



**Savanah Environmental
Unit 606, 1410 Eglin Office Park, Sunninghill**

**Occupational and Environmental Health Risk Assessment –
Input into Waste Licence Application
Dates of Survey: 16th to 18th, 21st, 22nd August & 9th September
2011**

QUICK REFERENCE	
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Apex References	
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1. INTRODUCTION

The risk assessment undertaken by Apex Environmental on asbestos contamination in soil, identified asbestos within various sites located throughout the Eastern and Central regions of South Africa. Soil contamination from asbestos waste was identified along specific railway lines and stations, where asbestos minerals had been previously transported or staged. The risk assessment was performed at the following sites: -

- Nelspruit Railway Station; Mpumalanga
- Komatipoort Railway Station; Mpumalanga
- Barberton Railway Station; Mpumalanga
- Polokwane Railway Station; Limpopo
- Apiesdoring Railway Station; Limpopo
- Nsese Yard; KwaZulu-Natal

The health risks posed to Transnet Freight Rail employees, contractors or even members of the public, is difficult to quantify. Exposure to asbestos will depend upon the degree of soil contamination (quantity of asbestos), duration of exposure (time spent in the area) and the modes by which the fibres are being made airborne by human and wind activity. **In the cases observed in this report, the potential health risk posed to Transnet Freight Rail employees, contractors and members of the public by the observed degree of contamination at the Mpumalanga sites can be considered as moderate to high.**

In an attempt to provide some sense of risk, the following must be borne in mind. A single asbestos bundle the size of a human hair through a microscope has the appearance of a large untwisted, steel cable i.e. made up of hundreds of smaller strands (fibres, in the case of asbestos). The problem with asbestos fibres is that they tend to fracture longitudinally (along their length) releasing thousands of Regulated Fibres ultimately into the air we breathe. These small diameter fibres and fibre-containing particles may remain suspended in the air for a long time and be carried long distances by wind or water before settling.

Although no previous occupational monitoring data is available from the site under investigation, it is anticipated that airborne concentrations of asbestos fibres could easily exceed typical background environmental levels of 0.00001 to 0.0001 f/ml * and even Occupational Exposure Limits of 0.2 f/ml (Regulated fibres) of air for any person handling the soil including those who may be in the vicinity¹.

2. EXECUTIVE SUMMARY

The occupational and environmental risk assessment undertaken during this investigation represents only a snapshot in time that generally will not be a good representation of employee exposure under various complex activities and environmental conditions. Thus, the semi-quantitative assessment of the distribution of the asbestos contaminated soil and potential for asbestos fibres to become airborne, remains the important aspect of this risk assessment.

Observations made during this and similar assessments undertaken by Apex of contaminated soil, found that over time, (particularly along railway lines and at stations) the more the soil is handled, the more finely distributed it becomes within the soil to a point where it becomes difficult to observe visually. Furthermore, the effect of rainfall on surface asbestos contaminated soil showed that the greater the amount of rainfall, the more separated and finely distributed the clumps become, to a point where it becomes difficult to observe visually particularly when it has dried out. These now larger patches of fibre bundles (once dried) can easily become airborne by wind or by employees walking or driving over the asbestos or digging into the soil.

All personal air monitoring samples taken, show levels to be Below Detectable Limit (BDL) i.e. below 0.01 f/ml. This is the lowest level of detection for analysis by phase contrast microscopy (PCM) (MDHS 39/4) ². This result was largely expected since no active disturbance was occurring within asbestos contaminated sites at the time of the risk assessment. The actual health risks posed to employees and the public during remediation activities can only be estimated at this stage since no air monitoring data is currently available. However, based upon previous experience of similar type work undertaken by Apex in KZN marshalling yards, the health risks posed to employees undertaking the work is considered moderate to high. The risk is dependent on many factors such as the quantity of asbestos handled, the moisture content of the soil, wind conditions on the day as well as the general handling techniques utilised by the removal contractor. Overall, similar experiences of airborne fibre concentrations greater than 500 meters downwind of these types of activities is considered low risk.

The asbestos likely to be encountered on these sites today may vary as follows:

- a) Loose clumps of either buried or surface asbestos, which generally tend to range in size from about the size of a person's hand to small barely visible pieces of a few millimetres in length.

- b) Clumps of asbestos that have been mixed within soil (soil that has been handled many times) to a point where the asbestos has separated literally into millions of small fibres that are invisible to the naked eye.
- c) Asbestos containing brake pads, asbestos rope insulation and asbestos cement products.

GPS coordinates were also taken by an Apex consultant in specific areas where asbestos waste and contamination was identified. The presence of asbestos poses an environmental and human health risk to people who operate on the site and nearby occupants in the areas, therefore the need and urgency to undertake the clean-up, removal and remediation of asbestos contaminated sites is imperative.

