

REPORT

On contract research for

BKS ENGINEERS (Pty) Ltd



MITCHELL'S PLAIN-PHILLIPI AND FIRGROVE-MITCHELL'S PLAIN TRANSMISSION LINE ROUTES, WESTERN CAPE

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1. TERMS OF REFERENCE

The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was contracted by BKS Engineers (Pty) Ltd to undertake a soil investigation between Phillippi and Firgrove, south-east of Cape Town in Western Cape Province. The purpose of the investigation is to contribute to the Environmental Impact assessment (EIA) process for a proposed 400 kV double circuit transmission line from Firgrove to Mitchell's Plain and a proposed 400 kV single circuit line from Mitchell's Plain to Phillip. The objectives of the study are;

- Using existing information, to classify the soils and to produce a soil map of the specified areas as well as
- To assess broad agricultural potential.

2. SITE CHARACTERISTICS

2.1 Location

The two corridors under investigation run as follows:

- Firstly, from the existing Phillippi substation (co-ordinates 33° 29' 51" S, 18° 32' 14" E) south-east to a new substation in the vicinity of the existing Mitchell's Plain substation (co-ordinates 34° 01' 16" S, 18° 36' 18" E).
- Secondly, from Mitchell's Plain approximately east to the existing Firgrove substation (co-ordinates 34° 02' 56" S, 18° 46' 57" E). This corridor also includes an option connecting the new substation at Mitchell's Plain to the existing Sitkland substation, north of Kuils River.

The locality is shown in Figure 1.

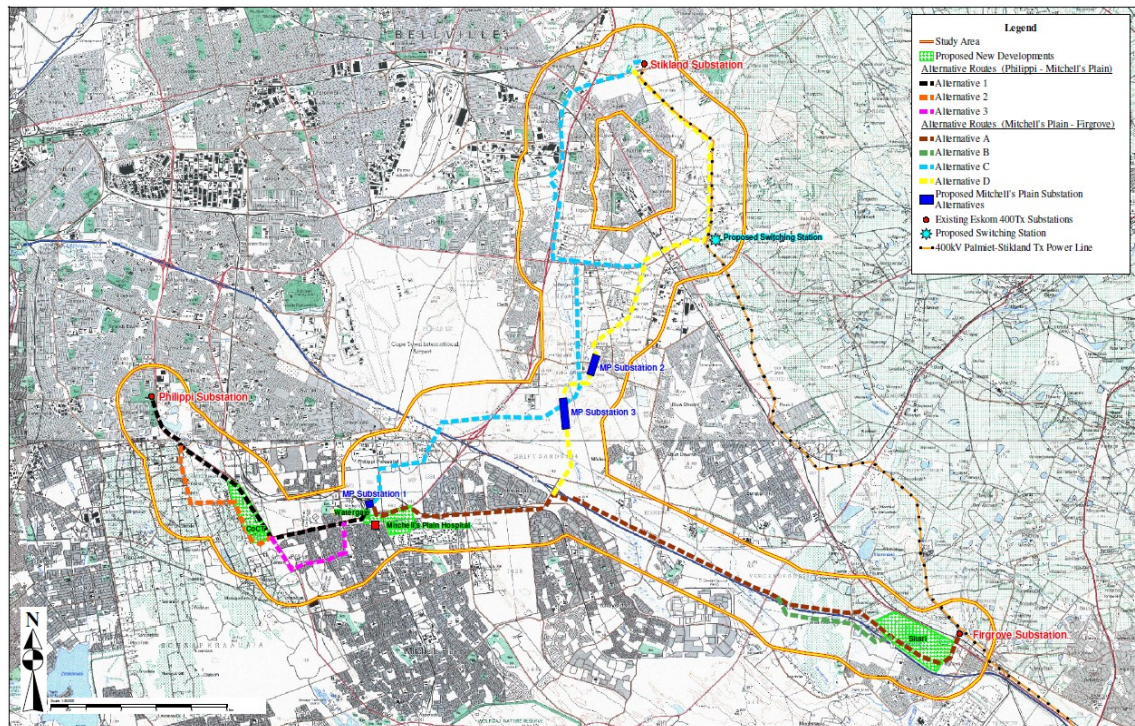


Figure 1 Locality map showing both corridors

2.2 Terrain

The area is located on the Cape Flats consists of virtually flat to slightly undulating topography. The routes lie generally at an altitude of less than 40 meters above sea level.

