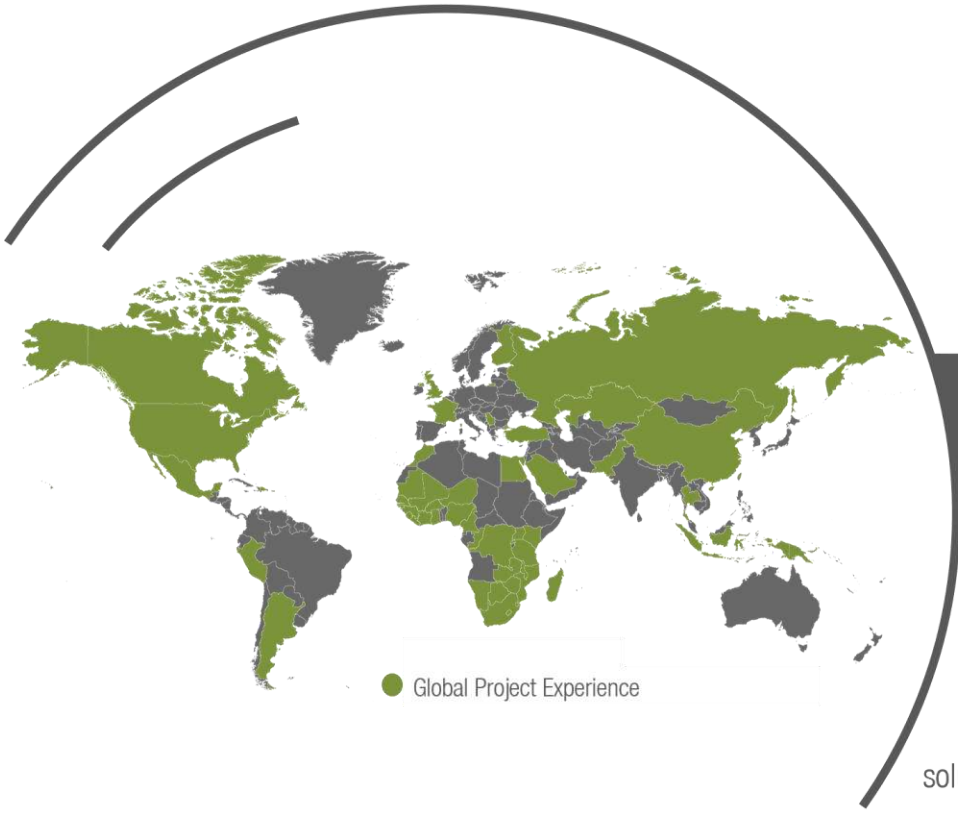

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Dorstfontein East Visual Impact Assessment

Visual Impact Assessment

Prepared for:
Exxaro Coal Central

Project Number:
EXX5725

September 2021

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Report Type:	Visual Impact Assessment
Project Name:	Dorstfontein East Visual Impact Assessment
Project Code:	EXX5725

Name	Responsibility	Signature	Date
Alistair Main	Environmental GIS Specialist		September 2021
Prevlan Chetty	Technical Review		September 2021

EXECUTIVE SUMMARY

Exxaro Central Coal (Pty) Ltd (hereafter ECC) holds an approved Mining Right with reference number MP 30/5/1/2/3/2/1 (51) MR for opencast and underground mining at the Dorstfontein East Coal Mine (DECM) situated in the Mpumalanga Province. The Dorstfontein East Coal Mine aims to extend the existing underground mining area (approved under the ownership of Total Coal South Africa (Pty) Ltd - hereafter "Total") and introduce additional infrastructure in support of the expansion. ECC aims to extend the underground mining area of the 2 Seam and 4 Seam associated with the Mining Right.

As part of the authorisation process, a Visual Impact Assessment (VIA) was conducted on the current operation design to determine the potential visual impacts that could arise from the development of the project on the surrounding environment. Digby Wells has applied a series of quantitative modelling techniques to determine the potential magnitude and spatial distribution of the visual impacts. The approach adopted by Digby Wells includes a characterisation of the project area in terms of its existing sense of place which is a critical factor in determining the relative influence that a coal-mining project has on an area. Once the sense of place was established, the potential receptors within a 20-kilometre zone of influence were identified and categorised. Multiple viewsheds were then run on the most prominent components that have been proposed, included the discard wash plant , the workshop and office area, and ventilation fan (and associated infrastructure within the worshop area footprint.

The findings from the viewshed analysis indicate that the discard wash plant will potentially have the largest visual impact influence on the surrounding environment, followed by the workshop, office, and ventilation fan area extending up to 20-kilometres away from the project development site. Importantly, the effective visual screening offered by the surrounding topography restricts the remainder of the viewshed modelling results across the mines various other infrastructure elements to the immediate project area within ten-kilometres of the project development site.

The VIA indicates Identified sensitive receptors include the motorists travelling on the R544 and R547, but exposure to the proposed development from these transport routes is limited to specific locations which can be mitigated with the use of visual screens such as tree-lines. Homestead and farming related structures that are within the high visual exposure zones have been identified, and mitigation measures are suggested to minimise the anticipated visual impact from the Project development. An effective method of mitigation would be in the form of tree-lines which should be placed closer to the location of the identified receptors. It must however be noted that due to the height of the proposed infrastructure the suggested mitigation measures are likely to reduce but not completely negate any potential visual impact.

The majority of human settlements that are within the greater modelled viewshed output regions are dispersed settlement holdings, who have a sense of place characterised by the regions surrounding open cast coal mines, so the anticipated impacts are not going to

significantly alter the sense of place, especially because all of the proposed activities and surface infrastructure is within in an existing operational mining footprint.

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1. Introduction

Exxaro Central Coal (Pty) Ltd (hereafter ECC) holds an approved Mining Right with reference number MP 30/5/1/2/3/2/1 (51) MR for opencast and underground mining at the Dorstfontein East Coal Mine (DECM) situated in the Mpumalanga Province. The Dorstfontein East Coal Mine aims to extend the existing underground mining area (approved under the ownership of Total Coal South Africa (Pty) Ltd - hereafter "Total") and introduce additional infrastructure in support of the expansion. ECC aims to extend the underground mining area of the 2 Seam and 4 Seam associated with the Mining Right.

The proposed additional infrastructure triggers activities listed in the Environmental Impact Assessment (EIA) Regulations, 2014 (GN R 982 of 4 December 2014 as amended by GN R 326 of 7 April 2017) promulgated under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). To this end, Digby Wells Environmental (hereinafter Digby Wells) was appointed as the independent Environmental Assessment Practitioner (EAP) to complete the EIA in support of the Environmental Authorisation (EA) application.

The EIA process includes a suite of specialist studies including an Visual Impact Assessment (VIA).

2. Project Background and Description

The DECM was previously owned by Total Coal South Africa (Pty) Ltd (Total) and was ceded to ECC on 20 August 2015 which has an approved Environmental Management Programme (EMPr), dated October 2017 and is also approved to undertake underground mining of deeper coal reserves at DECM. Subsequently, additional coal reserves have been identified for mining which is not covered under the existing approval. Exxaro Central Coal is now applying to expand the underground mining areas. This application "the Project", pertains to the expansion of underground mining and the addition of new surface infrastructure within the existing Mining Right Area (MRA) MP30/5/1/2/51MR. The underground mining operations will be accessed from the existing Pit 2 open cast and Dorstfontein West operations. The Dorstfontein East Coal Mine , intends to further extend the Life-of-Mine (LoM) through the exploitation of these identified additional coal reserves between 2021 until 2034 (14 years).

In addition, a portion of Pit 3, which is approved for opencast mining, will now be included in the underground mining extension. The Pit 3 coal reserves are contained in both Seam 4 and Seam 2.

2.1. Mining

The planned LoM is one year for the construction phase followed by an approximate 14-year operational (production) phase. A coal discard processing plant has been proposed to treat 100 kilotons per month (ktpm) of re-mined coal discard, with a total of 1,200,000 tonnes per annum (tpa).

2.2. Proposed Infrastructure

The required infrastructure/activities proposed for the extension include (refer **Error! Reference source not found.**):

- Portal ventilation fan;
- Sewage Treatment Plant;
- Water Treatment Plant;
- Potable Water storage tank;
- Erikson Pond;
- A new 22 kV overhead powerline from the existing substation to a new 22kV substation;
- Run of Mine (RoM) Stockpile conveyor at portal;
- Change house;
- Lamp room;
- Office;
- Clinic;
- Stores;
- Workshop area;
- Stone dust silo; and
- Coal discard processing plant.

An environmental regulatory process comprising of an amendment and consolidation of the Environmental Management Programme (EMPr) and Integrated Water Use License (IWUL) is required for the new proposals. The proposed extension of the underground areas is depicted in **Error! Reference source not found.** and **Error! Reference source not found.** below.

The Visual Impact Assessment is concerned with surface infrastructure that will potentially cause a visual impact on the surrounding environment and in particular, potentially sensitive receptors within the surrounding environment.