Asbestos related health risks are well documented in epidemiological and basic science literature; but a direct correlation between given asbestos exposures to the health hazard outcomes **continues to be difficult to quantify**. The US Environmental Protection Agency (EPA) as well as the International Agency for Research on Cancer of the World Health Organization has declared asbestos as a human carcinogen. Specifically, in studies of occupational exposure, inhalation of asbestos fibers has been shown to cause asbestosis (pulmonary fibrosis), pleural or peritoneal mesothelioma, and bronchial carcinoma.

Asbestos fibers are basically chemically inert. They do not evaporate, dissolve, burn or biodegrade in the environment. However, single fibers and clumps of fibers may be released in the air as dust as a result of wind erosion and other types of activities that generate dust. Once inhaled, fibers may be deposited and retained in the airways and lung tissue. Because asbestos fibers remain in the body, each exposure to asbestos increases the likelihood of developing an asbestos related disease. Many of these diseases caused by asbestos (asbestosis, mesothelioma, lung cancer) take between 15 and 40 years to be diagnosed.

The human respiratory system is therefore assumed to accumulate fibres linearly with concentration. For this reason alone, the cumulative nature of asbestos in the lungs be it in small doses over long periods of time or a single large dose over a few hours or days, the health risks posed to potentially exposed Transnet employees and contractors, should not be underestimated.

3. METHODOLOGY

The risk assessment was conducted using visual inspection by a suitably experienced, competent Asbestos Technician. The degree of risk was based upon and can be considered

primarily as a qualitative assessment based on substantial previous experience, measured airborne concentrations, an extensive literature review on the subject and the observed degree of on-site asbestos contamination on the day.

In order to maintain a reasonable degree of consistency, the risk assessment strategy employed by CSS for TFR (the country wide asbestos risk assessment) provided some guidance for this assessment ³.

All attempts were made to locate any asbestos or material suspected of containing asbestos.

The risk assessment was undertaken with a view to assessing the potential occupational and environmental risks posed by the remediation of contaminated yards located within Mpumalanga, Limpopo and KwaZulu-Natal regions; in order for Savannah Environmental to obtain a waste license on behalf of TFR for the remediation of the above mentioned sites ⁴. The information on-site was then presented within the Impact Assessment tables (Tables 2 -7 below).

The assessment of the impacts of asbestos contaminated land was calculated using the methodology provided by Savannah Environmental (PTY) LTD. This methodology was originally designed for the assessment of environmental impacts of proposed developments. Asbestos is a naturally occurring silicate and therefore will not have any significant impact on the environment or environmental systems but rather on human health. Modifications were therefore applied to this methodology by Apex assessors in order to provide some useful information on the anticipated human health impacts of the remediation of asbestos contaminated land.

4. ASBESTOS LEGISLATION / OCCUPATIONAL EXPOSURE LIMITS (OEL)

4.1 Occupational Health & Safety Act, 1993: Asbestos Regulations, 2001.

Asbestos Regulations 2001 promulgated in terms of Occupational Health & Safety Act, 1993 applies to every employer or self employed person who carries out work at their workplace that may be exposed to asbestos containing dust⁵.

The regulations further make the following provisions:

- Regulation 4 states that no employer or self employed person shall require or permit any person to work in an environment in which he or she would be exposed to asbestos in excess of the prescribed Occupation Exposure Limit (OEL) for airborne asbestos is 0.2 regulated fibres per cubic centimetre of air or 0.2 f/ml, averaged over a 4-hour working period, measured in accordance with MDHS 39/4².
- Regulation 21 requires any person who intends to carry out “demolition work” involving asbestos, such as cleaning –up spilt raw asbestos, must be a Registered Asbestos Contractor, registered with the Department of Labour. In addition, asbestos contractors must ensure that a Plan of Work is submitted to an Approved Asbestos Inspection Authority for approval before commencing with the demolition work. In TFR’s case, the handling of asbestos contaminated soil.
- Regulations 7 – 13 require that an assessment for potential exposure, air monitoring is undertaken, medical surveillance of employees is undertaken, a respiratory zone is demarcated and that exposure to asbestos is controlled.
- Regulation 13 (1) states that an employer shall ensure that the release of asbestos dust into any environment complies with the provisions of the Atmospheric Pollution Prevention Act, 1989 (Act. No. 73 of 1989), the National Water Act, 1998 (Act No. 36 of 1998) and the National Environmental Management Act, 1998 (Act. No.107 of 1998)⁶.
- Regulation 14 (1) (a) and (b) regulate asbestos that forms part of structures of workplace, building, plant or premises. These regulations require that steps be undertaken to identify the location of asbestos in workplace areas and make and maintain a written inventory of the location of asbestos.

