encountered inside the trench line and not avoidable, the trench must be sloped so that the Frogfoot Infrastructure can be installed underneath the service being crossed. Clearance of 300mm
6.3.7 Crossing of services: refer to Service Wayleaves on the crossing method(s)/distances

6.3.8 Trenching within the residential area will be done to a depth of 300mm and no deeper than 500mm. See Figures 2.1 and 2.2 below.

6.3.9 Trenching shall be done by hand excavation.

6.3.10 Any uprooting of trees, brush or shrubs will require consent in writing from the property owner.

6.3.11 No trench shall be left open overnight unless suitably demarcated, signage displayed, and arrangements are made with the client and residents.

6.3.12 When trenching across driveways/ pathways/ guttering or kerbs, will require proper support, and must be in place until the trenching is complete.

6.3.13 Where tunnelling beneath kerb is not possible, a cut using an angle grinder will be used to create a smooth uniform finish.

6.3.14 All backfill of the trench will be of the same compaction level or of a better standard than that prior to the excavation.

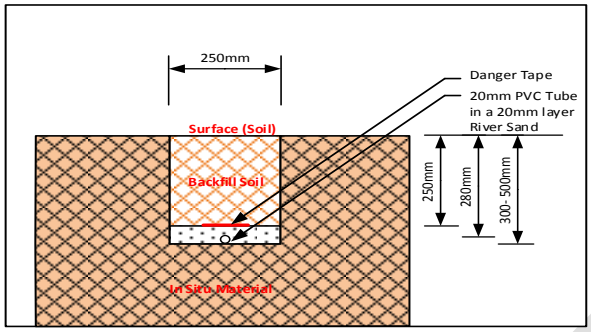
6.3.15 Caution will be exercised to ensure no large rocks are placed on top of the 20mm PVC conduit which may cause damage.

6.3.16 Where conduit is to be laid beneath pavers, the pavers are to be carefully removed for reuse. Upon reinstatement of the pavers, a bedding of river sand ~20mm deep is to be placed beneath the pavers.

6.3.17 The standard of reinstatement expected will be of the same or better quality prior to

Figure 2.1 – Residential Trenching

excavation and must meet the client's expectations.



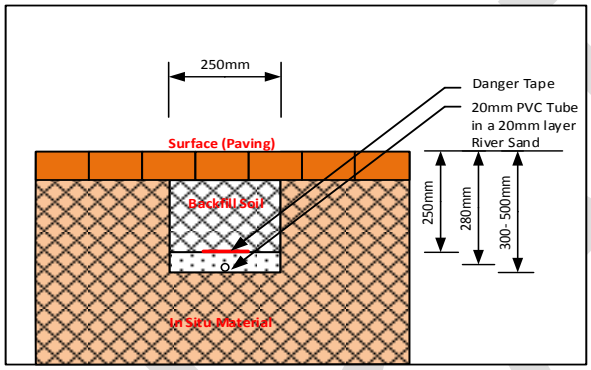


Figure 2.2 – Residential Trenching under pavement

Definitions

- Core: cables linking the FF node to the backhaul supplier's network entry point, and cables interconnecting different FF nodes.
- Feeder: cables feeding from the FF node - into the feeder area – to the feeder joints, housing the splitters.
- Distribution: cables feeding from the feeder joints into the blocks, feeding the distribution joints (aerial or in BB's), where the drops to the houses are terminated.

a. Core Route Trenching:
   i. Refer to *Figure 6.1 – Core Trench Diagram* below as reference.
   ii. The fibre core route trench will be dug to a depth of no less than 900mm and typical house a 110mm, a 4way 14/10mm and a 12 way 12/10mm ducts. Any variations hereof will be indicated on the drawing.

iii. Typically, this will be done by hand excavation unless otherwise stipulated by

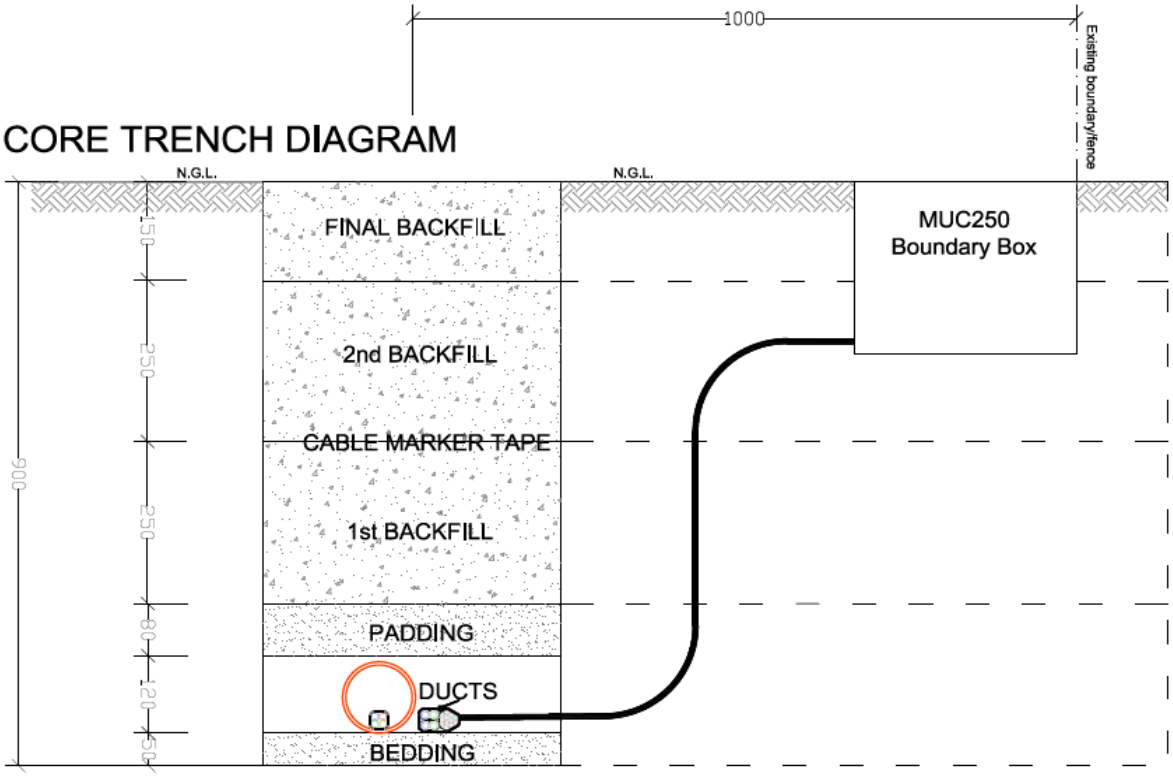


Figure 6.1 – Core Trench Diagram

the client.

b. Feeder Trenching
   i. Refer to *Figure 6.2 – Feeder Trenching Diagram* below as reference.
   ii. The fibre feeder route trench will be dug to a depth of no less than 600mm and typical house a 4way 14/10mm and/or a 12 way 12/10mm duct. Any variations hereof will be indicated on the drawing.

iii. Typically, this will be done by hand excavation unless otherwise stipulated by

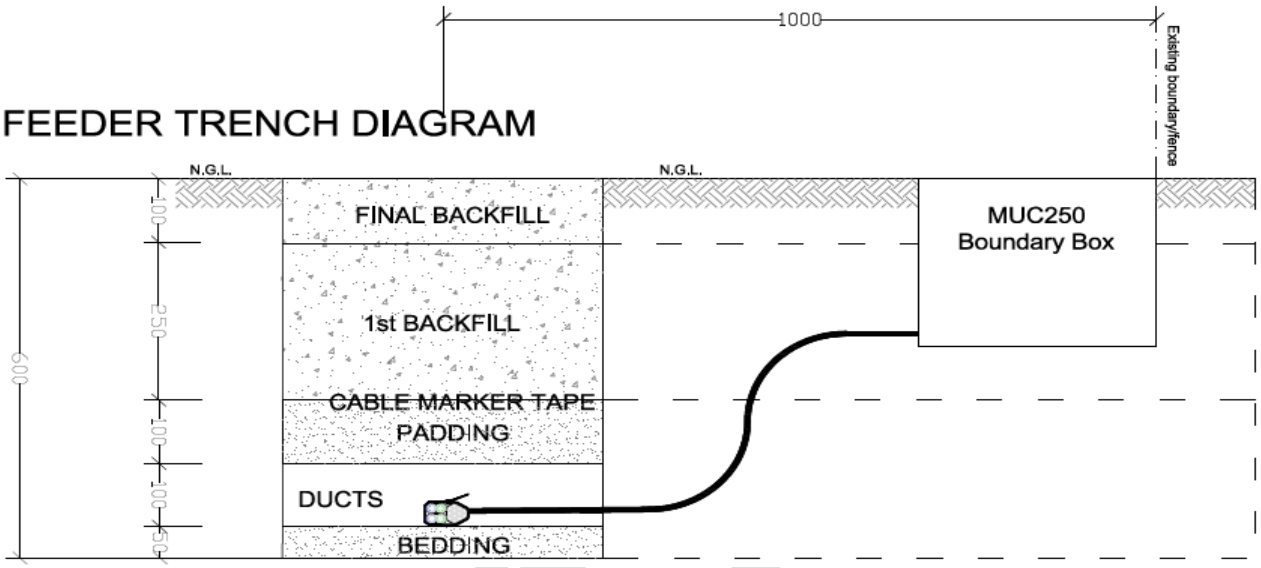


Figure 6.2 – Feeder Trenching Diagram

the client.

c. Distribution Route Trenching
   i. Use *Figure 6.3 – Feeder Trenching Diagram* below as reference.
   ii. The fibre distribution route trench will be dug to a depth of no less than 450mm and typical house a 12 way 8/5mm duct. Any variations hereof will be indicated on the drawing.
   iii. Typically, this will be done by hand excavation unless otherwise stipulated by the client.
   iv. Micro-trenching may very well be used at the discretion of the client. This will be stipulated ahead of the commencement of the work.

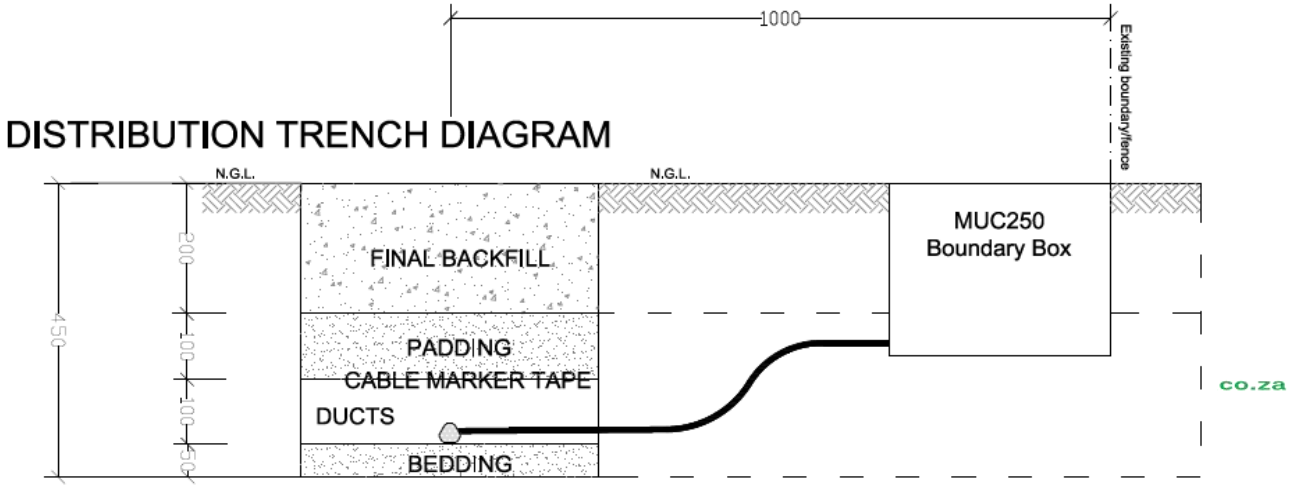


Figure 6.3 – Feeder Trenching Diagram

d. Micro-Trenching

i. Refer to *Figure 6.4 – Micro-Trenching Reinstatement Solution* below.