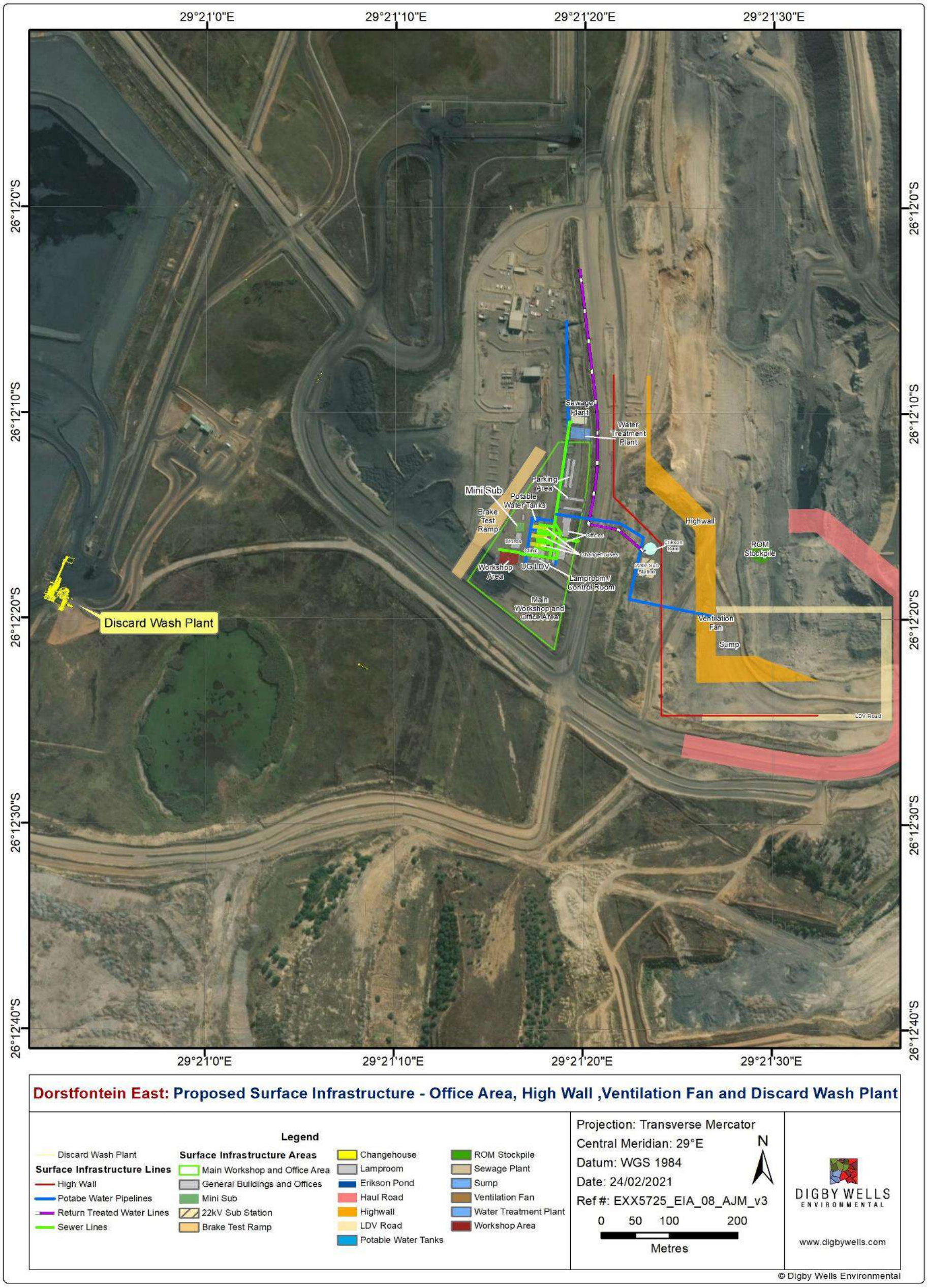

Figure 2-1: Proposed Surface Infrastructure

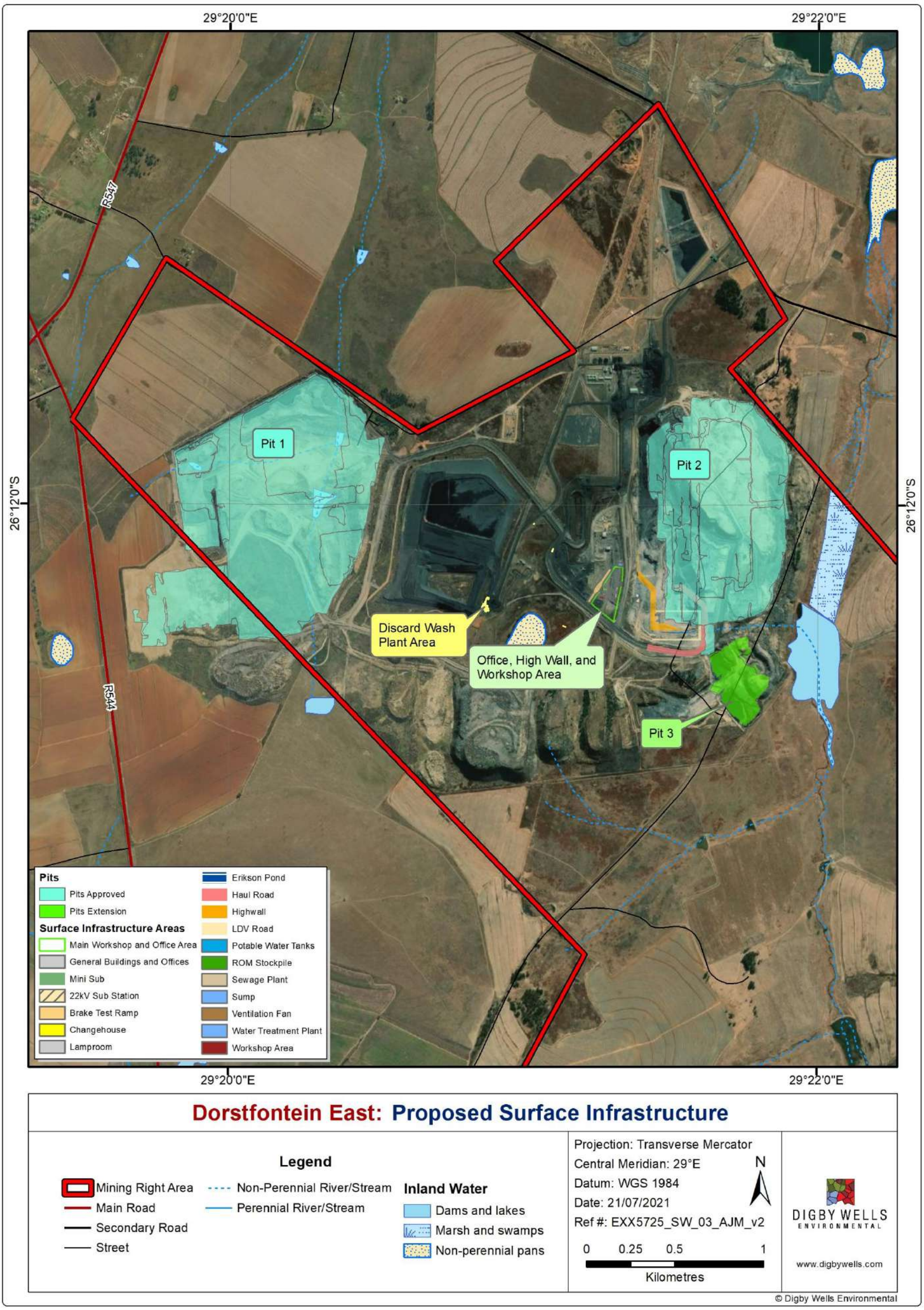

Figure 2-2: Approved and Proposed Surface Infrastructure (Including Pits)

2.3. Topography

A desktop study was conducted to evaluate the topography of the receiving environment along with an evaluation of aerial and satellite imagery. Figure 2-4 provides an overview of the regional topography for the region, which indicates an elevation range from 1,480 metres above mean sea level (m.a.m.s.l.) in the Olifants River and Steenkoolsprtuit calleys to 1,760m.a.m.s.l., which characterises the area as a moderate undulating terrain with low hills and pan depressions. The hills in the region have an elevation range between 60 and 80 meters, which is conducive to moderate-to-high visual screening. It must also be noted that the presence of existing mining infrastructure in the form of discard dumps, stockpiles, and overburden dumps will also provide a level of visual screening.

2.4. Vegetation

The regional vegetation is classified as Eastern Highveld grassland, defined by highveld short dense grass land (Arsitida, Digitaria, Erafrostsis, Themeda, Tristachya etc.). Woody species are sporadically distributed throughout the region. The regional vegetation characterisation is not conducive to high visual screening, with the exception of the sporadic woody species. Figure 2-5 provides an overview of the regional vegetation in the area.

