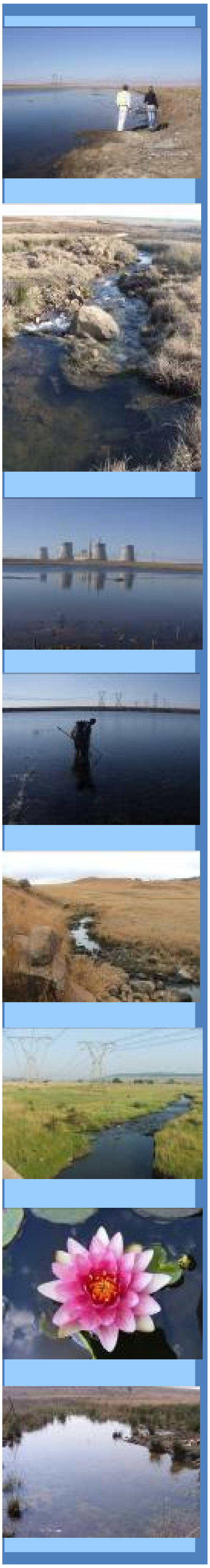

February 2010

SURFACE WATER

PROPOSED TUTUKA GENERAL WASTE DISPOSAL SITE: SURFACE WATER REVIEW

Proponent: **Eskom Holdings Limited**

Produced by: Zitholele Consulting

FINAL SURFACE WATER REVIEW REPORT

Project 12333

PURPOSE OF THIS DOCUMENT

Eskom is currently operating the Tutuka Power Station as part of its electricity generation fleet. Throughout the operational life of the station, general waste, inclusive of garden waste and building rubble, is being generated at the station. This waste is being disposed of in an authorised general waste disposal site within the Tutuka Power Station premises.

The current waste disposal site provides disposal services to New Denmark Colliery, Thuthukani Township, Tutuka Power Station, selected contractors and some neighbouring farmers. This particular disposal site has, subsequent to its establishment, reached its capacity, and as of the end of October 2008, the waste has been transported to a waste disposal site at Kriel town, which is approximately 200 km away. The associated transportation costs are high and therefore an alternative, sustainable, means of waste disposal needs to be put in place.

To minimise the operational costs of the waste disposal, potential sites have been identified within the Tutuka Power Station premises, one of which is located immediately adjacent (contiguous) to the existing waste disposal site and would result in an extension of the existing domestic waste disposal site. Another proposed alternative for provision of disposal space was an amendment to the height limitation of the current waste disposal site. As a means to comply with the necessary legal requirements, the new / extended waste disposal site and waste disposal activities must be appropriately designed and licensed, in line with the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) requirements and the National Environmental Management Waste Act (NEM:WA) legislation for licensing.

Eskom Generation appointed Zitholele Consulting (Pty) Ltd, an independent environmental consultant, to conduct the appropriate EIA and Waste Management Licensing process to evaluate the potential environmental and social impacts of the proposed project. As part of the environmental process several specialist assessments were undertaken in order to inform the Impact Assessment Phase. This report details the findings from the surface water review undertaken for the proposed project.

The surface water resource assessment found that the current site does not impact on surface water. It is recommended that the proposed site be constructed in such a way as to avoid and minimise the potential for contaminated runoff to enter the natural system. If the waste site is designed as such, the impact to surface water will be negligible.

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1 INTRODUCTION

1.1 Project Background

Eskom is currently operating the Tutuka Power Station as part of its electricity generation fleet. Throughout the operational life of the station, general waste, inclusive of garden waste and building rubble, is being generated. This waste is being disposed of in an authorised general waste disposal site within the Tutuka Power Station premises.

The current waste disposal site provides domestic waste disposal services to New Denmark Colliery, Thuthukani Township, Tutuka Power Station, selected contractors and some neighbouring farmers. This particular disposal site has reached its capacity, and as of the end of October 2008, the waste has been transported to a waste disposal site at Kriel town, which is approximately 200 km away from the power station. The associated transportation costs are high and therefore an alternative means of waste disposal needs to be put in place.

Two alternatives are available for the Tutuka Power Station waste disposal site. The first would be to extend the current waste disposal site and to apply for a permit amendment into a new Waste License. The second alternative is to establish a new waste disposal site within close proximity to the power station property and the current site. A site selection exercise in line with the Minimum Requirements for the Disposal of Waste by Landfill, Draft 3rd edition (Department of Water Affairs[1], 2005) was undertaken to identify the suitable alternatives.

After the site selection process a study area was identified that would provide sufficient space for any of the potential waste disposal site alternatives. The study area is illustrated in Figure 1-1 below.

[1] DWA previously referred to as the Department of Water Affairs and Forestry (DWAF).

