# 4 PROJECT DESCRIPTION

## 4.1 Introduction

Eskom, as South Africa's public electricity utility, generates, transmits and distributes electricity throughout South Africa. Eskom's principal generation technology is pulverised coal with approximately 90% of its current generating capacity lying in coal-fired power stations. One such power station is the Tutuka Power Station (hereafter referred to as "Tutuka"), a coal fired power generation facility commissioned between 1985 and 1990.

Tutuka Power Station is located 25 km north-north-east of Standerton in the province of Mpumalanga. Tutuka currently disposes of its ash in a dry (20% moisture content) form by means of conveyors, spreader and a stacker system from the station terrace to the ash disposal site. According to Eskom's plans, the complete ash disposal site would eventually cover an area of 2 500 ha (Existing & Remaining ash disposal site & pollution control canals) and is located approximately 4.5 km east of the station terrace. **Figure 4.1** provides an overview of the process to show where the ash disposal activities fit within the power generation process.

With the promulgation of the environmental laws, and the National Environmental Management Waste Act, NEMWA, Act 59 of 2008, in particular, Eskom would like to pro-actively align its continued ashing activities, with the requirements of the NEMWA waste licensing processes.

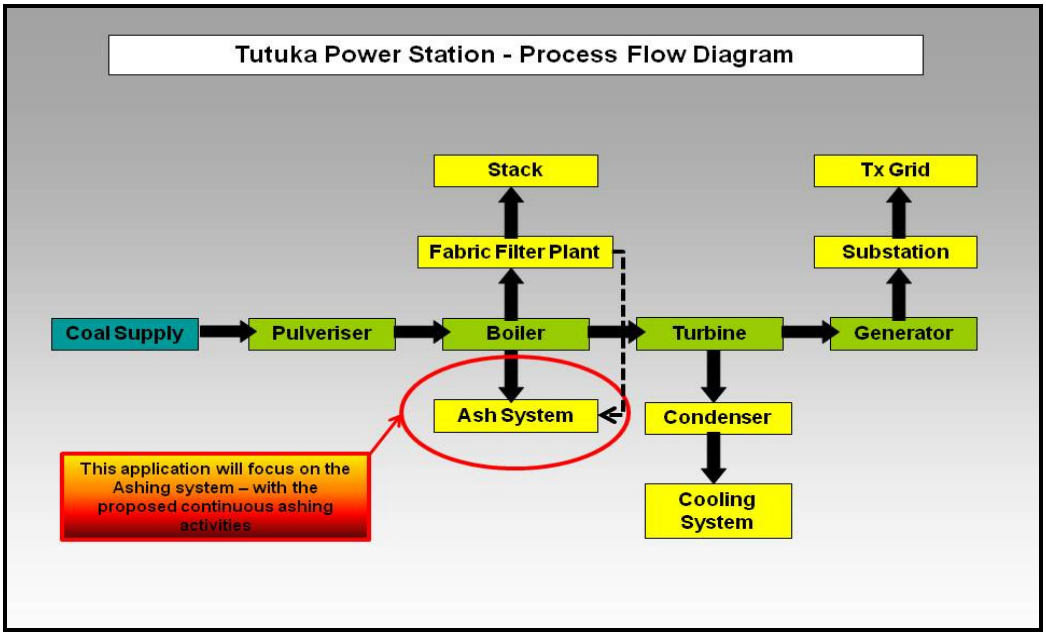


**Figure 4.1**: An overview of the activities on site and where this project fits within the power generation process

## 4.2 Location of the Proposed Site for Expansion

Tutuka Power Station is located approximately 25 km north-north-east (NNE) of Standerton in the Mpumalanga Province. The power station falls within the Lekwa Local Municipality which falls within the Gert Sibande District Municipality.

The study area is within an 8 km radius from the source of the ash, at Tutuka Power Station Site, and is made up of agricultural, mining and power generation activities. (**Figure 4.2** and **4.3**).

