



**ASSESSMENT OF THE IMPACT THAT THE  
REMEDICATION OF ASBESTOS CONTAMINATED  
SOIL MAY HAVE ON THE SOIL ENVIRONMENT:  
POLOKWANE AND APIESDORING YARDS  
(LIMPOPO PROVINCE)**

15 September 2011

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## **DECLARATIONS**

I, Petrus Stephanus Rossouw, declare that I –

- act as an independent specialist consultant in the fields of Soil Science and the Assessment of the Agricultural Potential, Land Use and Land Capability of soil;
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2006;
- have and will not have any vested interest in the proposed activity proceeding;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report; and
- will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not.

## **P.S. ROSSOUW**

I, Johan Hilgard van der Waals, declare that I –

- act as an independent specialist consultant in the fields of Soil Science and the Assessment of the Agricultural Potential, Land Use and Land Capability of soil;
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2006;
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- will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not.

## **J.H. VAN DER WAALS**

## EXECUTIVE SUMMARY

Transnet Freight Rail requires a waste licence in order to undertake remediation of asbestos contaminated areas on their Polokwane and Apiesdoring (Limpopo) yards. Conservation Support Services prepared a report for Transnet Freight Rail (TFR) titled *Assessment of Environmental Contamination From Asbestos Waste* (31 August 2009) that identifies asbestos contaminated areas along TFR's operational footprint.

Savannah Environmental (Pty) Ltd on behalf of Transnet Freight Rail (TFR), contracted Terra Soil Science cc to assess the impact that certain remediation options of asbestos contaminated soil will have on the soil environment. The study that was undertaken by Terra Soil Science cc has the following aims:

- Assess the land type and land capability of the areas that are contaminated with asbestos;
- Assess the impact that the remediation of the asbestos contaminated areas will have on the soil environment.

Land type data for the site was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff, 1972 – 2006). The study area was traversed and observations regarding the landscape and occurrence of soils were made continuously.

The Polokwane yard is situated in the Ae and Bd land types while the Apiesdoring yard is situated in the Ae land type. The Ae land type is described as “red-yellow apedal, freely drained soils” and refers to yellow and red coloured soils where a free water table are not encountered. The Bd land type is described as a “plinthic catena: upland duplex and marginalitic soils rare.” A perfect catena is represented by (from higher to lower lying areas) Hutton, Bainsvlei, Avalon and Longlands soil forms. Gleyed soils, such as Rensburg, Willowbrook, Katspruit and Champagne soil forms, can occur in the valley bottom. Soils with hard plinthite are common in areas where sandstone underlies the area. Where water tables have not extended far beyond the valley bottom, red soils may dominate. In these cases plinthic soils are restricted to valley bottoms and pans.

Prior to development the areas that now constitute the Polokwane and Apiesdoring yards would have fallen into the arable and grazing land capability groups. This means that these areas could have been used for crop and animal production. The low rainfall would have dictated crop choice in cases where irrigation is not possible. Because of the development of the study areas as railway stations and shunting yards, land capability cannot be ascribed to these areas. The study areas can only be used for the purposes that they have been developed for.

The Polokwane yard falls within urban development. The area itself has been transformed to such an extent that natural occurring soils were only noted at points 205 and 206. These soils are of the Hutton soil form

The soils found in the Apiesdoring yard have also been transformed and the only natural soils are found outside the yard. Point 187 is an observation made outside the yard and constitutes the Oakleaf soil form.

In terms of human health, the extent to which asbestos fibres are released into the atmosphere is of much more importance than the transport thereof through surface water runoff. Asbestos is not water soluble and will not be transported through the soil profile to underground water bodies. Dust production on the greater part of Polokwane yard should not be a problem as the site does not comprise large areas of exposed soil. Dust production may be severe on the Apiesdoring yard as vegetative cover is sparse and the soils are of a fine texture. The area is also relatively dry and the natural soils show signs of dispersion and clay transport. Table A and B summarises general observations regarding the soils of the Polokwane and Apiesdoring yards.

**Table A** General observations regarding the soils of the Polokwane yard

Observation	Yes	No
Shallow water table (<1.5 m deep)		✓
Seasonally wet soils		✓
Unstable rocky slopes or steep slopes with loose soil		✓
Dispersive soils		✓
Soils of high clay content		✓
Any other unstable soil feature		✓
Sensitive to wind erosion		✓

**Table B** General observations regarding the soils of the Apiesdoring yard

Observation	Yes	No
Shallow water table (<1.5 m deep)		✓
Seasonally wet soils		✓
Unstable rocky slopes or steep slopes with loose soil		✓
Dispersive soils	✓	
Soils of high clay content		✓
Any other unstable soil feature		✓
Sensitive to wind erosion	✓	

In their report, titled *Assessment of Environmental Contamination From Asbestos Waste* (31 August 2009), Conservation Support Services proposes the following remediation actions for asbestos contaminated soil: "The preferred methodology is for full remediation of sites and railway lines. This includes excavation of contaminated soil and visible waste, placing it into sealed containers, and transporting and disposing of the waste at a H:H landfill." An alternative approach would be that of encapsulation.

The soils of both the Polokwane and Apiesdoring yards have been transformed to such an extent that a land capability class cannot be assigned to these areas. Furthermore, it is imperative that asbestos containing soil be remediated as these soils poses a major risk to human health and cannot be used for crop production, grazing or horticultural purposes. Disturbing of these soils is unwise. Table C and D summarise the impacts that may result from the remediation of the asbestos contaminated soil on the soil environment.

