7 PROJECT ALTERNATIVES

7.1 Introduction

In terms of the EIA Regulations published in Government Notice R543 of 2 August 2010 in terms of Section 24 of the National Environmental Management Act (Act No. 107 of 1998), feasible and reasonable alternatives have to be considered within the Environmental Scoping Study, including the 'No Go' option. All identified, feasible and reasonable alternatives are required to be identified in terms of social, biophysical, economic and technical factors.

A key challenge of the EIA process is the consideration of alternatives[1]. Most guidelines use terms such as 'reasonable', 'practicable', 'feasible' or 'viable' to define the range of alternatives that should be considered. Essentially there are two types of alternatives:

- incrementally different (modifications) alternatives to the Project; and
- fundamentally (totally) different alternatives to the Project.

Fundamentally different alternatives are usually assessed at a strategic level, and EIA practitioners recognise the limitations of project-specific EIAs to address fundamentally different alternatives.

7.2 The 'no go' alternative

The 'no go' alternative is the option of not proceeding with the continuous ashing project at Tutuka Power Station.

Eskom's core business is the generation, transmission and distribution of electricity throughout South Africa. Electricity by its nature cannot be stored and must be used as it is generated. Therefore electricity is generated according to supply-demand requirements. The reliable provision of electricity by Eskom is critical to industrial development and poverty alleviation in the country.

Tutuka Power Station envisages the continuation of dry ash disposal. As part of its planning processes, Eskom developed designs which were approved internally, before the commencement of environmental laws. With the promulgation of the environmental laws, and the National Environmental Management Waste Act, Act 59 of 2008, in particular, Eskom would like to pro-actively align its continued ashing activities with the requirements of the waste licensing processes.

[1] In terms of the EIA Regulations published in Government Notice R543 of 2 August 2010 in terms of Section 24 (5) of the National Environmental Management Act (Act No. 107 of 1998), the definition of "alternatives" in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity which may include alternatives to: (a) the property on which or location where it is proposed to undertake the activity; (b) the type of activity to be undertaken; (c) the design or layout of the activity; (d) the technology to be used in the activity; (e) the operational aspects of the activity and (f) the option of not implementing the activity.

The need for this project is to allow Tutuka Power Station to continue ashing in an environmentally responsible and legally compliant manner for the duration of the operating life of the power station.

In the event that the continuous ashing project does not proceed either the power station will run out of land to legally dispose of its ash and the power station will ultimately be required to close down, which would contribute negatively to the provision of reliable base load power to the national grid, and the country's developmental plans.

Even though the no-go alternative is considered to be unfeasible, the 'no go' alternative was still b investigated further in the EIA phase as an alternative as required by the EIA Regulations.

7.3 Technical Alternatives

The coal-fired power generation process results in large quantities of ash, which is disposed of in an ash disposal facility. Generally, Eskom has access to, and uses, coal of a low grade (called middlings coal) which produces a larger mass of ash during combustion. Over time, the quality of the coal provided to Eskom has degraded, due to higher ash quantities in the coal. The Tutuka Power Station utilises a dry ashing disposal method.

The waste product is transported to the disposal site by conveyor belts, and 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, in Current operation.

As the ash disposal advances, the topsoil is stripped ahead of the activities, stockpiled and is taken by truck and placed on top of the final ash disposal facility height. Grass is then planted in this top soil for rehabilitation.

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.

Due to the fact that Tutuka Power Station utilises dry ashing disposal method, it is considered reasonable that in order to continue ashing a dry ashing method should still be utilised in order to avoid a very costly re-design of the entire Power Station.

A further technical alternative to limit the need for ash disposal facilities includes the use of higher grade coal which would reduce the amount of ash produced in the power generation process. The boilers are designed to use a specific grade of coal and the boiler plant would require a redesign for higher grade coal. In order for this alternative to be implemented would require the complete redesign and reconstruction of the power station. The combination of the costs involved in the reconstruction of the power station as well as the higher price of the

higher grade coal would have a knock on effect on the country's electricity prices. Therefore, this alternative is not considered feasible.