**Figure 4.2:** Tutuka Power Station forms the centre point of the study area

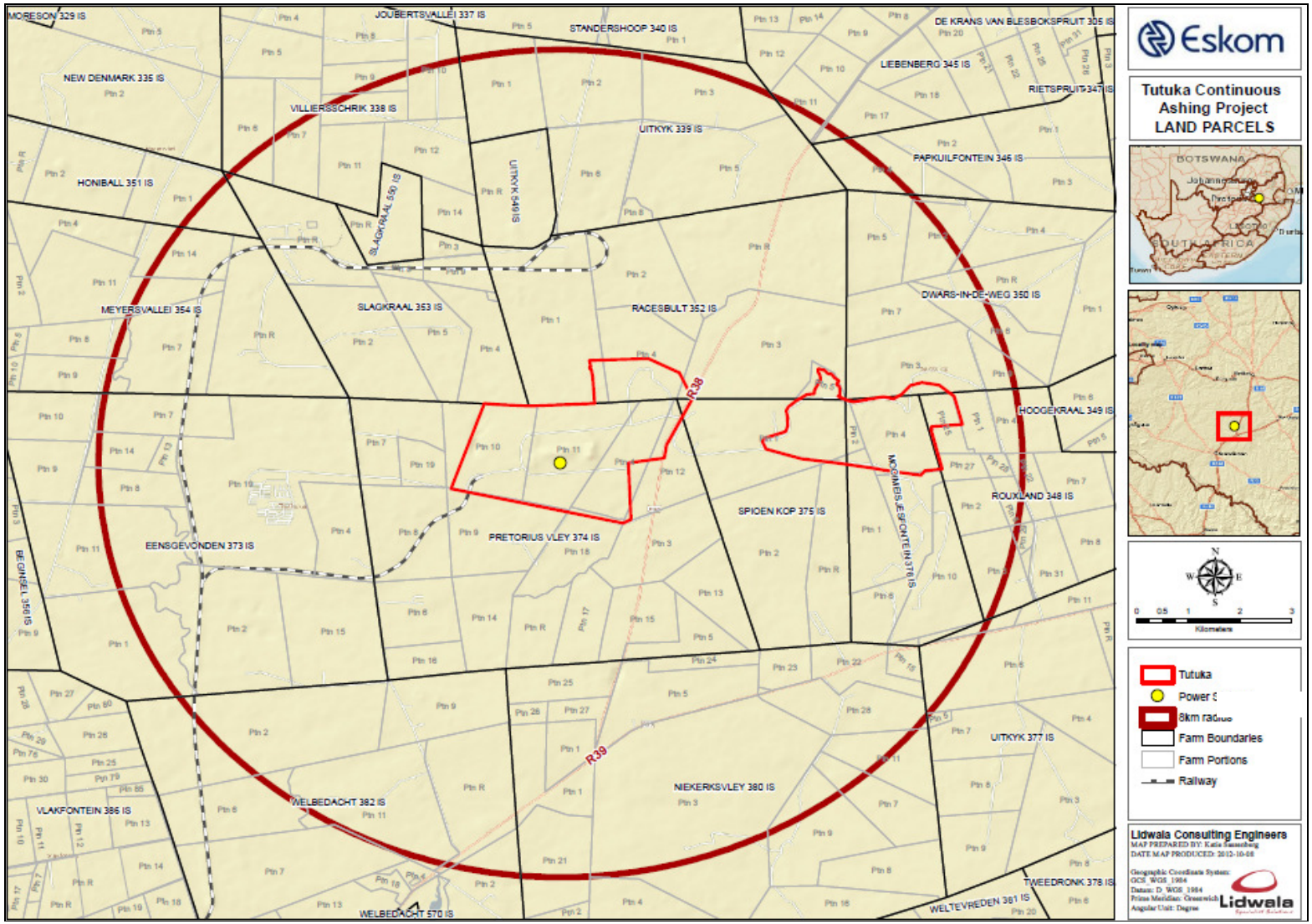


**Figure 4.3**: The study area overlaid onto a topographical map background

## 4.3 Detailed Description of the Project

The project involves the proposed continuous disposal of ash by the Tutuka Power Station in the Mpumalanga Province.

The coal-fired power generation process results in large quantities of ash as a by-product of coal combustion, which is disposed of at an ash disposal facility on Eskom's land. The station will continue to use dry methods of ash disposal.

The ash disposal process will involve ash being transported (in a semi dry state – 20% to 30% moisture content) from the power station terrace to the ash disposal facility. The method of disposing the ash is by means of a stacker system supplemented by a spreader (**Figure 4.4**).

Throughout the ashing process, ash will be handled in two independent phases, handling ash on terrace to a centralised loading system at a transfer house. The ash overland conveyor transfers the material off terrace to the ash disposal facility.

**Figure 4.4:** Stacker being used to dispose of ash at the Tutuka Power Station

The ash disposal facility structure consists of three layers of ash, at two levels or tiers (upper and lower tier):

- A stabilising layer of ash, at an average of 15m above natural ground creating the first ash stacker level (Lower tier).
- A volume of ash varying from 15 m to 45 m placed above the first tier forms the second ash stacker level (Upper tier).
- A final back stack layer of 12m is placed above the second tier.

