7.4 ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE PROPOSED PROJECT AND THE ALTERNATIVES

An understanding of the biophysical, cultural/heritage and socio-economic context and sensitivity within which the proposed project is located is important in understanding the potential impacts of the project. This section provides a description of these attributes in the receiving environment of the project footprint.

7.4.1 Baseline Biophysical Environment Affected by the Proposed Activity

7.4.1.1 Geology

Introduction

Mineral resources can be sterilised and/or lost through the placement of infrastructure and activities in close proximity to resources, by preventing access to potential mining areas. Geological processes can also influence soil forms and the potential for palaeontological resources.

A baseline situational analysis is described below in order to understand:

- The potential for sterilisation of mineral reserves; and
- The potential for geological lineaments such as faults and dykes. Faults, dykes and other lineaments can act as preferential flow paths of groundwater, which can influence both the dispersion of potential pollution plumes and the inflow of water into mine workings.

Data Sources

Information in this section was sourced from the South32 EIA and EMPR for the Amendment of the EMPR Report (Knight Piésold (Pty) Ltd (KP), 2018), the Geohydrology Specialist Report for the Wessels Mine (GHT Consulting (GHT), 2017) and the Scoping Report for the Changes to the Infrastructure Layout and Activities at the Mamatwan Manganese Mine (MMT) (SLR, 2021).

Description

Regional Geology: The world's largest land-based sedimentary manganese deposit is contained in the Kalahari Manganese Field (KMF), situated 47 km north-west of Kuruman in the Northern Cape. The general stratification of the KMF is illustrated in Figure 7-1. The KMF comprises five erosional, or structurally preserved, relics of the manganese bearing Hotazel Formation of the Paleoproterozoic Transvaal Supergroup. These include the Mamatwan-Wessels deposit (also known as the main Kalahari Basin), the Avontuur and Leinster deposits, and the Hotazel and Langdon Annex/Devon deposits. Wessels is located in the Hotazel Formation (Transvaal Supergroup). The Hotazel Formation typically consists of repeated thin layers of black iron oxides (magnetite or hematite) alternating with bands of iron-poor shales and cherts – known as the banded iron formations.

The Hotazel Formation is underlain by basaltic lava of the Ongeluk Formation (Transvaal Supergroup) and directly overlain by dolomite of the Mooidraai Formation (Transvaal Supergroup). The Transvaal Supergroup is overlain unconformably by the Olifantshoek Supergroup which consists of arenaceous sediments, typically interbedded shale, quartzite and lavas overlain by coarser quartzite and shale. Sulphide-bearing Olifantshoek Group sediments, comprising Mapedi Formation shales and mudstones, and the Lucknow

Formation quartzite horizons are of significance at Wessels Mine. The whole Supergroup has been deformed into a succession with an east-verging dip.

<table>
<tr><th colspan="4">Supergroup / Group / Subgroup / Formation</th><th>Geological Description</th></tr>
<tr><td colspan="4">Kalahari Group</td><td>Kalahari sands, calcrete, clays & gravel beds</td></tr>
<tr><td colspan="5">Kalahari unconformity</td></tr>
<tr><td colspan="4">Karoo Supergroup</td><td>Dwyka tillite</td></tr>
<tr><td colspan="5">Dwyka unconformity</td></tr>
<tr><td colspan="3" rowspan="2">Olifantshoek Supergroup</td><td>Lucknow Formation</td><td>White ortho-quartzite</td></tr>
<tr><td>Mapedi Formation</td><td>Green, maroon and black shales and quartzites</td></tr>
<tr><td colspan="5">Olifantshoek unconformity</td></tr>
<tr><td rowspan="9">Transvaal Supergroup</td><td rowspan="9">Postmansburg Group</td><td rowspan="8">Voelwater Subgroup</td><td>Mooidraai Formation</td><td>Dolomite, Chert</td></tr>
<tr><td rowspan="7">Hotazel Formation</td><td>Banded ironstone (upper)</td></tr>
<tr><td>Upper Manganese Ore Body</td></tr>
<tr><td>Banded Ironstone (middle)</td></tr>
<tr><td>Middle Manganese Ore Body</td></tr>
<tr><td>Banded Ironstone (middle)</td></tr>
<tr><td>Lower Manganese Ore Body</td></tr>
<tr><td>Banded Ironstone (lower)</td></tr>
<tr><td colspan="2">Ongeluk Formation</td><td>Andesitic Lava</td></tr>
</table>

Figure 7-1: General Stratigraphic Column for the KMF

The Olifantshoek Supergroup is overlain by the Dwyka Formation which forms the basal part of the Karoo Supergroup. This consists of tillite (diamictite) which is covered by sands, claystone and calcrete of the Kalahari Group.

Local Geology: Wessels Mine exploits the northernmost portion of the KMF, which is an orebody preserved in a 40 km long (north – south) by 15 km wide (east - west) basin. It occupies a gently folded structure, the Dimothen syncline, which plunges at a shallow angle (3º to 8º) to the north-north-west. The Hotazel Formation (Voëlwater Subgroup, Postmasburg Group) of the Transvaal Sequence hosts the manganese mineralisation at Wessels Mine.

The volcanogenic – sedimentary manganese enriched horizons are erosional or structurally preserved relicts of the Proterozoic aged Hotazel Formation. The latter is characterised by three manganese rich horizons separated by Banded Ironstone Formations (BIF). The lowermost of the three units, the Lower Body (LB) is the only unit presently being mined. High grade (on average 48%) Wessels-type manganese mineralisation occurs at Wessels Mine. The ore is typically coarse grained, shiny, massive or vuggy with the principal ore minerals being Hausmannite and Braunite II.

The Hotazel Formation is underlain by the Ongeluk Formation lava and, unconformably overlain by inter-bedded red shales of the Proterozoic Mapedi Formation (Olifantshoek Group). The unconformity is known as the Olifantshoek Unconformity. The Mapedi lithologies are in turn overlain by remnants of Lucknow Formation quartzite and Karoo age Dwyka Formation tillite (preserved in the north-eastern portion of Wessels Mine) and finally a cover of Kalahari Quaternary age alluvial/fluvial sediments. The tillite also truncates unconformably into the underlying sediments.

Lineaments: Structural deformation near Wessels Mine is significantly more complex than further south within the basin. Faulting is dominated by north - south and east-north-east – west-south-west trending systems. Fault displacements vary in scale from cm to m. Sub-vertical displacements of up to 200 m have been recorded. Differential movement parallel or sub-parallel to bedding planes also occurs. These are commonly defined at Wessels Mine as shear planes. Dykes occurring at Wessels Mine are primarily orientated in a north-east – south-west direction, often following older fault surfaces. Thicknesses vary from 10's of cm to several m (up to 70 m have been recorded). Normal thicknesses are; however, in the order of 20 - 30 m. No dykes and faults have been identified beneath the project footprint.

Conclusion

Where new permanent infrastructure is placed within close proximity to mineable ore there is the possibility that sterilisation can occur. It is not envisaged that the location of the proposed railway balloon will result in any sterilisation of minerals. No dykes and faults have been identified beneath the project footprint. There are; however, dykes located further afield from the project footprint. These lineaments are not considered to be preferential flow paths for contamination and therefore do not affect the site selection or design of the proposed railway balloon.

7.4.1.2 Topography

Introduction

Changes to topography through the development of the proposed project may impact on surface water drainage, visual aspects and the safety of both people and animals. To understand the basis of these potential impacts, a baseline situational analysis is described below.

Data Sources

Information in this section was sourced from the South32 EIA and EMPR for the Amendment of the EMPR Report (KP, 2018) and the Scoping Report for the Changes to the Infrastructure Layout and Activities at the MMT (SLR, 2021).

Description

Regional Topography: The broader environment is characterised by terrain that is predominantly flat with a gentle slope towards the north-west. The elevation varies from 1 087 m to 1 107 m above mean sea level (mamsl). There are two ranges of high ground running through the region from south to north. The eastern range contains the Asbestos Mountain and Kuruman Hills. To the west are the Langeberg and Koranna mountains. The natural topography of the area surrounding the Wessels Mine has been largely influenced by mining activities associated with the Nchwaning Mine and Black Rock Mine, and mines further afield, including the MMT, United Manganese of Kalahari (UMK) and the Tshipi Borwa mines.

Local Topography: The Wessels mining area is predominantly flat with the only significant topographical features being the tailings storage facility (TSF), stockpiles and WRDs. Majority of the project footprint has been transformed by existing mining operations and activities; therefore, the topography of the site has been altered.

Conclusion

Mining activities, infrastructure and communities have the potential to alter the topography and the natural state of undisturbed areas. An alteration of the natural topography has the potential to impact both animals and people. The proposed project; however, does not pose safety risks to third parties and animals, as the topography within the project footprint has already been largely transformed and is largely located within the boundary of the Wessels Mine which is access-controlled.

7.4.1.3 Climate

Introduction

Climate can influence the potential for environmental impacts and related mine design. Specific issues are listed below:

- Rainfall could influence erosion, evaporation, vegetation growth, rehabilitation planning, dust suppression, and surface water management planning;
- Temperature could influence air dispersion through impacts on atmospheric stability and mixing layers, vegetation growth, and evaporation which could influence rehabilitation planning; and
- Wind could influence erosion, the dispersion of potential atmospheric pollutants, and rehabilitation planning.

To understand the basis of these potential impacts, a baseline situational analysis is described below.

Data Sources

Information in this section was sourced from the South32 EIA and EMPR for the Amendment of the EMPR Report (KP, 2018) and the Scoping Report for the Changes to the Infrastructure Layout and Activities at the MMT (SLR, 2021).

Description

Climate: The project footprint falls within an area typical of the central Kalahari Desert and within the Northern Steppe Climatic Zone, as defined by the South African Weather Bureau (SAWB). This is a semi-arid region characterised by seasonal rainfall, hot temperatures in summer, and colder temperatures in winter.

Rainfall: Rainfall data from the Mukulu Station is provided in Table 7-3, for the period 1912 – 2017. The Mukulu Station is located approximately 6 km from the Wessels Mine and is the closest station to the project area with a reliable record. Rainfall records for this region seem to vary with 250 mm per annum being reported for Hotazel, 375 mm per annum reported for a local game ranch, whilst rainfall maps, weather service data and other sources of rainfall data all suggest rainfall for the site that varies between 250 - 380 mm per annum. The Mean Annual Precipitation (MAP), as indicated by the Mukulu Station, is 289 mm per annum.

Table 7-3: Rainfall Data from the Mukulu Station

Name of rainfall station	Rainfall station number	Distance (km)	Latitude (°)(‘)	Longitude (°)(‘)	Record (years)	MAP (mm)
Mukulu	0392640_W	5.91	27° 10’	22° 51’	106	289

The average monthly rainfall depths are indicated in Figure 7-2. Approximately 81% of the annual rainfall falls in spring and summer, between October – March, in the form of showers with the maximum amount of precipitation falling in February. Rainfall events are generally short, with most rainfall events occurring in one day.