4.2 Environmental Clearance Limit and Background levels

4.2.1 The **Environmental Clearance Limit** is generally taken as **< 0.01 f/ml**. This is the lowest level of detection for analysis by Phase Contrast Microscopy (PCM) (MDHS 39/4) ².

4.2.2 The Asbestos Regulations 2001, define the Occupational Exposure Limit, "*means an occupational exposure limit of 0.2 regulated fibres per millilitre of air averaged over any continuous period of four hours measured in accordance with MDHS 39/4*".

4.2.3 Exposure to all forms of asbestos should be reduced to the minimum reasonably practicable, that is, well below the control limits. They apply only to people working with asbestos, not to other employees or to members of the public. For these categories, exposure should be kept below the clearance limit of 0.01 respirable fibres/ml of air. At this accepted clearance level for removal work, there are still 10,000 fibres per cubic metre in the air. A human requires one cubic metre of air to breathe per hour so there is still considerable risk. American research suggests that a person breathing this level of asbestos for ten years would stand a three in 1000 chance of developing an asbestos cancer *.

* <http://www.lhc.org.uk/members/pubs/books/asbestos/asb05.htm> (*Asbestos Hazards Handbook - Chapter 5*).

4.2.4 According to the U.S. Agency for Toxic Substances and Disease Registry (ATSDR), general background environmental levels of asbestos to which we all may be exposed range between 0.00001 f/ml and 0.0001 f/ml in air and tend to be highest in cities and industrial areas ¹.

5. AIR MONITORING RESULTS

Environmental Clearance Limit for static samples is < 0.01 f/ml².

Occupational Exposure Limit (OEL) for airborne asbestos is 0.2 f/ml⁵.

Table 1: Air Monitoring Results

DATE MONITORED	SAMPLES TAKEN	RESULTS (FIBRES / ml)	COMPLIANT / NON - COMPLIANT
16/08/2011	One personal sample taken on Apex employee during site assessment at Nelspruit Station	BDL	Compliant
17/08/2011	One personal sample taken on Apex employee during site assessment at Komatipoort Station	BDL	Compliant
18/08/2011	One personal sample taken on Apex employee during site assessment at Baberton Station	BDL	Compliant
22/08/2011	One personal sample taken on Apex employee during site assessment at Apiesdoring Station	BDL	Compliant
23/08/2011	One personal sample taken on Apex employee during site assessment at Polokwane Station	BDL	Compliant
	One personal sample taken on Apex employee during site assessment at Ladana Station	BDL	Compliant
09/09/2011	One personal sample taken on Apex employee during site assessment at Nsese Station	BDL	Compliant

BDL Below Detectable Limits

6. PLOTTED GOOGLE EARTH LOCATIONS FOR POSITIONS INSPECTED



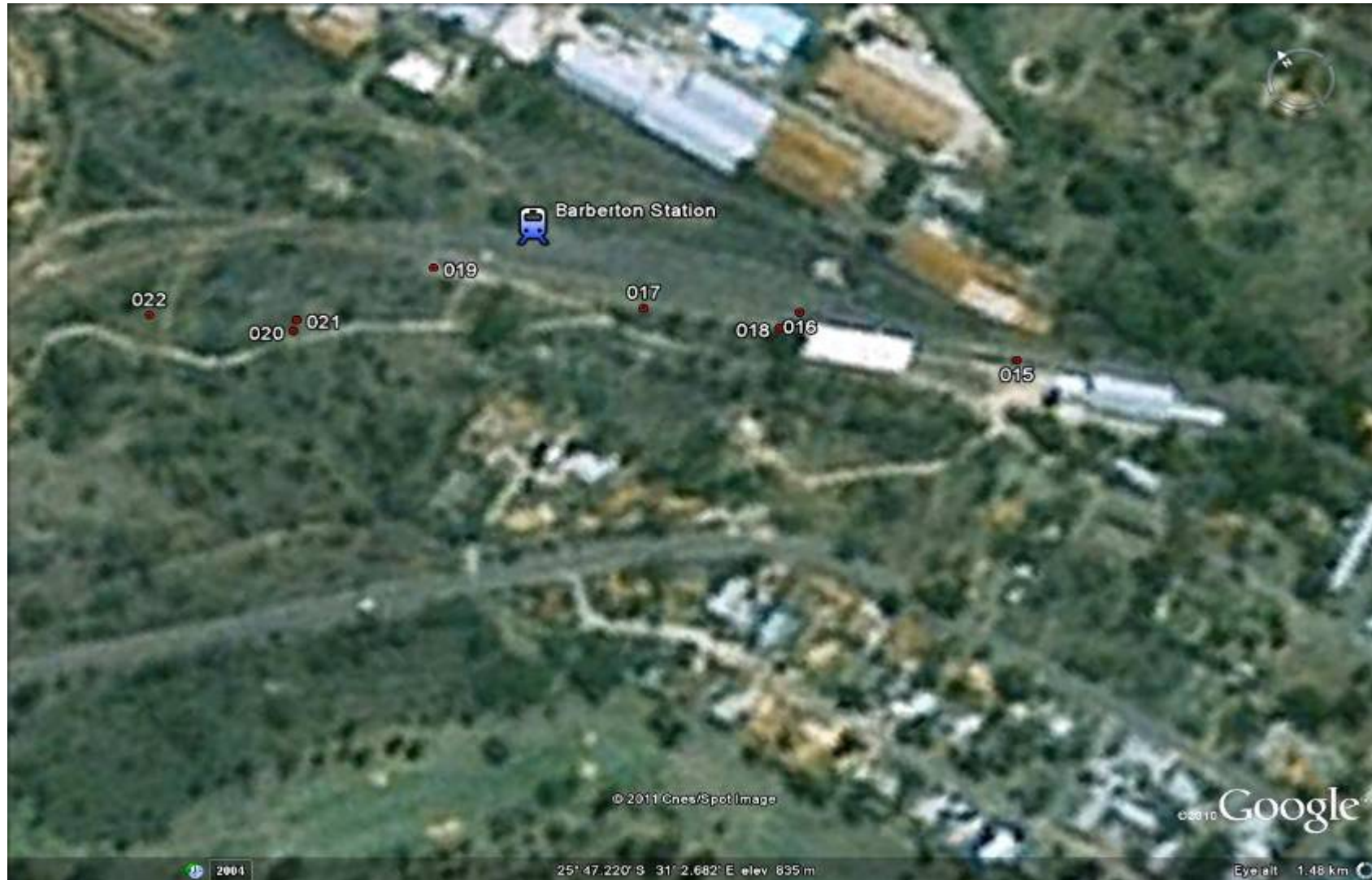
SAVANNAH ENVIRONMENTAL
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For Apex