The immediate project areas field investigation that was conducted in 2020 by DWE concluded that the vegetation habitats within the Project Area include, grasslands, wetlands, outcrops of sandstone and ferricrete and modified areas. Project Area comprises of Wetlands, Grasslands (Primary and Secondary), Rocky Outcrops (Sandstone Sheaths and Ferricrete Outcrops) and Cultivated (transformed and/or modified) units. The project area is heavily modified as a result of ecisiting mining activities.

Figure 2-3 shows the regional vegetation characterisation of the study outside of the existing mining areas.

Figure 2-3: Regional vegetation field photo

2.5. Existing environment

The project are falls within the Gert Sibande District Municipality, the largest of three districts in Mpumalanga, with numerous strategic national roads passing through it. The mining and manufacturing sectors are the strongest economic drivers in the municipality. The region is relatively sparsely populated when compared to the economic hubs and regional services centres such as Emalahleni and Middleburg. Within the immediate and surrounding area to the proposed development area, there are no large aggregates of community settlements, but rather disperse settlement patterns that are associated with the farms in the region. The largest settlement in relation to the proposed infrastructure is Kriel, 10km south – west of the proposed infrastructure.

The VIA focuses on a 20-kilometre zone of influence around the proposed development area, which is characterised by open-cast coal mining activity, with numerous coal mines within the close proximity of the project areas. Coal mining operations in the region are relatively small when compared to the Witbank coal-fields and operate with an open-cast mining method. In terms of supporting infrastructure, the region contains roads, electrical power supply and

railway lines. The closest coal fired power station is within 15-kilometres of the proposed development.

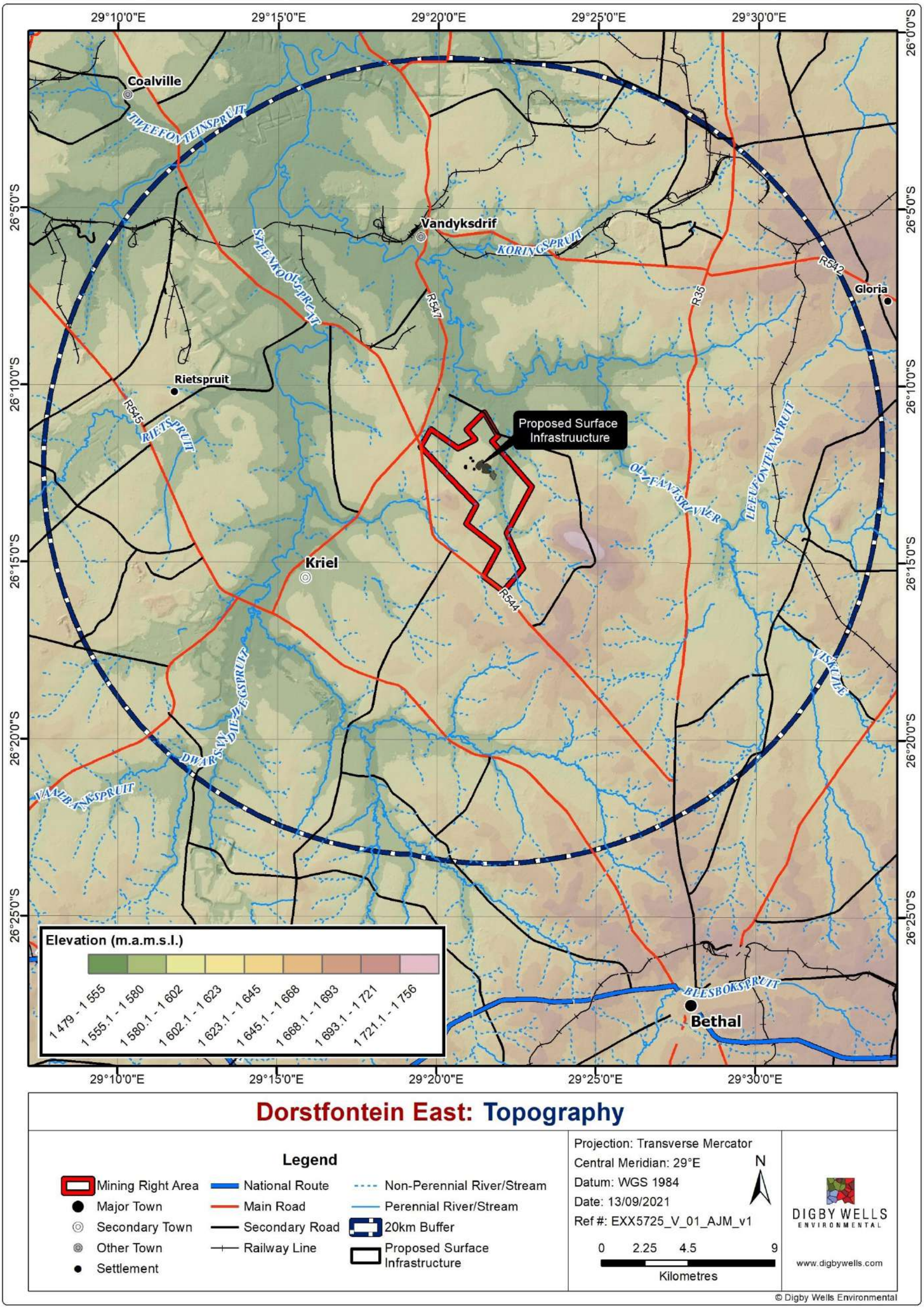

Figure 2-4: Regional Topography

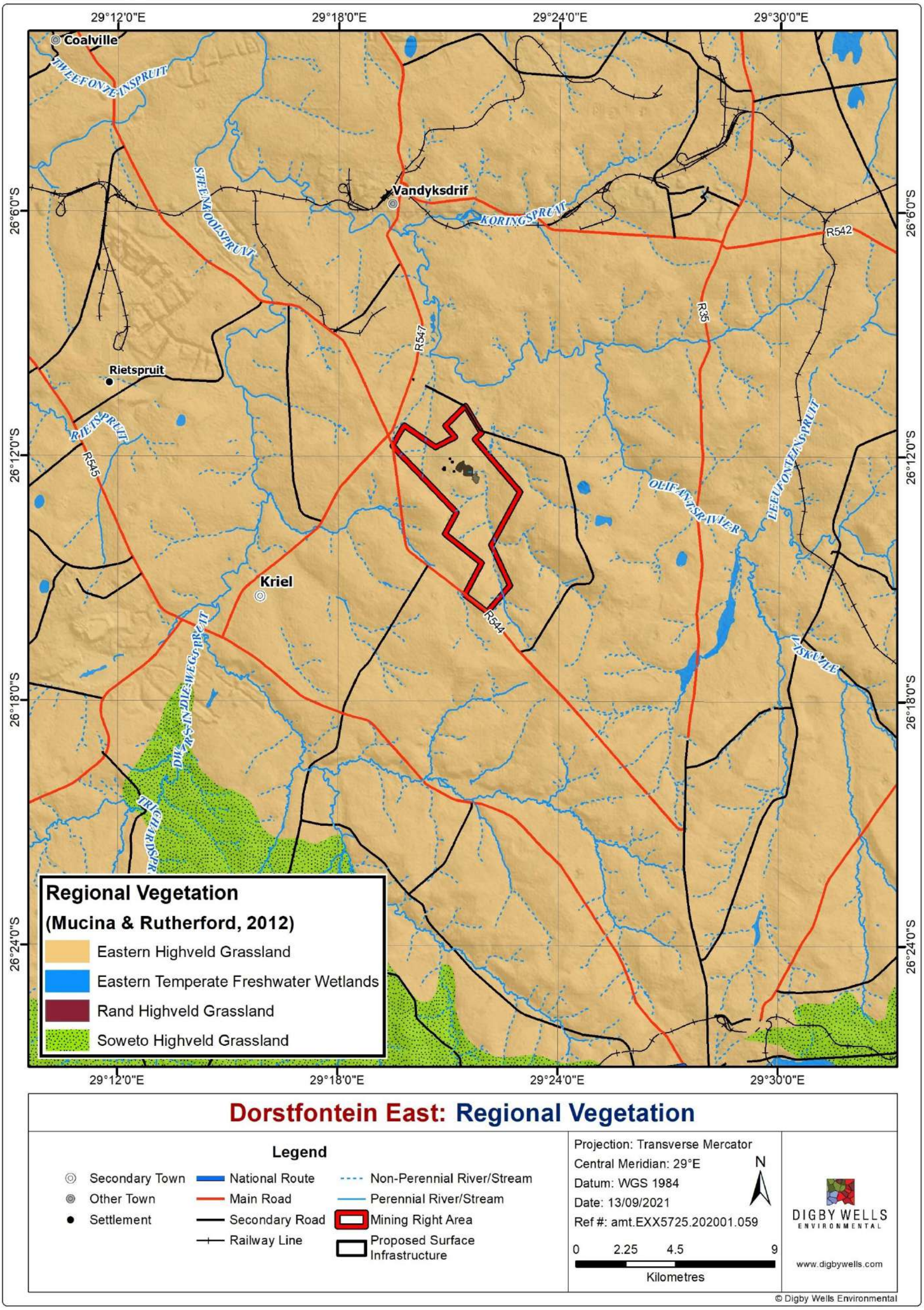

Figure 2-5: Regional vegetation

3. Terms of reference

The Terms of Reference (ToR) for the VIA are to:

- Describe the baseline visual characteristics of the proposed Project site and surrounding area.
- Identify, describe, and assess the expected significance of potential visual impacts that may arise due to the implementation of the project.
- Recommend appropriate mitigation measures and management actions to avoid or minimise potential negative impacts with the proposed project.

