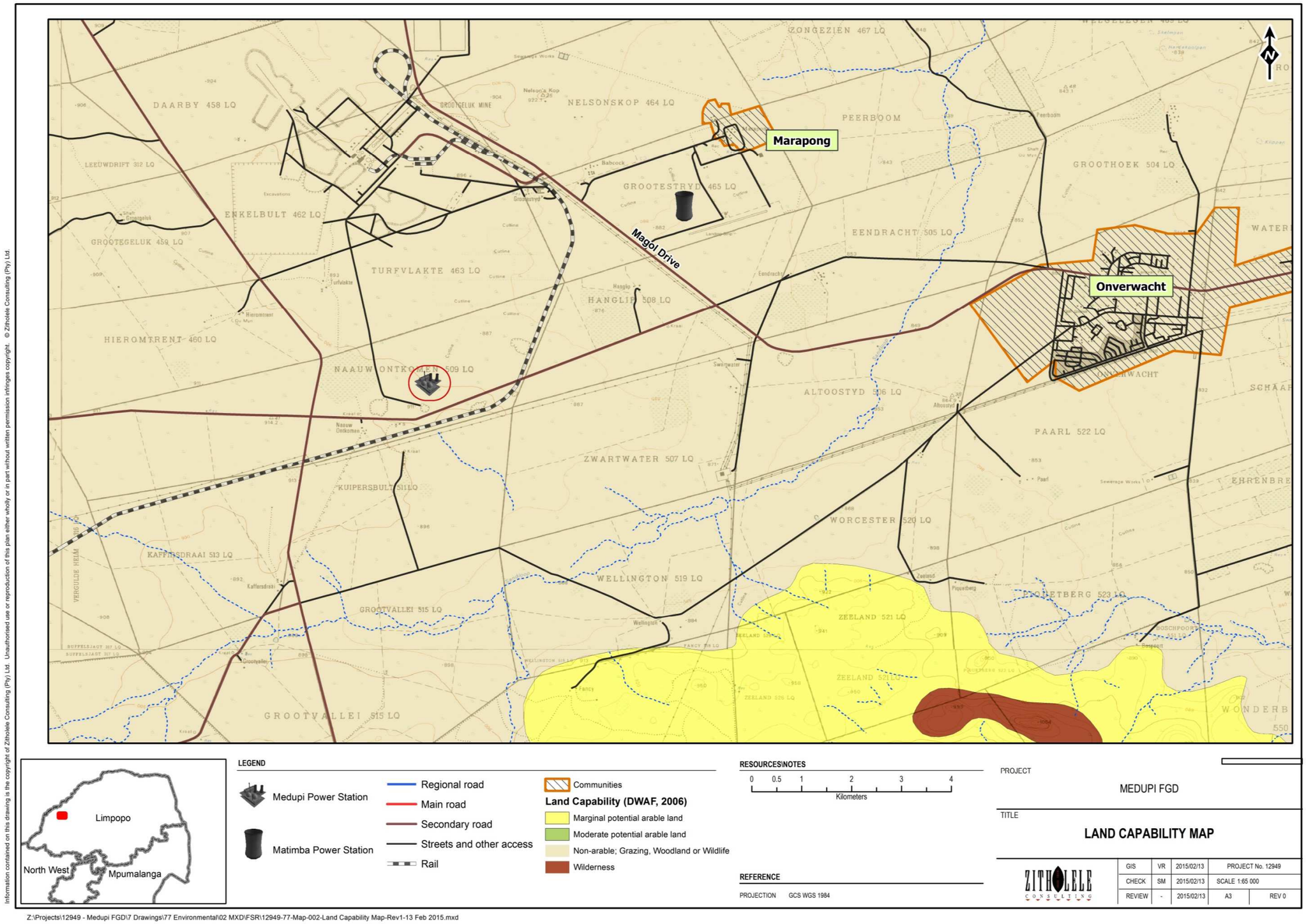

Figure 8-9: Land capability in the area

The study area contains clay rich soils, shallow soils and light textured soils.

8.3.1.1 Clay rich soils

In general soils with higher clay content are associated with the colluvial derived/transported materials, and are most often found associated with the lower lying streams and river deposits, albeit that the geology and underlying lithologies also influence the soil pedogenisis, with the more basic lithologies producing soils with more structure and heavier clay percentages.

The higher clay contents, and in places the swelling clay (2:1 Montmorillonite clays) have resulted in stronger than average soil structure that varies from pedocutanic to prismacutanic with distinctive slick-n-sides in the wet state and prominent open cracking at surface in the dry state. Stronger than average structure is noted in some of the colluvial and alluvial derived soils associated with the lower lying areas and flood plain deposits.

The sensitivity of these soils to being disturbed (worked on or moved) is evident in the ease of erosion that is noted where over grazing or disturbance of the topsoil has occurred, while the wetness factor and their importance in soil water storage and base flow transfer renders these materials as highly sensitive.

8.3.1.2 Shallow soils

A significant proportion of the soils within the study area are of a shallow to very shallow rooting depth. These soils are almost always founded directly on a hard rock interface, with little to no saprolite at the base of the “B” horizon and are considered of a poor to very poor land capability rating.

These soils are associated with the more resistant host rock lithologies and often form the ridge lines and upper slope positions. The resultant poor vegetative cover, the generally lower clay content and lower organic carbon contents result in a high sensitivity rating for these materials.

8.3.1.3 Light Textured Soils

The light textured soils include the majority of the orthic form soils, as well as some of the deeper hydromorphic soil Forms. The majority of these Forms are characterised by a humic “A” horizon overlying a red or red-brown apedel (poorly structured) B, with indications of mottling within the lower “B” horizons in the case of the hydromorphic soils.

Depths to the “C” horizon or the plinthic layer vary from less than 400mm on the shallow forms to over 800mm on the deep colluvial soils. The soils generally show a very thin saprolitic horizon, with the sub soils founded directly on hard bedrock.

The sensitivity of these soils is highly variable and depended on the depth and relative texture (clay content) of the materials. However, on average, and for the dry soils that are greater than 500mm deep, these soils are of the least sensitive, are generally more easily worked on and with, and can be stored with relative ease and re-used at closure for rehabilitation.

8.3.2 Land capability

The land capability within the study area consists mainly of arable and grazing land. However, it is also important to note that the pre-development conditions or status quo for the area of concern is one of disturbed industrial. For the most part the site comprises land that has been cleared or disturbed to some degree by the power station development.

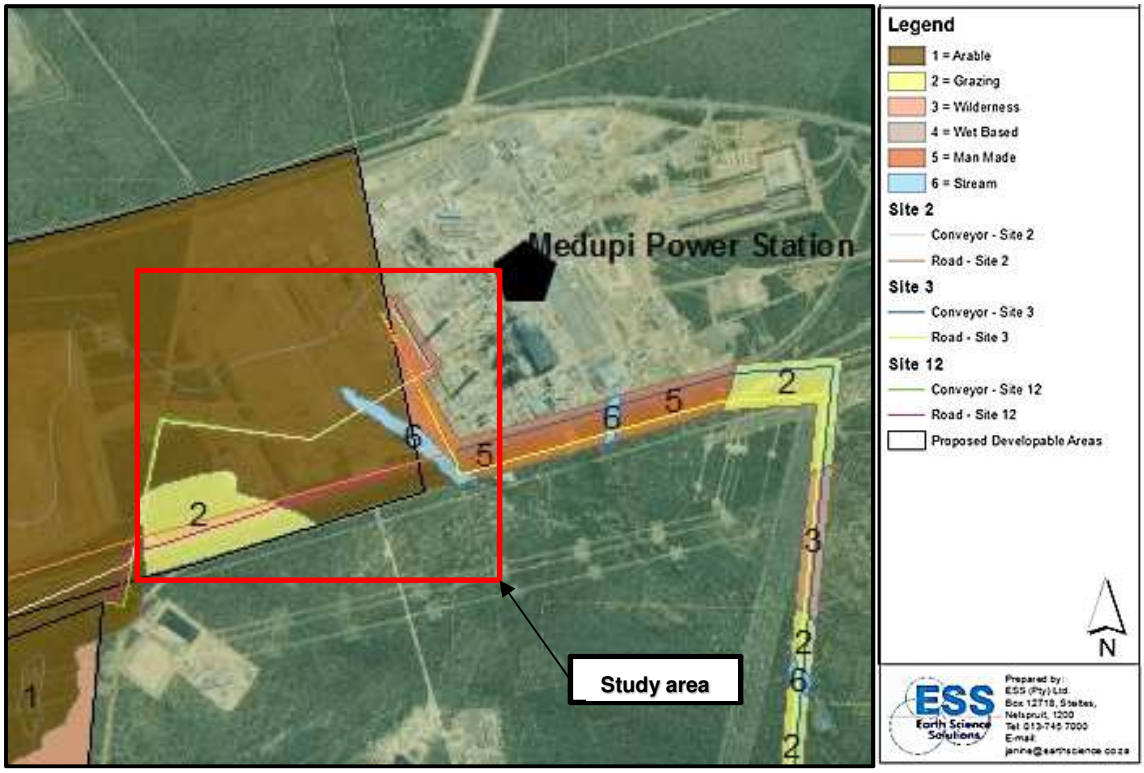

Figure 8-10: Land capability within the study area (excerpt from soils specialist study)

8.4 Groundwater

Information relating to groundwater resources within the proposed study area was obtained from the Hydrogeological Impact Assessment Study undertaken by Golder Associates Africa (Pty) Ltd (Brink & van der Linde, 2018), including literature sited within the study report. This specialist study report is included in **Appendix G-3** to this FEIR.

8.4.1 Regional Groundwater

Two distinct and superimposed groundwater systems are present in the geological formations of the coal fields in South Africa. They are the upper weathered aquifer and the system in the fractured rock below.

The Weathered Aquifer System generally occurs in the top 5-15 m and normally consists of soil and weathered rock. The upper aquifer is associated with the weathered horizon. In boreholes, water may often be found at this horizon. The aquifer is recharged by rainfall.

In a Fractured Aquifer System, grains in the fresh rock below the weathered zone are well cemented, and do not allow significant water flow. All groundwater movement therefore occurs along secondary structures such as fractures, cracks and joints in the rock. These structures are best developed in sandstone and quartzite, hence the better water-yielding properties of the latter rock type. Dolerite sills and dykes are generally impermeable to water movement, except in the weathered state.

8.4.2 Groundwater Quality

An analysis of groundwater monitoring results from 2016 were undertaken and it was found that the water quality of the existing boreholes is largely poor quality, with water quality classes ranging from Class 0 (Ideal water quality) to Class IV (Unacceptable water quality).

8.4.3 Regional Aquifer Recharge

From the published hydrogeological maps (DWAF 1996) the average recharge for the study area is shown as between 10 to 15mm per annum.

8.4.4 Groundwater Vulnerability

Groundwater vulnerability gives an indication of how susceptible an aquifer is to contamination. Groundwater vulnerability at the MPS is shown on the national groundwater is indicated as medium.

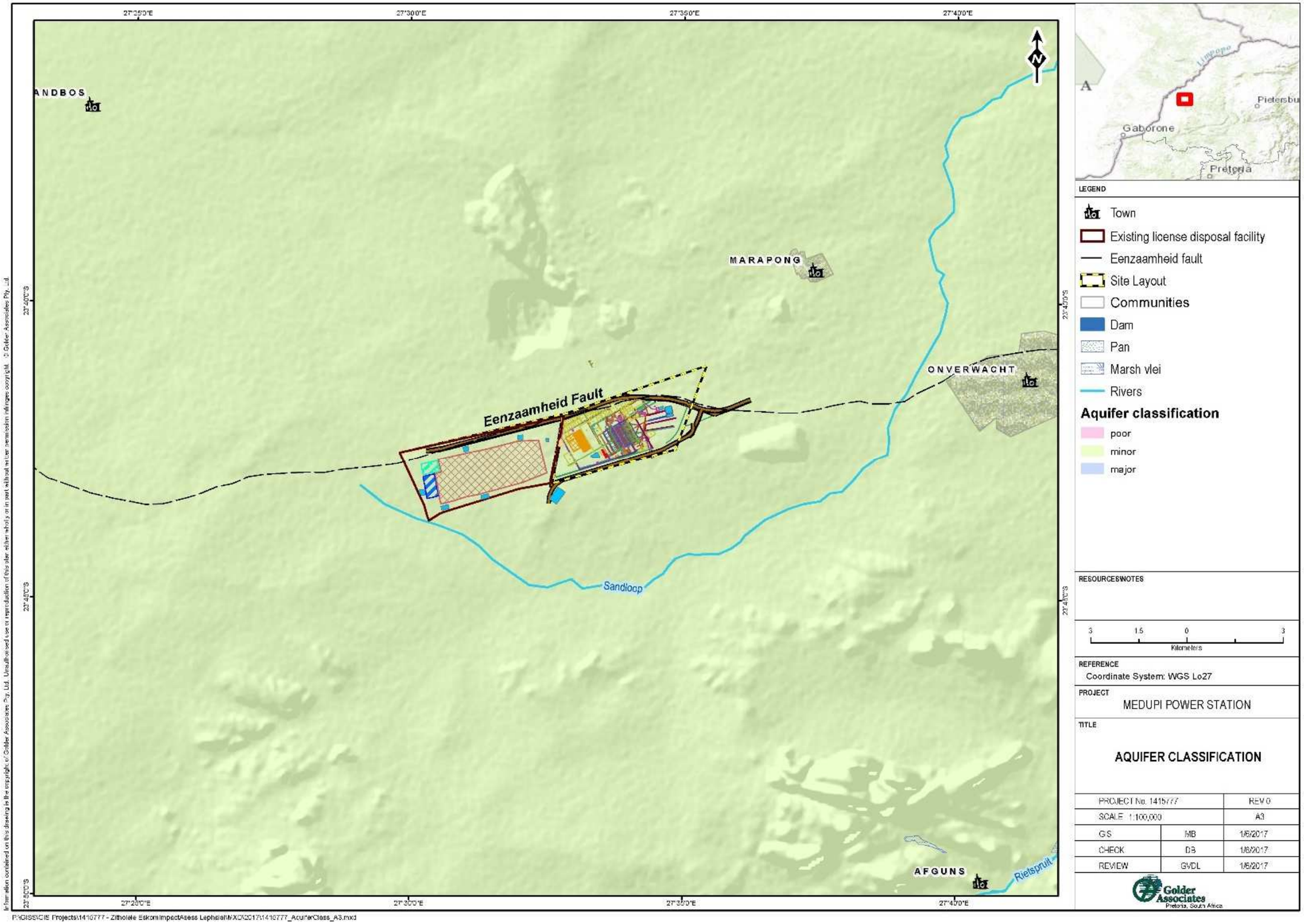

Figure 8-11: Regional aquifer classification

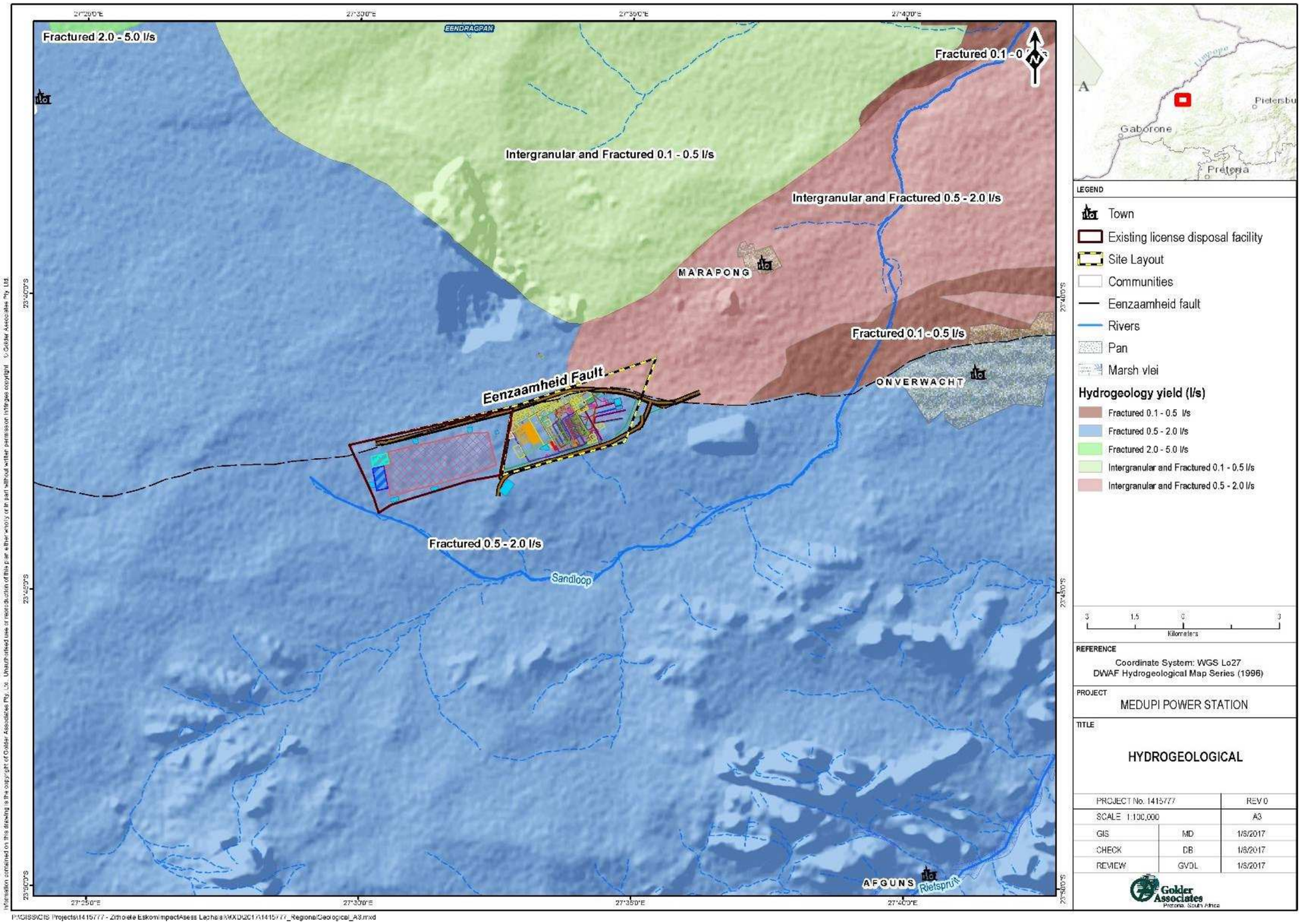

Figure 8-12: Hydrogeology Map

8.4.5 Aquifer Classification and Borehole Yield

The published hydrogeological maps series by DWAF (1996) was used to define the regional aquifer classification (**Figure 8-11**), which is classified as a minor aquifer system with fractured aquifer zones (**Figure 8-12**). The published hydrogeological maps (DWAF 1996) indicate that the average borehole yield in the area is between 0.5l/s and 2.0l/s.

8.4.6 Groundwater Levels and Flow Directions

From the available data and previous groundwater studies undertaken in the area, groundwater levels ranged from between 4.41 to 69.98 meters below ground level (mbgl), with the average water level as 30.4mbgl. The groundwater flow from the study area is primarily away from the site, towards the east/south-east and northeast towards the non-perennial Sandloop River.

8.5 Surface Water

Information relating to the surface water resources within the proposed study area was obtained from the Surface Water Impact Assessment Study undertaken by Golder Associates Africa (Pty) Ltd (Sithole & Jordaan, 2018), and Biodiversity and Wetland Assessment undertaken by Natural Scientific Services (NSS) (Abell, et al., 2018), including literature sited within these study report. These specialist study reports are included in **Appendix G-4** to this FEIR.

8.5.1 Regional Drainage Network

The study area is located within the A42J Quaternary catchment (**Figure 8-13**) to the south of the Lephalale coalfield where numerous mining developments are foreseen predominantly to the north of the Eenzaamheid Fault line. There are no perennial streams originating within the area itself. The closest perennial river is the Mokolo into which the non-perennial Sandloop River drains. The Mokolo flows through A42J to the Limpopo River.

Medupi is situated in the Mokolo catchment, with the non-perennial Sandloop River flowing around the site in an easterly to north easterly direction to confluence with the Mokolo River approximately 16 kilometres downstream of the town of Lephalale. The study site falls in a predominantly flat area of the Limpopo Water Management Area (WMA).

8.5.2 Water uses in the catchment

The water use within the catchment is predominantly agriculture (87%) and industry (13%) related. The Limpopo Province, and in particular, the Lephalale area, is a water stressed area with evaporation significantly higher than precipitation. Agricultural and industrial land uses in the municipal area are water intensive. There is therefore a high demand for water from an already water-stressed catchment.

Within the provisions of the National Water Act (Act 39 of 1998 as amended) as stipulated in the National Water Resources Strategy, there is a need to meet the water requirements of the

Reserve (Basic Human needs and Ecological) in terms of water quantity and quality. Taking the requirements into account, there is insufficient water to maintain the current balance. Added to this, it is anticipated that water demand will increase with new developments proposed in the Mokolo Catchment, such as new or expanded mining activities and new power stations (Bohlweki Environmental, 2006).

The MCWAP scheme has been initiated in order to provide adequate water to supply the current and planned water users with allocations of water from the Mokolo Dam. Medupi Power Station already has an allocation for water from the MCWAP phase 1 scheme. There is currently a WULA in process for additional water allocation to Medupi from the MCWAP phase 2 scheme in order to supply for the planned FGD technology operation. This WUL is been applied for at a strategic level by Eskom. The total water requirement will be of 15.4 million m^3 per annum, the pipeline infrastructure is being sized for this and the licence will be for the same amount.

8.5.3 Water Resource Classification and Resource Quality Objectives

The classification of significant water resources in the Crocodile (West), Marico, Matlabas and Mokolo catchments in accordance with the Water Resource Classification System (WRCS) was undertaken in 2011 / 2012 and finalised in 2013.

In terms of the classification system, each quaternary catchment is classified as a Class I, II or III, defined as:

- Class I - Minimally used: Water resource is one which is minimally used and the overall condition of that water resource is minimally altered from its pre-development condition;
- Class II - Moderately used: Water resource is one which is moderately used and the overall condition of that water resource is moderately altered from its pre-development condition; and
- Class III - Heavily used: Water resource is one which is heavily used and the overall condition of that water resource is significantly altered from its pre-development condition.

The recommended Class for quaternary catchment A42J is a Class II (Department of Water Affairs, 2013). In this respect mitigation implemented must be such that it will protect the water resources so that an ecological category of B/C is maintained.

The determination of Resource Quality Objectives (RQO) for the area was undertaken in 2016/ 2017 and will be gazetted during the first quarter of 2018 (DWS, 2017, Report number: DM/WMA01/00/CON/RQO/0516). The proposed RQOs and numerical limits are set out in **Table 8-5**.

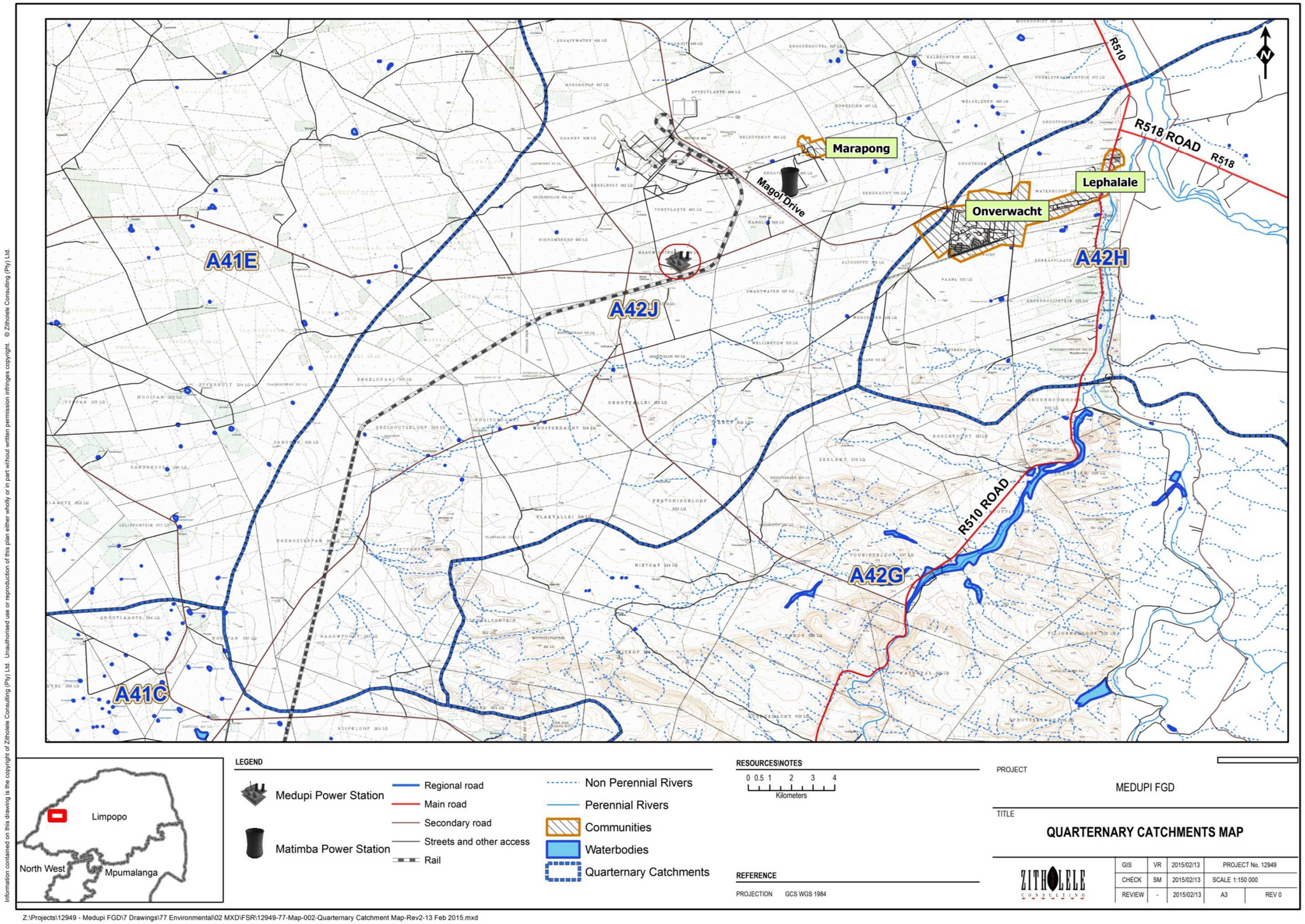

Figure 8-13: Quaternary catchments map

Table 8-5: RQOs and numerical limits for quaternary catchment A42J

Component	Sub-component	RQO	Indicator	Numerical Limit	Context/Rationale for RQO/numerical limit
Quality	Nutrients	Instream concentration of nutrients must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Orthophosphate (PO_4^-) as Phosphorus	≤0.05 milligrams/litre (mg/l) (50th percentile)	Present ecological state maintained. Require baseline data.
			Nitrate (NO_3^-) & Nitrite (NO_2^-) as Nitrogen	≤0.1 milligrams/litre (50th percentile	Present ecological state maintained. Require baseline data.
	Salts	Instream concentration of salinity must be maintained to protect present ecological state and the aquatic ecosystem health.	Electrical Conductivity	≤55 milliSiemens/metre (mS/m)(95th percentile)	Maintain present water quality.
	System Variables	pH range must be maintained within limits specified to support the aquatic ecosystem and water user requirements.	pH range	6.5 (5th percentile) and 8.5 (95th percentile)	Aquatic ecosystem as the driver. Present ate
		A baseline assessment to determine the present state instream turbidity is required. Limits must be defined to control the impacts of slate mining on the resource.	Turbidity	A 10% variation from background concentration is allowed. Limits must be determined.	No baseline data available. Monitoring required to determine present state.
	Toxics	The concentrations of toxicants must pose no risk to aquatic organisms and to human health.	Atrazine	≤0.078 milligrams/litre (mg/l)	Human health is the driver. Aquatic ecosystem is the driver. Ecological specification. Ecological Reserve manual (2008). No monitoring data.
			Imidacloprid	≤ 0.000038 milligrams/litre (mg/l)	Human health considerations. Environment Protection Authority of New Zealand – Environmental Exposure Limit
			Aluminium (Al)	≤ 0.062 milligrams/litre (mg/l)(95th percentile)	Strictest of Ecological specifications for all metals except manganese. Manganese – domestic user requirements. Ecological Reserve manual (2008), South African Water Quality Guidelines (1996)
			Manganese (Mn)	≤ 0.15 milligrams/litre (mg/l) (95th percentile)	
			Iron (Fe)	≤ 0.1 milligrams/litre (mg/l) (95th percentile)	
			Lead (Pb) hard	≤ 0.0057 milligrams/litre (mg/l) (95th percentile)	
			Copper (Cu) hard	≤ 0.0048 milligrams/litre (mg/l) (95th percentile)	
			Nickel (Ni)	≤ 0.07 milligrams/litre (mg/l) (95th percentile)	
			Cobalt (Co)	≤ 0.05 milligrams/litre (mg/l) (95th percentile)	
			Zinc (Zn)	≤ 0.002 milligrams/litre (mg/l) (95th percentile)	
Habitat	Instream	Habitat diversity should be maintained in a B ecological category.	Index of Habitat Integrity, Rapid Habitat Assessment Method and Model (RHAMM)	Instream Habitat Integrity EC = B ≥ 82%	Maintenance of ecological integrity. Present ecological state.
	Riparian habitat	Riparian vegetation should be maintained within B ecological category.	Index of Habitat Integrity, Vegetation Response Assessment Index	VEGRAI EC = B ≥ 82%	Maintenance of ecological integrity. Present ecological state

8.6 Biodiversity (Terrestrial Ecology) and Wetlands

Information relating to the biodiversity and wetland resources within the proposed study area was obtained from the Biodiversity and Wetland Assessment undertaken by Natural Scientific Services (NSS) (Abell, et al., 2018), including literature sited within these study report. This specialist study report is included in **Appendix G-5** to this FEIR.

The study area investigated by NSS largely cover undisturbed areas within the existing MPS footprint, including the farm portion on which the ADF is located, as well as a buffer area of 500m outside the MPS property boundary. However, in this EIA only wetland resources and possible impacts within the proposed railway yard site or FGD infrastructure footprint within the MPS footprint, or within 500m of these sites were considered.

8.6.1 Regional Biodiversity (Terrestrial Ecology) setting

The Study Area is situated in the Mokolo River Catchment area (8387 km^2), where the Mokolo River system varies from good to fair health (RHP, 2006). The lower Mokolo River is dominated by hardy, pool dwelling species of fish. It is possible that some species may have been lost due to fragmentation of the river from the Limpopo River. No fish species requiring permanent flow were recorded, but several species that require flowing water for breeding purposes remain, such as the Large Scale Yellowfish (*Labeobarbus marequensis*) and other *Labeo* species. However, no alien fish species were recorded.

The poor habitat diversity within the region caused the invertebrate assemblage to be dominated by hardy families associated with marginal vegetation and sand. The moderately scoring SASS assessments are likely to be as a result of the irregular flow regime.

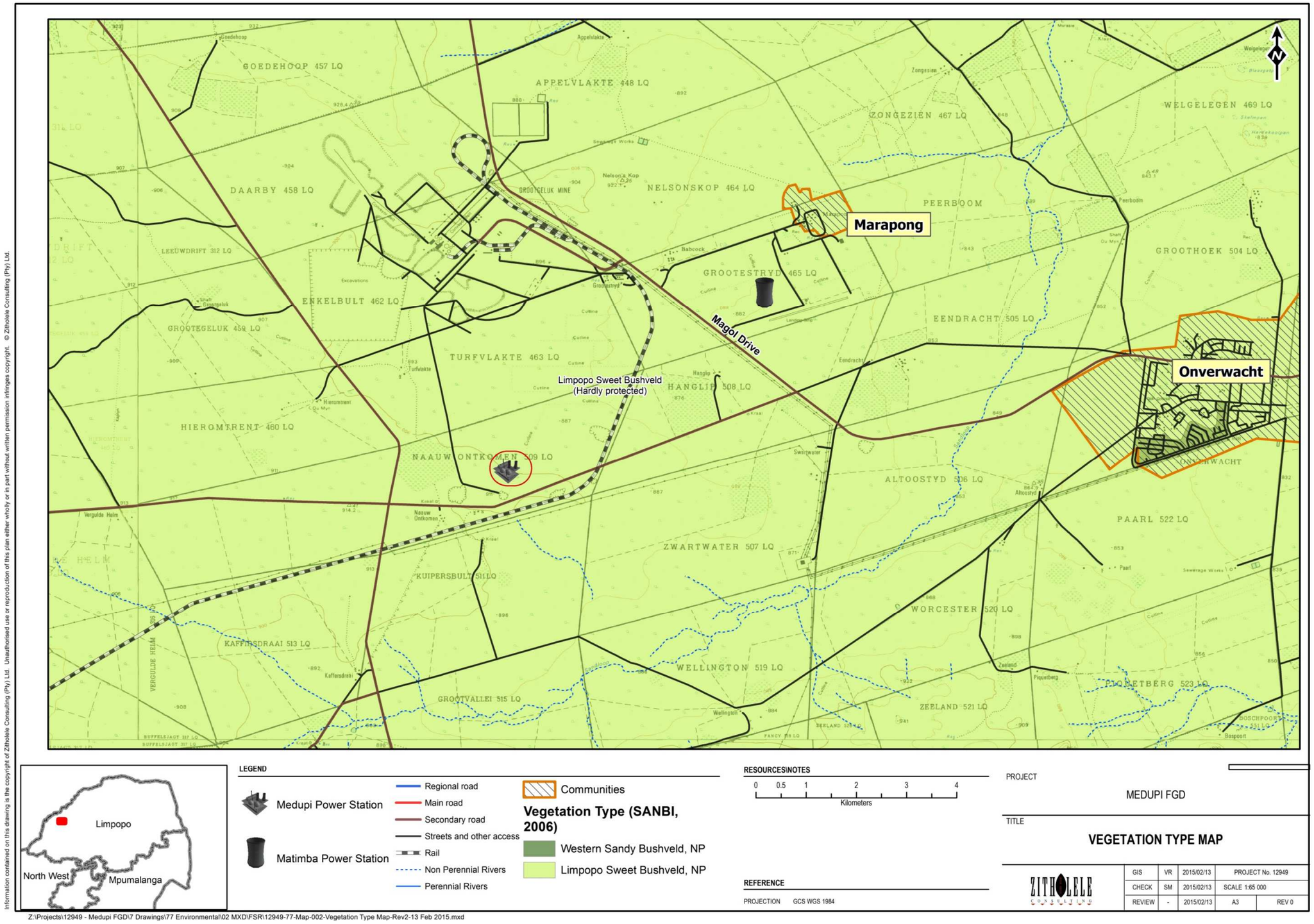

Figure 8-14: Vegetation type within the study area

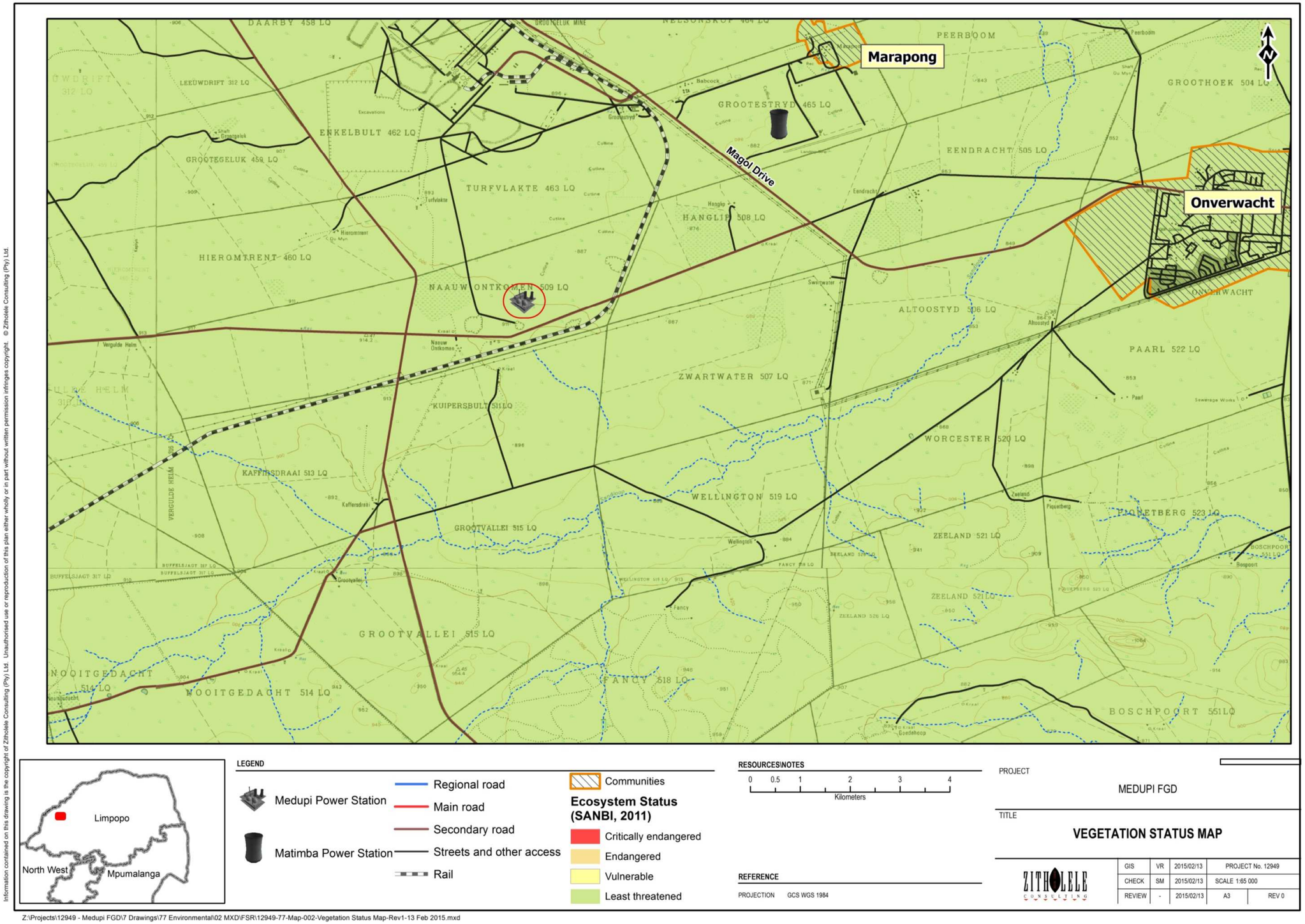

Figure 8-15: Conservation status of the vegetation type within the study area

Table 8-6 provides a comparison of the observed species richness, with that expected at both local and regional scales. From this table it is evident that remaining natural and semi-natural areas in and around Medupi support a considerable proportion of the region's faunal diversity.