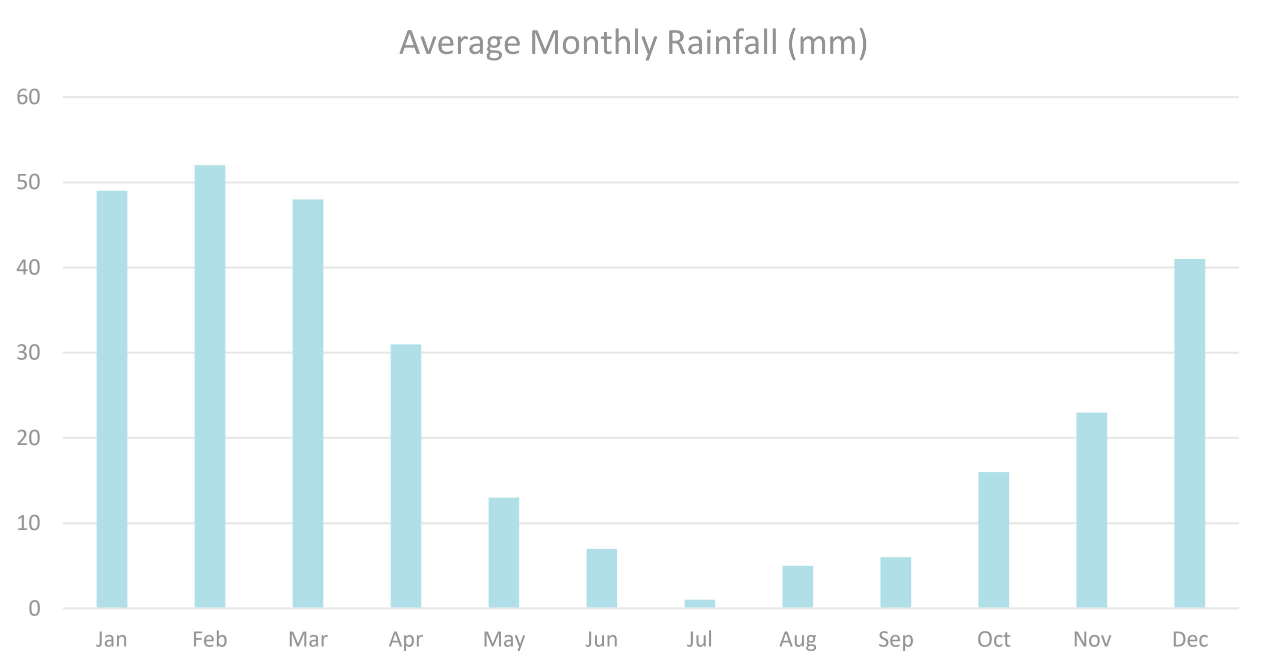

Figure 7-2: Monthly Rainfall (Mukulu Station Measured Data, 1912 - 2017)

Wind: The annual average wind roses for the Kuruman Weather Station (located approximately 60 km west of Wessels Mine) for the years 2015, 2016 and 2017 are shown in Figure 7-3, with the period average wind field and diurnal variability in the wind field provided in Figure 7-4. The predominant wind direction is from the south-south-east and south with most of the strong winds from the west. Frequent winds also occur from the north. Over the three-year period (2015 – 2017), the frequency of occurrence of south-south-easterly wind was between 12% and 17%, with winds with a westerly component occurring approximately 15% of the time. Winds occur less frequently from the easterly sector. During the day winds are more frequent from the westerly and the northerly sectors, with the strongest winds directly from the west. The wind shifts during the night-time to dominantly south-south-easterly and southerly winds. Day-time calms occurred for 9% of the time, with night-time calms for 24% of the time.

According to the Beaufort wind force scale, wind speeds between 6-8 m/s equates to a moderate breeze, with wind speeds between 14-17 m/s near gale force winds. Based on the three years of South African Weather Service (SAWS) data (2015 - 2017), wind speeds exceeding 6 m/s occurred for only 1% of the time, with a maximum wind speed of 10 m/s. The average wind speed over the three years was 2.06 m/s. Calm conditions (wind speeds < 1 m/s) occurred for 17% of the time. The United States Environmental Protection

Agency (US EPA) indicates a friction velocity of 5.4 m/s to initiate erosion from coal storage piles (US EPA, 2006). Thus, the likelihood exists for wind erosion to occur from open and exposed surfaces, with loose fine material, when the wind speed exceeds at least 5.4 m/s. Wind speeds exceeding 5.4 m/s occurred only for 2% over the three years (2015 - 2017).

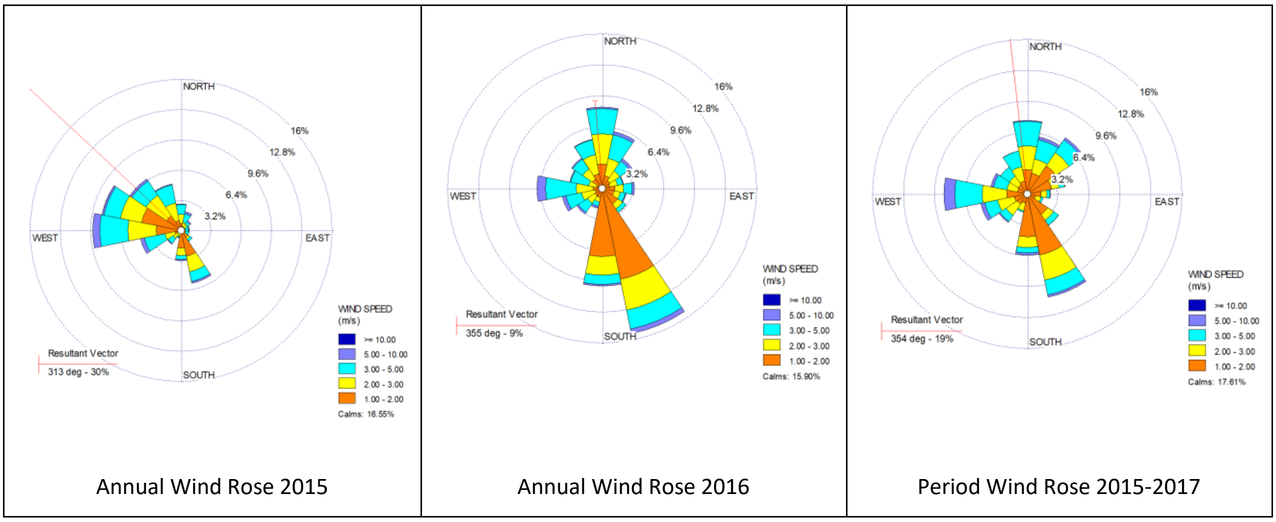

Figure 7-3: Period and Annual Wind Roses (Kuruman Weather Station Measured Data, 2015 – 2017)

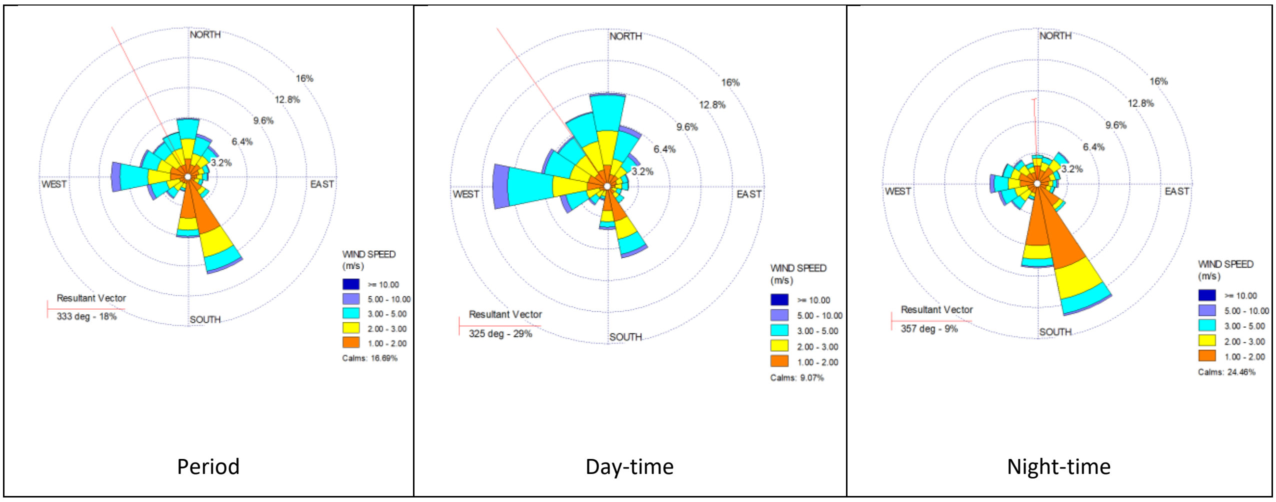

Figure 7-4: Period, Daytime and Night-time Wind Roses (Kuruman Weather Station Measured Data, 2015 – 2017)

Ambient Temperature: Average daily maximum temperatures for January (the hottest month) in the order of 30°C are expected, but temperatures as high as 45°C are not uncommon during hotter periods. Average minimum temperatures of 1°C are expected in the mid-winter months, but low humidity will preclude the possibility of frost.

Conclusion

The project area's semi-arid region is characterised by erratic rainfall, hot temperatures in summer and cold temperatures in winter. High rainfall events can increase the erosion potential and the formation of erosion gullies. The presence of vegetation does; however, allow for surface infiltration thereby reducing the effects of erosion. Wind significantly affects the amount of material that is suspended from exposed surfaces to the atmosphere. The wind speed determines the distance of downward transport, as well as the rate of dilution of pollutants in the atmosphere. Where wind speeds increase above 5m/s the possibility of dust dispersion increases and this will require consideration from a planning and management perspective. These climatic aspects need to be taken into consideration as part of the project's management planning.

7.4.1.4 Soils and Land Capability

Introduction

Soils are an important component of most ecosystems. Soil is the medium in which most vegetation grows and a range of vertebrates and invertebrates exist. In the context of mining operations, soil is even more significant if one considers that mining is a temporary land use, whereafter rehabilitation (using soil) is the key to re-establishing post closure land capability that will support post closure land uses.

Mining projects have the potential to damage soil resources through physical loss of soil and/or the contamination of soils, thereby impacting on the soils' ability to sustain natural vegetation and altering land capability. Contamination of soils may in turn contribute to the contamination of surface and groundwater resources, while loss of the topsoil resource reduces chances of successful rehabilitation and restoration. To understand the basis of these potential impacts, a baseline situational analysis is described below.

Data Sources

Information in this section was sourced from the Soil and Agricultural Assessment as Part of the BA Process for the Proposed Extension of the Railway Infrastructure at the Wessels Mine, Northern Cape Province (TerraAfrica, 2021).

Description

Soil Distribution and Forms: The distribution of soils is closely linked to the topography and parent materials from which they are derived. The better drained soils are generally associated with a less basic parent material; while the more structured and more clay-rich (less easily drained) soils are associated with the intrusive, basic parent material.

The project area consists of two soil forms, namely the Ermelo Form and the Witbank Form. The Ermelo Form consists of bleached to slightly chromic sandy topsoil that is underlain by yellow-brown apedal subsoil that is deeper than 1.5 m. This soil form is well-drained, structureless (apedal), supports natural vegetation and has a grazing land capability. The Witbank Form represents soils that were previously natural soils, and consists of a mixture of natural soils, anthropogenic materials and excavated areas.

Land Capability: The Ermelo Form with its deep, sandy profiles has the potential for arable land capability and could be suitable for irrigated crop production. However, due to unfavourable climatic conditions, the land capability is that of extensive grazing. Where Witbank Soil Forms are located, the land capability is that of wilderness. This is because vegetation in these areas is sparse or absent.

Conclusion

The land capability within the project footprint is that of extensive grazing and wilderness. In this regard, soil management is important if the land capability is to be appropriately reinstated as part of closure activities.

7.4.1.5 Biodiversity

Introduction

In the broadest sense, biodiversity provides value for ecosystem functionality, aesthetic, spiritual, cultural, and recreational reasons. The known value of biodiversity and ecosystems is as follows:

- Soil formation and fertility maintenance;
- Primary production through photosynthesis, as the supportive foundation for all life;
- Provision of food and fuel;
- Provision of shelter and building materials;
- Regulation of water flows and water quality;
- Regulation and purification of atmospheric gases;
- Moderation of climate and weather;
- Control of pests and diseases; and
- Maintenance of genetic resources.

The establishment of infrastructure, as well as certain supportive activities have the potential to result in the loss of vegetation, habitat and related ecosystem functionality through physical disturbance and/or contamination of soil and/or water resources. To understand the basis of these potential impacts, a baseline situational analysis is described below.

Data Sources

Information in this section was sourced from the Biodiversity Assessment as Part of the BA Process for the Proposed Extension of the Railway Infrastructure at the Wessels Mine, Northern Cape Province (Scientific Terrestrial Services (STS), 2021).

Description

Flora: The Wessels Mine is located within the Savanna Biome. The Savanna Biome comprises various vegetation types, one of which is within the project area – the Kathu Bushveld vegetation type (see Figure 7-5). The Kathu Bushveld vegetation type is characterised by *Vachellia erioloba, V. karroo, Searsia lancea* and *Ziziphus mucronate* and is found within the North West and Northern Cape provinces of South Africa. The shrub layer is generally poorly developed, with *Grewia flava* and *Tarchonanthus camphoratus* and an open grass layer, with much bare soil in places. The Kathu Bushveld has been identified by the National Biodiversity Assessment (NBA), 2018 as poorly protected and of Least Concern.