2.3 Climate

The climate of the area (Koch & Stehr, 2003) can be regarded as typical of the Cape west coast, with a low, all-year round rainfall distribution, warm to hot summers and cool winters. The main climatic indicators are given in Table 1 below.

Table 1 Climate Data

Month	Rainfall (mm)	Min. Temp (°C)	Max. Temp (°C)	Average frost dates
Jan	14.5	15.5	29.5	Start date: End date: Days with frost: -
Feb	14.7	15.6	29.8	
Mar	13.8	14.4	28.4	
Apr	48.9	11.9	25.3	
May	76.7	9.2	21.5	
Jun	89.2	6.9	18.4	
Jul	89.0	5.7	17.6	
Aug	79.9	5.9	18.4	Summer (Oct-Mar): Winter (Apr-Sept):
Sep	45.9	7.4	20.3	
Oct	32.7	9.4	23.3	
Nov	21.7	12.4	26.3	
Dec	14.8	14.3	28.2	
Year	524.7 mm	17.3°C (Average)		

The extreme high temperature that has been recorded is 43.0°C and the extreme low –0.5°C.

2.4 Parent Material

Most of the area comprises aeolian sands of the Witzand Formation (Geological Survey, 1990).

3. METHODOLOGY

The whole of the country is covered by land type data at 1:250 000 scale. However, most of the study area occurs within the boundary of the coverage by 1:50 000 scale soil maps (Jacobs, Oosthuizen & Stehr, 2003). It was therefore decided to use this information. In the 1:50 000 scale survey, soil mapping units were established according to dominant and sub-dominant soil forms, which could then be allocated to a class of general agricultural potential.

However, the portion of the routes that occur on the 1:50 000 map sheet 3418BB Somerset West has not yet been finalized and has consequently not yet been digitized and added to the rest of the survey. In order to incorporate this information in the map, the provisional information was checked and correlated so that lines could be drawn and the map was then digitised to produce the version included in the Appendix.

4. MITCHELL'S PLAIN-PHILLIPI

4.1 Soils

The area consists mainly of moderately deep to deep, fine- to medium-grained, grey to yellow sandy soils, dominantly of the Fernwood (Fw) and Namib (Nb) soil forms. Where the sandy soil has a subsoil clay horizon ("duplex" soil character), these soils belong mainly to the Kroonstad (Kd) and Katspruit (Ka) soil forms. Smaller areas of shallow soils with a structured clay or hardpan carbonate subsoil also occur.

A summary of the main soil characteristics is given in **Table 2** below (with corresponding colours as shown on the map).

(Note: the mapping units on the 3418 Somerset West 1:50 000 map sheet were digitized separately from another soil survey, so their symbols have no number added on).

Table 2 Soil mapping units of the Mitchell's Plain-Phillipi route

Map Unit	Dominant Soil form	Soil characteristics	Agricultural Potential
dNb	Namib	Deep (>1 200 mm), yellowish-grey, eluvial sands	Low to moderate
dFw	Fernwood	Deep (>1 200 mm), yellowish-grey, aeolian sands	Low to moderate
dLt	Lamotte	Deep (>1 200 mm), yellowish-grey, eluvial sands with a dark brown to reddish-brown subsurface horizon with iron and organic matter accumulation	Low to moderate
mdLt	Namib	Moderately deep to deep (600-1 200 mm), yellowish-grey, eluvial sands with a dark brown to reddish-brown subsurface horizon with iron and organic matter accumulation	Low to moderate
sKd	Kroonstad	Shallow (300-600 mm), grey to brown, sandy soils overlying mottled, usually structured, hydromorphic loamy sand to clay loam subsoils; often in low-lying positions	Low
sKa	Katspruit	Shallow (200-400 mm), grey to black, fine to medium sandy to sandy loam topsoils, on hydromorphic clay loams to clay subsoils; often in low-lying areas.	Very low
dWb	Witbank	Disturbed or excavated areas	Very low
U	-	Built up areas that were not surveyed	None