**Table C** Impacts on the soil environment of the Limpopo yards owing to the remediation of asbestos contaminated soil

<b>Nature:</b> Loss of soil due to removal during remediation of asbestos contaminated soil		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	local (1)	local (1)
<b>Duration</b>	permanent (5)	permanent (5)
<b>Magnitude</b>	small (0)	small (0)
<b>Probability</b>	improbable (2)	improbable (2)
<b>Significance</b>	<b>low (12)</b>	<b>low (12)</b>
<b>Status (positive or negative)</b>	positive	positive
<b>Reversibility</b>	Not reversible	Not reversible
<b>Irreplaceable loss of resources?</b>	No	No
<b>Can impacts be mitigated?</b>	No	
<b>Mitigation:</b> None		
<b>Cumulative impacts:</b> None		
<b>Residual Impacts:</b> None		

**Table D** Impacts on the land capability of the Polokwane and Apiesdoring yards owing to the remediation of asbestos contaminated soil

<b>Direct impacts:</b> None
<b>Indirect impacts:</b> None
<b>Cumulative impacts:</b> None
<b>Environmental Impact Statement:</b> The asbestos contaminated soils pose a risk to human health and environmental quality. Remediation of these soils is of utmost importance. If these soils are not cleaned-up the health of those working on the yard and living in the vicinity is at risk.

Remediation of the contaminated soils may lead to open excavated areas. The extent of soil removal coupled with the already impacted nature of the area does not warrant the implementation of mitigation measures. To cover these areas with soil would entail removal of soil from some other (probably not impacted) area and may therefore constitute loss of valuable soil resources. Soil erosion is a minimum in the area owing to the nature of the soils and the extent of urban development.

Both the Polokwane and Apiesdoring yards have been transformed to such an extent that natural occurring soils are only encountered in isolated spots. A land capability class cannot be assigned to these areas as the yards can only be used for the purposes for which development has taken place. Implementation of the remediation plans, for asbestos contaminated soil, proposed by Conservation Support Services in their report titled *Assessment of Environmental Contamination From Asbestos Waste* (31 August 2009) will have no negative effect on the soil environment.

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## **1. TERMS OF REFERENCE**

Savannah Environmental (Pty) Ltd on behalf of Transnet Freight Rail (TFR), contracted Terra Soil Science cc to assess the impact that remediation options of asbestos contaminated soil will have on the soil environment.

## **2. INTRODUCTION**

### **2.1. Background and Study Aims**

Transnet Freight Rail requires a waste licence in order to undertake remediation of asbestos contaminated areas on their Polokwane and Apiesdoring (Limpopo) yards. Asbestos defines a group of natural occurring, fibrous silicate minerals which exist in metamorphic or altered basic and ultrabasic rocks. Asbestos is a term that is limited by the Environmental Protection Agency of the United States of America to six fibrous minerals: chrysotile (from the Serpentine group), and amosite, crocidolite, tremolite, actinolite and anthophyllite (from the Amphibole group). An asbestos fibre is defined as having a length of more than 5mm and a length:width ratio of 3:1.

Ancient history has recorded the health risks associated with asbestos. The geographer Strabo (1st century) noted that workers that were exposed to asbestos had many health problems. In fact, Pliny the Elder urged his countrymen not to pursue slaves from the asbestos mines because they die young. It was, however, not until the Industrial Revolution that the hazard posed by asbestos was taken seriously. In the late 19th century large quantities of asbestos were used in the textile and building industries. Not long afterwards (1906), the first documented death owing to asbestos inhalation was recorded. By 1918 life insurance companies in the U.S.A charged asbestos workers higher premiums. By the 1970's an array of health problems had been found to be associated with the mining of asbestos, as well as the manufacture and use of asbestos products. In modern times, more than 5000 products have been manufactured from asbestos.

The main health risks posed by asbestos are:

- Asbestosis: Exposure to airborne asbestos fibres can cause pulmonary fibrosis. The lungs build up fibrotic scar tissue around asbestos fibres which causes difficulty in breathing, decrease blood flow to lungs which results in poor oxygen exchange, enlarged heart, a persistent dry cough and ultimately death.
- Cancer of lungs
- Mesothelioma: This is a rare form of cancer that affects thin membranes which surrounds the lungs and other internal organs.
- Cancer of pleura and peritoneum
- Cancer of bronchus
- Cancer of intestines

- Warts or corns: Dermal contact with asbestos can result in the formation of warts or corns

The mining and use of asbestos in South Africa were banned in 2008 under the Environmental Conservation Act of 1989. The then Environmental Affairs and Tourism Minister Marthinus van Schalkwyk was reported to state that the new regulations have the following as main objectives:

- South Africa will prohibit the mining of any asbestos material;
- South Africa will prohibit the processing or manufacturing of any asbestos containing material;
- South Africa will prohibit the import and export of any asbestos or asbestos containing product;
- South Africa will stop the import of any asbestos waste other than from a member of the Southern African Development Community.

Asbestos is heat resistant and impervious to chemical treatment (mostly). It has no odour, is not water soluble and does not migrate through soil. The main health risk is that posed by airborne asbestos fibres. The fibres may be released into the atmosphere from materials present on the site, including material buried at insufficient depths, as well as erosion, weathering and/or disturbance, for example by heavy vehicle movement or construction work, of asbestos contaminated soil.

The tendency of fibres to be released into the atmosphere is increased if the asbestos is present as loose or friable lagging blankets and insulation boards. If the site is dry, well drained and overlain by coarse, granular soil or fill, the fibres tend to become airborne more readily. Asbestos concentrations as low as 0.001% (weight basis) in loose, coarse textured soil may give rise to measurable levels of airborne asbestos if disturbed.