Legend

- Towns
- Existing Railway
- Proposed Railway Extension Layout
- Upgrade to Existing Line

Vegetation Types

- Open Mixed Senegalia mellifera – Vachellia erioloba – Vachellia haematoxylon Woodland
- Senegalia melifera Thicket
- Transformed

0 100 200 Meters

Scale: 1:8 000 @ A3

Projection:Transverse Mercator
Datum: Hartebeeshoek, Lo 23

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Figure 7-5

Vegetation Types

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2021/08/26

Following a field assessment undertaken by STS on 10 June 2021, three broad habitat units were distinguished at the project footprint (see Figure 7-6). These are as follows:

- Transformed Area Habitat Unit: This habitat unit includes existing gravel roads and the active mining area and comprises of little to no remaining vegetation. This habitat unit is no longer representative of the associated vegetation type (Kathu Bushveld) and is considered to be of low sensitivity. Existing impacts include historic transformation due to mining, edge effects of mining activities and active mining leading to dust and noise pollution, impacting on the biodiversity of the adjacent areas;
- Senegalia Melifera Thicket Habitat Unit: This habitat unit, although encroached, is considered representative of the reference vegetation type. The herbaceous layer has recovered from extended dry periods and grazing activities, providing suitable groundcover. The vegetation structure comprises encroached stands of *Senegalia melifera* with relatively homogenous grass swards scattered throughout. No alien species were identified in this habitat unit. This habitat unit is not considered a unique landscape, as it is well-represented at a regional level; and
- Open Mixed Senegalia Melifera – Vachellia erioloba – Vachellia haematoxylon Woodland Habitat Unit: This habitat unit comprises a well-established and dense herbaceous layer. The habitat unit is considered representative of the reference vegetation type and the woody component is open and not encroached. No alien species were identified in this habitat unit. This habitat unit is not considered a unique landscape, as it is well-represented at a regional level.

Dominant trees and shrubs, herbs and forbs and graminoids identified within the project footprint are provided in Table 7-4. Protected species are shade in green. A full list of floral species recorded on site is provided in the Biodiversity Study (see Appendix E).

Legend

- Towns
- Existing Railway
- Proposed Railway Extension Layout
- Upgrade to Existing Line

Habitat Units

- Intermediate
- Low

0 100 200 Meters

Scale: 1:8 000 @ A3

Projection:Transverse Mercator
Datum: Hartebeeshoek, Lo 23

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Figure 7-6

Habitat Units

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Table 7-4: Dominant Floral Species Identified with the Project Footprint

Species Type	Species			
Tree and Shrub Species	*Grewia flava*	*Melolobium candicans*	*Senegalia mellifera*	
	Vachellia erioloba		*Vachellia haematoxylon*	
Herb and Forb Species	*Aptosimum elongatum*	*Crotalaria orientalis*	*Cucumis africanus*	*Dimorphotheca sp.*
Graminoid Species	*Eragrostis lehmanniana*		*Schmidtia kalahariensis*	

The following floral species of conservation concern (SCC), as per the national and provincial protected species regulations (NFA, NCNCA and the NEM: BA), were identified within the project footprint:

- *Vachellia erioloba* (protected as per the NFA);
- *Vachellia haematoxylon* (protected as per the NFA);
- *Harpagophytum procumbents* (protected as per the NCNCA and NEM: BA)*;* and
- *Boophone disticha* (protected as per the NCNCA).

It is noted that none of the afore-mentioned species are considered threatened according to the Red-Data List (RDL) of South African plants. Notably, no alien species were identified within the project footprint; however, these do occur within the region and are known to flourish specifically in disturbed areas.

It is important to note that as part of the proposed project, consideration was given to provincial and national biodiversity sensitivity databases, such as the National Protected Areas Expansion Strategy (NPAES), 2010, the South African Conservation Areas Database (SACAD), 2020, the South African Protected Area Database (SAPAD), 2020, the Important Bird Areas (IBAs), 2015, the National Freshwater Ecosystem Priority Areas (NFEPA) Database, 2011, the Northern Cape Critical Biodiversity Area (CBA), 2016 database and the Strategic Water Source Areas (SWSA) for Surface Water, 2017 database. The project footprint does not fall within or within 10 km of any sensitive habitats identified in these databases (except the NPAES database – the project footprint is approximately 4 km south-east of the Eastern Kalahari Bushveld Focus Area).

Fauna: Anthropogenic activities, as well as historic grazing in the local area have resulted in a decline of habitats associated with the project footprint. In particular, overgrazing has led to a decline in more favourable and palatable herbaceous species, impacting on food availability for fauna in the surrounding area. Increased human presence in the area has further led to a decline of larger mammal species due to increased levels of persecution (snaring/hunting) and competition for space. Due to the arid nature of the environment, food and water resources are not as readily available for fauna, which has been further compounded by the degraded state of the habitats. As such, faunal species must range over larger distances to meet their individual energy requirements. Mines, roads and the current railway have impacted upon habitat connectivity to the west, whilst connectivity to the east is largely unhindered by large scale developments.

Following a site assessment undertaken by STS on 10 June 2021, it was revealed that invertebrate abundances were low. However, this is likely attributable to the winter season. Insects play an integral role in ecosystem maintenance and are also a primary food resource for many species in arid regions, the decline of which places increased stresses on insectivorous species and has a notable knock-on impact for other species. The decline in suitable herbaceous material and the encroachment of woody species in areas has led to a decrease in suitable habitat. Suboptimal habitat conditions, as well as anthropogenic activities have led to a cascading effect on faunal species which is evident in the loss of species diversity and abundances adjacent the mine.

Species, or signs thereof, observed within the project footprint are provided in Table 7-5. A full list of faunal species with the potential to occur on site is provided in the Biodiversity Study (see Appendix E).

Table 7-5: Faunal Species, or Signs thereof Identified with the Project Footprint

Species Type	Scientific Name	Common Name
Mammals	*Cryptomus hottentosus*	Common Mole Rat
	Elephantulus intufi	Bushveld Sengi
	Hystrix africaeaustralis	Porcupine
	Lepus capensis	Cape Hare
	Lupulella mesomelas	Black-Backed Jackal
	Raphicerus campestris	Steenbok
	Tragelaphus strepsiceros	Kudu
Avifauna	*Calendulauda africanoides*	Fawn-Coloured Lark
	Cercotrichas paena	Kalahari-Scrub Robin
	Prinia masulosa	Karoo Prinia
	Sigelus silens	Fiscal Fly-Catcher
	Tchagra senegalus	Back-Crowned Tchagra
Arachnids	*Agelediidae sp*	Funnel-Web Spide
Insects	*Cynthia cardui*	Painted Lady Butterfly
	Danaus chrysippus	African Monarch
	Pachylomerus femoralis	Flattened Giant Dung Beetle
	Sternocera sp	Giant Jewel Bug
Reptiles	*Pedioplanis namaquensis*	Namaqua Sand Lizard
	Agama aculeata	Ground Agama
Amphibians	None	

No faunal SCC were identified on site. While faunal SCC may occur within the project footprint and in the region, they are unlikely to be wholly reliant on the areas affected by the proposed project.

Conclusion

Three habitat units were identified within the project footprint, namely the *Senegalia Melifera* Thicket, the Open Mixed *Senegalia Melifera – Vachellia erioloba – Vachellia haematoxylon* Woodland and Transformed Areas. Protected floral species, as per the FNA, NCNCA and the NEM: BA have been identified within the project footprint, which would need to be managed as part of the proposed project. While no alien species were identified, they do occur elsewhere in the region and are known to proliferate in disturbed areas. In this regard, alien species would need to be managed as part of the proposed project, as well as part of rehabilitation measures post-closure.

7.4.1.6 Surface Water

Introduction

Surface water resources include drainage lines and paths of preferential flow of stormwater runoff. Mine-related activities have the potential to alter the drainage of surface water through the establishment of infrastructure and/or result in the contamination of the surface water resources through seepage and/or spillage of process materials and non-mineralised (general and hazardous) and mineralised wastes. To understand the basis of these potential impacts, a baseline situational analysis is described below.

Data Sources

Information in this section was sourced from the South32 EIA and EMPR for the Amendment of the EMPR Report (KP, 2018), the Wessels Mine Surface Water Study (KP, 2017) and the Scoping Report for the Changes to the Infrastructure Layout and Activities at MMT (SLR, 2021).

Description

Catchments: The Wessels Mine is located within the Lower Vaal Water Management Area (WMA) (Primary Catchment D) and within the quaternary catchment D41M (see Figure 7-7). The quaternary catchment D41M has a catchment area of 2 628 km^2, a mean annual runoff (MAR) of 0.6 mm and a MAP of 305 mm. The Lower Vaal WMA is located downstream of the Bloemhof Dam and upstream of the Douglas Weir. Major rivers in the WMA include the Molopo, Harts, Dry harts, Kuruman and Vaal rivers.

Surface Water Resources: The Ga-Mogara and Kuruman rivers (non-perennial) are located approximately 13 km east and 4.7 km north-east of the Wessels Mine, respectively. No other drainage line or wetlands have been identified within or in close proximity to the Wessels Mine and project footprint.

Surface Water Use: Agricultural activities are the main activities downstream of the Wessels Mine. These activities include livestock (beef and dairy cattle, goats, non-wooled sheep, pigs and ostriches) and dryland cropping (maize, sunflower, cotton, groundnuts and vegetables). Other mining activities with reliance on water in the WMA include mining for diamonds, iron ore, manganese and other minerals, such as limestone, dolomite and amphibole asbestos.

Conclusion

Mining infrastructure has the potential to influence contributions of runoff to the catchment and related natural drainage patterns. In addition to this, mining activities and infrastructure present contamination sources that have the potential to pollute surface water resources. These impacts must be considered during the proposed project; however, given that there are no surface water resources in close proximity to the project footprint, it is not anticipated that surface water resources would be affected.