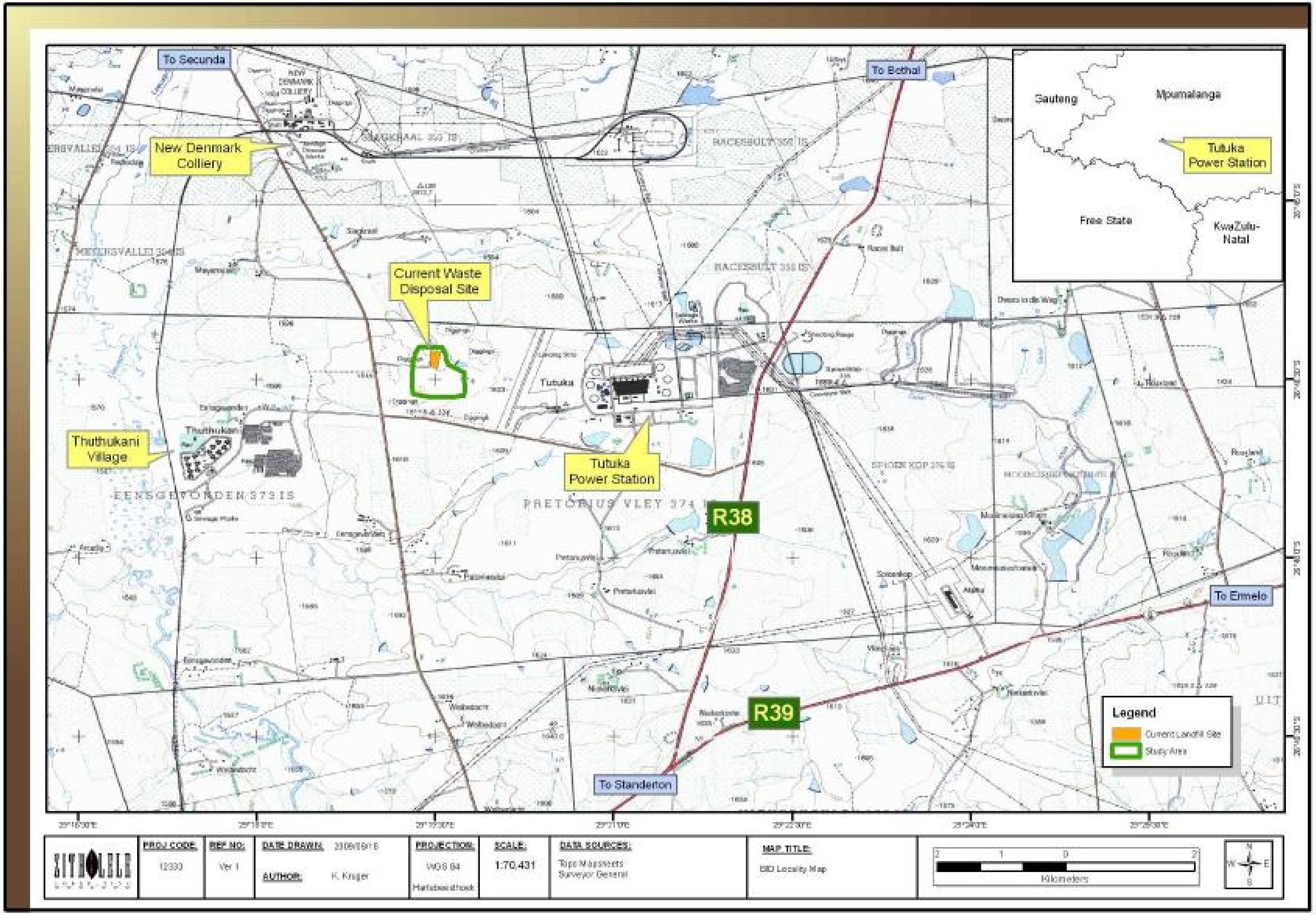

Figure 1-1: Proposed Study Area.

1.2 Study Scope

Eskom's Generation Division appointed Zitholele Consulting (Pty) Ltd, an independent environmental consultant, to conduct an EIA and Waste Management Licencing process to evaluate the potential environmental and social impacts of the proposed project. As part of the environmental impact assessment for the aforementioned project it is required that certain biophysical specialist investigations are undertaken. Internal resources at Zitholele Consulting were appointed to undertake the Surface Water Review, detailed in this report.

1.3 Study Approach

Zitholele Consulting undertook the aforementioned specialist study through a desktop investigation using GIS software and data from the Department of Water Affairs (DWA) database.

1.4 Project Personnel

The following project person was involved in the compilation of this report.

Konrad Kruger, BSc Hons (Geog)

Mr. Konrad Kruger graduated from the University of Pretoria with a BSc Honours in Geography in 2003. He has been involved in a variety of environmental projects in the last six years and has become specialised in undertaking specialist studies, mapping and environmental consulting. He has undertaken GIS mapping for mining, residential as well as industrial developments. He is also an experienced land ecologist and will provide expertise for this project in terms of soil surveys, land capability assessments and mapping.

1.5 Assumptions and Limitations

The following assumptions were made during the assessment:

- The site will be operated in a similar way to the current operations.

2 SURFACE WATER ASSESSMENT

2.1 Data Collection

The site visit was conducted in January 2010 and notes taken on the surface water situation. In addition a desktop surface water resource survey was undertaken to investigate the potential surface water bodies that could be affected by the proposed waste disposal site. Data from the WRC database (DWA) as well as the 1:50 000 topographical maps from the surveyor general were utilised as part of the analysis.

2.2 Regional Description

Regionally the site is located within the C11K quaternary catchment that drains southwards towards the Grootdraai Dam via the Leeuspruit (Figure 2-1). The Grootdraai Dam is a significant surface water body in the region. The description below was obtained from the Department of Water Affairs:

“Grootdraai Dam is situated in the upper reaches of the Vaal River less than 10 km upstream of Standerton. It has a catchment area of 8 195 km^2, a mean annual precipitation of approximately 750 mm, a mean annual potential evaporation at the dam site of 1 400 mm and a natural inflow of 580 million m^3/annum. The full supply capacity of the reservoir is 364 million m^3, making it a 0.7 MAR dam.

Grootdraai Dam is a composite structure comprising a central concrete gravity section 360 m long and two earthfill flanks giving a total crest length of 2 180 m and a maximum wall height of 42 m above lowest foundation level. The dam was completed in 1982 and was built primarily to support the water needs of the SASOL I, II and III coal to petrol plants at Secunda, Eskom's Tutuka Power Station as well as the Matla, Duvha, Kendal and Kriel Power Stations located on the coal fields in the adjacent Olifants River basin.

The dam also provides some flood attenuation for Standerton and stores up to 100 million m^3/annum of flood water pumped into the upper reaches of the Vaal River basin from Heyshope Dam in the Usutu basin.”