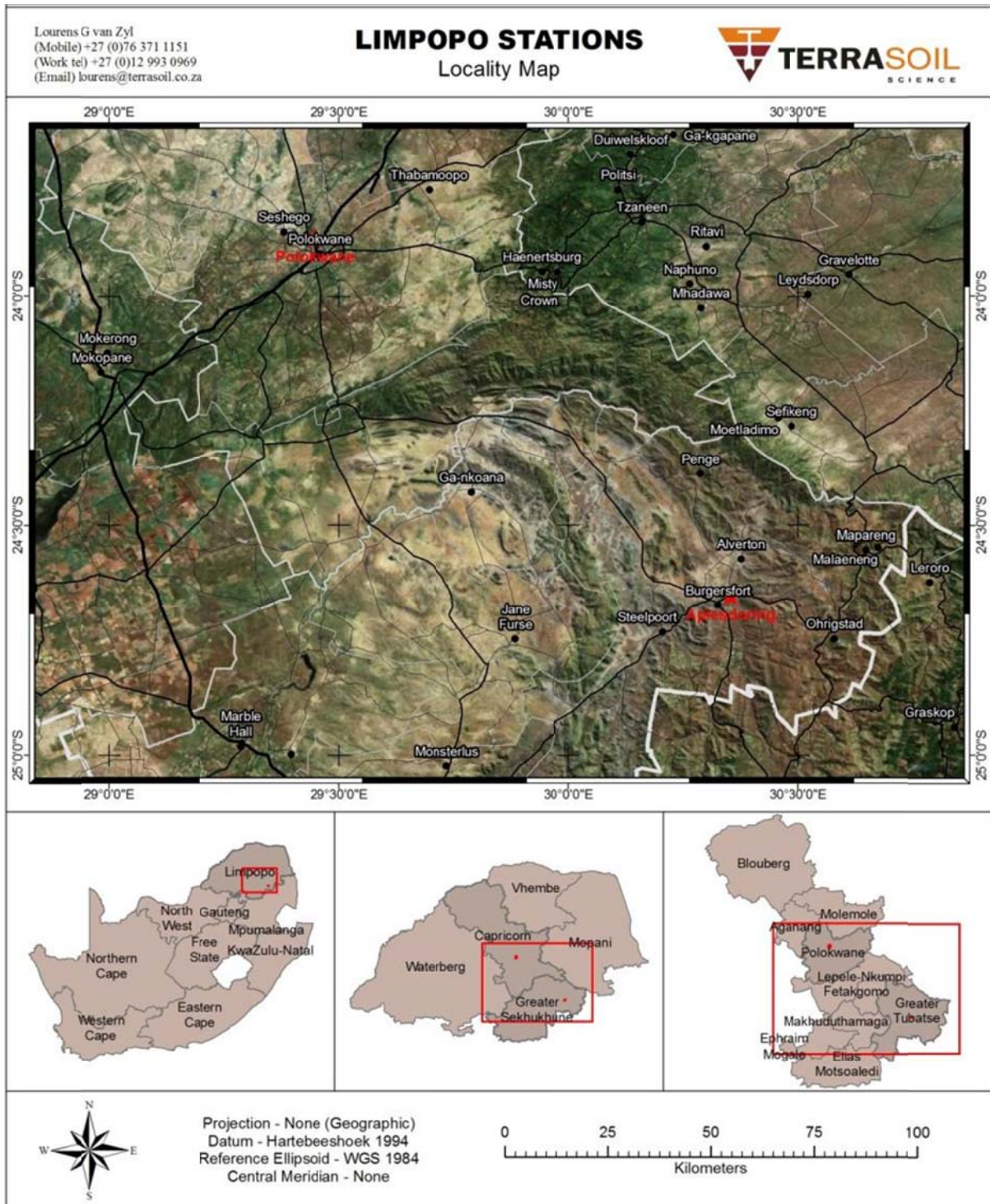
It is therefore of utmost importance that asbestos contaminated soil or areas where asbestos is present be remediated as soon as possible. Conservation Support Services prepared a report for Transnet Freight Rail (TFR) titled *Assessment of Environmental Contamination From Asbestos Waste* (31 August 2009) that identifies asbestos contaminated areas along their (TFR's) operational footprint. Remediation options are proposed. The study that was undertaken by Terra Soil Science cc has the following aims:

- Assess the land type and land capability of the areas that are contaminated with asbestos;
- Assess the impact that the remediation of the asbestos contaminated areas will have on the soil environment.

## **2.2. Survey Area Locality**

Figure 1 illustrates the location of Transnet Freight Rail's Polokwane and Apiesdoring yards. Both these yards are located in the Limpopo Province. The Polokwane yard is

situated in the City of Polokwane, whereas the Apiesdoring yard is situated near Burgersfort.



**Figure 1** Locality map of the Transnet Freight Rail's Polokwane and Apiesdoring (Limpopo) yards

### **3. METHODOLOGY**

#### **3.1. Land Type Data**

Land type data for the site was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff, 1972 – 2006). The land type data is presented at a scale of 1:250 000 and entails the division of land into tland types, typical terrain cross sections for the land type and the presentation of dominant soil types for each of the identified terrain units (in the cross section). The soil data is classified according to the Binomial System (MacVicar et al., 1977). The soil data was interpreted and re-classified according to the Taxonomic System (MacVicar, C.N. et al. 1991).

#### **3.2. Soil Survey**

The study area was traversed and observations regarding the landscape and occurrence of soils were made continuously. The areas are used as railway yards and shunting platforms and therefore covered in infrastructure necessary to perform these duties. Where possible augering was done to depth of 1200 mm and specific soil characteristics were noted. Soil form (Soil Classification, A Taxonomic System for South Africa, Soil Classification Working Group) and soil depth were recorded.