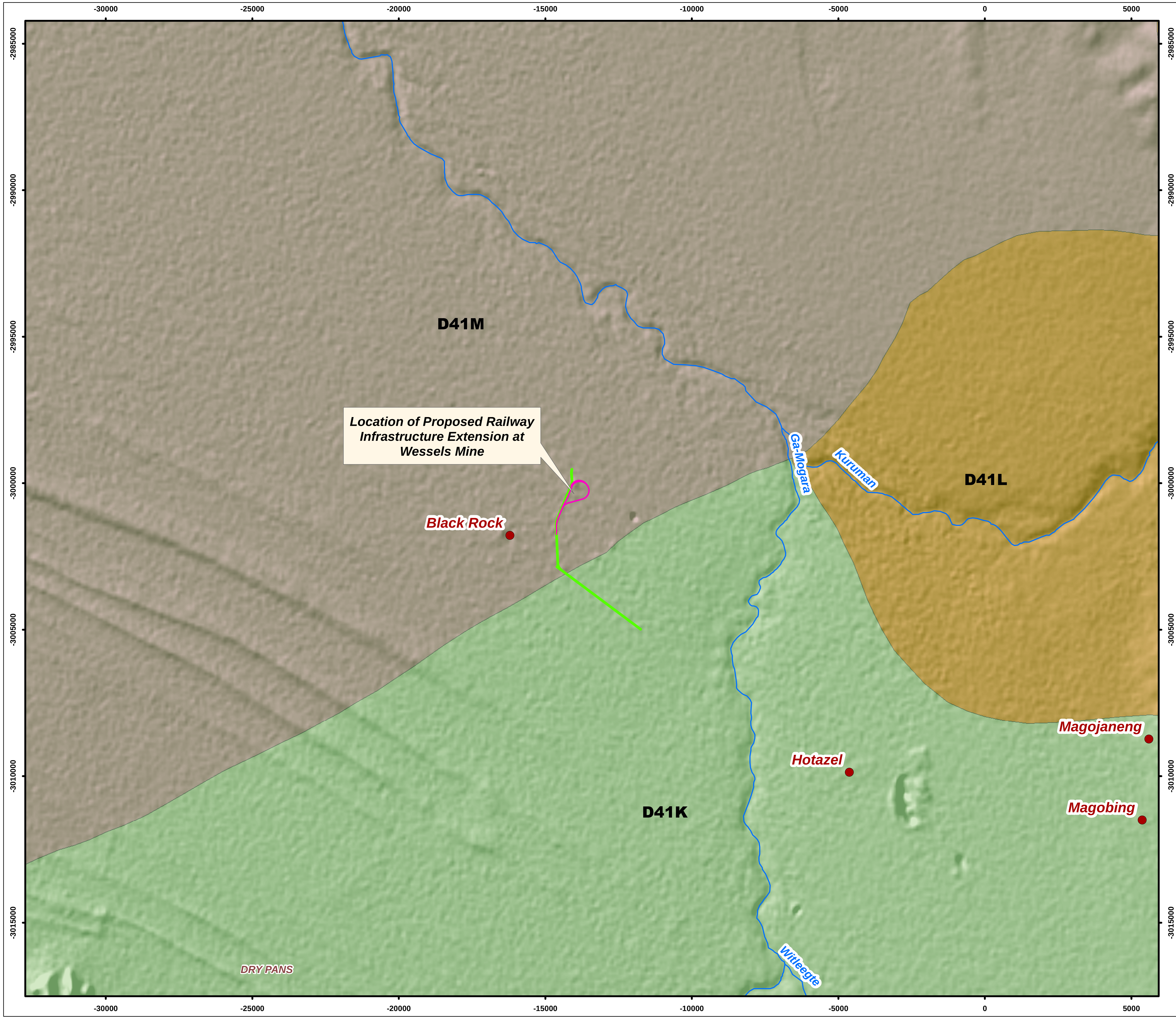

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Figure 7-7

Catchment Areas Identified Within the Project Area

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7.4.1.7 Groundwater

Introduction

Groundwater is a valuable resource and is defined as water which is located beneath the ground surface in soil/rock pore spaces and in the fractures of lithologic formations. Activities such as the handling and storage of hazardous materials, mineralised and non-mineralised wastes have the potential to impact groundwater resources, both to the environment and third-party users, through potential pollution. To understand the basis of these potential impacts, a baseline situational analysis is described below.

Data Sources

Information in this section was sourced from the South32 EIA and EMPR for the Amendment of the EMPR Report (KP, 2018), the Wessels Mine Surface Water Study (KP, 2017) and the Scoping Report for the Changes to the Infrastructure Layout and Activities at the MMT (SLR, 2021).

Description

Aquifer: Four aquifer units occur in the region, namely the Ongeluk, Hotazel, Moordraai and Kalahari Formations. Based on the Aquifer Classification Map of South Africa, the local aquifer of Wessels Mine is classified as poor, the electrical conductivity measures 70 – 150 millisiemans per metre (mS m), the vulnerability is rated as least; and the susceptibility is rated as low. A poor aquifer is described as a moderately-yielding aquifer system of variable water quality.

Groundwater Recharge: The site's semi-arid climate and a relatively thick unsaturated zone (>25 m deep on average) are not conducive to active recharge, which has been calculated to be between 1 and 4% of average annual rainfall. Groundwater is up to 25 000 years old in deeper, confined aquifers, although surficial unconfined/semi-confined aquifers have been recharged in relatively recent time. Site aquifers are recharged directly from rainfall, though stable isotope results suggest that infiltration of standing surface water contained in topographical depressions may be of importance regionally. Recharge occurs via the relatively permeable Kalahari Formation, the recharge front mobilising soil nitrates, particularly at sites that have been overgrazed or stripped of vegetation.

Groundwater Levels: Groundwater levels at Wessels Mine have been monitored through various boreholes from 2002 to the present day. Data from the most recent surveys (September 2016) indicates that the hydraulic gradient is towards the south-west. The water table appears to be locally elevated towards the duck pond and TSF at the Wessels Mine. Average groundwater elevation is approximately 998.3 mamsl; with the average groundwater table depth at approximately 40.9 metres below ground level (mbgl).

Groundwater Use: Majority of the groundwater in the broader region is used in the form of third-party boreholes. Use is primarily for livestock water, but also supplies potable water to local farms.

Conclusion

The proposed project is located on a minor aquifer with an average depth of 40.9 mbgl. Due the nature of the proposed project, it is not anticipated that groundwater would be affected.

7.4.1.8 Air Quality

Introduction

Existing sources of emissions in the region and the characterisation of existing ambient pollution concentrations are fundamental to the assessment of cumulative air impacts. A change in ambient air quality can result in a range of impacts which in turn may cause a disturbance and/or health impacts to nearby receptors. To understand the basis of these potential impacts, a baseline situational analysis is described below.

Data Sources

Information in this section was sourced from the South32 EIA and EMPR for the Amendment of the EMPR Report (KP, 2018), the Scoping Report for the Changes to the Infrastructure Layout and Activities at the MMT (SLR, 2021) and the Landscape/Visual Site Sensitivity Verification Report (SSVR) compiled for the proposed project (SLR, 2021).

Description

Regional Air Quality: The following regional sources of emissions of most significance were identified:

- Fugitive dust: Occurs as a result of vehicle entrainment of dust from local paved and unpaved roads, wind erosion from open areas and dust generated by agricultural activities. Vehicle entrainment from the various unpaved farm and public roads is anticipated to be a significant, but is a localised source of dust;
- Current mining operations in the area: Particulates represent the main pollutant of concern at mining operations, whether it is underground or opencast. The amount of dust emitted by these activities depends on the physical characteristics of the material, the way in which the material is handled and the prevailing weather conditions. Current mining operations in relatively close proximity to the Wessels Mine include Nchwaning Mine and Black Rock Mine, and mines further afield, including MMT, UMK Mine and the Tshipi Borwa Mine;
- Biomass burning: Biomass burning emissions include CO, CH_4 and NO_2 gases;
- Veld burning: Veld burning represents significant sources of combustion-related emissions in many areas of the country;
- Rail-related emissions: Emissions from diesel generated locomotives include particulates, NO_2, SO_2, CO and various volatile organic compounds (VOC) including polycyclic aromatic hydrocarbons (PAH);
- Household fuel combustion: It is likely that households within the region utilise coal or wood for cooking and space heating (during winter) purposes. Emissions from domestic burning include PM_{10}, NO_2, CO_2, CO, PAHs, particulate benzo(a)pyrene and formaldehyde; and
- Vehicle tailpipe emissions: Significant primary pollutants include CO_2, CO, hydrocarbons (HCs), SO^2, O_x, and particulates. Secondary pollutants include NO^2, photochemical oxidants (ozone), sulphur acid, sulphates and nitric acid.

Local Air Quality: The key operations and activities that contribute to the air pollution within the Wessels Mine include:

- Ventilation emissions from underground mine workings (NO_x, CO_x and particulates);
- Dust generated from the tailings dams and spills along the delivery pipelines;

- Diesel generators;
- Vehicle tailpipe emissions;
- Materials handling operations (e.g., crushing, tipping of waste rock and ore, conveying of ore, stockpiles);
- Vehicle activity on paved and unpaved roads (during construction, operation and decommissioning); and
- Wind erosion from exposed working surfaces.

These emissions contribute towards both nuisance value, mainly in the immediate area of the source (large particle deposition) and potential increased health impacts (PM_{10} in particular).

Potential Receptors: Air Quality Sensitive Receptors (AQSR) generally include places of residences and areas where members of the public may be affected by air pollution. Sensitive receptors within a 10 km radius of the proposed project area include the Kuruman River and gravel access road to the east, the R380 and R31 roads to the south and the R380 road and town of Blackrock to the west.

Dust Fallout Data: Dust monitoring at Wessels Mine is conducted on a monthly basis at three locations within the area. The monitoring of dust fallout commenced in 2010 and the most recent dataset, from September 2015 – November 2016 is presented in Figure 7-8. Data indicates that dust fallout rates in accordance with the National Dust Control Regulations (NDCR) for residential and non-residential areas have not been exceeded at the Wessels Mine.

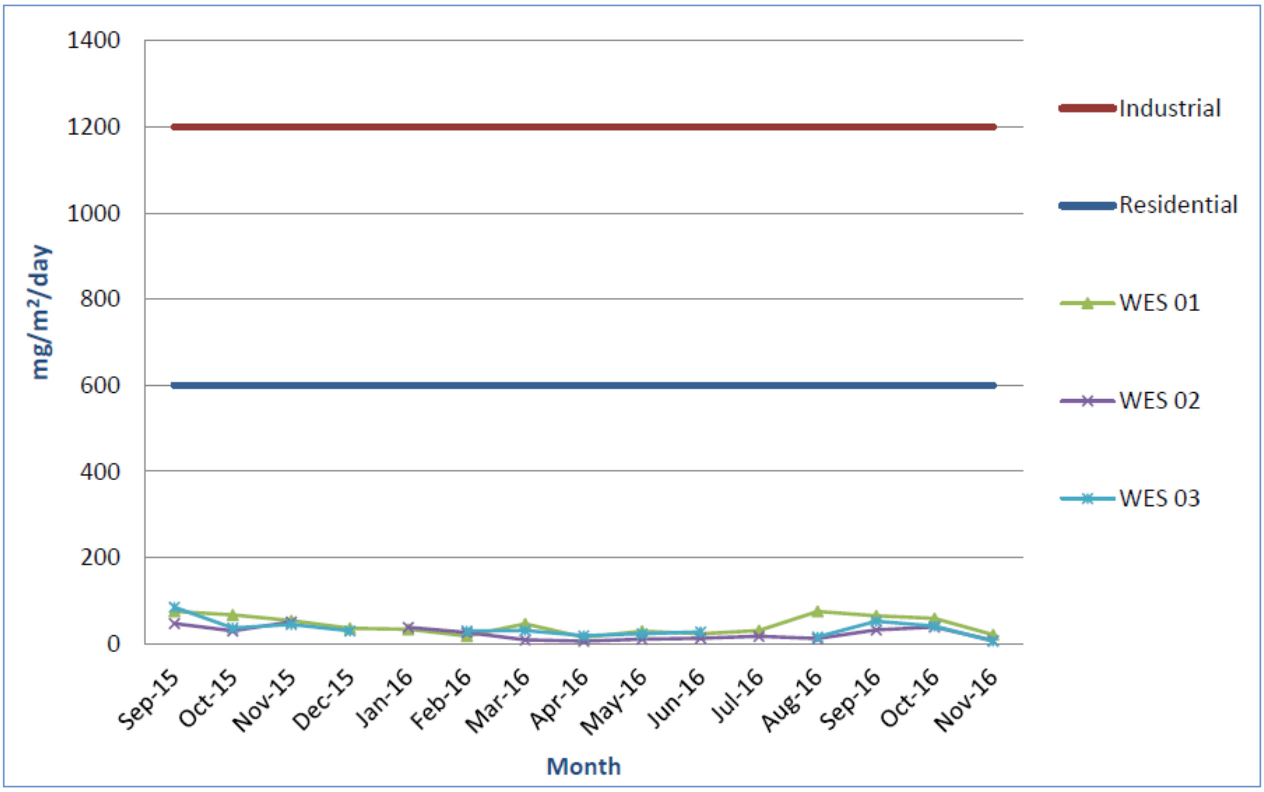


Figure 7-8: Dust Fallout Rates at Wessels Mine (Measured Data September 2015 - November 2016)

Conclusion

The project area is situated within a region hosting numerous sources of emissions. Monitoring results at Wessels Mine indicate that dust fallout from the existing mining operations do not exceed the NDCR limits. Management measures for current mining activities need to be complied with at all times to effectively manage operational contributions to ambient air concentrations and dust fallout.

Due to the nature of the proposed project, it is unlikely to result in any material changes to localised air impacts. Given the prevalence of agricultural activity within the region, it must be noted that the emissions to air generated by the proposed project will be negligible, limited primarily to the construction phase and is not expected that impacts will be felt by the agricultural community. With that being said, measures to limit and control dust during the construction phase must be considered as part of the proposed project.