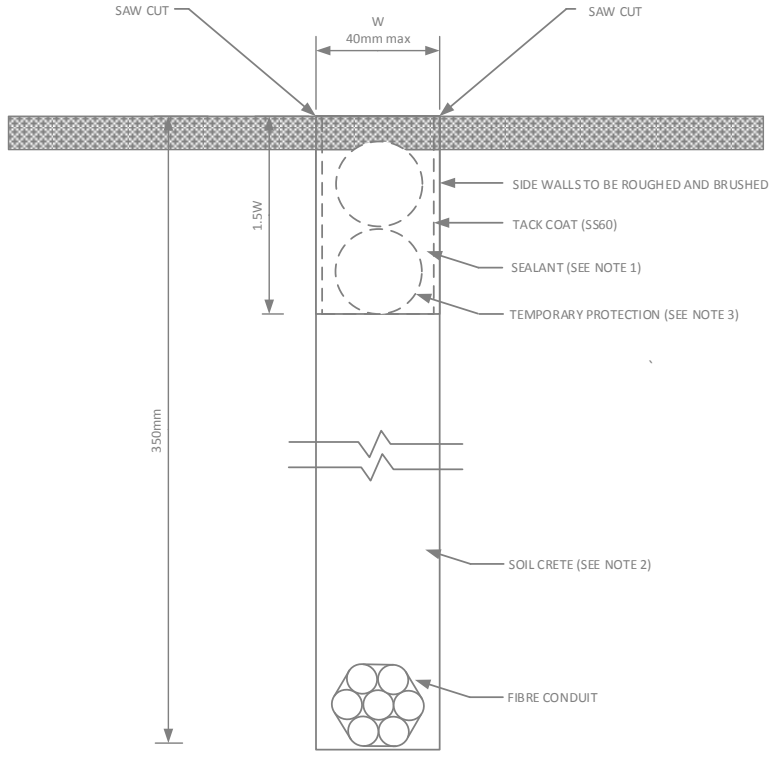
ii. The use of micro-trenching will make use of Frogfoot's machinery unless otherwise stipulated by the client.

iii. Every effort should be made to cut along existing road joints wherever possible.

iv. Cut lines will have to be marked out on the roads surface before the commencement of work.

v. When a bend is required, the cut radius should be no smaller than 3m.

vi. A typical cut thickness of 35-40mm will be made to a depth of 350mm.



NOTES:

1. SEALANT
   - 1.1 WARM APPLIED BITUMEN RUBBER OR POLYMER MODIFIED BITUMEN. (ELASTIC RECOVERY AT 15 DEGREES C MORE 80%; BITUMEN SOFTENING POINT MORE THAN 80%).
   - 1.2 MORE THAN ONE APPLICATION MAY BE
   - 1.3 BIND WITH 7mm or 4.75mm PRE-COATED STONE AGGREGATE ON FINAL APPLICATION.
2. SOIL CRETE
   - 2.1 3% MINIMUM CEM 1 42.5R
   - 2.2 APPLIED WET USING POKER VIBRATOR REQUIRED
3. TEMPORARY PROTECTION
   - 3.1 PLACE 30MM SISAL ROPES ON TOP OF SOILCRETE
   - 3.2 REQUIRED FOR SAFETY REASONS AND TO ALLOW SOILCRETE TO SET.
   - 3.3 REMOVE SISAL ROPE PRIOR TO TACK AND AND SEALANT APPLICATION.

Figure 6.4 – Micro-Trenching Reinstatement Solution

6.4 Bedding & Padding

6.4.1 Bedding material is only required where the trench bottom is not suitable to lay the duct(s) on directly.

6.4.2 Bedding material must consist of fine aggregate that can pass a 13mm Diamond mesh sieve.

6.4.3 Bedding must be 30-50mm thick dependant on the bottom of the trench, the bedding is done to protect the duct from being damaged by sharp obstacles.

6.5 Duct Laying

6.5.1 All ducts must be de-coiled using a de-coiler.

6.5.2 Ducts must be de-coiled continuously from Hand Hole to Hand Hole

6.5.3 If there is any 8/5mm configuration in the same trench, the 8/5mm configuration must be installed nearest to the boundary wall.

6.5.4 Bending radius entering any sleeve/MH/HH/BB must be considered that the bend radius doesn't exceed the manufactures specification.

6.6 Backfilling

6.6.1 Backfilling must be done in layers of 150mm using a Rammer, the first compaction must be done at 250mm above the Duct bank.

6.6.2 The soil conditions must be suitable to be compacted, the test if it is compactable is to press a test sample in your hand and if it stays in the shape pressed it is suitable. If water peels out between your fingers it is too wet and if it collapses/crumbles it is too dry, add water during compaction.

6.6.3 Rocks greater than a fist size must be removed from the backfill material, only material containing some rocks may be used above layer 2.

6.6.4 Trench/Warning tape must be installed after the first layer of compaction

6.6.5 Compaction must be done up to the NGL.
6.6.6 The backfilling must be able to pass a DCP test.

6.7 Reinstatement

6.7.1 The standard of reinstatement expected will be of the same or better quality prior to excavation and must meet the client's expectations
6.7.2 Upon reinstatement of pavers, a bedding of river sand ~20mm deep is to be placed beneath the pavers
6.7.3 Asphalt reinstatement must be done to meet the Wayleave condition.
6.7.4 Only Hot Asphalt is allowed, Cold Asphalt may be used as a temporary Solution if it impacts the HSE of the site.
6.7.5 Factors to be kept in mind during the reinstatement process of all excavations.
6.7.6
6.7.7 All backfill of the trench will be of the same compaction level or of a better standard than that prior to the excavation.
6.7.8 Caution will be exercised to ensure no large rocks are placed on top of any ducting which may cause damage.
6.7.9 The standard of reinstatement expected will be of the same or better quality prior to excavation and must meet the client's expectations.

6.7.10 Reinstatement of conventional trenching.

After every layer of material between 200-300mm a suitable compaction effort will be applied.
A DCP test will need to be conducted every 125m or 8 times per km after all the filling has been done. A record must be kept of the results obtained.
Reinstatement of a bitumen layer must be placed and suitably compacted.
Reinstatement of concrete must be neatly smoothed over.
Upon reinstatement of pavers, a bedding of river sand ~20mm deep is to be placed beneath the pavers.

6.7.11 Reinstatement of micro-trenching

Where micro-trenching is used, the reinstatement applied will match that of the surrounding paving.
Reinstatement of bitumen layers
A bedding of porous concrete of thickness 50mm will be instituted before the conduit is laid within the trench.
Thereafter a mixture of 4Mpa concrete will be applied wet, using a vibratory

poker up to a level 50mm below the final road paving.
The sides of the cut are to be cleaned using either a wire brush or compressed air.
Place a 30mm Sisal rope on top of the soilcrete to aid with the curing process and for safety reason.
A tack coat is to be applied by hand to the sides of the cut.
After heating the polymer modified bitumen crack sealant to 100°-160° Celsius, apply to the cut until it is just above the final road level.
Allow it to stand for 15min or until the ambient temperature is reached before allowing any vehicle to pass over it.

6.7.12 Reinstatement of Concrete
6.7.13 The concrete will be levelled to the existing level and neatly smoothed over.
6.7.14 Reinstatement of Pavers
6.7.15 The cement colour will be matched to the surrounding pavers.
6.7.16 The cement fill should be neatly matched to the surrounding pavers.

6.8 Manholes 900R

6.8.1 Manhole(s) need to be assembled before installation.
6.8.2 Determine an Area to be excavated in line with the route that the new duct bank won't be crossed by any other service provider to pass the Manhole.
6.8.3 Excavate a pit 300mm wider than the Manhole's Diameter and deep enough to install the Manhole flush with NG.
6.8.4 A drainage pit needs to be excavated in the MH pit, directly underneath the drainage hole, 300mm x 300mm x 200mm, this needs to be filled with 19mm Stone Chip.
6.8.5 Bottom entries need to be used.
6.8.6 The entry nearest to the Boundary Wall is reserved for the Distribution route (Breakout Routes, 8/5mm Duct), Access and Feeder (Backhaul) needs to be installed in the entry closest to the roadway.
6.8.7 Manholes need to be compacted in Layers of 150mm.

Ducting should be skinned back that 100mm is left, from the Manhole wall. The exposed duct should be left at a length of 100mm.

6.8.8 The entry holes that have been used must be sealed with expanding Foam.
6.8.9 Manholes must be left cleaned.

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6.9 Hand Hole 600R

6.9.1 Hand hole(s) need to be assembled before installation.

6.9.2 Determine an Area to be excavated in line with the route so that the new duct bank won't be crossed by any other service provider to pass the Manhole.

6.9.3 Excavate a pit 300mm wider than the Hand Hole's Diameter and deep enough to install the Hand Hole flush with NGL.

6.9.4 A drainage pit needs to be dug in the excavated pit, underneath the drainage hole, 300 x 300 x 200, this needs to be filled with 19mm Stone Chip.

6.9.5 Bottom entries needs to be utilized the one nearest to the Boundary Wall is reserved for the Distribution (Breakout routes) (8/5mm Duct), Access and Feeder (Backhaul) needs to be installed in the entry closest to the roadway.

6.9.6 Ducting should be skinned back so that 100mm is left, from the Hand Hole wall. The exposed duct should be left at a length of 100mm.

6.9.7 Hand Holes need to be compacted in Layers of 150mm.

6.9.8 The entry holes that have been used must be sealed with expanding Foam.

6.9.9 Manholes must be left cleaned.

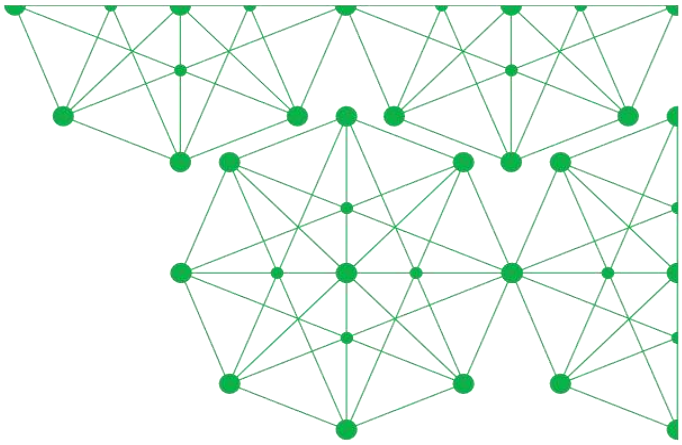
6.10 Boundary Box

6.10.1 The BB needs to be installed close as possible to the boundary wall.

6.10.2 A drainage pit needs to be dug in the excavated pit, underneath the drainage hole, 100 x 100 x 100, this needs to be filled with 19mm Stone Chip.
6.10.3 The entry duct needs to be left at a length of 100mm inside the Boundary Box
6.10.4 The BB needs to be installed at the point where the two Boundaries meet.
6.10.5 Two 8/5mm single ducts need to be installed to the Boundary wall where the logical entry point to the ERF's will be.
6.10.6 The ducts should be installed at least 300mm in depth from the boundary box to the property boundary so that the HDC will be able to avoid trenching into the municipal servitude
6.10.7 Boundary box must be left cleaned and locked.

6.11 Horizontal Directional Drilling

6.11.1 Drill Plans need to be submitted and approved before drilling may start.
6.11.2 The correct Bentonite ratio must be used while drilling.
6.11.3 Drill pits should be excavated to expose services but may not be closer than 300mm from the roadway. No tunnelling is allowed underneath the 300mm toward the Roadway.
6.11.4 Permission to use any Municipal water outside of the Drilling Company premises must be granted and written permission to be available on request.
6.11.5 110mm or 160mm Sleeves of Class 8 or higher must be used.



6.11.6 Only Butt Welding is allowed to join two lengths of 160mm sleeves
6.11.7 All newly installed sleeves need to be taped at both ends to ensure the sleeve is free from debris.

6.12 Impact Moling

6.12.1 Impact Moling is the preferred method to cross Driveways so that the least amount of disruption is done to the resident.
6.12.2 Launch pits should be excavated next to the driveway but should be done in a manner that the Surface of the Driveway won't sink in after the Launch Pit has been reinstated.
6.12.3 The sleeve size to be used must be decided beforehand from the planning document so that the duct(s) can be hauled freely.
6.12.4 Only soil conditions where it is possible to achieve a straight line from Launch Pit to Exit Pit are allowed to attempt by Moling.

6.13 Hauling of Ducts

6.13.1 Hauling of ducts through HDD Sleeves and Road Cut Sleeves needs to be foamed after installing the Ducting.
6.13.2 Care should be taken when hauling the ducts through sleeves so that the ducts do not kink.
6.13.3 Ducts should not be hauled in a manner that damages the outer sheath, shaving will occur, but this should be controlled to a minimum.

6.14 Pulling the fibre SDU/MDU

a. Using a suction hand pump fitted to the EBB end of the 20mm PVC Conduit, and 20mm sponge attached to a draw string/wire will need to be sucked the length of the tube.
b. By attaching the draw string to the Kevlar strength members of the pre-terminated 4 core fibre, it can be pulled from the PVC terminal box to the EBB.
c. At this point the fibre cores will need to be rolled up and neatly packed away before closing up the boundary box.