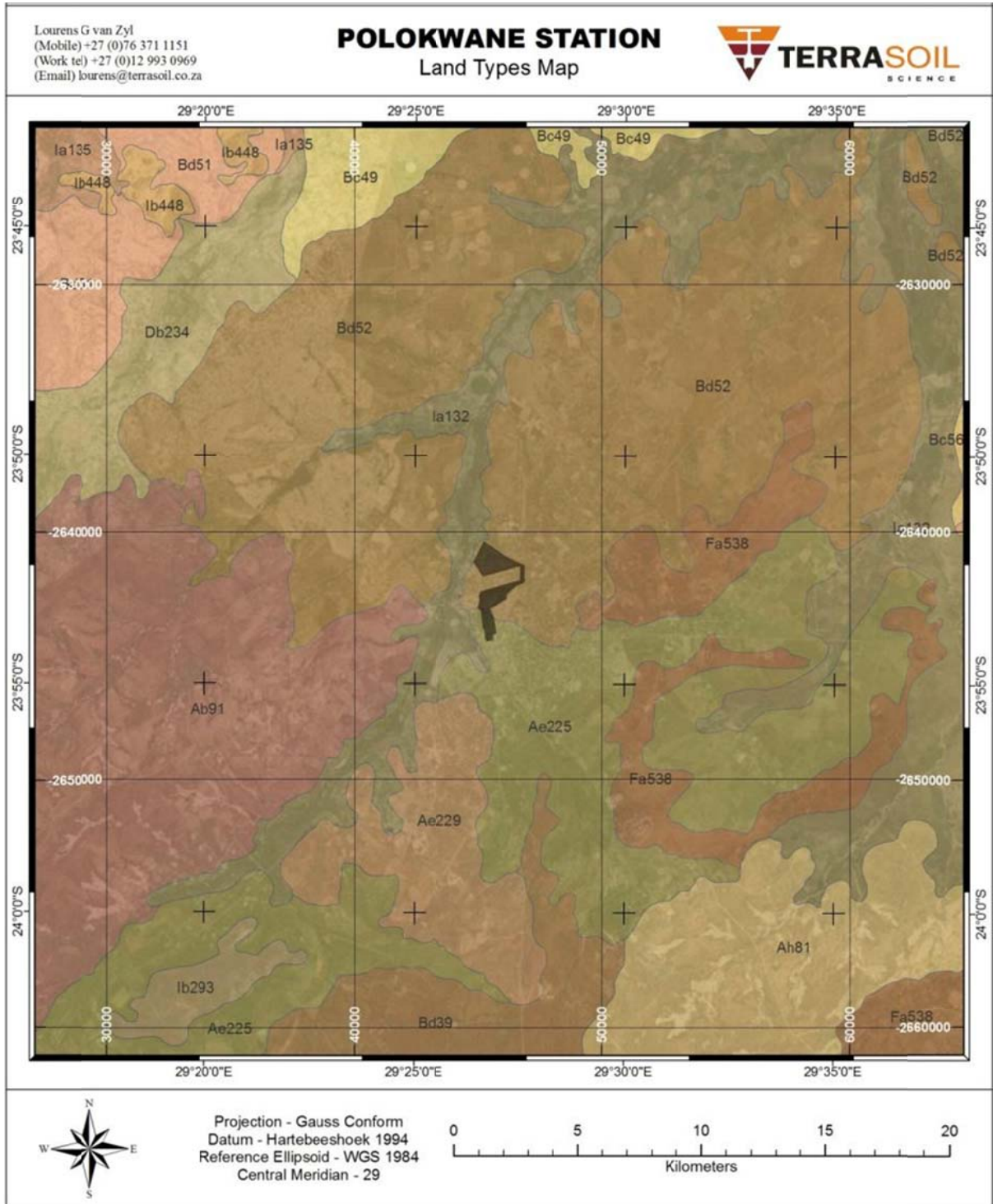
#### **3.3. Rainfall Data**

Rainfall data for the area was obtained from the Department of Agriculture (AGIS).