4. Relevant legislation, standards and guidelines

The VIA has been completed in terms of NEMA Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) Appendix 6: Specialist Reports. Where applicable, the Report uses references from the International Finance Corporation's (IFC) Performance Standards.

At a national level, the following legislative documents potentially apply to the visual assessment:

- Regulations in Chapter 5 (Integrated Environmental Management) of the NEMA, 1998 (Act No. 107 of 1998) (NEMA) and the Act in its entirety. The Act states that "the State must respect, protect, promote and fulfil the social, economic and environmental right of everyone…" Landscape is both moulded by, and moulds, social and environmental features;
- The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) and related provincial regulations – in some instances there are policies or legislative documents that give rise to the protection of listed sites. The NHRA states that it aims to promote "good management of the national estate, and to enable and encourage communities to nurture and conserve their legacy so that it may be bequeathed for future generations". A holistic landscape whose character is a result of the action and interaction and/or human factors has strong cultural associations as societies and the landscape in which they live are affected by one another in many ways; and
- Section 17 of the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEM: PAA) sets out the purposes of the declaration of areas as protected areas which includes the protection of natural landscapes. Landscapes are defined by the natural, visual and subjectively perceived landscape; these aspects of a landscape are intertwined to form a holistic landscape context.

In addition, the VIA utilises the "Guideline for involving visual and aesthetic specialists in EIA processes" document by Oberholzer (2005) has been used as a best practice guideline for this Visual Impact VIA. Although these guidelines were developed for the Western Cape province of South Africa they are relevant for this VIA as "the guidelines promote the principles

of EIA best practice without being tied to specific legislated national or provincial EIA terms and requirements" (Oberholzer, 2005).

5. Assumptions, limitations and exclusions

The constraints and limitations to the impact assessment are presented in Table 5-1 below.

Table 5-1: Applicable Constraints and Limitations and their Consequences

Constraint or Limitation	Consequence
At the time of the compilation of the report, the infrastructure heights associated with the project design were unavailable. To effectively model the potential visual impact, assumptions were drawn using existing UCD facilities as a baseline.	Attempts were made to model the "worst-case" scenario. As such, the modelling outputs are limited to the assumed heights that were used at the time of the study.

6. Data

The datasets utilised as part of this assessment are presented in Table 6-1 below.

Table 6-1: Datasets utilised

Dataset	Description	Application
5m National Geospatial Institute (NGI) Contours	The 5 m-resolution contour dataset from the DRDLR is generated by the Intergraph Dual Mass Camera (DMC) which captures stereo imagery at a GSD of 0.5 m (NGI, 2018). The NGI also contracts service providers with similar cameras to acquire data owing to the scale of the operation. Currently, the NGI aims to capture 40% of the country every 3 years and the remaining areas every 5 years. The dataset included in this research is the 5 m contour dataset (referred to as the NGI dataset), which was last updated 8 December 2009, for the study area	The 5m NGI contours were used to generate a continuous representation of the earths surface over the project area and its surroundings.
Client provided infrastructure layout	Infrastructure designs were provided to DWE in CAD format representing the various infrastructure components and footprints.	The CAD data was converted to a GIS-native format (Shapefile) which formed the basis of the areas to be modelled.
Open Street Map (OSM) datasets	OSM datasets are community driven, publicly available datasets representing spatial points of interest. This includes roads and spatial points of interest such as tourist attractions and accommodation.	The OSM data was utilized to identify potential receptors.

Satellite Imagery – Google Earth Platform	Google Earth provided access to satellite imagery over the project site. The latest imagery date over the regional project area is dated to the 21/04/2021.	The satellite imagery was utilized to interpret receptor locations.

7. Methodology

This section of the report describes the methodology adopted in determining the status quo of the visual environment on the various Project sites.

7.1. Determining the baseline environment

Determinations of the baseline environment are critical in characterising the existing sense of place for the study area. The sense of place is composed of the topography, the regional vegetation and the existing environment. As per the Oberholzer environment categorisation, the project area is best described as an area of medium scenic, cultural or historical significance.

7.2. Receptor identification

Potential receptors were identified using the 2018 national land use data as distributed by the Department of Forestry, Fisheries and the Environment. In addition, Digby Wells identified the locations of disperse settlements which characterise the region using the available satellite and aerial imagery in conjunction with Open Street Map datasets which includes the distribution of road networks and other points of significant interest. Receptors that are regarded as sensitive to visual impacts include residents, tourists and motorists.

7.3. Viewshed Modelling

The topographical representation of the project area was derived using the 5m NGI contour dataset, which was interpolated to represent a continuous raster surface. Using geospatial modelling techniques, a series of viewsheds were then run using individual infrastructure features which commonly have the largest visual prominence. The viewshed modelling techniques applied utilise a combination of ArcGIS and GlobalMapper software environments to identify areas from which the proposed development will be potentially visible. The procedure then also categorises the magnitude of visual impact which is determined by the distance from the development and how much of the infrastructure is visible to the receptor area. Visual exposure and the visual impact of a development diminish exponentially with distance (Oberholzer, 2005).

The concept of viewshed modelling is depicted in Figure 7-1: Theoretical background of viewshed modelling. The topography denotes whether a development will be visible from a receptor. In **Error! Reference source not found.** the development is only visible from the receptors within the valley and on the slopes of the hills facing it. The development will be hidden from all receptors beyond the first hills.

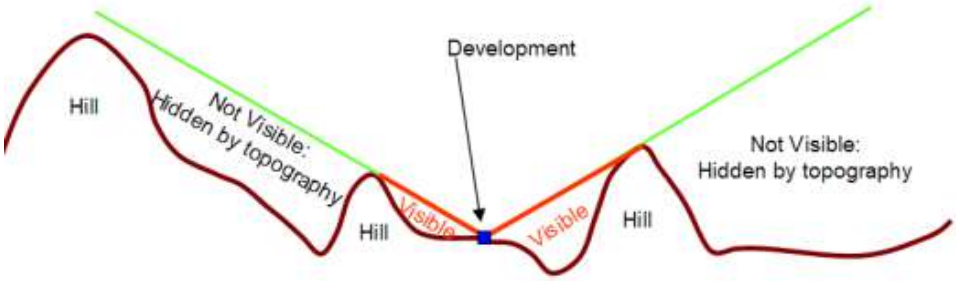

Figure 7-1: Theoretical background of viewshed modelling

Viewshed models were created for daytime conditions only. These viewshed models are based on the topography only and do not take the screening effect of vegetation into account. The viewshed models depict worst case scenarios and show the areas from which the Project may potentially be visible.

Based on findings from the field work, along with the sense of place categorisation for this project, the zone of influence was determined to be within 20-kilometre. Table 7-1 below lists the various infrastructure elements that were run as part of the assessment.

Table 7-1: Infrastructure viewshed modelling parameters

Infrastructure	Offset Height
Discard Dump	30-meter
Box-cut & Berm	5-meter
Overburden Stockpile	20-meter
Vent Shaft	5-meters
Product Stockpiles & Plant	10-meter
Workshops, Offices & PCD Area	5-meter

7.4. Impact assessment methodology

Impacts and risks have been identified based on a description of the activities to be undertaken. Once impacts have been identified, a numerical environmental significance rating process will be undertaken that utilises the probability of an event occurring and the severity of the impact as factors to determine the significance of a particular environmental impact.

The severity of an impact is determined by taking the spatial extent, the duration and the severity of the impacts into consideration. The probability of an impact is then determined by the frequency at which the activity takes place or is likely to take place and by how often the type of impact in question has taken place in similar circumstances.

Following the identification and significance ratings of potential impacts, mitigation and management measures will be incorporated into the Environmental Management Plan (EMP).

Details of the impact assessment methodology used to determine the significance of physical, bio-physical and socio-economic impacts are provided below.

The significance rating process follows the established impact/risk assessment formula:

Significance = Consequence x Probability x Nature

Where

Consequence = Intensity + Extent + Duration

And

Probability = Likelihood of an impact occurring

And

Nature = Positive (+1) or negative (-1) impact

Note: In the formula for calculating consequence, the type of impact is multiplied by +1 for positive impacts and -1 for negative impacts.