6.15 DIT

DIT test to be conducted as per 8(a)

6.16 Blowing of Fibre

a. Blowing of Fibre will commence once there are an adequate number of sub sections where the ducts are completely installed, and reinstatement is completed.

b. This is done to allow the floating and splicing to run without interruptions or hold ups.
c. These teams can be moved between sub sections at the client's discretion.
d. Clear instruction will be given by Frogfoot in the form of detailed drawings for floating and splicing of cables.
e. The contractor will be liable to ensure that cables are neatly packed away and adequately labelled.

6.17 Splicing

a. Referring to *Figure 5 – Illustration of Splicing (HH-ACB)* below.
b. Core 1 of ACB1 will be spliced to core 1 of the 8F cable which will be connected to point 1 on the splitter
c. Core 1 of ACB2 will be spliced to core 5 of the 8F cable which will be connected to point 2 on the splitter
d. Cores 2, 3 and 4 of the 8F cable will be reserved for ACB1 when additional splitters are later to be installed in the EBB.
e. As stated in point d, cores 6, 7 and 8 of the 8F cable will be reserved for ACB2.

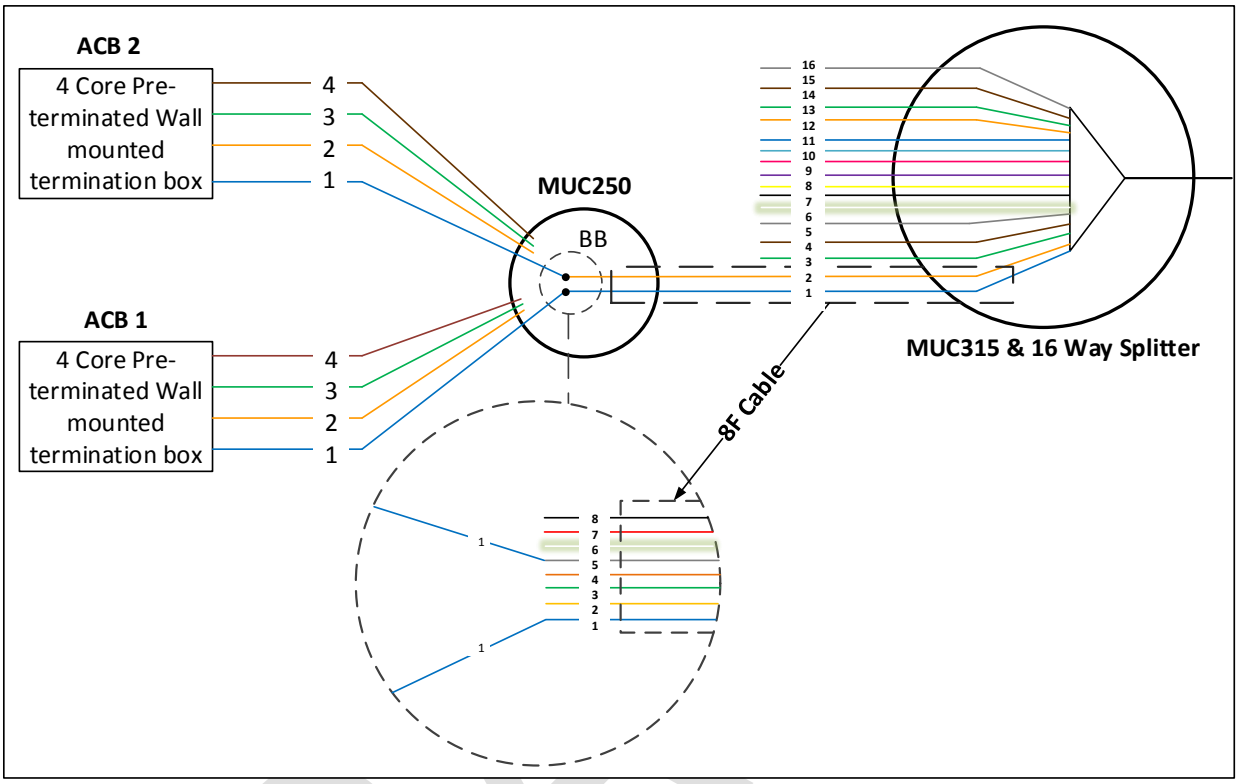


Figure 5 – Illustration of Splicing (HH-ACB)

7. OSP - Fibre to the Home (FTTX)

a. The section below describes the project requirements in terms of planning and the design solution for OSP for Frogfoot FTTX network expansion.

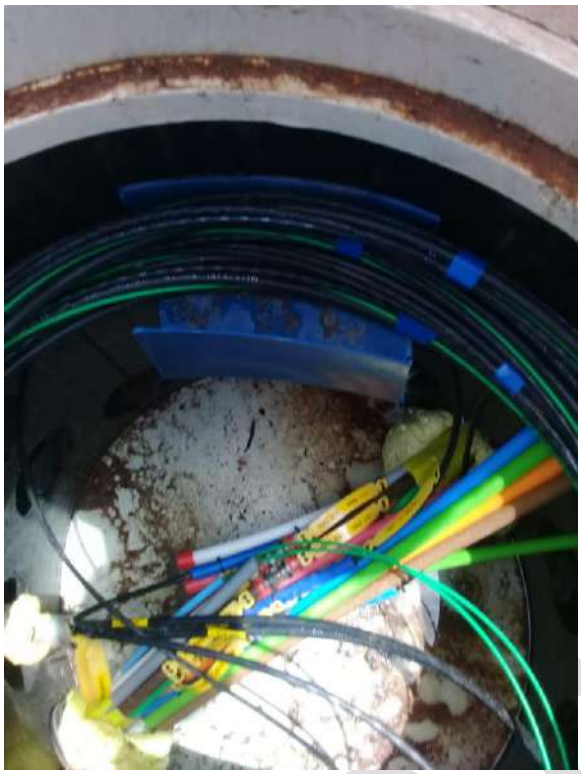
7.1 OSP Planning

a. Listed below are the requirements which must be determined, planned and authorized by all the relevant parties.
   i. After a designated area and node placement is selected, the proposed routes are to be designed and drawn by the relevant planners.
   ii. The closest connection to a back-haul fibre must be used.
   iii. The proposals are to be scrutinized during a site survey. Paying particular attention to obstacles and existing services along the way.
   iv. Photos are to be taken for future reference.

v. All existing services should be noted. Existing services should be used as far as possible, granted that they fall within regulation to do so
vi. Any complications or alterations are to be amended on the proposed drawings until an all-inclusive final drawing is attained.
vii. Termination, aggregation and distribution equipment to be used and location thereof.
viii. Once all relevant information is gathered, scoping of a node room can begin.
ix. Establishment of a schedule in order to notify residents of potential traffic related obstructions at least 7 days before they occur.
x. Future maintenance of all links, special requirements and network upgrades should be kept in mind throughout the planning process.
i. Any implications encountered during installation will be forwarded to the client, who shall then advise on the required solution.

7.2 Labelling

7.2.1 All newly installed infrastructure needs to be labelled correctly. Refer to the FTTH Labelling Specification.



8. Testing Methods

Tests

a. DIT testing should be conducted before and after reinstatement is completed. Mentioned below are the steps which constitute the full test. Please refer to the Frogfoot DIT Procedure.
   i. Foam Sponge Test (Repeat if dirt is still coming out. Sponge to be 2x ID)
   ii. Air Tightness Test (Blowing compressed air for 1 min to remove dirt and debris)
   iii. Dart/Mandrill Test (OD to be 85% of Duct ID)
   iv. Pressure Test (Pressurize to 10Bar. Losing 1Bar over 5min is acceptable)
      i. DIT testing should be conducted before reinstatement is completed, this will ensure that the reinstated area doesn't need to be opened up again if there is a fault. Mentioned below are the steps which constitute the full test.
      ii. Foam Sponge Test (Repeat if dirt is still coming out. Sponge to be 2x ID)
      iii. Air Tightness Test (Blowing compressed air for 1 min to remove dirt

and debris)

iv. Dart 3m long (Dart OD to be 80% of Duct ID)
v. Pressure Test (Pressurize to 10Bar. Losing 1Bar over 5min is acceptable)
vi. Total time to be tested per Duct is 5min
vii. Pressure tests on 14/10mm Duct to be tested for 5min
viii. Pressure tests on 8/5mm Duct to be tested for 1min

v.

b. DCP Testing should be conducted once the trenches are filled and compacted with their respective graded material.
    i. A DCP test should be done ever 100m – 125m or 8 times for every 1km.
    ii. The DCP test results and the exact coordinates will be recorded.
    iii. The DCP test will be done to the distance 0.5m below that of the trench depth but no less than 1m from the surface.
    iv. 4 DCP test should be done around every EBB, MH and HH.
        i. DCP Testing should be conducted once the trenches are filled and compacted with their respective graded material.
        ii. The DCP test results and the exact coordinates will be recorded in WGS84 standard
        iii. The DCP test will be done to a maximum depth of 200mm above the uppermost duct, e.g. Trench depth 600mm, duct bank uppermost 500mm test will be done up to a maximum depth of 300mm.
        iv. First compare trench vs virgin. If it fails:
        v. Then check average of 14mm/blow, or 70mm per 5 blows.
        vi. Measurement per blow must be equal or smaller than 14mm per blow.

c. Before cable installation begins, the cable reels should be carefully inspected for any imperfections such as nails, broken flanges, cable crossovers, or anything else that might cause damage to the cable as it is played out. Precautions should be taken to protect stored reels from possible damage by vandals or other sources while left unattended. The thermal protective covering that is provided on each reel of fibre optic cable should always remain in place when storing reels.

Pre-construction Fibre Measurements

The cable on all reels need to be inspected for damage as they are received. As a precaution and to avoid costly extra cable removal operations, all fibres should be measured on the reel using an OTDR. Measurements on single-mode fibre cables should be

made at user-specified wavelengths or both 1550 nm and 1300 nm.

1. Optical continuity in all fibres.
2. Length of each fibre.
3. The optical attenuation coefficient of each fibre at user-specified wavelengths.

d. **Post-construction measurements** provide assurance that cable placing, splicing, and link construction activities have been completed that will enable the intended transmission system to function properly and to provide support for any future maintenance activities on the link.

The most common post-construction measurements include the following:

- Length of the fibre link
- Attenuation for fibre link
- Splice losses
- Optical return loss
- Reflectance or high loss in link

e. OTDR testing must be done from the point of termination back to node. A few key properties which need to be tested and recorded are below. Please refer to the Frogfoot OTDR Results document.

i. Project Name.
ii. Phase, sector and sub-sector reference.
iii. Link reference.
iv. Termination box number.
v. Fibre cable used.
vi. Measured Optical Length.
vii. Attenuation at:
    i. 1310nm (db.).
    ii. 1550nm (db.).
    iii. 1625nm (db.).
viii. Attach a copy of the test results.
ix. Person conducting the test, the date, and relevant signatures.
x. Serial number of the machine used.

8.1 Troxler Testing

8.1.1 Troxler to be done as per the Wayleave conditions.

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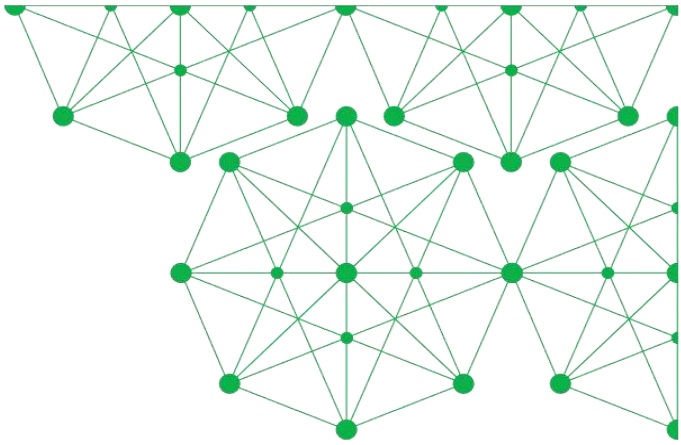


9. Aerial Line Construction.

Survey - Gather Route Information

- The information on this route must accurately indicate distances.
- Take photos of all obstacles on the route (existing services, bridge crossings, rocky areas, buildings, built-up areas, paved/tarred areas, wetlands, overhead obstacles, etc.).
- Identify all obvious landmarks where the route changes direction (take photos).
- Note down any road repair work necessary - record distances and GPS coordinates.
- Provide for a series of DCP test readings along the route and document the exact positions.
- Description of the topography along the route (sloping, edge of cliff, adjacent to lake, forest surroundings, rivers, swampy areas, etc.) - record distances and GPS coordinates.
- Description of the ground condition along the route and distances (rocky, sandy, grassy, clay, etc.) - record distances and GPS coordinates.
- Contractor is responsible to locate possible warehouse/camp sites where material can safely be stored.
- Indicate the availability of hospitals / clinics / police stations along the route - in case required during operational activities.
- Plan the route to allow for projected road or rail deviations.
- Double-check recorded details on the return journey.