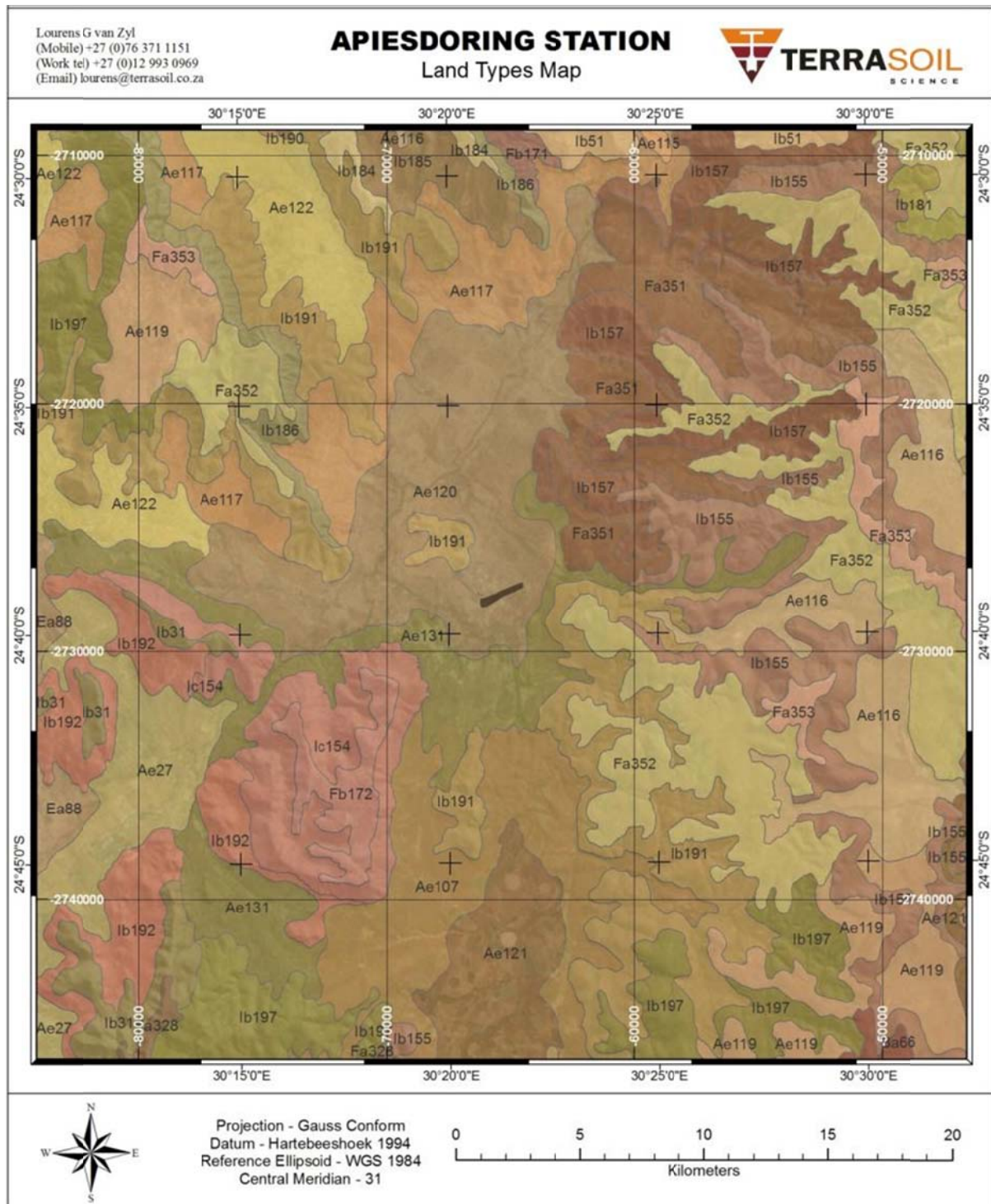
### **4. RESULTS AND DISCUSSION**

#### **4.1. Land Type Data**

Figure 2 and Figure 3 illustrate the land type data for the study areas. The Polokwane yard is situated in the Ae and Bd land types while the Apiesdoring yard is situated in the Ae land type. The Ae land type is described as “red-yellow apedal, freely drained soils” and refers to yellow and red coloured soils where a free water table are not encountered. The Bd land type is described as a “plinthic catena: upland duplex and marginalitic soils rare.” A perfect catena is represented by (from higher to lower lying areas) Hutton, Bainsvlei, Avalon and Longlands soil forms. Gleyed soils, such as Rensburg, Willowbrook, Katspruit and Champagne soil forms, can occur in the valley bottom. Soils with hard plinthite are common in areas where sandstone underlies the area. Where water tables have not extended far beyond the valley bottom, red soils may dominate. In these cases plinthic soils are restricted to valley bottoms and pans.



**Figure 2** Land type data for the Polokwane yard



**Figure 3** Land type data for the Apiesdoring yard

The following soil forms may have occurred in the area of the Polokwane yard (land types Ae225 and Bd52) and the Apiesdoring yard (Ae120) prior to development:

- The Hutton soil form comprises an orthic A-horizon overlying a red apedal B-horizon, underlain by unspecified material. The yellow-brown apedal B-horizon has macroscopically weakly developed structure or is altogether without structure and reflects weathering under well drained, oxidised conditions. The clay fraction is dominated by non-swelling 1:1 clay minerals and the red colour of the soil is

ascribed to iron oxide coatings on individual soil particles that are dominated by hematite.

- The Oakleaf soil form comprises an orthic A-horizon that overlies a neocutanic B-horizon and unspecified material. The neocutanic B-horizon is characterised by colour variation due to clay movement and accumulation and an apedal or weakly developed structure.
- The Mispah soil form comprises an orthic A-horizon that overlies hard rock.
- The Glenrosa soil form comprises an orthic A-horizon overlying a lithocutanic B-horizon. The lithocutanic B-horizon is a pedologically young horizon where clay illuviation has occurred.

#### 4.2. Rainfall Data

The rainfall for the area varies from 401 to 600 mm per year. Figure 4 is a map that exhibits the mean annual rainfall for Polokwane and Apiesdoring areas.

#### 4.3. Land Capability

Eight land capability classes are recognised and these are divided into three land capability groups. Table 1 summarises this division.