7.4.1.9 Noise

Introduction

Mining activities and infrastructure have the potential to cause an increase in ambient noise levels in and around the proposed project area. This may cause a disturbance to nearby receptors. Land uses and potential receptor sites including residential areas surrounding the mine have been described in the land use section (section 7.4.3.2). To understand the basis of these impacts, a baseline situational analysis is described below.

Data Sources

Information in this section was sourced from the South32 EIA and EMPR for the Amendment of the EMPR Report (KP, 2018).

Description

The local topography surrounding Wessels Mine is considerably flat, and therefore no screening against the noise generated by the mine is provided. The local vegetation does; however, provide some of attenuation through the absorption of sound by the interspersed shrubs and medium-sized trees of the Kathu Bushveld. Although the local environment is characterised as being rural, several other mining operations are present within the area, which contribute to existing ambient noise levels within the local region. An additional source contributing to the ambient noise levels is road traffic from the nearby main road to Kuruman and Kathu.

Ambient noise levels along the boundary of Wessels Mine were studied in accordance with the procedures stipulated in South African National Standards (SANS) 10103. Measurements were processed in order to remove noise contributions of noise emissions not originating from mining operations at the Wessels Mine. Noise contours obtained at Wessels Mine for daytime and night-time conditions are provided in Figure 7-9 and Figure 7-10, respectively. The data indicates that both daytime and night-time noise levels at Wessels Mine are well below the SANS 10103 70 dBA requirement, as typical for industrial areas.

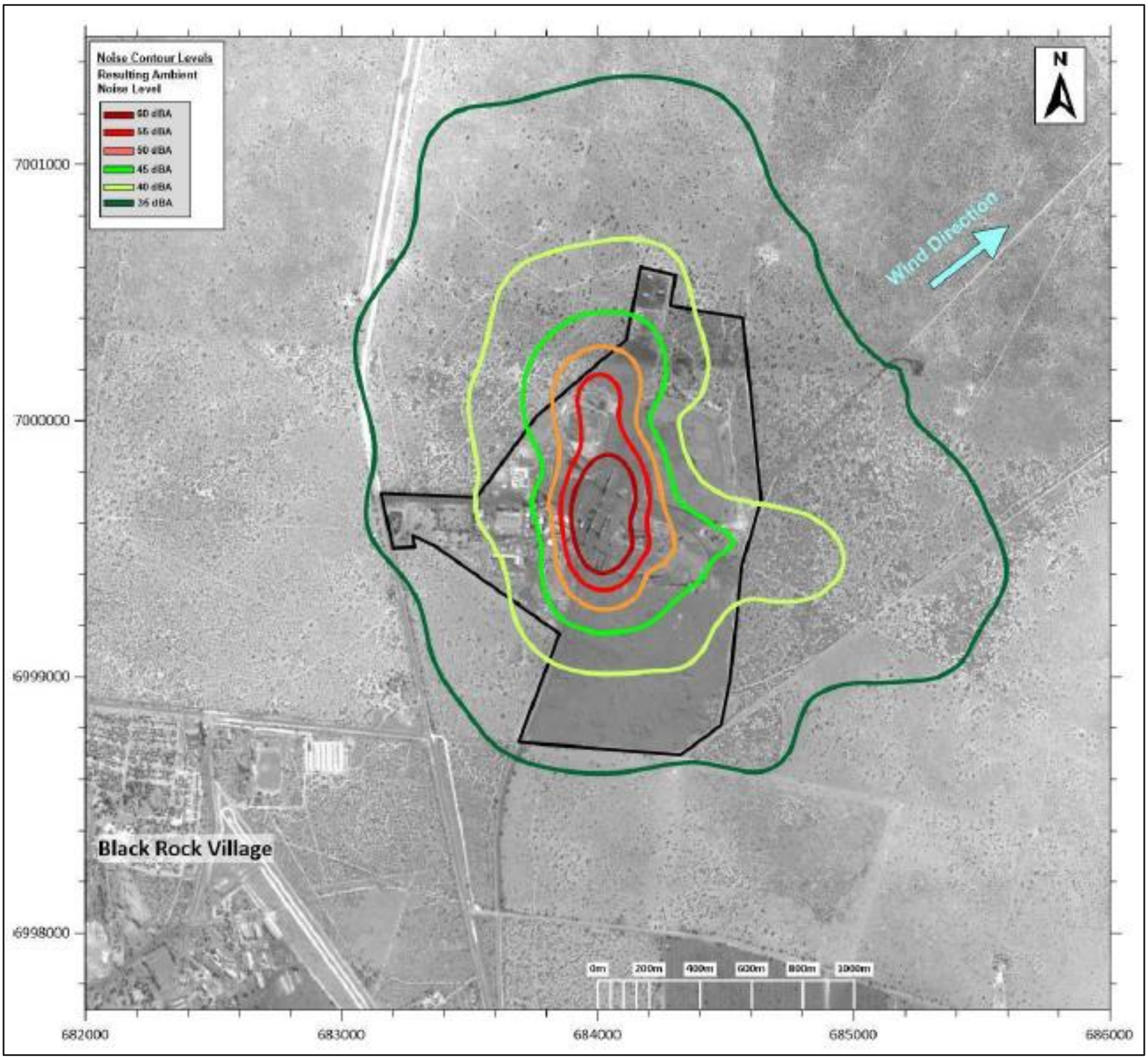


Figure 7-9: Noise Contours for Daytime Conditions

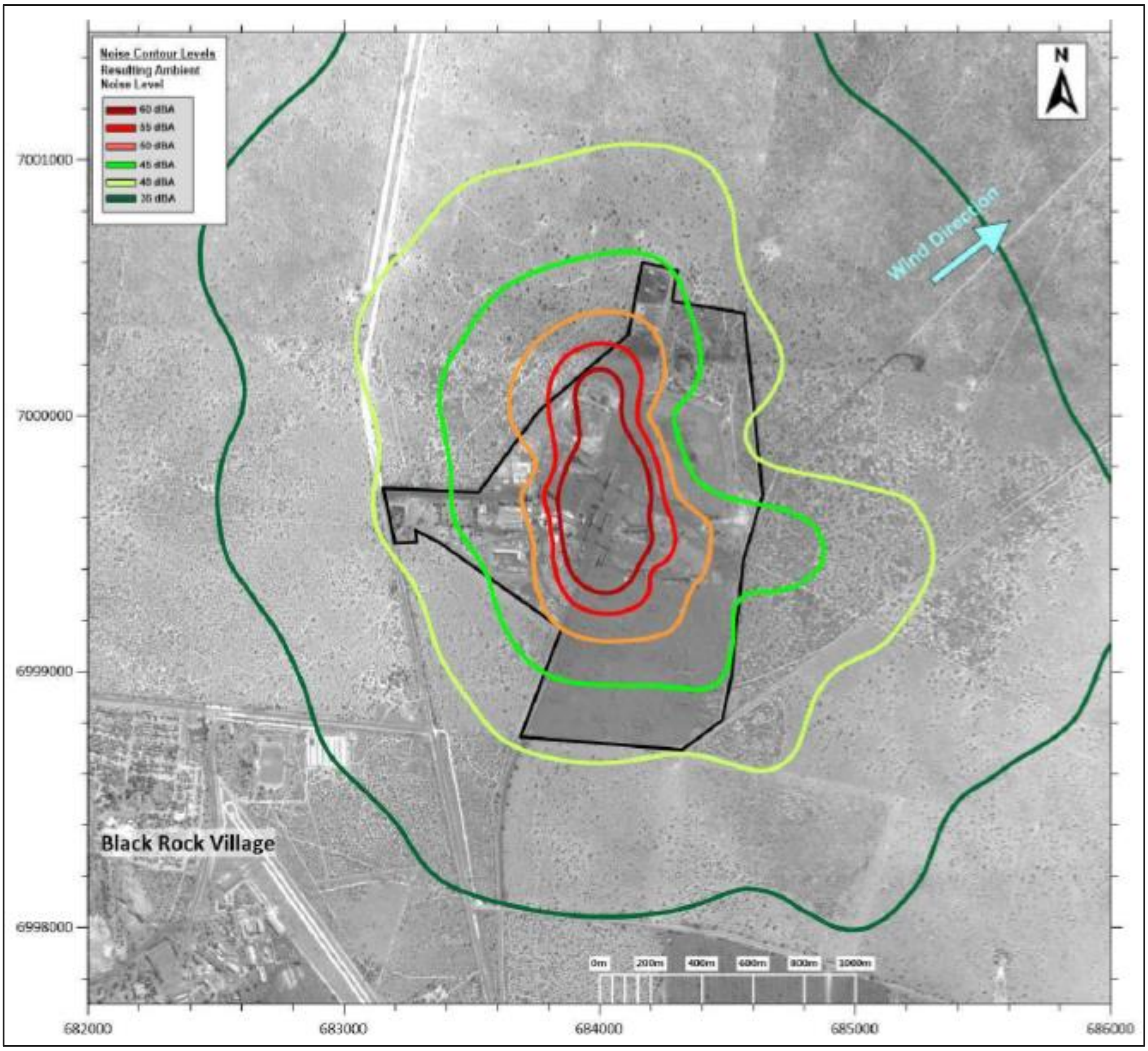


Figure 7-10: Noise Contours for Night-Time Conditions

<u>Conclusion</u>

Areas that are located in close proximity to mining activities have elevated ambient noise levels. Given that the project footprint is located adjacent to the Wessels Mine, the noise environment has already been altered and as such, is not expected that the proposed project will result in an increase in noise disturbance. Due to the nature of the proposed project, it is unlikely to result in any material changes to noise impacts.

7.4.1.10 Visual

<u>Introduction and Link to Impact</u>

Mining infrastructure has the potential to alter the landscape character at the proposed project area and surrounding area through the establishment of both temporary and permanent infrastructure. To understand the basis of these potential impacts, a baseline situational analysis is described below.

Data Sources

Information in this section was sourced from the South32 EIA and EMPR for the Amendment of the EMPR Report (KP, 2018), the Scoping Report for the Changes to the Infrastructure Layout and Activities at the MMT (SLR, 2021) and the Landscape/Visual Site Sensitivity Verification Report (SSVR) compiled for the proposed project (SLR, 2021).

Description

Landscape Character: The broader environment is characterised by terrain that is predominantly flat with a gentle slope towards the north-west. There are two ranges of high ground running through the region from south to north. The eastern range contains the Asbestos Mountain and Kuruman Hills. To the west are the Langeberg and Koranna mountains. The natural topography of the area surrounding the Wessels Mine has been largely influenced by mining activities associated with the Nchwaning Mine and Black Rock Mine, and mines further afield, including MMT, UMK and the Tshipi Borwa mines. The project footprint is largely located within the Wessels Mine on disturbed land; however, a portion of the project footprint is located adjacent to the Wessels Mine (eastern portion). This eastern portion is located in largely undisturbed farmland, with a vegetation structure comprising encroached stands of *Senegalia melifera* with relatively homogenous grass swards scattered throughout.

Scenic Quality: The scenic quality is linked to the type of landscapes that occur within an area. Scenic quality ranges from high to low as follows:

- High – these include the mountains and koppies, water bodies such as farm and irrigation dams, and natural drainage systems;
- Moderate – these include agricultural activities and recreational areas; and
- Low – these include towns, communities, roads, railway line, industries and existing mines.

When these landscape types are considered as a whole, the scenic quality of the majority of the project footprint is considered to be low, due to existing mining infrastructure. The landscape to the east of the project footprint has not been disturbed by existing and surrounding mining activities, bar the gravel access and farm roads. The area provides limited topographical variety since the terrain is relatively flat and is not considered scarce as it is representative of the greater landscape and common in the area. The scenic quality is thus considered to be moderate to low.

Sense of Place: The sense of place results from the combined influence of landscape diversity and distinctive features. The primary informant of these qualities is the spatial form and character of the natural landscape taken together with the cultural transformations and traditions associated with the historic use and habitation of the area. The project footprint is located within a “mining belt”. Surrounding existing mining operations and the infrastructure that supports these mines dominates the area to the west, south and south-east of the area. It follows that the immediate area within and surrounding the proposed project has a relatively weak sense of place (when the viewer is within the mining belt). However, seen in context with the site surrounded by large open spaces of arid vegetation, the harsh nature of the mining activities is “softened”. When the viewer views the area from outside the “mining belt”, the larger area has a stronger sense of place.