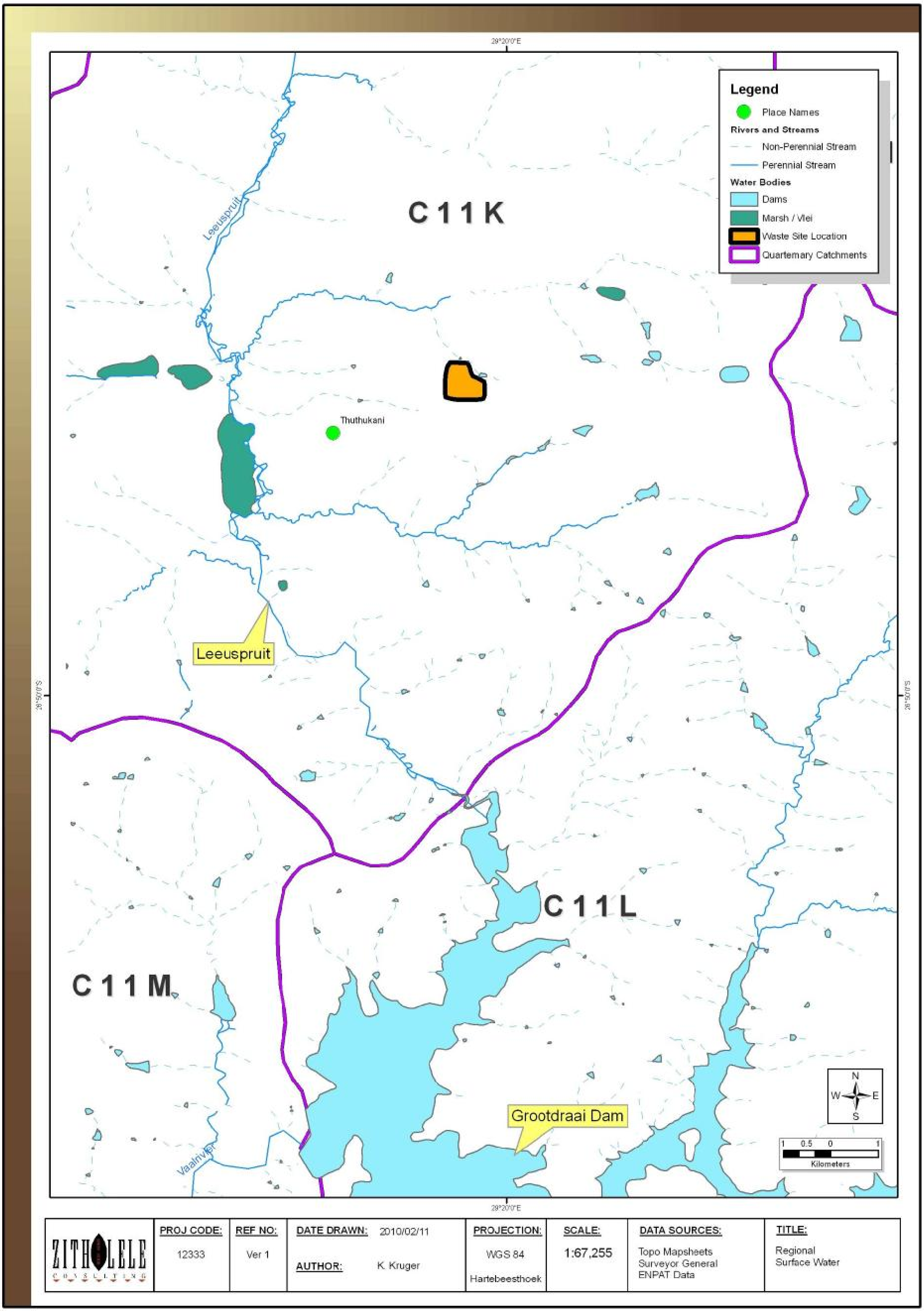

Figure 2-1: Regional Surface Water Map

2.3 Site Description

The proposed waste disposal site is located just south (50 – 75 m) of an unnamed non-perennial stream. This stream drains north-westwards towards a tributary of the Leeuspruit known as the Racesbult spruit. After approximately 4 km the Racesbult spruit enters the Leeuspruit which then drains southward towards the Grootdraai Dam. The unnamed stream has two small earthen dams located within the stream that was constructed prior to 1982. It is possible that these dams were used by farmers as a water source for livestock, as the main land use in the area is grazing land. These dams are not in use at present as they have silted up.

In addition to the dams in the stream several old borrow pits are located within the dolorite sill in the vicinity of the waste site. These old pits were used during the power station and road construction in the area as a source of base material prior to 1982. The pits have through time accumulated water and at present provide small ponds in which some aquatic life has established itself. These pits are closed units that do not link up with any of the streams or dams in the area.

All the features described above are illustrated in Figure 2-2 below. As shown on the map, there are two borrow pit areas within the potential study site for the waste disposal site. As these are currently functioning as natural water features in spite of their anthropogenic origin, it is suggested that they be avoided.

Currently there are two surface water monitoring points adjacent to the current waste disposal site and two surface water monitoring points within the Racesbult spruit, one above and one below the confluence of the unnamed tributary with the Racesbult spruit. Any surface water impacts should be picked up in the quarterly monitoring undertaken at the power station. As shown in the Figure below there is also a ground water monitoring network present on site. Unfortunately the monitoring points within the unnamed stream very often cannot be used due to the fact that there is no surface water available to monitor. Indications from the Racesbult spruit monitoring points are that for the following monitoring criteria there is no significant impact to surface water as the monitored levels over the last 8 years are below South African drinking water standards;

- Electrical Conductivity;
- Sodium;
- Calcium;
- Chlorine; and
- Sulphates.

These results from the GHT report are attached in Appendix A.

In addition to these points mentioned the Tutuka Power Station has an extensive monitoring network covering all the potential downstream water bodies including the Leeuspruit, in order to monitor impacts to regional users such as the Grootdraai Dam.

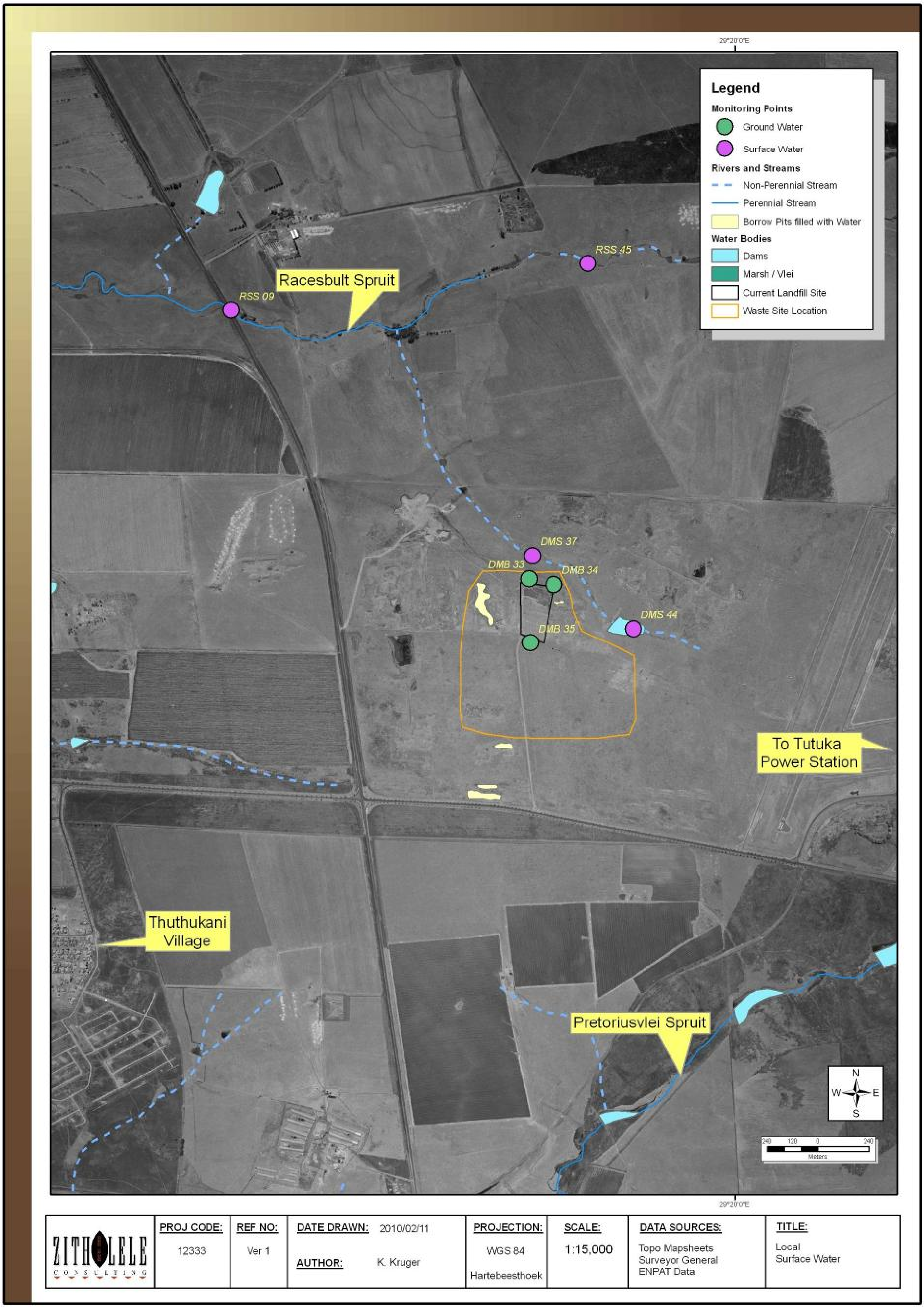

Figure 2-2: Local Surface Water Map

3 IMPACT ASSESSMENT METHODOLOGY

The impacts will be ranked according to the methodology described below. Where possible, mitigation measures will be provided to manage impacts. In order to ensure uniformity, a standard impact assessment methodology was utilised 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:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in Table 3-1.