Table 8-6: Summary of faunal species richness in the study area as compared to a regional scale (taken from Abell et. al. 2018)

FAUNAL GROUP	SPECIES RICHNESS						
	POTENTIAL			OBSERVED			
	REGION[1]	QDS[2]	MEDUPI[3]	BEC (2006)	FGD	MEDUPI	VICINITY[4]
Mammals	124	41	89	18	43	47	54
Birds	345	314	304	67	158	183	211
Reptiles	96	83	47	7	20	20	46
Frogs	27	22	20	8	16	19	14
Butterflies	176	149	88	3	9	26	15
Dragonflies & Damselflies	66	66	48	0	2	3	1
Scorpions	11	11	11	0	1	1	2
Megalomorph Spiders	4	4	2	0	0	0	1

KEY

[1]Species recorded during atlas projects within the four regional QDSs 2327CB, 2327DA, 2327CD & 2327DC

[2]Species that have been recorded during atlas projects within the QDS 2327DA wherein Medupi is situated

[3]Species that are likely to occur (LoO of 2 or 3) in Medupi

[4]Species recorded during NSS studies in the vicinity: Grootegeluk and Limpopo West Mines, Mafutha Project and Matimba Power Station

8.6.2 Biodiversity at the study area

The biodiversity specialist considered vegetation and biodiversity within the MPS and ADF footprints, as well as the area within 500m of the MPS site boundary. The EIA application, however only consider the footprint of the proposed FGD infrastructure, railway yard and associated structures and infrastructure within the MPS footprint as indicated by the red shape in **Figure 8-16**. As a result only aspects and impacts associated with the construction and operation of the railway yard and FGD infrastructure within the MPS were considered in this DEIR.

The Study Area falls within the Limpopo Sweet Bushveld (code SVcb 19) vegetation type (**Figure 8-14**) as described by Mucina and Rutherford (2006). The typical vegetation consists of short open woodland. In disturbed areas thickets of *Acacia erubescens*, *Acacia mellifera* and *Dichrostachys cinerea* are almost impenetrable. The conservation status of the Limpopo Sweet Bushveld is classified as Least Threatened (**Figure 8-15**), however the vegetation type has been facing increasing pressure from numerous coal mining projects within the vicinity with a much greater percentage of land transformed.

Vegetation communities identified within the study site (red boundary indicated in **Figure 8-16**) are mainly *Acacia* dominated Woodlands with associated Wetlands and included: *Acacia*

nigrescens - *Grewia* Open Veld and Disturbed *Acacia* mixed woodland. No wetlands, water bodies, depressions or washes are present within the railway yard FGD infrastructure footprint.

The main vegetation impact is considered to be reed encroachment and there are clear indications that the regulated flow regime is contributing to this problem. Alien vegetation was very sparse and only a few Syringa (*Melia azedarach*) was recorded. Downstream from Lephalale, disturbance to the riparian zone was limited to bridges, sand mining, and agricultural practices (RHP, 2006).

NSS surveys in and around the FGD study area yielded 43 mammal, 158 birds, 20 reptile, 16 frog, nine butterfly, two dragonfly and one scorpion species, greatly contributing to the overall Medupi inventory (**Figure 8-17**). Of all of these species, only the endangered Tawny Eagle was noted or recorded within the study site boundaries as indicated in **Figure 8-17**.

Notable faunal observations in and around the FGD study area (outside the boundaries of the MPS) included Serval (Near Threatened, abbreviated as NT), Brown Hyaena (NT), White-backed Vulture (Endangered, abbreviated as EN), Tawny Eagle (Vulnerable, abbreviated as VU) and Red-billed Oxpecker (NT), African Bullfrog (Protected Species, abbreviated as PS) and Giant Bullfrog (NT), and also an out of range observation of Sanderling (nearest SABAP 2 record 190km east near Polokwane), and a 300km westwards range extension on Green House Bat (*Scotophilus viridis*) based on recorded bat call data.

Local farmers reported the presence Leopard (VU), Cheetah (VU), African Wild Dog (EN), Spotted Hyaena (NT) and Pangolin (VU) as well as Southern African Python (PS) and Nile Crocodile (EN, now absent). African Bullfrogs were found to be particularly abundant in the more natural areas in and near the southern section of Medupi, where there are a number of breeding sites for this species. As both bullfrog species appear to utilize the same type of breeding habitat (Du Preez & Carruthers, 2009 as cited in (Abell, et al., 2018), this area and its pans might also provide suitable breeding habitat for Giant Bullfrog. However, only a dam along the southern boundary of the ADF yielded potential signs of this species in the form of a single froglet (Abell, et al., 2018).

Heavily fenced game areas immediately south and south-west of Medupi support at least nine of the 22 regionally occurring large game species. These include Plains Zebra, Giraffe, Nyala, Blue Wildebeest, Red Hartebeest, Blesbok, Waterbuck, Eland and Gemsbok. The NT Grey Rhebok was seen just south of Medupi. Multiple fences along boundaries likely prevent access of larger species such as most carnivores, ungulates, Aardvark and Pangolin. Chacma Baboon (*Papio ursinus*) were observed jumping fences without much difficulty to drink at a water trough and as such it is likely that other primates such as Vervet Monkey and Lesser Galago are also present (Abell, et al., 2018).

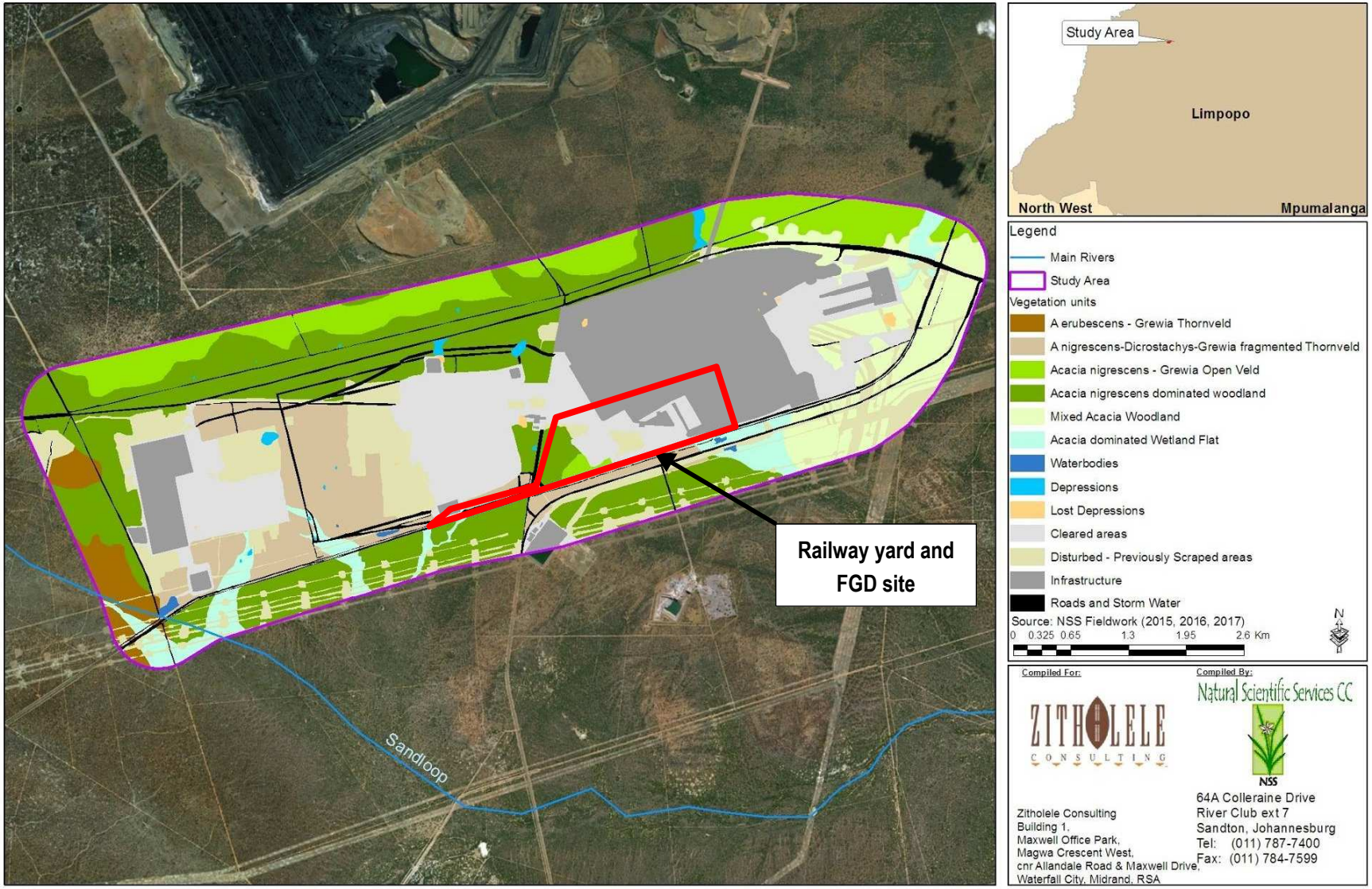

Figure 8-16: Vegetation Units for the study area (from Abell et. al. 2018)

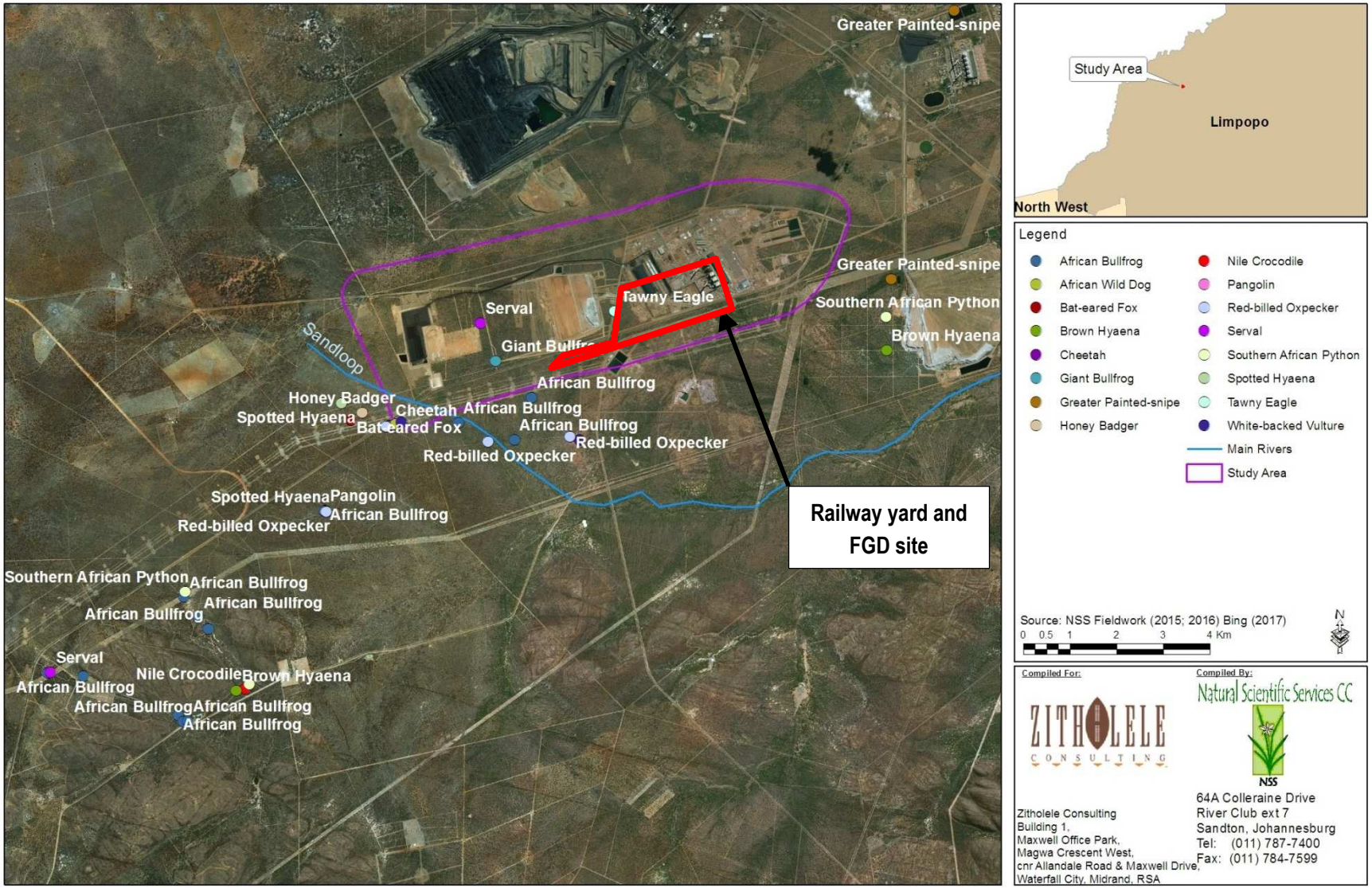

Figure 8-17: Localities of Conservation Important Fauna surveyed in and around MPS (from Abell et. al. 2018)

8.6.3 Regional wetlands and watercourses

The MPS and associated infrastructure is situated on a watershed and comprises both northwards and southwards draining systems. The hot semi-arid plains of the Limpopo Sweet Bushveld covering the study area are characterised by a series of ephemeral pans and drainage features, which were termed Semi-Ephemeral Washes (SEWs). These are situated in the upper reaches of their catchment and characterised by a very gradual slope (<1%) and cross sectional profile. Although a very slight change in vegetation structure (not composition) is sometimes apparent, no clearly defined channel is obvious and it is often difficult to locate these systems on the ground without the aid of aerial imagery.

Ephemeral pans, which are characteristic of hot semi-arid areas, are distinguished by fluctuating and unpredictable changes in their hydrological regime and of physical and chemical conditions (Lahr, 1996, as cited in Abell, et al., 2018). Their existence, extent and duration therefore depend on climatic factors and on morphometric and sediment characteristics. They contain a uniquely adapted fauna that copes in different ways with changing and often extreme temperatures, oxygen levels, pH, salinity and turbidity.

The typical ephemeral pan is a shallow, closed basin (Belk and Cole, 1975, as cited in (Abell, et al., 2018) that usually contains a well-adapted fauna. Characteristic groups include large Branchiopoda: Anostraca or fairy shrimps, Notostraca or tadpole shrimps, and Spinicaudata and clam shrimps. These three groups of crustaceans are often referred to as phyllopods. Assemblages of species of these groups are found all over the world in hot arid and semi-arid regions.

In addition to the Semi-Ephemeral Washes (SEWs) identified at the southwestern extent of the MPS ADF site, a number of pans are located in the surrounding landscape. The presence of pans within the moisture stressed environment means that these wetlands are key providers ('hotspots') of ecosystem services, including water and food supply.

8.6.4 Wetlands within the study area

Due to the extent of the areas to be investigated, NSS identified and delineate watercourses and wetland systems at a desktop level within a 500m buffer of the MPS and ADF and undertook ground truthing mainly within December 2015 and November 2016 within the areas identified. The main focus of the study was therefore to investigate wetlands within the 500m buffer zone from the boundary of the MPS (**Figure 8-18**) since most of the MPS footprint and that of the existing ADF was already either under construction or totally transformed with the installation of infrastructure and support services.

The Sandloop is a tributary of the Mokolo River. The Sandloop has a Present Ecological State (PES) of moderately modified (C category) where the loss and change of natural habitats and biota have occurred but the basic ecosystem functions are still predominately unchanged. The Ecological Importance (EI) and Ecological Sensitivity (ES) are reported as Moderate and Low, respectively.

Four Hydro-geomorphic (HGM) wetland units were identified surrounding the MPS, which include two south–east and one north–east draining Washes (SEW 1 – 3), and multiple inward-draining depressions (D1) (**Figure 8-19**). No wetland units were however identified within the study area depicted by the red shape in **Figure 8-19**, although SEW 2 is located just southeast of the study site outside the MPS property boundary. A summary of the wetland assessment for SEW 2 undertaken by NSS is provided in **Table 8-7**.

The railway yard and FGD infrastructure study site, including associated structures and infrastructure, furthermore do not impact directly on the Sandloop tributary. The upper reaches of this system diagonally bisect the south western corner of the MPS ADF site and is classified as a Freshwater Ecosystem Priority Area (FEPA) in recognition of its reference site suitability as an upper foothill ephemeral system that is still in a largely natural state.

The depressions identified within the greater study area surrounding the MPS are small in extent and ephemeral in nature. Due to the large number of depressions within the CBG4 vegetation type, they are classified as Least Threatened.

NSS utilised the WET EcoServices tool to obtain an understanding on what ecosystem services the four Hydro-geomorphic (HGM) units identified around the study area would provide services. With all four units, the main service is Biodiversity Maintenance. This is evident during high rainfall events when these areas become inundated and provide breeding and foraging habitat for an array of species. In addition to this, the Semi-Ephemeral Washes also provided services for toxicant and nitrate removal as well as phosphate and sediment trapping.

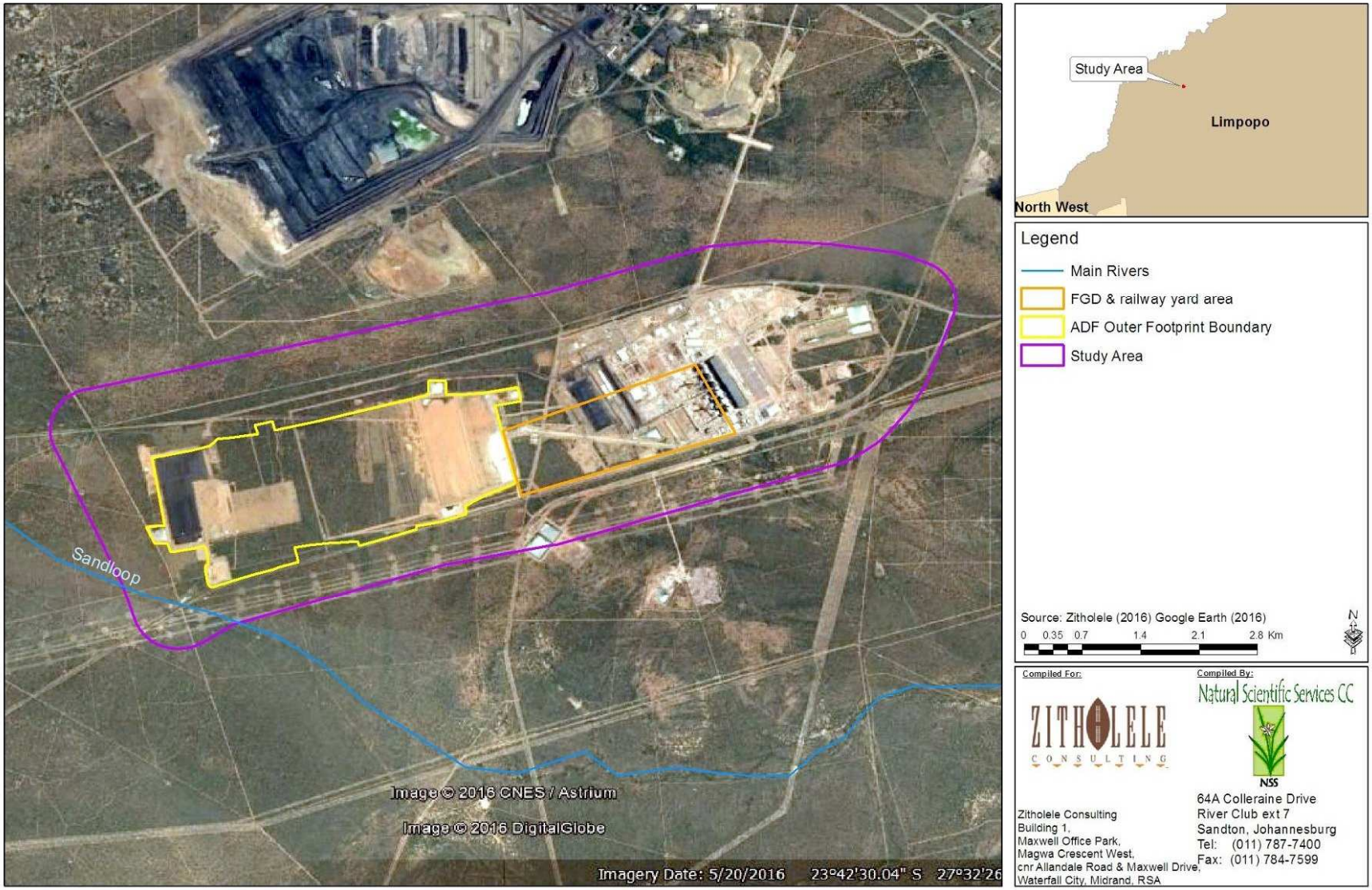

Figure 8-18: Locality map showing the study area for the wetland assessment

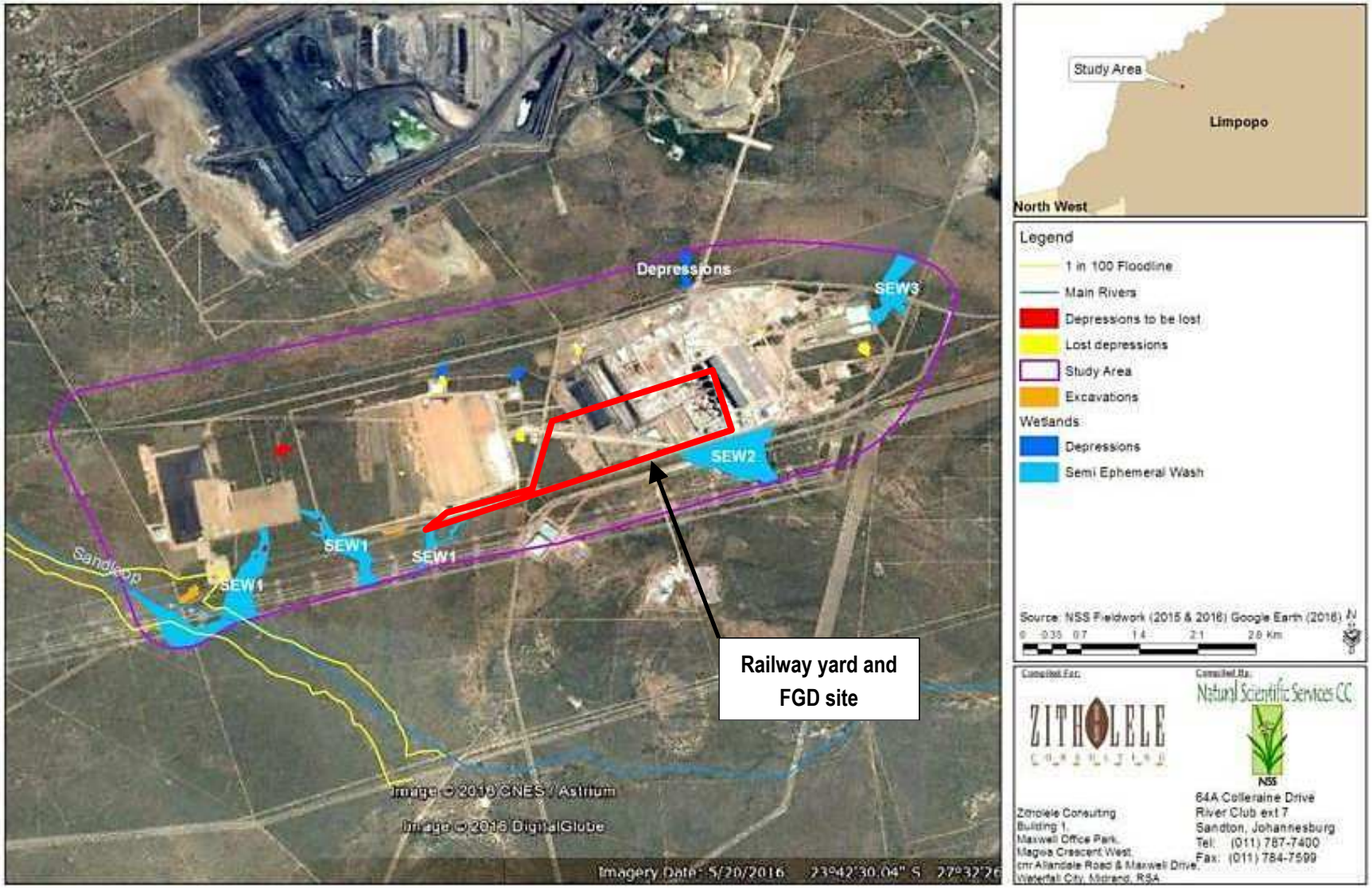

Figure 8-19: Extent of wetlands identified surrounding the MPS

Table 8-7: Wetland summary HGM Unit 2 (taken from Abell et. al. 2018)

HGM Unit 2 – Semi-arid Ephemeral Wash 2

HGM Unit 2 and sampling points

SETTING			
Coordinates (Centroid)	23°42'44.20"S 27°33'57.96"E	Area Within Site (ha)	38.0
Alt (m a.s.l.)	902	Level 1: System	Inland
Aspect	South-east	Level 2a: Ecoregion	1.03
Regional vegetation	SVcb 19 LSB	Level 2b: NFEPA WetVeg	CBG 4
Quaternary catchment	A42J	Level 3: Landscape unit	Plain
Limpopo BCPLAN V2	ESA 1	Level 4a:	NA
Waterberg TCBA	ON	Level 4b:	NA
MBG	E: Low NB and risk		

SITE DESCRIPTION	
Overview	Semi-ephemeral wash, with pockets within the drainage showing wetland characteristics (pooling).
Wetland indicators	Terrain relatively flat and difficult to determine slope. The soil indicators were present along certain points of the system. A number of pools found along system before entering the Sandloop.
Impacts	Likely a fair amount of water is diverted into the system compared to natural flow. MPS acts as a large hardened surface with surface / catchment area runoff increasing flood peaks substantially during high rainfall events but two natural depressions, a borrow pit and a road assist to attenuate flow, create depositional environments, and stem flow. Some excavations have formed more permanent dams. Increased roughness, saturation and nutrient loading. Pits (excavation), tailings (infilling), tailing sediment are washing onto system.
Dominant species	*Non wetland species: Acacia nigrescens, A karoo, Dichrostachys cinerea*; *Grewia bicolor* and *Grewia flava.* Denser Grass Sward in places
Soil characteristics	Mixture of wet-based and man-made soils

Present Ecological State (PES)		
Hydrology	Geomorphology	Vegetation
C	**C**	**D**

Wetland Ecosystem Services
Maintenance of biodiversity; Toxicant removal; Phosphate trapping; Sediment trapping; Flow attenuation

Wetland Importance and Sensitivity		
Hydrological	Ecological	Cultural
Moderate (2.1)	**Very High (4.0)**	**Low (1.4)**

8.7 Air Quality

Information relating to the air quality within the proposed study area was obtained from the Air Quality Specialist Report undertaken by Airshed Planning Professionals (von Gruenewaldt, et al., 2018), including literature sited within these study report. This specialist study report is included in **Appendix G-6** to this FEIR.

In the evaluation of air emissions and ambient air quality impacts reference is made to National Ambient Air Quality Standards (NAAQS) for compliance. These standards generally apply only to a number of common air pollutants, collectively known as criteria pollutants. Criteria pollutants typically include SO_2, NO_2, carbon monoxide (CO), inhalable particulate matter, (including Thoracic particulate matter with an aerodynamic diameter of equal to or less than 10 µm (PM_{10}) and Inhalable particulate matter with an aerodynamic diameter equal to or less than 2.5 µm ($PM_{2.5}$), benzene, ozone and lead. For the proposed Project, pollutants of concern included SO_2, NO_2, PM_{10} and $PM_{2.5}$ (screened against NAAQS) and metals within the ash deposition facility (screened against international health effect screening levels).

8.7.1 Regional Air Quality

The DEA identified the potential of an airshed priority area in the vicinity of the Waterberg District Municipality (Government Gazette, Number 33600; 8 October 2010). This was later expanded to include the Bojanala Platinum District Municipality, North-West Province (Government Gazette, Number 34631; 30 September 2011) and the Waterberg-Bojanala Priority Area (WBPA) was officially declared on 15th June 2012 (Government Gazette, Number 35435). The Medupi Power Station therefore falls within the Waterberg-Bojanala Priority Area.

The WBPA Air Quality Management Plan: Baseline Characterisation was released for public comment on the 7th August 2014 (SAAQIS, 2014, access date: 2014-08-21). This Baseline Characterisation reported that power generation activities contribute 95% of SO_2, 93% of NO_2 and 68% of the particulate emissions across the Waterberg District Municipality.

8.7.2 Air Quality at a local scale

Existing sources of atmospheric emissions which occur in the vicinity of the proposed development sites include:

- Matimba Power Station and its associated ash dump;
- Coal mining operations (such as Grootegeluk coal mine situated just north of the MPS);
- Brickworks operating at Farm Hanglip;
- Household fuel combustion;
- Potential veld fires (infrequent);
- Sewage works (Farm Nelsonskop);
- Windblown dust from open areas and agricultural activities;

- Vehicle exhaust releases and road dust entrainment along paved and unpaved roads in the area.

Ambient air quality monitoring data was obtained from two sources close to the study area, i.e. a DEA monitoring station located at Lephalale and an Eskom operated monitoring station located at Marapong. The DEA monitoring station located in Lephalale is the closest monitoring station with sufficient data relating to NO_2, PM_{10}, $PM_{2.5}$ and SO_2 short-term ground level concentrations. The data obtained was for the period January 2013 to November 2014 and are summarised in **Table 8-8** below.

Table 8-8: Summary of the data availability and compliance with NAAQS for the ambient data measured at Lephalale (taken from von Gruenewaldt, et al., 2018)

Pollutant	Monitoring Period	Data Availability (%)	Frequency of Exceedance of Hourly NAAQ Limit	Frequency of Exceedance of Daily NAAQ Limit	Annual Average Ground Level Concentrations (µg/m³)	Within Compliance with NAAQS (Y/N)
SO_2	2013	93	0	0	7	Y
	2014	96	2	0	6	Y
NO_2	2013	93	0		14	Y
	2014	98	2		13	Y
PM_{10}	2013	93	NA	4	32	Y
	2014	98	NA	0	23	Y
$PM_{2.5}$	2013	93	NA	0 [(a)]	14	Y
			NA	4 [(b)]		Y
			NA	40 [(c)]		N
	2014	98	NA	0 [(a)]	12	Y
			NA	1 [(b)]		Y
			NA	17 [(c)]		N

The measured SO_2, NO_2 and PM_{10} concentrations were within NAAQS at Lephalale for the period January 2013 to November 2014. The $PM_{2.5}$ concentrations measured at Lephalale are within the NAAQS applicable till 2029 but exceed the more stringent NAAQS applicable in 2030.

The measured NO_2, PM_{10}, $PM_{2.5}$ and SO_2 short-term ground level concentrations from the Marapong monitoring station operated by Eskom for the period January 2013 to November 2014 are provided in **Table 8-9**.

The measured SO_2 and NO_2 concentrations are within NAAQS at Marapong for the period January 2013 to November 2014, however the PM_{10} concentrations exceed the NAAQS at Marapong for the period 2013 and 2014. $PM_{2.5}$ concentrations at Marapong are within the NAAQS applicable till 2029 but exceed the more stringent NAAQS applicable in 2030.

Table 8-9: Summary of the data availability and compliance with NAAQS for the ambient data measured at Marapong (taken from von Gruenewaldt, et al., 2018)

Pollutant	Monitoring Period	Data Availability (%)	Frequency of Exceedence of Hourly NAAQ Limit	Frequency of Exceedence of Daily NAAQ Limit	Annual Average Ground Level Concentrations (µg/m³)	Within Compliance with NAAQS (Y/N)
SO_2	2013	92	12	1	19	Y
	2014	66	3	0	17	Y
NO_2	2013	98	21		18	Y
	2014	47	0		15	Y
PM_{10}	2013	94	NA	87	59	N
	2014	36		18	40	N
$PM_{2.5}$	2013	90		0 [(a)]	15	Y
				3 [(b)]		Y
				34 [(c)]		N
	2014	94		0 [(a)]	11	Y
				1 [(b)]		Y
				5 [(c)]		N

Air quality sensitive receptors located around the study area include residential areas such as Marapong northeast of the existing Matimba Power Station, a residential settlement to the northwest of Matimba Power Station and Lephalale situated to the southeast and east of the existing power station respectively. Farm households are scattered through the area, with livestock farming (primarily cattle and game) representing the main agricultural land-use in the area.

8.7.3 Air Quality at MPS

Onsite emissions associated with construction and operations at the MPS were qualitatively considered by the air quality specialist. The specialist identified that PM_{10} and $PM_{2.5}$ emissions due transportation of limestone and waste generating nuisance dust were potential impacts that needed consideration. Limestone will need to be transported to site for the FGD and the sludge and salts will be transported from site to a licenced facility, after storage at a temporary hazardous waste storage facility on site.. The transport of these materials and waste will be undertaken by trucks. The trips per day (as provided by the proponent) were given as 13 and 69 for waste (salts and sludge) and limestone, respectively, when all six units are operational.

In the specialist' opinion various local and far-field sources are expected to contribute to the suspended fine particulate concentrations in the region. Contributing local dust sources include wind erosion from exposed areas, fugitive dust from mining and brickmaking operations, vehicle entrainment from roadways and veld burning, while household fuel burning may also constitute a local source of low-level emissions.

8.8 Noise

Information relating to noise within the proposed study area was obtained from the Noise Specialist Report undertaken by Airshed Planning Professionals (von Gruenewaldt & von Reiche, 2018), including literature sited within this report. This specialist study report is included in **Appendix G-7** to this FEIR.

Noise is generally defined as unwanted sound transmitted through a compressible medium such as air. Sound in turn, is defined as any pressure variation that the ear can detect. Human response to noise is complex and highly variable as it is subjective rather than objective. Noise is reported in decibels (dB). "dB" is the descriptor that is used to indicate 10 times a logarithmic ratio of quantities that have the same units, in this case sound pressure.

In South Africa, provision is made for the regulation of noise under the National Environmental Management Air Quality Act, No 30 of 2004 (NEMAQA), but environmental noise limits have yet to be set. It is believed that when published, national criteria will make extensive reference to South African National Standard (SANS) 10103 of 2008 '*The measurement and rating of environmental noise with respect to annoyance and to speech communication*'. These guidelines, which are in line with those published by the International Finance Corporation (IFC) and World Health Organisation (WHO), were considered in this noise assessment.

8.8.1 Noise within the study area

Since the perception of noise is subjective to the observer over a fairly short distance no regional description of noise levels is possible. The noise levels at the study site is however characterised by existing construction activities associated with the construction of the MPS.

Noise Sensitive Receptors (NSRs) generally include private residences, community buildings such as schools, hospitals and any publicly accessible areas outside the industrial facility's property. Homesteads and residential areas which were included in the assessment as NSRs were identified from available maps and satellite imagery. The NSRs identified during the noise assessment study is shown geographically in **Figure 8-20** below.