The waste product is deposited onto the disposal site by means of a stacker, which handles some 85% of the total ash whilst the remaining 15% is placed by a standby spreader system. The ash is disposed by two stacker methods, the parallel frontstacking method and the Radial frontstacking method:

Parallel Frontstacking method

- The stackers drive east and west along a shiftable conveyor
- Ash is stacked in parallel lines over the crest of the previous frontstack overlapping the crest by approximately 1 meter
- The ash is stacked on top of the previous frontstack surface to a cone height of between 2 and 4 meters
- The stacker continues to stack until the crest is out of reach
- A bulldozer is used to flatten and doze the ash over the crest

Radial Frontstacking method

- The ash is stacked ahead of stacker in semi circles over the crest of the previous frontstack and must overlap the previous crest by approximately 1 meter
- This overlapping provides a practical working area
- The ash is stacked on top of previous frontstack surface to a cone height of between 2 and 4 meters
- The 2 meter high cone is a minimum to prevent "soft" spots forming in the frontstack surface
- The 4 meter high cone is the maximum to prevent over bulldozing, reducing bulldozing efficiency
- The bulldozer is used to flatten and doze the ash over the crest.

The ash disposal facility will have surface runoff water systems (drains and pollution control dams) in place for the construction, operation and decommissioning of the facility. Surface water is divided into clean and dirty water which are handled differently.

Clean water is water that has not come into contact with the ash and/or station operational area, such water is used for irrigation purposes and re-use in the power station. The clean water system consists of a series of stormwater cut-off drains, diversion bunds, berm penstocks and clean water dams. The stormwater drains divert the clean water into the clean water dams where the water is used as mentioned above. It is assumed that the extension to the existing facility will make use of similar infrastructure. For further details on the specific infrastructure for the project, please refer to the Conceptual Design report (**Appendix C**).

All clean water is prevented from entering the settling basin and dirty water dam by a series of stormwater cut-off drains.

Dirty water is surface water runoff from exposed ash surfaces, seepage from the ash facility and power station operational area. This water is only suitable for dust suppression on exposed ash surfaces and is not allowed to discharge into natural water courses.

The dirty water system consists of a series of dirty water cut-off drains, a dirty water pipeline, settling basin and dirty water dam. Runoff from the exposed ash surfaces is transported to a settling basin and dirty water dam by means of buried concrete pipe with manholes for flushing and inspection purposes. The dirty water settling basin where the ash residues settle and then is released back to the dirty water dam.

The dust suppresion is managed by using water from the dirty water dams to dust suppress, irrigate and rehabilitate exposed surfaces of the ash disposal facility.

Ground preparation for ash disposal advancement will include stripping of topsoil in front of the activities, and trucking and placing the soil on top of the final disposal facility height (50 mm thick), as a rehabilitation means. Following this process, grass will then be planted in this top soil.

The proposed continuous development, is an ash disposal facility with the following specifications:

- Capacity of airspace ~158million $m^3$; and
- Ground footprint of ~800Ha (Ash disposal facility & pollution control canals)

### 4.4 Associated Infrastructure

The existing ash disposal facility has the required dirty and clean water channels and the clean storm water flows to the north and south clean water dams. The dirty water flows to the south settling dam and then to the south dirty water dam. Facilities for the continuous ashing activities will also require this infrastructure (**Appendix C**) for the proposed infrastructure. The power station also requires the expansion / upgrade of their existing emergency ashing area called TT02.

### *4.4.1 Upgrade of Emergency Ashing Area (TT02)*

During times where it is not possible to transport ash to the ash disposal facility, Tutuka makes use of an emergency ashing area called TT02 (**Figure 4.5**). Possible reasons for not being able to transport ash to the disposal facility include the loss of the ash conveyor system and challenges in the ash plant. Currently, the amount of ash that is off loaded during emergency offloading far exceeds the capacity of the existing footprint, due to deterioration in quality of coal received by the station and also prolonged out of service ash conveying system due to plant break-downs.


**Figure 4.5:** The location of the existing emergency ashing area (TT02) within the Tutuka Power Station Terrace area. The figure also shows the proposed extension of the facility.

- ***TT02 Operating Philosophy***

TT02 was designed to only be used as a temporary storage facility for emergency ashing for 7 days. The average ash production rate per day is 13 500 tons and the storage needed at the emergency offloading area is 94 500 m3. This foot print (20 785 m2) was measured during actual emergency ashing occurrences, which took place in the past.