**Table 1** Land capability classes and intensity of use

Land capability class	Increased intensity of use									Land capability groups
	W	F	LG	MG	IG	LC	MC	IC	VIC	
I	W	F	LG	MG	IG	LC	MC	IC	VIC	Arable land
II	W	F	LG	MG	IG	LC	MC	IC		
III	W	F	LG	MG	IG	LC	MC			
IV	W	F	LG	MG	IG	LC				
V	W		LG	MG						Grazing land
VI	W	F	LG	MG						
VII	W	F	LG							
VIII	W									Wildlife

W - wildlife

F - forestry

LG - light grazing

MG - moderate grazing

IG - intensive grazing

LC - light cultivation

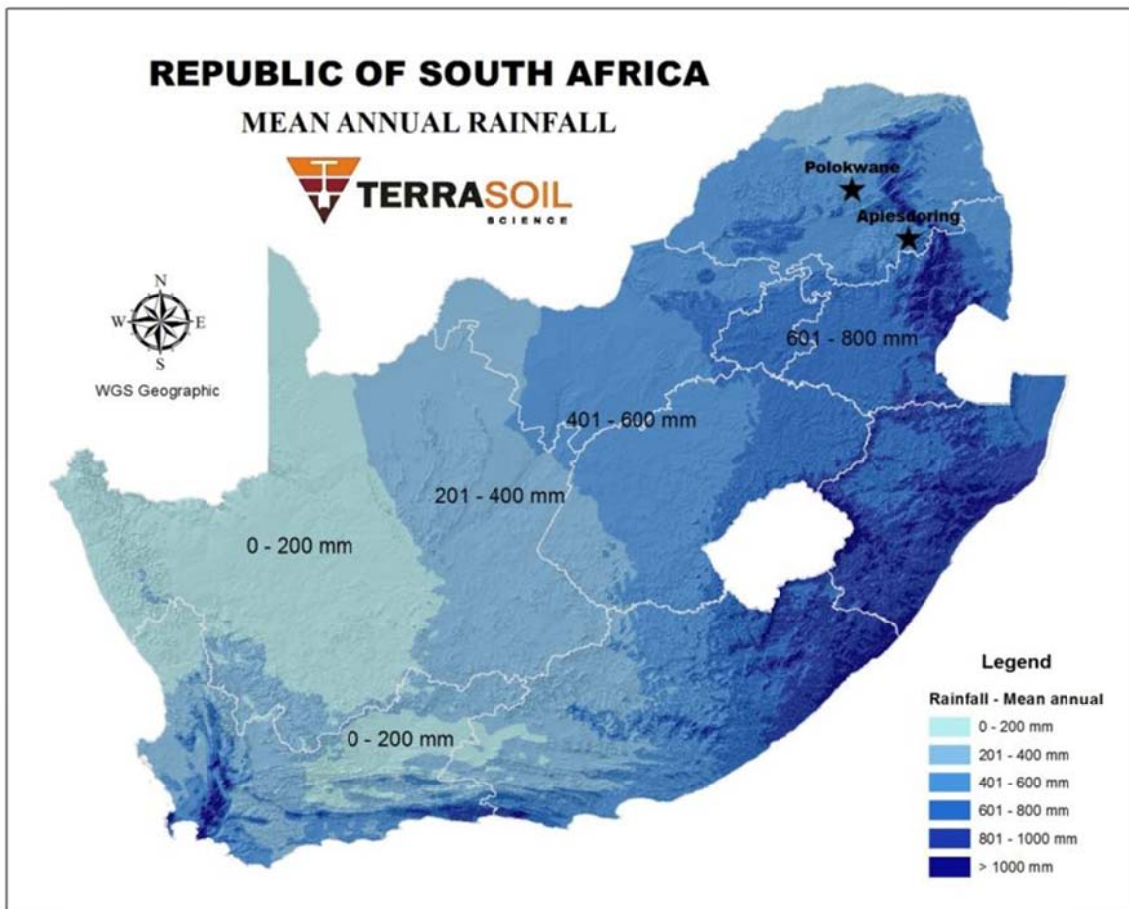
MC - moderate cultivation

IC - intensive cultivation

VIC - very intensive cultivation

Prior to development the areas that now constitute the Polokwane and Apiesdoring yards would have fallen into the arable and grazing land capability groups. This means that these areas could have been used for crop and animal production. The low rainfall would have dictated crop choice in cases where irrigation is not possible. Because of the development of the study areas as railway stations and shunting yards, land capability

cannot be ascribed to these areas. The study areas can only be used for the purposes that they have been developed for.