Table 3-1: Quantitative rating and equivalent descriptors for the impact assessment criteria

Rating	Significance	Extent Scale	Temporal Scale
1	VERY LOW	*Isolated sites / proposed site*	<u>Incidental</u>
2	LOW	*Study area*	<u>Short-term</u>
3	MODERATE	*Local*	<u>Medium-term</u>
4	HIGH	*Regional / Provincial*	<u>Long-term</u>
5	VERY HIGH	*Global / National*	<u>Permanent</u>

A more detailed description of each of the assessment criteria is given in the following sections.

3.1 Significance Assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1 000 km^2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in Table 3-2 below.

Table 3-2 : Description of the significance rating scale

Rating		Description
5	Very high	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	High	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	Moderate	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	Very low	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity are needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	No impact	There is no impact at all - not even a very low impact on a party or system.

3.2 Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in Table 3-3.

Table 3-3 : Description of the spatial rating scale

Rating		Description
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of impacts possible, and will be felt at a regional scale (District Municipality to Provincial Level).
3	Local	The impact will affect an area up to 5 km from the proposed study area.
2	Study Area	The impact will affect an area not exceeding the study area.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than proposed landfill footprint.

3.3 Duration Scale

In order to accurately describe the impact it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in Table 3-4.

Table 3-4: Description of the temporal rating scale

Rating		Description
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium term	The environmental impact identified will operate for the duration of life of disposal site.
4	Long term	The environmental impact identified will operate beyond the life of operation.
5	Permanent	The environmental impact will be permanent.

3.4 Degree of Probability

Probability or likelihood of an impact occurring will be described as shown in Table 3-5 below.

Table 3-5 : Description of the degree of probability of an impact occurring

Rating	Description
1	Practically impossible
2	Unlikely
3	Could happen
4	Very Likely
5	It is going to happen / has occurred

3.5 Degree of Certainty

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used as discussed in Table 3-6. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 3-6 : Description of the degree of certainty rating scale

Rating	Description
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Cannot know	The consultant believes an assessment is not possible even with additional research.
Does not know	The consultant cannot, or is unwilling, to make an assessment given available information.

3.6 Quantitative Description of Impacts

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:

$$\textbf{\textit{Impact Risk}} = \frac{\text{SIGNIFICANCE} + \textit{Spatial} + \text{Temporal}}{\mathbf{3}} \times \frac{\text{Probability}}{\mathbf{5}}$$

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

Table 3-7 : Example of Rating Scale

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
	LOW	*Local*	Medium-term	*Could Happen*	
Impact to water	**2**	***3***	**3**	**3**	**1.6**

Note: The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criteria rating of 2,67. The probability (3) is divided by 5 to give a probability rating of 0,6. The criteria rating of 2,67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to five classes as described in the table below.

Table 3-8 : Impact Risk Classes

Rating	Impact Class	Description
0.1 – 1.0	**1**	**Very Low**
1.1 – 2.0	**2**	**Low**
2.1 – 3.0	**3**	**Moderate**
3.1 – 4.0	**4**	**High**
4.1 – 5.0	**5**	**Very High**

Therefore with reference to the example used for water above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a low impact.

3.7 Cumulative Impacts

It is a requirement that the impact assessments take cognisance of cumulative impacts. In fulfilment of this requirement the impact assessment will take cognisance of any existing impact sustained, any mitigation measures already in place and any additional impact to environment through continued and proposed future activities. Thereafter mitigation measures will be proposed and the residual impact will be calculated if these are implemented.

Using the criteria as described above an example of how the cumulative and residual impact assessment will be done is shown below:

Table 3-9: Impact Rating Scale

Impact	Significance	Spatial Scale	Temporal Scale	Probability	Rating
Initial / Existing Impact (I-IA)	**2**	**2**	**2**	*1*	0.4
Additional Impact (A-IA)	**1**	***2***	**1**	*1*	0.3
Cumulative Impact (C-IA)	**3**	***4***	**2**	*1*	0.6
Residual Impact after mitigation (R-IA)	**2**	***1***	**2**	*1*	0.3

As indicated in the example above the Additional Impact Assessment (A-IA) is the amount that the impact assessment for each criterion will increase. Thus if the initial impact will not increase, as shown for temporal scale in the example above the A-IA will be 0, however, where the impact will increase by two orders of magnitude from 2 to 4 as in the spatial scale the A-IA is 2. The Cumulative Impact Assessment (C-IA) is thus the sum of the Initial Impact Assessment (I-IA) and the A-IA for each of the assessment criteria.

In both cases the I-IA and A-IA are assessed without taking into account any form of mitigation measures. As such the C-IA is also a worst case scenario assessment where no mitigation measures have been implemented. Thus a Residual Impact Assessment (R-IA) is also made which takes into account the C-IA with mitigation measures. The latter is the most probable case scenario, and for the purpose of this report is considered to be the final state Impact Assessment.

3.8 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:

- Significance or magnitude- IN CAPITALS
- Temporal Scale – <u>in underline</u>
- Probability – <u>*in italics and underlined*</u>.
- Degree of certainty - **in bold**
- Spatial Extent Scale – *in italics*

4 IMPACT ASSESSMENT

The Impact Assessment highlighted and described the impact to the environment following the above mentioned methodology and assessed the impacts to Surface Water.

The impact assessment was undertaken for the construction, operational and decommissioning phases of the domestic disposal site project. The waste disposal site will consist of a waste dump with a single access point and an access road (Figure 4-1). It should be noted that there is currently a waste disposal site on the terrain and it is anticipated that the activities of the proposed site would be identical to the current operations.

Figure 4-1: Example of what the waste site would look like while operating

4.1 Initial Impact

As mentioned above, the site currently has an operating waste disposal facility on site. The runoff from the site is controlled by means of storm water cut-off trenches around the waste body. Other existing impacts to surface water in the area are mainly in the form of dirty storm water runoff from the Thuthukani village, but this is some distance away (>2 km). As indicated in Section 2, the current operations form part of a surface and ground water monitoring campaign. There are 4 surface water monitoring points around the current waste disposal site that can identify any impact from the site on the surface water (unnamed tributary and the Racesbult spruit).

The current monitoring results from these monitoring points indicate that the two points in the unknown stream do not have enough surface water to have a reliable data pool. The two points in the Racesbult spruit however, provide a long term scenario as depicted in the results in Appendix A. Currently the surface water conforms to the South African drinking water quality guidelines, and with the exception of Calcium, all the constituents monitored are lower in concentration after the water from the unnamed stream site joins the Racesbult spruit.

There is evidence of some impact from the Tutuka Power Station onto the Racesbult spruit upstream of the current waste disposal site, but these impacts have dissipated by the time the spruit reached the current waste disposal site.