Ash is fed to the overland conveyors via the cross conveyor which receives ash from the transverse conveyors. When the ash conveyor system is offline the ash is temporarily stored at TT02 until the problematic elements in the ash plant or conveyor system comes back online and can continue sending ash to the ash disposal facility. A front end loader

moves the ash that has been collected under the head of the cross conveyor to the back of TT02 and works its way towards the overland conveyors. If the emergency ashing facility becomes full and if the overland conveyors are still offline ash is loaded onto 10 ton trucks which transport the ash to the ash disposal facility. This is a practice Eskom has committed to minimising. If the overland conveyors are online then ash is loaded onto an emergency ash feeder which loads the ash onto the overland conveyors.

TT02 also has two sumps which are used to collect dirty water. The dirty water collects in the sumps with any run off ash. The ash settles and the water flows into a clean compartment via a series of drains. A pump in the clean water compartment pumps the water to stations drains.

- ***Proposed TT02 operations for extension of emergency ashing facility***

  The operations of TT02 have not changed, however, the area to be utilised will be increased.

- ***Scope of Work***

  The following work has been identified as required for the upgrade of the emergency ashing area (TT02)

  - Design of the increased area required at TT02 such that there is sufficient space for front end loaders to manoeuvre comfortably around the site;
  - All civil works related to increasing the size of TT02 from 1 880$m^2$ to 20 785$m^2$ (foundation works, installation of steel reinforcement, pouring of concrete slab, channels, silt traps etc.);
  - Provision of a 3 meter high bund / wall to prevent ash from spilling over from TT02 into the surrounding areas. The geotechnical properties of the ash must be considered so as to avoid a scenario where a 15m high ash heap fails. It is imperative that ash must not come into contact with or contaminate the surrounding areas;
  - Provision of drainage to channel any contaminated water to an additional silt trap;
  - Provision of a silt trap in order to collect the contaminated water and remove it to the station's dirty water drains and to remove settled ash
  - Locating of any above ground or sub terrain services (such as pipes, electrical cabling etc.) so as not to damage them; The existing pipes and power cables, above and below ground level should be rerouted to make sure that these services are not below the emergency ashing area.

- Rerouting any of the identified services, as necessary; and the
- Removal of any unnecessary old fencing on the south side of this site as well as the installation of new fencing as required.

### *4.4.2 Transitional arrangements for Class C barrier system on ash disposal facility (Eskom motivation)*

The current ash disposal facility grows in the eastern direction, where the main stacker system is shifted to the next position every 6 months. The last shift was in July 2014 and the next shift would be in January 2015. This process is repeated two times in a year. The main dump is growing by 80 meters every year, where the shift distance is 40 meters at a time. Through these shifting's Eskom covers the remaining landscape in front of the ash disposal facility at a rate of 80 meters per year. The face width of this main disposal facility face is about 1300 meters and the front face height is about 32 meters. The main disposal facility is in operation for about 85% of the time every year. The current main ash disposal facility would run out of space in 2025.

The standby ash disposal facility is also growing in the eastern direction at a rate of 240 meters and its face width is about 100 meters. The height of this face is about 35 meters. This standby ash disposal facility is covering the front landscape at a rate of 240 meters every year. The standby ash disposal facility is in operation for the remaining 15% of the time when the main ash disposal facility system is not available. The standby ash disposal facility's remaining volume is much smaller than the main ash disposal facility and hence this standby ash disposal facility would run out of space in 2018.

The original SRK ash dump design (basically the same as the Demcotech design, within the EIA Alternative A), makes allowance for ash disposal facility Phase One area and also ash disposal Phase Two area. The station is currently using the Phase One area. With the higher ash production rate and the extension of the power station life, it would be required to explore the Phase Two area sooner and to have enough ash stacking space up to 2055. Tutuka has already covered about three quarters of the Phase One area. Due the small size of the remaining space in Phase One, Eskom submits that there is no material benefit to accrue by installing a **Class C** liner for the last remaining quarter remaining landscape area of Phase One (Existing Facility) please refer to **Figure 4.6**.

Eskom proposed to start using the **Class C** liner for the Phase Two area, which is the southern landscape (also called the phase two according to the original SRK design). This Phase Two area is new and no ash has been placed on this area.

In terms of timelines and milestones for installation of the Class C liner, the following is predicted:

- The ash disposal facility stability study and design should be complete by 28/02/2017;
- The scope of design work should be complete in 30/08/2017;
- The construction for the new ash disposal facility on the southern area should start at about 01/07/2019 after the tender process and the tender adjudication process; and
- The new ash dump should be in operation from December 2020.