The matrix calculates the rating out of 147, whereby intensity, extent, duration and probability are each rated out of seven as indicated in **Error! Reference source not found.**. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation and again after consideration of the mitigation has been applied; post-mitigation is referred to as the residual impact. The significance of an impact is determined and categorised into one of eight categories (Table 7-2). The descriptions of the significance ratings are presented in Table 7-3.

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, (i.e., there may already be some mitigation included in the engineering design). If the specialist determines the potential impact is still too high, additional mitigation measures are proposed.

Table 7-2: Impact assessment parameter ratings

Rating	Intensity/ Replaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
7	Irreplaceable loss or damage to biological or physical resources or highly sensitive environments. Irreplaceable damage to highly sensitive cultural/social resources.	Noticeable, on-going natural and/or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international borders.	Permanent The impact is irreversible, even with management, and will remain after the life of the project.	Definite There are sound scientific reasons to expect that the impact will definitely occur. > 80% probability
6	Irreplaceable loss or damage to biological or physical resources or moderate to highly sensitive environments. Irreplaceable damage to cultural/social resources of moderate to high sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond Project Life The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost Certain/Highly Probable It is most likely that the impact will occur. < 80% probability

Rating	Intensity/ Replaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
5	Serious loss and/or damage to biological or physical resources or highly sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province/Region Will affect the entire province of region.	Project Life (> 15 years) The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely The impact may occur. < 65% probability
4	Serious loss and/or damage to biological or physical resources or moderately sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures/items of cultural significance.	Average to intense natural and/or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long Term 6-15 years and the impact can be reversed with management.	Probable Has occurred here or elsewhere and could therefore occur. < 50% probability

Rating	Intensity/ Replaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
3	Moderate loss and/or damage to biological or physical resources or low to moderately sensitive environments, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	Local Local extending only as far as the development site area.	Medium Term 1-5 years and the impact can be reversed with minimal management.	Unlikely Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. < 25% probability
2	Minor loss and/or effects to biological or physical resources or low sensitive environments, not affecting ecosystem functioning. Minor medium term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experienced by a small percentage of the baseline.	Limited Limited to the site and its immediate surroundings.	Short Term Less than 1 year and is reversible.	Rare/Improbable Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. < 10% probability

Rating	Intensity/ Replaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
1	Minimal to no loss and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to common place structures.	Some low-level natural and/or social benefits felt by a very small percentage of the baseline.	Site Specific Limited to specific isolated parts of the site.	Immediate Less than 1 month and is completely reversible without management.	Highly Unlikely/None Expected never to happen. < 1% probability

Table 7-3: Probability/Consequence matrix

Probability	Significance																																						
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	-21	**-20**	**-19**	**-18**	**-17**	**-16**	**-15**	**-14**	**-13**	**-12**	**-11**	**-10**	**-9**	**-8**	**-7**	**-6**	**-5**	**-4**	**-3**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
Consequence																																							

8. Results

8.1. Categorisation of Visual Impacts

The expected visual impact of the Project was categorised based on the type of receiving environment and the type of development as detailed in Table 8-1 (Oberholzer, 2005). The table provides an indication of the visual impacts that can be expected for different types of developments in relation to the nature of the receiving environment. Following this classification system, the Project is classed as a **Category 5 development**. The receiving environment is best described as an **area of medium scenic, cultural or historical significance**. It is therefore expected that the Project will potentially have a **high visual impact** on the receiving environment as shown in Table 8-2.

Table 8-1: Key to Categorisation of Development (adapted from Oberholzer, 2005)

Type of Development	Examples of Development
Category 1	Nature reserves, nature related recreation, camping, picnicking, trails and minimal visitor facilities.
Category 2	Low-key recreation/resort/residential type development, small-scale agriculture/nurseries, narrow roads and small-scale infrastructure.
Category 3	Low density resort/residential type development, golf or polo estates, low to medium-scale infrastructure.
Category 4	Medium density residential development, sports facilities, small-scale commercial facilities/office parks, one-stop petrol stations, light industry, medium-scale infrastructure.
Category 5	High density township/residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large-scale infrastructure generally. Large-scale development of agricultural land and commercial tree plantations. Quarrying and mining activities with related processing plants.

Table 8-2: Categorisation of Expected Visual Impact (adapted from Oberholzer, 2005)

Type of Environment	Type of Development (Low to High Intensity)				
	Category 1 Development	Category 2 Development	Category 3 Development	Category 4 Development	Category 5 Development
Protected/wild areas of international, national or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high, scenic, cultural or historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected
Areas or routes of medium scenic, cultural or historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected
Areas or routes of low scenic, cultural or historical significance	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected
Disturbed or degraded sites/run down urban areas/wasteland	Little or no visual impact expected. Possible benefits	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

For projects where a high or very high visual impact is expected, Oberholzer (2005) recommends that a Level 4 visual assessment be conducted. A Level 4 visual assessment includes the following:

- Identification of issues raised in the scoping phase, and site visit;
- Description of the receiving environment and the proposed project;
- Establishment of view catchment area, view corridors, viewpoints and receptors;
- Indication of potential visual impacts using established criteria;
- Description of alternatives, mitigation measures and monitoring programmes; and
- Complete 3D modelling and simulations, with and without mitigation.

8.2. Receptor identification

An analysis of the various datasets used for the receptor identification indicates the following categories of receptors shown in Table 8-3.

Table 8-3: Receptor categorisation

Identified Receptor Category	Description	Distance from proposed development
Disperse settlements	The project area is characterized by disperse settlements which are located throughout the surrounding farms.	Ranging from immediate vicinity to 20 km.
Town Settlements	Thubelihle	5.1 km
	Kriel	7 - 10 km
	Blesboklaagte	11.2 km
	Vanwyksdrif	11 km
Nature Reserve	None within the Zone of Infuence	-
Motorists	R544	2.2 km
	R547	2.2 km
	R545	11 km
Surrounding Coal Mine Operations	Various active and inactive coal mines around the region	Ranging from 1 km to 20 km.

Figure 8-1 provides a spatial representation of the various potential sensitive receptors that have been identified.

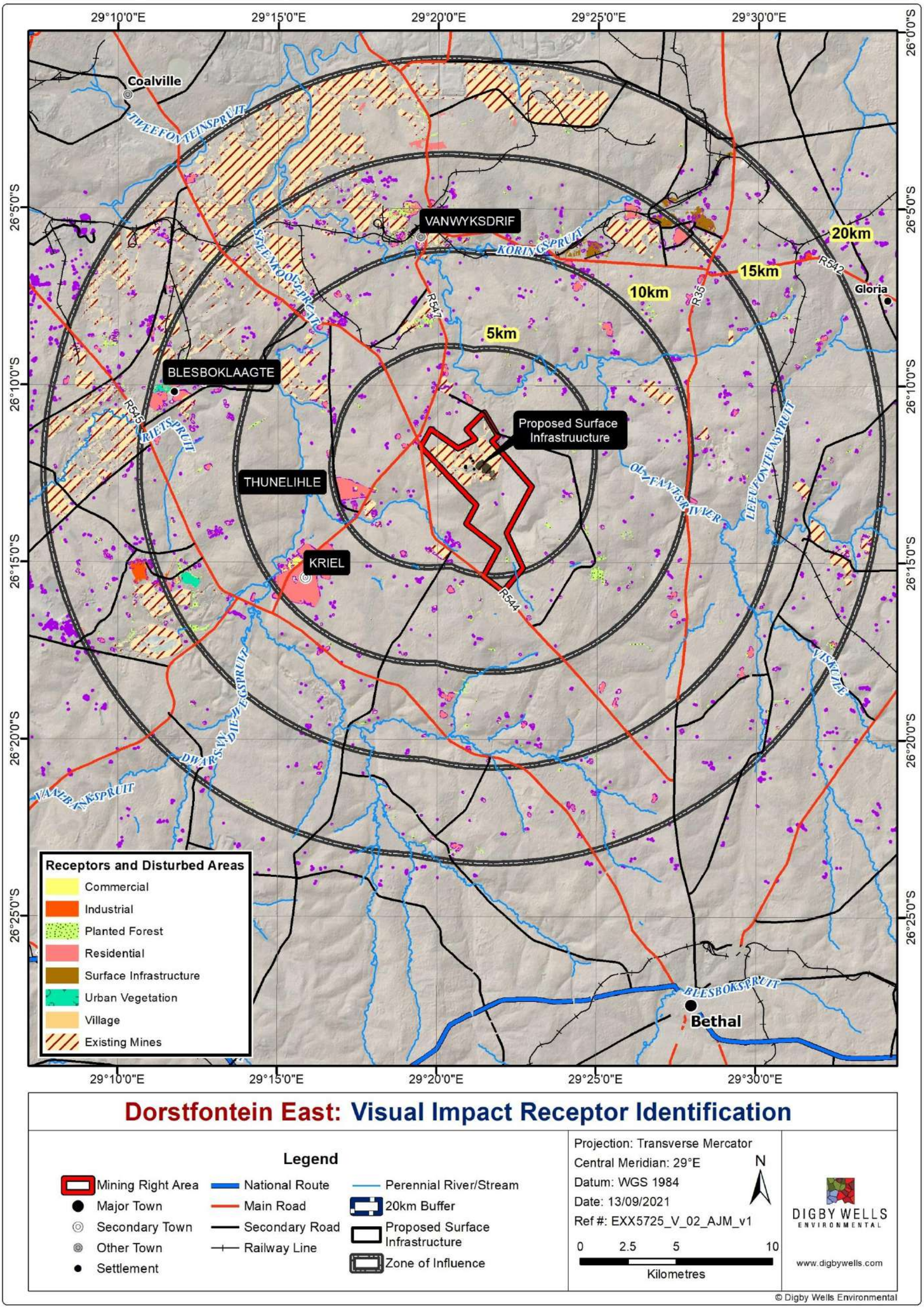

Figure 8-1: Receptor identification and distribution

8.3. Viewshed assessment

The results from the viewshed modelling process are presented in this section, where individual viewsheds were run to model the potential impact of the most significant infrastructure features as detailed in table Table 7-1.