Pre-Install Meeting

A pre-install meeting or meetings must be held to discuss the survey results, the optimum pulling sites, span lengths, installation equipment and hardware requirements, logistics, splice locations, terrain, and other vital installation topics.

Checks to be undertaken prior to commencing with the planned aerial work

- Does the contractor have approved aerial route drawings, signed by the client?
- Do the drawings show the alignment of the aerial route within the wayleave specification?
- Are the wayleaves in place? (must always be kept on site).
- Contractor must scan for the locations of existing services.

- Are the aerial route drawings being marked indicated on which side of existing road/pathway to stay?
- Has the accessibility of poles to splicing vehicles been considered?
- Does the cable have a UV resistant cable jacket?

9.1 Tree/Bush Cutting

9.1.1 Public Streets and Thoroughfare.

9.1.1.1 The local authority should perform the cutting or trimming of trees in public streets and thoroughfares whenever satisfactory arrangements can be made.

9.1.1.2 Standing written agreements should be arranged whenever possible.

9.1.1.3 Traffic regulations and road signs must be strictly adhered to.

9.2 Pole Planting

9.2.1 It is desirable to maintain a uniform length of span and depart from it only when this is rendered necessary by such conditions as uneven ground or sharp bends, or to avoid dangerous positions for poles or stays. Preferred span length of 50m must be adhered to.

9.2.2 Selection of pole and stay positions

Survey

- Survey rods must be planted in line at selected pole positions so that, when erected, the poles will be in a straight line.
- A spirit level must be used to verify that there is no lean to the rods.
- As the survey advances, the rear rods used for lining up - will be withdrawn and survey pegs driven into the ground in the exact position previously occupied by the survey rod.
- The location of the poles to be erected along roads shall be in accordance with the way leave drawings and conditions stipulated by the authorities concerned.
- Square wooden pegs shall be used to mark the position of every pole, stay or strut.
- The numbering (or other details) and marking of the wooden pegs shall be done as agreed upon by both the client and contractor.
- The tops of pegs that show the positions of angle poles must be marked with blue lumber crayon crosses.
- A survey peg for a strut position must show the approximate spread of the strut.

In selecting the positions for poles, stays, and struts, the planner should comply with the following requirements:

Obtain the necessary ground clearance at the least cost.

9.2.2.1 Avoid dongas, culverts, drains and other water channels.

9.2.2.2 Avoid obstructing private roads and entrances.

9.2.2.3 Reduce road crossings to a minimum and avoid long oblique crossings.

9.2.2.4 Avoid trees. Where this is impossible, select a position that will result in minimum interference from trees and the minimum of tree cutting even if construction costs are increased slightly by the action taken.

9.2.2.5 Plan the route to allow for projected road deviations.

9.2.2.6 Keep the route as far away as practical from power lines. To add general requirement

9.2.2.7 Select stay positions that will result in the most efficient spread/height ratio (due regard being paid to clearance between wires or projected wires and the stay wire and the least exposure to danger from traffic

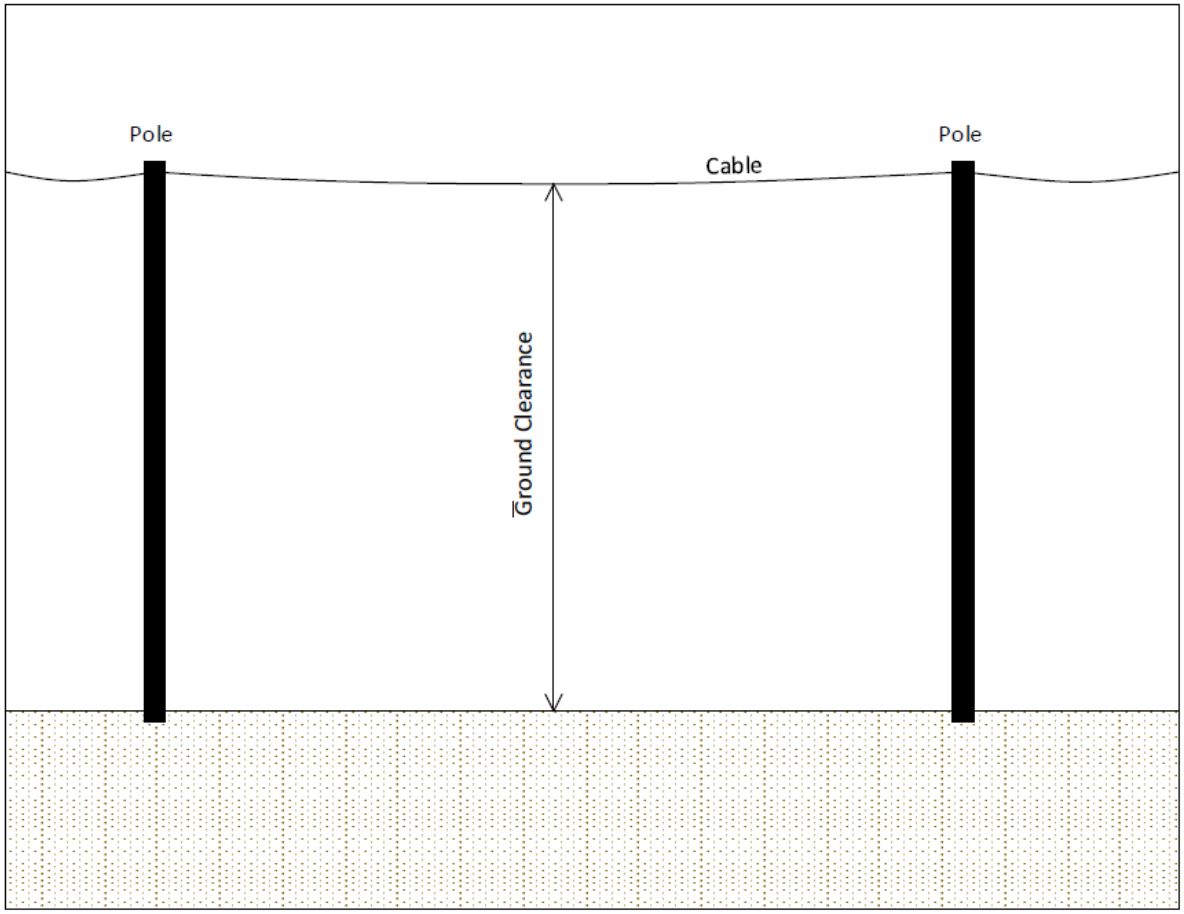
9.2.2.8 The principle to be followed in all cases is that neither stays nor poles are to be planted where they are likely to cause obstruction or to be dangerous to users of the road or pedestrians.

Vertical Clearance

9.2.3 Routes should be so designed that when they are loaded to their maximum capacity and at a conductor temperature of 50 C, the lowest cables (whether open or covered) will have the minimum vertical clearance at the point of least clearance.

9.2.4 Ground clearance of routes

Ground Clearance: The distance between the cable and ground level, measured at any point between 2 poles in a span.



Location of route	Clearance (m)
1. Across any national road	6.5
2. Across abnormal provincial roads	7.0
3. Across other provincial roads.	6.1
4. Across other public roads.	6.1
5. Across street roads other than (2) (3) or (4) above.	5.0
6. Along streets (including midblock), roads or privately-owned railway lines or near towns.	3.7

9.2.5 Cables round a curve

Care must be taken to prevent cables round a curve from hanging over a road. Where this is unavoidable, clearance must be provided as stated in the table.

9.2.6 Double termination.

Cables must be double terminated at the following points.

9.2.6.1 At all angles in the route where the angle in the line exceeds 15°.

9.2.6.2 At all changes in gradient where the vertical angles exceed 8°.

9.2.6.3 At all road crossings (excluding minor roads)

9.2.7 Stays and struts

Stays are of great importance to the stability of a route and their positions should be selected with care. They should generally be provided as follows:

9.2.7.1 On all poles where cables terminate (terminal stays).

9.2.7.2 At all changes in direction of a route (angle stays)

9.2.7.3 Struts should only be used where any kind of stay or unstayed poles set in concrete cannot be provided.

9.3 Excavation of pole holes and the erection of poles

9.3.1 Tools to be used

9.3.1.1 The tools provided for hole-digging include picks, shovels, earth augers, earth scoops and crowbars, and particularly where blasting is required, compressors, drills, and sledgehammers. The tools to be used for any particular work are determined largely by soil conditions but are also influenced by other considerations.

9.3.1.2 On large works, wherever ground conditions permit, full use could be made

of boring machines. (Earth auger) In residential areas only hand digging is permitted.

9.3.2 Excavations

9.3.2.1 Where the ground is very rocky, holes may need to be prepared with the aid of compressors, drills, and sledgehammers.

9.3.2.2 Where the ground is soft, earth augers or earth scoops and crowbars are suitable for digging. These are more economical than picks and shovels and have the advantage of disturbing the ground less. Picks and shovels must be used if baseplates are to be fitted to poles.

9.3.2.3 Pole holes excavated by pick and shovel should normally be oblong in shape with the longer sides in the direction of the route, except at terminal poles, where the longer sides should be at right angles to the route. The holes should not be made wider or longer than is convenient for digging. If the holes are too large, the ground will be unnecessarily disturbed and the stresses on the poles will not be withstood by solid earth.

9.3.2.4 When augers or earth scoops are used, care must be taken to ensure that the holes are dug in their correct positions. Greater accuracy is necessary than with the pick and shovel method, as the size of the hole is smaller and there is less scope for the adjustment of pole positions during alignment.

9.3.3 Planting Depth

The depths to which poles must be planted are as follows:

TYPE OF POLE	DEPTH
6 m pole	0.9 m
7m/ 8m pole	1.2 m
9m and more	1.5 m

9.3.3.1 When a pole is to be planted in sloping ground, the depth of the hole should be measured from the lowest point on the ground surface.

Measuring of hole depth

9.3.3.2 Where the ground is very soft, poles may be planted 300mm deeper than shown above, but only if the necessary vertical clearance will still be within limits.

9.3.3.3 Where poles are planted in soil that is difficult to compact, such as sand, the pole should be cast in concrete. The concrete should be cast so that it has a minimum radius of 400mm around the centre of the pole and to a depth of 800mm

9.3.3.4 In all other cases, and where clearances will be inadequate, additional wind stays should be fitted and the pole planted to the normal depth.

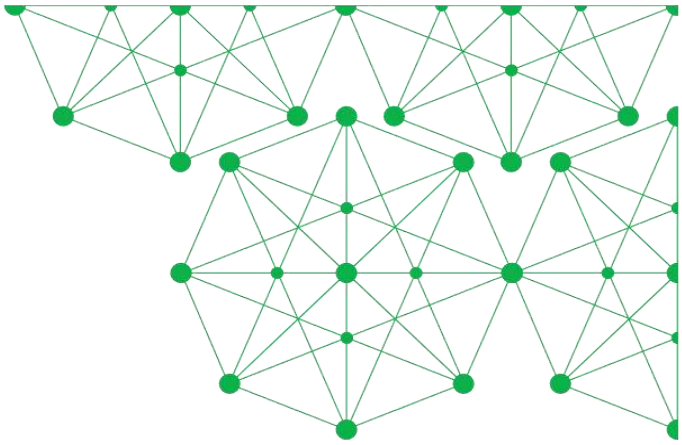
9.3.3.5 Care must be exercised after excavation to prevent loose earth from falling into a hole before the pole is erected in position. Before backfilling a hole, a final check must be made to ensure that the planting depth of the pole is correct. In case of wooden poles, a ready check is provided by the metal discs, which are affixed by the suppliers. These discs are located 3.5 meter from the butt end in respect of poles up to 9.15 meters in length.

9.3.3.6 Ramming of poles - To stabilize pole in loose soil, the filling must be done in three stages and for every stage the soil must be rammed with a pole rammer from the bottom to the top. Backfilling and ramming should take place in 300 mm, 600mm and 300mm intervals respectively.

9.3.4 Erection of poles

Wooden pole inspection (prior to installation)

- Correct type of pole supplied? (length and thickness)
- Excessively bent or cracked poles should never be used. Horizontal cracks perpendicular to the grain of the wood may weaken the pole. One large knot



or several smaller ones at the same height on the pole may be evidence of a weak point on the pole.

- Inspect the pole for evidence of termites or ants.
- Ensure that all poles are fitted with 'end plates' and strapping at both ends.
- The poles should never be off loaded and stacked on the ground for long periods as this could cause damage to the poles as well as the environment.
- Hammer Test (existing poles): Rap the pole sharply with a hammer weighing about 1kg, starting near the ground line – then continue upwards around the pole to a height of approximately 1.5m. The hammer will produce a clear sound and rebound sharply when striking sound wood. Decayed areas will be indicated by a dull sound or a less pronounced hammer rebound.