Airshed conducted a baseline noise survey on 3 September 2015 at three locations around the MPS. The survey consisted of 60-minute samples during the day and 30 minute samples during the. For noise measurements conducted in September, the equivalent day/night noise levels at 2 of the locations correspond to typical noise levels prevalent in suburban districts. The equivalent day/night noise levels at the third location correspond to typical noise levels prevalent in a central business district, which is as a result of fast travelling heavy vehicles on the road in the vicinity of the sampler.

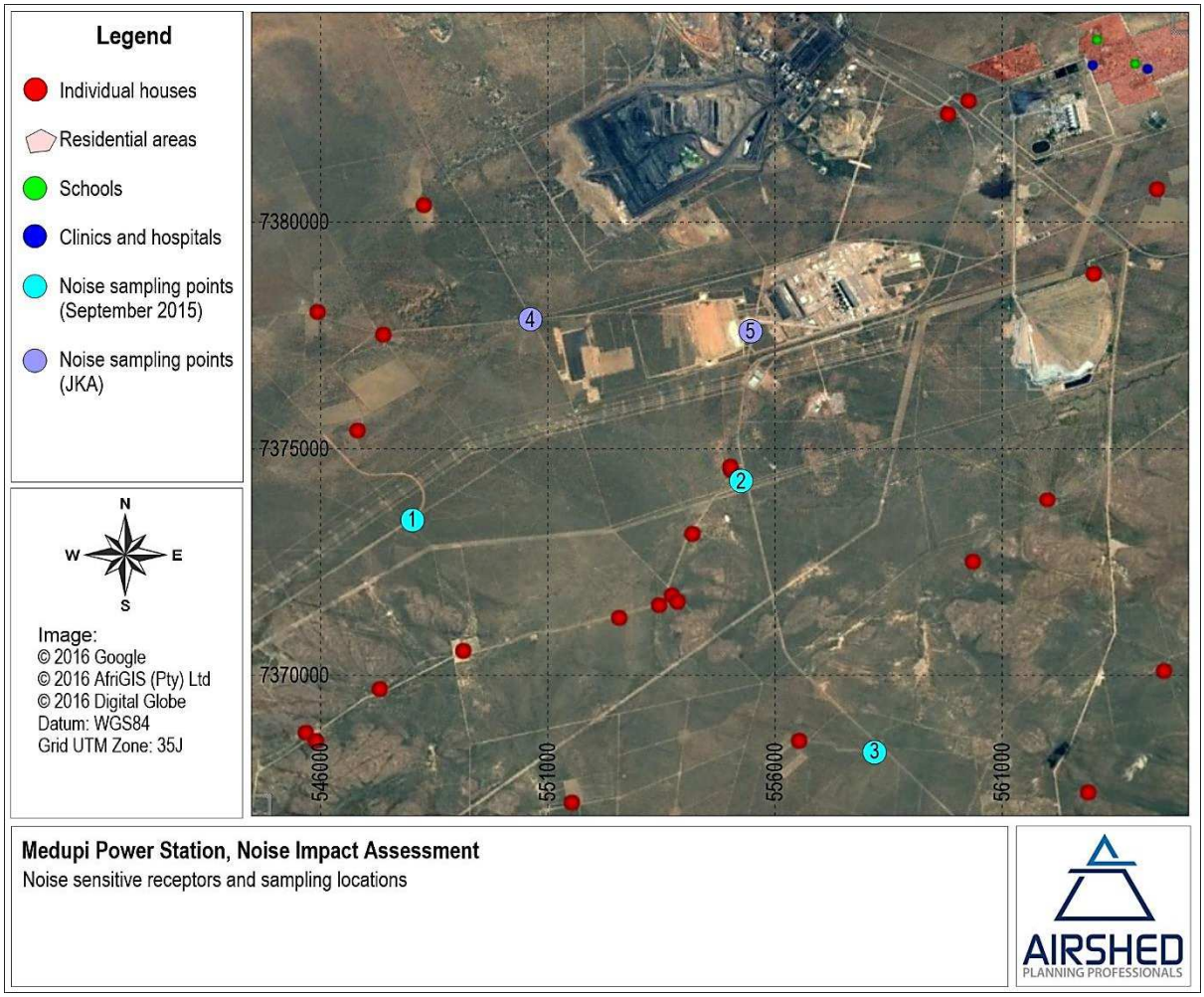

Figure 8-20: Location of identified NSRs surrounding the MPS

For the assessment, an access road was assumed for the transport of the sludge and salts from the site for illustrative purposes. The simulated equivalent continuous day-time rating level ($L_{Req,d}$) of 55 dBA (noise guideline level) extends ~70m from the road. The results for the day-time simulation are presented in isopleth form in **Figure 8-21**.

The simulated equivalent continuous night-time rating level ($L_{Req,n}$) of 45 dBA (noise guideline level) extends ~100m from the road. These distances can be assumed for any road that will be utilised for the transport of the sludge and salts from the site. The results for the night-time simulation are presented in isopleth form in **Figure 8-22**.

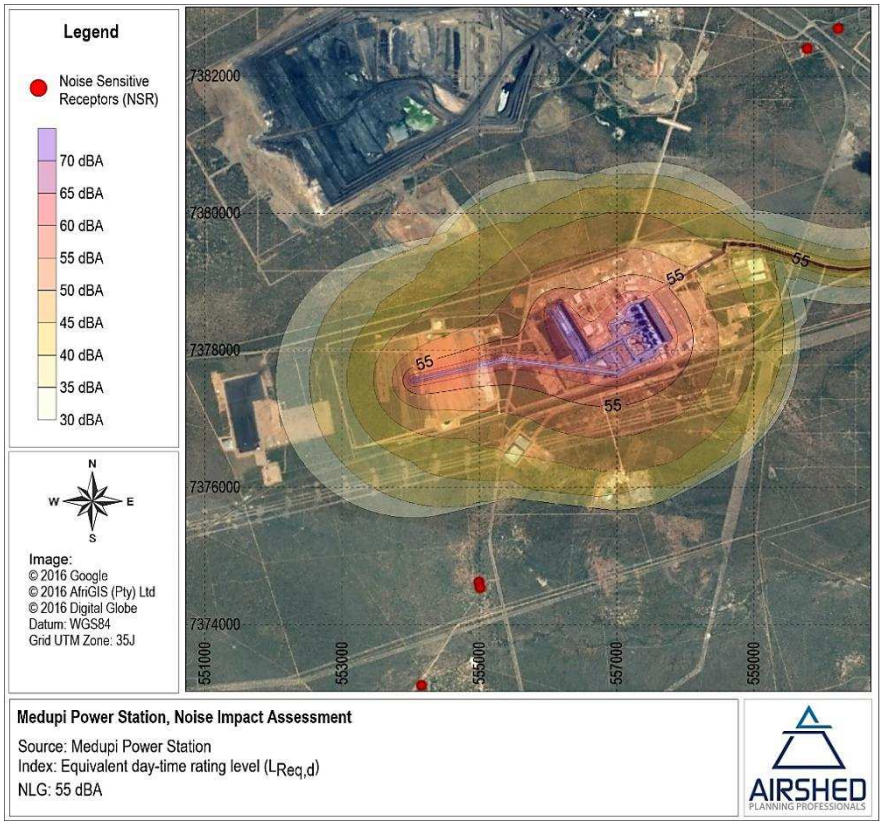

Figure 8-21: Simulated equivalent continuous day-time rating level ($L_{Req,d}$) for project activities

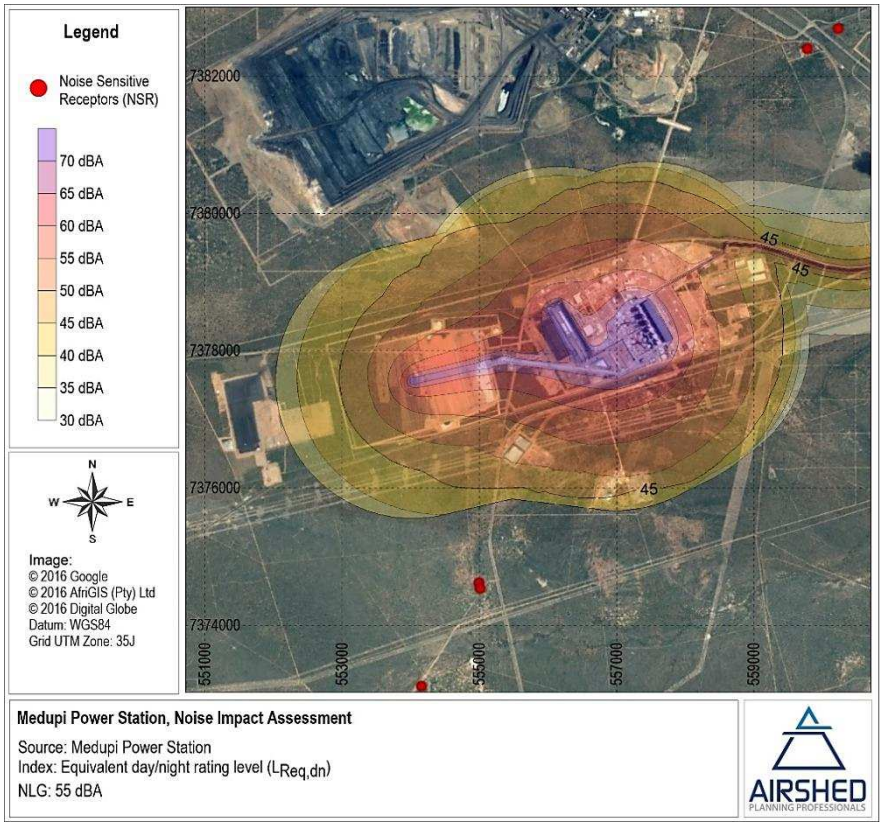

Figure 8-22: Simulated equivalent continuous night-time rating level ($L_{Req,n}$) for project activities

8.9 Socio-economic

Information relating to the social environment within the proposed study area was obtained from the Social Impact Assessment Specialist Report undertaken by NGT Holdings (Tomose, et al., 2018), including literature sited within this report. This specialist study report is included in **Appendix G-8** to this FEIR. Other sources consulted include the Medupi Environmental Impact Assessment Report for the authorisation of the Power Station (Bohlweki; 2006), as well as from the Lephalale Municipality Integrated Development Plan 2017-2018. A Socio-economic report compiled by SRK Consulting (Ismail *et al*; 2013) also provides a more recent summary of the Lephalale Municipality current status.

8.9.1 Regional and local setting

The study area is situated approximately 15km west of Lephalale in the Limpopo Province. The Medupi Power Station is positioned in the area under the jurisdiction of Lephalale Local Municipality (LM), which forms part of the Waterberg District Municipality (DM). The Lephalale LM covers an area of 19 605km^2, and consists of 12 wards with 38 villages.

Lephalale LM is characterised by a mix of human settlements which vary from formal to informal in townships. Marapong is the closest human settlement to MPS and is located approximately 8.6km north-east of the power station. The second closest location is Onverwacht at approximately 10.5km east of the power station. Lephalale Town is third human settlement situated in close proximity to the power station and it is located approximately 12.6km east of Medupi and east of Onverwacht. These three human settlements are located north and east of Medupi and the existing ADF with prevailing winds blowing north-south and north-east to south-west towards Thabazimbi and the village of Steenbokpan (located some 27km west of Medupi). This means that Marapong, Onverwacht and Lephalale will likely not be directly significantly affected by emissions from Medupi as determined by the direction of winds and its variables.

Heavy industries include the newly built Medupi Power Station, the existing Matimba Power Station, Grootegeluk coal mine, Sasol and these are all located west of the town of Lephalale within close proximity to Marapong. A number of new mines are in the planning stages and some have already started operating, mining among other resources coal and platinum among other resources. Coal presents the dominant resources currently being mined in Lephalale due to fact that the Waterberg coal reserves represent 40% of South African coal reserves and are mined to support two coal fired power stations in the area and the Sasol coal-to-liquid petrochemical industry. A third power station is planned in the area and is currently undergoing the approval process.

Land uses of Lephalale LM can be described as a mix of agricultural activities, game farming, cattle ranching, industrial activities such as mining, power generation, domestic and industrial water supply. These activities make up 87% of the total land use of Lephalale LM. Lephalale LM and the Waterberg District are characterised by a number of game farms and conservation areas, with the Waterberg Mountains boasting a national conservation status.

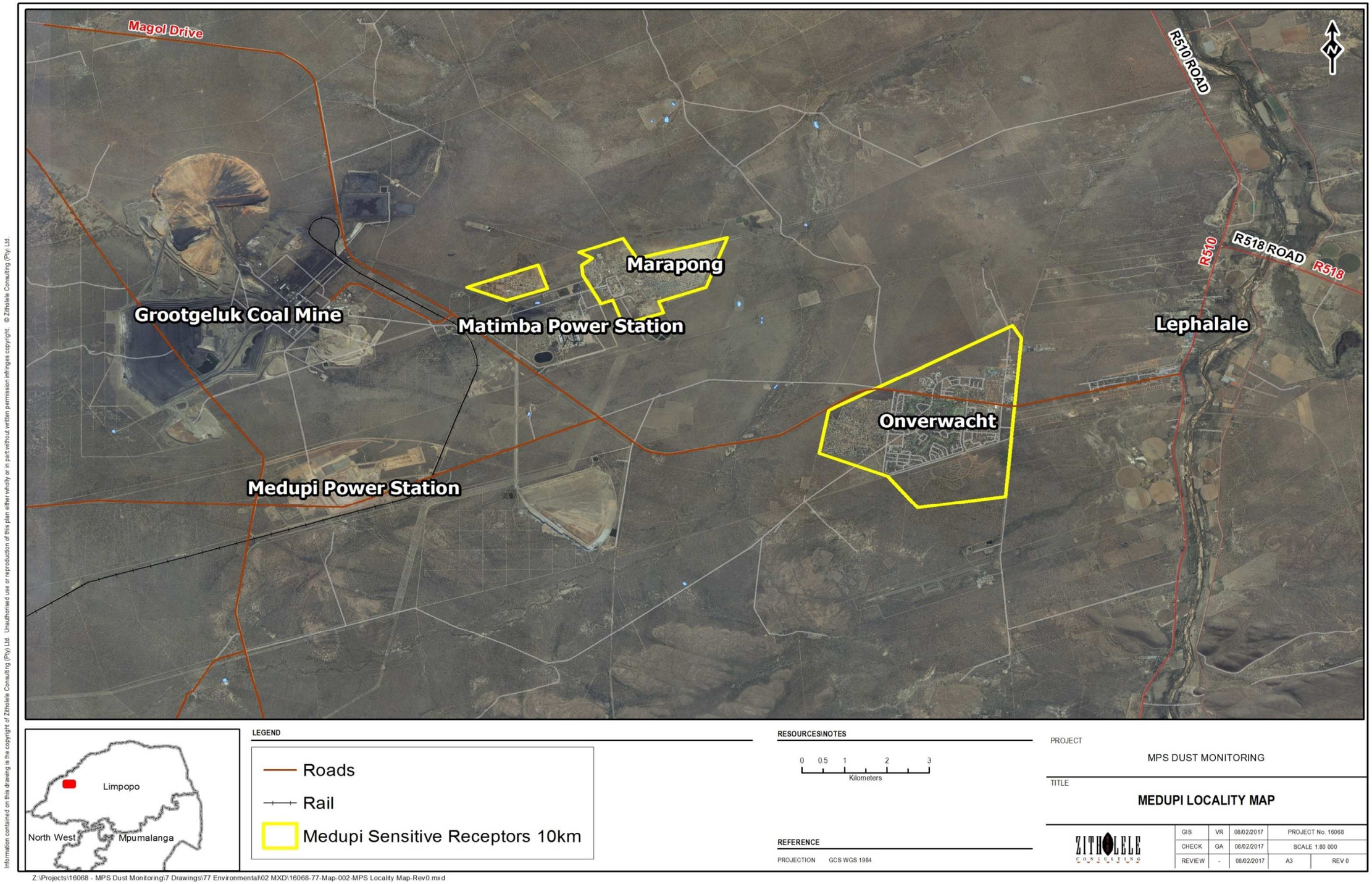

Figure 8-23: Sensitive settlements and communities around the MPS

Within Lephalale LM only one declared conservation area is found and it is situated south-east of the town of Lephalale i.e. D"Njala Nature Reserve.

The study area is characterised by a number of secondary roads, with Nelson Mandela Drive cutting across the Town of Lephalale, past Onverwacht towards MPS. In the east, it joins the R510, which links Lephalale to Thabazimbi in the south, west of Mokolo River. Other secondary roads that are linked to the R510 which provide access to Lephalale include the R518 and R33. A railway line from Grootegeluk mine passes east and south of Medupi Power Station and extends westwards south of the existing ADF, then south towards Thabazimbi. This is the only documented railway line within the study area.

8.9.2 Population Dynamics in Lephalale LM

The Local Economic Development Strategy for Lephalale LM indicate that the population in Lephalale has increased by 45% between 2001 and 2014 from 85 155 to 123 869 (**Figure 8-24**) (LM IDP, 2016-2017 statistics as cited in (Tomose, et al., 2018). Latest statistics reported in the Integrated Development Plan (IDP) for the LM indicate that total population size is around 140 240 residents (Lephalale LM, 2017).

Population growth in the Lephalale town node is among the highest in the Limpopo Province. The surge in population is also experienced south of Lephalale LM; for example, Thabazimbi has experienced a population increase of 35%, Mookgopong an increase of 13%, Modimolle an increase of 11%, Bela-Bela an increase of 36% and Mogalakwena recorded an increase 11% in the same period. In Lephalale LM the influx can be directly attributed to the construction of the Medupi built coal fired power station project and associated ancillary infrastructure. An assumption was also made that the overall increase in population in the region could be as a result of projected future projects associated with the Waterberg coal fields e.g. the expansion of the mining industry as well as coal-to-liquid petrochemical industry project such as Sasol Mafutha 1 in Lephalale (Tomose, et al., 2018).

The latest key population statistics was reported in the Lephalale LM IDP of 2017-2018 and is shown in **Table 8-10** below.

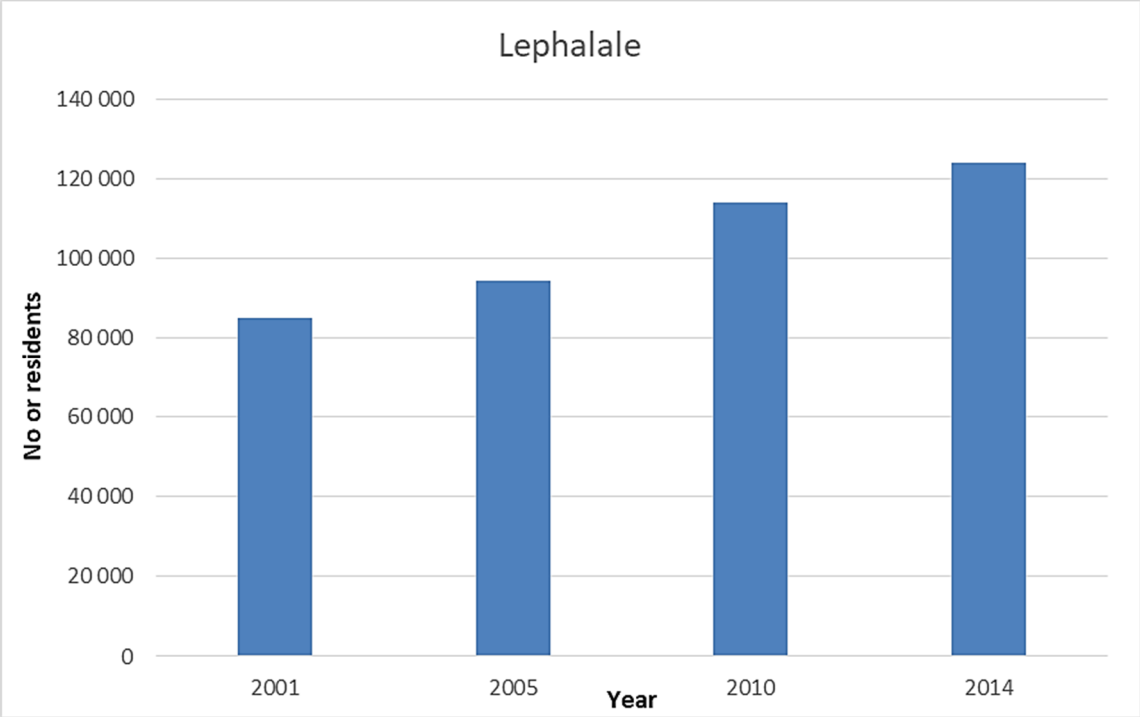

Figure 8-24: Total Population of Lephalale LM 2001-2014 (adapted from Tomose, et al., 2018)

Table 8-10: Key population statistics in Lephalale LM (Lephalale LM, 2017)

Total Household	**43 002**	**100%**
Total Population	140 240	100%
Young (0 – 14)	40 358	29.20%
Working Age	95 103	54.80%
Elderly (65+)	5 403	3.50%
Dependency ratio	35 136	33.20%
Sex ratio	121 -5. 6	21-1
Growth rate	2011 - 2016	13.50%
Population density	8 person per km²	
Unemployment rate	2016	22.20%
Youth unemployment rate	2016	27%
No schooling aged 20+	3 769	6.20%
Higher education aged 20+	12 615	16.40%
Matric aged 20+	16 579	23.50%
Number of households	430 002	
Number of agricultural households	6 757	22.60%
Average household size	3.2	
Female headed households	16 443	39.10%
Formal dwellings	34 610	82.30%
Flush toilet connected to sewer	17 536	41.60%
Piped water inside dwelling	17 390	41.30%
Electricity for lighting	37 602	89.40%

8.9.3 Education and Skills Levels in Lephalale LM

Lephalale LM has a total of 94 various educational facilities spread throughout the municipality. According to the LM's IDP report (2015-2016), more than 95% of the population is within 30 minutes walking distance to the nearest education facility. Accessibility to schools in the rural areas is relatively good particularly for primary schools. This is not the case with regards to secondary schools as there are still students who stay more than 10km away from the nearest education facility. Access to secondary education has resulted in low numbers of pupils proceeding to tertiary education. The assumption is made that this could be as the result of learners being despondent of traveling long distance to go to school and the cost of public transport resulting in absenteeism and poor learner performance at the end of the year prohibiting them to proceed further with their education.

In terms of overall performance, the LM seems to be slightly higher than the Waterberg DM and Limpopo Province in terms of education levels but not sufficient to respond to the needs of the growing economy such as that of Lephalale. Statistics on level of education within the Lehpalale LM, Waterberg DM and Limpopo Province is presented in Figure 8-25.

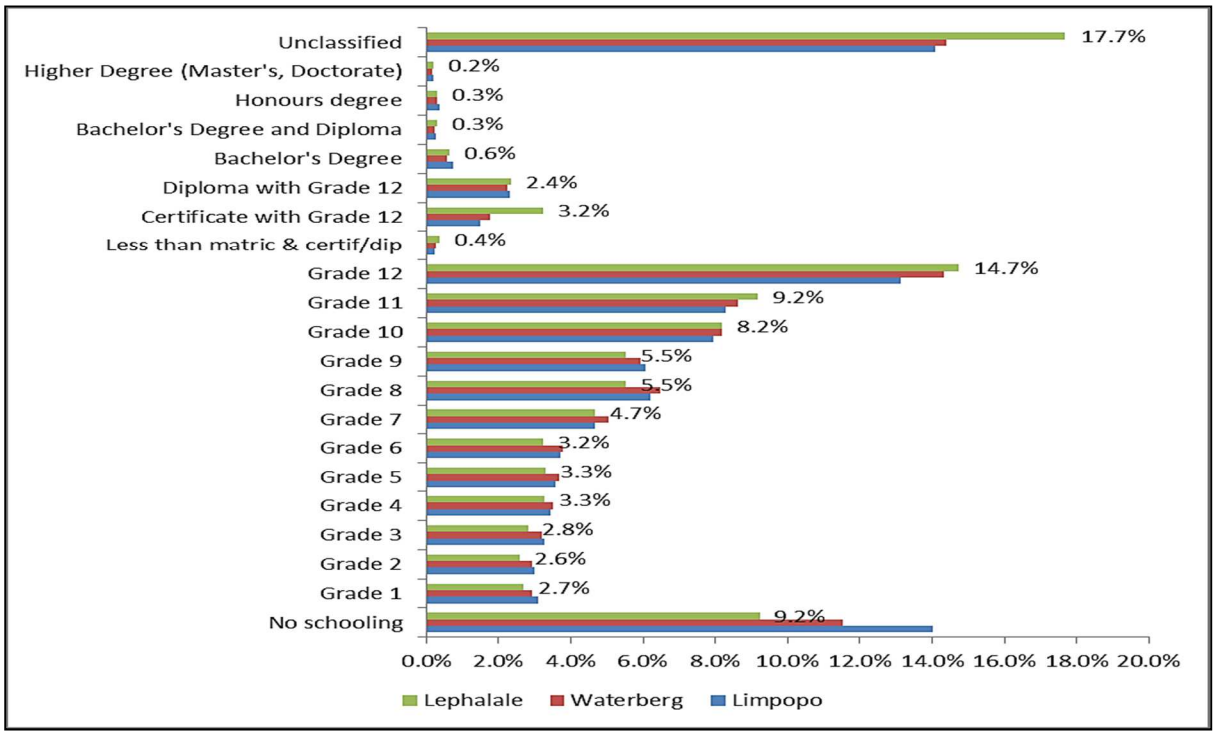

Figure 8-25: Education levels within the Lephalale LM, Waterberg DM and Limpopo Province (taken from Tomose, et al., 2018)

8.9.4 Community Health and Wellness in Lephalale LM

The World Health Organisation (WHO) in 2012 reported that one in eight deaths in the world is due to air pollution. The pollution is either ambient (outdoor) or indoor. WHO further concluded that 88% of premature deaths in middle and low income countries whose economy is coal based to ambient pollution. South Africa is one of such countries whose economy is coal based economy.

In Lephalale, coal is the main source of pollution throughout its life cycle: from extraction, combustion through to disposal. It contributes to pollution of both ambient and domestic air through a wide range of pollutants such as PM (particulates/dust), SO_2, NO_2, O_3 (Ozone) (Itzkin, 2015, as cited in (Tomose, et al., 2018)). Liquid fossil fuel burnt/used by cars contributes to carbon monoxide (CO), while other known general pollutants include lead and volatile organic compounds.

A study undertaken by Itzkin (2015) provides a good insight into amount of pollution experienced by the people in the Waterberg as the result of the combustion of coal. **Figure 8-26** presents a correlation between illnesses generally associated with the combustion of coal and illnesses diagnosed in residents of Lephalale, Marapong and Steenbokpan in the Lephalale LM (Tomose, et al., 2018).

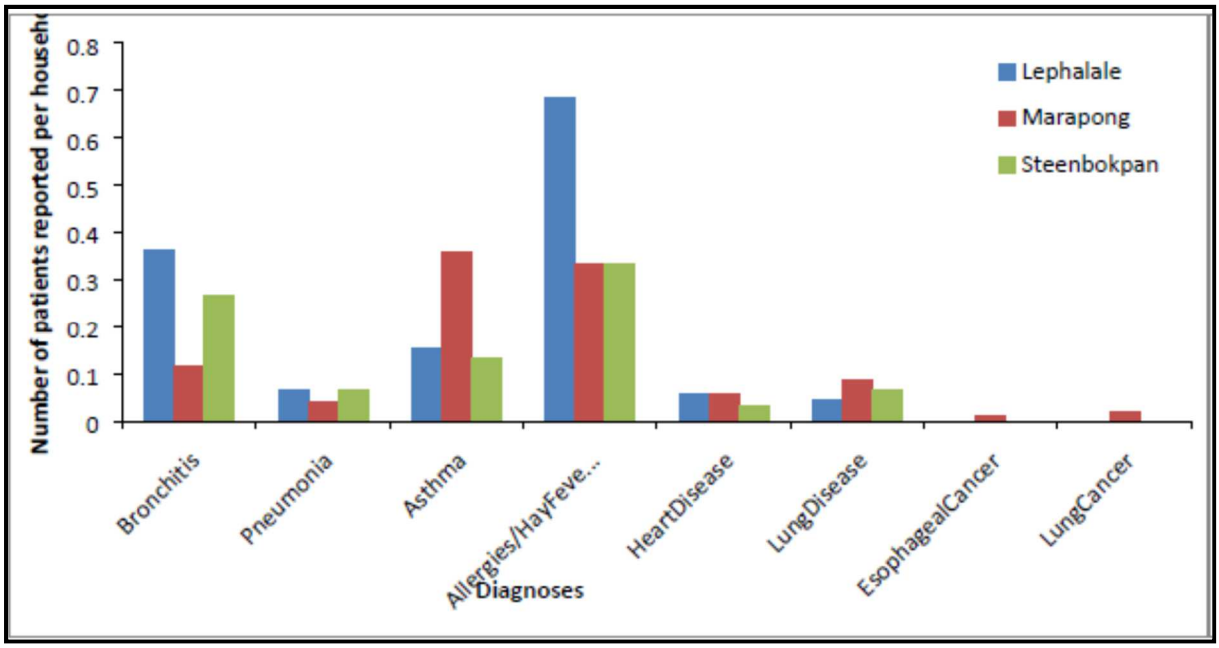

Figure 8-26: Diagnoses of those who went to seek medical assistance for Lephalale, Marapong and Steenbokpan represented as average number per household (from Itzkin, 2015 as cited by Tomose, et al., 2018)

8.9.5 Economic development in Lephalale LM

The Lephalale LM is currently in the second stage of considerable public sector investment which is estimated at R140 billion over six years. With the anticipated Eskom developments, Coal miners are planning developments to meet the increased demand for coal. One such is the Grootegeluk coal mine owned by Exxaro. As part of its mining expansion programme, Exxaro has announced that it will be constructing a new coalmine named Thabametsi. Exxaro is also targeting the development of a 1 200MW independent power plant to be attached to the new mine.

The new coal mines and power stations could lead to a six-fold increase in households in and around Lephalale. This will create a significant demand for building materials and will have positive implications for retail, service and small industry development and it is predicted that

the life expectancy of the economic boom will be 30 years due to the additional power station and all the mining activity.

8.9.6 Employment Rate and Occupation in Lephalale LM

The rate of unemployment in Lephalale is at 22.2%, which is well below the provincial average of 32.4% as per the 2011 national census. Unemployment amongst the youth currently stands at 27%, also below the Limpopo provincial average of 42%. This is due in large measure to local developments associated with Medupi power station and the expansion of coal production from the mines which can be taken to have absorbed a lot of the latent labour force.

Sector employment has changed considerably over the last 2 decades with a noticeable drop in agriculture related employment, contrasted by a noticeable increase in mining related employment opportunities since the early 2000s. This is clearly indicated in **Figure 8-27** below.

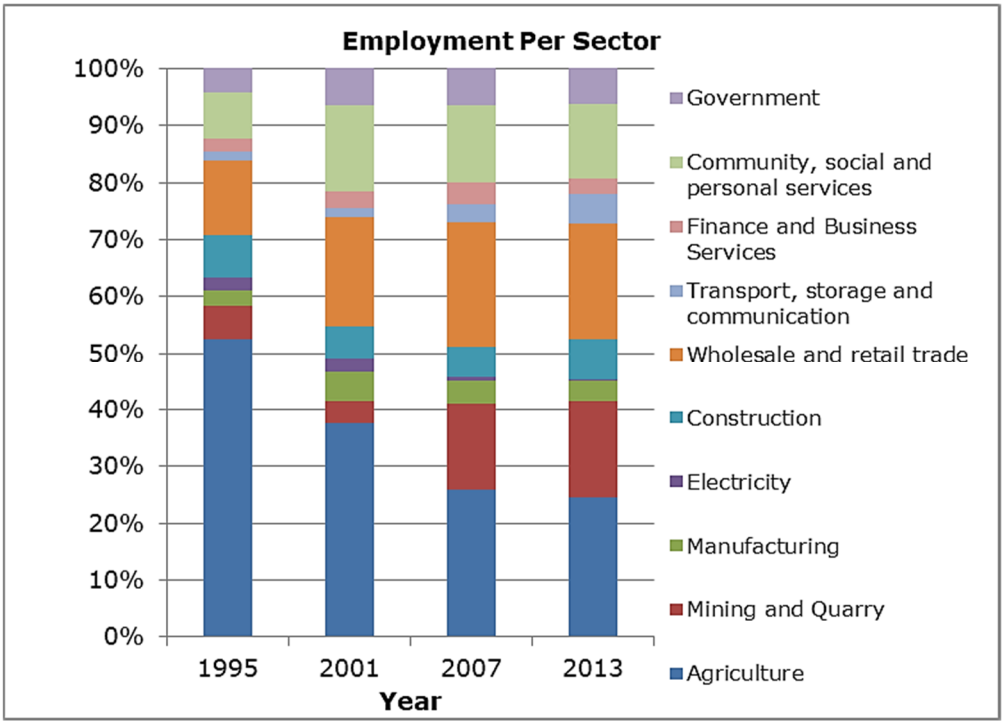

Figure 8-27: Sector Employment within Lephalale LM (taken from Tomose, et al., 2018)

8.9.7 Water resources

Mokolo Dam is a large dam supplying the Lephalale LM and was constructed in the late 1970s and completed in July 1980 (DWS, 2009, as cited in Tomose, et al., 2018). The aim of the dam was to supply water to Matimba Power Station, Grootegeluk coal mine, Lephalale LM for irrigation purposes downstream of the dam (agricultural activities). Therefore, it can be argued that before 2008 Lephalale LM solely depended on the Mokolo Dam for its water.

Due to the rapid industrial growth and urbanisation, the Mokolo Dam could not meet the water supply to the Lephalale LM post 2008. The Department of Water and Sanitation

commissioned the Mokolo Crocodile (West) Water Argumentation Project (MCWAP) to meet future water demands in Lephalale LM. MCWAP was staged into two phases, namely Phase 1 and Phase 2.

Phase 1 (augmentation of existing water supplies) aimed at providing drinking quality water to industries and municipality and Phase 2 (transferring the surplus effluent return flow from the Crocodile River (West) / Marico WMA) aimed at providing low quality water to industries. Among the known stakeholders who participated in the project and who require water in the area for current and future needs are the Lephalale LM, Eskom (Matimba, Medupi + 4 coal fired power stations), IPPs, Grootegeluk Mine (coal mining), Exxaro Projects and Sasol (Mafutha 1).

Ninety two (92%) percent of water infrastructure in the Municipality is over 20 years old, while sixteen percent (16%) of the water service system has been identified as being in poor to very poor condition. Additional challenges that are faced around water infrastructure include:

- Poor borehole yields in rural areas.
- Bulk water services in urban areas have reached full utilization.
- Illegal connections in rural areas.
- Lack of accountability to water losses.
- Limited availability of ground water in rural areas.
- Low quality of drinking water in rural areas.

8.9.8 Sanitation services

Sanitation is another social service that is directly linked to the availability of water resources. The assessment of this infrastructure within the project area around Medupi power station has found that 94% of waterborne sanitation infrastructure in the municipality is over 20 years old. About 15% of the sanitation network had been identified as being in very poor condition. The assets have experienced significant deterioration and may be experience impairment in functionality and will require renewal and upgrading (Lephalale Local Municipality, 2014, as cited in Tomose, et al., 2018).

Problems noted around the question of sanitation are that there is a need to redesign the existing sewer networks in Lephalale Town and Onverwacht to reduce the number of pump stations. Further, the area does not have sufficient water resources and infrastructure to accommodate a waterborne sanitation system for all households. More than 50% of households in the municipality are without hygienic toilets (**Table 8-11**). Sanitation backlog is estimated to be 14 250 units, mostly in the farms and rural village. Other than what will be distributed by the Phase 2 MCWAP, there is no clear indication on what percentage of low quality (effluent) water will be derived from the existing Lephalale LM sanitary infrastructure.

Table 8-11: Sanitation within the Lephalale LM (taken from Tomose, et al., 2018)

Type of Toilet	1995		2001		2007		2013	
	No of household	%	No of household	%	No of household	%	No of household	%
Flush or chemical toilet	6,367	33%	9,190	45%	12,119	44%	13,784	45%
Pit latrine	9,647	50%	11,240	54%	12,723	46%	14,435	47%
Below RDP	3,384	17%	207	1%	2,835	10%	2,518	8%
Total	**19,397**	**100%**	**20,638**	**100%**	**27,677**	**100%**	**30,737**	**100%**

8.10 Heritage, Archaeology and Palaeontology

Information relating to the heritage, archaeological and palaeontological resources within the proposed study area was obtained from the Heritage Impact Assessment Specialist Report (Tomose & Sutton, 2018) and Palaeontological Impact Assessment Specialist Report (Tomose & Bamford, 2018) undertaken by NGT Holdings, including literature sited within this report. This Heritage and Archaeological Assessment specialist report is included in **Appendix G-9,** while the Palaeontological Assessment specialist report is included in **Appendix G-10** to this FEIR.