7.4 Location Alternatives

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

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

In order to allow for a robust environmental process, all land within a radius of 8 km was assessed in order to identify potential alternatives sites. The Tutuka Continuous Ashing EIA Secondary Study Area therefore comprises an 8 km radius around the source of ash at Tutuka Power Station (**Figure 7.1**).

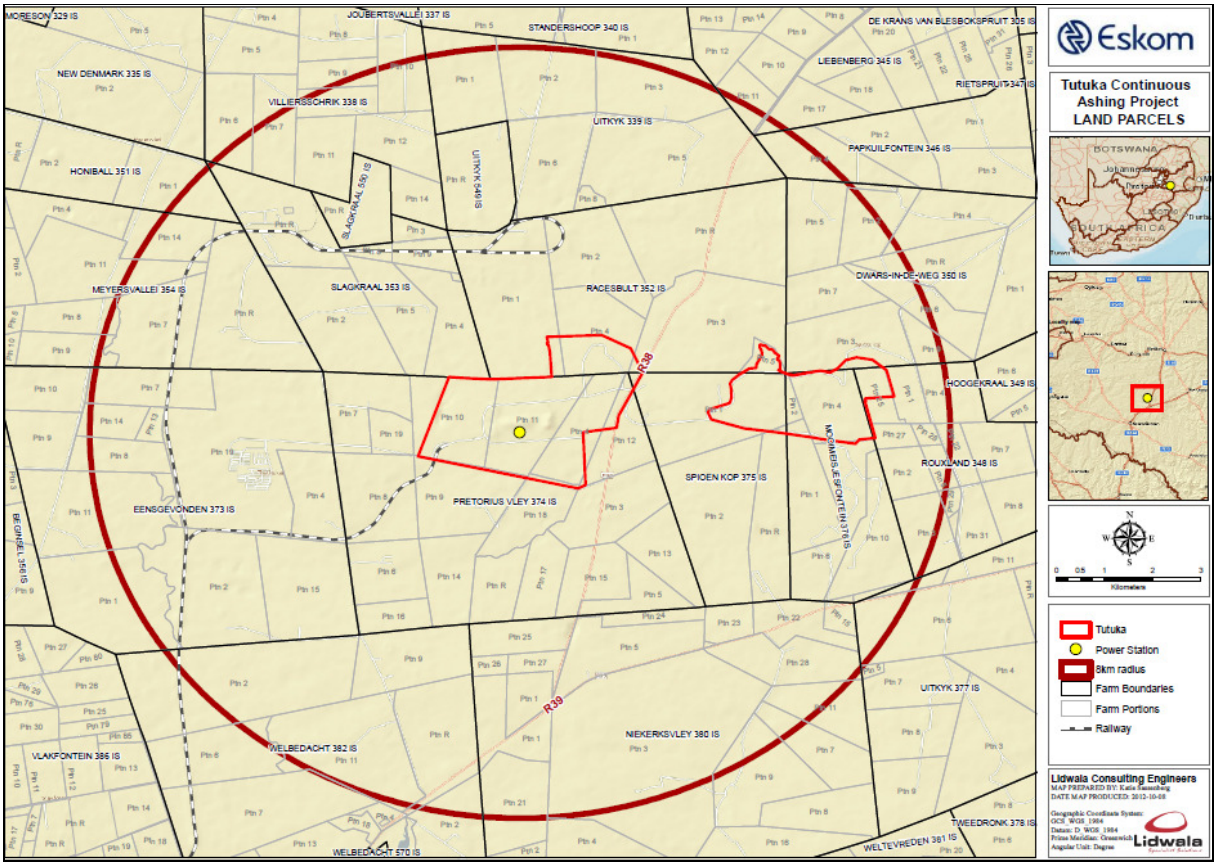

Figure 7.1: Proposed Secondary Study Area within which alternative sites were to be identified.

7.4.1 Screening Analysis and Methodology

A screening study was initiated in order to assess where potential alternative sites are located within the study area that would be suitable for use for the proposed continuous ashing project. The study area was demarcated using an 8 km radius around Tutuka Power Station.