Note: where the same mapping unit is shown with a different number attached, eg dNb1, dNb4 etc, this simply refers to a separate occurrence of the same mapping unit, as referred to in the table above

4.2 Agricultural Potential

The sandy soils that predominate in the study area (deep Fernwood/Namib) have a low to moderate agricultural potential. Although these sandy soils are freely-drained and easy to work, they are prone to droughtiness, due to the low clay content (often <10%), and they are not very fertile, with much of the nutrients having been leached out. They may also have a susceptibility to wind erosion if exposed, caused by the fine to medium grade of sand.

The podzols (Lamotte form), may have a slightly higher clay content, but are often more acidic, with a lower pH. However, adding organic matter and fertiliser to all of these sandy soils can often make them productive.

The duplex soils (mainly Kroonstad) have a subsoil clay horizon (often at a shallow depth) which can often result in a wetness/flooding hazard, so these duplex soils have a low potential.

5. FIRGROVE-MITCHELL'S PLAIN

5.1 Soils

The area consists mainly of a mixture of soils. Moderately deep to deep, fine- to medium-grained, grey to yellow sandy soils, dominantly of the Namib (Nb) soil form, occur mainly in the west, while shallower, duplex soils (sandy topsoil abruptly overlying a structured clay subsoil) of the Kroonstad (Kd) or Estcourt (Es) soil forms are found more toward the east. An area of wetland soils of the Katspruit (Ka) soil form is found next to the Kuils River, just east of Khayelitsha and the Eerste River itself.

A summary of the main soil characteristics is given in **Table 3** below (with corresponding colours as shown on the map).

Table 3 Soil mapping units of the Firgrove-Mitchell's Plain route

Map Unit	Dominant Soil form	Soil characteristics	Agricultural Potential
dNb	Namib	Deep (>1 200 mm), yellowish-grey, eluvial sands	Low to moderate
dHu	Hutton	Deep (> 1 200 mm), red, sandy loam soils	Moderate to high
mdNb	Namib	Moderately deep (600-1 200 mm), yellowish-grey, eluvial sands, often on cemented hardpan carbonate	Low to moderate
mdKd	Kroonstad	Moderately deep (600-1 200 mm), grey to brown, sandy soils overlying mottled, usually structured, hydromorphic loamy sand to clay loam subsoils.	Low to moderate
sNb	Namib	Shallow (300-600 mm), yellowish-grey, eluvial sands, usually on cemented hardpan carbonate	Low
sGs	Glenrosa	Shallow (300-600 mm), grey-brown, loamy topsoils on weathering rock	Low
sKd	Kroonstad	Shallow (300-600 mm), grey to brown, sandy soils overlying mottled, usually structured, hydromorphic loamy sand to clay loam subsoils; often in low-lying positions	Low
sKa	Katspruit	Shallow (300-500 mm), grey to black, fine to medium sandy to sandy loam topsoils, on hydromorphic clay loams to clay subsoils; often in low-lying areas.	Very low
vsKa	Katspruit	Very shallow (100-300 mm), grey to black, fine to medium sandy to sandy loam topsoils, on hydromorphic clay loams to clay subsoils; in low-lying areas.	Very low
Vlei	Katspruit	Virtually permanent wetland areas, surface water and hydromorphic soils	None
U	-	Built up areas that were not surveyed	None

Note: where the same mapping unit is shown with a different number attached, eg dNb1, dNb4 etc, this simply refers to a separate occurrence of the same mapping unit, as referred to in the table above.