South African cultural heritage extends as far back as 2.0 million years ago (mya) in the form of Stone Age artefacts that represent some of the earliest tool types found. The South African archaeological record covers all the Stone Age periods, Iron Age periods and more recent historical periods. This rich cultural heritage also includes culturally significant places on the landscape that became important to the many varied groups of people that once lived here and whose descendants continue to live here.

8.10.1 Regional heritage, archaeological and palaeontological setting

There have been recorded scattered finds of Stone Age sites, rock paintings and engravings in the larger region. Most of the Stone Age sites can be classified as open (surface) sites which imply that most of the artefacts occur in secondary context. There are a number of known Stone Age sites in the Limpopo Province.

Southeast of the study area, but less than 150km away, is Makapansgat. This site complex includes the Makapansgat Lime Works site which has yielded fossils dated to greater than 4.0 mya. The Lime Works has also yielded hominin fossils of *Australopithecus Africanus* (Tobias, 1973; Reed et al., 1993, as cited in Tomose & Sutton, 2018). Adjacent to the Lime Works is Cave of Hearths. This site has one of the longest sequences of occupation in southern Africa, yielding Early Stone Age (ESA) tools beyond 300k years old up to Later Stone Age artefacts.

Southwest in the Waterberg Plateau area a number of Middle Stone Age (MSA) and Late Stone Age (LSA) sites have been identified.

A large (9,000ha) survey undertaken northwest of the current area identified a number of MSA sites. The scatters of artefacts were primarily located in the calcrete pans of the area. They identified the technological attributes of the stone tools to a post-Howiesons Poort industry that falls <70k years ago. However, no formal sites or sites within primary context were noted. One Rock Art site has been noted in the area. Nelsonskop, near Lephalale contains engravings and cut markings on the rock face (van Schalkwyk, 2005, as cited in Tomose & Sutton, 2018).

Further west in Limpopo along the Makgabeng Plateau there is a higher density of Iron Age evidence. The region has yielded pottery of the Eiland style that falls in the late Early Iron Age. The Eiland facies is contemporary with one of the more important Limpopo Iron Age sites, Mapungubwe.

A number of heritage assessment reports have been conducted in the wider area that reflects varying degrees of heritage present. While these reports did not cover the current project footprint, areas around the project have been surveyed.

8.10.2 Heritage, archaeological and palaeontological resources within the study site

Known archaeological resources within the MPS footprint include Stone Age occurrences, Rock Art, Iron Age occupations and historical activity. The Phase II HIA study of the MPS footprint conducted by Mbofho Consulting and Project Managers has resulted to information that has been used to construct the receiving environment showing areas known to have contained graves. These are graves that according to the local communities were destructed with the construction of Medupi PS and the associated infrastructure.

The study undertaken by Tomose & Sutton (2018) did not result to the identification of any heritage resources. A survey of the existing ADF footprint and the Medupi precinct in which the FGD technology and the proposed railway yard is to be constructed was undertaken by Nkosinathi Tomose in January 2018. The proposed development area for the construction of the FGD technology and the proposed railway yard has been significantly transformed through previous construction activities. For example, the foundations for the FGD technology are within an area that was deeply excavated during the construction of the Medupi PS six units. The proposed railway yard is within an area where there has been disturbances associated with Medupi PS associated infrastructure such as storm water management systems, the existing ADF and site roads.

A potential grave site, however, was identified outside of the current project footprint for the railway yard and FGD infrastructure, but could potentially be impacted by additional construction and expansion of the area. This grave is situated between the Medupi Power Station and the existing ADF (**Figure 8-28**). A summary of the possible grave site is provided in **Table 8-12** below. From **Figure 8-28** it is clear that the possible grave site is located outside the proposed footprint for the railway yard (green triangular shape), conveyor alignment (yellow shape) and FGD infrastructure (blue shape) within the MPS.

Table 8-12: possible grave site located between the MPS and ADF

Site	EMFGD 03 Grave
Type	One possible grave
Location/Coordinates	S23˚ 42' 26.8″ E027˚ 32' 49.5″
Density	One grave, Low Density
Approximate Age (> 60 or <60 years old) or Archaeological Time Period	> 60 years (date is unknown) SAHRA regulations stipulate graves with unknown dates be treated as >60 years
Applicable Section of the NHRA, No 25 of 1999:	Section 36
Site Description:	The possible grave has still not been confirmed as an actual grave. But should be confirmed and area fenced and treated as a no-go area with a 10 meter buffer (*Figure 12*).

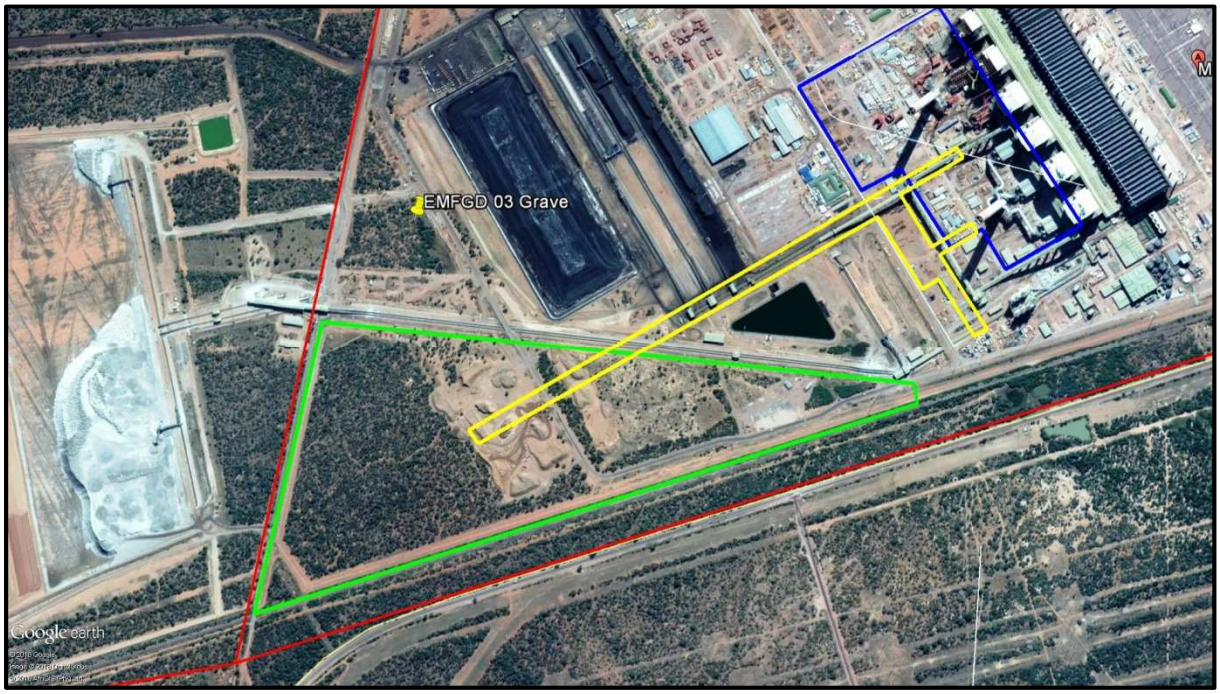

Figure 8-28: Aerial map of the area reflecting the location of a possible grave site between the MPS and ADF

With regard to palaeontological resources (fossils), the area to be developed lies on the Sandriviersberg and Mokalakwena Formations, (Kransberg Subgroup, Waterberg Group) which are sandstones and conglomerates 1700 to 2000 million years old and so pre-date any large bodied fossil plant and any vertebrate fossil. Micro-organisms such as algae had evolved by this time but they do not preserve in conglomerates. Sandstones are usually too coarse to preserve such small fossils. The Palaeontological Desktop Study determined that there are no palaeontological fossils or material exists within the geology of the area.

8.11 Traffic Impact

Information relating to the traffic movements and impacts within the proposed study area was obtained from the Traffic Impact Assessment Specialist Report undertaken by Hatch Goba (Venter, 2017), including literature sited within this report. This specialist study report is included in **Appendix G-11** to this FEIR.

8.11.1 Existing road network

The major routes in the study area are the R518 and R510 which links Lephalale to the N1 and Nelson Mandela Drive connects Lephalale with Medupi and Marapong, while the minor routes surrounding Medupi Power station are the D1675 and Afguns Road (**Figure 8-29**).

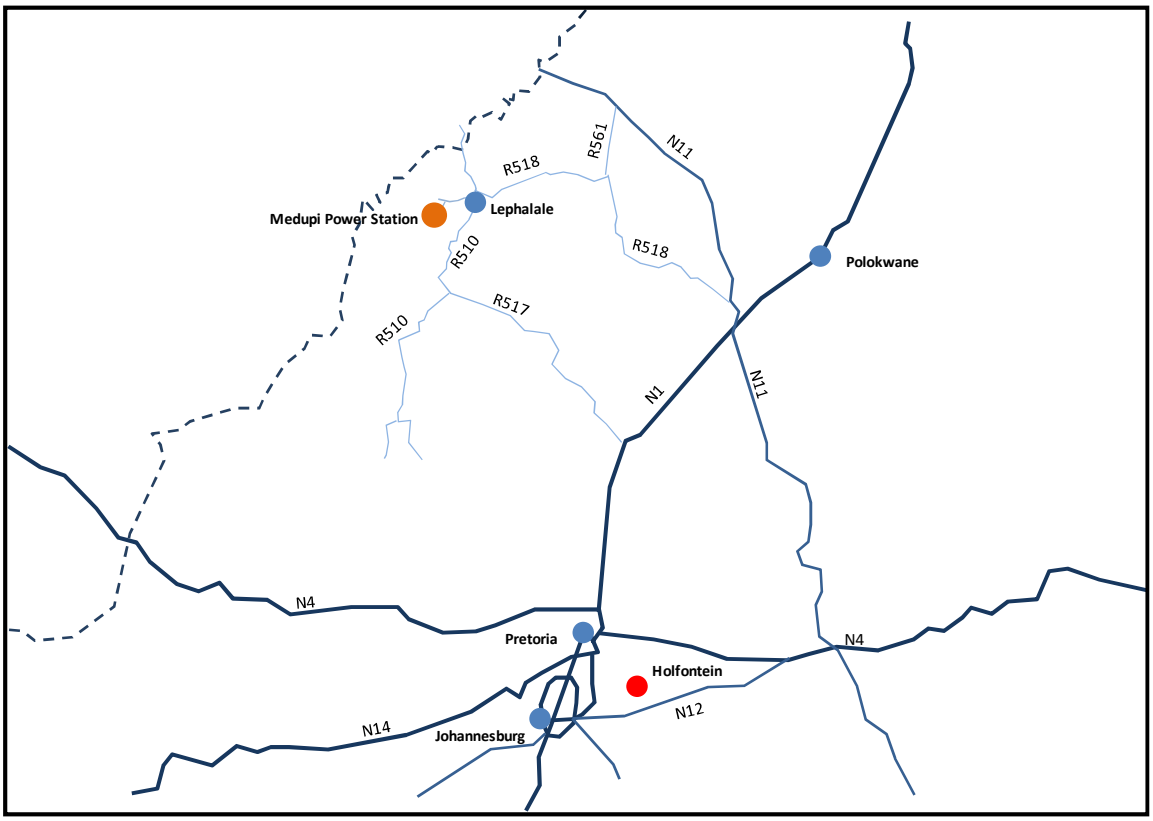

Figure 8-29: External road network to and from the MPS (taken from Venter, 2017)

The most direct traffic route from Johannesburg uses the N1 to reach regional roadways R33, R517, and R510. A single rail line services the Exxaro Grootegeluk coal mine and Medupi Power Station, running approximately north/south adjacent to R510 highway. This line passes through the towns of Thabazimbi, Amandelbult, and Rustenburg.

The closest South African ports to the project site are Durban (925 km, approximately a 9-hour drive via highways N3, N1, R33, R517, and R510); Port Elizabeth (1,445 km, approximately a 14-hour drive via highways N2, N10, N1, R33, R517, and R510); and Cape Town (1,768 km, approximately a 17.1/2-hour drive via highways N1, R33, R517, and R510).

8.11.2 Traffic at the MPS

The FGD plant is situated more or less in the middle of Medupi, and access to this plant will either be from Entrance Gate 1, 2 or 4 (**Figure 8-30**).

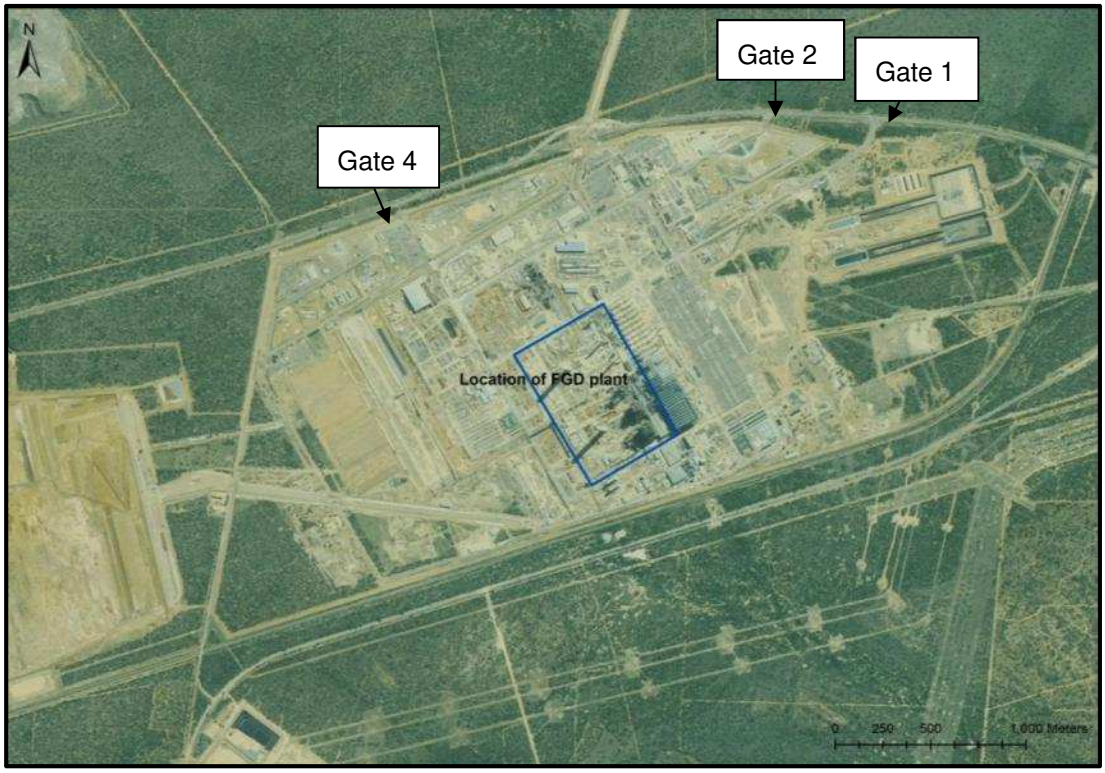

Figure 8-30: Access gates at the MPS

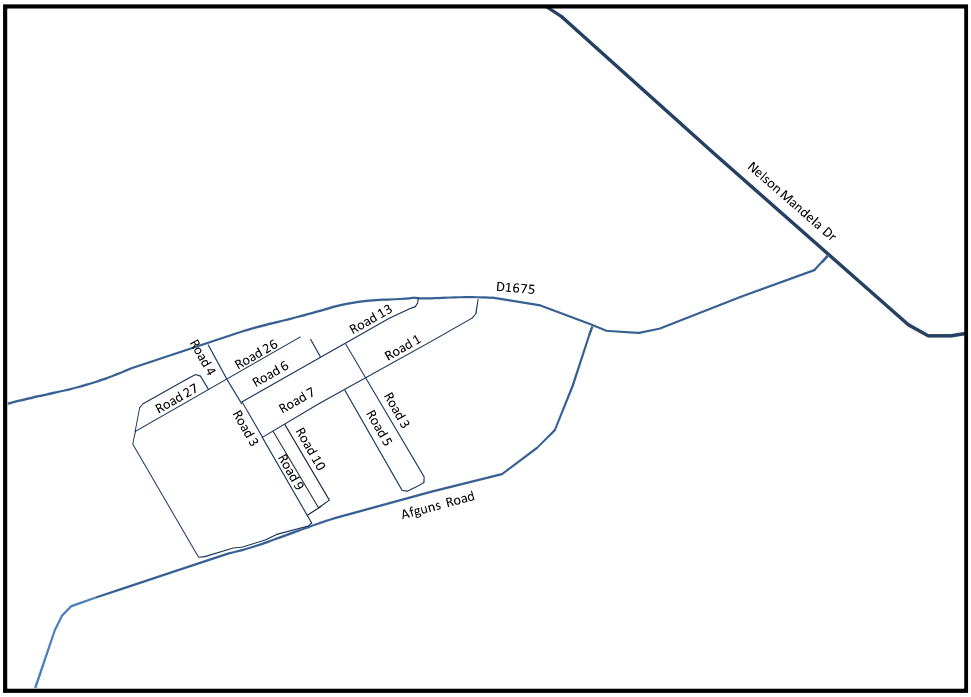

Figure 8-31: Internal road network at MPS

Nelson Mandela Drive and the Afguns Road provides access to Medupi Power station, following onto the D1675 and then through Entrance Gate 1, 2 or 4. Afguns road provides access to farms in the area and connects with the R510 further south (**Figure 8-31**).

The peak hour was identified as 16:00 to 17:00 for the 24-hour period. Traffic counts were undertaken at two locations at junctions along internal roads outside the MPS. The results from a traffic count undertaken at the main access point from Nelson Mandela Drive are shown in **Figure 8-32** below.

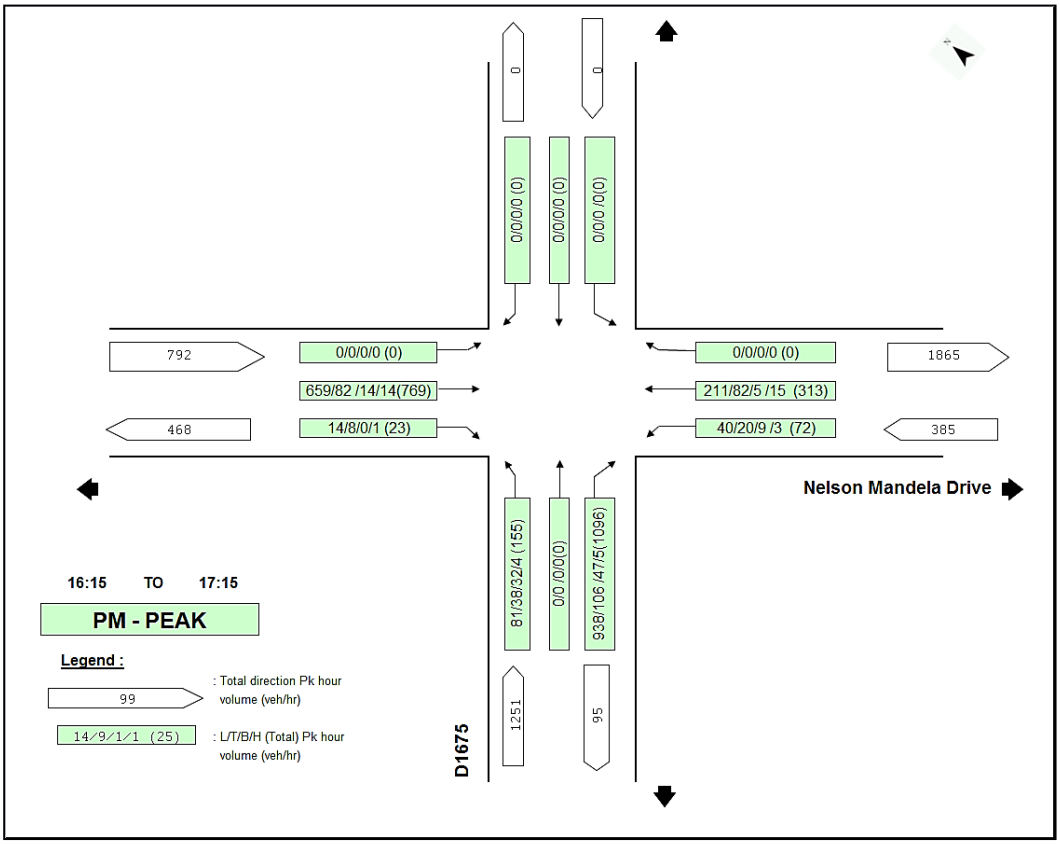

Figure 8-32: PM peak hour traffic volumes – Nelson Mandela Drive/D1675

Level of Service (LOS) ratings have been used to evaluate the existing and future traffic situation. LOS tries to answer how good the present traffic situation is at a particular intersection. Thus it gives a qualitative measure of traffic in terms of delays experienced. It is represented by six levels ranging from level A to level F. Level A represents minimal delays where the driver has the freedom to drive with free flow speed and level F represents uncomfortable conditions accompanied by long delays

Nelson Mandela Drive / D1675 and D1675 / Afguns Road intersections currently operates at a LOS F for the northbound movement during the PM peak hour, and a LOS A for the west- and eastbound movement.

This indicates that it operates well within capacity for the priority movement, but the vehicles coming from Medupi Power Station and Afguns road, wanting to turn into Nelson Mandela Drive are struggling to find a gap and long delays are experienced by motorists.

9 KNOWLEDGE GAPS, LIMITATIONS AND SCOPE CHANGES

Knowledge gaps, assumptions and limitations that have been identified by the EAP and specialists are provided in the following sections.

9.1 Information and data limitations

- Confirmation regarding the source of limestone could not be confirmed during the compilation of the EIR and as such potential impacts associated with the transport of limestone to the MPS was not be considered in this EIA. However, it must be noted that standards regulating road transport of material, including the transport of hazardous material exist to which the service providers transporting hazardous waste conform. Through these standards and regulations hazardous material is isolated to prevent any contamination of the environment during transport. Therefore, the impact of the hazardous material on the receiving environments is deemed low through implementation and adherence to the relevant standards and regulations. Impacts associated with the increased number of trucks on main and access roads were considered qualitatively by the transport specialist.
- Due to the fact that the source of limestone has not been confirmed, possible impacts associated with the long haul of limestone could not be considered. The scope of this EIA thus considered possible impacts from the point the proposed rail infrastructure ties off from the mainline that runs between Thabazimbi and Lephalale.
- The disposal of WWTP salts and sludge could only be considered in the short term with Eskom's interm measure to truck these wastes to an appropriately authorised landfill site, e.g. Holfontein Waste Disposal Facility. Eskom has in the meantime obtained a letter from EnviroServ Waste Management (Pty) Ltd confirming that Eskom will be able to dispose of the waste at Holfontein Waste Disposal Site. This letter is included in **Appendix I-1**. A worst-case scenario is that Eskom must truck all gypsum generated once all generation units are operational, however no feasibility assessment has been undertaken to confirm the sustainability and financial feasibility of this. Impacts associated with the trucking of WWTP wastes beyond 5 years are therefore not considered in this EIA. A separate process to assess the potential management, re-use or disposal of ash and FGD wastes will be commissioned towards the end of 2018 to identify the best possible disposal site and to allow consideration of additional proposals to deal with disposal of Type 1 and 3 on a regional scale. One such proposal is to consider a possible regional hazardous waste disposal facility , which may be commissioned by Eskom or by a Third Party, and which may be configured to allow hazardous and general waste generated by other industries to be disposed of at such a regional disposal facility.

9.2 Specialist study limitations

Knowledge gaps, assumptions and limitations have been highlighted in the sections below only for specialists that reported on such limitations in their assessment reports. Some specialists, however, did not note any limitations and knowledge gaps.

9.2.1 Groundwater Assessment

The following groundwater information gaps were identified:

- Additional groundwater information may be required for the existing licensed disposal facility;
- The only available aquifer parameters were defined by Groundwater Complete (2017) on five existing monitoring boreholes and at Medupi Power station during 2008 (IGS) and 2009 (Golder). More site specific aquifer parameters are required to the north and west of the existing licensed disposal facility. Hydraulic conductivity (k) and Transmissivity (T) are values that indicate the rate at which groundwater flows in the subsurface. These aquifer parameters can be highly variable in the aquifers systems due to the different geological unit's sandstone, shale, clay, mudstone and coal and geological conditions (faults, dykes, sills, and weathering) that apply. These hydraulic parameters are essential to understand and update the conceptual model and form the basis for estimating potential contaminant migration rates. These are calculated from borehole testing results.

9.2.2 Surface Water Impact Assessment

The following limitations and assumptions have been made in this specialist study:

- No flow and rainfall data against which the runoff calculations might be calibrated were available. The runoff volumes were therefore calculated theoretically;
- Since there is very limited flow data available for a precise estimation of the roughness coefficients, the Manning's 'n' coefficients were estimated by comparing the vegetation and nature of the channel surfaces to published data (Webber, 1971, as cited in (Sithole & Jordaan, 2018), therefore slightly conservative estimations were adopted.
- With regard to the specialist opinion provide for trucking of salts and sludge, the nature of materials being transported, the mode of transportation, the route chosen for transportation, and the distance over which the materials are transported were of most significance in assessing the potential surface water impacts;
- The assumption was furthermore made that the transportation route does intersect with surface water resources;

9.2.3 Biodiversity (Terrestrial Ecology) and Wetlands

The following limitations and assumptions have been made in this specialist study:

- It is important to note that the absence of species on site does not conclude that the species is not present at the site. Reasons for not finding certain species during the different visits (all conducted in mid-summer) may be due to:
    - The fragmented nature of the remaining natural vegetation within the boundary of the Medupi Power Station FGD Project area.

- The duration of fieldwork and the period at which rainfall events took place. I.e. while the December 2015 fieldwork took place during a heavy rainfall period – this was beneficial for faunal species. Floral species require some growth time after such events.

- Some plant species, which are small, have short flowering times, rare or otherwise difficult to detect may not have been detected even though they were potentially present on site.

- As an alternative to other vegetation cover methods (such as the Domin method), the Braun-Blanquet cover-abundance scale was used to analyse vegetation. It is reported that the Braun-Blanquet method requires only one third to one fifth the field time required to other similar methods. Furthermore, cover-abundance ratings are better suited than density values to elucidate graphically species-environment relationships. For extensive surveys this method provides sufficiently accurate baseline data to allow environmental impact assessment as required by regulatory agencies. However, there are a couple of problems that have been detected with such sampling methods. These are as follows:

  - It can be seen as subjective and dependent upon the experience and knowledge of the vegetation type by the surveyor. The cover estimate may vary from observer to observer.

  - There also may be a problem when the cover estimate is very close to two different classes (on the border so to speak) and then it is for the observer to decide which class it should be allocated to. In Hurford & Schneider's (2007) experience, in marginal situations, where the cover of a species is close to a boundary between two classes, the chance of two observers allocating the species to the same cover class is no better than 50:50. However, when comparing to other sampling methods such as Domin, Braun-Blanquet scale is better adapted for monitoring (less cover classes and fewer boundaries).

- Several inherent and unavoidable limitations need to be considered when interpreting survey results. Reasons for the lack of detection of some species include:

  - Inductions and security protocol which significantly decreased the amount of time spent in the study area.

  - The small, fragmented nature of the study area, and disturbances from Medupi Power Station.

  - The short duration of each field survey, and the lack of significant rainfall preceding the January survey.

  - The cryptic nature of certain species or simply lack of species presence. Some animal species, which are uncommon, small, migratory, secretive or otherwise difficult to find

may not have been detected even though they were potentially present in the study area.

- Even though all attempts were made to take samples under optimal conditions certain limitations were encountered. The limitations to this study included:
  - Wetland assessment techniques are inherently subjective.
  - The PES and EcoServices were also not designed for systems such as Ephemeral Washes
  - The boundary determined by infield wetland delineation can often occur within a certain tolerance because of the potential for the change in gradient of the wetness zones within wetlands.
  - The modification of the soil profile related to agricultural activities and the clearing of the site and the modification of the hydrological conditions within disturbed sites limits the accuracy of the resulting boundary as the sampling methodology relies heavily on interpretation of undisturbed soil morphology and characteristic.
  - The use of vegetation indicators (seasonal and temporary zones) was limited to non-existent due to the ephemeral nature of the systems. Riparian vegetation was even not evident. Only vegetation structure in comparison to surrounding areas was conducted.
  - Water was limited to sandy pools within the drainage features in the study area.
  - None of the biomonitoring indices could be used due to the ephemeral nature of these systems (Not within this Scope). Instead Invertebrate hatching at two pans in the ADF site was conducted. Due to time constraints the hatching experiment was allowed to run for 10 days but it would have been ideal to continue for up to 28 days.

9.2.4 **Air Quality**

The following limitations and assumptions have been made in this specialist study:

- Emissions emanating from all existing sources in the area were not quantified nor were resultant ambient air pollutant concentrations due to such sources simulated, with the exception of the existing Matimba Power Station and its associated ashing operations. Given that Matimba Power Station is the most significant source of ambient SO_2 concentrations in the region, this study limitation is not significant for assessing compliance and health risk potentials due to SO_2. Matimba Power Station is, however, not the major contributor to ambient fine particulate concentrations. In order to project cumulative particulate concentrations other significant sources, particularly local mining operation emissions, would need to be quantified.
- Routine emissions from power station operations were estimated and modelled. Atmospheric releases occurring as a result of accidents were not accounted for.

- For the current assessment, the assumption was made that the ash and gypsum would be mixed and disposed of together at the existing disposal facility. The gypsum material on the disposal facility is expected to provide a crust when mixed with water. To what extent this material will crust will depend on how the material is disposed (i.e. mixed with the ash or deposited as layers of gypsum material in between the ash material) and how much water is added to the disposal facility. The crust may also be disturbed from time to time with activity on the disposal facility, therefore for the current assessment, the effectiveness of this crust in lowering windblown emissions could not be quantified.
- Mesoscale Model version 5 (MM5) was used as the "initial guess" field for the CALMET model. Although two monitoring stations are located within the study area, MM5 could not be used together with the surface measurements as the Eskom-operated Marapong station is sited incorrectly providing questionable wind direction and, with one representative station (South African Weather Service Station located at Lephalale), CALMET requires 100% data availability which was not present.
- Source parameters and emission rates for these emission scenarios required for input to the dispersion modelling study were provided by Eskom personnel. The assumption was made that this information was accurate and correct.
- A constant NH_3 background concentration of 20 ppb was used in Calpuff (Scorgie et al, 2006, as cited in (von Gruenewaldt, et al., 2018). Measured ozone data from the Marapong station was included for the background data required for the chemical transformation module in Calpuff.

9.2.5 Noise Assessment

The following limitations and assumptions have been made in this specialist study:

- The quantification of sources of noise was restricted to activities associated with the project scope.
- Shielding effect of infrastructure was not considered in simulations. This approach will provide a conservative estimate of the estimated sound pressure levels from the project.
- Terrain was not accounted for in this assessment, providing a conservative estimate of noise levels as no natural shielding is taken into account.
- Source strength calculations were based on theoretical estimates not taking into account acoustic shielding or mitigation as a conservative estimate.
- The background used for the estimation of cumulative change in noise levels was selected from measured data points within the study area.

9.2.6 Social Assessment

The following assumptions and limitations are applicable to this study:

- In order to understand the social environment and to predict impacts, complex systems have to be reduced to simple representations of reality. The experience of impacts is

subjective on what one person may see as a negative impact may not be perceived as such by another person.

- The study was based on information available to the author during the assessment process and at the time of compilation of the SIA report.
- In addition to the various drafts of the SIA for the FGD Retrofit Project report compiled by NGT, information on stakeholders and comments received during the various public participation meetings for the project was utilised, as is usually the case with SIAs that form part of the Environmental Impact Assessment (EIA) process. SIAs normally draw heavily from information gathered during public participation (identified stakeholders as well as comments received).
- No economic modelling or analysis was done as part of the SIA. Any data relating to the economic profile of the area was obtained from municipal sources, such as municipality / provincial websites, Integrated Development Plans (IDPs), Service Delivery and Budget Implementation Plans (SDBIPs) and census data.
- This report only applies to the Medupi Power Station FGD Retrofit Project, the existing authorised ADF, the proposed railway yard with its associated infrastructure and it will not necessarily be accurate for and applicable to similar activities at other sites.

9.2.7 Heritage, Archaeology and Palaeontology

The following assumptions and limitations are applicable to this study:

- Based on the findings made by Mbofho Consulting and Project Managers, NGT cannot rule out the subterranean burial grounds and graves since in some areas they identified areas with soil heaps that are reportedly to have been dumped on top of graves. NGT was not part of this Phase II HIA study conducted on site; it therefore not take full responsibility or liability for any issues that were raised and addressed in this report other than to make reference to it as an important document to consider in dealing with heritage issues at Medupi PS. may be addressed by the current heritage social consultation on site.

9.2.8 Traffic Assessment

- The following gaps existed at completion of the TIA report:
    - The arrival and departure profiles of the traffic/trucks during the construction and operation phases.
    - The origin and destination of the generated traffic during construction.
    - Staff movements and transport during construction and operation.
    - Details regarding abnormally dimensioned machine components required during the construction and operation of the FGD facility.
- Eskom is still in the process of developing their heavy haul/lift plans and thus we could not include any information under this section.

9.3 Changes in project / process scope

Towards the middle of 2017 changes to the authorisation and licencing approach for the Medupi FGD Retrofit Project applications were proposed in order to streamline the application processes to ensure compliance with the NEMAQA compliance requirements by the year 2021. The following changes were subsequently implemented:

- Confirmation that the assessment of an additional multiuse disposal facilities, which could be used for the disposal of ash and gypsum, and maybe salts and sludge have been removed from this current application scope and will be undertaken as a separate authorisation process.
- The application for a Waste Management Licence (WML) for the existing ADF was removed from the integrated Environmental Impact Assessment process hence the EIA application will not be an integrated Environmental Impact Assessment application. The proposed disposal of gypsum together with ash on the existing authorised ADF footprint will be dealt with through a separate amendment process to the existing ADF WML.
- The EIA application in terms of the National Environmental Management Act, 107 of 1998, as amended, will include application for activities associated with the construction and operation of the FGD system within the Medupi PS footprint and the railway yard and siding, including limestone and gypsum handling facilities, e.g. PCDs, diesel storage facilities new access roads, Waste Water Treatment plant, facilities for temporary storage of salts and sludge.
- A Water Use Licence Application will focus on water uses triggered by the construction and operation of the FGD system, railway yard and limestone / gypsum handling areas, and within 500m of the approved ADF footprint.

As a result of these changes the project scope for specialists was updated and specialists were requested to amend their reports to reflect these changes.

10 SUMMARY OF SPECIALIST STUDIES

A number of specialists were appointed by Zitholele Consulting to investigate several aspects of the proposed FGD system and its associated infrastructure, and the railway yard development. A summary of these specialists' findings and recommendations are provided in the following sections.

10.1 Geology

Based on this limited information, the following brief comments were provided:

- The site is mainly underlain by quartzites, shale, sandstones and conglomerates. Soils and weathered and fractures rock are present to depths typically varying from 10 to 15m, below which the soils become relatively fresh.
- Standard foundation systems are expected to be applicable, comprising generally shallow foundations.
- Excavatability is expected to be soft to intermediate, with hard rock class (drill and blast) for excavation in moderately weathered or harder rock (location dependent, but generally below about 5m depth).
- The Limestone and Gypsum Offloading Facility below the railway yard is proposed to be 15m in depth. Hard rock (drill and blasting) excavation will be required from a depth of about 2m.
- Dependent on the thickness of the surficial soils and any fill materials over the area, a contingency allowance should be made for encountering rock during the installation of such services or shallow foundations, where hard rock excavation (hydraulic rock hammer or drill and blast) may be necessary.
- Standard footing systems such as shallow pad and strip footings are expected to be applicable for the area.
- Deep excavations are expected to require reinforcement and/or stabilisation, particularly at shallow depths. Dependent on the quality of the rock and degree of fracturing, the lower half of the 15m deep excavation may potentially be unreinforced and unstabilised. Core orientated geotechnical drilling and associated structural analysis of the ground will be required prior to design to test for this design solution.
- Groundwater can be expected from a shallow depth in the excavation. The volume of water seepage is expected to be relatively low, and reducing as the excavation proceeds into less fractured rock.
- No significant geotechnical hazards or fatal flaws were identified. All the geotechnical considerations mentioned can be mitigated in the design of the facility. Significant further investigations will be required for all items of infrastructure as the design proceeds.

10.2 Soils and Land Capability

The infrastructure planned for the facility will include some large and heavy structures and relatively deep excavations. These will entail the removal of significant quantities of soil, and possibly the complete removal of soil and soft overburden in places were the foundations for the larger structures are to be excavated.