9.3.4.1 A wooden pole should be erected by laying it on the ground in such a position that by raising the top section, the base should slide into the hole.

9.3.4.2 The side of the hole away from the pole should be protected by a crowbar or steel plate placed vertically so that the pole base bears against it during erection.

9.3.4.3 Lightly loaded wooden poles should have all fittings attached before they are erected.

9.4 Pole Holes

Poles must be buried sufficiently deep for stability. The depth depends on the height of the pole. Check with local authorities to confirm these dimensions.

Length of pole	Plant depth
< 6 m (20 feet)	0.9 m (3 feet)
7 – 8 m (23 – 26 feet)	1.2 m (4 feet)
>9 m (30 feet)	1.5 m (5 feet)

All excavations for pole holes will be such that the survey peg indicates the centre of the hole. If the holes are too large, the soil will be unnecessarily disturbed, and the poles will not be supported by solid earth. (A diameter of approximately 400mm (16 inches) is recommended). Where a hole is dug on sloping ground, the depth of the hole shall be measured from the lowest point on the ground surface. In extreme rocky conditions where holes cannot be excavated to the specified depth, an arrangement between contractor and client can be reached for poles to be set in concrete.

9.5 Pole Spacing

It is advisable to maintain a uniform span length and depart from this only when it is rendered necessary by conditions such as: (1) uneven ground (2) sharp bends (3) or to avoid dangerous positions. This may necessitate the planting of additional poles or omitting of poles. Steel measuring wires for standard span lengths should be made up locally. When the length of span has been chosen the appropriate wire should be used to determine the distance between successive poles. A steel tape measure should be used for checking the length of the measuring wire daily during the survey.

9.5.1.1 Poles must be set to a plumb line, a spirit level being used for the purpose, and they must be aligned correctly. As wooden poles may not be quite straight, extra care should be taken when setting and aligning them. If necessary, a survey rod and spirit level should be used to ensure that there is no leaning in any direction.

9.5.1.2 Angle poles which are not stayed or strutted should be set back slightly against the angle so that they assume a vertical position when the cables are strained. If necessary, a hole must be packed with stones on that side of the pole where the ground must withstand the pull of the cables.

Pole in hole – before backfilling.

9.5.1.3 For ALL poles erected in normal conditions: The backfill material must be mixed with 5kg of cement per pole and well compacted as a dry mix in layers as follows:

9.5.1.4 Mix half of the soil that has been dug out with 5kg of dry cement.

Preparation of Dry mix

9.5.1.4.1 Divide the mixture into two equal portions.

9.5.1.4.2 Use one part of the mixture for a (300 mm) first backfill layer. Compact with a pole rammer.

9.5.1.4.3 Use ordinary soil for (600 mm) backfill. Compact with a pole rammer. (Can be compacted every 300mm).

9.5.1.4.4 Use the remaining mixture as the (300 mm) final layer. Compact with a pole rammer.

Compacting of soil and dry mix completed

9.5.1.5 In very dry & sandy areas - where the soil moisture is very low to zero, some water may be added to moisten the soil before mixing with the cement. Using a dry mixture ensures that 'a permeable crust' is eventually formed around the pole that allows moisture to dissipate and prevent the pole from rotting.

9.5.1.6 'Abnormal conditions' where special procedures apply is with soil in:

9.5.1.6.1 Very sandy conditions (where poles are e.g. cemented in).

9.5.1.6.2 Rocky conditions.

9.5.1.6.3 Very wet or clay conditions.

9.5.1.7 The placing of cement in a dry mix for backfill MUST be adhered to in order to ensure that Safety, Stability and Longevity of the infrastructure is not compromised and may result in future claims against the company and/or installer.

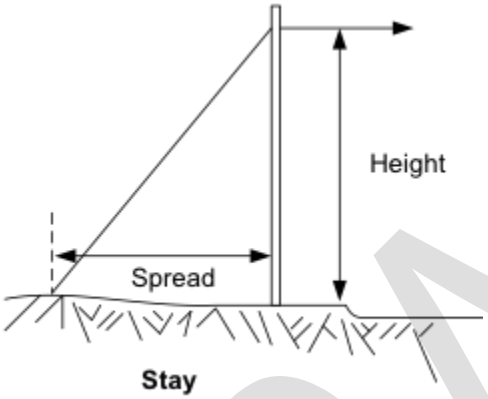
9.6 Suggested Pole Planting Work Practices

- Avoid dongas, culverts, drains or water channels.
- Avoid obstructing private roads and entrances.
- Restrict road crossings to a bare minimum, and if possible, stick to the same side of the road throughout.
- Avoid trees and where not possible, select a position which will minimise interference from trees – even at the expense of construction costs being increased slightly by this action.
- Along national and other proclaimed roads the poles and stays should be located in the position agreed to by the Road Authority and as indicated on the wayleave.
- Keep the route as far away as practically possible from power lines.
- Where the ground is very soft, poles may be planted 300 mm (12 in) deeper than specified, but only if the necessary vertical clearance is maintained.
- Ensure that all holes necessary for pole dressing are drilled prior to erection.
- Maintain a distance of at least 1m from trig beacons and stations.
- The principle to be followed in all cases is that neither stays nor poles are to be planted where they are likely to cause obstruction or to be dangerous to users of the road, or where they are likely to interfere with ordinary road maintenance such as the clearing and trimming of the edges of the road or the cutting of drains, gutters, etc.
- In railway reserves, the poles should be located as close as possible to the

boundary fence.

9.7 Spread/Height Ratio

The spread is the distance from the foot of the pole to the point to where the stay enters the ground.



The height is the distance from the ground to the pole attachment.
Wind stays shall have a spread/height ratio of 0.6:1
Terminal and line stays has a spread/height ratio of 1:1

9.8 The fitting of stays and struts

A stay wire should be terminated on a pole in the positions shown below – 4.2m above ground level

End pole with a stay wire

Pole configuration:

- 6m wooden pole (8m wooden pole at road crossings)
- Stay wire set:

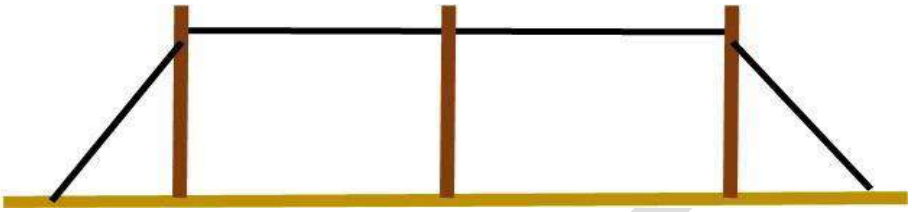
- Double wrap guy grip (top make-off),
- 5 x 38mm staples (to secure top make-off to pole),
- Stay wire (same length as pole),
- Guy marker (to ensure visibility of stay wire)
- Thimble grip (bottom make-off)
- Adjustable stay rod
- Base plate.
- Stay guard

- Cable hanger with bandit strap clamps
- Cable anchoring clamp – AC10 260
- 5m UV resistant conduit or bosal pipe (25mm for 1 cable, 50mm for 2 cables), secured to pole with 3 x bandit straps (bottom, middle and top)
- PVC sleeve to route cable/s from pole to hand hole

9.9 Types of Stays

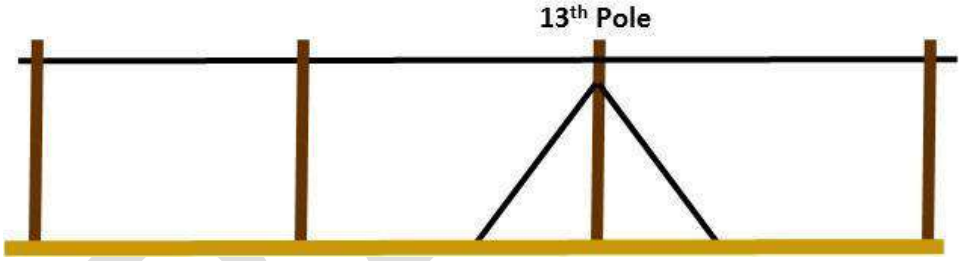
8.9.1 Terminal stays

Provided where the route starts and ends. This stay must be on the side of the pole opposite to the direction of the cable route.



8.9.2 Line stays

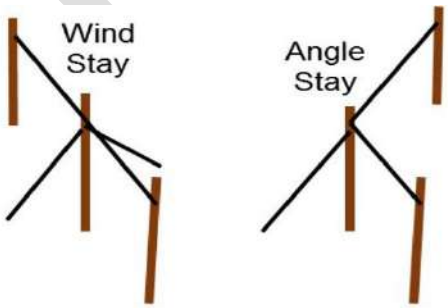
Installed at every 13th pole along the route or spaced alternatively as per specification. Line stays must be installed on poles either side of rivers and road crossings where normal span lengths are exceeded.



8.9.3 Wind stays & Angle stays

Wind stays are used to stabilize a cable route against wind. Fitted at 90˚ against the direction of the cable route and on either side of a pole.

Angle stays are used to counter-act a change in direction of the cable route by more than 15˚or as per client specs.



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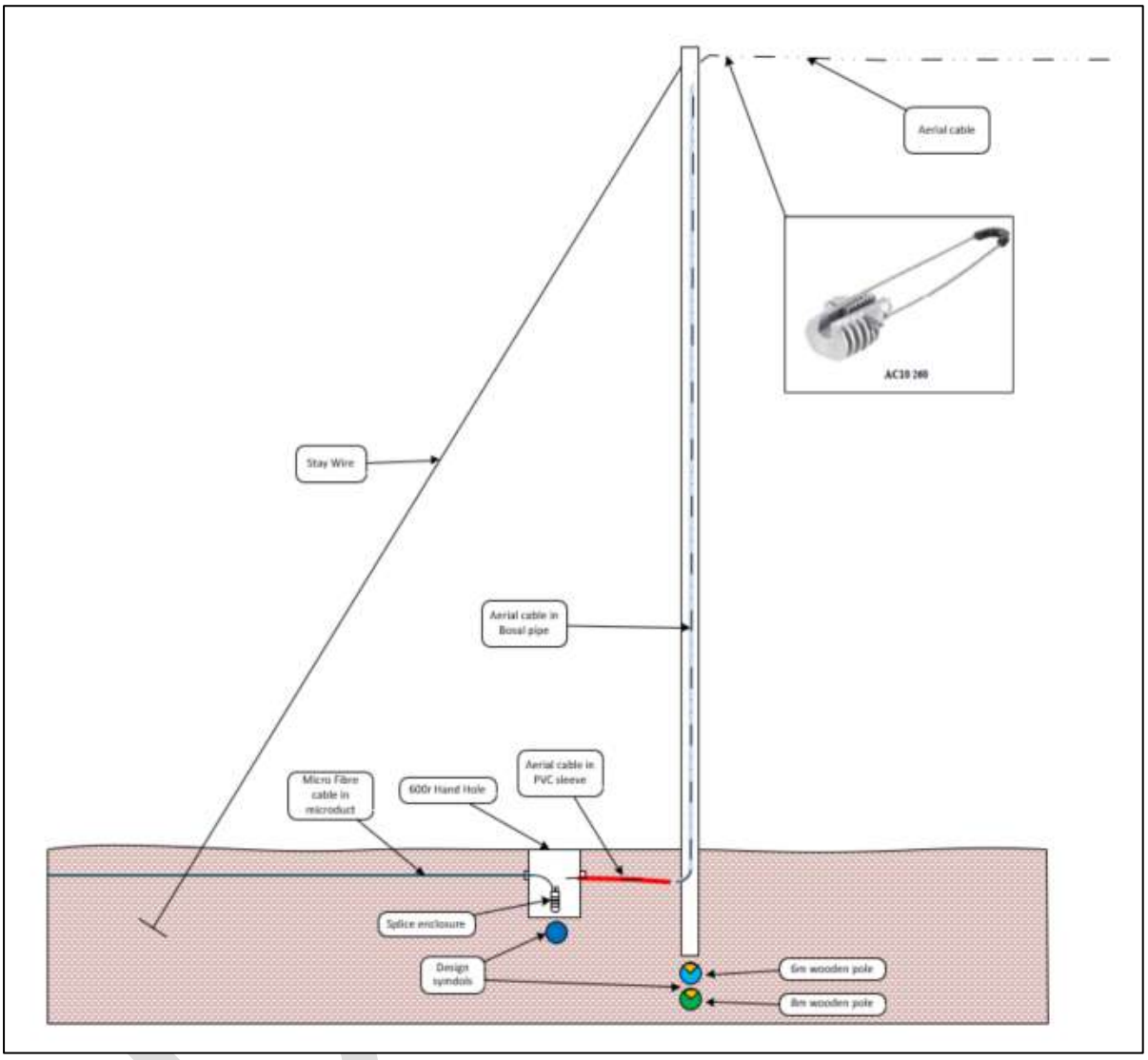

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9.9.1 On wooden poles, five 8mm G.S. staple should be used to secure the stay wire.