**Figure 4** Mean annual rainfall for the Polokwane and Apiesdoring area

#### 4.4. Observations made during the Site Visit

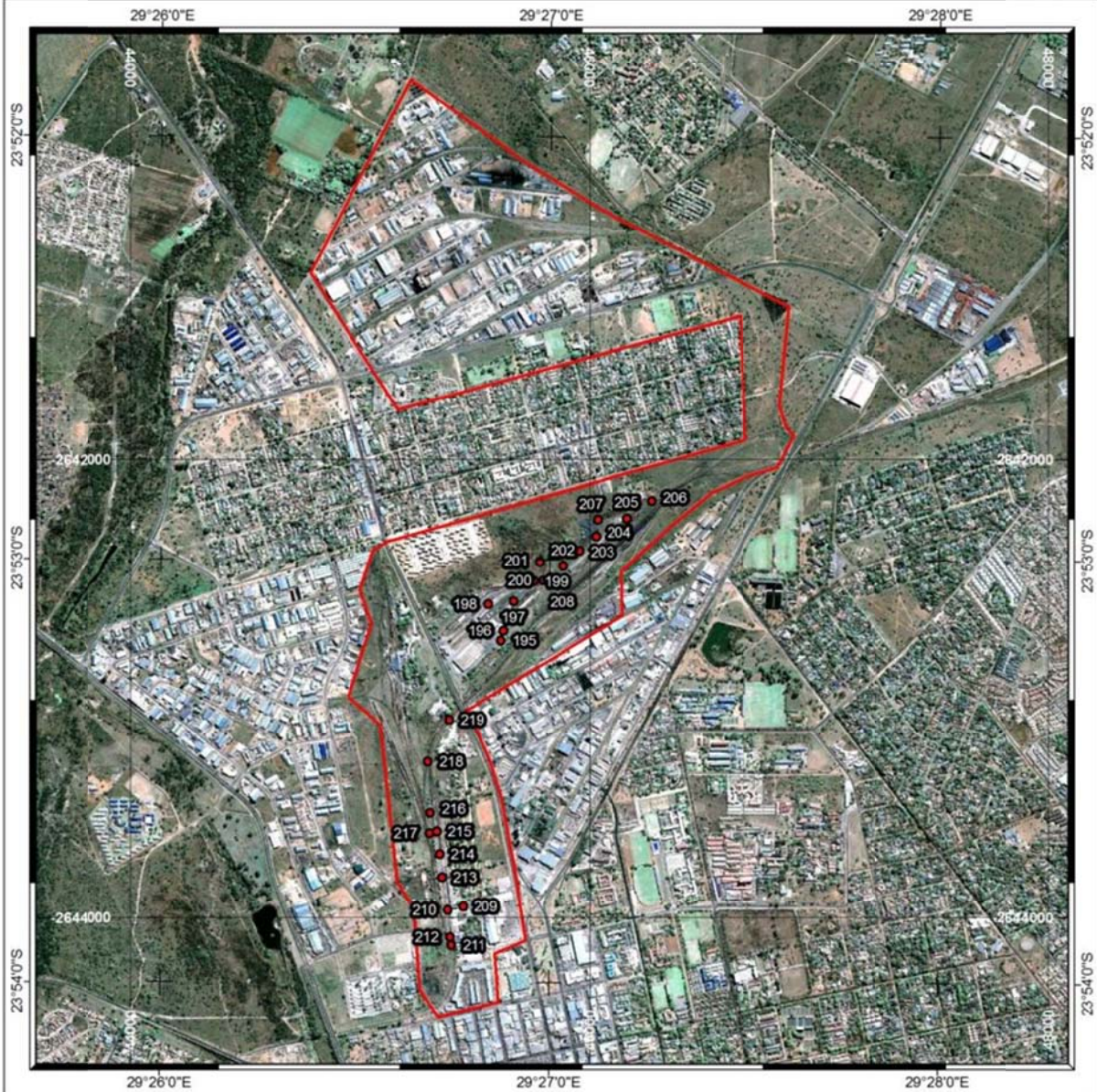
Figure 5 and Figure 6 illustrate the observation points for the Polokwane and Apiesdoring yards, respectively. The Polokwane yard falls within urban development. The area itself has been transformed to such an extent that natural occurring soils were only noted at points 205 and 206. These soils are of the Hutton soil form. Figure 7 illustrate the apedal structure of the soil form. Figure 8 and 9 illustrate the extent of transformation.

The soils found in the Apiesdoring yard have also been transformed and the only natural soils are found outside the yard. Point 187 is an observation made outside the yard and constitutes the Oakleaf soil form as illustrated by Figure 10. Figure 11 and 12 illustrate the transformation of natural occurring soils owing to discard of waste and development of infrastructure related to railway yards.

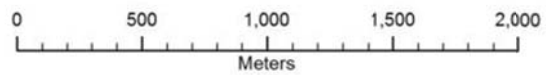
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# POLOKWANE STATION

Sattelite Image & Sample Points



Projection - Gauss Conform  
Datum - Hartebeeshoek 1994  
Reference Ellipsoid - WGS 1984  
Central Meridian - 29



**Figure 5** Observation points map for the Polokwane yard

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# APIESDORING STATION

Sattelite Image & Sample Points



**Figure 6** Observation points for the Apiesdoring yard



**Figure 7** The Hutton soil form exhibits an apedal structure



**Figure 8** Photo illustrating the transformation of the natural occurring soils owing to development



**Figure 9** Photo illustrating the transformation of the natural occurring soils owing to development



**Figure 10** The neocutanic B-horizon of the Oakleaf soil form exhibits a variation in colour owing to clay movement



**Figure 11** The soils of the Apiesdoring yard have largely been disturbed



**Figure 12** The soils of the Apiesdoring yard have largely been disturbed

#### **4.5. Soil Erosion and Dust Production**

In terms of human health, the extent to which asbestos fibres are released into the atmosphere is of much more importance than the transport thereof through surface water runoff. Asbestos is not water soluble and will not be transported through the soil profile to underground water bodies.

Wind velocity and turbulence are important contributing factors, but the following govern the release of asbestos fibres, from soil material, into the atmosphere:

- Surface roughness: Wind erosion is less severe where the soil surface is rough.
- Soil moisture content: Water inhibits dust formation.
- Stability of soil aggregates (structure): Stable, heavier clods, aggregates and material withstand the action of wind better.
- Size of soil particles (texture): Particles of about 0.1 mm in diameter are partly responsible for the movement of smaller and larger particles. Saltating particles bounce against larger particles causing surface creep and collide with smaller particles to send these into the atmosphere. Fine, sandy soil is therefore more prone to wind erosion.
- Soil crust stability: The presence of organic matter, clay and other cementing agents is important in stabilising aggregates and may contribute to the formation of a stable crust that inhibits wind erosion.
- Vegetative cover: Vegetative cover will reduce wind erosion as wind velocity is slowed down, surface roughness is increased and soil bulk is stabilised through root growth and organic acids.

Dust production on the greater part of Polokwane yard should not be a problem as the site does not comprise large areas of exposed soil. Dust production may be severe on the Apiesdoring yard as vegetative cover is sparse and the soils are of a fine texture. The area is also relatively dry and the natural soils show signs of dispersion and clay transport. During remediation, the soil must be wetted to approximately field capacity in order to prevent dust production. Field capacity is a term used to describe the maximum water holding capacity of a soil.