A number of site-specific baseline (existing environment) conditions are of special significance and need to be taken into account when considering potential impacts associated with the proposed development. These include:

- FGD retrofit infrastructure to be constructed and operated within the Medupi Power Station footprint;
- Temporary storage of FGD WWTP solid waste (salts and sludge) at a hazardous waste storage facility within the Medupi Power Station footprint, to be removed by an accredited service provider to an approved waste disposal facility;
- Temporary trucking of salts and sludge from the FGD WWTP to a designated hazardous waste facility for disposal;
- Construction of a pollution control facility receiving dirty water runoff from the limestone holding area (licencing in terms of the NWA); and
- Construction of infrastructure for the loading and offloading of gypsum and limestone at the proposed railway siding for the possible transport of limestone and gypsum to and from the power station, respectively.

It is furthermore important to note that the pre-development conditions for the area of concern are one of disturbed industrial. For the most part the site comprises land that has been cleared or disturbed to some degree by the power station development. The concerns and probable impacts that could affect the soils and associated land capability include:

- The loss of the soil resource due the **change in land use** and the removal of the resource from the existing system (Sterilization) as a result of construction activities. These activities could result in the complete loss of the soil resource for the life of the project. The management of waste could potentially sterilize the soils permanently, if not removed/striped, stored and well managed;
- The loss of the soil resource due to **erosion** (wind and water) of unprotected materials due to the removal of vegetative cover and/or topsoil;
- The loss of the utilization potential of the soil and land capability due to **compaction** of areas adjacent to the constructed facilities by vehicle and construction activities;
- Loss of the resource due to **removal** of materials for use in other activities;
- The **contamination** of the resource due to spillage of raw materials and reagents (Gypsum, limestone etc.) that are transported to the site;
- The **contamination** of stored or in-situ materials due to dust or dirty water from the project area and transport routes;

- The **loss** of the soil utilization potential due to the disturbance of the soils and potential loss of nutrient stores through leaching and de-nitrification of the stored or disturbed materials.

Impacts or impact groups identified and assessed by the soils and land capability specialist are provided in **Table 10-1** below.

Table 10-1: Impacts identified by the soils and land capability specialist

Development Phase	Impact / Impact Group
Planning / Pre-construction	Loss of utilisable resource (sterilization and erosion), compaction and contamination or salinization.
Construction Operational	Loss of utilisable resource (Sterilisation and erosion), compaction, de-nitrification and contamination or salinisation.
Decommissioning	Net loss of soil volumes and utilisation potential due to change in material status (Physical and Chemical) and loss of nutrient base.

10.3 Groundwater

The study yielded the following findings and conclusions:

- The existing licensed disposal facility is mainly underlain by Waterberg sediments comprising of sandstone, subordinate conglomerate, siltstone and shale.
- The initial regional groundwater conceptual model identifies two aquifer zones namely weathered, and fractured aquifer zones, but needs to be confirmed and updated, supported by future test pumping and borehole logs.
- The average groundwater level measured during the hydrocensus for the area of investigation is 30.4 mbgl;
- Constituents of the hydrocensus groundwater samples that exceeded the SANS 241 (2011) maximum allowable standard include EC (2), TDS (2), Na (2), Cl (3), N (2), Al (3), F (4), Fe (5), and Mn (1). The numbers in brackets indicate the number of boreholes in which these constituents exceeded.
- Two boreholes, BU02 and BU03, showed elevated Nitrate values (Class III; 16mg/l and IV; 66mg/l respectively). This water quality poses chronic health risks is and represents poor and unacceptable water quality. The elevated nitrate concentrations are probably related to point- source pollution caused by animal farming and stockades.
- The baseline water quality of the combined sampled boreholes is summarised in **Table 10-2** below.

Table 10-2: Baseline Groundwater Quality

Item	Physical Parameters			Macro Determinants (Major Ions and Trace Metals)								Minor Determinant		
	pH	EC mS/m	TDS mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	Cl mg/l	SO4 mg/l	NO 3 mg/l	MAL K Mg/l	F mg/l	Fe mg/l	Mn mg/l
No. of Records	10	10	10	10	10	10	10	10	10	10	10	10	10	10

10% Percentile	5.67	15.35	112.8	6.165	1.9525	11.804	2.5892	16.2	5	0.2	8	0.2	0.0408	0.0421
Median Baseline water Quality	**7.3**	**75.8**	**450**	**27.66**	**21.385**	**80.285**	**6.7065**	**101.5**	**38**	**0.25**	**242**	**1.1**	**1.5715**	**0.106**
Average	7	103.19	642.2	57.1504	30.3111	105.095	10.1201	207	34.3	8.58	201.2	1.3	2.5966	0.1782
90% Percentile	7.53	212.4	1377.6	140.5	67.629	203.87	18.855	532.6	62.9	21	357.2	2.34	6.6366	0.3691
Max. Allowable Limit (SANS 241:2011)	<5 >9	<170	<1200	<300	<100	<200	<100	<300	<500	<11	-	<1.5	<0.3	<0.5

- Based on the hydrocensus water quality analyses, the background groundwater quality at the MPS is Marginal (Class II) to Poor (Class III - IV) water quality.
- Only boreholes GE06 and VER02 groundwater quality are representative of calcium magnesium bicarbonate type of water (Ca, Mg–(HCO_3). This water type represents unpolluted groundwater (mainly from direct rainwater recharge) and is probably representative of the pristine background water quality.
- The groundwater vulnerability of the study area is shown on the national groundwater vulnerability map as low to medium.

Impacts or impact groups identified and assessed by the soils and land capability specialist are provided in **Table 10-3** below.

Table 10-3: Impact identified by the groundwater specialist for the construction of FGD infrastructure and railway yard

Development Phase	Impact / Impact Group
Planning / Pre-construction **Construction** **Operational** **Decommissioning**	Identical impacts were identified for all phases of the development and include: • Impact on the ambient groundwater quality; • Impact on the groundwater quantity/recharge; • Impact on groundwater flow regime.

The groundwater specialist furthermore undertook a qualitative impact assessment based on professional opinion and knowledge of the study site for the proposed trucking of Type 1 Waste to a Hazardous Disposal Facility for a period of 5 years.

10.4 Surface water

The surface water study yielded the following findings and conclusions:

- The study area is located within the Limpopo Water Management Area (WMA) and within quaternary catchment A42J.
- Based on South African Weather Services (SAWS) weather station number 0717595_W and the DWS's weather station A4E003, the MAP and MAE for the study area were determined to be 416.09 mm and 2 572 mm, respectively.

- Non-perennial streams, mainly the Sandloop River, drain the study area. The general drainage of the area is in an easterly direction towards the Mokolo River. These non-perennial streams in the area were found to be seasonal and only likely to flow after rainfall events.
- The study area has gentle slopes of 0.5% to 5% in general with relatively steeper slopes to the south of the study area.
- In order to establish baseline water quality for the study area prior to the construction of the FGD and the expansion of the existing ADF, a water quality monitoring programme was established by Golder in 2015. Baseline water quality could not be established during the site visits due to lack of flow. As a result water quality data obtained from the Wetland Assessment (Natural Scientific Services, 2015) was utilised for water quality analysis.
- It was established that the existing water management system at MPS include:
  - A dirty water management system to ensure that polluted water the power station and its associated infrastructure, including the existing ADF, as well as sediment-laden runoff from disturbed areas is separated from clean area runoff and that it is collected in Pollution Control Dams (PCD); and
  - A clean water management system to divert water undisturbed by the power station's operations around the disturbed project footprint.
- The floodline study was updated by generating floodlines using higher resolution contour lines and it was found that the 1:100 year floodline remains outside the footprint of the proposed ADF. However, the updated floodline does encroach on a section of the western-most PCD.
- The existing Medupi site and ADF site have a combined area of approximately 1,874 ha (18. 7 km^2) which equates to 1.03% of quaternary catchment A42J with a catchment area of 1 812 km^2 (WRC, 2012).
- The Sandloop River tributary has an estimated catchment area of 4,467 ha (44.7 km^2). The reduction in catchment area from the Medupi site and ADF site of approximately 1,874 ha (18.7 km^2) equates to a 49.95% decrease in catchment area. It is therefore anticipated that during the operational phase of the ADF, there will be a reduction in the total runoff reporting to the Sandloop River tributary, however limited reduction to the Mokolo system.

The potential surface water impacts considered by the Surface Water Impact Assessment are summarised in **Table 10-4**.

Table 10-4: Summary of potential surface water impacts with respect to Medupi Power Station

Development Phase	Impact / Impact Group

Planning / Pre-construction **Construction** **Operational** **Decommissioning**	• Changes in surface water catchment areas • Changes in surface water quality • Change in surface water runoff • Erosion • Off-site water requirements

If not mitigated, the potential surface water quality impacts will ultimately affect the downstream water users. It should be noted that the Sandloop River and its tributaries are generally downstream of Medupi and the topography around the study area is such that runoff generated at Medupi drains towards the Sandloop River and its tributaries. This potentially polluted water will flow towards downstream users via the river system.

10.5 Biodiversity (Terrestrial Ecology) and Wetlands Assessment

A terrestrial ecological assessment and wetland and watercourse assessment was undertaken by NSS for the intact areas within the proposed footprint of the MPS and ADF, as well as within 500m area of the boundary of the MPS. These assessments included a broad description of the biophysical environment coupled with site investigations to assess the regional vegetation and local flora, recorded alien invasive species, local diversity of mammals, birds, reptiles, frogs, butterflies, dragonflies and damselflies, scorpions and megalomorph spiders. Site visits also focused on the delineation of wetlands and pans within 500m of the MPS and sediment and water quality analysis of surface water bodies.

This study made the following conclusions:

- No Red Listed plant species were recorded within the study site.
- Conservation Important (CI) Protected Tree species found within the study area and surrounds include *Boscia albitrunca*, *Sclerocarya birrea* and *Spirostachys africana*. *Boscia albitrunca* and *Sclerocarya birrea* are both Keystone species.
- Vegetation communities occurring within the footprint of the proposed railway yard and FGD infrastructure within the MPS include *Acacia erubescens* - *Grewia* Thornveld, *Acacia nigrescens* - *Grewia* Open Veld, and *Acacia* mixed woodland. The sensitivity ratings of these habitats are presented in **Table 10-5** as reported by (Abell, et al., 2018).
- NSS surveys in and around the FGD study area yielded 43 mammal, 158 birds, 20 reptile, 16 frog, 9 butterfly, 2 dragonfly and 1 scorpion species, greatly contributing to the overall Medupi inventory.
- Semi-ephemeral systems are providing an important foraging, breeding and migration habitat for a diverse array of species and are therefore considered extremely important.
- Four HGM units were identified surrounding the MPS and associated ADF, i.e. two south–east and one north–east draining Washes (SEW 1 – 3) and multiple inward-draining depressions (D1). It is however only SEW 2 located just south of the MPS generation units that are likely to be impacted by the construction of the railway yard and FGD infrastructure within the MPS footprint.

- For the study area, the NFEPA Project recognises the Sandloop System as a FEPA River. This system is rated regionally as having a Moderately Modified (or C) PES.
- There are currently no Threatened Ecosystems within the larger region around the study site. The closest vegetation type under threat is the Springbokflats Thornveld.
- According to the Limpopo C-Plan, the study area is situated within a provincial Ecological Support Area (ESA) and Critical Biodiversity Area (CBA) 1.
- It is anticipated that the construction of the FGD and associated storage facilities will reduce the health of SEW 2 to an Upper D (Largely modified) without mitigation and a Lower D with mitigation. The drivers likely to be most adversely affected include hydrology and vegetation.
- In terms of hydrology, without mitigation, one would expect an increase in floodpeaks and this potential for erosion as a result of the increase in exposed, impermeable surfaces such as compacted areas, concrete, tar and other structures including the stockpiles themselves.
- Deposition and erosion in turn will likely decrease the state of the vegetation along this system. With implementation of the planned stormwater infrastructure and other suggested mitigation the it is anticipated that there will be less erosion and deposition , however there will still be a reduction in overall water inputs due to catchment loss and the presence of stormwater infrastructure channelling water into Medupi's large eastern dams.
- In terms of biodiversity the overall goal of the project should be to minimise loss to biodiversity wherever possible. This may be achieved through commitment to the listed mitigation, effective rehabilitation of the ADF and the relocation of bullfrogs and other amphibians to newly created habitat elsewhere. The overall objective of the project as it relates to wetlands should be to ensure that there is no net loss in wetland functionality from the current state as a result of the construction of the FGD
- It is anticipated that at completion of the MPS approximately 3.6 ha of pan habitat will be lost. Although this appears to be a small size, it is significant when considering that this represents 20 possible breeding locations. It is therefore required that wetland offset plan be developed and implemented by Eskom.
- Eskom has affirmed its commitment to commission a wetland rehabilitation and stage 1 offset plan that will serve to offset functional losses to SEW 2, including the other SEWs and pans. NSS has already been appointed to commence with the development of such a plan for presentation to the DEA and DWS.
- Eskom should support the recently commissioned wetland rehabilitation and bullfrog relocation / pan restoration projects in terms of rainfall reporting, labour, machinery and engineering resources to enable the successful creation of new pan habitat, e.g. within Site 12 which is the area just south of the MPS ADF or any other appropriate habitat, and the successful relocation and establishment of bullfrogs therein.

Table 10-5: Sensitivity rating of different habitats / floral communities in the study area (adapted from Abell et. al. 2018)

UNIT	HABITAT & FLORAL COMMUNITY	CURRENT CONDITION & IMPACTS	SUCCESS FOR REHABILITA-TION	CI SPECIES	REGIONAL CONSERVATION VALUE	OVERALL SIGNIFICANCE *
Natural Areas						
	Acacia erubescens - Grewia Thornveld	• Understorey has limited herbaceous cover (sampling in the mid summer season) – only tree cover dominant. • Limited cover for faunal species and limited floral diversity • 2.26% of the study area	Difficult to rehabilitate to a similar natural state due to the soil structure and arid conditions. Extended effort will be required to ensure successful rehabilitation. According to Kevin *et al* (2010), moisture is the most important ecological factor necessary for successful rehabilitation of denuded patches in semi-arid environments.	• Limited Herpetofauna and avifaunal species utilise this area • Scattered PT species	• Least Concern Vegetation Unit • Limpopo C-Plan – CBA and within FEPA buffer	**MEDIUM**
	Acacia nigrescens - Grewia Open Veld	• Typical Habitat for the region with a diversity of tree, grass and forb species • Understorey –grass layer more dominant than shrub • Limited alien invasives present • Fragmentation is occurring • 9.19% of the study area		• Habitat utilisation for numerous faunal species. • Potential foraging area for Giant Bullfrog • PT floral species present	• Least Concern Vegetation Unit • Limpopo C-Plan - ESA	**MEDIUM**
	Acacia mixed woodland	• Highly fragmented • Alien Invasives present – edge effects occurring • Increase in species such as *Dichrostachys cinerea* • 6.59% of the study area		• Potential foraging area for Giant Bullfrog • PT floral species present	• Least Concern Vegetation Unit • Limpopo C-Plan - ESA	**MEDIUM-LOW**
Transformed Areas						
	Conveyor and associated areas; ADF, MPS, Cleared areas and stockpiles; Gravel road and fence line	• Highly transformed • High human presence/activity • 46.61% of the study area	As per statement above	• *Sclerocarya birrea* seedlings present on edges of soil stockpile areas. • Potential for CI species to occur are limited	• Least Concern Vegetation Unit • Limpopo C-Plan - ESA	**LOW**

Impacts identified and assessed by the biodiversity and wetland specialists are provided in **Table 10-6**.

Table 10-6: Impact identified for the railway yard and FGD footprint area by biodiversity and wetland specialists

Development Phase	Impact / Impact Group
Planning / Pre-construction	• No impacts identified during planning / pre-construction phase
Construction (Site clearing and construction activities)	• Loss of Acacia Woodland Habitat • Loss of utilisable resource (sterilization and erosion), compaction and contamination or salinization. • Potential increase in alien vegetation species • Potential loss of CI floral species • Potential loss of CI faunal species (excluding bullfrogs and raptors) • Potential loss of CI raptor species • Loss of foraging habitat for game species • Loss of catchment area and consequent decrease in water inputs as a result of the necessary containment of dirty water runoff • Increased faunal mortality • Increased sensory disturbance to fauna • Increase in flood peaks, sediment loads and erosion to wetlands
Operational	• Potential increase in alien vegetation species • Loss of catchment area and consequent decrease in water inputs as a result of the necessary containment of dirty water runoff • Increased faunal mortality • Increased sensory disturbance to fauna • Spills, roadkills and other traffic associated impacts due to trucking waste to an appropriately licenced waste disposal facility, e.g. Holfontein • Contamination of wetlands from storage facilities associated with the ADF and FGD– Consequences for bullfrogs and aquatic invertebrates
Decommissioning	• No impacts identified during planning / pre-construction phase

10.6 Air Quality

The objective of the investigation undertaken by the air quality specialist was to quantify the possible impacts resulting from the proposed activities on the surrounding environment and human health, and included activities associated with the construction and operation of the FGD system within the MPS footprint and the railway yard and siding, including limestone and gypsum handling facilities and diesel storage facilities new access roads.

Impacts from the construction activities were considered but not assessed further as their impacts would be localised and of a temporary nature. The impacts from the railway siding and handling operations as well as vehicle entrainment from the new access road would contribute to the particulate matter, but will be localised and will not exceed ambient National Ambient Air Quality Standards offsite. These changes were therefore not deemed significant and were thus not assessed further.

Furthermore, dust emissions potentially resulting from the transportation of limestone and wastes generated by the FGD process were considered. The air quality specialists compiled a screening model to qualitatively assess the significance of this potential impact. This qualitative assessment concluded that PM_{10} and $PM_{2.5}$ concentrations resulting from vehicle entrainment as a result of transporting limestone, salts and sludge on a paved road surface (assuming all six units are operational) are well below the NAAQS.

An Impact Prediction Study was undertaken where SO_2, NO_2 and particulate concentrations were simulated using the CALMET/CALPUFF dispersion modelling suite. Ambient concentrations were simulated to ascertain highest hourly, daily and annual averaging levels occurring as a result of the baseline and proposed Project operations.

Three scenarios were assessed: (i) 2014 baseline: the potential impacts due to the Matimba Power Station operations, (ii) 2020 baseline: the potential impacts due to the Matimba Power Station operations and the Medupi Power Station operations including all six units without FGD, and (iii) proposed Project operations: the potential impacts due to the Matimba Power Station operations and the Medupi Power Station operations including all six units with FGD.

The fugitive emissions due to windblown dust from the existing ash facility was also quantified at the existing Ash Disposal Facility (ADF) as an unmitigated operation (no controls in place) and as a mitigated operation (80% control efficiency in place through active re-vegetation and wetting). Stack emissions and parameters were provided by Eskom personnel for the study.

Main findings of the air quality study include:

- SO_2 concentrations were measured to infrequently exceed short-term NAAQ limits at the monitoring stations located at Marapong and Lephalale. Modelled SO_2 concentrations also indicate infrequent short-term exceedances of the National Ambient Air Quality (NAAQ) limits at these sensitive receptors. There is however compliance with the NAAQS.
- Currently, the Matimba Power Station is likely to be the main contributing source to the ambient SO_2 ground level concentrations in the study area due to the magnitude of its emissions. Other sources which may contribute significantly due to their low release level include: spontaneous combustion of coal discards associated with mining operations, clamp firing emissions during brickmaking at Hanglip and potentially household fuel burning within Marapong.
- NO_2 concentrations have been measured to infrequently exceed short-term NAAQ limits (but are in compliance with NAAQS) at the monitoring stations located at Marapong and Lephalale. Low level sources of NO_x in the region include combustion within coal discard dumps, brick firing operations and possibly also household fuel burning and infrequent veld burning.
- Measured PM_{10} concentrations exceed the daily NAAQS at Marapong for the period 2014 but are lower at Lephalale (where levels comply with daily NAAQS). The measured $PM_{2.5}$ concentrations are within the daily NAAQS applicable till 2030 at Marapong and Lephalale, but exceed the more stringent daily NAAQS applicable in 2030. The annual average PM_{10} and $PM_{2.5}$ concentrations measured at Lephalale are within NAAQS.

- The 2014 baseline simulations indicated that the contribution of Matimba Power Station to primary and secondary particulates resulted in no exceedances of the SO_2, NO_2, PM_{10} and $PM_{2.5}$ NAAQS at Marapong and Lephalale.
- Simulation results from the 2020 baseline simulations indicated that the area of non-compliance with the hourly and daily SO_2 NAAQS extended ~30km southwest of the Medupi Power Station due to the cumulative operations of Matimba Power Station and Medupi Power Station without FGD control.

The air quality impact assessment study concluded the following:

- The area of exceedance of the hourly and daily SO_2 NAAQS was significantly reduced when FGD controls on the Medupi Power Station are considered, bringing the simulated ground level concentrations within compliance of the hourly and daily SO_2 NAAQS at all sensitive receptors in the study area.
- Simulated impacts from the Matimba Power Station and the Medupi Power Station without FGD (2020 baseline) was in non-compliance with SO_2 NAAQS on a regional scale resulting in a MODERATE significance.
- The area of non-compliance of SO_2 concentrations reduces significantly for proposed Project operations (i.e. Matimba Power Station operations and Medupi Power Station operations with FGD) and reduces the significance to LOW as no exceedances of the NAAQS are simulated at the closest sensitive receptors in the study area.
- No exceedances of the NAAQS for NO_2, PM_{10} and $PM_{2.5}$ were simulated at sensitive receptors due to proposed project operations, resulting in LOW significance. However, available monitoring data shows that the PM_{10} concentrations are in non-compliance with the daily NAAQS at Marapong. Simulated impacts due to proposed project operations, however, do not contribute significantly to current ambient particulate concentrations.

Air quality impacts assessed in the Air Quality Specialist Report are summarised in **Table 10-7** below.

Table 10-7: Impact identified for the MPS by air quality specialist

Development Phase	Impact / Impact Group
Planning / Pre-construction	• No impact during the planning phase.
Construction	• Impacts not likely to impact the ambient air quality more than the existing (status quo) status.
Operational	• Impact of SO_2, NO_2, PM_{10} and $PM_{2.5}$ emissions on ambient air quality.
Decommissioning / Rehabilitation	• Impacts not likely to impact the ambient air quality more than the existing (status quo) status.

10.7 Noise

The main objective of this study was to establish baseline/pre-development noise levels in the study area and to quantify the extent to which ambient noise levels will change as a result of the proposed project.

In the assessment sampled and simulated noise levels were assessed against the International Finance Corporation (IFC) guidelines for residential, institutional and educational receptors (55 dBA during the day and 45 dBA during the night) since these (a) are applicable to nearby Noise Sensitive Receptors (NSRs) and (b) in-line with South African National Standards (SANS) 10103 guidelines for urban districts. The IFC's 3 dBA increase criterion was used to determine the potential for noise impact.

Noise will be generated during the project's construction, operational and decommissioning/closure phases. Construction and decommissioning/closure phase activities, however, will be for limited time frames and was not assessed in detail for the noise assessment study.

The noise assessment concluded the following:

- Several individual residential dwellings are located within a few kilometres from the MPS. There are also residential areas to the north and northeast of the Matimba Power Station.
- Baseline noise levels are affected by road traffic, mining activities, birds and insects. Noise levels in the vicinity of the MPS are currently comparable to levels typically found in suburban districts. Representative day- and night-time as well as 24-hour baseline noise levels of 48.3 dBA, 43.7 dBA and 50.9 dBA, respectively, were calculated from survey results.
- Noise impacts during the operational phase will be more notable at night.
- The operational phase will result in noise levels that do not exceed the selected impact criteria at the nearest NSR. 'Little' to no reaction from individuals within this impacted area may be expected.
- It was concluded that, given the conservative nature of the assessment, the implementation of the basic good practice management measures recommended by the noise specialist would ensure low noise impact levels. From a noise perspective, the noise specialist recommended that the project may proceed.

Potential noise impacts assessed in the Noise Specialist Report are summarised in **Table 10-8** below.

Table 10-8: Impact identified for the MPS by the noise specialist

Development Phase	Impact / Impact Group
Planning / Pre-construction **Construction** **Operational** **Decommissioning / Rehabilitation**	Increase in noise levels.

10.8 Social

The objectives of the Social Impact Assessment (SIA) study included the assessment of potential social impacts of the FGD retrofit and the proposed railway siding and focused on

the social benefits of the proposed FGD on the surrounding communities and industries, as well as impacts on the ecosystem such as the biosphere and its natural resources like water and ecology.

Based on the various impact assessment and impact rating processes, the following conclusion were made about the proposed Medupi FGD and the proposed railway siding:

- The significance of positive social impacts generally exceeds the significance of negative social impacts in the implementation of the FGD, the ADF and the railway siding throughout all four stages of the project.
- The implementation of the proposed FGD technology at Medupi will result in reduced levels of SO_2 in the medium and long term. As the result of this, the significance of health risks associated with the SO_2 emissions will be minimized on a long-term basis.
- The outcome of the FGD retrofit will be an improved biosphere in the region and South Africa, which will translate to improved quality of life for the citizens of Lephalale and the communities located south and southwest of the study area who are also affected by pollutants containing SO_2.
- One of the most pressing issues identified during the survey relates to stakeholder relations and project communication. Eskom and its stakeholders have done a significant amount of work in dealing with concerns of various interested and affected parties on the ground. Collectively, they have contributed to the establishment structures entrusted with the management of stakeholder relations and communication as part of the Medupi project. A committee has been established to deal with such issues; for example, the Medupi Environmental Monitoring Committee (EMC) as well as the Stakeholder Relations Office in the region. It is therefore concluded that necessary strategies and measures have been put in place to deal with and manage stakeholder relations and communication.
- Taking into consideration of ecosystem services beneficiaries and drivers, the potential impacts of the proposed railway siding for lime off-taking were assessed. The land on which the proposed siding is to be constructed is already reformed or altered, therefore it was concluded that the railway siding will not have any adverse negative social and economic impacts in terms of increase in traffic volumes and possible road carnage resulting from trucks transporting lime to Medupi.
- In conclusion, the water issue was assessed to be the biggest threat in the project lifespan. The current allocation to Medupi will be able to operate the six generation units at Medupi but will not be able to meet the full water demand for the FGD. The current raw water abstraction from Mokolo Dam of which the Lephalale LM is also dependent on for raw water to support its domestic and farming communities' poses is a biggest socio-economic threat in terms of ecosystems support services.

The social specialist recommended that from a social point of view, the proposed FGD technology retrofit project and the proposed railway siding should be granted authorisation provided that there will be implementation of and adherence to the following:

- Mitigation measures in the SIA must be included in the Environmental Management Programme (EMPr), which will be approved as condition of environmental authorisation.
- Although Eskom has done a lot to address concerns relating to communication with local communities and stakeholders, it is recommended that the EMC should further strengthen its multi-stakeholder engagement strategy or adopt new forms of communication that resonate with the interests of I & APs in the region.
- Strengthening multi-stakeholder engagement should be done in a manner that does not polarise relations between existing stakeholders. One way of addressing this issue is to develop a sub-committee for the Environmental Monitoring Committee (EMC).
- If established, the EMC sub-committee could include a representative from each of the affected communities. This would be in addition to those communities' representatives already listed in the EMC Terms of Reference (ToR).
- Community representatives from Steenbokpan (Leseding) and the farms (farming community) would form part of the EMC sub-committee due to the fact that they feel excluded in programmes and workshops that deal with issues arising from Medupi construction and the associated infrastructure and technology such as the FGD.
- In addition to EMC public meetings and workshops, the sub-committee would ensure that all community concerns and grievances are deliberated on and addressed directly by the EMC and outside the EMC public meetings. The EMC ToR allows for the election of alternates. Therefore, this recommendation for EMC sub-committee is in line with EMC ToR.
- In projects of similar nature to Medupi, a grievance mechanism committee is often established and communicated to the community in line with best practice. The Medupi EMC is a sufficient structure to handle all issues relating to the environment, monitoring and auditing. However, without increasing bureaucracy, Eskom should consider appointing an independent company/specialist that specialises in the management of Social Risks.
- The social specialist recommended that Eskom should fast-track the retrofitting and synchronising of the FGD technology.
- In terms of material transport to and from site for the construction of the FGD and to transport gypsum, salts and sludge by-products of the FGD. This will help mitigate environmental risks associated with the use of public roads to transport these materials. It will also assist alleviate possible increase in traffic volumes associated with the FGD construction material transportation.
- In terms of FGD by-products it recommended that Eskom should considered tendering the offtake of gypsum for commercial purposes instead of its combined disposal with the ash. This will be dependent on the quality of gypsum. In the event poor quality gypsum is produced, it will be disposed of with ash on a WSF.
- The specialist further recommended that Eskom should lobby (together with other industries) DWS to speed up the implementation of Phase 2 MCWAP. This will guarantee Eskom and other industries in Lephalale appropriate water allocation to support the FGD and the growing industries around it such as expanded coal mining due to coal reserves

in the Waterberg region. The speeding up of the Phase 2 MCWAP by DWS would also assist mitigate the potential water risk to Lephalale associated with the abstraction of raw water by industries from Mokolo Dam of which the municipality and its constituencies is also directly dependent on for potable water.

Impacts identified and assessed by the socio-economic specialist are provided in **Table 10-9.**

Table 10-9: Impact identified for the railway yard and FGD footprint area by socio-economic specialist

Development Phase	Impact / Impact Group
Planning / Pre-construction	• Developing spin off businesses to support FGD construction phase (Positive) • Employment expectations and influx of migrant labour
Construction	• Employment of skilled, semi-skilled and unskilled labours in the construction of the FGD (Positive) • Tenders and contract opportunities for local businesses in construction of the FGD and ancillary infrastructure (Positive) • Improvement in local road conditions with the construction of the FGD (Positive) • Extension of the construction phase currently underway in Medupi resulting to prolonged contractor activity in Lephalale which benefit local businesses (Positive) • Increase in traffic volumes resulting from a combination of existing road users and an increase in construction vehicles/trucks transporting materials to and from Medupi for the construction of the FGD • Increase in occupation health and safety risks resulting from increase in traffic volumes associated with construction vehicles/trucks working on the FGD as well risks associated with the actual prolonged construction phase at Medupi • Increase in pressure for water demand and allocation to support the construction of the FGD, the ADF, and existing industries and for domestic uses • Improvement in local road conditions with the construction of the FGD and ADF (Positive) • Increase in negative public sentiments about the project FGD
Operational	• Synchronisation and operation of the FGD technology at Medupi will result to reduction in SO2 levels in the atmosphere resulting to improved ambient air quality and improved human health as the result of the FGD (Positive) • Reduction is respiratory related diseases such as asthma, bronchitis, lung cancer, eye irritations, pneumonia and cardiovascular disease resulting from emission such as SO_2 (Positive) • Stabilization of the National Grid and improved electric supply to support the growing economy and achievement of social imperative such as provision of power for domestic use throughout the country (Positive) • Development of the secondary industries as the result of implementation of the FGD through sales of its commercial suitable gypsum to the farming industry-locally, regional, nationally and possibly internationally (Positive)
Decommissioning	• Employment opportunities in disassembling and recycling of recyclable materials from the FGD and the ADF (Positive)

10.9 Heritage, Archaeology and Palaeontology

The objectives of the Heritage Impact Assessment (HIA) study was to assessment potential impacts the FGD retrofit and the proposed railway siding would have on potential heritage, archaeological and palaeontological resources that may occur within the proposed development site. Furthermore, to assess impacts on the identified resources resulting from the proposed development activities in four stages of the project: planning, construction, operational and decommissioning.

The study results and conclusions are also informed by the Phase II HIA study and heritage public participation process (PPP) undertaken within the Medupi PS footprint by Mbofho Consulting and Project Managers. This HIA attempted to reconstruct the environment prior to construction of Medupi and through heritage PPP with the affected community remapped the areas known to have contained graves that were accidental disturbed or desecrated with the construction of Medupi.

The following conclusions were drawn from the HIA:

- It is concluded that there are no heritage and archaeological resources identified within the area proposed for the railway yard and the Medupi PS FGD technology construction sites. The land in which the railway yard is proposed has been transformed from previous construction activities on site.
- There were also no heritage and archaeological resources around the existing and licensed ADF facility – during the survey of the ADF the site were already constructed.
- The assessment of historic maps of the area Medupi PS also did not yield any burial grounds or graves as well as stone walls and historic buildings. However, the assessment of a Phase II HIA report by Mbofho Consulting and Project Manager yielded burial grounds and graves as well as areas that are known to have contained graves.
- Based on the findings made by Mbofho Consulting and Project Managers one cannot rule out the subterranean burial grounds and graves since in some areas they identified areas with soil heaps that are reportedly to have been dumped on top of graves.
- It is concluded that, based on the exiting engineering drawings of the proposed FGD technology development footprint and its survey, thereof that there are no archaeological or heritage resources. Like with the railway yard and the existing and licensed ADF facility the land in which the proposed FGD technology is to be constructed is already transformed through previous construction activities.
- With regards to palaeontological resources (fossils), it is concluded that, there is an extremely small chance of finding any fossils of any kind in the proposed development area.

Impacts identified and assessed by the heritage, archaeology and palaeontology specialists are provided in **Table 10-10**.

Table 10-10: Impact identified for the railway yard and FGD footprint area by heritage, archaeology and palaeontology specialists

Development Phase	Impact / Impact Group
Planning / Pre-construction **Construction** **Operational** **Decommissioning**	• No impacts on heritage, archaeological or palaeontological resources identified.

10.10 Traffic

The purpose of the Traffic Impact Assessment (TIA) is to quantify the impact of normal traffic, as well as the transportation of abnormal loads, on the road network during both construction and operation of the FGD facility.

Level of Service (LOS) ratings have been used to evaluate the existing and future traffic situation. LOS tries to answer how good the present traffic situation is at a particular intersection. Thus it gives a qualitative measure of traffic in terms of delays experienced. It is represented by six levels ranging from level A to level F. Level A represents minimal delays where the driver has the freedom to drive with free flow speed and level F represents uncomfortable conditions accompanied by long delays.

With regards to the trucking of chemical salts and sludge, it is expected that trucks will operate for 12 hours a day, seven days a week and will be the same volume side tipper trucks that deliver coal. Based on waste production rates obtained from Eskom it is estimated that once all 6 generation units are operational, the number of track to transport chemical sludge and salts amount to 10 trucks and 3 trucks, respectively, totalling to 13 trucks daily.

The traffic specialist furthermore calculated the number of truck loads that would be required in the event that limestone had to be trucked to site on a daily basis. It was estimated that a total of 69 trucks would be required to deliver a total of 3456 tons of limestone to the MPS per day when all 6 generation units are operational.

The following conclusions and recommendations were made:

- The trucks delivering building material to the site should follow a similar route as recommended for the trucking of Limestone and salts and sludge.
- There should be a pointsman at the intersection of D1675 / Afguns Rd and Nelson Mandela Drive / D1675 during the peak hours to alleviate the traffic congestion.
- Undertake an assessment study with regards to the proposed weigh bridge design and determine whether it may cause queuing to back up onto the public road, which might have an impact on other road users.
- Ash and gypsum will be conveyed to the existing ADF and therefore this process will generate no additional traffic impacts.

- The sludge and salts will be trucked to an existing licensed hazardous waste facility.
- It is suggested that the trucks delivering limestone to Medupi Power Station could utilise the Afguns Road in order to have a minimal impact on other road users. By utilising the Afguns – Thabazimbi road, the trucks will avoid travelling through Lephalale town and avoid other busy nodes within the study area.
- 10 Year Post development traffic analyses have indicated that both intersections, Nelson Mandela Drive / D1675 and Afguns Rd / D1675 have poor levels of service for the northbound movement. The following road layout changes are proposed:
    - Nelson Mandela Dr / D1675: Provide signals, add a left turning slip lane along D1675 (northbound), introduce a right turning lane for the northbound right movement, provide an additional eastbound lane for the straight movement. It is recommended that the relevant road authority should fund the upgrade of this intersection, since the existing intersection is already operating at a Level of Service (LOS) F.
    - Afguns Rd / D1675 – It is recommended that the priority control intersection should be upgraded, this study is only looking at conceptual design and it is recommended that a detail design study should be undertaken at this intersection to determine the best upgrade option.

Traffic impacts assessed by the traffic specialist are provided in **Table 10-11**.

Table 10-11: Impact identified relating to traffic within the railway yard and FGD footprint

Development Phase	Impact / Impact Group
Planning / Pre-construction	• No traffic impacts during the planning / pre-construction phase.
Construction	• Impact of additional generated traffic due to the construction phase on existing road layouts and road users.
Operational	• Additional generated traffic due to the operational phase of the FGD plant. • Transport of limestone from limestone sources. • Transport of salts and sludge to a hazardous waste disposal facility.
Decommissioning	• Reduction in traffic volumes due to decommissioning.

11 ENVIRONMENTAL IMPACT ASSESSMENT

11.1 Impact Assessment Methodology

Impacts identified during this EIA were ranked according to the methodology described below. Mitigation or management measures were provided to avoid, minimise, reduce or manage potential impacts. In order to ensure uniformity, a standard impact assessment methodology was utilised by all specialists and EAP so that a wide range of impacts can be compared with each other. The impact assessment methodology makes provision for the assessment of impacts against the following criteria, as discussed below.