8.3.1. Discard Wash Plant viewshed results

The results indicate that the discard dump will have the largest potential for visual impact based on the area of visibility. Very high visual exposure is limited to the region within five kilometres of the development area. The results also show that the majority of the visual impact is anticipated to occur to the Norther an Eastern side of the project area, owing to the visual screening from the topographical variation. Sections along the R547 and R5444 main road are affected by High levels of visual exposure. Figure 8-2 shows the extent of the viewshed modelling results from the discard dump. The main contribution is due to the vertical offset of 15-meters, which is anticipated to be the highest feature from the operational phase of the mine of the proposed new infrastructure.

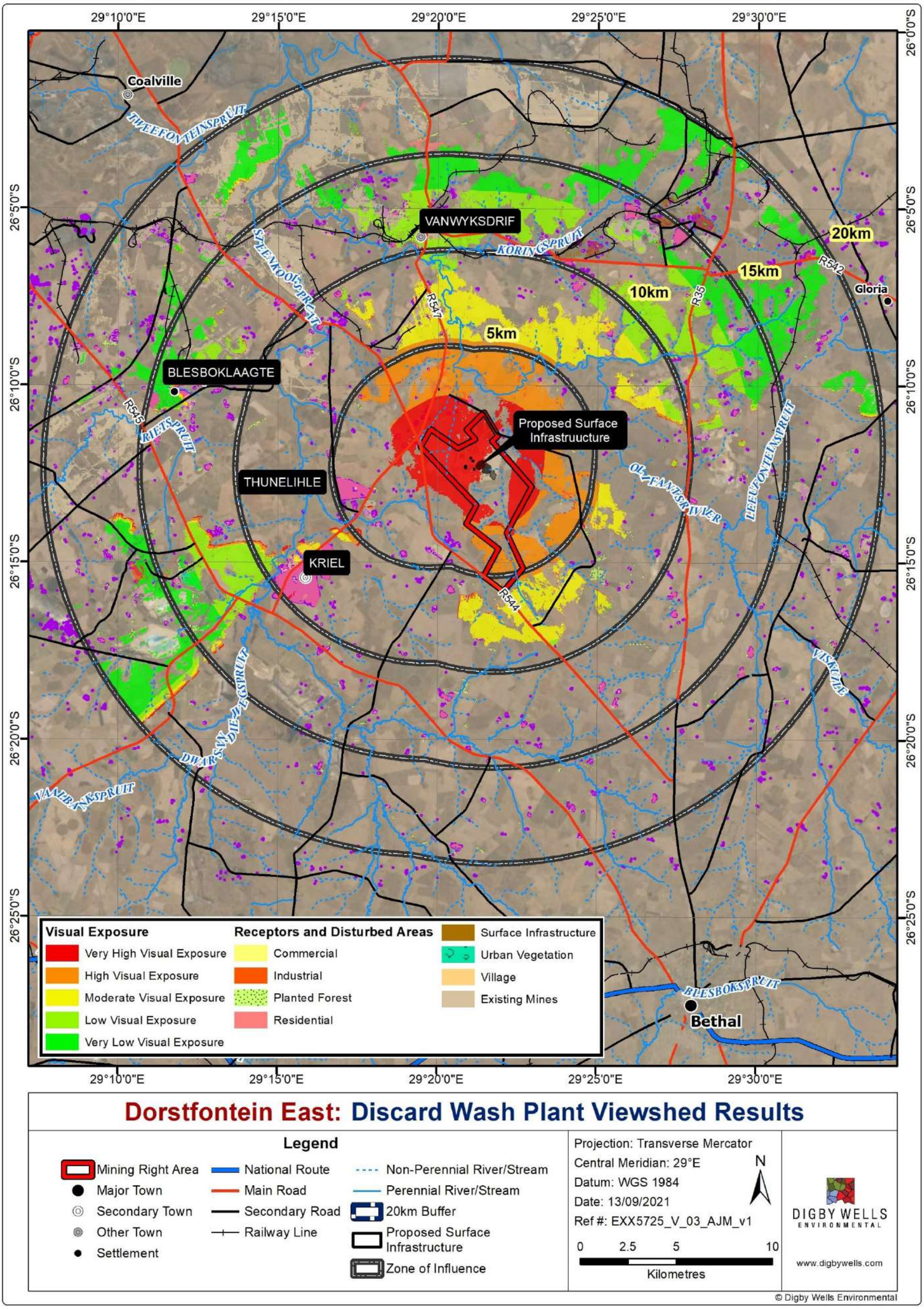

Figure 8-2: Viewshed results - Discard Wash Plant

8.3.2. Office, Main Workshop and Ventilation Fan results

The results from the Office, Main Workshop and Ventilation area viewshed analysis indicate that most of the visual exposure is expected to be restricted to the immediate region, with high visual exposure also occurring to the North-East of the project are within ten to twenty kilometres of the proposed development area. The highest degrees of visual exposure are anticipated to occur to the immediate East and North-East of the project development area, within a five kilometre proximity of the proposed development area. Extensions of moderate and low level exposure are seen towards the north of the project development area, which is already exposed to existing mining infrastructure, such as the discard dump, berms and existing open pits. A potential moderate visibility location is identified along the R544 and R547. Figure 8-3 shows the extent of the viewshed modelling results from the office, workshop, and ventilation fan area.