5.2 Agricultural Potential

The sandy soils that predominate in the study area (deep Namib soils) have a low to moderate agricultural potential. Although these sandy soils are freely-drained and easy to work, they are prone to droughtiness, due to the low clay content (often <10%), and they are not very fertile, with much of the nutrients having been leached out. They may also have a susceptibility to wind erosion if exposed, caused by the fine to medium grade of sand.

However, adding organic matter and fertiliser to all of these sandy soils can often make them productive.

The duplex soils (mainly Kroonstad, occasionally Estcourt) have a sandy topsoil abruptly subsoil clay horizon (often at a shallow depth) which can often result in a wetness/flooding hazard, so these duplex soils have a low potential. This is especially prevalent in the lowest parts of the landscape, especially close to the rivers.

6 PYLON POSITIONS

At a workshop held in Pretoria in March 2011, all of the proposed pylon positions for each route alternative were analysed for the potential impact on the soils occurring, from an agricultural viewpoint.

The rating that was used allocated the following classes:

0 – no impact

1 – low impact

2 – medium impact

3 – high impact

Using the soil maps (as in the Appendix), the ratings were applied for each route and the results were as follows:

PHILIPPI - MITCHELL'S PLAIN

Alternative 1 – only PM-1-18 is medium, all the rest are low or no impact.

Alternative 2 – all sites are medium, as this is an area of agricultural holdings

Alternative 3 – all sites are no impact

Alternative 4 – all sites are medium, as this area also has some agricultural holdings.

FIRGROVE - MITCHELL'S PLAIN

Alternative A – all sites are low or no impact (no areas with agriculture and good soils are traversed)

MITCHELL'S PLAIN - STIKLAND

Alternative C – all sites are no impact

Alternative D – only MS-D-33 and 34 are moderate (agricultural land near Polkadraai Road), all other sites are low or no impact

7 CONCLUSIONS

The soils are generally sandy, freely-drained, but lacking somewhat in fertility. Where subsoil clay horizons occur, they may well be prone to waterlogging. However, as long as care is taken in crossing wetlands or rivers, there is no fatal flaw that can be identified at this stage.

The impact of a transmission line is comparatively small, with small, isolated “footprints” for each separate pylon, as long as irrigated areas are not impacted. A request was made by the Western Cape Provincial Department of Agriculture to address the possibility of “unique soils” occurring in the study area. Due to the prevailing sandy nature of the soils, and associated fertility depletion, it is extremely unlikely that “unique” soils occur in the area, and there has been no project that has mapped such soils, especially at a detailed scale. The soil investigation has identified the areas of varying potential in order that comparisons may be made.

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Jacobs, E.O., Oosthuizen, A.B. & Stehr, B.I., 2003. Soils of the Cape Metropolitan area (Second edition). Report No. GW/A/1999/83, ARC-Institute for Soil, Climate and Water, Pretoria.