11.1.1 Nature of the impact

Each impact should be described in terms of the features and qualities of the impact. A detailed description of the impact will allow for contextualisation of the assessment.

11.1.2 Extent of the impact

Extent intends to assess the footprint of the impact. The larger the footprint, the higher the impact rating will be. **Table 11-1** below provides the descriptors and criteria for assessment.

Table 11-1: Criteria for the assessment of the extent of the impact.

Extent Descriptor	Definition	Rating
Site	Impact footprint remains within the boundary of the site.	1
Local	Impact footprint extends beyond the boundary of the site to the adjacent surrounding areas.	2
Regional	Impact footprint includes the greater surrounds and may include an entire municipal or provincial jurisdiction.	3
National	The scale of the impact is applicable to the Republic of South Africa.	4
Global	The impact has global implications	5

11.1.3 Duration of the impact

The duration of the impact is the period of time that the impact will manifest on the receiving environment. Importantly, the concept of reversibility is reflected in the duration rating. The longer the impact endures, the less likely it is to be reversible. See **Table 11-2** for the criteria for rating duration of impacts.

Table 11-2: Criteria for the rating of the duration of an impact

Duration Descriptor	Definition	Rating
Construction / Decommissioning phase only	The impact endures for only as long as the construction or the decommissioning period of the project activity. This implies that the impact is fully reversible.	1
Short term	The impact continues to manifest for a period of between 3 and 5 years beyond construction or decommissioning. The impact is still reversible.	2
Medium term	The impact continues between 6 and 15 years beyond the construction or decommissioning phase. The impact is still reversible with relevant and applicable mitigation and management actions.	3
Long term	The impact continues for a period in excess of 15 years beyond construction or decommissioning. The impact is only reversible with considerable effort in implementation of rigorous mitigation actions.	4
Permanent	The impact will continue indefinitely and is not reversible.	5

11.1.4 Potential intensity of the impact

The concept of the potential intensity of an impact is the acknowledgement at the outset of the project of the potential significance of the impact on the receiving environment. For example, SO_2 emissions have the potential to result in significant adverse human health effects, and this potential intensity must be accommodated within the significance rating. The importance of the potential intensity must be emphasised within the rating methodology to indicate that, for an adverse impact to human health, even a limited extent and duration will still yield a significant impact.

Table 11-3: Criteria for impact rating of potential intensity of a negative impact

Potential Intensity Descriptor	Definition of negative impact	Rating
High	Any impact to human health/mortality/loss of a species.	16
Moderate-High	Significant impact to faunal or floral populations/loss of livelihoods/individual economic loss	8
Moderate	Reduction in environmental quality/loss of habitat/loss of heritage/loss of welfare amenity	4
Moderate-Low	Nuisance impact	2
Low	Negative change with no associated consequences.	1

Within potential intensity, the concept of irreplaceable loss is taken into account. Irreplaceable loss may relate to losses of entire faunal or floral species at an extent greater than regional, or the permanent loss of significant environmental resources. Potential intensity provides a measure for comparing significance across different specialist assessments. This is possible by aligning specialist ratings with the potential intensity rating provided. This allows for better

integration of specialist studies into the environmental impact assessment. See **Table 11-3** and **Table 11-4** below.

Table 11-4: Criteria for the impact rating of potential intensity of a positive impact.

Potential Intensity Descriptor	Definition of positive impact	Rating
Moderate-High	Met improvement in human welfare	8
Moderate	Improved environmental quality/improved individual livelihoods.	4
Moderate-Low	Economic development	2
Low	Positive change with no other consequences.	1

It must be noted that there is no HIGH rating for positive impacts under potential intensity, as it must be understood that no positive spinoff of an activity can possibly raise a similar significance rating to a negative impact that affects human health or causes the irreplaceable loss of a species.

11.1.5 Likelihood of the impact

This is the likelihood of the impact potential intensity manifesting. This is not the likelihood of the activity occurring. If an impact is unlikely to manifest then the likelihood rating will reduce the overall significance. **Table 11-5** provides the rating methodology for likelihood.

The rating for likelihood is provided in fractions in order to provide an indication of percentage probability, although it is noted that mathematical connotation cannot be implied to numbers utilised for ratings.

Table 11-5: Criteria for the rating of the likelihood of the impact occurring

Likelihood Descriptor	Definition	Rating
Improbable	The possibility of the impact occurring is negligible and only under exceptional circumstances.	0.1
Unlikely	The possibility of the impact occurring is low with a less than 10% chance of occurring. The impact has not occurred before.	0.2
Probable	The impact has a 10% to 40% chance of occurring. Only likely to happen once in every 3 years or more.	0.5
Highly Probable	It is most likely that the impact will occur and there is a 41% to 75% chance of occurrence.	0.75
Definite	More than a 75% chance of occurrence. The impact will occur regularly.	1

11.1.6 Cumulative Impacts

Cumulative impacts are reflected in the potential intensity of the rating system. In order to assess any impact on the environment, cumulative impacts must be considered in order to

determine an accurate significance. Impacts cannot be assessed in isolation. An integrated approach requires that cumulative impacts be included in the assessment of individual impacts.

The nature of the impact should be described in such a way as to detail the potential cumulative impact of the activity.

11.1.7 Significance Assessment

The significance assessment assigns numbers to rate impacts in order to provide a more quantitative description of impacts for purposes of decision making. Significance is an expression of the risk of damage to the environment or benefit resulting from a positive impact, should the proposed activity be authorised.

To allow for impacts to be described in a quantitative manner in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus, the total value of the impact is described as the function of significance, spatial and temporal scale as described below:

Impact Significance = (extent + duration + potential intensity) x likelihood

Table 11-6 provides the resulting significance rating of the impact as defined by the equation as above.

Table 11-6: Significance rating formulas

Score	Rating	Implications for Decision-making
< 3	Low	Project can be authorised with low risk of environmental degradation
3 - 9	Moderate	Project can be authorised but with conditions and routine inspections. Mitigation measures must be implemented.
10 - 20	High	Project can be authorised but with strict conditions and high levels of compliance and enforcement. Monitoring and mitigation are essential.
21 - 26	Fatally Flawed	Project cannot be authorised

An example of how this rating scale is applied is shown below:

11.1.8 Table 11-7: Example of Rating Scale

Nature	Extent	Duration	Potential Intensity	Likelihood	Rating
Emission of SO_2 to the environment in concentrations above the minimum emissions standards. The area is a priority hotspot in terms of air emissions	*Global*	Long term	HIGH	**Probable**	High
	5	4	16	0.5	12.5

and there are several industrial operations that contribute to extensive emissions of SO_2.					

11.1.9 Notation of Impacts

In order to make the report easier to read the following notation format is used to highlight the various components of the assessment:

- Extent- in *italics*
- Duration – in <u>underline</u>
- Potential intensity – IN CAPITALS
- Likelihood - in **bold**

11.2 Geology and Geotechnical suitability

The geology and geotechnical conditions at the proposed railway yard area and FGD infrastructure within the MPS footprint were considered by the geotechnical specialist based on existing geological and geotechnical information obtained from existing studies covering the study area.

Based in this available information the geotechnical specialist undertook a **qualitative assessment** based on professional opinion of the impact of the underlying geology on the proposed infrastructure developments.

11.2.1 FGD system within the MPS footprint

Based on existing information, most notably Golder report reference 12087-8856-1 entitled: *Medupi Power Station: Shallow Groundwater Study*, dated June 2009, the following ground conditions are apparent within the MPS footprint:

- The site is underlain by a sequence of pebbles, weathered quartzitic conglomerate with fresh variously fractured quartzitic conglomerate at depth.
- The conglomerate is interbedded with bluish grey siltstone bands. The drilling has shown that the siltstone forms discontinuous layers of up to 50cm thick but mostly about 20cm thick.
- Generally surface weathering to shallow depth (<5m) occurs, while in some boreholes a second fractured and associated weathered zone is observed and is normally found between 7 - 14m.
- Some boreholes showed no surface weathering, while boreholes in the extreme north or west, show the presence of deep weathering, up to 21m.
- Water strikes were made in 14 of the 35 boreholes at depths between 6 and 10.5m below surface

The specialist concluded that:

- Standard foundation systems are expected to be applicable, comprising generally shallow foundations.
- Excavatability is expected to be soft to intermediate, with hard rock class (drill and blast) for excavation in moderately weathered or harder rock (location dependent, but generally below about 5m depth).

11.2.2 Railway yard, including limestone and gypsum handling facilities and associated infrastructure

A qualitative assessment (professional opinion) of the geotechnical conditions within the railway yard site was undertaken based on the existing Rockland Geocscience report (Ref: RG014/169/Rev0) dated March 2015 entitled: *Report on the Geotechnical Investigation Conducted for a Proposed Rail Siding, Railway yard and Off-loading Facility at Medupi Power Station, Lephalale, Limpopo Province*.

The following conclusions were reached:

- Excavation of test pits and geophysical surveys across the site encountered medium dense silty sand to between 1.1m and 1.8m, underlain by dense gravel to between 1.5m and 2.4m, underlain by very soft rock quartzite, with TLB refusal at 1.8m on medium hard rock quartzite at one test pit location, and finally refusal on hardpan ferricrete at 2.4m.
- Data and information on two boreholes closest to the railway yard revealed that one borehole was dry while the other supported water levels at 2.6 m below surface. The dry borehole indicates slightly and moderately weathered conglomeratic quartzite in zones below 3.5m depth, becoming fresh from 14.5m depth, whilst the borehole containing water indicated the boundary between slightly to moderately weathered quartzite and fresh quartzite at 16.5m.

The Limestone Offloading Facility at the railway yard is proposed to be 15m in depth. Based on the above, the following is interpreted:

- Hard rock (drill and blast) excavation will be required from a depth of about 2m.
- Dependent on the thickness of the surficial soils and any fill materials over the area, a contingency allowance should be made for encountering rock during the installation of such services or shallow foundations, where hard rock excavation (hydraulic rock hammer or drill and blast) may be necessary.
- Standard footing systems such as shallow pad and strip footings are expected to be applicable for the area.
- Deep excavations are expected to require reinforcement and/or stabilisation, particularly at shallow depths. Dependent on the quality of the rock and degree of fracturing, the lower half of the 15m deep excavation may potentially be unreinforced and unstabilised.
- Groundwater can be expected from a shallow depth in the excavation. The volume of water seepage is expected to be relatively low, and reducing as the excavation proceeds into less fractured rock.

It was concluded, based on available studies and specialist opinion, that no significant geotechnical hazards or fatal flaws were identified. All the geotechnical considerations mentioned can be mitigated in the design of the facilities.

11.3 Soils and Land Capability

When considering the potential impacts of the proposed railway yard and FGD infrastructure on the soils and land capability, firstly, it is important to note that the pre-development conditions or status quo for the area of concern is one of disturbed industrial. For the most part the site comprises land that has been cleared or disturbed to some degree by the existing power station development.

11.3.1 **Planning / Pre-development phase: Soils and Land Capability**

No potential impacts on soils or land use were identified during the planning and pre-development phase. The MPS was constructed to be wet FGD ready, therefore alignment of the FGD system, railway yard and associated infrastructure were pre-determined during the planning phases for the power station itself. Although design of the infrastructure is still required to align with existing infrastructure at the MPS, no pre-construction intrusive work was required to inform the designs.

11.3.2 **Construction phase: Soils and Land Capability**

Impact 1: Loss of utilisable resource (sterilization and erosion), compaction and contamination or salinisation

During construction it is expected that soils within the development area will be stripped, followed by preparation of laydown areas, stockpile areas and preparation of the surface for construction of infrastructure.

Existing impact: Most of the proposed development site within the proposed FGD footprint has been stripped of topsoil and transformed for construction purposes, therefore potential loss of topsoil has potentially occurred already. In contrast, a large portion of the railway yard site still has intact vegetation, which will be removed and topsoil stripped during the construction phase.

Cumulative impact: Construction activities especially at the railway yard footprint will contribute to the potential loss of topsoil if not managed and mitigated to acceptable levels. The proposed retrofit project will, if improperly managed and without mitigation, have a **definite,** MODERATE to HIGH negative significance, that will affect the *development site and its immediate* surroundings for the medium to long term (life of the project and possibly beyond), and is *going to occur.*

Residual impact: The proposed mitigation measures will **probably** reduce the negative significance rating and resultant risk impact to a MODERATE or LOW. Based on the historical activities (disturbed nature of the site) these actions are *very likely to occur*.

11.3.3 Operational phase: Soils and Land Capability

Impact 1: Loss of utilisable resource (sterilization and erosion), compaction and contamination or salinisation

The loss of utilisable soil resources during the operational phase revolve around potential for spillage and contamination of the in-situ and stockpiled materials, contamination due to dirty water run-off and/or contaminated dust deposition/dispersion, the de-nutrification of the stockpiled soils due to excessive through flow and the leaching out of nutrients and metals due to rain water on unconsolidated and poorly protected soils.

Existing impact: A positive impact will be the rehabilitation with stockpiled soils of areas where temporary infrastructure was constructed or areas were cleared during the start-up and construction phase.

Cumulative impact: This impact relates to the cumulative impact on stockpiled topsoil or insitu soil due to spillages of hazardous substances, compaction due to uncontrolled vehicle and pedestrian traffic, and loss of topsoil due to improperly managed erosion and handling.

In the un-managed scenario these activities will **probably** result in a MODERATE to HIGH negative significance that will affect the *development footprint and adjacent sites* for the medium to long term. These effects are *very likely to occur*.

Residual Impact: In the *long term* (Life of the operation and beyond) and if implemented correctly, the above mitigation measures will **probably** reduce the negative impact on the utilisable soil reserves to a significance rating of MODERATE LOW in the medium term, and is *very likely to occur*.

However, if the soils are not retained/stored and managed, and a workable management plan is not implemented the residual impact will definitely incur additional costs and result in the impacting of secondary areas (Borrow Pits etc.) in order to obtain cover materials etc.

11.3.4 Decommissioning and closure phase: Soils and Land Capability

Impact 1: Net loss of soil volumes and utilisation potential due to change in material status (Physical and Chemical) and loss of nutrient base.

Existing impact: The impacts on the soil resource during the decommissioning and closure phase may potentially have both a positive (i.e. reduction in areas of disturbance through rehabilitation and return of soil utilization potential), and a negative effect, through loss of soils, erosion, compaction and contamination of the natural resource.

Cumulative impact: The impact will **probably** remain the net loss of the soil resource if no intervention or mitigating strategy is implemented. The intensity potential will remain MODERATE and negative for the medium to short term for all of the activities if there is no active management (rehabilitation and intervention) in the decommissioning phase, and

closure will not be possible. The impacts will be confined to the *development area and its adjacent buffer*, and is *likely* to happen.

However, with interventions and well planned management, there will be a MODERATE to HIGH positive intensity potential as the soils are replaced and fertilisation of the soils is implemented after removal of the infrastructure.

Ongoing rehabilitation during the operational and decommissioning phases will bring about a net long-term positive impact on the soils, albeit that the land capability will likely be reduced to grazing status.

Residual impact: On closure of the operation the *long-term* negative impact on the soils will be reduced from a significance ranking of MODERATE to LOW if the management plan set out in the EMPr is effectively implemented. These impacts will be confined to the development site and its adjacent environments, and is *very likely* to occur.

11.3.5 Impact assessment of the FGD system on Soils and Land Capability

The specialist considered the loss of soil resources during the construction and operational phase and has concluded that with the implementation of proposed soil conservation plans and other proposed mitigation measures the residual impact on soils would be Moderate to Low. The fact that the proposed development site is located within an already disturbed area has also contributed to the significance rating although existing and proposed mitigation measures need to continue to manage stockpiled soils for effective rehabilitation during the decommissioning phase.

Table 11-8: Impact assessment of FGD system on soil and land capacity

Description of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
Construction Phase						
Loss of utilisable resource (sterilization and erosion), compaction and contamination or salinisation	Existing	2	4	4	**0.5**	5 - MOD
	Cumulative (current and FGD)	2	4	4	**0.5**	5 - MOD
	Post Mitigation	1	1	2	**0.5**	2 - LOW
Operational Phase						
Loss of utilisable resource (sterilization and erosion), compaction and contamination or salinisation	Existing	2	4	8	**0.75**	10 – MOD-HIGH
	Cumulative (current and FGD)	2	4	4	**0.75**	7 - MOD
	Post Mitigation	1	3	2	**0.5**	3 - MOD
Decommissioning Phase						
Net loss of soil volumes and utilisation potential due to change in material status (Physical and	Existing	1	3	2	**0.5**	3 - MOD
	Cumulative (current and FGD)	1	3	2	**0.2**	1 - LOW
	Post Mitigation	1	1	1	**0.2**	0 - LOW

Description of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
Chemical) and loss of nutrient base.						

11.3.6 Mitigation and management measures for impacts on the soil and land capacity

Based on the assessment conducted, it can be concluded that based on the management of impacts, the loss, degree of contamination, compaction and erosion of this resource can be mitigated and reduced to a level that is more acceptable.

The reduction in the risk rating (during the construction phase) of the impact can be achieved implementing the following mitigation measures:

- Limiting the area of impact to as small a footprint as possible, inclusive of the resource (soils) stockpiles and the length of servitudes, access and haulage ways and conveyencing systems;
- Construction of the facility and associated infrastructure over the less sensitive soil groups (reduce impact over wetlands and soils sensitive to erosion and/or compaction);
- The development and inclusion of soil management as part of the general housekeeping operations, and the independent auditing of this management;
- Concurrent rehabilitation of all affected sites that are not required for the operation;
- The rehabilitation of temporary structures and footprint areas used during the pre-construction/feasibility investigation (geotechnical pits, trenching etc.);
- Effective soil stripping during the less windy months when the soils are less susceptible to erosion;
- Effective cladding of any berms and all soil stockpiles with vegetation or large rock fragments, and the minimising of the height of storage facilities to 15m and soil berms to 1,5m wherever possible; and
- Restriction of vehicle movement over unprotected or sensitive areas, this will reduce compaction.

The impacts on the soils during the operational phase can be mitigated with the following management procedures:

- Minimisation of the area that can potentially be impacted (eroded, compacted, sterilised or de-nutrified);
- Timeous replacement of the soils so as to minimise/reduce the area of affect and disturbance;
- Effective soil cover and adequate protection from wind (dust) and dirty water contamination – vegetate and/or rock cladding;
- Regular servicing of all vehicles in well-constructed and bunded areas;

- Regular cleaning and maintenance of all haulage ways, conveyencing routes and service ways, drains and storm water control facilities;
- Containment and management of spillage;
- Soil replacement and the preparation of a seed bed to facilitate and accelerate the re-vegetation program and to limit potential erosion on all areas that become available for rehabilitation (temporary servitudes), and
- Soil amelioration (rehabilitated and stockpiled) to enhance the growth capability of the soils and sustain the soils ability to retain oxygen and nutrients, thus sustaining vegetative material during the storage stage.

11.4 Groundwater

The groundwater specialist undertook a **qualitative assessment** (professional opinion) of the potential impact that identified aspects or activities may have on groundwater resources underlying the railway yard and FGD infrastructure study area within the MPS. The qualitative assessment took into consideration the existing groundwater studies that were undertaken during the initial EIA application for the MPS itself, as well as subsequent groundwater studies and monitoring reports that was undertaken within the proposed study area. Qualitative assessments were undertaken for the following aspects / activities:

- Trucking of Type 1 Waste to a Hazardous Disposal Facility;
- Construction and operation of the FGD system within the Medupi Power Station Footprint, including all associated infrastructure and processes necessary to support its operation; and
- Construction and operation of the railway yard, limestone and gypsum handling facilities, including diesel storage facilities and associated infrastructure between the Medupi Power Station and existing ADF.

11.4.1 Professional opinion on trucking of Type 1 Waste to a Hazardous Disposal Facility

For a 5-year period of the operational phase, sludge and salts will be trucked to a licensed hazardous waste disposal site. During transportation of hazardous waste, the trucking contractor should adhere to all regulations and standards of both environment and safety. Safe Working Procedures (SWP) for transportation of hazardous waste must be in place, to minimize the risk of contamination to the environment and groundwater should a spillage occur.

A hazardous spillage could contaminate the groundwater, and samples of any nearby boreholes should be analysed and monitored after a spillage incident. Storage of hazardous waste on site will arise to additional disposal facilities and increasing risks to contamination the groundwater regime.

Possible impacts on the groundwater regime associated with trucking process of type 1 waste, to a licensed hazardous waste disposal site are based on a simplified groundwater risk assessment and are presented in **Table 11-9**. The risk rating is based on a possible risk/impact that activities from the trucking process of type 1 waste poses to the groundwater regime. Assessment is based on positive and negative outcome of impact/risk to the groundwater regime.

Table 11-9: Simplified Groundwater Risk Assessment to support specialist opinion

Activity	Positive Impacts	Negative Impacts
Removal of hazardous waste from existing licensed waste disposal facility	Removal of contamination source	None
Transportation of hazardous waste to a licensed hazardous waste disposal site	Removal and transportation of hazardous waste	None
Spillage during transportation of hazardous waste	None	Contamination of groundwater and impacting on existing users in vicinity of spillage
Disposal of hazardous waste	Disposal of hazardous waste	None

It is thus concluded, based on the simplified groundwater risk assessment that trucking of type 1 waste to a licensed hazardous waste disposal site is effectively a positive impact on site since the hazardous waste is removed from site in a responsible manner and disposed of at a licenced waste facility licenced for this purpose.

11.4.2 Impact assessment of the FGD system on groundwater resources

The groundwater specialist provided an **impact assessment** (**Table 11-10**) of whether groundwater resources could potentially be impacted with the construction and operation of the FGD system and all associated infrastructure within the MPS footprint. From the aerial view it is evident that the entire Medupi FGD footprint area is disturbed during the construction activities at the power station.

Table 11-10: Impact assessment of FGD system on groundwater resources

Description of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
Planning / Pre-construction Phase						
Groundwater quality	Existing	*1*	2	4	**0.2**	1 - LOW
	Cumulative (current and FGD)	*1*	2	4	**0.5**	4 - MOD
	Post Mitigation	*1*	1	2	**0.1**	0 - LOW
Groundwater Volume/recharge	Existing	*1*	2	2	**0.2**	1 - LOW
	Cumulative (current and FGD)	*1*	2	4	**0.2**	1 - LOW
	Residual/Post Mitigation	*1*	1	2	**0.1**	0 - LOW
Groundwater Flow	Existing	*1*	2	2	**0.2**	1 - LOW
	Cumulative	*2*	2	2	**0.2**	1 - LOW
	Post Mitigation	*1*	1	2	**0.1**	0 - LOW
Construction Phase						
Groundwater quality	Existing	*1*	2	4	**0.5**	4 - MOD
	Cumulative (current and FGD)	*1*	2	4	**0.5**	4 - MOD
	Post Mitigation	*1*	1	2	**0.1**	0 - LOW
Groundwater Volume/recharge	Existing	*1*	2	2	**0.5**	3 - MOD
	Cumulative (current and FGD)	*2*	2	4	**0.5**	4 - MOD

Description of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
	Post Mitigation	1	1	2	**0.1**	0 - LOW
Groundwater Flow	Existing	1	2	2	**0.75**	4 - MOD
	Cumulative	2	2	2	**0.2**	1 - LOW
	Post Mitigation	1	1	2	**0.1**	0 - LOW
Operational Phase						
Groundwater quality	Existing	2	3	4	**0.75**	7 - MOD
	Cumulative (current and FGD)	2	3	4	**0.75**	7 - MOD
	Post Mitigation	1	3	2	**0.2**	1 - LOW
Groundwater Volume/recharge	Existing	2	3	2	**0.2**	1 - LOW
	Cumulative (current and FGD)	1	2	4	**0.5**	4 - MOD
	Post Mitigation	2	2	2	**0.1**	1 - LOW
Groundwater Flow	Existing	2	3	2	**0.2**	1 - LOW
	Cumulative (current and FGD)	1	2	4	**0.2**	1 - LOW
	Post Mitigation	2	2	2	**0.1**	1 - LOW
Decommissioning Phase						
Groundwater quality	Existing	1	2	2	**0.2**	1 - LOW
	Cumulative (current and FGD)	1	3	2	**0.2**	1 - LOW
	Post Mitigation	1	2	1	**0.1**	0 - LOW
Groundwater Volume	Existing	1	2	2	**0.2**	1 - LOW
	Cumulative (current and FGD)	1	2	2	**0.2**	1 - LOW
	Post Mitigation	1	2	1	**0.1**	0 - LOW
Groundwater Flow/recharge	Existing	1	2	2	**0.2**	1 - LOW
	Cumulative (current and FGD)	1	2	2	**0.2**	1 - LOW
	Post Mitigation	1	2	1	**0.1**	0 - LOW

The predicted impact of the FGD system on the groundwater quality, volume and flow is of **Low significance** during all phases if proposed mitigation measures are implemented successfully.

The specialist thus concluded that construction and operation of the FGD system would have a **minor** change in the volume of water entering groundwater storage (reduced recharge in comparison to status quo conditions) and with **negligible** changes expected in the groundwater flow regime.

11.4.3 Impact assessment of the railway yard and associated infrastructure on groundwater resources

The groundwater specialist provided an **impact assessment** (**Table 11-11**) of whether groundwater resources could potentially be impacted with the construction and operation of the railway yard, limestone and gypsum handling facilities and all associated infrastructure.

Table 11-11: Impact assessment of railway yard and associated infrastructure on groundwater resources

Description of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
Planning / Pre-development phase						
Groundwater quality	Existing	1	2	2	**0.2**	1 - LOW
	Cumulative	1	2	4	**0.2**	1 - LOW
	Post Mitigation	1	1	2	**0.1**	0 - LOW
	Existing	1	2	2	**0.2**	1 - LOW

Description of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
Groundwater Volume/recharge	Cumulative	1	2	4	**0.2**	1 - LOW
	Residual/Post Mitigation	1	1	2	**0.1**	0 - LOW
Groundwater Flow	Existing	1	2	2	**0.2**	1 - LOW
	Cumulative	1	2	4	**0.2**	1 - LOW
	Post Mitigation	1	1	2	**0.1**	0 - LOW
Construction phase						
Groundwater quality	Existing	1	2	2	**0.5**	3 - MOD
	Cumulative	1	2	4	**0.5**	4 - MOD
	Post Mitigation	1	1	2	**0.1**	0 - LOW
Groundwater Volume/recharge	Existing	1	2	2	**0.5**	3 - MOD
	Cumulative	1	2	2	**0.5**	3 - MOD
	Post Mitigation	1	1	2	**0.1**	0 - LOW
Groundwater Flow	Existing	1	2	2	**0.75**	4 - MOD
	Cumulative	1	2	2	**0.2**	1 - LOW
	Post Mitigation	1	1	2	**0.1**	0 - LOW
Operational phase						
Groundwater quality	Existing	2	3	4	**0.75**	7 - MOD
	Cumulative	2	2	8	**0.5**	6 - MOD
	Post Mitigation	1	3	2	**0.2**	1 - LOW
Groundwater Volume/recharge	Existing	2	3	2	**0.2**	1 - LOW
	Cumulative	1	1	4	**0.2**	1 - LOW
	Post Mitigation	2	2	2	**0.1**	1 - LOW
Groundwater Flow	Existing	2	3	2	**0.2**	1 - LOW
	Cumulative	1	1	4	**0.2**	1 - LOW
	Post Mitigation	2	2	2	**0.1**	1 - LOW
Decommissioning phase						
Groundwater quality	Existing	1	2	2	**0.2**	1 - LOW
	Cumulative	1	3	2	**0.2**	1 - LOW
	Post Mitigation	1	2	1	**0.1**	0 - LOW
Groundwater Volume	Existing	1	2	2	**0.2**	1 - LOW
	Cumulative	1	2	2	**0.2**	1 - LOW
	Post Mitigation	1	2	1	**0.1**	0 - LOW
Groundwater Flow/recharge	Existing	1	2	2	**0.2**	1 - LOW
	Cumulative	1	2	2	**0.2**	1 - LOW
	Post Mitigation	1	2	1	**0.1**	0 - LOW

Based on the impact rating in **Table 11-11**, the specialist concluded that the predicted impact of construction and operation of the railway yard and associated infrastructure **on groundwater quality, volume and flow is of Low significance** during all phases after the proposed mitigation measures has been successfully implemented.

11.4.4 Proposed mitigation measures for impacts on groundwater

Management and mitigation measures proposed by the specialist include:

- Safe working procedures (SWP) for construction work should be in place to specifically minimize the risk of contamination to the environment and groundwater should a spillage occur.
- Any spillages that occur should be logged in a quantitative manner.

- Any accidental spillage should be cleaned up immediately to limit contamination and if intensity is high, the impact must be reversed with the applicable mitigation and management actions.
- Monthly groundwater monitoring is recommended to form part of the mitigation and management of the existing licensed disposal facility. This monitoring must be included in the monitoring network and will function as an early warning system for contaminant migration (if any).
- Frequent inspection during construction and maintenance of constructed infrastructure must be undertaken.

11.5 Surface water

11.5.1 Impact assessment of the FGD system, railway yard and associated infrastructure on surface water resources

The surface water specialist / hydrologist completed an impact assessment for the identified impacts on surface water resources. Impact ratings for these impacts are provided in **Table 11-12**.

During consideration of the potential impacts it was important to note that the MPS already has an allocated footprint into which the proposed activities will be constructed. There is, therefore, already an impact on the environment. Furthermore, due to the existing impact a Storm Water Management System (SWMS) has been implemented on the development site. The surface water specialist concluded that the SWMS appears to be well operated and maintained, therefore, the existing impact is rated as low.

Table 11-12: Impact assessment of the FGD system, railway yard and associated infrastructure on surface water resources

Description of Impact	Impact Type	Extent	Duration	Potential Intensity	Likelihood	Rating
Planning / Pre-construction						
Pollution of natural surface water features (Water quality).	Existing	2	2	4	0.2	1.6 – LOW
	Cumulative	2	2	4	0.2	1 .6 – LOW
	Residual	2	2	4	0.2	1.6 – LOW
Reduction of the surface water runoff footprint.	Existing	1	1	1	0.1	0.3 – LOW
	Cumulative	1	1	1	0.1	0.3 – LOW
	Residual	1	1	1	0.1	0.3 – LOW
Flooding of nearby watercourses.	Existing	1	1	1	0.1	0.3 – LOW
	Cumulative	1	1	1	0.1	0.3 – LOW
	Residual	1	1	1	0.1	0.3 – LOW
Construction Phase						
Pollution of natural surface water features (Water quality).	Existing	2	3	4	0.5	4.5 – MOD
	Cumulative	2	3	4	0.5	4.5 – MOD
	Residual	2	2	4	0.2	1.2 – LOW
Reduction of the surface water runoff footprint.	Existing	1	1	1	0.1	0.3 – LOW
	Cumulative	1	1	1	0.1	0.3 – LOW
	Residual	1	1	1	0.1	0.3 – LOW
Flooding of nearby watercourses.	Existing	1	1	1	0.1	0.3 – LOW
	Cumulative	1	1	1	0.1	0.3 – LOW

Description of Impact	Impact Type	Extent	Duration	Potential Intensity	Likelihood	Rating
	Residual	1	1	1	0.1	0.3 – LOW
Operational Phase						
Pollution of natural surface water features (Water quality).	Existing	2	2	4	0.2	1.6 – LOW
	Cumulative	2	2	4	0.2	1.6 – LOW
	Residual	2	2	4	0.2	1.6 – LOW
Reduction of the surface water runoff footprint.	Existing	1	1	1	0.1	0.3 – LOW
	Cumulative	1	1	1	0.1	0.3 – LOW
	Residual	1	1	1	0.1	0.3 – LOW
Flooding of nearby watercourses.	Existing	1	1	1	0.1	0.3 – LOW
	Cumulative	1	1	1	0.1	0.3 – LOW
	Residual	1	1	1	0.1	0.3 – LOW
Decommissioning Phase						
Pollution of natural surface water features (Water quality).	Existing	2	3	4	0.5	4.5 – MOD
	Cumulative	2	3	4	0.5	4.5 – MOD
	Residual	2	2	4	0.2	1.6 – LOW
Reduction of the surface water runoff footprint.	Existing	1	1	1	0.1	0.3 – LOW
	Cumulative	1	1	1	0.1	0.3 – LOW
	Residual	1	1	1	0.1	0.3 – LOW
Flooding of nearby watercourses.	Existing	1	1	1	0.1	0.3 – LOW
	Cumulative	1	1	1	0.1	0.3 – LOW
	Residual	1	1	1	0.1	0.3 – LOW

Cumulatively, there is no expectation for further impact to the environment because of where the activities are proposed to be located. With mitigation the residual surface water pollution impact will be low due to the probability of dirty water spilling over into the environment from Medupi Power Station. Proper maintenance of the SWMP will reduce the rating to low. Ongoing surface water monitoring is important to ensure that this trend continues, especially during high rainfall events.

With the construction and decommissioning phases an increased pollutant load may be expected due to construction and decommissioning activities. This is clearly indicated in the impact assessment in **Table 11-12** with moderate impact ratings being assigned, however with the existing SWMP in place coupled with regular maintenance the residual impact for all phases will be low.

It is furthermore unlikely that a significant reduction in surface water runoff will occur due to the construction of the railway yard and FGD infrastructure within the MPS. The main reason for this is exactly the fact that the proposed infrastructure will be constructed within the MPS footprint. The existing SWMS will continue to ensure clean and dirty water separation as to avoid dirty water from entering the downstream water resources. Therefore the likely impact on surface water runoff will be low as demonstrated in **Table 11-12**. Furthermore, run-off may increase as areas are rehabilitated during the decommissioning phase which would largely result in a limited but positive impact.

In respect of potential flooding, the surface water specialist concluded that the existing SWMS appears to be adequately designed to cater for the existing facilities

The specialist further concluded that the runoff around the facility in the clean areas is not markedly changed for the sub-catchment of the Sandloop, resulting in a potential impact significance of low.

11.5.2 Specialist Opinion on sludge and salts trucking impact

The surface water specialist provided a **qualitative assessment** (specialist opinion) on the significance of the surface water impacts for the proposed trucking of sludge and salts from MPS proposed temporary hazardous waste storage area in Limpopo Province to an appropriately licensed existing hazardous waste facility outside of the Medupi Power Station study area. The specialist made the following observations and conclusions:

- The trucking of salts and sludge from Medupi to the licensed hazardous waste site will pose a **medium potential risk impact** to the water resources in the study area.
- The medium, rather than high, risk impact assessment rating is in light of the fact that MPS has taken significant steps in investigating this matter beforehand. Various specialist studies have been commissioned to investigate this matter and its associated risks thoroughly and give specialist opinions as well as mitigation measures where possible.
- The specialist concluded in his opinion that the transportation of salts and sludge from Medupi Power Station to an appropriately licensed existing hazardous waste facility outside of the study area will **not pose a serious threat to water resources in the region**.

11.5.3 Mitigation and management measures for potential surface water impacts

Considering all potential impacts identified on the surface water resources the specialist proposed the following mitigation and management measures:

- As this will be within the existing footprint, it is unlikely that there will be considerable impacts from the removal of vegetation and/or topsoil during excavation. However, this aspect should be considered and managed to reduce erosion which could cause siltation of the surrounding surface water resources.
- Removal of topsoil should be done systematically, only clearing the necessary areas at a time.
- Clean and dirty surface water channels must be constructed to divert runoff separately to the appropriate storage dams (dirty water to the PCD to avoid eroded soils entering the clean water areas) as required by the relevant legislation and norms and standards.
- The existing SWMS will need to be optimally operated and maintained.
- Ongoing monitoring of the surface water must continue or be commissioned for pH, Total Dissolved Solids, Electrical Conductivity, Alkalinity, potassium, calcium, sodium, chloride, fluoride, sulphate, nitrate, ammonium, Total Hardness, Metals: arsenic, beryllium, cadmium, barium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, uranium, vanadium and zinc using ICP-MS), orthophosphate, Total Suspended Solids, Oil and Grease.

- Monitoring of surface water must be undertaken in accordance with the stipulations of the Water Use Licence, once issued.
- To prevent possible pollution of the receiving surface water environment, dirty water containment structures should be designed, constructed, maintained and operated such that they do not spill over more than once in 50 years. A minimum freeboard of 0.8 m above Full Supply Level (FSL) must also be maintained as per GN704 requirements (flow-based hydraulic sizing requirements).
- Water accumulated in the containment facility during the wet season should be used as a priority in the process water circuit to ensure that the capacity requirements are not compromised during periods of heavy and/or extended rainfall.
- It is recommended that an update to both the storm water management plan (SWMP) and the existing water balance be undertaken such that it caters for the proposed FGD and ADF infrastructure as well as be designed and operated in line with the DWS's GN704.
- The proposed water quality monitoring programme, as per the stipulations of the Water Use Licence, once issued, must be strictly followed and sustained so that chemical constituent levels can be monitored and analysed over time.
- Pollution of surrounding surface water features should be avoided at all costs during the lifespan of the Medupi Power Station project. In the unfortunate occurrence of surface water resources pollution, swift and effective corrective measures should be implemented, and the relevant authorities notified without delay.
- With respect to the transportation of sludge and salts from Medupi to a hazardous waste disposal site, it is recommended that a route selection study be carried out to determine the least potential water surface impacts, considering other factors such as the traffic impact assessment. From a surface water perspective, a route via a national road (highway) would be most appropriate as the likelihood of accidents and spillages due to poor road conditions will be minimised.
- The service provider must undertake all required permitting and compliance processes, as required.