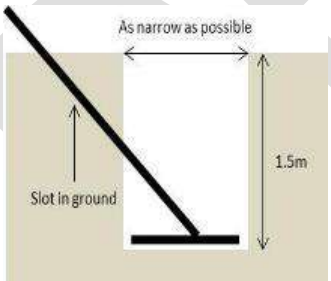
9.9.2 Stay holes

9.9.2.1 The stay hole should be marked out behind the pole and the hole dug so that the plate bears against undisturbed earth as far as possible. The cross-section of the hole should be confined to the smallest size necessary for ease of excavation and the depth should be such that the unthreaded portion of the rod protrudes 100 mm from ground level (various stay rod lengths)

9.9.2.2 A slot must be cut for the stay rod, which should protrude from the ground and be in line with the pole route in the case of a line stay. It should bisect the angle in the case of an angle stay. The stay should be buried to within 100mm of its threaded end unless ground conditions are exceptionally difficult. The rod must not be bent.

9.9.2.3 The ground with a dry mix must be well rammed as it is returned in layers of 300mm into the hole. Where difficulty in consolidating the ground is anticipated, stones should be included with the initial replacements of earth. In exceptional cases may the stays be concreted.

The cross-section of the hole shall be confined to the smallest size necessary to accommodate a stay plate.



The depth of stay holes shall be 1.5 (5 feet) meters or at such a depth where the unthreaded portion of the stay rod protrudes by no more than 25mm (1 in) above ground level. Stay rods without plates may be used where solid rock is encountered. The stay rod is now inserted in a hole drilled into the rock and secured with a chemical anchor. In difficult to dig ground conditions shallower holes are allowed subject to approval and shall then be backfilled using concrete.

9.10 Support pole with a boundary box

Pole configuration:

- 6m wooden pole
- A UV-resistant drop tube will be used to route the 8f drop cable
- The drop tube will be routed in a UV resistant PVC conduit or a bosal pipe – strapped to the pole – for additional protection.

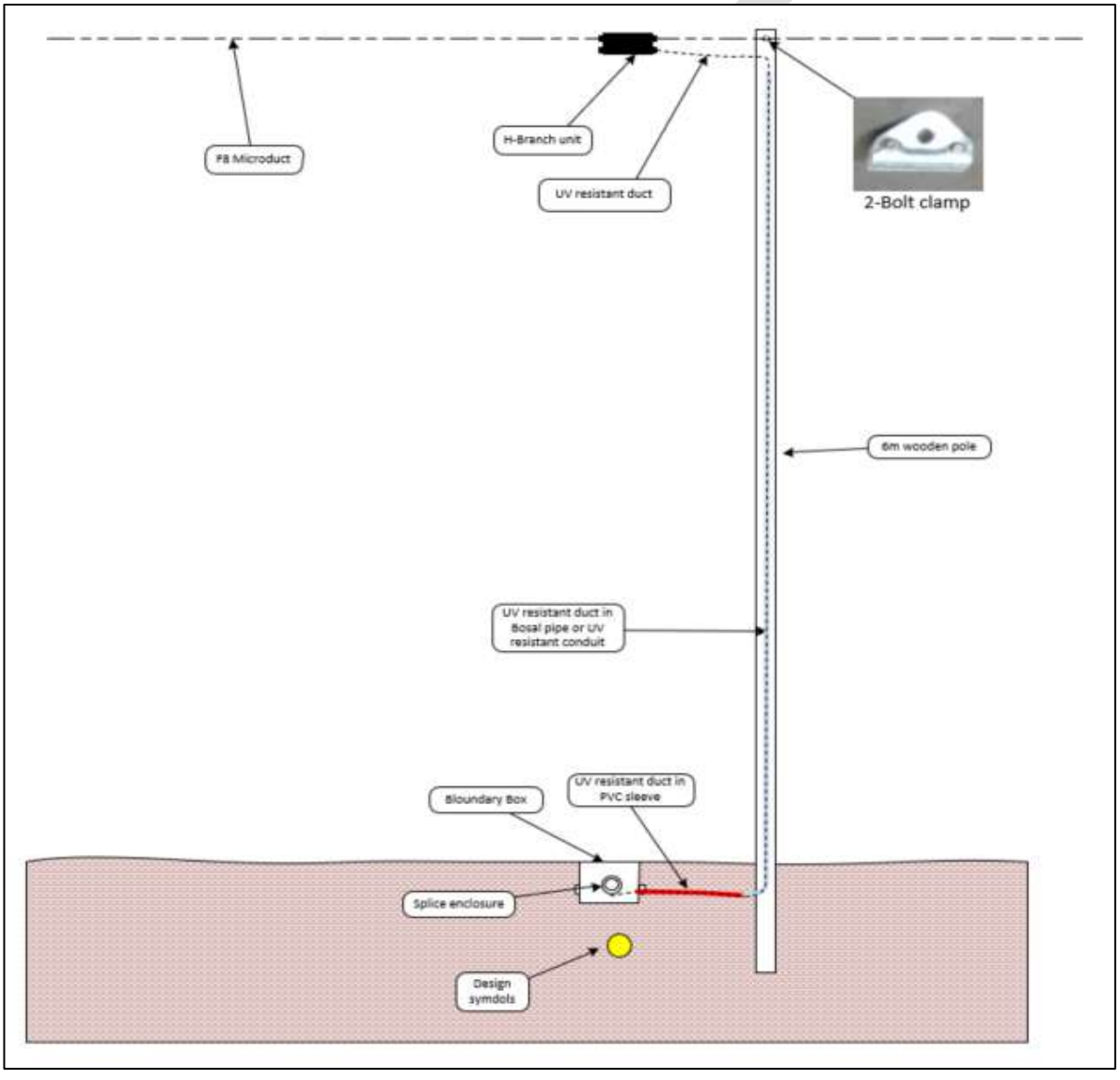


Figure 7: Support pole with boundary box

9.10.1.1 Stay rods without plates may be used where solid rock is encountered. The stay rod should be inserted in a hole drilled into the rock in the line of the stay and secured by chemical anchor. When filling in the hole it is important that the mixture be tamped thoroughly.

9.10.2 Stay guards

9.10.2.1 Stay guards must be fitted on all stays, which are exposed to vehicular or pedestrian traffic.

9.10.2.2 The stay guard must be fitted just above the crosshead to ensure greatest visibility, especially at night.

9.10.3 Termination of stay wire.

9.10.3.1 Top and bottom end make-off must always be used.

9.10.3.2 Use top preformed make off and staple it around the pole with ends meeting together.

9.10.3.3 Twist top preformed make-off around suspension wire, cut a length of suspension wire same as the length of the pole.

9.10.3.4 Place bottom preformed make-off's around the crosshead.

9.10.3.5 Pull tight and cut the suspension wire in line with the crosshead and twist the bottom preformed make- off.

9.10.4 Tightening stay after terminating

9.10.4.1 After the stay wire has been terminated, it should be tightened by means of a stay key – The top end of the stay rod must be flush with the stay rod nut. In order that scope may be left for further tightening of the stay, it is desirable to put tension on the stay wire by means of a draw vice before terminating at the crosshead

9.10.5 Struts

9.10.5.1 The length of a strut pole should be such that a terminal should have a spread of 1:1 and that, the butt is buried to a vertical depth of at least, 900mm. Some 1m to 1,1m of strut will then be buried in the ground.

9.10.5.2 For a wooden pole, a strut bracket must be used to attach the top end of the strut pole to the pole.

End pole with a strut

9.11 Strut Accessories configuration:

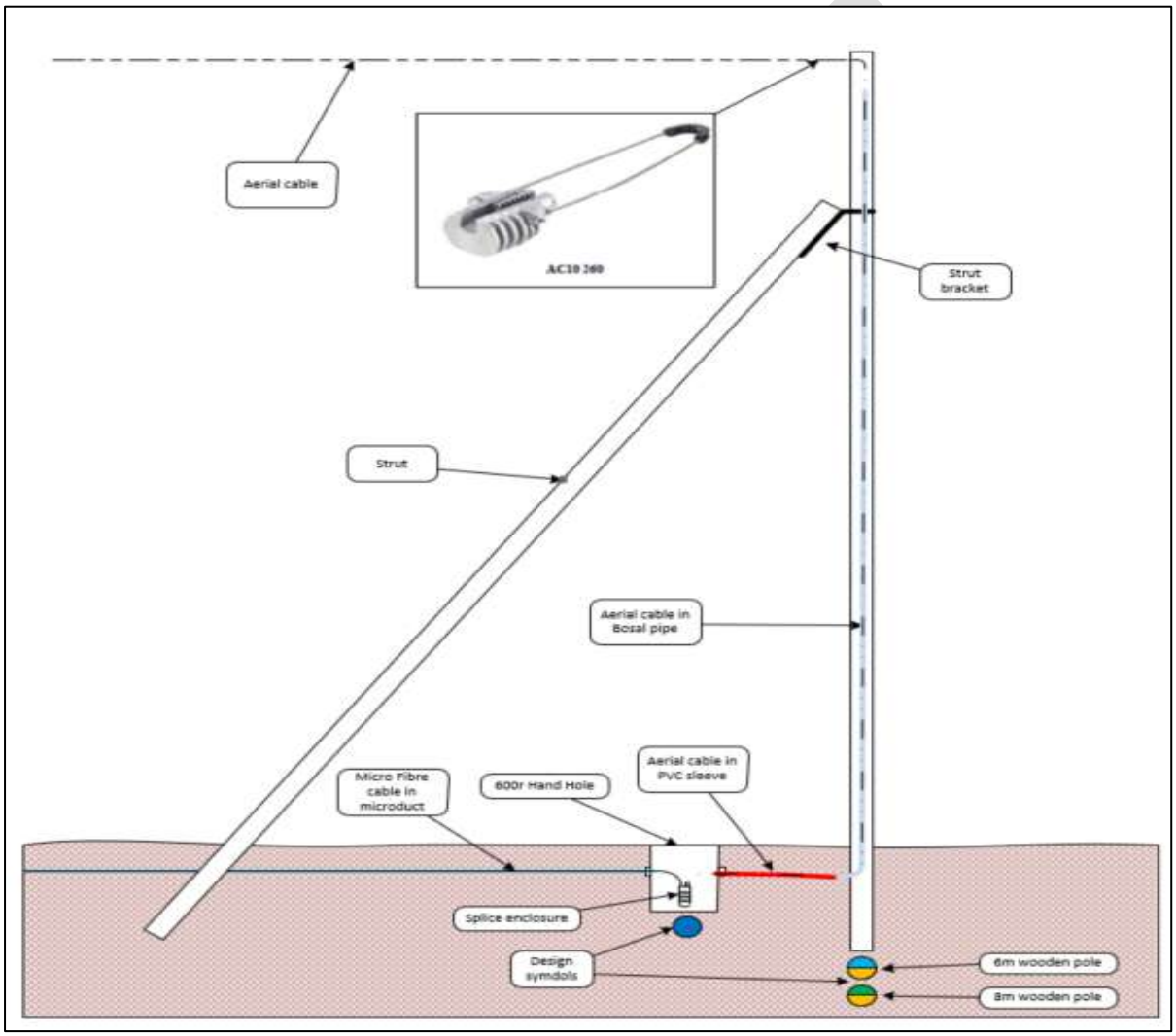
9.11.1 Poles

6m wooden pole (8m wooden pole at road crossings)

9.11.2 Accessories

- Stay wire set
- Double wrap guy grip (top make-off),
- x 38mm staples (to secure top make-off to pole),
- stay wire (same length as pole),
- guy marker (to ensure visibility of stay wire)
- Thimble grip (bottom make-off)
- Adjustable stay rod

- Base plate.
- Cable hanger with 180mm bolt
- Cable anchoring clamp – AC10 260
- 5m UV resistant conduit or bosal pipe (25mm for 1 cable, 50mm for 2 cables), secured to pole with 3 x bandit straps (bottom, middle and top)
- PVC sleeve to route cable/s from pole to hand hole



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9.12 Construction of overhead routes with wooden poles

9.12.1 Safety

Aerial cable installation can be hazardous as personnel may be working at a considerable height above the ground on ladders, bucket trucks or even climbing poles and near electrical transmission wires. All workers should have proper training and personal protective equipment before being allowed to work on aerial installations.