Visual Receptors: Visual receptor locations and routes that are sensitive and/or potentially sensitive to the visual intrusion of the proposed project include the towns of Black Rock and Hotazel located 15 km north and 1.8 km south-west, respectively, the gravel access road located within the eastern-most section of the proposed project area, and the R380 located 650 m westwards. The proposed project is not considered to have a significant visual impact on these areas given the following details:

- The proposed project entails the extension of an existing railway line;
- It is located within and adjacent to the existing Wessels Mine operation, which is visually intrusive;
- The proposed project is linear in nature and will not comprise of any high structures; and
- The proposed project area is not visible from the R380 and the towns of Black Rock and Hotazel, as the Wessels Mine is obstructing it.

Conclusion

When considering landscape character, scenic quality, sense of place and visual receptors the baseline conclusion is that the project footprint is located in an area which has already been disturbed by mining and historic agricultural activities. It follows that the visual value of the project area has already been influenced.

7.4.2 Baseline Cultural/Heritage Environment Affected by the Proposed Activity

7.4.2.1 Cultural/Heritage and Palaeontology

Introduction

Cultural/heritage resources include all human-made phenomena and intangible products that are the result of the human mind. Natural, technological or industrial features may also be part of heritage resources as places that have made an outstanding contribution to the cultures, traditions and lifestyles of the people or groups of people of South Africa.

Paleontological resources are fossils, the remains or traces of prehistoric life preserved in the geological (rock stratigraphic) record. They range from the well-known and well-publicized (such as dinosaur and mammoth bones) to the more obscure but nevertheless scientifically important fossils (such as palaeobotanical remains, trace fossils, and microfossils). Paleontological resources include the casts or impressions of ancient animals and plants, their trace remains (for example, burrows and trackways), microfossils (for example, fossil pollen, ostracodes, and diatoms), and unmineralised remains (for example, bones of Ice Age mammals).

Mining activities and mining-related infrastructure have the potential to impact heritage/cultural and paleontological resources through the placement of infrastructure and through related construction and operational activities. To understand the basis of these potential impacts, a baseline situational analysis is described below.

Data Sources

Information in this section was sourced from the South32 EIA and EMPR for the Amendment of the EMPR Report (KP, 2018), the Scoping Report for the Changes to the Infrastructure Layout and Activities at the MMT (SLR, 2021) and the HIA compiled for the proposed project (CTS Heritage, 2021).

Description

Cultural/Heritage: The Wessels Mine is situated in an area that, as a whole, has had a relatively low human presence due to the dryness of the region, and as such, if there were human settlements they tended to be located on or near watercourses. In this regard, archaeological artefacts have predominantly been located along the riverbanks of the Kuruman and Ga-Mogara rivers. Identified cultural/heritage resources in close proximity to the project area and that are not associated with the banks of the surrounding rivers include a cemetery and limestone houses, located approximately 8 km westwards. The grave site has more than 60 graves, are unmarked and have no tombstones. The cemetery most likely represents the graves of mine workers from the 1940s and 1970s, while the limestone houses date to the 1920s and are likely the original farmsteads of the respective farms.

Following a field assessment undertaken by CTS Heritage on 2 June 2021, cultural/heritage materials of significance were not identified within or in close proximity to the project footprint.

Palaeontology: The Wessels Mine is underlain by aeolian red sand and the occasional surface calcrete with deep sandy soils of the Hutton soil forms. The Kuruman River and associated riverbanks are embedded with the Kalahari sediments that cover the Precambrian metamorphic crust and characterised as silty, sandy, rocky and poorly drained. In this regard, it is unlikely that paleontological resources would be identified.

Conclusion

The project footprint is situated within a region that harbours few cultural/heritage resources and no cultural/heritage resources of significance have been identified within the project footprint. Furthermore, the project footprint is located within an area where there is an unlikelihood for the identification of palaeontological resources. Notwithstanding the afore-mentioned, the potential exists for resources to be buried beneath the surface of the ground and chance finds during the construction phase would need to be managed accordingly.

7.4.3 Baseline Socio-Economic Environment Affected by the Proposed Activity

7.4.3.1 Socio-Economic

Introduction

Mining operations have the potential to result in both positive and negative socio-economic impacts. The positive impacts are usually economic in nature with mines contributing directly towards employment, procurement, skills development and taxes on a national, regional and local scale. In addition, mines indirectly contribute to economic growth in the national, regional and local economies by strengthening the national economy and by increasing the number of income-earning people. This has a multiplying effect on the trade of other goods and services in other sectors.

The negative impacts associated with mining operations can be both social and economic in nature. In this regard, mines can cause:

- An influx of people seeking job opportunities which can lead to increased pressure on basic infrastructure and services (housing, health, sanitation and education), informal settlement development, increased trespassing, increased crime, introduction of diseases and disruption to the existing social structures within communities; and

- A change to not only pre-existing land uses, but also the associated social structure and meaning associated with these land uses and way of life. This is particularly relevant in the closure phase when the economic support provided by mines ends, the natural resources that were available to the pre-mining society are reduced, and the social structure that has been transformed to deal with the threats and opportunities associated with mining finds it difficult to adapt.

To understand the basis of these potential impacts, a baseline situational analysis is described below.

Data Sources

Information in this section was sourced from the Community Survey (Statistics South Africa (StatsSA), 2016).

Description

The socio-economic environment on a provincial, district and municipal level are summarised in Table 7-6.

Table 7-6: Socio-Economic Environment of the Province and District and Local Municipalities

Category and Indicator	Northern Cape Province	JTGDM	JMLM
Demographics			
Municipality Size	378 276.6 km^2	27 498.9 km^2	20 215 km^2
Population Size	1 193 780	242 265	84 200
Population Density	3.2 per km^2	8.8 per km^2	4.2 per km^2
Age	• 0 - 29 years (56%) • 30-59 years (34%) • 60 years and older (10%)	• 0 - 29 years (62%) • 30-59 years (30%) • 60 years and older (8%)	• 0 - 29 years (64%) • 30-59 years (29%) • 60 years and older (6%)
Gender	• Female (50%) • Male (50%)	• Female (51%) • Male (49%)	• Female (55%) • Male (45%)
Race	• Black African (48%) • Coloured (43%) • White (8%) • Indian or Asian (1%)	• Black African (84%) • Coloured (10%) • White (6%)	• Black African (97%) • White (2%) • Coloured (1%)
Language	• Afrikaans (56%) • Setswana (33%) • IsiXhosa (5%) • English (2%) • Others (4%)	• Setswana (75%) • Afrikaans (19%) • Sesotho (1%) • IsiXhosa (1%) • Others (4%)	• Setswana (92%) • Afrikaans (3%) • Others (5%)
Migration	• South African (99%) o Northern Cape (87%) o North West (3%) o Western Cape (3%) o Gauteng (2%) o Free State (2%) o Others and outside of South Africa (3%)	• South African (99%) o Northern Cape (90%) o North West (5%) o Gauteng (1%) o Free State (1%) o Western Cape (1%) o Others and outside of South Africa (2%)	• South African (100%) o Northern Cape (93%) o North West (5%) o Others and outside of South Africa (2%)
Households			
Household Number	353 713	72 310	23 922
Household Type	• Formal houses (74%) • Shacks (14%) • Flats in backyards (5%) • Others (5%) • Traditional dwellings (2%)	• Formal houses (71%) • Shacks (10%) • Flats in backyards (7%) • Traditional dwellings (6%) • Others (6%)	• Formal houses (69%) • Traditional (13%) • Flats in backyards (10%) • Shack (6%) • Others (2%)
Service Delivery			
Water	• Piped water inside house or yard (80%) • Community stand (8%) • Communal tap (7%) • Others (5%)	• Piped water inside house or yard (39%) • Community stand (27%) • Communal tap (24%) • Others (10%)	• Community stand (45%) • Communal tap (32%) • Borehole in yard (7%) • Piped water inside yard 5%) • Oher (11%)
Electricity	• Pre-paid or conventional meters (90%)	• Pre-paid or conventional meters (90%)	• Pre-paid or conventional meters (89%)

Category and Indicator	Northern Cape Province	JTGDM	JMLM
	• No access (7%) • Solar or other (3%)	• No access (9%) • Unmetered (unpaid) or other (1%)	• No access (10%) • Other (1%)
Toilets	• Flush toilet (71%) • Pit toilet (19%) • Other (6%) • No access (4%)	• Pit toilet (58%) • Flush toilet (31%) • No access (7%) • Other (4%)	• Pit toilet (81%) • No access (7%) • Flush toilet (5%) • Other (7%)
Refuse	• Regular service provider (65%) • Own dump (22%) • Other (6%) • Communal dump (4%) • None (3%)	• Own dump (64%) • Regular service provider (25%) • Communal dump (2%) • Other (6%) • None (3%)	• Own dump (84%) • Communal dump (6%) • None (4%) • Other (6%)
Economics			
Employment	• Employed (38%) • Other not economically active (42%) • Unemployed (15%) • Discouraged work seeker (5%)	• Employed (32%) • Other not economically active (47%) • Unemployed (14%) • Discouraged work seeker (7%)	• Employed (16%) • Other not economically active (61%) • Unemployed (10%) • Discouraged work seeker (13%)
Sector of employment	• Formal (72%) • Informal (15%) • Private household (11%) • Unsure (2%)	• Formal (75%) • Informal (11%) • Private household (13%) • Unsure (1%)	• Formal (65%) • Informal (17%) • Private household (16%) • Unsure (2%)
Annual Income	• Average – R30 000 ○ R0 – R20 000 (41%) ○ R20 0001 – R150 000 (44%) ○ R150 001 – R600 000 (10%) ○ R600 001 and above (1%) ○ Unspecified (4%)	• Average – R30 000 ○ R0 – R20 000 (32%) ○ R20 0001 – R150 000 (51%) ○ R150 001 – R600 000 (12%) ○ R600 001 and above (1%) ○ Unspecified (4%)	• Average – R14 600 ○ R0 – R20 000 (62%) ○ R20 0001 – R150 000 (37%) ○ R150 001 – R600 000 (11%) ○ R600 001 and above (1%)
Education			
Education Level	• None (8%) • Primary (or some) (19%) • Matric (or some secondary) (65%) • Tertiary (5%) • Unspecified (3%)	• None (10%) • Primary (or some) (19%) • Matric (or some secondary) (62%) • Tertiary (5%) • Unspecified (4%)	• None (15%) • Primary (or some) (30%) • Matric (or some secondary) (48%) • Tertiary (3%) • Unspecified (4%)

Conclusion

The socio-economic environment descriptions for the province and district and local municipalities indicate that in the communities surrounding the Wessels Mine, there are significant social and economic challenges. The existing situation indicates that there is a measure of unemployment and informal settlement development, with limited inward migration of people with the resultant pressure on basic infrastructure and services (education, sanitation, water etc.). Whilst the proposed project may contribute (cumulatively) to the social and economic challenges described above, due to the nature, scale and limited extent of the proposed project, it is expected that the associated negative socio-economic impact will be negligible. The proposed extension of the railway infrastructure will contribute and allow for the creation of short-term employment and procurement opportunities. However, similarly to the afore-mentioned negative impacts, this positive impact will be negligible due to the limited nature, scale and extent of the proposed project.

7.4.3.2 Land Use

Introduction

Mining activities have the potential to affect land uses both within the mine area and in the surrounding areas. This can be caused by physical land transformation and through direct or secondary impacts. The key-related potential environmental impacts are water, air and noise pollution, visual impacts and the influx of job seekers with related social ills. To understand the basis of the potential land use impacts, a baseline situational analysis is described below.

Data Sources

Information in this section was sourced from the South32 EIA and EMPR for the Amendment of the EMPR Report (KP, 2018), the Scoping Report for the Changes to the Infrastructure Layout and Activities at the MMT (SLR, 2021), site observations, Windeed searches and a review of topographical maps and satellite imagery.