11.6 Biodiversity (Terrestrial Ecology) and Wetlands

11.6.1 Impact assessment of the FGD system, railway yard and associated infrastructure on terrestrial ecology and wetlands

The terrestrial ecologist and wetland specialist undertook an impact assessment for the identified impacts on ecology and wetland resources in and around the study site. Impact ratings for identified impacts are provided in **Table 11-13**.

It should be noted that the scope of the biodiversity specialist assessment included assessment of impact on terrestrial ecology and wetlands resulting from the construction and operation of the FGD system, railway yard, all associated infrastructure, fuel storage areas and ADF, and surrounding sensitive areas. This EIA however only considered the construction and operation of the FGD system, railway yard and associated infrastructure,

excluding the already authorised ADF area and processes for an additional ADF which are assessed and considered in a separate application for amendment of the existing WML. As a result, impacts on the receiving environment as a result of the construction of the ADF were not considered here.

During assessment of the biodiversity and potential wetlands within the proposed FGD footprint, railway yard and associated infrastructure supporting these systems, it was concluded that no direct impact occurred on wetlands within this footprint area. The closest wetland to the proposed infrastructure is situated outside the MPS just south of the proposed FGD infrastructure site. Impact on this wetland (referred to as SEW 2 in the specialist report) would be expected to be minor since the FGD infrastructure is situated within the footprint of the existing MPS, which means that engineering and mitigation management measures to manage dirty water runoff, erosion, for example, is pre-existing at the proposed site, thereby reducing impacts on the receiving environment outside the MPS footprint.

A number of impacts relating to the potential loss of vegetation species, habitat and fauna mortality during the construction phase were identified and assessed by the biodiversity specialist. During the assessment it was concluded that after successful implementation of the proposed mitigation measures the cumulative impact significance could be reduced with the residual impact being reduced to MODERATE or LOW significance. The fact that the proposed development footprint for the FGD and railway yard was presently disturbed and transformed contributed to the impact significance rating.

Another prominent impact feature that was identified during the construction phase is the loss of catchment area contributing to storm water runoff due to the need to separate and contain contaminated “dirty” water. Associated with this is an expected increase in flood peaks and pollution through contaminated runoff. Mitigation measures for the loss of catchment area and decreased water input to wetland areas is limited resulting in an impact significance rating of HIGH. Impacts related to pollution run-off and increased flood peaks can be mitigated to MODERATE to LOW impact significance levels.

Table 11-13: Impact assessment of the FGD system, railway yard and associated infrastructure on biodiversity at the study site

Nature of Impact	Impact type	Extent	Duration	Potential Intensity	Likeli-hood	Rating
Construction Phase						
Direct Impact: Potential loss of vegetation units.	Existing	1	5	2	1	8 - MOD
	Cumulative	1	5	2	1	8 - MOD
	Residual	1	5	2	1	8 - MOD
Direct Impact: Potential increase in alien vegetation species	Existing	1	3	4	1	8 - MOD
	Cumulative	3	5	4	1	12 - HIGH
	Residual	1	1	2	0.5	2 - LOW
Direct Impact: Potential loss of CI floral species	Existing	1	5	4	1	10 - HIGH
	Cumulative	1	5	4	1	10 - HIGH
	Residual	1	5	2	1	8 - MOD
Direct Impact: Potential loss of CI faunal species (excluding bullfrogs and raptors)	Existing	1	5	4	0.5	5 - MOD
	Cumulative	1	5	8	0.5	7 - MOD
	Residual	1	5	4	0.2	2 - LOW

Nature of Impact	Impact type	Extent	Duration	Potential Intensity	Likeli-hood	Rating
Direct Impact: Potential loss of CI raptor species	Existing	1	5	4	0.5	5 - MOD
	Cumulative	1	5	8	0.5	7 - MOD
	Residual	1	5	4	0.2	2 - LOW
Direct Impact: Loss of foraging habitat for game species	Existing	1	5	2	1	8 - MOD
	Cumulative	1	5	4	1	10 - HIGH
	Residual	1	5	2	0.2	2 - LOW
Direct & Indirect: Loss of catchment area and decrease in water inputs	Existing	2	3	2	0.5	4 - MOD
	Cumulative	3	4	4	1	11 - HIGH
	Residual	3	3	4	1	10 - HIGH
Direct Impact: Increased faunal mortality.	Existing	1	2	2	1	5 - MOD
	Cumulative	1	2	2	1	5 - MOD
	Residual	1	2	2	0.5	3 - MOD
Indirect: Increased sensory disturbance to fauna	Existing	2	2	4	1	8 - MOD
	Cumulative	2	3	8	0.75	10 - HIGH
	Residual	1	2	4	0.5	4 - MOD
Direct & Indirect: Increased pollution; Increased dust & erosion and ultimately degradation of surrounding wetlands.	Existing	2	2	4	1	8 - MOD
	Cumulative	2	3	8	0.75	10 - HIGH
	Residual	1	2	4	0.5	4 - MOD
Indirect: Increase in floodpeaks, sediment loads and erosion to wetlands.	Existing	2	3	4	1	9 - MOD
	Cumulative	2	3	4	1	9 - MOD
	Residual	1	2	1	0.5	2 - LOW
Operational / Decommissioning Phase						
Direct & Indirect: Loss of catchment area and consequent decrease in water inputs.	Existing	2	3	2	0.5	4 - MOD
	Cumulative	3	4	4	1	11 - HIGH
	Residual	3	3	4	1	10 - HIGH
Direct Impact: Increased faunal mortality.	Existing	1	2	2	1	5 - MOD
	Cumulative	1	2	2	1	5 - MOD
	Residual	1	2	2	0.5	3 - MOD
Direct Impact: Spills -Sedimentation and Surface water contamination	Existing	0	0	0	0	0 - LOW
	Cumulative	3	2	8	0.5	7 - MOD
	Residual	3	2	4	0.5	5 - MOD
Direct Impact: Contamination of wetlands from storage facilities associated with the ADF and FGD– Consequences for bullfrogs and aquatic invertebrates.	Existing	3	5	4	1	12 - HIGH
	Cumulative	3	5	8	1	16 - HIGH
	Residual	3	3	4	0.5	5 - MOD

Impacts identified relating to the operational phase of the MPS FGD and railway yard is largely a continuation of impacts that emerged during the construction phase. Loss of catchment area and decreased water inputs remain after construction, while vehicle traffic within the MPS footprint remains a threat to the fauna present on the MPS footprint. Furthermore, contamination from pollution runoff from the power station footprint remain a concern, although these impacts can largely be reduced to MODERATE impact significance subsequent to successful implementation of the proposed mitigation measures.

A number of management and mitigation measures to prevent impact on fauna, flora, vegetation habitat and downstream wetland systems have been proposed by the specialist and is presented in the next section.

11.6.2 Mitigation and management measures for impacts on terrestrial ecology and wetlands

The following management and mitigation measures were proposed by the biodiversity and wetland specialists:

- All clearing of vegetation needs to occur only within the required construction and operational footprint of the proposed FGD / railway yard area. If at all possible vegetation in the western corner of the railway yard area must remain intact and undisturbed.
- The area of construction should be fenced to prevent encroachment into surrounding vegetation.
- Any bulbous or protected species that can be transplanted must be removed and transplanted to a similar habitat nearby.
- Alien species must be monitored and controlled under the MPS Alien Control Programme.
- Construction crew must be made aware of the alien species that occur on site, specifically Category 1 species and must be trained in the basics for recognition and removal.
- MPS has removed tree species successfully during the construction phase of their MPS. Therefore the same would apply here. The Environmental Officer (EO), or trained botanist will be required to tag all Protected Trees within the footprint for removal and relocation. These individual plants will need to be monitored over the long term.
- Permits will be required from the Department of Agriculture, Forestry and Fisheries (DAFF) for the removal of sensitive or protected tree species.
- Any other species that may be identified as Conservation Important (CI) must either be translocated (if possible) or specific mitigation must be compiled by a qualified botanist in collaboration with the MPS EO.
- In order to reduce the impact on CI faunal species on site, it is recommended that clearing be undertaken in winter, where possible. It is recommended that immediately prior to clearing that a walk down be conducted by Eskom's environmental manager or environmental officer in conjunction with a suitable specialist, preferably one with expertise in arachnids, to intensively search the site preferably in the height of the rainy season (December) to detect and relocate any baboon or trapdoor spiders or scorpions frogs, tortoises. If any of these species are encountered during development the specialist with should advise upon and oversee relocation.
- Likelihood is very low that nests of CI raptor species would be encountered on site. However, if encountered <u>during construction</u>, its location should be marked and reported to the relevant authorities before construction continues. Normally a minimum 1km radius buffer or exclusion zone should is applied to such points but given the complex nature of this project would require in-depth consultation with an appropriately experienced ornithologist. As far as possible large trees above 5m should be marked and safeguarded in the unaffected areas.
- Minimise disturbance footprint and restrict construction and operation activities to within the proposed construction and operational footprint area. The Environmental Officer (EO) must monitor the carrying capacity relative the game within the Railyard area and act

accordingly to ensure that there is enough grazing land for the existing game within this area, otherwise implement capture and relocation.

- The mitigation with regards to catchment loss is limited and the residual impact risk remains High. Efforts should be centred on minimising catchment loss by minimizing the PCD, coal stockpile and other associated infrastructure to as small an area as possible.
- Mitigation of increased faunal mortality require the site to be searched prior to clearing by an appropriately qualified specialist and any less mobile fauna relocated. Maintain existing tortoise road signs and insert new ones where necessary. Continue to enforce speed regulation controls such as speed humps and limits.
- Keep lighting to a minimum during construction but most significantly during operation to limit the impact of increased sensory disturbance to fauna. Lights should be angled downwards and hooded to lower light pollution. Restrict unnecessary access to the remaining patches of natural vegetation.
- To mitigate impacts from traffic and human activity the following should be applied:
  - Remain outside of the Sandloop buffer area;
  - Service and maintain vehicles regularly;
  - Eskom must ensure that all trucks before leaving the storage area shall be completely covered with a tarpaulin or any other effective measure/device. Trucks must not be over-loaded to ensure no spillage during transportation;
  - Reduce coal movement as much as possible during high wind events;
  - Proper drainage system shall be provided in the coal storage area so that water drained from sprinkling and runoff is collected at a common tank and can be reused after treatment.
  - Traffic and construction activities should be limited to daylight hours.
  - Regular surface wetting is required;
  - Demarcate and restrict anthropogenic disturbances to the construction area.
  - Measures such as speed humps, signage and fines should be implemented to reduce speeding and any off-road driving.
  - Off-road driving must be prohibited in all surrounding natural areas as this could increase the risks of erosion.
- Erosion and Storm Water Management Plan must be revised to allow for heavy rainfall events.
- Measures to reduce the risk of contamination from the trucking spills include a concrete slab layer beneath roads and kerb inlets to the dirty water system.
- Spilt material must regularly be cleaned up and that all drains inlets and stormwater infrastructure is regularly inspected for blockages and cleared out.
- The gypsum offtake structure may be a problem following high rainfall events, however a concrete bunding and a central depression is proposed to prevent spills. Again it is important to ensure this area is kept tidy and regularly cleaned out.

- Additionally, manganese levels in the stockpiles as well as the environment should be monitored through regular water quality testing at the pans immediately south of the FGD and compared to current baseline levels.
- All of these measures however are designed to cope with a 1 in 50 year peak 24 hour rainfall event. However, should an extreme rainfall event occur that exceeds this estimate or if maintenance (clearing drains etc.) has been inadequate these structures may fail and contaminants may enter SEW 2.

11.7 Air Quality

11.7.1 Impact assessment of the FGD system, railway yard and associated infrastructure on ambient air quality

The air quality specialist completed an impact assessment for the identified impacts on ambient air quality at the MPS and locally. During assessment of the air quality impacts, the specialist concluded that the operational phase is considered to be the phase with the largest impact on ambient air quality. Impact ratings for these impacts are provided in **Table 11-14**.

The construction and decommissioning (rehabilitation) phases were considered not likely to impact the ambient air quality more than the existing (status quo) status. As a result only the impact associated with the operational phase of the FGD system, railway yard and associated infrastructure were subjected to quantitative impact assessment.

The proposed Project operations were assessed as the cumulative impact which includes the operations of the Matimba Power Station and the Medupi Power Station including six units with FGD.

Table 11-14: Impact assessment of the FGD system, railway yard and associated infrastructure on ambient air quality during operational phase

Description of Impact	Impact type	Spatial Scale	Duration	Significance	Probability	Rating
Increase in SO_2	Existing	4	3	4	4	2.9 - MOD
	Cumulative[b]	3	3	3	3	1.8 - LOW
	Residual	3	3	3	3	1.8 - LOW
Increase in NO_2	Existing	2	3	3	3	1.6 - LOW
	Cumulative[b]	2	3	3	3	1.6 - LOW
	Residual	2	3	3	3	1.6 - LOW
Increase in PM_{10}	Existing	2	3	3	3	1.6 - LOW
	Cumulative[b]	2	3	3	3	1.6 - LOW
	Residual	2	3	3	3	1.6 - LOW
Increase in $PM_{2.5}$	Existing	2	3	3	3	1.6 - LOW
	Cumulative[b]	2	3	3	3	1.6 - LOW
	Residual	2	3	3	3	1.6 - LOW

The area of non-compliance of cumulative SO_2 concentrations reduces significantly with FGD with no exceedances of the NAAQS at sensitive receptors, reducing the significance to LOW.

No exceedances of the NAAQS for NO_2, PM_{10} and $PM_{2.5}$ were simulated at sensitive receptors due to proposed Project operations resulting in LOW significance.

11.7.2 Mitigation and management measures for potential air quality impacts

Considering all potential impacts identified on air quality the specialist proposed the following mitigation and management measures:

- The FGD control is considered a scenario of the assessment and not a mitigation measure for the significance rating as it is an operational activity that is to take place.
- As the proposed Project operations will significantly reduce SO_2 impacts from the Medupi Power Station, it is recommended that the FGD Retrofit Project be implemented.
- The movement of sludge and salt off-site to a licenced facility will contribute to fugitive vehicle entrainment emissions. It is recommended that the access road being used is properly maintained to minimise the impacts from this source.

11.8 Noise

11.8.1 Impact assessment of the FGD system, railway yard and associated infrastructure on ambient noise levels

The noise specialist completed an impact assessment for the identified impacts on ambient noise levels at the MPS and locally. During assessment of the noise impacts, the specialist concluded that with noise mitigation, noise levels from the project will be low. Impact ratings for these impacts are provided in **Table 11-15**.

Table 11-15: Impact assessment of the FGD system, railway yard and associated infrastructure on ambient noise levels

Nature of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
Planning / Pre-construction Phase						
***Indirect Impact:* Increase in noise levels**	Existing	2	1	1	0.5	2 - LOW
	Cumulative	2	1	1	0.5	2 - LOW
	Residual	2	1	1	0.5	2 - LOW
Construction Phase						
***Indirect Impact:* Increase in noise levels**	Existing	2	1	1	0.5	2 - LOW
	Cumulative	2	1	2	0.5	3 - MOD
	Residual	2	1	1	0.5	2 - LOW
Operational Phase						
***Indirect Impact:* Increase in noise levels**	Existing	2	1	1	0.5	2 - LOW
	Cumulative	2	1	1	0.5	2 - LOW
	Residual	2	1	1	0.5	2 - LOW
Decommissioning Phase						
Indirect Impact: Increase in noise levels	Existing	2	1	1	0.5	2 - LOW
	Cumulative	2	1	2	0.5	3 - MOD
	Residual	2	1	1	0.5	2 - LOW

The impacts on ambient noise levels relate entirely to the potential increase in noise levels through all phases of the proposed development as shown in **Table 11-15**.

The impact assessment undertaken by the noise specialist rated impact on noise levels during the planning and operational phases as low. The specialist concluded that during these phases the noise levels in the area are representative of suburban districts. Cumulative impacts would be similar to baseline levels during the planning phase, while change in noise levels due to operation is expected to be slight at NSRs.

The specialist identified that during the construction and decommissioning phases the construction and decommissioning activities would result in a Moderate noise impacts, but with noise levels remaining local yet still notable.

The specialist therefore concluded that in the quantification of noise emissions and simulation of noise levels as a result of the proposed project, it was calculated that ambient noise evaluation criteria for human receptors will not be exceeded at NSRs. Therefore, reaction from members of the community within this impact area is not very likely.

11.8.2 Mitigation and management measures for potential noise level impacts

Considering all potential impacts identified on noise levels the specialist proposed the following mitigation and management measures as described below.

For general activities, the following good engineering practice must be applied:

- To minimise noise generation, vendors should be required to guarantee optimised equipment design noise levels.
- A mechanism to monitor noise levels, record and respond to complaints and mitigate impacts should be developed.

In managing transport noise specifically related to trucks, efforts should be directed at:

- Minimizing individual vehicle engine, transmission and body noise/vibration. This is achieved through the implementation of an equipment maintenance program.
- Minimize slopes by managing and planning road gradients to avoid the need for excessive acceleration/deceleration.
- Maintain road surface regularly to avoid corrugations, potholes etc.
- Avoid unnecessary idling times.
- Minimizing the need for trucks/equipment to reverse. This will reduce the frequency at which disturbing but necessary reverse warnings will occur. Alternatives to the traditional reverse ‘beeper’ alarm such as a ‘self-adjusting’ or ‘smart’ alarm should be considered. These alarms include a mechanism to detect the local noise level and automatically adjust the output of the alarm is so that it is 5 to 10 dB above the noise level in the vicinity of the moving equipment. The promotional material for some smart alarms does state that the

ability to adjust the level of the alarm is of advantage to those sites 'with low ambient noise level' (Burgess & McCarty, 2009, as cited in (von Gruenewaldt & von Reiche, 2018).

11.9 Social

11.9.1 Impact assessment of the FGD system, railway yard and associated infrastructure on the social environment

An Impact assessment of the FGD system, railway yard and associated infrastructure on the social environment was undertaken by the appointed social specialist. The impact assessment table provided by the specialist in his specialist report (included as Appendix G to this FEIR) has been simplified, summarised and reduced to highlight the major findings and trends concluded by the social specialist (**Table 11-16**). The reader is urged to peruse the impacts assessment table in the Social Impact Assessment Report as the specialist furthermore aligned recommendations or mitigation measures with each impact in the table, provided a short motivation to support the impact assessment ratings.

For the benefit of I&APs the main impacts and mitigation measures are highlighted in this section in order to provide the reader an overall understanding of impacts and mitigation measures / recommendations concluded by the specialist. A number of positive impacts were identified by the social specialist and for the reader's benefit the impact descriptions (column 1 in **Table 11-16**) of these positive impacts has been shaded in a light shade of green.

All impacts identified during the Operational and Decommissioning Phases were considered positive impacts, whereas half of the impacts identified during the construction phase are positive impacts on the surrounding community.

During the Planning / Pre-construction Phase the establishment of spin-off businesses, e.g. B&Bs, to support the construction phase of the Medupi FGD and railway yard was identified as a positive impact that could contribute to the local economy and employment opportunities. However, the publication of the proposed FGD construction project is likely to attract migrant labourers with employment expectations at the MPS.

Positive impacts associated with the Construction Phase of the FGD, railway yard and associated infrastructure revolve around economic and employment opportunities as well as upgrading of infrastructure such as local roads. However, the Construction Phase is also likely to result in increased traffic within the study area, and higher demand on already stressed water allocation for the Lephalale area.

Positive impacts identified during the Operational Phase of the FGD include the improvement of the ambient air quality through the significant reduction of SO_2 due the operational FGD system, a reduction in respiratory related diseases coupled with an overall improvement in the quality of life, the stabilisation of the national electricity grid to support amongst other local economic development, and the establishment of business and employment opportunities resulting from the sale of gypsum.

Table 11-16: Impact assessment of the FGD system, railway yard and associated infrastructure on socio-economic environment

Description of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
Planning / Pre-construction Phase						
Indirect Impact: **Developing spin off businesses to support FGD construction phase (B&Bs) (Positive Impact)**	Existing	2	3	8	1	13 – HIGH
	Cumulative	2	3	8	1	13 – HIGH
	Residual	2	2	8	1	12 – HIGH
Indirect Impact: **Employment expectations and influx of migrant labour**	Existing	3	2	2	0.75	5 – MOD
	Cumulative	4	3	8	0.75	11 – HIGH
	Residual	1	2	1	0.5	2 – LOW
Construction Phase						
Direct Impact: **Employment of skilled, semi-skilled and unskilled labourers in the construction of the FGD (Positive Impact)**	Existing	1	1	1	1	3 - MOD
	Cumulative	2	1	4	1	7 - MOD
	Residual	2	1	1	0.5	2 - LOW
Direct Impact: **Development of tenders and contract opportunities for local businesses in construction of the FGD and ancillary infrastructure (Positive Impact)**	Existing	2	1	1	1	4 - MOD
	Cumulative	2	1	2	1	5 - MOD
	Residual	2	1	1	1	4 - MOD
Indirect Impact: **Improvement in local road conditions with the construction of the FGD (Positive Impact)**	Existing	2	4	1	1	7 - MOD
	Cumulative	2	1	1	1	4 - MOD
	Residual	2	2	1	0.5	3 - MOD
Direct Impact: **Extension of the construction phase currently underway in Medupi resulting to prolonged contractor activity in Lephalale which benefit local businesses (Positive Impact)**	Existing	1	1	1	1	3 - MOD
	Cumulative	2	1	2	1	5 - MOD
	Residual	1	1	2	0.5	2 - LOW
Indirect Impact: **Increase in traffic volumes resulting from a combination of existing road users and construction vehicles/trucks transporting materials to and from Medupi for the construction of the FGD**	Existing	2	1	1	1	4 - MOD
	Cumulative	2	1	1	0.75	3 - MOD
	Residual	2	1	1	0.5	2 - LOW
Indirect Impact: **Increase in occupation health and safety risks resulting from increase in traffic volumes and prolonged construction phase at Medupi**	Existing	2	1	1	0.5	2 - LOW
	Cumulative	2	1	1	0.75	3 - MOD
	Residual	2	1	1	0.2	1 - LOW
Indirect Impact: **Increase in pressure for water demand and allocation to support the construction of the FGD, the ADF, and existing industries and for domestic uses**	Existing	2	2	2	0.5	3 - MOD
	Cumulative	3	2	4	0.75	7 - MOD
	Residual	3	3	8	1	14 - HIGH
Indirect Impact: **Increase in negative public sentiments about the project FGD**	Existing	2	1	1	0.75	3 - MOD
	Cumulative	2	1	1	0.75	3 - MOD
	Residual	2	1	1	0.5	2 - LOW
Operational Phase						
Direct Impact: **Operation of the FGD technology will result to reduction in SO_2 levels in the atmosphere, resulting in improved ambient air**	Existing	2	4	8	1	14 - HIGH
	Cumulative	4	4	8	1	16 - HIGH
	Residual	5	4	8	0.1	2 - LOW

Description of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
quality and improved human health as the result of the FGD (Positive Impact)						
***Direct Impact:* Reduction is respiratory related diseases and overall improvements to human health and quality of life for the locals and labourers through improved ambient air quality in the receiving environment due to implementing FGD (Positive Impact)**	Existing	2	2	8	1	12 - HIGH
	Cumulative	2	2	4	0.75	6 - MOD
	Residual	2	1	8	0.1	1 – LOW
***Indirect Impact:* Stabilization of the National Grid and improved electric supply to support the growing economy and achievement of social imperative such as provision of power for domestic use throughout the country (Positive Impact)**	Existing	4	2	2	1	8 - MOD
	Cumulative	4	2	2	0.75	6 - MOD
	Residual	4	4	2	0.1	1 - LOW
***Direct Impact:* Development of the secondary industries as the result of implementation of the FGD through sales of its commercial suitable gypsum to the farming or secondary industry (Positive Impact)**	Existing	1	1	2	1	4 - MOD
	Cumulative	1	1	2	0.75	3 - MOD
	Residual	1	1	2	0.5	2 - LOW
Decommissioning Phase						
***Indirect Impact:* Employment opportunities in disassembling and recycling of recyclable materials from the FGD (Positive Impact)**	Existing	1	3	1	0.5	3 – MOD
	Cumulative	2	1	2	1	5 – MOD
	Residual	2	1	8	1	11 – HIGH

The social specialist therefore concluded that the significance of positive social impacts generally exceeds the significance of negative social impacts in the implementation of the FGD system and the railway siding throughout all four stages of the project.

What is believed to be the greatest positive impact or benefit of the installation of the Medupi FGD system, railway yard and associated infrastructure by the EAP, the specialist further concluded that implementation of the proposed FGD technology at the MPS will result in reduced levels of SO_2 in the medium and long term in the region and South Africa. As a result of this, the significance of health risks associated with the SO_2 emissions will be minimized on a long-term basis contributing to an improved biosphere in the region and South Africa. This will ultimately translate to improved quality of life for the citizens of Lephalale and the communities located south and southwest of the study area who are also affected by pollutants containing SO_2.

11.9.2 Mitigation and management measures for identified impacts

Proposed mitigation and management measures proposed to enhance positive impacts and minimise negative impacts include:

- Construction activities for the FGD system, railway yard and associated infrastructure should be restricted within the existing Medupi footprint in order to minimise land use impacts on surrounding properties.
- All measures and recommendation proposed by the traffic specialist to reduce traffic impacts must be implemented to reduce social impacts associated with increased traffic volumes. Recommended measures include installation of traffic lights and traffic circles at major intersections such as D1675, Afguns and Nelson Mandela Drive near Medupi and Matimba Power Station, and the introduction/implementation of appropriate traffic calming measures.
- Eskom explore alternative water sources to minimise the risk of overly depending to MCWAP Phase 2 for the implementation of the FGD, if possible.
- Eskom must continue to undertake project public participation and communication with stakeholder groups in order to strengthen multi-stakeholder engagement and participation in the planning and implementation of the FGD retrofit project.

The social specialist proposed recommendations to be considered by Eskom for implementation. It should therefore be understood that such recommendations may not necessarily be implemented after consideration. Proposed recommendations highlighted by the social specialist include:

- Eskom could develop initiatives to contribute towards educating and developing necessary skills for the locals to take advantage of opportunities associated with the FGD construction and operation.
- Local businesses could be incubated and developed to be able to take opportunities in the FGD BID.
- Eskom to advertise the types of available jobs, the required education and skillset to take up employment opportunities in order to potentially reduce influx of migrant labour.
- Although Eskom has done a lot to address concerns relating to communication with stakeholders, it is recommended that the EMC should further strengthen its multi-stakeholder engagement strategy or adopt new forms of communication that resonate with the interests of I & APs in the region. This should be done in a manner that does not polarise relations between existing stakeholders. One way of addressing this issue could be to develop a sub-committee for the EMC, <u>if found to be required through consultation with EMC stakeholders</u>. If deemed necessary, the sub-committee should include a representative from each of the affected communities. This should be in addition to those communities' representatives already listed in the EMC Terms of Reference (ToR).
- Community representatives from Steenbokpan (Leseding) and the farms (farming community) should form part of the EMC sub-committee due to the fact that they feel excluded in programmes and workshops that deal with issues arising from Medupi construction and the associated infrastructure and technology such as the FGD.
- In addition to EMC public meetings and workshops, the sub-committee will ensure that all community concerns and grievances are deliberated on and addressed directly by the EMC and outside the EMC public meetings. The EMC ToR allows for the election of

alternates. Therefore, this recommendation for EMC sub-committee is in line with EMC ToR.

- Eskom should consider appointing an independent company/specialist that specialises in the management of Social Risks to advise on the facilitation between the various project stakeholders such as the appointed contractors, the EMC, the Environmental Control Officer (ECO), the affected community and community organisations such as NGOs, local labourers, local Small Medium Enterprises (SMMEs) as well as big industries.

11.10 Heritage, Archaeology and Palaeontology

The Heritage and Palaeontological Impact Assessments did not identify any heritage, archaeological or palaeontological resources within the proposed development footprint for the FGD infrastructure, railway yard and associated infrastructure. Therefore no impacts exist that may have a detrimental impact on any heritage, archaeological or palaeontological resources.

No impact assessment was therefore conducted to establish the significance of a potential impact. However, since the assessment of existing literature and investigation of the development area does not guarantee that no resources would be uncovered during the construction phase, it is recommended that Eskom, and contractors acting on behalf of Eskom, adopt an appropriate identification and monitoring protocol for the identification of potential archaeological and palaeontological resources during construction. This protocol must also advise on all relevant steps to protect or remove resources, or acquire the services of a qualified archaeologist or palaeontologist to undertake the necessary steps required in terms of the current heritage legislation. Excavations should be monitored by the ECO in line with the protocol and ff archaeological or palaeontological resources are discovered the ECO must order a stoppage of works in order to have the finds inspected by a qualified archaeologist or palaeontologist, who will advise further on appropriate mitigation measures.

11.11 Traffic

11.11.1 Impact assessment of the FGD system, railway yard and associated infrastructure on the social environment

The traffic specialist completed an impact assessment for the traffic impacts resulting from the construction and operation of the FGD system, railway yard and associated infrastructure at the MPS. Impact ratings for identified traffic impacts are provided in **Table 11-17**.

During assessment of the impact impacts, the specialist concluded that by implementing proposed upgrades at major intersections, the Level of Service (LOS) would be increased from LOS F, which is the worst, to at least a LOS of B or A.

Table 11-17: Impact assessment of the FGD system, railway yard and associated infrastructure on traffic to and from the MPS

Nature of Impact	Impact type	Extent	Duration	Potential Intensity	Likelihood	Rating
Construction Phase						
Direct Impact: **Impact of additional generated traffic due to the construction phase on existing road layout and road users**	Existing	3	4	4	1	11 - HIGH
	Cumulative	3	1	8	1	12 - HIGH
	Residual	3	3	1	0.1	1 - LOW
Operational Phase						
Direct Impact: **Impact of additional generated traffic due to the operational phase of the FGD plant**	Existing	3	4	8	1	15 - HIGH
	Cumulative	3	5	16	1	24 - FLAW
	Residual	3	3	1	0.1	1 - LOW
Indirect Impact: **Impact of the transport of Limestone from the limestone sources**	Existing	4	3	4	0.1	1 - LOW
	Cumulative	4	4	8	0.75	12 - HIGH
	Residual	4	3	4	0.2	2 - LOW
Indirect Impact: **Impact of transported salts and sludge to one of the four potential licensed hazardous waste facilities**	Existing	4	3	4	0.1	1 - LOW
	Cumulative	4	4	8	0.75	12 - HIGH
	Residual	4	3	4	0.2	2 - LOW
Decommissioning Phase						
Direct Impact: **Impact of reduction in traffic volumes due to decommissioning phase**	Existing	3	1	16	1	20 - HIGH
	Cumulative	3	1	8	1	12 - HIGH
	Residual	3	1	1	0.1	1 - LOW

No impacts on the road network were anticipated during the Planning / Pre-construction phase, and as a result no impact rating for this phase was determined.

Furthermore it is concluded that all identified impacts were regarded as low once the proposed mitigation measures has been implemented.

11.11.2 Mitigation and management measures for potential traffic impacts

Proposed management measures and recommendations to reduce traffic impacts include:

- Proposed upgrades for the following major road intersections include:

  <u>Nelson Mandela Drive / D1675</u>

  - Provide signals;
  - Add a left turning slip lane along D1675 (northbound);
  - The introduction of a right turning lane for the northbound right movement;
  - Provision of an additional eastbound lane for the straight movement;
  - It is recommended that the relevant road authority should fund the upgrade of this intersection, since the existing intersection is already operating at a LOS F.

  <u>D1675 / Afguns Rd</u>

  - Upgrade the priority control intersection to a one lane roundabout.

- It is recommended that a detail design phase should be carried out as part of the traffic impact assessment for this project. During the detail design process various intersection upgrade options (roundabout, signals, sliplanes etc) will be tested and compared to ensure that the most optimum and cost-effective intersection upgrade are selected.
- Vehicles delivering limestone to MPS and transporting salts and sludge from the MPS to an offsite service provider must utilise the Afguns Road in order to have a minimal impact on other road users.
- There should be a pointsman at the intersection of D1675 / Afguns Rd and Nelson Mandela Drive / D1675 during the peak hours to alleviate the traffic congestion and assist the northbound traffic.

12 MONITORING AND MAINTENANCE

A number of the specialist assessments, that was undertaken for the construction and operation of the FGD infrastructure, railway yard and associated infrastructure, recommended monitoring and maintenance measures that must be implemented prior, during the construction phase or during decommissioning / rehabilitation phase.

These proposed monitoring and maintenance measures are provided in the sections below.

12.1 Soils

The soils and land capability specialist proposed a soil conservation plan for the construction, operational and decommissioning phases of the proposed development. These soil conservation plans aims to maintain the integrity of the topsoil removed during construction.

Making provision for retention of utilisable material for the decommissioning and/or during rehabilitation will not only save significant costs at closure, but will ensure that additional impacts to the environment do not occur.

The proposed soil conservation plans for the construction, operational and decommissioning phases of the development is provided in **Table 12-1**, **Table 12-2** and **Table 12-3** below.

Table 12-1: Construction Phase – Soil Utilization Plan

Phase	Step	Factors to Consider	Comments
Construction	Delineation of areas to be stripped		Stripping will only occur where soils are to be disturbed by activities that are described in the design report, and where a clearly defined end rehabilitation use for the stripped soil has been identified.
	Reference to biodiversity action plan		It is recommened that all vegetation is stripped and stored as part of the utilizable soil. However, the requirements for moving and preserving fauna and flora according to the biodiversity action plan should be consulted.
	Stripping and Handling of soils	Handling	Where possible, soils should be handled in dry weather conditions so as to cause as little compaction as possible. Utilizable soil (Topsoil and upper portion of subsoil B2/1) must be removed and stockpiled separately from the lower "B" horizon, with the ferricrete layer being seperated from the soft/decomposed rock, and wet based soils seperated from the dry soils if they are to be impacted.
		Stripping	The "Utilizable" soil will be stripped to a depth of 750mm or until hard rock/ferricrete is encountered. These soils will be stockpiled together with any vegetation cover present (only large vegetation to be removed prior to stripping). The total stripped depth should be 750mm, wherever possible.
	Delineation of Stockpiling areas	Location	Stockpiling areas will be identified in close proximity to the source of the soil to limit handling and to promote reuse of soils in the correct areas. All stockpiles will be founded on stabilized and well engineered "pads"
		Designation of Areas	Soils stockpiles will be demarcated, and clearly marked to identify both the soil type and the intended area of rehabilitation.

Table 12-2: Operational Phase – Soil Conservation Plan

Phase	Step	Factors to Consider	Comments
Operation	Stockpile management	Vegetation establishment and erosion control	Enhanced growth of vegetation on the Soil Stockpiles and berms will be promoted (e.g. by means of watering and/or fertilisation), or a system of rock cladding will be employed. The purpose of this exercise will be to protect the soils and combat erosion by water and wind.
		Storm Water Control	Stockpiles will be established/engineered with storm water diversion berms in place to prevent run off erosion.
		Stockpile Height and Slope Stability	Soil stockpile and berm heights will be restricted where possible to <1.5m so as to avoid compaction and damage to the soil seed pool. Where stockpiles higher than 1.5m cannot be avoided, these will be benched to a maximum height of 15m. Each bench should ideally be 1.5m high and 2m wide. For storage periods greater than 3 years, vegetative (vetiver hedges and native grass species - refer to Appendix 1) or rock cover will be essential, and should be encouraged using fertilization and induced seeding with water and/or the placement of waste rock. The stockpile side slopes should be stabilized at a slope of 1 in 6. This will promote vegetation growth and reduce run-off related erosion.
		Waste	Only inert waste rock material will be placed on the soil stockpiles if the vegetative growth is impractical or not viable (due to lack of water for irrigation etc.). This will aid in protecting the stockpiles from wind and water erosion until the natural vegetative cover can take effect.
		Vehicles	Equipment, human and animal movement on the soil stockpiles will be limited to avoid topsoil compaction and subsequent damage to the soils and seedbank.