9.12.2 Pole Handling Personal Protection Equipment (PPE)

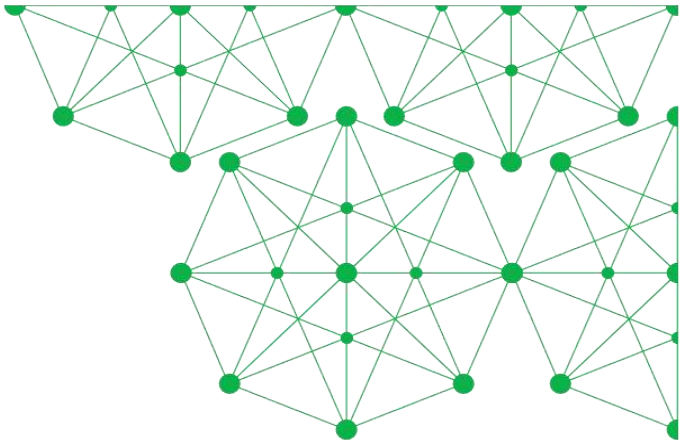
- Safety boots with steel caps.
- Protective clothing with long sleeves.
- Shoulder pads.
- Gloves.
- Hardhat.

9.12.3 Climbing Ladders

- Keep hands free of tools or materials when climbing or descending a pole or ladder.
- Workers climbing up or down ladders must always face the ladder and maintain a 3-point contact. This effectively means that 2-hands and 1-foot or 2-feet and 1-hand must always be on the ladder.
- Ladder must be positioned correctly (1-4 ratio).
- Ladder must be properly secured (lashed and held).
- Ladder must be in a good condition.
- Pole ladder must be used.
- A worker must be correctly positioned on the ladder.
- A safety harness must be worn and secured to the pole once the working position is reached.
- Never climb any pole if the span they support is being placed under tension.

9.12.4 Transportation of Poles

Poles must never exceed the 0.5m vehicle overhang and must have a red flag secured on the overhanging end. Poles that are loaded onto a truck must be purpose built for carrying poles, poles must be secured to ensure that the cargo does not



move while it is in transit.

9.12.5 Pole Off-Loading Procedure

Ensure that the removal of any one pole will not cause shifting or rolling of any of the remaining poles.
Step 1: Unfasten the poles.
Step 2: Slide one pole at a time towards the rear end of the vehicle.
Step 3: When the pole reaches its equilibrium point, the persons on the vehicle must raise their end slowly.
Step 4: The persons on the ground slowly pull the pole until 1m of it is left on the back of the vehicle bed.
Step 5: The persons on the ground receive the pole and gently place it on the ground.
A pole must never be dropped on the ground, as this could damage the pole and/or cause injury to team members.

9.13 Pole Handling Ratios

Smaller poles may be handled manually with sufficient personnel available but larger poles require proper mechanical aids.
7m pole =4 people
8m pole =6 people
9m pole = 8 people or a mechanical aid
10m pole = mechanical aid.
11m + pole = mechanical aid

9.13.1 Lengths of Poles

Wooden poles are available in – 6, 7, 8, 9, 10 and 11m lengths and are classified as light duty and heavy duty.

9.13.2 Erecting poles

9.13.2.1 Poles should be erected as described. The S-hooks should be fitted before erection wherever possible. As wooden poles might not be quite straight, care should be taken when setting and aligning them. To aid in checking the depth of planting, wooden poles are supplied with discs affixed 3.5m from the butt end in respect of poles up to 9.1m in length and 3.5m from the butt end for special longer poles.

9.13.2.2 The heavier poles available in a consignment should be used at angle positions,

particularly where stays will be attached below resultant positions on the poles. Poles which appear too light for the job should be put aside for use where suitable, e.g. for drop wire support.

9.13.2.3 Wooden angle poles which are not stayed, should be set back slightly so that they assume a vertical position when the line wires are strained. When filling in a pole hole in such cases, the backfill must be firmly rammed with a pole rammer and if necessary, the hole packed with stones on that side of the pole where the ground will have to withstand the pull of the wires.

9.13.2.4 Where angle poles are not stayed and are not set in concrete, their positions should be selected so that staying will be possible later if rendered necessary by the erection of additional wires.

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9.13.2.5 Wherever it is necessary to drill or cut wooden poles for the attachment of fittings, the exposed wood must be treated liberally with creosote to protect it from rotting. The butt end of a wooden pole must never be cut.

9.13.3 Clearance

At points where there will be inadequate ground clearance with the normal poles, longer poles must be used.

9.13.4 The use of wooden poles set in concrete

Wooden poles (up to and including 8.0 meters) set in concrete should only be used in the following cases.

- On routes where the planting of stays at small angles, may be difficult or give rise to objections from property owners.
- For distribution purposes in blocks, where the nature of the soil is such

that an unstayed pole would lean when two or more drop wires are erected.

- In extreme rocky conditions where the minimum required planting depth cannot be achieved

9.13.4.1 The following table indicates the minimum depth required casting a pole in concrete.

Length of pole	Minimum depth
7m	600mm
8m	800mm

9.13.4.2 Only new wooden poles may be set in concrete. Recovered or existing wooden poles must not be concreted, as much of the preservative will have leached away.

9.13.5 The use of unstayed concreted wooden poles at angles is limited by the following factors:

- Pole size.
- Size of angle.
- Methods of planting poles in concrete

9.13.5.1 Pole Holes

The hole for a pole, which is to be concreted, should be circular in shape. The diameter should be kept to a minimum but must be sufficient to ensure that there will be a radius of 400mm of concrete between the sides of the pole and the undisturbed ground. The hole for an angle pole must be dug so that the pole when planted will be on the correct position.

9.13.5.2 Concrete Mixture

The concrete to be used must be made from a mixture of 1-part cement, two parts sand and five parts crushed stone.

9.13.5.3 Pole Setting

The pole complete with fittings is been put in position and lined-up in the normal manner.

9.13.5.4 Angle Pole

9.13.5.4.1 An angle pole must then be tilted, with a rake of 1 in 26, towards the position where the angle stay would normally be planned.

9.13.5.4.2 The various lengths of poles, planted to correct depth with a rake of 1 in 26, will be set out of the vertical at the top by the following approximate amounts: -

LENGTH OF POLE	SET AT TOP
7,9 meters	250mm
7,3 meters	225mm
6,0 meters	175mm
5,4 meters	150mm

9.13.5.5 Filling of Hole

When the pole has been set correctly, it must be firmly held. Concrete is then poured into the hole to fill it to ground level. The concrete must not be rammed but should be worked around the pole with a light stick.

9.13.5.6 Props

Props, as required, are then placed against the pole to maintain its correct setting. The pole must then be left undisturbed for at least 24 hours, to allow the concrete to set.

9.13.6 To clamp a pipe/U channel to a pole.

9.13.6.1 For new installations, galvanised steel pipe must be used to protect the cables

9.13.6.2 The pipe must extend to 350mm below ground level to protect the cable.

9.13.6.3 Unroll a length of tape enough to fit round the pipe and the pole, slip a buckle over the one side of the tape.

9.13.6.4 Pass the tape around the pipe and pole and pass the loose end of the tape through the buckle on the pole side of the long part of the tape.

9.13.6.5 Bend the end of the tape back and move the buckle along the tape so as to engage with the bent end.

9.13.6.6 Pull the tape tight by hand, place it in the groove in the nose of the tool and grip it between the jaws of the sliding grip.

9.13.6.7 Protect the bare cable on the top of the pole with pieces of cable sheathing to prevent damage to the cable by the steel tape.

9.13.6.8 Tension the tape further by turning the tensioning handle, taking care not to over-tension the tape.

9.13.6.9 Bend the tool back over the buckle to bend the tape at the joint. Release the tension on the handle while bending the tool back to prevent the tape from breaking.

9.13.6.10 Cut the tape by using the build-in cutter on the clamping tool.

9.13.6.11 Remove the tool and hammer the end of the tape and securing clamps on the buckle down to secure the tape end.

9.13.6.12 There must be 3 straps per pole.

9.13.6.13 The buckle must be positioned directly away from the natural position where the ladder will rest against the pole.

9.14 Hauling of overhead optical fibre cable

9.14.1 Preparation of route

Route preparation – planting of poles, with the correct S-hooks fitted and bush cutting – should be completed before starting with the hauling activities.

9.14.2 Installation process - Conventional Method

9.14.2.1 Fit specially designed pulleys for the erection of Optical Fibre Aerial Cable to every pole on the route for the length of cable to be erected.

9.14.2.2 Feed the hauling rope through the pulleys.

9.14.2.3 Make a hauling eye at the end of the cable by removing a piece of the cable sheath (250-300mm), after which the Kevlar of the cable is then wound around the cable and attached to the cable with a 300mm 25/8 heat shrink sleeve.

9.14.2.4 Place the drum with cable at least one span length or 50 metres away from the pole where the cable will go through the first pulley. This would prevent the cable from bending too much while being hauled. Ensure Cable is decoiled in

correct direction, indicated on the cable drum. Under no circumstances should the cable be bent.

9.14.2.5 Hook the mechanical fuse to the end of the hauling rope and to the hauling eye of the cable. Hauling can now begin.

9.14.2.6 Cable lengths of up to 5000 m can be erected with one haul if the terrain allows it (flat, straight terrain).

9.14.2.7 Radio Communication between persons at the drum, alongside the cable-end and the hauling gang must be maintained.

9.14.2.8 If a short hauling rope is used, haul the rope through the next lot of pulleys as the rope becomes available during the hauling process.

9.14.2.9 The hauling gang must haul the cable evenly to prevent jerking. The person(s) at the cable drum must "feed" the cable off the drum according to the speed with which the cable is hauled. There must be no strain on the cable between the drum and the first pulley.

9.14.2.10 When hauling the cable, a person with a two-way radio must walk alongside the cable-end to ensure that the cable is not twisting with the rope, especially at angle-poles where the possibility of twisting is greater.

9.14.2.11 Sticking of the mechanical fuse and swivels must be avoided. When the cable starts twisting, hauling must be stopped immediately. The cause of the problem must be pinpointed and rectified before hauling can continue.

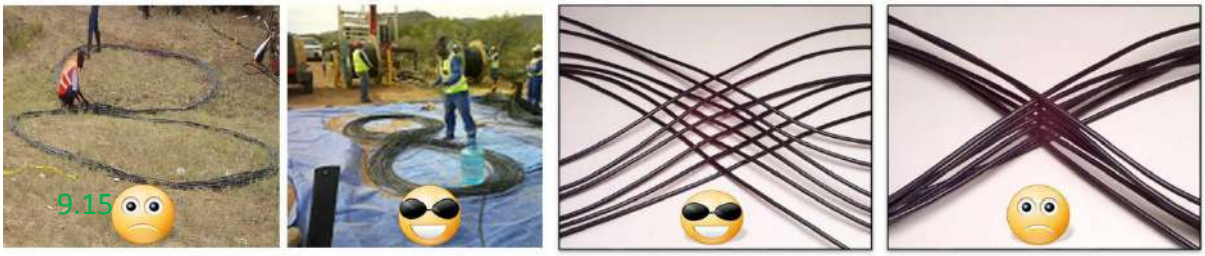
9.14.3 Installation process – Figure 8 Method

9.14.3.1 Place the drum approximately halfway along a long hauling section to reduce the strain on the cable.

9.14.3.2 Follow steps (1) to (5) as in paragraph 8.7.2.

9.14.3.3 The one half of the cable length is hauled in the one direction.

9.14.3.4 The balance of the cable is then completely run off the drum into a figure 8 on a tarpaulin after which it is then hauled in the opposite direction.



9.15.1.1 Radio Communication between persons at the drum, alongside the cable-end and the hauling gang must be maintained.

9.15.1.2 This method should be used when the terrain is such that the conventional method cannot be used.

9.15.1.3 The figure 8 method should not be used for cables longer than 2500 metres as it becomes risky to manage a bigger coil than 1250 meters of optic fibre cable without damaging the cable.

9.15.1.4 It is recommended that an additional splice should rather be introduced at every 2500 meters if the conventional method cannot be used.

9.15.2 Securing of cable to poles

9.15.2.1 Termination

9.15.2.1.1 A DYNAMOMETER or sag gauge, (tension meter), 0- 1000 KG (0- 10KN), must be used to obtain the correct tension (sag) on the cable.

9.15.2.1.2 To terminate the cable at a terminal pole (beginning or end of route), a preformed, galvanised steel thimble type dead-end, is wrapped around the cable and hooked onto a suspension hook.

9.15.2.1.3 Terminate cable with correct size dead-end at 1st terminating pole, leaves 20-meter slack for jointing purpose.

9.15.2.1.4 The jointing slack is then coiled in a 500 mm coil and secured to the pole as high as possible from the ground. Starts coiling by rolling the slack cable like a wheel. This will ensure that no twists are put in the slack, which will result in the fibres being damaged.

9.15.2.1.5 When a route deviates with an angle greater than 10°, the cable must be terminated as follows:

9.15.2.1.5.1 Fit a triple S-hook on the angle-pole

9.15.2.1.5.2 Wrap a temporary dead-end around the cable beyond the angle-pole.

9.15.2.1.5.3 Hook the one end of the Dynamometer into the thimble of the dead-end and a rope to the other end.

9.15.2.1.5.4 A number of workers must then pull on the rope until the desired tension is obtained.

9.15.2.1.5.5 While the tension is held steady, a person on top of the pole then wraps a dead-end around the cable and hooks it onto the termination hook.