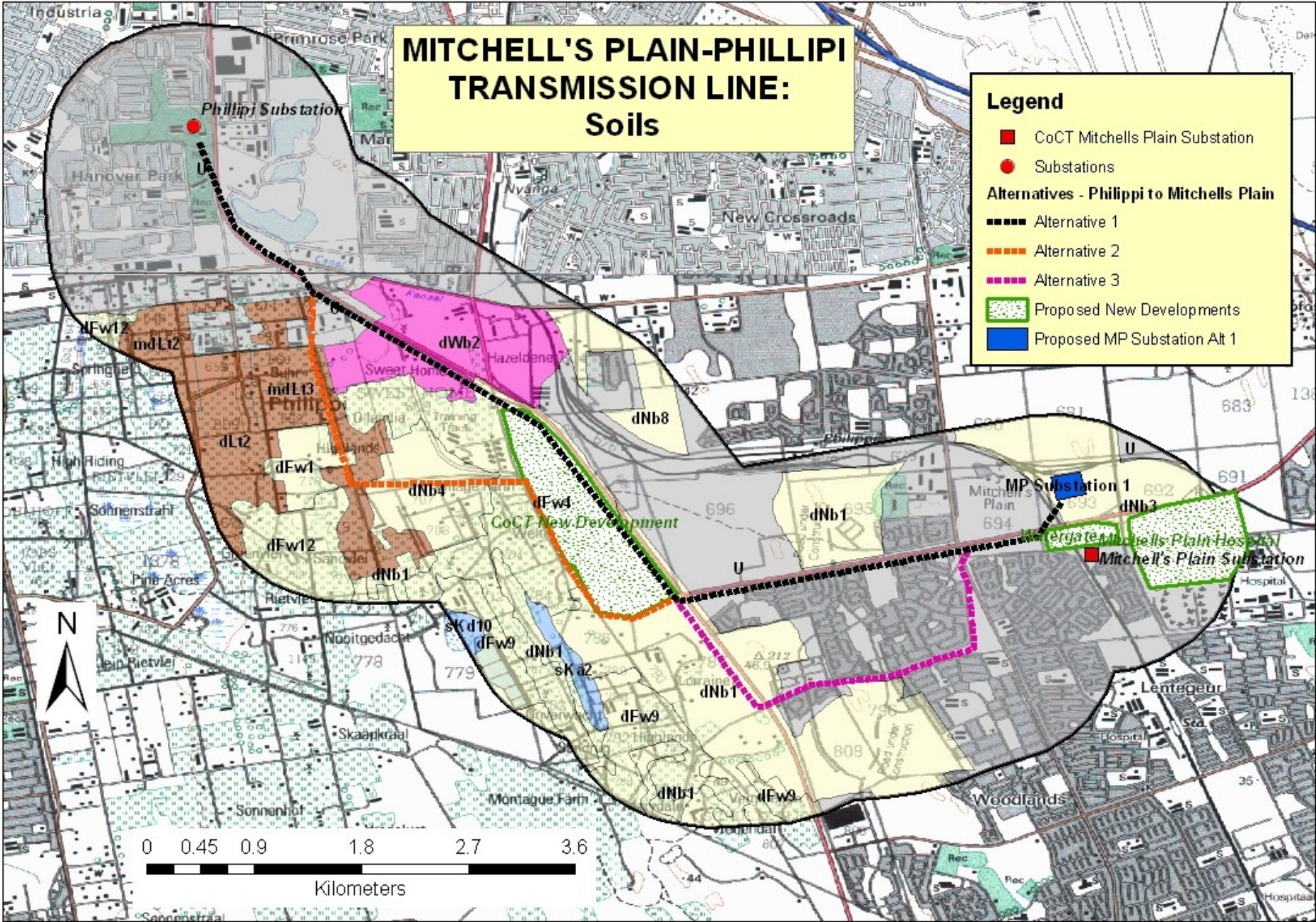
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**APPENDIX:
SOIL MAPS**