Table 12-3: Decommissioning Phase – Soil Conservation Plan

Phase	Step	Factors to Consider	Comments
Decommissioning & Closure	Rehabilitation of Disturbed land & Restoration of Soil Utilization	Placement of Soils	Stockpiled soil will be used to rehabilitate disturbed sites either ongoing as disturbed areas become available for rehabilitation and/or at closure. The utilizable soil (500mm to 750mm) removed during the construction phase, must be redistributed in a manner that achieves an approximate uniform stable thickness consistent with the approved post development end land use (Conservation land capability and/or Low intensity grazing), and will attain a free draining surface profile. A minimum layer of 300mm of soil will be replaced.
		Fertilization	A representative sampling of the stripped and stockpiled soils will be analysed to determine the nutrient status and chemistry of the utilizable materials. As a minimum the following elements will be tested for: EC, CEC, pH, Ca, Mg, K, Na, P, Zn, Clay% and Organic Carbon. These elements provide the basis for determining the fertility of soil. based on the analysis, fertilisers will be applied if necessary.
		Erosion Control	Erosion control measures will be implemented to ensure that the soil is not washed away and that erosion gulleys do not develop prior to vegetation establishment.
	Pollution of Soils	In-situ Remediation	If soil (whether stockpiled or in its undisturbed natural state) is polluted, the first management priority is to treat the pollution by means of in situ bioremediation. The acceptability of this option must be verified by an appropriate soils expert and by the local water authority on a case by case basis, before it is implemented.
		Off site disposal of soils.	If in situ treatment is not possible or acceptable then the polluted soil must be classified according to the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (Local Dept of Water Affairs) and disposed of at an appropriate, permitted, off-site waste facility.

The specialist furthermore proposed the following monitoring and maintenance recommendations:

- During the rehabilitation exercise, preliminary soil quality monitoring should be carried out to accurately determine the fertilizer and pH requirements that will be needed, in the event that rehabilitation efforts to date has been unsuccessful. Where rehabilitation has been unsuccessful, soil sampling should also be carried out annually after rehabilitation has

been completed and until the levels of nutrients, specifically magnesium, phosphorus and potassium, are at the required levels for sustainable growth.

- Monitoring should always be carried out at the same time of the year and at least six weeks after the last application of fertilizer.
- Soils should be sampled and analysed for the following parameters:

pH (H_2O)	Phosphorus (Bray I)	
Electrical conductivity	Calcium mg/kg	
Cation exchange capacity	Sodium mg/kg;	
Magnesium mg/kg;	Potassium mg/kg	Zinc mg/kg;
Clay, sand and Silt	Organic matter content (C %)	

The following maintenance is recommended:

- The area must be fenced, and all animals kept off the area until the vegetation is self-sustaining;
- Newly seeded/planted areas must be protected against compaction and erosion (Vetiver hedges etc.);
- Traffic should be limited were possible while the vegetation is establishing itself;
- Plants should be watered and weeded as required on a regular and managed basis were possible and practical;
- Check for pests and diseases <u>as part of the approved inspection/auditing schedule</u> and treat if necessary;
- Replace unhealthy or dead plant material;
- Fertilise, hydro seeded and grassed areas soon after germination, and
- Repair any damage caused by erosion.

12.2 Groundwater

The following recommendations regarding monitoring were made by the groundwater specialist and include:

- Monthly monitoring of exiting monitoring boreholes groundwater levels and quality. Monitoring should be conducted to be consistent with the existing WUL (Licence no.: 01/A42J/4055);
- Monitoring of groundwater resources must be undertaken in accordance with the stipulations relating to monitoring as per the Water Use Licence and Environmental Authorisation to be issued and <u>existing WUL (Licence no.: 01/A42J/4055)</u>;
- <u>The proposed monitoring network must be updated and re-assessed in the event that any annual independent audit find shortcomings in the existing monitoring network;</u>
- Aquifer testing of new monitoring boreholes to determine hydraulic parameters and update initial groundwater conceptual model. The groundwater conceptual model with aquifer parameters provides the basic input into a groundwater numerical model; and

- The newly-drilled monitoring boreholes must be incorporated into the existing monitoring programme.

12.3 Surface water

Based on the potential contaminants of concern the surface water specialist proposed the following recommended water quality programme:

- The existing (NSS) as well as proposed (Golder) water quality monitoring points should be monitored regularly and are shown in **Figure 12-1**, while the existing water quality and water volumes monitoring points are listed in **Table 12-4**.
- For this study, three monitoring points in the Sandloop River and two points on the unnamed tributary were identified and sampled. The properties of the proposed water quality monitoring locations are listed in **Table 12-5**. The proposed monitoring point have also been included in the Water Use Licence Application for the Medupi FGD project for consideration by the Department of Water and Sanitation. Adoption and implementation of the proposed monitoring locations must therefore be undertaken in line with the stipulations of the WUL for the project. The three monitoring locations in the Sandloop River were identified to establish a baseline water quality and flow along the main watercourse.
- The remaining two monitoring sites are located on the unnamed tributary of the Sandloop River that runs to south west of the existing licensed disposal facility. The monitoring points include one upstream of the disposal facility and one downstream of the disposal facility before the confluence with the Sandloop River.
- Samples should be taken as per the specifications of the WUL at the proposed locations.
- The parameters to be analysed should include pH, Total Dissolved Solids, Electrical Conductivity, Alkalinity, Potassium, Calcium, Sodium, Chloride, Fluoride, Sulphate, Nitrate, Ammonium, Total Hardness, Metals: Arsenic, Beryllium, Cadmium, Barium, Chromium, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Uranium, Vanadium and Zinc using ICP-MS), Orthophosphate, Total Suspended Solids, Oil and Grease.

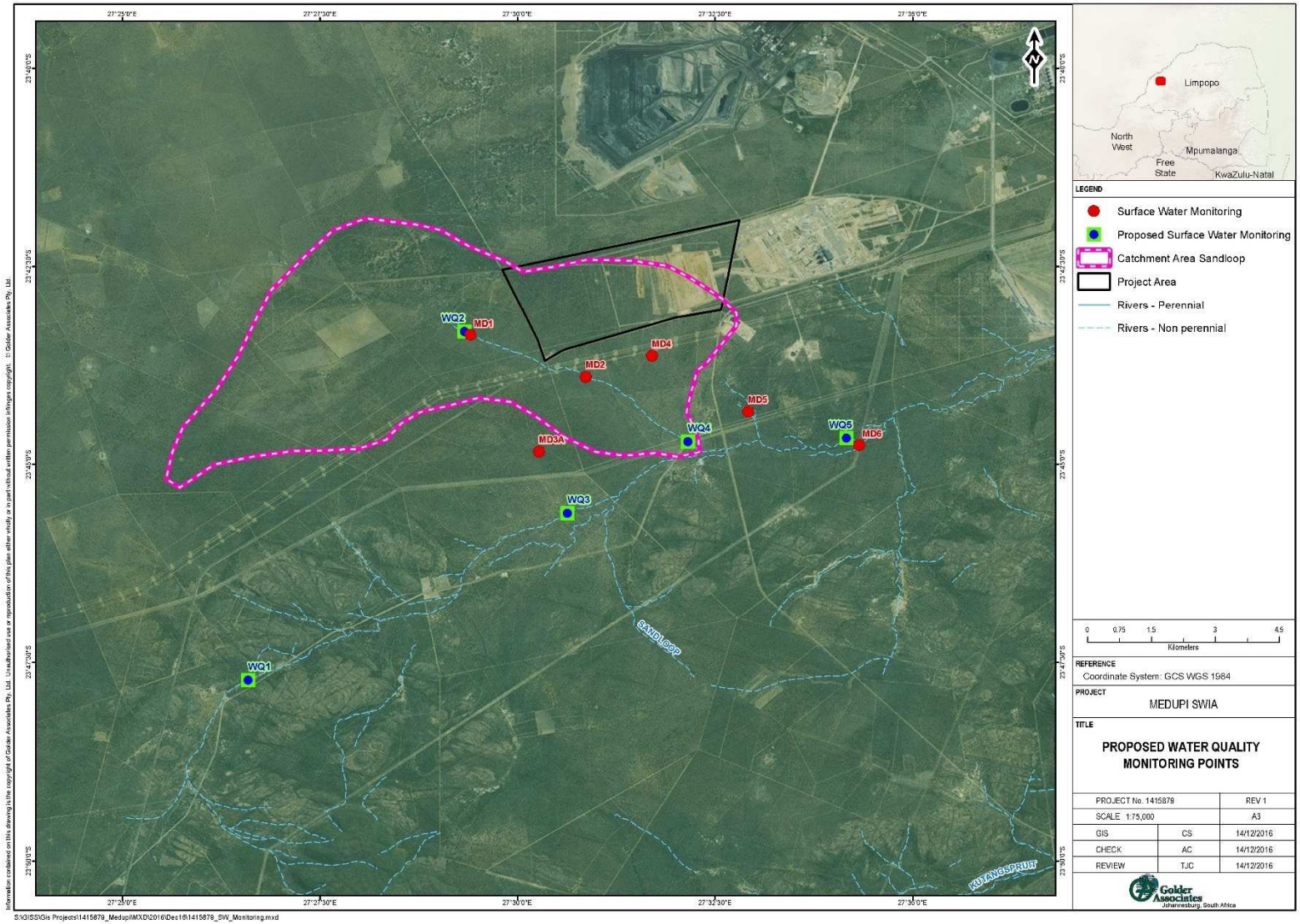

Figure 12-1: Medupi Power Station study area with existing and proposed water quality monitoring points

Table 12-4: Existing surface water quality and quantity monitoring sites at Medupi

Golder Site Name	River/ Location	Latitude	Longitude	Motivation for point location
MD1	Sandloop tributary (major)	23°43'22.38"S	27°29'24.49"E	Provide water quality on major tributary upstream of Eskom operation.
MD2	Sandloop tributary	23°43'54.09"S	27°30'51.95"E	Provide water quality and quantity after tributary passes Site 13 (existing ADF).
MD3	Site 2 (proposed)	23°44'50.52"S	27°30'16.55"E	Provide water quality at proposed Site 2.
MD4	Site 12 (proposed)	23°43'38.15"S	27°31'42.38"E	Provide water quality at proposed Site 12.
MD5	Sandloop tributary (minor)	23°44'20.34"S	27°32'55.28"E	Provide water quality on minor tributary downstream of Eskom operation.
MD6	Sandloop River	23°44'45.55"S	27°34'19.61"E	Establish water quality on the Sandloop River.

Table 12-5: Proposed surface water quality and quantity monitoring sites at Medupi

Golder Site Name	River/ Location	Latitude	Longitude	Motivation for point location
WQ1	Sandloop River (upstream)	27°26'34.96"E	23°47'42.65"S	Establish baseline water quality data furthest upstream Sandloop River.
WQ2	Sandloop tributary (major, upstream)	27°29'19.53"E	23°43'19.53"S	Provide water quality on major tributary upstream of Site 13 (ADF).
WQ3	Sandloop River (central)	27°30'36.07"E	23°45'38.27"S	Establish baseline water quality and flow data in the Sandloop River across Eskom operation.
WQ4	Sandloop tributary (major, downstream)	27°32'10.80"E	23°44'42.77"S	Provide water quality and flow on major tributary downstream of Site 13 (ADF).
WQ5	Sandloop River (downstream)	27°34'10.40"E	23°44'38.95"S	Establish baseline water quality data furthest downstream Sandloop River.

12.4 Biodiversity (Terrestrial Ecology) and Wetlands

The following recommendations regarding monitoring were made by the specialist and include:

- Biodiversity and wetland monitoring must be undertaken in line with the existing monitoring protocol of the MPS.
- Regular surface and ground water quality monitoring is required to be continued at the identified sampling sites.
- Sediment analysis of depressions and the ephemeral washes must be conducted yearly and compared with the current results for the site. This will then indicate whether heavy metal concentrations are increasing during the Operation Phase of MPS and FGD complex.

- Annual monitoring of the aquatic invertebrate assemblage should be conducted at the various remaining sediment sampling sites.
- Amphibian assemblages should be monitored at key sediment sampling sites as well as the newly created pans once a year by means of acoustic, visual encounter transects.
- Measures should be implemented to minimise erosion on site, and potential sedimentation and contamination of the downstream ephemeral watercourse and associated dams;
- It is advised that water quality at local boreholes (if present) be monitored before and during construction of the site. The exact duration, frequency and positioning of the sampling points should be determined from the geohydrological studies commissioned for the site.

12.5 Noise

In the event that noise related complaints are received, short term (24-hour) ambient noise measurements should be conducted as part of investigating the complaints. The results of the measurements should be used to inform any follow up interventions.

The following procedure should be adopted for all noise surveys:

- Any surveys should be designed and conducted by a trained specialist.
- Sampling should be carried out using a Type 1 Sound Level Meter (SLM) that meets all appropriate International Electrotechnical Commission (IEC) standards and is subject to annual calibration by an accredited laboratory.
- The acoustic sensitivity of the SLM should be tested with a portable acoustic calibrator before and after each sampling session.
- Samples of at least 24 hours in duration and sufficient for statistical analysis should be taken with the use of portable SLM's capable of logging data continuously over the time period. Samples representative of the day- and night-time acoustic climate should be taken.
- The following acoustic indices should be recoded and reported:

  L_{Aeq} (T)

  L_{Aleq} (T)

  Statistical noise level LA90

  L_{Amin} and L_{Amax}

  Octave band or 3rd octave band frequency spectra.
- The SLM should be located approximately 1.5 m above the ground and no closer than 3 m to any reflecting surface.
- Efforts should be made to ensure that measurements are not affected by the residual noise and extraneous influences, e.g. wind, electrical interference and any other non-acoustic interference, and that the instrument is operated under the conditions specified by the manufacturer. It is good practice to avoid conducting measurements when the wind speed is more than 5 m/s, while it is raining or when the ground is wet.

- A detailed log and record should be kept. Records should include site details, weather conditions during sampling and observations made regarding the acoustic climate of each site.

12.6 Heritage, archaeology and palaeontology

If in the extremely unlikely event that any fossils are discovered during the construction of the FGD copmplex, then it is strongly recommended that a palaeontologist be called to assess their importance and rescue them if necessary.

13 ENVIRONMENTAL IMPACT STATEMENT

13.1 Key considerations

Given the circumstances of the proposed retrofitting of the FGD plant and associated infrastructure and construction of the railway yard and associated structures and infrastructure a number of key considerations must be considered in order to reach a balanced and sustainable recommendation regarding the proposed construction and operational activities.

To illustrate the aspects related to key considerations, an environmental sensitivity overlay map has been included in **Figure 13-1** hereafter, which shows the proposed FGD complex, railway yard, and associated infrastructure in relation to key environmental sensitivities. The environmental sensitivity overlay map has also been included in A3 size in Appendix D-4 to this FEIR.

Key considerations that must be taken into account include:

- The Medupi Power Station is currently under construction, with 3 generation units already operational, while the remaining 3 units are under construction. The construction activities associated with the generation units are clearly seen in **Figure 13-1**, with the power station area under active construction being classified as no natural habitat remaining.
- The FGD retrofit infrastructure will be constructed and operated within the Medupi Power Station footprint;
- The railway yard development area furthermore falls within the existing MPS footprint between the power station and existing ADF. A large portion of the railway yard area is currently transformed due to construction activities, while the remaining portion still has intact vegetation, although characterised by notable alien infestation. The extent of intact vegetation is evident from **Figure 13-1**, with the secondary PCD and a portion of the proposed railway yard to be constructed within the intact vegetation.
- Existing pollution management measures such as clean and dirty water separation infrastructure, is already installed within the MPS footprint. This already provides some assurance that possible impacts originating from the FGD system and associated infrastructure will be managed within the existing pollution management system.
- The construction of the FGD system and the proposed railway yard has been considered during the initial planning phases of the MPS before construction started. As a result, the station has been designed and constructed to allow retrofitting of a wet FGD system, whereas the area earmarked for the railway yard was specifically set aside to allow alignment of the proposed railway yard with the existing mainline between Thabazimbi and Lephalale passing the power station along its southern boundary. The placement and alignment of the proposed infrastructure is therefore already considered optimal and therefore alternatives were not considered.
- The MPS was granted an Environmental Authorisation for construction and operation of the current ADF. An investigation was undertaken to identify an additional ADF site which would receive ash and gypsum (both type 3 wastes), and chemical salts and sludge from

the WWTP (Type 1 waste). However, this investigation was met with several site constraints relating to biodiversity and social flaws and as a result Eskom made a decision to apply for the long terms waste disposal site in a separate EA application process. There is consideration for a development of a regional waste management facility, in which there could be disposal, recycling, etc, and such can be developed by Eskom or a Third Party.

- This EA application therefore only considered the short-term waste disposal option of trucking chemical salts and sludge to a licenced waste disposal facility for the first 5 years of operation. However, in the event that an additional waste disposal facility to receive power station and FGD waste has not been developed before the estimated 5 year has passed, disposal of the chemical salts and sludge to a licenced waste disposal facility may continue, or an alternative facility contracted, until such time that a suitably licenced waste disposal facility has been constructed and operational to accept these waste streams.
- Temporary storage of FGD WWTP solid waste (salts and sludge) will be occur at a hazardous waste storage facility (identified by the purple outlined areas in **Figure 13-1**) within the Medupi Power Station footprint, designed and constructed according to specific requirements as stipulated in the Norms and Standards for the Storage of Waste, which will be removed by an accredited service provider to an approved waste disposal facility;
- It is understood that the demand for water in the region is high and with the expected growth of the local economy in Lephalale and influx of labourers, contractors and support services, the demand is expected to increase. Eskom has already been granted a water allocation from the MCWAP Phase 1 to operate the MPS fully including the operation of 3 of the 6 FGD absorber units. Furthermore, Eskom has engaged the Department of Water and Sanitation (DWS) to provide the required water allocation from the MCWAP Phase 2A to operate the remaining 3 FGD absorber units.
- The MCWAP Phase 1 and 2 has been designed not only to supply water to Eskom for operation of the MPS, but also to ensure a supply of water to other industries such as mining, as well as a sufficient supply of potable water to the local municipality and communities in the district. Therefore, it should be noted that the water allocation granted to Eskom will not be in competition with the water demands from other water users in the region.
- The MPS, which is a dry-cooled power station, is furthermore designed and constructed to significantly reduce water consumption when compared to other wet-cooled power stations in the Eskom fleet. Although the operation of the FGD will result in an increased consumption of water due to the implementation of the wet FGD technology, it is estimated that even with the additional consumption of water by the wet FGD system, the MPS's water consumption will still be significantly less than that of wet-cooled power stations.
- Through the construction and operation of the MPS, Eskom has already established mechanisms to engage with communities that may be affected within the power station's zone of influence through existing forums such as the MPS Environmental Monitoring Committee (EMC) and other initiatives to make a difference in the lives of local residents.

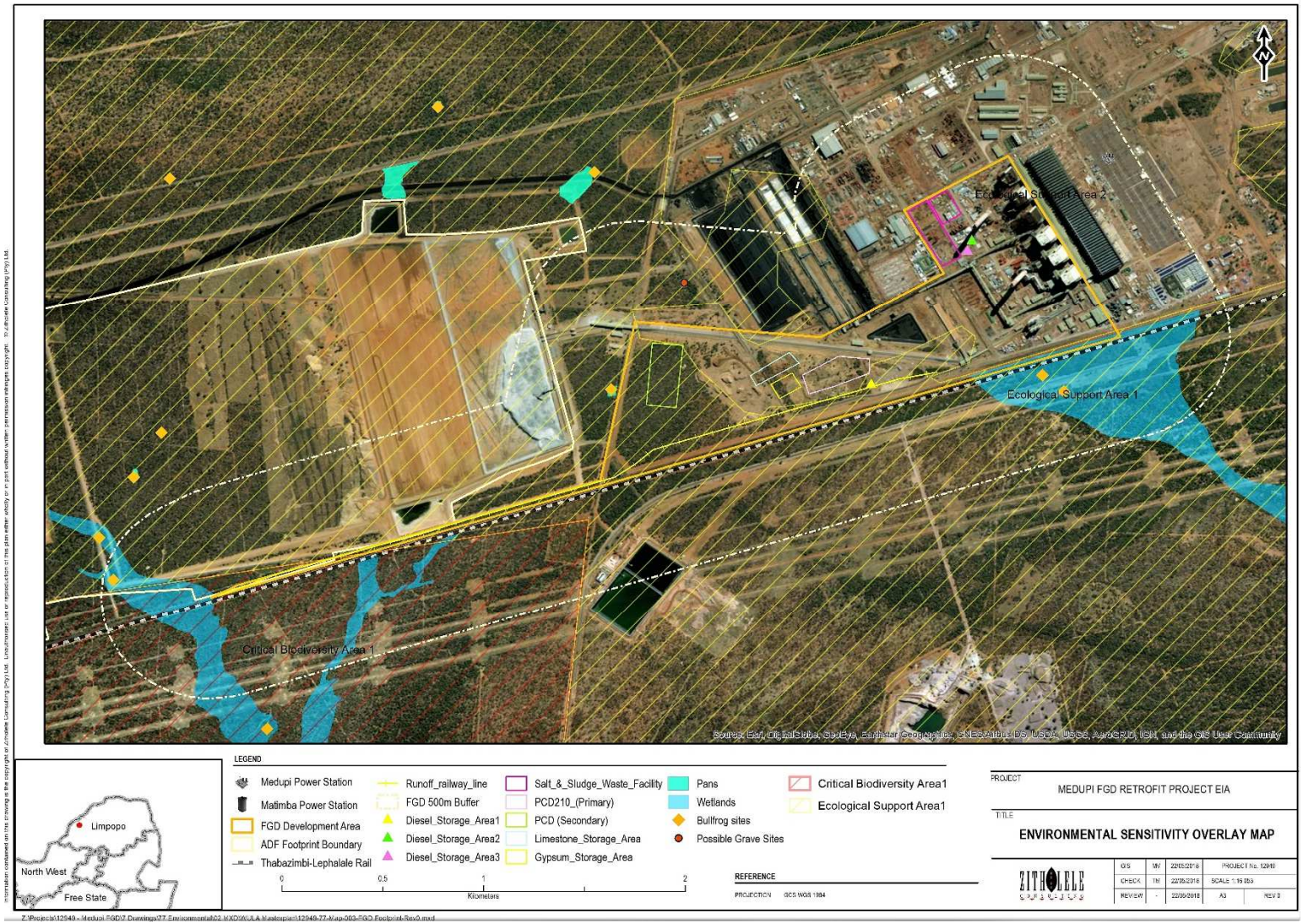

Figure 13-1: Environmental Sensitivity Overlay Map

13.2 Key findings

A summary of the key findings and conclusions reached by the specialists commissioning on this project include the following sections.

13.2.1 Geotechnical considerations

The geotechnical specialist concluded, based on available studies and specialist opinion compiled by the specialist, that **no significant geotechnical hazards or fatal flaws were identified within the study area**. Foundation designs for all infrastructure to be constructed at the FGD and railway yard areas is expected to require standard foundation design that does not require additional engineering specification. The only deep excavation that will be undertaken is an estimated 15m excavation for the limestone offloading facility (Tippler building). It is likely that ground water may be intersected, however the specialist concluded that all the geotechnical considerations mentioned can be mitigated in the design of the limestone offloading facility.

13.2.2 Soils and Land Capability

The key findings from the soils and land capability specialist indicate the impact of concern is loss of soil resources at the development site. No potential impacts on soils or land use were identified during the planning and pre-development phase. The specialist considered the loss of soil resources during the construction and operational phase and has concluded that with the implementation of proposed soil conservation plans included in **section 12.1,** and other proposed mitigation measures the **residual impact on soils would be Moderate to Low**.

The fact that the proposed development site is located within an already disturbed area has also contributed to the significance rating although existing and proposed mitigation measures need to continue to manage stockpiled soils for effective rehabilitation during the decommissioning phase.

13.2.3 Groundwater Resources

Key findings highlighted by the groundwater impact assessment are that groundwater levels are generally shallow, i.e. ~2m in some areas, with an average groundwater level of 30.4 mbgl. The hydrocensus water quality analyses concluded that the background groundwater quality at the MPS is Marginal (Class II) to Poor (Class III - IV) water quality, with exceedances of some constituents observed in some boreholes tested.

The specialist also concluded, based on the simplified groundwater risk assessment that trucking of type 1 waste to a licensed hazardous waste disposal site is effectively a positive impact on site since the hazardous waste is removed from site in a responsible manner and disposed of at a waste facility licenced for this purpose.

The groundwater impact assessment furthermore concluded that **residual impacts on groundwater quality, volume and flow** relating to the construction and operation of the FGD,

railway yard and associated infrastructure **shows an overwhelmingly Low impact significance** if proposed mitigation measures are implemented successfully.

13.2.4 Surface water

The surface water specialist raised an important consideration during the assessment of impacts on surface water quality, runoff and flooding. Since an existing impact is already occurring on site, a Storm Water Management System (SWMS) has been implemented on the development site. The surface water specialist concluded that the SWMS appears to be well operated and maintained, therefore the existing impact is rated as Low.

It is furthermore **unlikely that a significant reduction in surface water runoff will occur** due to the construction of the railway yard and FGD infrastructure within the MPS. The main reason for this is exactly the fact that the proposed infrastructure will be constructed within the MPS footprint. The existing SWMS will continue to ensure clean and dirty water separation, amongst other management measures, to avoid dirty water from entering the downstream water resources. Therefore, the likely impact on surface water runoff will be of Low significance.

The specialist further concluded that the **runoff around the facility in the clean areas is not markedly changed for the sub-catchment of the Sandloop**, resulting in a potential impact significance of low.

The surface water specialist also compiled a professional opinion to assess the likely impact of trucking salts and sludge to an off-site waste disposal facility. It was concluded that the **transportation of salts and sludge** from Medupi Power Station to an appropriately licensed existing hazardous waste facility outside of the study area **will not pose a serious threat to water resources in the region**.

13.2.5 Biodiversity (Terrestrial Ecology) and Wetlands

It must again be noted here that although the wetland specialist assessed potential impacts on wetlands resulting from the MPS and ADF, wetlands were largely impacted by the development of the ADF. **Impact on semi-ephemeral wash SEW 2 as a result of the FGD plant, railway yard, and associated infrastructure is expected to be minor** since the FGD infrastructure is situated within the footprint of the existing MPS, which means that engineering and mitigation management measures to manage dirty water runoff, erosion, for example, is pre-existing at the proposed site, thereby reducing impacts on the receiving environment outside the MPS footprint.

A key finding of the biodiversity and wetlands specialists relate to the **potential loss of vegetation species, habitat and fauna mortality during** the construction. It was concluded that after successful implementation of the proposed mitigation measures, such as rehabilitation of downstream wetlands and pans, and proposed offsets, the cumulative impact significance could be reduced with **the residual impact being reduced to Moderate or Low significance**.

Another prominent impact feature that was identified during the construction phase is the loss of catchment area contributing to storm water runoff, increased flood peaks and pollution through contaminated runoff. The specialist concluded that **impacts related to pollution run-off and increased flood peaks can be mitigated to Moderate to Low** impact significance levels.

It must lastly by taken into account that the specialist has assessed impacts to the identified wetlands in relation to the Mining and Biodiversity Guidelines (MBG), and FEPA guidelines as it relates to mining activity, and recommended that a 1km buffer on around all FEPA listed systems is enforced. The operation of a power station can certainly not be considered mining operations and it is therefore concluded that the specialist has inappropriately linked the ash disposal facilities to mining classifying the ADF as a "residue stockpile", and therefore that the MBG's are applicable. In terms of the NEMWA, as amended, the definition of "*residue stockpile*" is "*any debris, discard, tailings, slimes, screening, slurry, waste rock, foundry sand, mineral processing plant waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated within the mining area for potential reuse, or which is disposed of, by the holder of a mining right, mining permit or, production right or an old order right, including historic mines and dumps created before implementation of this Act.*" When considering this definition it becomes clear that the following conditions must be true:

1. ash must be derived or incidental to a mining operation, **and**
2. ash must be stockpiled, stored or accumulated within the mining area,
3. by the holder of a mining right, mining permit or, production right

This is not the case for ash generated from a power station, therefore the recommendations of a 1km buffer area around FEPA wetlands should not be seen as definite. The EAP proposes that the 500m buffer as per the NWA is acceptable in this case and should be the guideline against which encroachment into the wetland buffer area should be considered.

13.2.6 Air quality

The air quality specialist assessed potential air quality impacts relating to the implementation of the FGD during the operational phase. Other possible impacts resulting from the construction phase, e.g. dust nuisance, were regarded as negligible and was expected not to exceed current air quality levels.

The specialist concluded that cumulative **SO_2 concentrations would reduce significantly** with the implementation of the FGD system, with no exceedances of the NAAQS at sensitive receptors, **resulting in an impact significance of Low**. Furthermore, continuing operation of the power station until such time the FGD infrastructure is installed and operational will not result in exceedances of the current minimum emissions standards in force.

The air quality specialist furthermore concluded that **no exceedances of the NAAQS for NO_2, PM_{10} and $PM_{2.5}$** resulted from simulations run at sensitive receptors also **resulting in Low impact significance**.

13.2.7 Noise

The impact assessment undertaken by the noise specialist rated **impact on ambient noise levels during the planning and operational phases as low**. The specialist concluded that during these phases the noise levels in the area are representative of suburban districts. The specialist also found that construction and decommissioning activities would result in a **Moderate noise impact, but with noise levels remaining local yet still notable**.

The specialist therefore concluded that in the quantification of noise emissions and simulation of noise levels as a result of the proposed project, it was calculated that **ambient noise evaluation criteria for human receptors will not be exceeded at NSRs**.

The impacts on ambient noise levels through all phases of the proposed development therefore resulted in overwhelmingly Low impact significance.

13.2.8 Social

A social specialist undertook an extensive impact assessment of the proposed FGD retrofit project on local communities and social aspects characteristic of the Lephalale area. All **impacts identified during the Operational and Decommissioning Phases were considered positive impacts**, whereas half of the impacts identified during the construction phase are positive impacts on the surrounding community.

During the Planning / Pre-construction Phase the establishment of spin-off businesses, e.g. B&Bs, to support the construction phase of the Medupi FGD and railway yard was identified as a **positive impact that could contribute to the local economy and employment opportunities**.

Positive impacts associated with the Construction Phase of the FGD, railway yard and associated infrastructure **revolve around economic and employment opportunities** as well as upgrading of infrastructure such as local roads.

The social specialist therefore concluded that the **significance of positive social impacts generally exceeds the significance of negative social impacts** in the implementation of the FGD system and the railway siding throughout all four stages of the project.

13.2.9 Heritage, Archaeology and Palaeontology

The Heritage and Palaeontological Impact Assessments did not identify any heritage, archaeological or palaeontological resources within the proposed development footprint for the FGD infrastructure, railway yard and associated infrastructure. Therefore **no impacts exist that may have a detrimental impact on any heritage, archaeological or palaeontological resources.**

13.2.10 **Traffic**

During assessment of the impact impacts, the specialist concluded that by implementing proposed upgrades at major intersections, the **Level of Service (LOS) would be increased** from LOS F, which equates to relatively long delays at intersections, to at least a LOS of B or A, indicating short stoppage times at intersections.

No impacts on the road network were anticipated during the Planning / Pre-construction phase, and as a result no impact rating for this phase was determined.

Furthermore, it is concluded that **all identified impacts were regarded as low once the proposed mitigation measures has been implemented**.

13.3 Summary of impacts and risks

The Environmental Impact Statement provides an account of the key findings of the EIA. Based on the significance ratings assigned to the anticipated environmental impacts, the EAP makes the following conclusions relating to impacts and risks:

- Potential impacts on geotechnical aspects, noise levels, heritage, archaeology, palaeontology, and traffic are minor and can successfully be mitigated to acceptable levels with proposed mitigation.
- Assessment of the proposed air quality impacts has demonstrated what was anticipated, i.e. that implementation of the FGD system would significantly reduce the SO_2 emissions at the MPS to very low levels. However, within the MPS operations the Wet FGD system will consume more water than the alternative technologies considered. The increased water demand from the Wet FGD system is offset by a water allocation from MCWAP Phase 1 and 2.
- The potential impact on local communities and social aspects is an overwhelmingly positive impact. Reduction of SO_2 levels is the primary positive impact that will result in better quality of life for residents in the region. Additionally, indirect positive impacts resulting from growth in the local economy and greater employment opportunities will be significant.
- Overall the impact of the installation of the FGD system, railway yard and associated infrastructure will have a Moderate to High impact on the local biodiversity, and to a lesser degree, wetlands in close proximity to the FGD. Although loss to intact vegetation types and habitat will be permanent for the life of the power station, impacts on fauna can be mitigated to more successfully to a greater extent.

14 REASONED OPINION OF THE EAP

During preparation of the reasoned opinion by the EAP for impacts associated with the proposed construction of the FGD complex, railway yard and all associated infrastructure, the following aspects were strongly considered:

1. The MPS is currently under construction with 3 of the 6 generation units already synchronised and operational.

2. The MPS was designed and constructed to incorporate wet FGD technology through a retrofit process. The available footprint for the FGD structure is therefore aligned with the existing infrastructure layout of the MPS and changes in technology will result in structural changes to the existing infrastructure.

3. The footprint of the railway yard was also reserved specifically to align with the existing rail infrastructure and MPS infrastructure layout to ensure ease of integration later on.

4. The MPS already has management and mitigation measures installed, whether it is optimised design and construction or the implementation of specific mitigation measures emanating from the original environmental authorisation. Assurance, to a large degree, already exists that additional impacts that may arise due to the FGD system and railway yard will also be managed within the existing management system.

5. All identified impacts relating to geotechnical conditions, soils and land capability, groundwater surface water resources, noise, social, heritage resources and traffic are largely of Low impact significance or has a positive impact, given that proposed mitigation measures are implemented successfully.

6. The positive impacts of the FGD system on the quality of life, economic and employment opportunities for local communities resulting from the operation of the MPS with FGD needs specific consideration.

7. It is acknowledged that impacts on biodiversity and existing wetlands are Moderate to High, and therefore stringent mitigation measures must be implemented to offset these impacts. The EAP further believes that the fact that the construction of the FGD system, railway yard and associated infrastructure within the existing MPS footprint, which is zoned for industrial activity, contribute to a large degree in the mitigation of identified impacts. The management of impacts from this infrastructure will be undertaken within the framework of an existing Environmental Management System further contribute to prioritise the mitigation of any significant impacts on the surrounding biodiversity and wetlands.

8. The high demand for water within a water stressed catchment is further acknowledged. It is expected that the demand for water will only increase with the increase in local economic development and influx of employers, labourers and businesses. These facts must however be considered in the light of the implementation of the MCWAP

Phase 1 and development of MCWAP Phase 2 that has been commissioned by the DWS specifically to bring different qualities of water to the region to secure water in the long term for household use and human consumption, agricultural uses, as well as to support industrial activities such as the MPS, mines in the region and other industrial activities. It must also be considered that the MPS was designed as a dry-cooled power station specifically to operate sustainably within a water stressed environment, even with the operation of wet FGD technology.

9. Ultimately, when considering the No-Go option, that if the FGD system is not installed, the MPS will not obtain compliance with its AEL conditions and funder requirements, and as a result will likely have to stop operation, the expected negative impact on the supply of electricity, economic growth and extensive economic benefits the No-Go option will approach a fatally flawed impact significance.

Therefore, taking all the aforementioned considerations into account it is the reasoned opinion of the EAP that the negative impacts associated with impacts on biodiversity and wetlands can be successfully mitigated to within acceptable levels, with the development contributing to the overwhelming positive impacts associated with the reduction in SO_2, significant benefits to the local economy and quality of life for local residents, **the proposed activities be authorised**.

The EAP recommends the following general conditions to be included:

- Environmental authorisation (EA) will be subject to the implementation of mitigation measures and conditions stipulated within the EMPr and this Environmental Impact Report.
- Construction must commence within a period of 5 years
- EA will be valid for the life of the Medupi Power Station, subject to revisions and amendments through legislated procedures as the need arise.
- Eskom must continue to investigate water saving measures for the Medupi Power Station.
- Eskom must continue to investigate mechanisms for waste reduction or minimisation, especially relating to the re-use of ash and gypsum. This has the potential to unlock further economic benefits for local communities living near power stations.

<u>The DEA Director: Biodiversity Conservation furthermore recommended the following conditions explicitly to be included as specific conditions in the Environmental Authorisation (EA):</u>

- <u>All wetlands areas must be avoided by the development activities, including a suitable buffer zone to avoid impacts on these water courses;</u>
- <u>Harvest of hill wash material must be prohibited within 100m of the delineated edge of all identified depressions and semi-arid ephemeral wash wetlands and within 500m radial buffer of the identified bullfrog breeding site;</u>

- A pre- and post-construction alien and invasive control, monitoring and eradication programme must be implemented along with an on-going programme to ensure persistence of indigenous species;
- Rehabilitation work must be done during low rainfall seasons and soil compaction should be prevented as far as possible;
- Alien invasive plant species in and around the road reserve must be removed in terms of Conservation of Agricultural Resources Act (CARA), and follow-up actions for at least 5 years need to take place; and
- All re-vegetation must be done with local indigenous plant species as specified by the Provincial Co-ordinator and/or Wetland Ecologist.

These conditions have furthermore been incorporated into the Environmental Management Programme (EMPr) for the Medupi FGD Retrofit Project.

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