In order to ensure that sites are identified in the most objective manner possible, a sensitivity mapping exercise was undertaken for the study area. The purpose of such an exercise was to identify suitable areas within the study area that could accommodate the proposed ash disposal facility and associated infrastructure and to pro-actively identify sensitive areas (i.e. fatal flaws) that should be avoided.

- ***Sensitivity Mapping***

The qualitative sensitivity mapping exercise divided the study area into three categories *viz.* lower, medium and higher sensitivity areas. A sensitivity map for the study area was requested from each of the following specialist fields:

Biophysical
- Biodiversity (Fauna and Flora)
- Surface Water
- Groundwater
- Avifauna
- Agricultural Potential

Social
- Social (including Visual)
- Air Quality
- Noise

Please refer to the detailed description in the Tutuka Continues Ash Disposal facility Scoping Report (Lidwala, 2012).

- ***GIS Layer Amalgamation and Sensitivity Indice Calculation***

In order to calculate a combined sensitivity rating for the study area, all the GIS layers received from each specialist area of study (e.g. ground water, biosensitivity etc) were combined to form one integrated layer (**Figure 7.2**). During this integration, string arrays were built containing information on the layer name, the assigned sensitivity rating for each particular area and the adjustment factor for the particular layer.

The presented maps were then created by reclassifying each logic result into five classes, namely:

- low sensitivity (green),
- low-medium sensitivity (light-green)
- medium sensitivity (yellow)
- medium-high (orange)
- high sensitivity (red).

Finally, the reclassified layer was clipped with the pre-determined no-go areas layer (to remove them from consideration – **Figure 7.3**) and further clipped with the 8km radius study area buffer to remove any extraneous features.