The initial impact to surface water is therefore rated as a LOW negative impact occurring in the *study area* and acting in the short term. This impact *could occur* and as such is rated as a **LOW** impact.

4.2 Additional Impact

The additional impact during the construction phase of the development of the new site will be mostly from the earthworks and earth-moving equipment. This process will mobilise dust that can be transported via surface runoff to the nearby stream. This could increase the turbidity levels in the downstream surface water bodies, impacting on aquatic life and water quality. In addition the earth-moving equipment could spill hydrocarbons and lubricants if they are not in a good working order. This impact should however be very limited in extent and only for a short period of time.

The additional impact to surface water resources during the construction phase is a MODERATE negative impact occurring in the *study area* and acting in the short term. This impact *could occur* and as such is rated as a **Low** impact.

During the operational phase the impact to surface water will derive from precipitation coming into contact with uncovered domestic waste. Due to the random composition of the waste, it is uncertain as to the potential pollutants that could be transported via runoff to the nearby surface water bodies. This could impact on the surface water quality and in extreme cases the pollutants could enter the larger river system, from where it will end up in the Grootdraai Dam. This dam supplies industrial water to not only Tutuka Power Station but several other industries such as Sasol Secunda and other power stations in the area. During the operational phase the additional impacts described above will be a HIGH negative impact occurring in the *regional* scale and acting in the Long Term. This impact *could occur* and is therefore rated as a **Moderate impact.**

During the closure of the site the waste will be capped and the site will be re-vegetated. The capping will also involve vehicle and material movements, so the potential impact is similar to the construction phase impacts. This impact is therefore rated as a MODERATE negative impact occurring in the *study site* and acting in the short term. This impact *could occur* and is therefore rated a **Low** impact as indicated in Table 4-1.

4.3 Cumulative Impact

The cumulative impact during the construction and operational phases remains as assessed above. Therefore the impact remains a **Low** impact during construction and a **Moderate** impact during operation. The same is applicable for the closure phase.

4.4 Mitigation Measures

- Ensure that all machinery on site is in a good working order and does not have leaks;
- Hydro-carbons should be stored in a bunded storage area or in designated facilities at the Tutuka Power Station;
- No refuelling shall take place on site;
- No maintenance of machinery to be done on site, but to be done at the station's demarcated area for this;
- Spill-sorb or a similar type of product must be used to absorb hydrocarbon spills in the event that such spills should occur;
- Care must be taken to ensure that in removing vegetation adequate erosion control measures are implemented;
- A storm water management plan, including sufficient erosion-control measures, must be compiled in consultation with a suitably qualified environmental practitioner / control officer during the detailed design phase prior to the commencement of construction;
- Add a dirty water and leachate collection system to the design of the landfill to capture all potential dirty water from the site;
- The propagation of low-growing dense vegetation suitable for the habitat such as grasses, sedges or reeds is the best natural method to reduce erosion potential in sensitive areas;
- Limit all activities to the proposed waste disposal site;
- Extend the current surface water monitoring plan to include turbidity monitoring during the construction phase of the disposal site;
- Ensure that the operational storm water system is maintained and monitored;
- Cover waste on a daily basis; and
- Ensure that soil is stockpiled in such a way as to prevent erosion from storm water.

4.5 Residual Impact

The residual impact with the successful implementation of the mitigation measures mentioned above will be slightly less significant as the probability reduces slightly. Therefore the rating reduces to **Low.** This is relevant for both the construction and operational phases.

With the rehabilitation and capping of the disposal site, the potential for surface water contamination will be removed. The area will be re-vegetated and the runoff will not come into contact with the waste.

Table 4-1: Impact Rating Matrix for Surface Water

Construction phase					
Impact Type	**Significance**	**Spatial**	**Temporal**	**Probability**	**Rating**
Initial	Low	Study site	Short Term	Could Occur	**1.0 Very Low**
Additional	Moderate	Study site	Short Term	Could Occur	**1.4 - Low**
Cumulative	Moderate	Study site	Short Term	Could Occur	**1.4 - Low**
Residual	Moderate	Isolated sites	Short Term	Could Occur	**1.2 - Low**
Operational Phase					
Impact Type	**Significance**	**Spatial**	**Temporal**	**Probability**	**Rating**
Additional	High	Regional	Long Term	Could Occur	**2.4 - Moderate**
Cumulative	High	Regional	Long Term	Could Occur	**2.4 - Moderate**
Residual	Moderate	Study site	Long Term	Could Occur	**1.8 – Low**
Closure and Rehabilitation Phase					
Impact Type	**Significance**	**Spatial**	**Temporal**	**Probability**	**Rating**
Additional	Moderate	Study site	Short Term	Could Occur	**1.4 - Low**
Residual	Low positive	Study site	Short Term	Could Occur	**1.2 – Low Positive**

5 CONCLUSION

In conclusion, the existing site is located close to an existing unnamed non-perennial stream. This stream flows into the Racesbult Spruit which in turn joins the Leeuspruit that drains into the Grootdraai Dam. This dam is a major surface water resource in the area, supplying water to several mines, power stations and industries.

The current operations at the Tutuka Power Station are monitored as part of a surface and ground water monitoring programme. The results from the analysis indicate that there is currently a very small impact to surface water resources from the existing operations.

The proposed development will impact on surface water during construction by mobilising dust that can migrate into the surface water system. In addition construction vehicles can spill lubricants and hydrocarbons that can also find their way into the surface water system. Due to the short duration of the construction phase (1 – 4 months) and the moderate likelihood of the impact occurring this impact is rated as a **Low** impact.

During the operational phase there is a potential for surface water to come into contact with the domestic waste on the site. Due to the unknown composition of domestic waste, any number of contaminants can enter the surface water system via runoff. In addition if this impact reaches the Leeuspruit and eventually the Grootdraai Dam the impacts could have an effect on all the users of the industrial water from the dam. This unmitigated scenario was rated as a **Moderate** impact. With the successful implementation of the mitigation measures this impact can be reduced to a **Low** impact.

During the closure phase the impact will be the same as assessed during the construction phase with earth-moving equipment operating on site. Once the closure is completed and the rehabilitation taken effect the impact will be a **Low** positive impact.

The review of the surface water resources at the proposed Tutuka general waste disposal site has found that the proposed development has the potential to impact on surface water. However these impacts can easily be mitigated by the successful implementation of the mitigation measures proposed in this report. It is therefore recommended that the development be approved conditional to the implementation of the abovementioned mitigation measures.