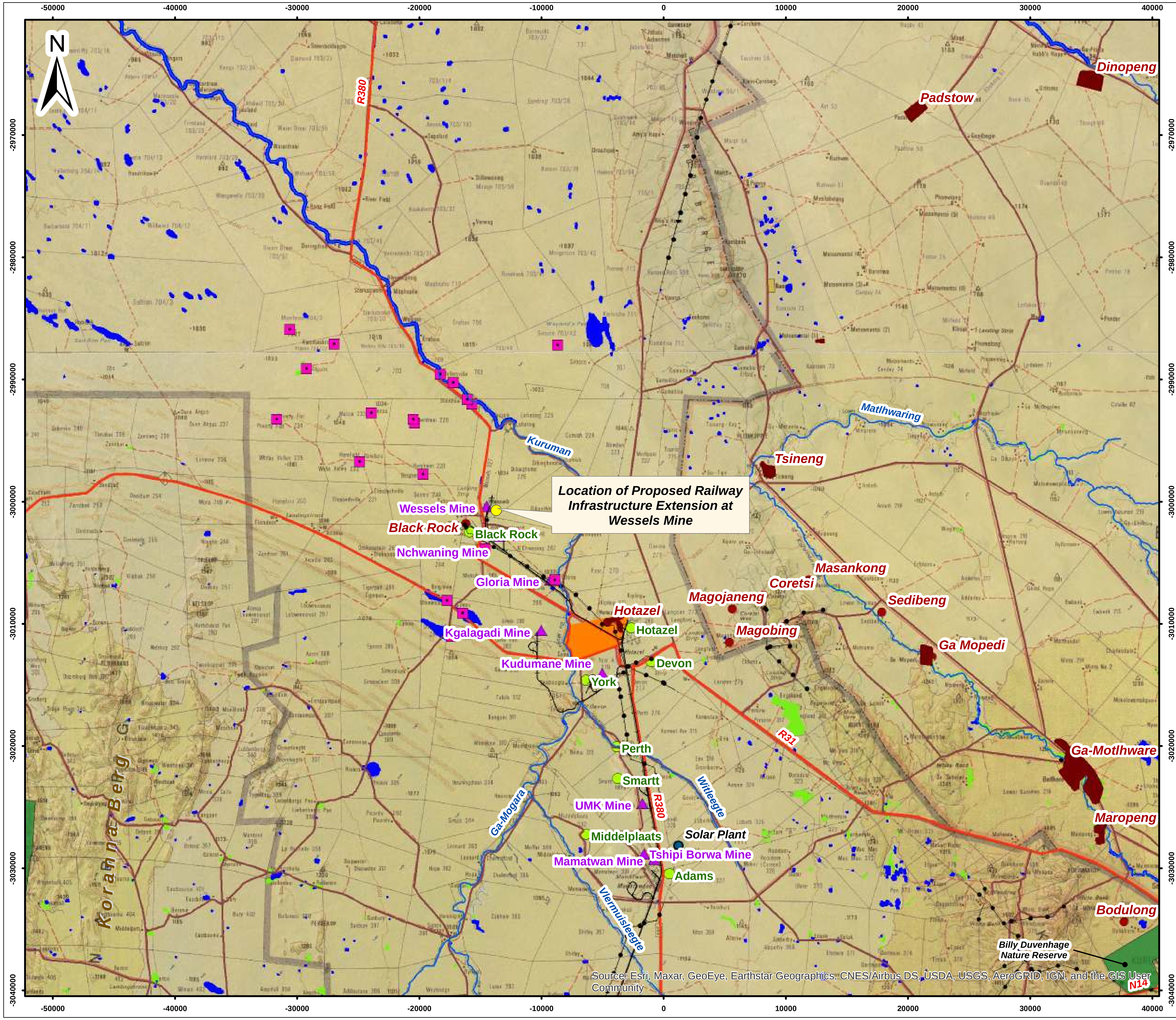
Description

Mining and Prospecting Rights: HMM holds a MR (Ref No. 03/2006(MR)) for remaining extent of the farm Wessels 227, portions 1 and 2 of the farm Dibiaghomo 226 and portion 1 of the farm Dikgathlong 268. The MR boundary is illustrated in the Regional Land Use Map provided in Figure 7-11.

Land Ownership: Land ownership details of the land on which the proposed project is located are provided in Table 7-7. Land ownership details of landowners of properties adjacent to the project area are provided in Appendix F.

Table 7-7: Land Ownership Within the Project Footprint

Property Name	Portion Number	Title Deed Reference	Registered Property Owner
Wessels 227	Remaining Extent	T2426/2010	Hotazel Manganese Mines (Pty) Ltd
Dibiaghomo 226	2	T2426/2010	
N'Chwaning 267	9	T2144/2015	
Mukulu 265	Remaining Extent	T288/1956	Assmang (Pty) Ltd
Gloria 266	1	T506/1966	



Legend

- Towns
- Location of Proposed Railway Extension
- Main Roads
- Secondary Roads
- Power Line
- Rivers and Streams
- Existing Railway
- Receptors / Isolated Farmsteads
- Solar Plant
- Operating Manganese Mines
- Closed / Dormant Mines
- Urban Areas
- Cultivated Land
- Wetlands
- Possible Hotazel Town Expansion Area
- South African Protected Areas (2020)

0 3 6 9 Kilometers

Scale: 1 : 300 000 @ A3

Projection: Transverse Mercator
Datum: Hartebeeshoek, Lo23

South32 Limited

Figure 7-11

Regional Land Use Map

SLR

SLR Consulting (Africa) (Pty) Ltd
P O Box 1596, Cramerview, 2060, South Africa
Tel: +27 (11) 467-0945 Fax: +27 (11) 467-0978

720.19136.00010

2021/08/10

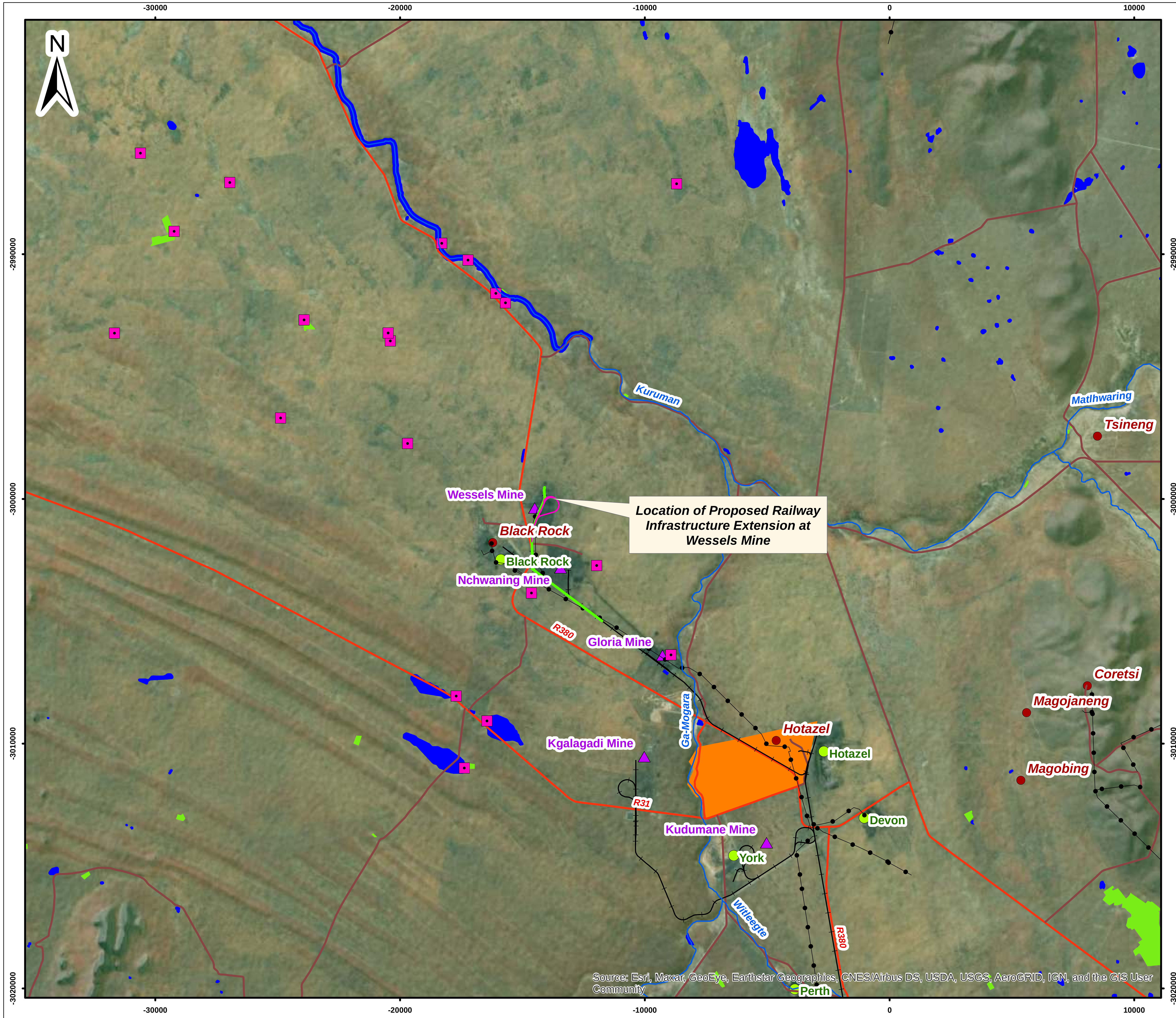
Land Claims: The DRDLR Land Claims Commissioner of the Northern Cape was contacted to confirm if any land claims were lodged on the proposed project area. The Land Claims Commissioner confirmed that no land claims have been lodged (see Appendix D).

Land Use: Land use within the broader region surrounding the Wessels Mine is a mixture of agriculture, residential, mining activities and renewable energy facilities. Regional and local land use maps are provided in Figure 7-11 and Figure 7-12, respectively. More detail is provided below.

- Agriculture: Agricultural activities currently undertaken within the areas surrounding the Wessels Mine include game farming and ad-hoc livestock grazing.
- Residential: Numerous towns are located in the area surrounding Wessels Mine. These are listed as follows:
  - Black Rock, approximately 2.5 km west;
  - Hotazel, approximately 15 km south;
  - Kuruman, approximately 69 km south-east; and
  - Kathu, approximately 74 km south.
- Infrastructure and Servitudes: Numerous Eskom-related infrastructure is located within close proximity of the Wessels Mine. These include 132 kV, 66 kV and 400 kV powerlines, as well as 132kV substations. The Sedibeng Vaal Gamagara water pipeline supplies MMT with process and potable water and is located approximately 400 m east of the boundary of MMT and approximately 20 km south-east of the Wessels Mine. Furthermore, there exists an extensive railway network in the area that is used by the surrounding mines and that runs to Coega in the Eastern Cape.
- Mining Operations and Other Industries: There are a number of mines located within the broader region. Those located within a 10 km radius of the Wessels Mine are as follows:
  - N'Chwaning Mine, approximately 2.5 km south-east;
  - Black Rock Mine, approximately 2.7 km south-east,
  - Gloria Mine, approximately 8 km south-east; and
  - Kalagadi Mine, approximately 10 km south-east.
- The Adams Solar Plant owned by Enel Green power (Pty) Ltd is located approximately 22 km south-east.

Conclusion

Whilst the project footprint is located within close proximity to Black Rock and Hotazel, it is not anticipated that these towns will be affected by the proposed project. This is due largely to the nature and limited scale and extent of the proposed project, as well as the mining-related context wherein the Wessels Mine is located. Various infrastructural components (powerline, pipeline and railway line) are located in close proximity or within the project footprint. The proposed project will need to be managed in such a way so as not to interfere with the infrastructure.



Legend

- Towns
- Proposed Railway Extension Layout
- Upgrade to Existing Line
- Main Roads
- Secondary Roads
- Power Line
- Rivers and Streams
- Existing Railway
- Receptors / Isolated Farmsteads
- Operating Manganese Mines
- Closed / Dormant Mines
- Cultivated Land
- Wetlands
- Possible Hotazel Town Expansion Area

0 1 2 3 Kilometers

Scale: 1 : 150 000 @ A3

Projection: Transverse Mercator
Datum: Hartebeeshoek, Lo23

South32 Limited

Figure 7-12

Local Land Use Map

SLR

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7.4.3.3 Traffic

Introduction

Traffic from mining projects has the potential to affect the capacity of existing road networks, as well as result in public road safety issues. To understand the basis of these potential impacts in the context of the project activities, a baseline situational analysis is described below.