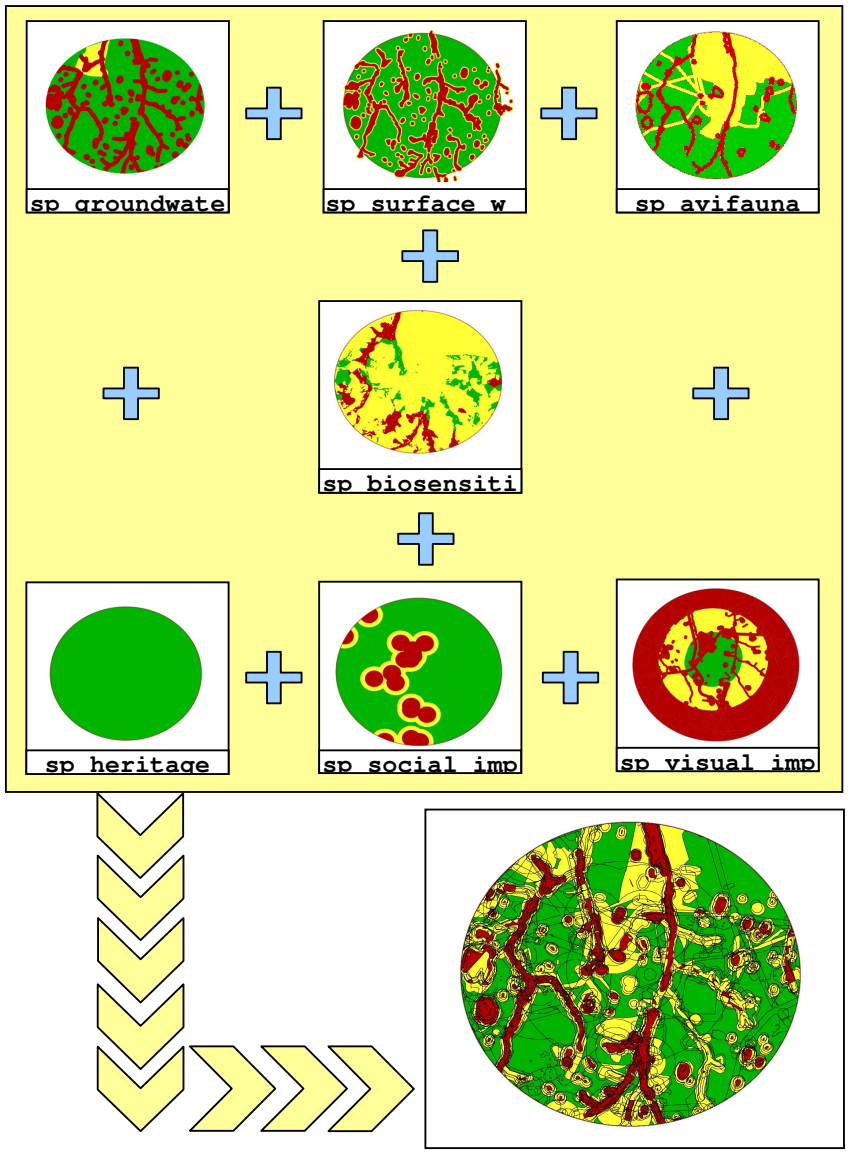

Figure 7.2: An example of typical layer integration process

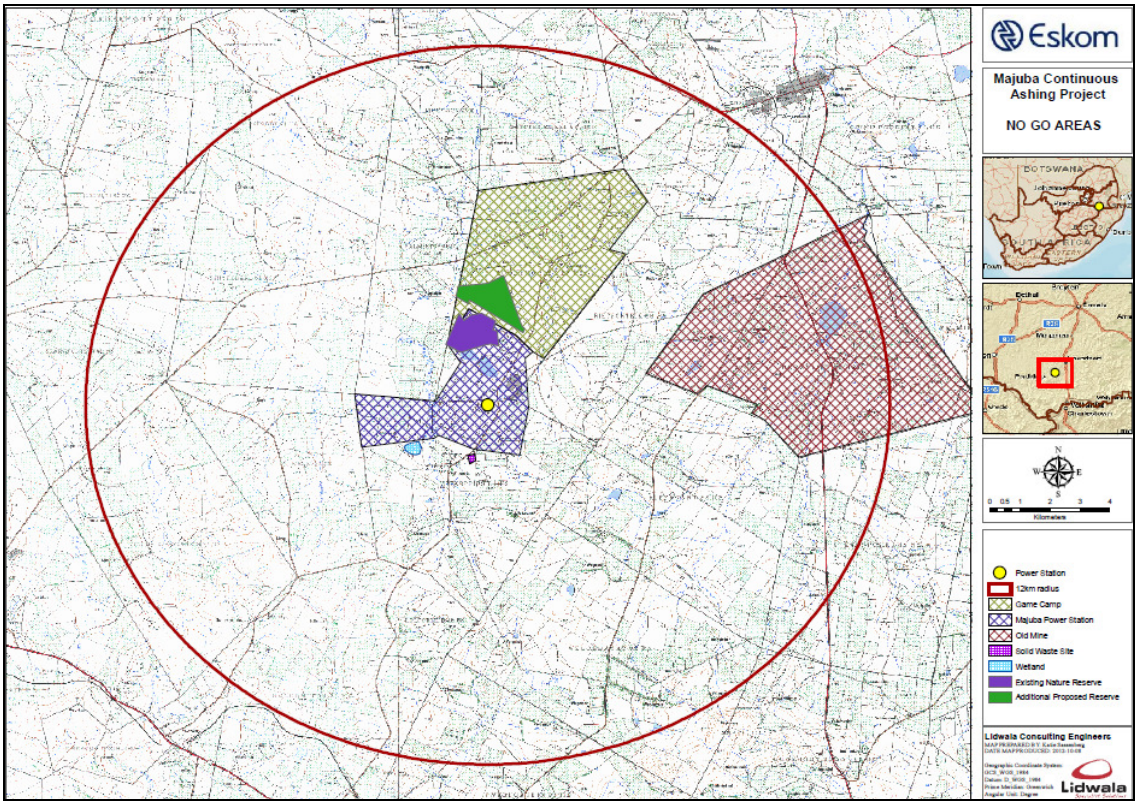

Figure 7.3: No-Go Areas Layer

- ***Adjustment Factor / weighting factor Methodology***

In order to give each component a weighting factor with which to adjust the layers, the following methodology was utilised.