ZITHOLELE CONSULTING (PTY) LTD

Konrad Kruger Anelle Lotter

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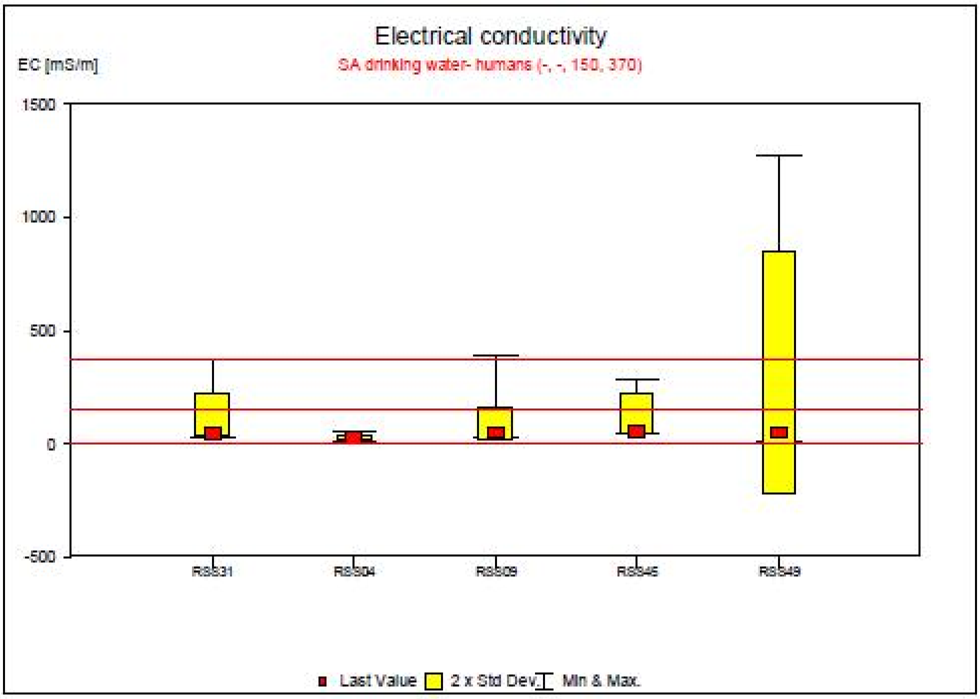
Appendix A: Monitoring Stats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SA drinking water- humans (-, -, 150, 370)
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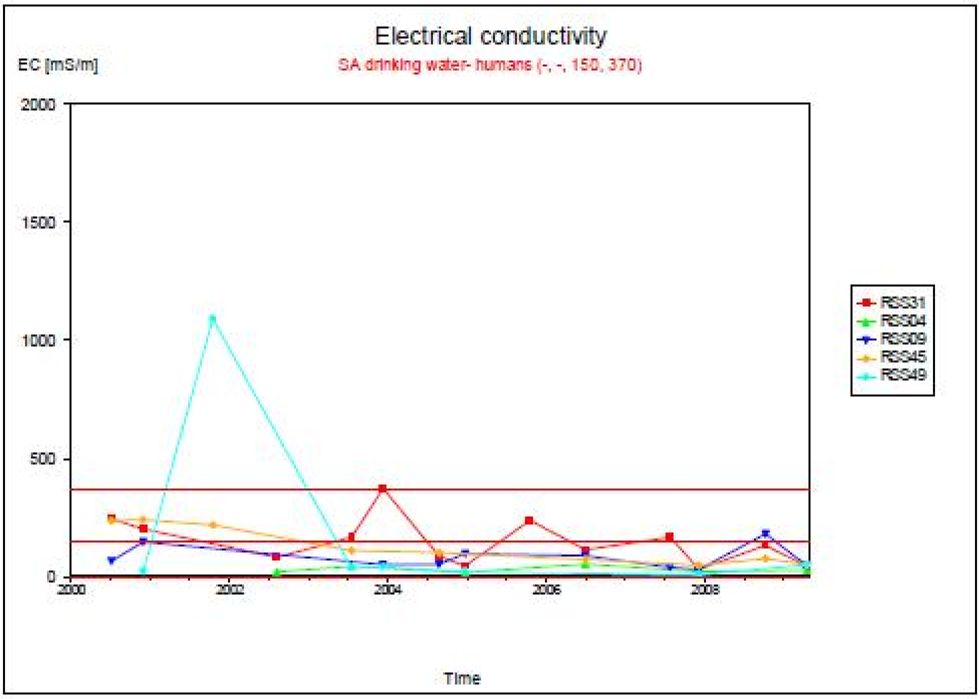
500
0
-500
RSS31
RSS04
RSS09
RSS45
RSS49
Last Value
2 x Std Dev