#### 4.6. General Observations

Table 2 and Table 3 summarise general aspects related to soil characteristics of the Polokwane and Apiesdoring yards, respectively.

**Table 2** General observations regarding the soils of the Polokwane yard

Observation	Yes	No
Shallow water table (<1.5 m deep)		✓
Seasonally wet soils		✓
Unstable rocky slopes or steep slopes with loose soil		✓
Dispersive soils		✓
Soils of high clay content		✓
Any other unstable soil feature		✓
Sensitive to wind erosion		✓

**Table 3** General observations regarding the soils of the Polokwane yard

Observation	Yes	No
Shallow water table (<1.5 m deep)		✓
Seasonally wet soils		✓
Unstable rocky slopes or steep slopes with loose soil		✓
Dispersive soils	✓	
Soils of high clay content		✓
Any other unstable soil feature		✓
Sensitive to wind erosion	✓	

#### **4.7. General Overview of the Proposed Mitigation Measures**

In their report, titled *Assessment of Environmental Contamination From Asbestos Waste* (31 August 2009), Conservation Support Services proposes the following remediation actions for asbestos contaminated soil: "The preferred methodology is for full remediation of sites and railway lines. This includes excavation of contaminated soil and visible waste, placing it into sealed containers, and transporting and disposing of the waste at a H:H landfill."

The following must be adhered to:

- The area should be adequately wetted to minimise the formation of asbestos fibres or dust.
- "Adequately wetted" means to sufficiently mix or penetrate the asbestos containing material and surrounding soil with a liquid in order to prevent the formation of airborne fibres or dust.
- The asbestos containing material should be visibly wet at all times. This means that wetting the area should be done with regular intervals throughout the period of working and not only after arrival in the morning or prior to commencement of work.
- Suitable liquids include a wetting agent, amended water (water to which surfactant chemicals have been added, such as a 50:50 mixture of polyoxyethylene ester and polyoxyethylene ether in a 0,16 % solution of water) or plain water.
- The asbestos containing material must be double bagged in plastic bags with a minimum thickness of 75 microns prior to transportation from the site. Transparent bags are recommended as this allows inspection of the content to see if it is adequately wetted without opening the bags once at the disposal site. Droplets of moisture must be visible on the inside of the bags. The operator, auditor or inspector is therefore not exposed to fibres.

The company which is contracted to remove the asbestos containing material and which will implement the mitigation procedures must be authorised by the Department of Labour as an asbestos contractor. This company must take notice of the

abovementioned legislation as well as the Asbestos Regulations, 2001, as published under Government Notice No. R. 155 of 10 February 2002 under section 43 of the OHS Act.

An alternative approach would be that of encapsulation. The soils are to be treated as described above to minimise dust production and encapsulated with an agent that would seal the area from the atmosphere.

#### 4.8. Possible Impact of Remediation Actions on the Soil Environment

The soils of both the Polokwane and Apiesdoring yards have been transformed to such an extent that a land capability class cannot be assigned to these areas. Furthermore, it is imperative that asbestos containing soil be remediated as these soils pose a major risk to human health and cannot be used for crop production, grazing or horticultural purposes. Disturbing of these soils is unwise. The remediation of the soils through excavation or encapsulation will have no effect on the soil environment. Table 4 and 5 summarise the impacts that may result from the remediation of the asbestos contaminated soil on the soil environment.

Remediation of the contaminated soils may lead to open excavated areas. The extent of soil removal coupled with the already impacted nature of the area does not warrant the implementation of mitigation measures. To cover these areas with soil would entail removal of soil from some other (probably not impacted) area and may therefore constitute loss of valuable soil resources. Soil erosion is a minimum in the area owing to the nature of the soils and the extent of urban development.

**Table 4** Impacts on the soil environment of the Mpumalanga yards owing to the remediation of asbestos contaminated soil

<b>Nature:</b> Loss of soil due to removal during remediation of asbestos contaminated soil		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	local (1)	local (1)
<b>Duration</b>	permanent (5)	permanent (5)
<b>Magnitude</b>	small (0)	small (0)
<b>Probability</b>	improbable (2)	improbable (2)
<b>Significance</b>	<b>low (12)</b>	<b>low (12)</b>
<b>Status (positive or negative)</b>	positive	positive
<b>Reversibility</b>	Not reversible	Not reversible
<b>Irreplaceable loss of resources?</b>	No	No
<b>Can impacts be mitigated?</b>	No	
<b>Mitigation:</b> None		
<b>Cumulative impacts:</b> None		
<b>Residual Impacts:</b> None		

**Table 5** Impacts on the land capability of the Polokwane and Apiesdoring yards owing to the remediation of asbestos contaminated soil

<p><b>Direct impacts:</b> None</p> <p><b>Indirect impacts:</b> None</p> <p><b>Cumulative impacts:</b> None</p>
<p><b>Environmental Impact Statement:</b> The asbestos contaminated soils pose a risk to human health and environmental quality. Remediation of these soils is of utmost importance. If these soils are not cleaned-up the health of those working on the yard and living in the vicinity is at risk.</p>

## 5. CONCLUSION

Both the Polokwane and Apiesdoring yards have been transformed to such an extent that natural occurring soils are only encountered in isolated spots. A land capability class cannot be assigned to these areas as the yards can only be used for the purposes for which development has taken place. Implementation of the remediation plans, for asbestos contaminated soil, proposed by Conservation Support Services in their report titled *Assessment of Environmental Contamination From Asbestos Waste* (31 August 2009) will have no negative effect on the soil environment.

## 6. REFERENCES

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