In a weighted matrix each variable / component is given a different importance weighting. In order to ensure that consensus is obtained with regards to the weighting / adjustment factors input from the project team and all specialists was obtained. Each member of the Project team was asked to rank each variable according to their own understanding of its significance, utilising the following ratings:

- 1 - low significance
- 2 - medium significance
- 3 - high significance

Once all the input was received, the rating provided for each variable was added and then divided by the number of people that took part in the exercise in order to obtain an average rating. Three sets of ratings were collected, namely:

- Specialist and Lidwala Project Team ratings
- Client ratings

- Combined ratings

For further details please refer to the detailed description in the Tutuka Continues Ash Disposal facility Scoping Report (Lidwala, 2012).

The final weighting factors for each aspect are therefore as follows:

- Social = 1.61
- Fauna and Flora = 2.19
- Surface Water = 2.29
- Ground Water = 2.35
- Agricultural Potential = 1.74
- Air Quality = 2.26
- Avifauna = 2.00

7.4.2 Final Screening Results

Figure 7.4 are the results of overlaying all the specialist input maps together incorporating the adjustment factor, thereby illustrating the overall environmental sensitivity of the area.

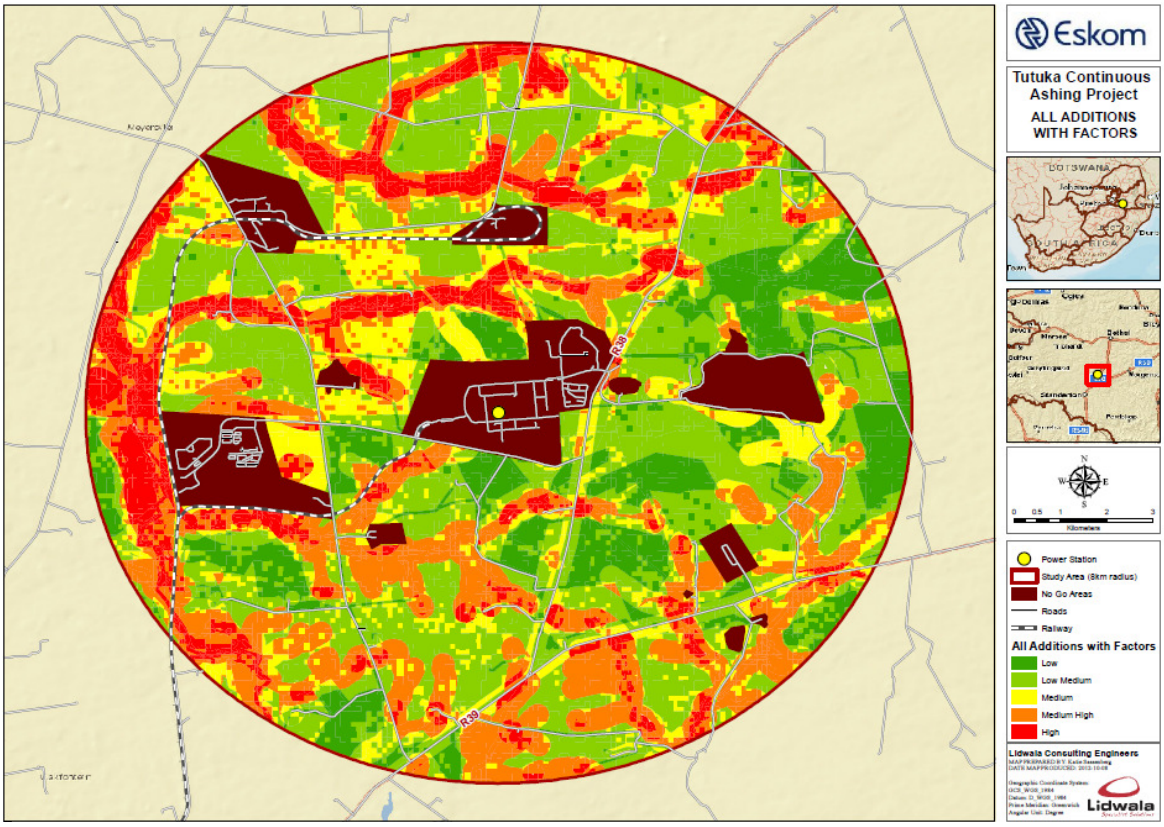

Figure 7.4: Overall Environmental Sensitivity (with adjustment factor)

Utilising the straight forward addition analysis it can be concluded that the overall sensitivity of the study area falls within the Low to Medium sensitivity range with only small areas being considered of Medium-High or High sensitivity.

The above maps were then utilized in order to determine the least sensitive areas of sufficient size that could be considered as alternative sites for the proposed ash disposal facility at Tutuka Power Station. Alternative sites are required to be at least 759 ha in size and are preferably required to fit within the low to low - medium sensitivity areas only and preferably without disturbing any existing infrastructure (**Figure 7.5**).

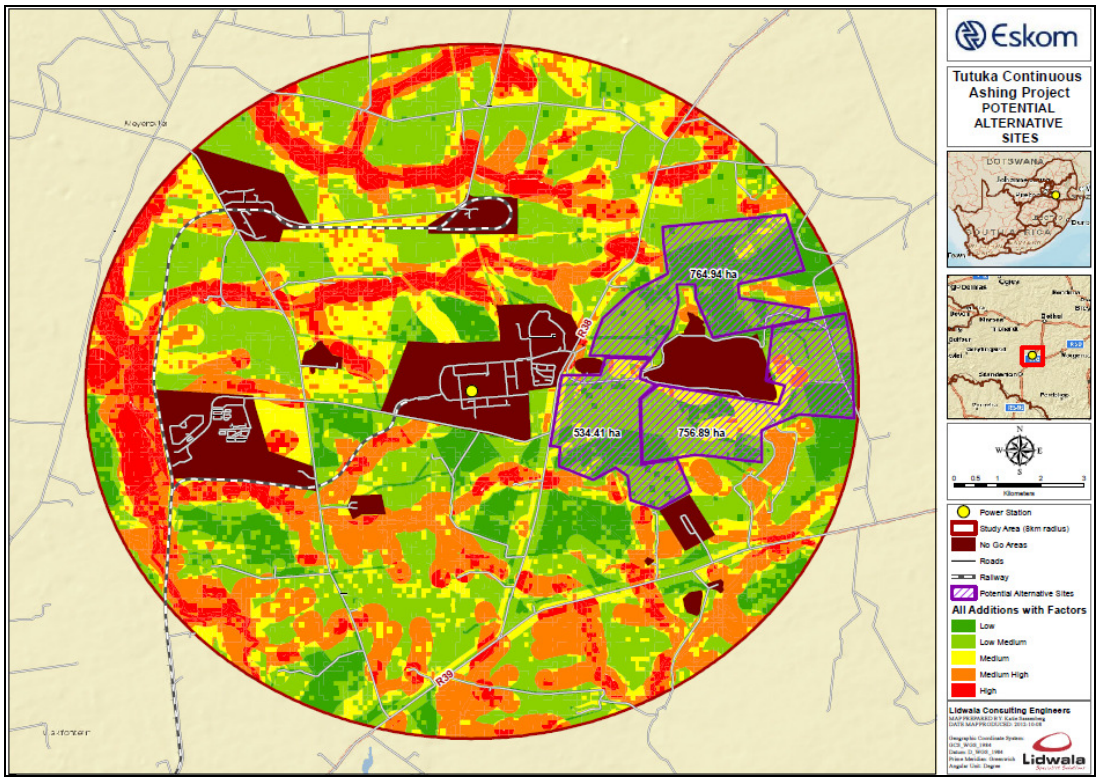

Figure 7.5: The potential areas, within the study area, large enough to accommodate the required area for the ash disposal facility (overlain on the sensitivity map).