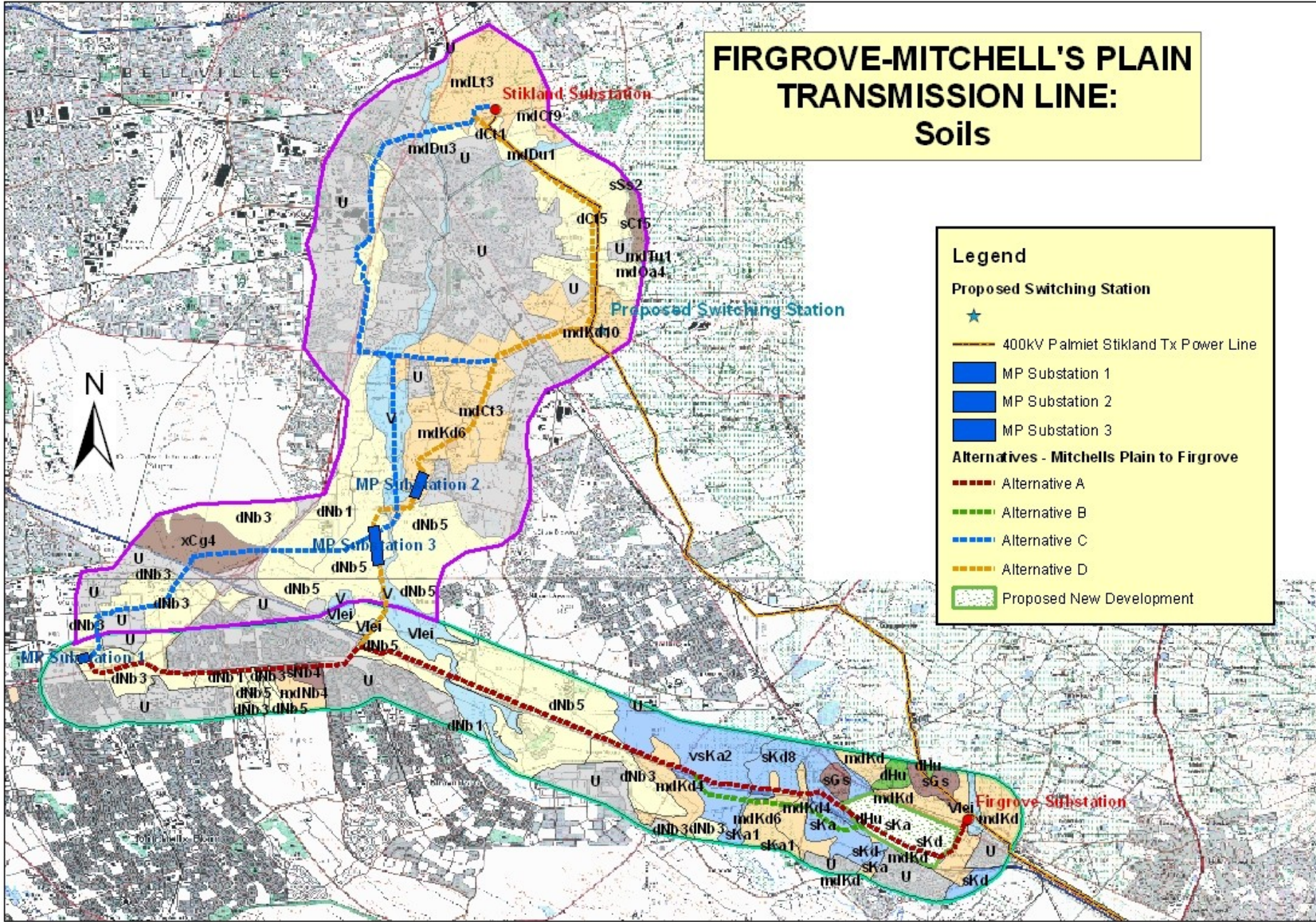
MITCHELL'S PLAIN-PHILLIPI TRANSMISSION LINE: Soils

Legend

- CoCT Mitchells Plain Substation
- Substations
- Alternatives - Philippi to Mitchells Plain**
- Alternative 1
- Alternative 2
- Alternative 3
- Proposed New Developments
- Proposed MP Substation Alt 1



FIRGROVE-MITCHELL'S PLAIN TRANSMISSION LINE: Soils



Legend

Proposed Switching Station

- ★

400kV Palmiet Stikland Tx Power Line

-

MP Substation 1

-

MP Substation 2

-

MP Substation 3

-

Alternatives - Mitchells Plain to Firgrove

- Alternative A
- Alternative B
- Alternative C
- Alternative D

Proposed New Development

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