9.15.2.1.5.6 After the cable is terminated, wait for a while plus/minus 10 minutes to allow the cable to stabilise before clamping the cable in the support clamp for intermediate support.

9.15.2.1.5.7 Remove the temporary dead-end from cable.

9.15.2.1.5.8 A dead-end is then wrapped around the cable in the opposite direction and hooked onto the termination hook. See point (8.7.4.1.7) for the loop of the piece of cable between the two dead-ends.

9.15.2.1.6 The same procedure is used where the drum is placed halfway along a hauling section.

9.15.2.1.7 Where a cable is terminated without the termination point being a joint, the loop of the piece of cable between the two dead- ends shall be at least 50mm away

from any structure but not more than 70mm.

9.15.2.1.8 To terminate the cable at the far end, follow the same process as described in 8.7.4.1.5.1 to 8.7.4.1.5.5.

9.15.3 Supporting of cable

9.15.3.1 To support the cable at intermediate poles, suspension hooks or triple suspension hooks are fitted to the poles. A tangent support is then wrapped around the cable and hooked onto the suspension hooks.

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10 Related Documents

Document Ref.	Document Title

11 Forms

Form No.	Form Title	Rev No.

12 Notes and Attachments

DIT, link results,

13 Safety, Health and Environmental Management (SHE)

9.1 Relevant Documentation

a. Before commencement of any works, the contractor will make themselves familiar with the health and safety requirements of the client (Refer to Frogfoot HSE Plan 12 April 2016 rev 0).
b. All health and safety specifications set out by the client will be read in conjunction with the relevant acts and regulations of occupational safety and environmental compliance, in order of the statutory and regulatory compliance of the contractor during execution of the works. These include, but are not limited:
   i. OHS Act 85 of 1993
   ii. COID ACT 130 of 1993
   iii. NEMA Act 107 of 1998
   iv. Construction Regulations 2014
   v. Frogfoot Waste Management Plan rev0

10.5Frogfoot DIT Results

Project:		**Contractor:**	
Region:		**Date:**	

All testing should be done in accordance the Frogfoot DIT Procedure.

Street Name If Applicable:								
Starting Point (HH/MH Nr):			**End Point (HH/MH Nr):**				**Distance:**	
Duct Size (mm):	**14/10**		**12/10**		**8/5**			
Test Type	**Test Performed**			**Number of ducts tested:**		**Notes:**		
Confirmation: Are the MH/HH and Ducts clearly labelled and neatly packed? Was this duct cleaned using a sponge and lubricant?	Yes	No	N/A					
Air Pressure: The duct will need to pass 10Bar worth of pressure. Did the successfully pass the 10min mark losing no more than 1Bar of pressure per 5min?	Yes	No	N/A					
Obstruction & Blockages: The duct will need to be pressurized to 5 Bar. For a 14/10 or a 12/10mm duct, the 5m dart should be used. For an 8/5mm duct, a	Yes	No	N/A					

4.2mm ball bearing will need to be used. Did the dart/ bearing make it the other end free of obstructions?					

Street Name If Applicable:									
Starting Point (HH/MH Nr):			**End Point (HH/MH Nr):**				**Distance:**		
Duct Size (mm):	**14/10**		**12/10**		**8/5**				
Test Type	**Test Performed**			**Number of ducts tested:**		**Notes:**			
Confirmation: Are the MH/HH and Ducts clearly labelled and neatly packed? Was this duct cleaned using a sponge and lubricant?	Yes	No	N/A						
Air Pressure: The duct will need to pass 10Bar worth of pressure. Did the successfully pass the 10min mark losing no more than 1Bar of pressure per 5min?	Yes	No	N/A						
Obstruction & Blockages: The duct will need to be pressurized to 5 Bar. For a 14/10 or a 12/10mm duct, the 5m dart should be used. For an 8/5mm duct, a	Yes	No	N/A						

4.2mm ball bearing will need to be used. Did the dart/ bearing make it the other end free of obstructions?					

Date:		**Signature:**	
Contractor Representative:			

Date:		**Signature:**	
Frogfoot Representative:			

10.6Frogfoot Fibre Handover

FROGFOOT LINK HANDOVER			
Client & Access Site Particulars		**Source Particulars**	
Project Number:		**Access Circuit:**	
Client / Company Name:		**Source Name:**	
Office Park & Building Number:		**Office Park & Building Number:**	
Floor (if Applicable):		**Floor (if Applicable):**	
Street Address:		**Street Address:**	
Region:		**Region:**	
Link Termination (e.g. Server Room):		**Location of POP (e.g. Basement):**	
Number of Fibres:		**Ports:**	
Ports:		**Row:**	
Termination Box		**Tray:**	

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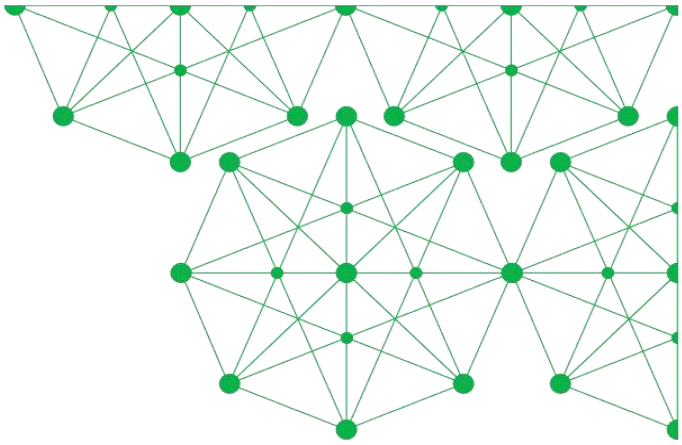

Number:				
Mid-Couplers Type (e.g. PC/APC):		ODU Number:		
Landlord Approval:		Mid-Couplers Type (e.g. PC/APC):		
Backhaul Ordered:		Type of Node (e.g. Passive, AE, GPON):		
Materials Ordered:		Wayleaves:	Yes/No	Expiration Date
		Electrical department:		
		Roads and storm water:		
		DFA:		
		Eskom:		
		Telkom:		
		Neotel:		
		Citi Telecoms:		
		Bulk water:		
		Water Sanitation:		
		High Voltage:		
PMO ACCEPTANCE				
Frogfoot Representative:		Date:		
Designation:				
Contact Number:		Signature:		
OTDR TEST RESULTS				
Fibre 1		Fibre 2		
Measured Optical Length (km):		Measured Optical Length (km):		
Attenuation at 1310nm (db):		Attenuation at 1310nm (db):		
Attenuation at 1550nm (db):		Attenuation at 1550nm (db):		
Attenuation at		Attenuation at		

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1625nm (db):		**1625nm (db):**	
Fibre 3		**Fibre 4**	
Measured Optical Length (km):		**Measured Optical Length (km):**	
Attenuation at 1310nm (db):		**Attenuation at 1310nm (db):**	
Attenuation at 1550nm (db):		**Attenuation at 1550nm (db):**	
Attenuation at 1625nm (db):		**Attenuation at 1625nm (db):**	
Person Conducting Test:		**Date of Test:**	
Serial Number of OTDR:		**Results Attached (YES/NO)**	
PROVISIONING MANAGER ACCEPTANCE			
Frogfoot Representative:		**Date:**	
Designation:		**Signature:**	
Contact Number:			

ANNEXURE 6

TREE PROTECTION GUIDELINE FOR CONSTRUCTION, EXCAVATION & TRENCHING FOR AERIAL AND UNDERGROUND FIBRE OPTIC CABLING

TREE PROTECTION GUIDELINE FOR CONSTRUCTION, EXCAVATION & TRENCHING FOR AERIAL AND UNDERGROUND FIBRE OPTIC CABLING

1. Introduction

Trees can be damaged or killed by a wide variety of construction activities. Such as broken or torn branches and root damage. Broken or torn branches can lead to diseases and insects inserting the trees through the open wounds.

Trees are never the same shape below ground as they are above, so it is difficult to predict the length or location of their roots. Typically, however, approximately 90-95 percent of a tree's root system is in the top 90--100 cm of soil 100 cm of soil, and more than half is in the top 30-50 cm. The part of this root system in which construction damage should be avoided is called the Root Protection Area (RPA).

One common method to identify the RPA is to define it as the "dripline"--the area directly below the branches/crown of the tree. However, many roots extend beyond the longest branches a distance equal to two or more times the height of the tree. For this reason, you should protect as much of the area beyond the dripline as possible.

On most construction or excavation sites space is limited and it is not possible to protect the entire canopy and root area. Just how close an activity can come without seriously threatening the survival of a tree depends on the species, the extent of damage, and the plant’s health. Some healthy trees can survive after losing 50 percent of their roots. However, other species are extremely sensitive to root cutting, even outside the dripline. Most trees can survive significant canopy pruning but not all species respond with successful regrowth of a visually acceptable canopy.

This guideline is aimed at providing direction for approaching and executing canopy pruning and root zone excavations for the purposes of installing fibre optic cabling both above ground mounted on poles and below ground in trenches, whilst minimizing any negative impact on the health and visual integrity of existing street trees.

2. Minimising Impact of Construction & Excavation Activities

2.1 Soil Damage and Compaction

Tree roots need loose soil to grow, obtain oxygen, and absorb water and nutrients. Stockpiled building materials, heavy machinery, and excessive foot traffic all damage soil structure. Lacking good soil aeration, roots suffocate and tree health declines.

Prevent soil compaction by carefully selecting storage areas and traffic routes and installing protective fences and signs. If you can, reroute traffic, install root system bridges with steel plates suspended over railroad ties or spread a layer (15cm or more) of wood chips on the soil within the RPA. Trees that are pruned or removed during the construction process should be chipped on site and the chips used for soil preservation tactics such as this.

Improper handling or disposal of materials used during construction also can harm roots. All building debris and chemical wastes be hauled away for proper disposal, and not burned or buried on the site.

Avoid changes in soil pH (acidity). Increases in pH are particularly dangerous to many species. Alkaline clays or limestones should not be used for fill or paving, and concrete should be mixed on a thick plastic tarp or outside the site. Mixing trucks should never be rinsed out on the site.

2.2 Excavation

Up to 40% of a tree's root system could be cut during the installation of a nearby utility line. This however, reduces water and nutrient uptake, and may compromise the stability of the tree. If it is not possible to relocate the utility line outside the tree's RPA, you can reduce root damage by as much as 25% by tunnelling under the tree's root system. When digging a trench near a tree, begin tunnelling when you encounter roots larger than in 2,5cm in diameter. Drilling single holes or bridging critical areas as opposed to cutting deep trenches saves many critical roots.

For all digging operations, insist that exposed roots be cut cleanly to promote quick wound closure and regeneration. Hand

excavation, vibratory plows, chain trenchers, and hand tools are preferred than bulldozers and backhoes. Minimize damage by avoiding excavation during hot, dry weather; by keeping the trees well-watered before and after digging; and covering exposed roots with soil, mulch, or damp burlap/hessian as soon as possible.

2.3 Root Pruning

Trenching and digging in the soil near trees can cut roots, and this can damage the tree resulting in tree decline or the tree falling over. Tree roots greater than about 2.5cm diameter should not be damaged. In some cases, roots of 2.5cm – 8cm diameter represent the major structural roots holding the tree upright. When roots greater than 2.5cm are exposed, a trained professional / arborist should be contacted.

3. Proposed additions/ amendments to Specifications

With reference to the following documents:

Aerial fibre Working Specification, March 2020

Frogfoot FTTH Implementation Specification Rev 1.4

The following guidelines / specification are proposed to be added / incorporated into the above working documents to ensure that impacts on existing street trees in Kimberley are minimized:

3.1 Hand excavation only within the Root Protection Area (RPA) of any street trees

3.2 As per both documents, permission from the landowner (municipality or closest resident/ property owner) must be sought before any pruning of canopy or excavation within the Root Protection Area (RPA) is carried out.

3.3 Attempt to have a minimum 1meter setback from the root flare of the tree trunk for any trenches or excavations. A 2m setback is much preferred and if at all possible / reasonable, all cable routes and excavations should remain outside the dripline of the canopy completely.

3.4 Tunneling under roots is preferable to cutting through them. If a root 2,5cm or greater in diameter is encountered this must be protected and either bridged or tunnel under it.

3.5 Cutting of roots must be made with tools that result in a clean sharp cut. No tearing. Any pruning of roots 2,5cm or larger must be undertaken by a knowledgeable person (arborist) and treated with the correct sealant product to avoid disease entering the tree tissue.

3.6 All pruning to tree canopies as per the Aerial Fibre Working Specification March 2020