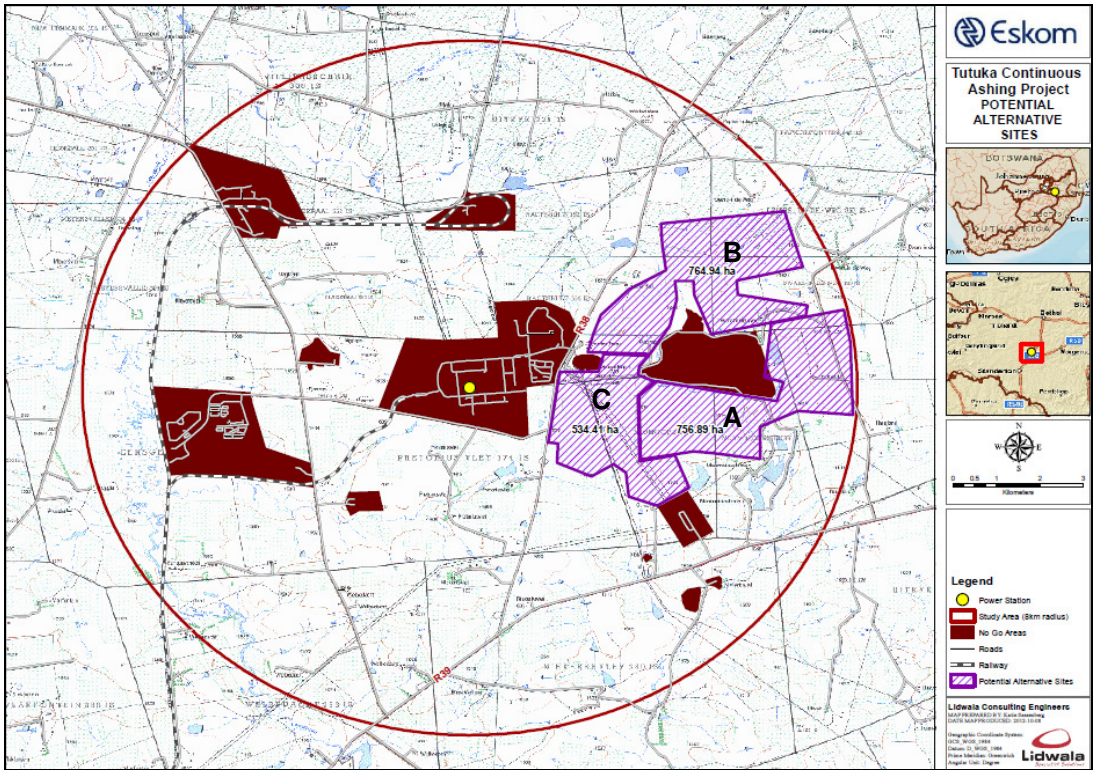

Figure 7.6: The three potential suitable alternative sites that can be evaluated and assessed in the EIA studies (overlain on 1 in 50 000 topographic map).

From the above analysis, three alternative sites have been identified as potentially suitable for the continuous ashing activities required at Tutuka Power Station. It is still noted that the proposed ash disposal facility should be placed as close to the existing ashing activities as possible to ensure that existing impacts are kept together and to limit the impact of associated linear infrastructure such as power lines and conveyor belts.

The boundaries between the alternatives have been determined exclusively according to the size requirement and is not based on any other Environmental considerations. All the studies were based on these three alternatives and preference rankings has been done according to them. The boundaries however are not fixed which means that more sensitive areas within one alternative can therefore be avoided by expanding the facility onto a less sensitive area within another alternative.

7.5 Conclusion

This chapter discussed the methodology of how the three potential site alternatives were identified through the use of sensitivity mapping during the scoping phase. These three alternative sites (or combinations thereof) have been investigated and assessed through detailed specialist studies during the EIA phase of the project.