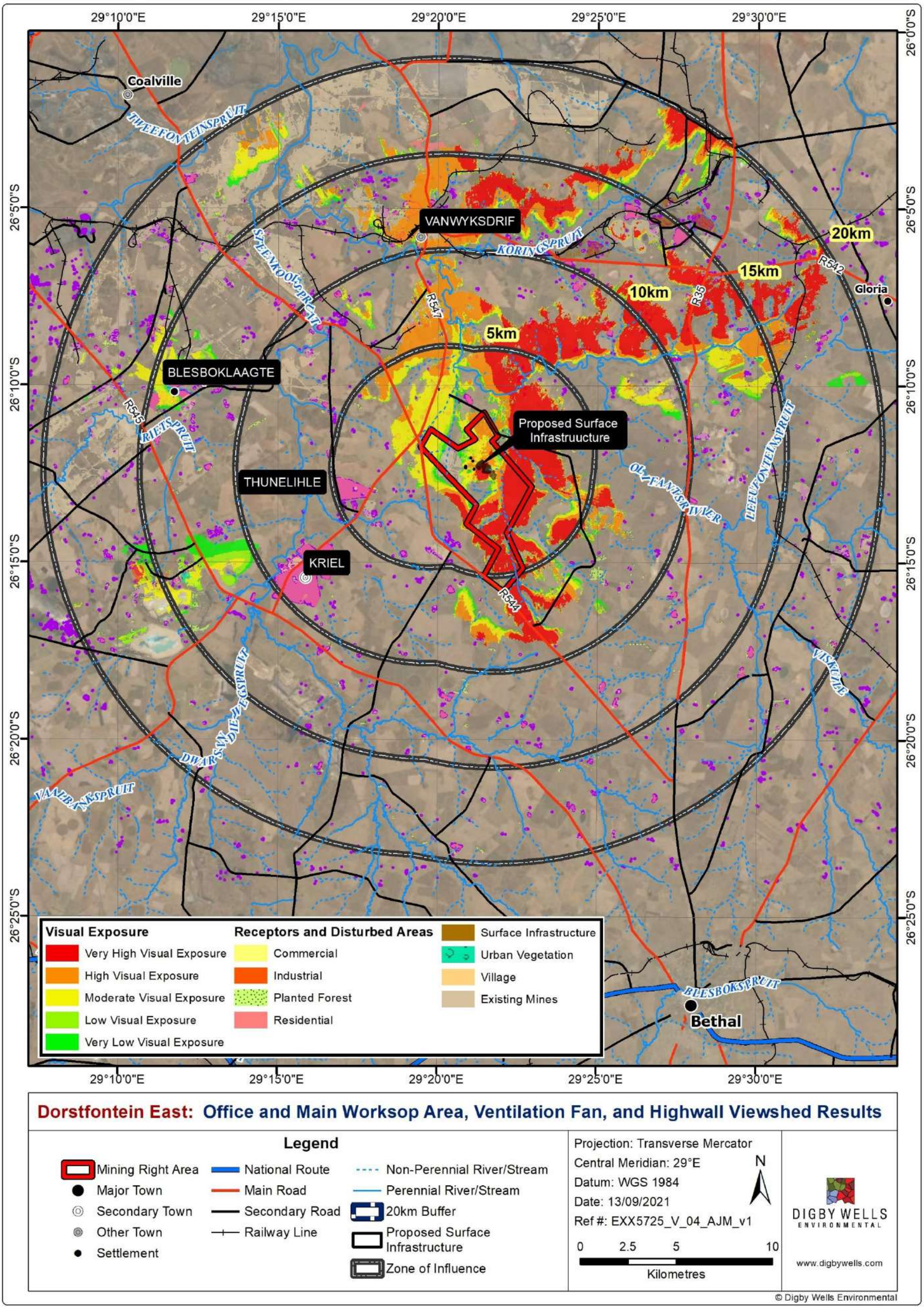

Figure 8-3: Viewshed results – Box cut & Berm

Figure 8-4: Sensitive receptor identification and suggested mitigation

The results from the viewshed modelling process suggest that the large majority of potential high to very high visual exposure impacts are expected to occur within 5-kilometers of the Project's development area. Figure 8-5 provides an overview of the identified receptors within the 5-kilometer zone of influence. Based on the cumulative impacts from the viewshed analysis, each identified receptor within the 5-kilometer zone of influence has an associated level of potential visual impact.

Table 8-4 provides details on the locations of the identified receptors and provides suggested mitigation measures for the short-listed receptors that would potentially have a high to very high visual impact.

Table 8-4: Receptors within 5-kilometer zone of influence

Map Id	Category	Farm Portion	Latitude	Longitude	Exposure (Mitigation Suggestion)
1	Farmstead	Vlaklaagte 45 IS Ptn RE/8	26° 11' 44.658" S	29° 22' 54.871" E	Very High (Suggested Mitigation)
2	Farmstead	Janpieta 41 IS Ptn RE	26° 13' 6.207" S	29° 24' 6.632" E	High (Suggested Mitigation)
3	Homesteads	Rietkuil 57 IS Ptn 16	26° 11' 43.414" S	29° 18' 59.282" E	Moderate (No Mitigation required)
4	Farmstead	Rietkuil 57 IS Ptn 2	26° 11' 27.098" S	29° 18' 44.136" E	Moderate (No Mitigation required)
5	Homesteads	Rietkuil 57 IS Ptn 16	26° 11' 39.738" S	29° 19' 18.400" E	Moderate (No Mitigation required)
6	Farmstead	Welstand 55 IS Ptn RE/6/55	26° 10' 54.300" S	29° 19' 29.349" E	Moderate (No Mitigation required)
7	Homesteads	Welstand 55 IS Ptn RE/7/55	26° 10' 40.653" S	29° 19' 39.377" E	Moderate (No Mitigation required)
8	Mining Operations	Lourens 472 IS Ptn 29	26° 10' 6.048" S	29° 20' 18.535" E	High (Suggested Mitigation)
9	Mining Operations	Lourens 472 IS Ptn 29	26° 10' 24.119" S	29° 20' 57.844" E	Very Low (No Mitigation required)
10	Farmstead	Lourens 472 IS Ptn RE	26° 9' 37.905" S	29° 20' 12.415" E	High (Suggested Mitigation)

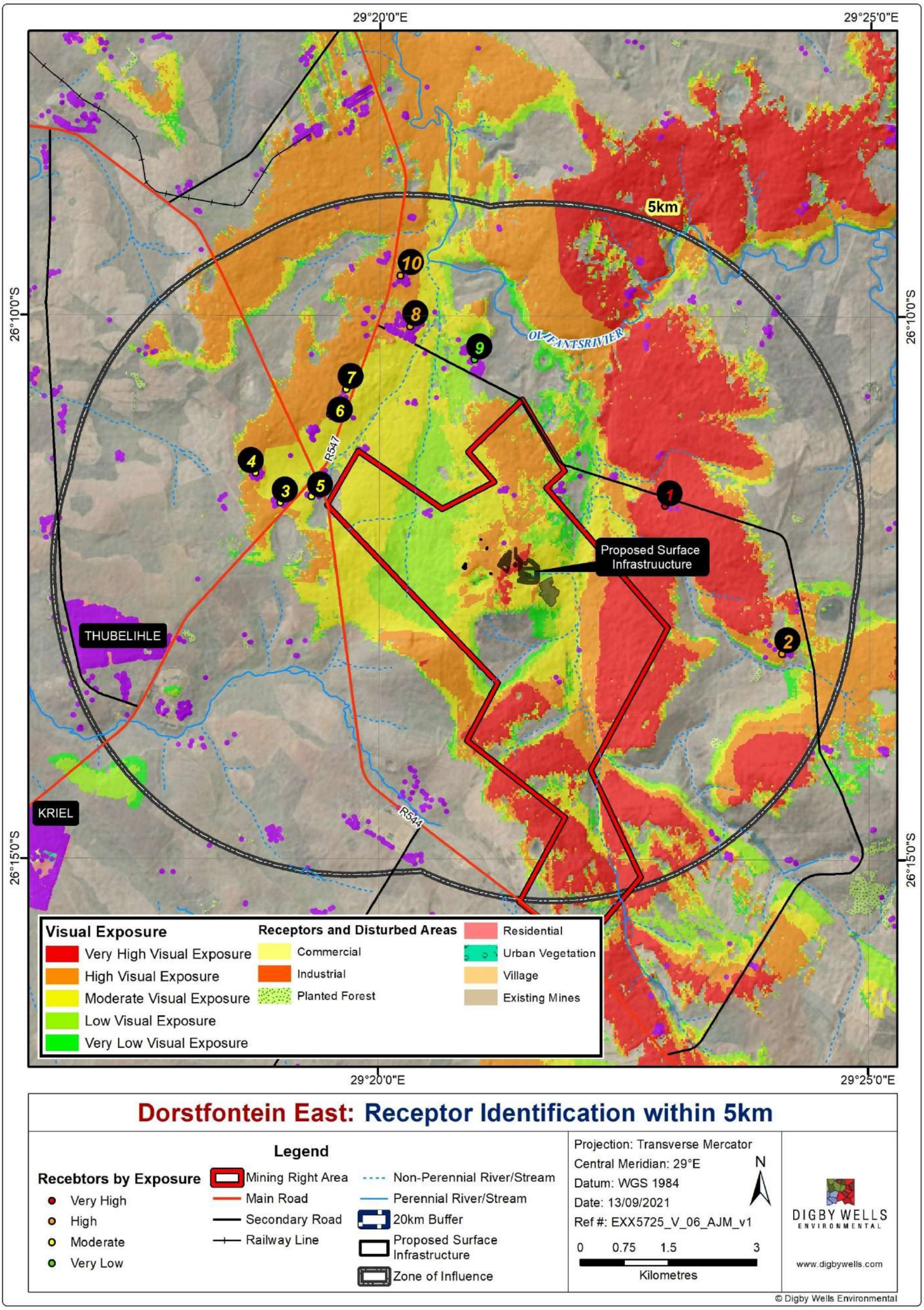

Figure 8-5: Identified receptors within 5-kilometer zone of influence

9. Impact assessment

The Project activities and infrastructure will be rated according to the visual impact they will have on the receiving environment, i.e. the environment before potential development. Negative visual impacts decrease the visual character of the pre-development environment. Neutral visual impacts assist to minimise the negative visual impacts of a development but do not result in a positive visual impact. A positive visual impact only occurs when an area is rehabilitated to a state that is better than the state of the pre-development environment, e.g. an infrastructure project area on previously agricultural land is rehabilitated to an area of natural vegetation and all visible signs of agriculture and infrastructure are removed. Positive visual impacts may only occur during the decommissioning and closure phase.

9.1. Construction phase

It must be noted that the proposed activities are within an operational mining area, so there are already impacts associated with the existing activities and existing infrastructure within the Mining Right Area. The impacts stated below only apply to proposed activities and extensions of existing activities.

Activities during the construction phase that may have potential visual impacts are listed in Table 9-1.

Table 9-1: Interactions and impacts - Construction phase

Interaction	Impact
Removal of vegetation / topsoil for establishment of mining and linear infrastructure	• Removal of all vegetation within the localised infrastructure area alters the aesthetics of the immediate area and creates a contrast between the stripped area and the surrounding vegetation. • Potential for dust pollution.
Construction of infrastructure	• Alteration of natural topography of the area, changing its baseline sense of place.

During the construction phase, the removal of the natural vegetation and alteration of land use is anticipated to have a visual impact on the immediate and surrounding region, however it is anticipated to be negligible in consideration that all proposed infrastructure is located within an operational mining area.