Data Sources

Information in this section was sourced from the Scoping Report for the Changes to the Infrastructure Layout and Activities at the MMT (SLR, 2021) and from site observations.

Description

Existing road intersections within the vicinity of the proposed project include the following:

- The provincial R380 which lies to the west of the Wessels Mine and traverses in a north-south direction between Hotazel and Kuruman;
- The R31 road starts from the R380 south of the Wessels Mine and goes in an east-west direction to Van Zylsrus; and
- Gravel and farms\ roads towards the east of the Wessels Mine used by farmers.

Conclusion

A key potential traffic-related impact is public safety. The proposed project will require the movement of heavy vehicles and an increase in the traffic in the project area during the construction phase. Due to the nature and limited scale and extent of the proposed project, and the surrounding mining-related land uses, the impacts on surrounding communities are expected to be limited. These impacts would; however, still need to be managed accordingly.

7.4.3.4 Description of Specific Environmental Features and Infrastructure on the Site

The environmental features associated with the project area are described in section 7.4.1 above. No notable environmental features are associated with the project footprint.

7.4.3.5 Environmental and Current Land Use Map

Regional and local land use maps are provided in Figure 7-11 and Figure 7-12, respectively.

7.5 ENVIRONMENTAL IMPACTS AND RISKS OF THE ALTERNATIVES

This section requires a list of potential impacts on environmental and socio-economic aspects that have been identified in respect of each of the main project activities and processes for each of the project phases in terms of the project alternatives. With reference to chapter 6, no project alternatives have been considered and as such this section is not applicable.

7.6 METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

The method used for the assessment of environmental issues is set out in Table 7-8. Part A provides the definition for determining impact consequence (combining intensity, spatial scale and duration) and impact significance (the overall rating of the impact). Impact consequence and significance are determined from Part B and C. The interpretation of the impact significance is given in Part D.

The assessment methodology enables the assessment of environmental issues including cumulative impacts, the severity of impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources), the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated.

Table 7-8: SLR's Impact Assessment Methodology

PART A: DEFINITIONS AND CRITERIA*		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of intensity, spatial extent and duration**
Criteria for ranking of the INTENSITY of environmental impacts	VH	Severe change, disturbance or degradation. Associated with severe consequences. May result in severe illness, injury or death. Targets, limits and thresholds of concern continually exceeded. Substantial intervention will be required. Vigorous/widespread community mobilization against project can be expected. May result in legal action if impact occurs.
	H	Prominent change, disturbance or degradation. Associated with real and substantial consequences. May result in illness or injury. Targets, limits and thresholds of concern regularly exceeded. Will definitely require intervention. Threats of community action. Regular complaints can be expected when the impact takes place.
	M	Moderate change, disturbance or discomfort. Associated with real but not substantial consequences. Targets, limits and thresholds of concern may occasionally be exceeded. Likely to require some intervention. Occasional complaints can be expected.
	L	Minor (Slight) change, disturbance or nuisance. Associated with minor consequences or deterioration. Targets, limits and thresholds of concern rarely exceeded. Require only minor interventions or clean-up actions. Sporadic complaints could be expected.
	VL	Negligible change, disturbance or nuisance. Associated with very minor consequences or deterioration. Targets, limits and thresholds of concern never exceeded. No interventions or clean-up actions required. No complaints anticipated.
	VL+	Negligible change or improvement. Almost no benefits. Change not measurable/will remain in the current range.
	L+	Minor change or improvement. Minor benefits. Change not measurable/will remain in the current range. Few people will experience benefits.
	M+	Moderate change or improvement. Real but not substantial benefits. Will be within or marginally better than the current conditions. Small number of people will experience benefits.
	H+	Prominent change or improvement. Real and substantial benefits. Will be better than current conditions. Many people will experience benefits. General community support.
	VH+	Substantial, large-scale change or improvement. Considerable and widespread benefit. Will be much better than the current conditions. Favourable publicity and/or widespread support expected.
Criteria for ranking the DURATION of impacts	VL	Very short, always less than a year. Quickly reversible
	L	Short-term, occurs for more than 1 but less than 5 years. Reversible over time.
	M	Medium-term, 5 to 10 years.
	H	Long term, between 10 and 20 years (likely to cease at the end of the operational life of activity).
	VH	Very long, permanent, +20 years (Irreversible, Beyond closure).
Criteria for ranking the EXTENT of impacts	VL	A part of the site/property.
	L	Whole site.
	M	Beyond the site boundary, affecting immediate neighbours.

	H	Local area, extending far beyond site boundary.					
	VH	Regional/National					
PART B: DETERMINING CONSEQUENCE							
INTENSITY = VL							
DURATION	Very long	VH	Low	Low	Medium	Medium	High
	Long term	H	Low	Low	Low	Medium	Medium
	Medium term	M	Very Low	Low	Low	Low	Medium
	Short term	L	Very low	Very Low	Low	Low	Low
	Very short	VL	Very low	Very Low	Very Low	Low	Low
INTENSITY = L							
DURATION	Very long	VH	Medium	Medium	Medium	High	High
	Long term	H	Low	Medium	Medium	Medium	High
	Medium term	M	Low	Low	Medium	Medium	Medium
	Short term	L	Low	Low	Low	Medium	Medium
	Very short	VL	Very low	Low	Low	Low	Medium
INTENSITY = M							
DURATION	Very long	VH	Medium	High	High	High	Very High
	Long term	H	Medium	Medium	Medium	High	High
	Medium term	M	Medium	Medium	Medium	High	High
	Short term	L	Low	Medium	Medium	Medium	High
	Very short	VL	Low	Low	Low	Medium	Medium
INTENSITY = H							
DURATION	Very long	VH	High	High	High	Very High	Very High
	Long term	H	Medium	High	High	High	Very High
	Medium term	M	Medium	Medium	High	High	High
	Short term	L	Medium	Medium	Medium	High	High
	Very short	VL	Low	Medium	Medium	Medium	High
INTENSITY = VH							
DURATION	Very long	VH	High	High	Very High	Very High	Very High
	Long term	H	High	High	High	Very High	Very High
	Medium term	M	Medium	High	High	High	Very High
	Short term	L	Medium	Medium	High	High	High
	Very short	VL	Low	Medium	Medium	High	High
			VL	L	M	H	VH
			A part of the site/property	Whole site	Beyond the site, affecting neighbours	Extending far beyond site but localised	Regional/ National
			EXTENT				
PART C: DETERMINING SIGNIFICANCE							
PROBABILITY (of exposure to impacts)	Definite/ Continuous	VH	Very Low	Low	Medium	High	Very High
	Probable	H	Very Low	Low	Medium	High	Very High
	Possible/ frequent	M	Very Low	Very Low	Medium	Medium	High
	Conceivable	L	Insignificant	Very Low	Low	Medium	High
	Unlikely/ improbable	VL	Insignificant	Insignificant	Very Low	Low	Medium
			VL	L	M	H	VH
			CONSEQUENCE				

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
Very High	Potential fatal flaw unless mitigated to lower significance.
High	It must have an influence on the decision. Substantial mitigation will be required.
Medium	It should have an influence on the decision. Mitigation will be required.
Low	Unlikely that it will have a real influence on the decision. Limited mitigation is likely required.
Very Low	It will not have an influence on the decision. Does not require any mitigation
Negligible	Inconsequential, not requiring any consideration.

7.7 POSITIVE AND NEGATIVE IMPACTS OF THE PROPOSED ACTIVITY AND ALTERNATIVES

As noted in chapter 6, no site alternatives were considered as the project footprint was determined due to the need to be in close proximity to the existing railway infrastructure.

7.8 POSSIBLE MANAGEMENT ACTIONS THAT COULD BE APPLIED AND THE LEVEL OF RISK

A summary of the issues and concerns raised by I&APs during the BA process to date is provided in Section 7.3. A list of the potential impacts raised by I&APs, as well as the possible management and mitigation measures, is provided in Table 7-9. An estimation of the level of residual risk after management or mitigation is provided.

Table 7-9: Possible Management Actions and the Anticipated Level of Risk

Issue and Concern Raised	Possible Management Actions or Alternatives to Address Issue	Impact Significance of the Possible Management Action Before and After Mitigation	
		Without Mitigation	With Mitigation
A major concern is that of dust created by the laydown station and the impact it has on the adjacent land. Dust affects the grazing capabilities of the adjacent land. Soil erosion: This region where the mine is situated has very lose sandy soil. Rainfall in the area is associated with very windy conditions. The tree removal with earthworks phase of the project will leave exposed soil which may affect the dust fall of the East Manganese Mine. Dust fall is tested on a monthly basis on the mine and the mine has been compliant thus far. The project may lead to excessive dust and may lead to non-compliance on the mine.	HMM will comply with the provisions of the EMPR which will include dust suppression measures during the construction phase (see chapter 9 and Table 9-1).	**Insignificant**	**INSIGNIFICANT**
Chemical pollution of soils: The project will result in contamination of groundwater resources. Based on the Geohydrological report of East Manganese the Regional groundwater flow is mainly in a north-western direction, with localised groundwater flow towards the drainage channels. Boreholes for groundwater testing are situated around the pit; the open pit is located in the in the Ga-Mogara River. There is a possibility that the chemical pollution of soils will be picked up in the quarterly borehole testing of the mine.	HMM will comply with the provisions of the EMPR which will include measures to manage groundwater-related impacts (see chapter 9 and Table 9-1).	**Insignificant**	**INSIGNIFICANT**
38(4)c(i) – If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be	HMM will comply with the provisions of the EMPR which will include measures to manage impacts on cultural/heritage and palaeontological resources (see chapter 9 and Table 9-1).	**Insignificant**	**INSIGNIFICANT**

Issue and Concern Raised	Possible Management Actions or Alternatives to Address Issue	Impact Significance of the Possible Management Action Before and After Mitigation	
		Without Mitigation	With Mitigation
alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule. 38(4)c(ii) – If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule. • 38(4)e – The following conditions apply with regards to the appointment of specialists: i) If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.			
The BAR and Biodiversity Assessment Report confirmed the presence of nationally and provincially protected plants in the project footprint, namely Va*chellia erioloba*, *Vachellia haematoxylon*, *Harpagophytum procumbents* and *Boophone disticha*. No indication was given of the density of protected trees on site and/or the number of trees that may be impacted on. The developer will	HMM will comply with the provisions of the EMPR which will include measures to manage terrestrial biodiversity-related impacts (see chapter 9 and Table 9-1)	**Medium**	**LOW**

Issue and Concern Raised	Possible Management Actions or Alternatives to Address Issue	Impact Significance of the Possible Management Action Before and After Mitigation	
		Without Mitigation	With Mitigation
therefore need to apply for and obtain a valid forest act license, prior to disturbing any protected trees on site. The department is assessing cumulative impacts on protected trees and once a certain threshold is exceeded, may ask for a biodiversity offset to be implemented, for impacts on slow-growing, long-lived protected trees that cannot be mitigated. Trees with active bird nests or other significant biodiversity features may not be damaged or disturbed without a valid fauna permit from the provincial Conservation Authority, under the NCNCA, if these would be affected.			

7.9 MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED

As noted in chapter 6, no site alternatives were considered as the project footprint was determined due to the need to be in close proximity to the existing railway infrastructure.

7.10 STATEMENT MOTIVATING THE PREFERRED ALTERNATIVE

The project is motivated by the inefficiency of the current railway configuration that does not allow for optimal and cost-effective loading of the manganese ore and product from the mine for transport to the market. The proposed project would allow for more ore to be loaded onto the railway carts in a shorter space of time, hereby increasing outputs and productivity. It would also decrease the need for road transport, which is considered more expensive and inefficient in relation to rail transport.

One design alternative, in addition to the preferred alternative, was considered for the proposed project. The alternative railway loop was proposed to be larger than the preferred alternative (refer to Figure 6-1). The smaller balloon loop is preferred as it will result in the least vegetation clearance, is located closest to the current active mining operations at Wessels Mine and would thus have been more likely subjected to edge effects that would have already resulted in the displacement of faunal species.