As a result of the above engineering, administrative and construction processes that needs to be completed following the Authorisation, and the timeframes associated with these, Eskom would like to motivate for a transitional period to be granted as far as the implementation of the **Class C** barrier system is concerned, until 31 December 2020. Eskom would then use the current stacking process without a liner for the remaining area on the eastern side of the current ash disposal facility.

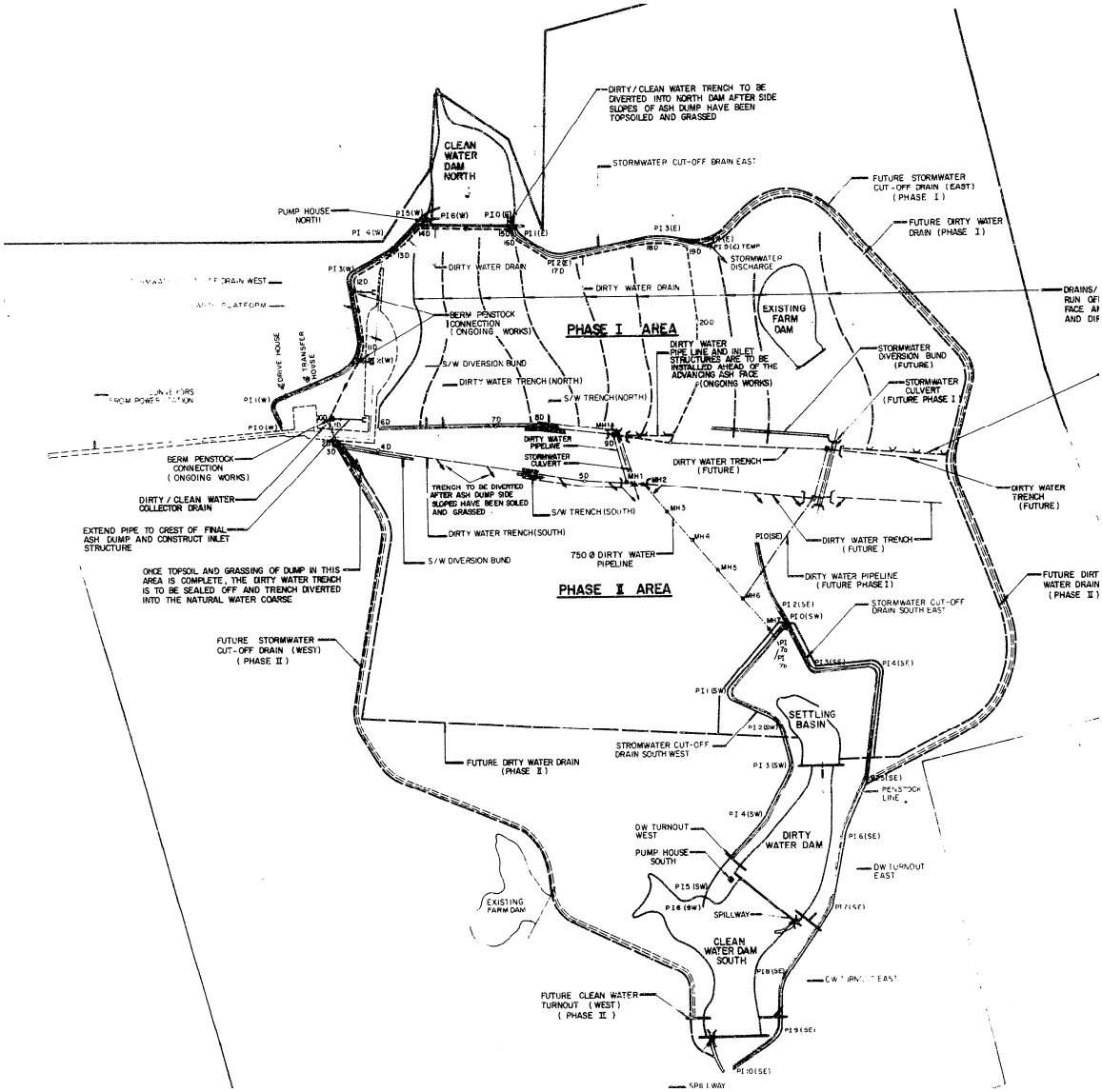


**Figure 4.6** Indicating the phases of the proposed Facility