Min & Max.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EC [mS/m]
SA drinking water- humans (-, -, 150, 370)
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1000
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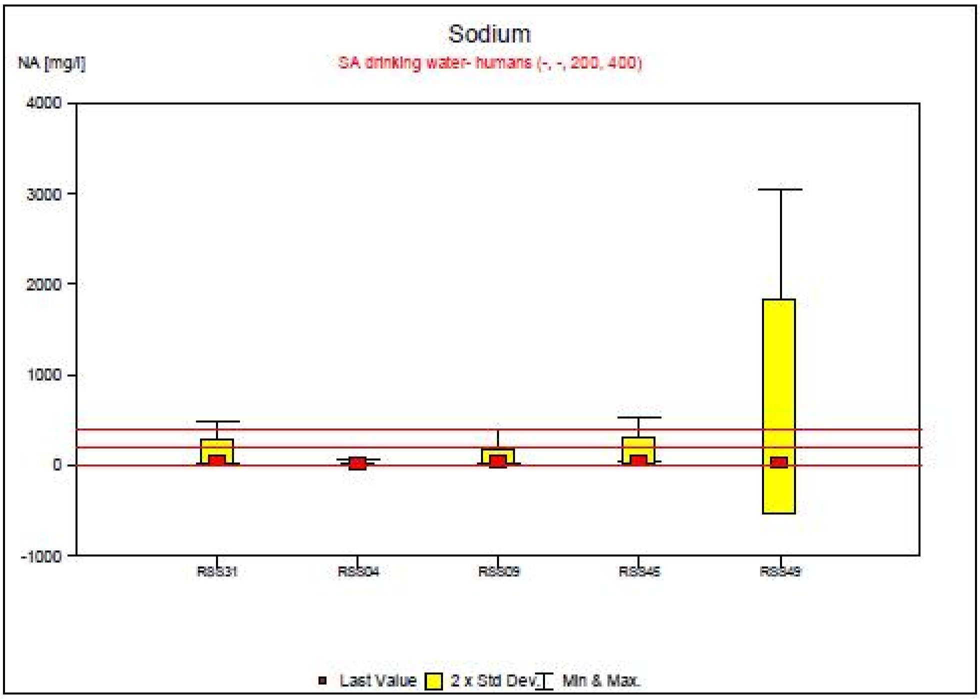
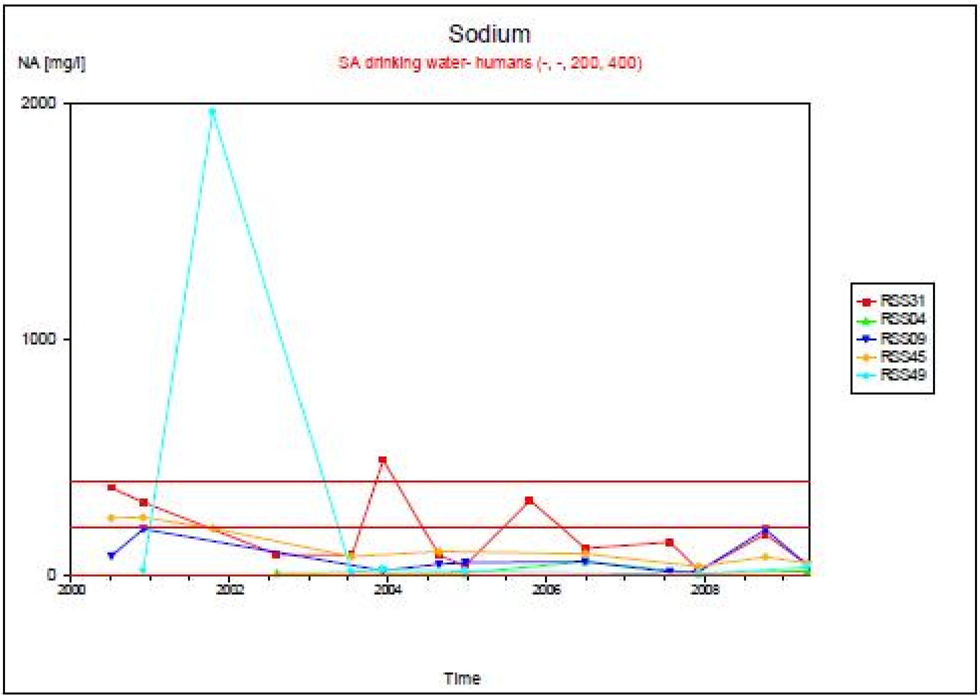
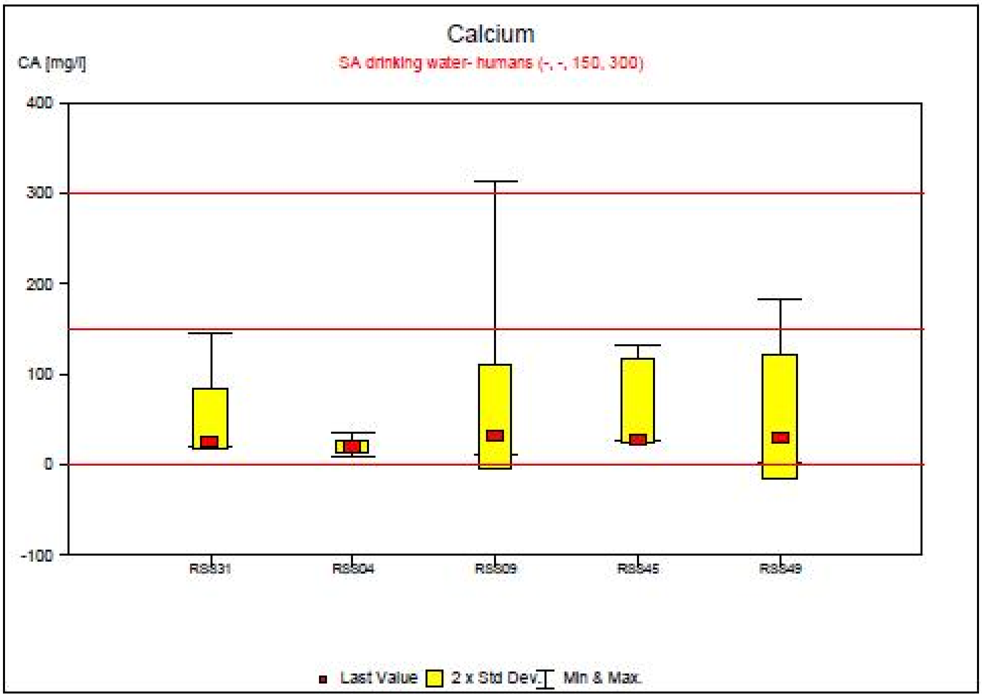
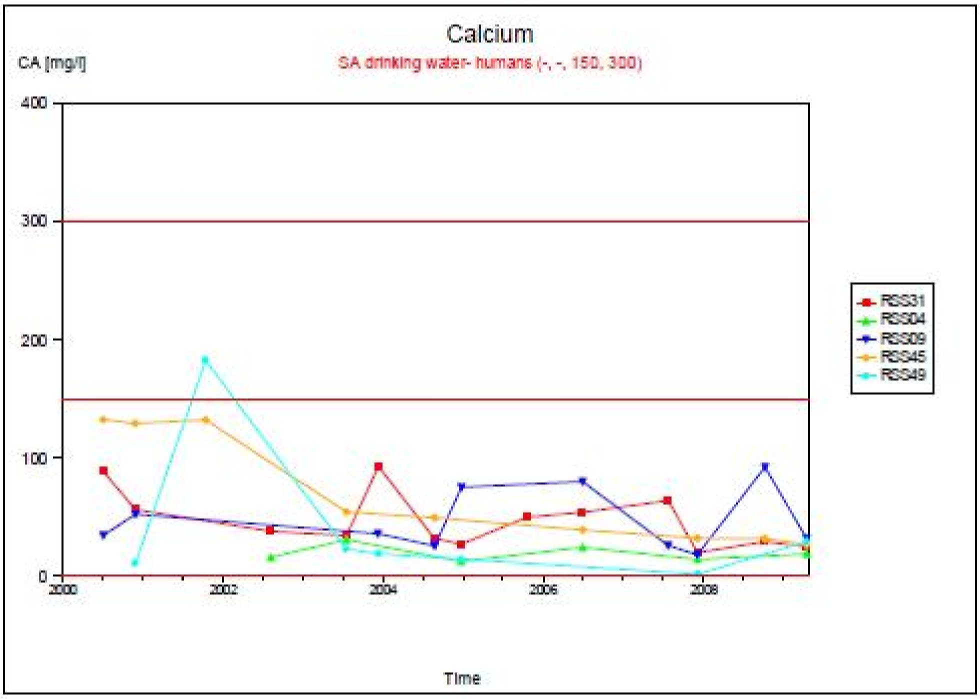
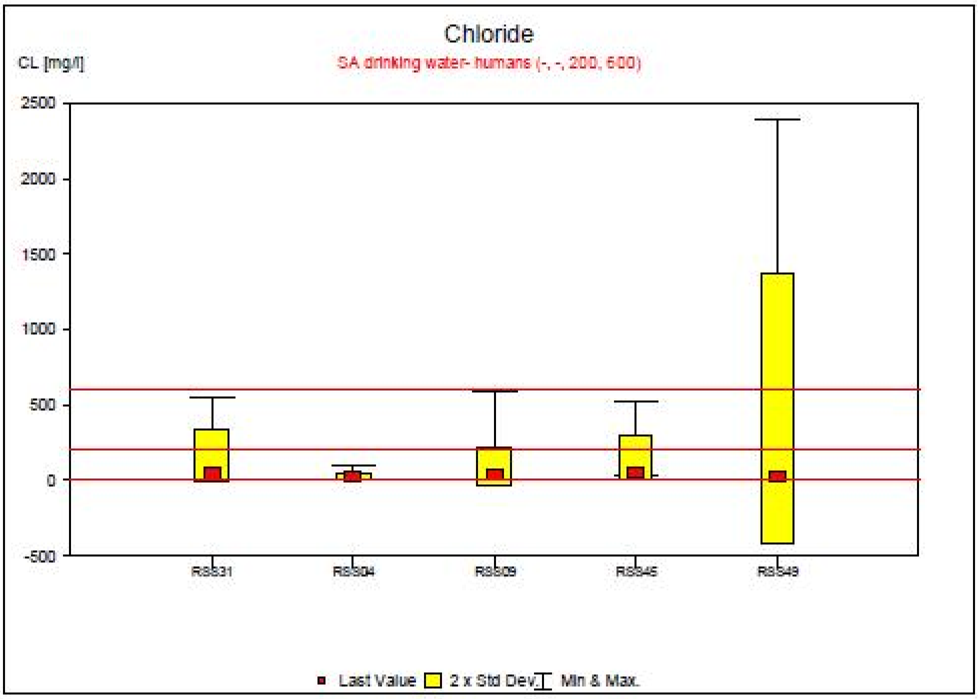
RSS45
RSS49