9.1.1. Impact ratings – Construction phase

Impacts associated with the construction phase are detailed below in Table 9-2.

Table 9-2: Impact rating - Construction phase

Activity, and Interaction: Removal of vegetation / topsoil for establishment of surface infrastructure and box cutting.			
• Removal of all vegetation within the localised infrastructure area alters the aesthetics of the immediate area and creates a contrast between the stripped area and the surrounding vegetation.			
Prior Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	2	The impact of the vegetation clearance will occur during the life of the project, although reduced during the decommissioning phase.	Minor -49
Extent	3	Vegetation removal will occur within mining and linear infrastructure areas as well as proposed road, where the viewshed results indicate a local area extension for impacts.	
Severity	-2	Significant change to the original visual character, which also creates a sharp contrast which is visually obtrusive during the construction phase.	
Probability	7	Definite probability of vegetation clearing particularly in the infrastructure areas, and areas cleared for infrastructure construction, and pit extension	
Nature	Negative		
Mitigation measures			
• Keep site clearing to a minimal, and restrict vehicle movement to dedicated areas; • Make use of existing roads to encourage minimal impacts/footprint; • The footprint of the proposed mining operations should be limited to the extent of the infrastructure where possible.			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	2	If mitigated the impact will cease after the operational life span	Negligible -18
Extent	2	Vegetation removal will occur within mining and linear infrastructure areas as well as proposed roads. The visual area may however be reduced with effective mitigation to the south west in the form of a tree line.	

Intensity	-2	The impact extent can be reduced which in turn will reduce the severity from a sensitive receptor perspective.	
Probability	3	There is an unlikely probability that the impact will occur if mitigation measures are implemented.	
Nature	Negative		
Activity, and Interaction: Construction of Infrastructure			
• Alteration to the baseline visual environment by creating sharp topographic variation over a relatively moderately undulating terrain. • Includes removal of natural vegetation which creates a sharp contrast.			
Prior Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	3	The impact of the vegetation clearance and stockpiling will last as long as the mine is in operation.	Minor -56
Extent	2	The impacts of the stockpiles are shown to have the potential to extend as far as 17km.	
Severity	-3	The viewshed results indicate that the stockpiles are likely to have the largest relative effect on the surrounding area from a visual perspective.	
Probability	7	The creating of stockpiles are very likely to occur to make way for the box cut.	
Nature	Negative		
Mitigation measures			
• All buildings and reflective surface must be limited in height and be painted natural hues to limit the extent and intensity of the visual impact. This is particularly relevant to the Discard Wash plant; • Bare land surfaces must be vegetated to limit soil erosion from surface runoff associated with stockpiles and dumps. Revegetate disturbed areas immediately after construction or apply dust suppression techniques where applicable;			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	3	The impact will occur during the life of the project.	Moderate -42
Extent	2	By specifically designing the mine facilities, the extent of the visual impact can be reduced to a more immediate area. It is noted that the current	

		footprint is limited to one specific area and falls within existing mining area footprints	
Intensity	-2	Due to position and location of the infrastructure being amongst existing mining footprints, the intensity is low	
Probability	6	High probability that the impact will continue to occur.	

9.2. Operational phase

Activities identified during the operational phase that are anticipated to have a visual impact are shown in Table 9-3.

Table 9-3: Interactions and impacts - Operational phase

Interaction	Impact
Presence of mine infrastructure, including discard wash plant, workshop area, office, water treatment plant, ventilation fans	• Alteration of natural visual aesthetic character • Alteration of natural topography of the area, changing its baseline sense of place. Discard wash plant, workshop area (including water treatment plant) are in contrast to the surrounding natural environment.
Lighting of mine infrastructure at night	• Alterations on the natural illumination in the area which can draw attention.

9.2.1. Impact ratings – Operations phase

Impacts associated with the construction phase are detailed below in Table 9-4

Table 9-4: Impact ratings - Operations phase

Activity, and Interaction: Operation of surface infrastructure (discard wash plant, workshop area, and related infrastructure)			
• Alterations of the natural visual character of the region • Long term vegetation loss • Land cover and land use changes.			
Prior Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**

Duration	6	The impact of surface infrastructure will occur during the life of the project, although reduced during the decommissioning phase	Moderate -84
Extent	3	The viewshed results indicate that the potential area of influence from the mine infrastructure is restricted to a local area around the site. .	
Severity	-3	The majority of high visual exposure is restricted to the immediate project area – The severity is therefore considered moderate.	
Probability	7	The operations on the mine are dependent on the development and maintenance of the supporting infrastructure.	
Nature	Negative		
Mitigation measures			
• As far as possible, preserve the natural vegetation to reduce the visual impact; • Sensitive receptors should be mitigated from the visual impact by a strategic usage of tree-lines and on site berm features which integrate with effective landform design. • Buildings associated with the Discard Wash Plant, Workshop area and related infrastructure should be kept to a colour that does not bear a large contrast to the existing natural vegetation and landscape.			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	5	If mitigated the impact will cease after the operational life span	Minor -60
Extent	2	Effective mitigation by using visual screens such as tree-lines and purpose driven landform designs such as berms which utilise overburden material have the potential to reduce the area of visual impact.	
Intensity	3	Moderate loss, and/or effects to biological or physical resources or low sensitive environments, not affecting ecosystem functioning.	
Probability	6	There is a definite probability that the impact will occur if mitigation measures are not implemented.	
Nature	Negative		
Activity, and Interaction: Extension of Pit 3			
Prior Mitigation			

Dimension	Rating	Motivation	Significance
Duration	5	The impact of the pit and plant will occur during the life of the project	Minor -50
Extent	3	The area of potential visual exposure is limited to the immediate project area, with small areas of encroachment to the local surrounding region.	
Severity	-2	The severity of the proposed pit extension is minor as it is an existing mining activity and the extensions are minimal	
Probability	7	The probability of an increased impact from the pit extension is likely.	
Nature	Negative		
Mitigation measures			
• Visual screens be placed in the form of tree-lines, particularly in line of site of the eastern sensitive receptors within 5km			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	5	The impact will occur during the life of the project.	Negligible -32
Extent	2	Visual screens have the potential to reduce the area of impact – Particularly from sensitive receptor locations to the east of the pit extension.	
Intensity	-1	Due to the existing mining activity, the intensity is negligible	
Probability	4	There is a probability that the impact will continue to occur.	
Nature	Negative		
Activity, and Interaction: Lighting of mine infrastructure at night			
• The mine site would contain lighting for security and operational safety purposes. • The artificial lighting could provide a source of distraction to receptors in the region.			
Prior Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	4	While the lighting will apply to the duration of the mines life, the lighting impacts are limited to night, and therefore the receptors are also reduced.	Negligible -32

Extent	2	The lighting can be limited to minimise the extent of the immediate project area	
Severity	-2	The severity of lighting is minimal as it is only required for operation areas that are limited during the night time.	
Probability	4	Site clearance has to take place for construction of the access and haul roads, so vegetation removal is inevitable.	
Nature	Negative		
Mitigation measures			
• Focus the lights towards components of the mine that require specific lighting to avoid light dispersal; • Consider utilizing lower lumen lighting that does now spill outside of the mine region.			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	4	The impacts will occur during the life of the project.	Slightly Detrimental -24
Extent	1	The extent of light spills can be limited to the immediate site and minimise any impact on receptors	
Intensity	2	The intensity will be minimal with the applied mitigation measures.	
Probability	4	Likely probability that the impact will continue to occur.	

10. Conclusion and recommendations

The results from the VIA indicate that proposed development features with the highest potential visual impact are the Discard Wash Plant and the Office and Workshop area due to their heights of 15 and 10-meters respectively. The surrounding topography acts as an effective visual screen which restricts the visibility of the infrastructure component of the mine to receptors that are within ten-kilometres of the proposed development.

Identified sensitive receptors include the motorists travelling on the R544 and R547, but exposure to the proposed development from these transport routes is limited to specific locations which can be mitigated with the use of visual screens such as tree-lines. Homestead and farming related structures that are within the high visual exposure zones have been identified, and mitigation measures are suggested to minimise the anticipated visual impact from the Project development. An effective method of mitigation would be in the form of tree-lines which should be placed closer to the location of the identified receptors. It must however

be noted that due to the height of the proposed infrastructure the suggested mitigation measures are likely to reduce but not completely negate any potential visual impact.

The majority of human settlements that are within the greater modelled viewshed output regions are dispersed settlement holdings, who have a sense of place characterised by the regions surrounding open cast coal mines, so the anticipated impacts are not going to significantly alter the sense of place, especially because all of the proposed activities and surface infrastructure is within in an existing operational mining footprint.

It is recommended that landform design principles be implemented for the design parameters of the various buildings and which is designed at both streamlining the rehabilitation approach for the operation along with minimising the vertical offset / height to ensure that a lower visual impact to the surrounding environment.

It is recommended that should the final design of the project differ in location and assumed heights significantly from this assessment, an update of the viewshed modelling be performed to quantitatively assess the anticipated visual impacts.

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