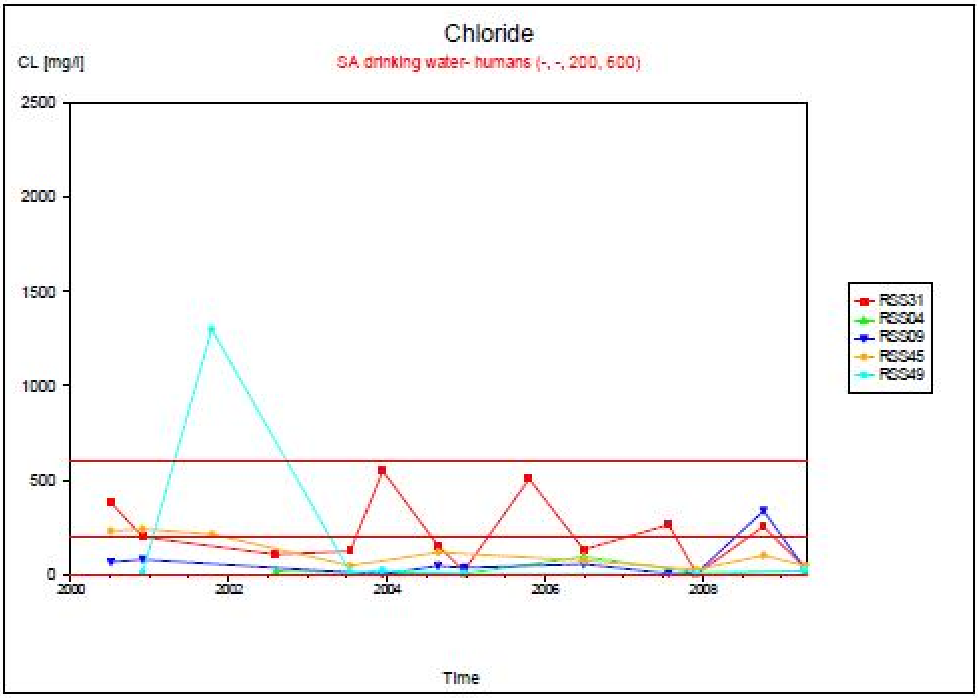

Sodium
NA [mg/l]
SA drinking water- humans (-, -, 200, 400)
4000
3000
2000
1000
0
-1000
RSS31
RSS04
RSS09
RSS45
RSS49
Last Value
2 x Std Dev
Min & Max.

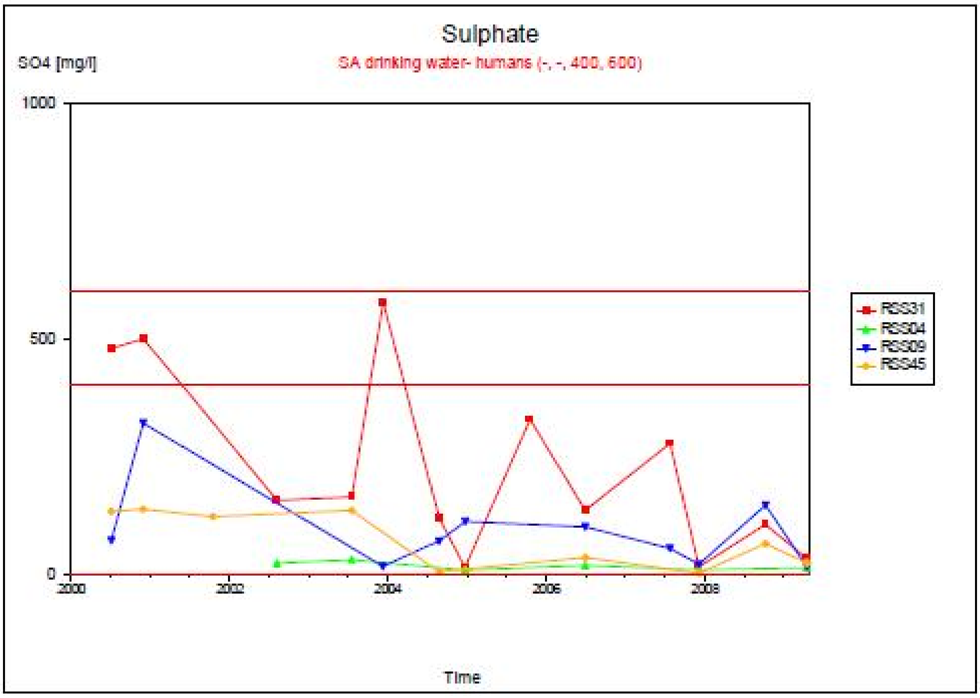

Sodium
NA [mg/l]
SA drinking water- humans (-, -, 200, 400)
2000
1000
0
2000
2002
2004
2006
2008
Time
RSS31
RSS04
RSS09
RSS45
RSS49


Calcium
CA [mg/l]
SA drinking water- humans (-, -, 150, 300)
400
300
200
100
0
-100
RSS31
RSS04
RSS09
RSS45
RSS49
Last Value
2 x Std Dev.
Min & Max.


Calcium
CA [mg/l]
SA drinking water- humans (-, -, 150, 300)
400
300
200
100
0
2000
2002
2004
2006
2008
Time
RSS31
RSS04
RSS09
RSS45
RSS49


Chloride
CL [mg/l]
SA drinking water- humans (-, -, 200, 600)
2500
2000
1500
1000
500
0
-500
RSS31
RSS04
RSS09
RSS45
RSS49
Last Value
2 x Std Dev
Min & Max.


Chloride
CL [mg/l]
SA drinking water- humans (-, -, 200, 600)
2500
2000
1500
1000
500
0
2000
2002
2004
2006
2008
Time
RSS31
RSS04
RSS09
RSS45
RSS49


Sulphate
SO4 [mg/l]
SA drinking water- humans (-, -, 400, 600)
1000
500
0
2000
2002
2004
2006
2008
Time
RSS31
RSS04
RSS09
RSS45