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7. EVALUATION OF RESULTS

- 7.1 All seven personal air monitoring samples taken, show levels to be Below Detectable Limit (BDL) i.e. below 0.01 f/ml. This is the lowest level of detection for analysis by phase contrast microscopy (PCM) (MDHS 39/4) ².
- 7.2 The BDL results obtained were attributed to the fact that no disturbance of the asbestos material was undertaken during the monitoring period. Asbestos fibre levels are most likely to become airborne and will reveal different results during activities such as track maintenance work and asbestos clean-up projects.

8. POTENTIAL IMPACTS OF CLEAN UP AND CURRENT FINDINGS

Asbestos containing dust is a complex mixture of fibrous structures. Not only do single fibres vary in dimensions but also such fibres may be found combined with other fibres in the form of bundles, clusters, or matrices. These are known as asbestos structures that can be inhaled.

The relationship between soil and air levels of asbestos fibres is therefore considered complex. The potential for asbestos fibres to become airborne depends on the type of work activities as well as natural activities such as the wind i.e. the potential for mechanical disruption of the soil by human and/or natural activities. The removal of asbestos and asbestos containing materials, including soil, is anticipated to be **High Risk** work. Suitable precautionary measures must be implemented during asbestos removal or even the disturbance of asbestos contaminated soil. In order to minimise the potential for the release of regulated fibres into the air (see Recommendations below).

- 8.1 Nelspruit Railway Station, Mpumalanga – visible contamination such as asbestos cement waste and loose Chrysotile fibre bundles / clumps were observed. No additional risk reduction strategies are required prior to remediation activities, The health risk of airborne asbestos fibres off-site (surrounding residential areas) even during windy conditions, is not considered significant during the proposed remediation of this site (**See Figures 1-6**).
- 8.2 Komatipoort Railway Station, Mpumalanga – visible contamination such as asbestos cement waste and a small amount of Chrysotile loose fibres were observed to be present. There were also airbrake blocks' containing Amosite fibres. In order to reduce the health risks an extra storage area should be provided to store the airbrake blocks for disposal. This yard is not

immediately adjacent to a residential area and therefore not considered to pose any significant risk to the surrounding residential areas.

- 8.3 Barberton Railway Station, Mpumalanga - visible contamination such as asbestos cement waste was observed to be present. Inspections revealed that this yard is unoccupied, although the general public was observed to use this station as a thoroughfare. Due to vegetation growth i.e. tall grass, it was impossible to thoroughly inspect this yard. This yard is not immediately adjacent to a residential area. No significant health risk is anticipated to be posed to surrounding communities during remediation activities. **(See Figures 12-14).**
- 8.4 Apiesdoring Railway Station, Limpopo – no visible asbestos contamination was observed on this site. A soil sample taken at this location revealed positive results for Amosite asbestos³. The health risk of airborne asbestos fibres off-site (surrounding residential areas) is not considered significant. A thorough re-inspection of the site for asbestos could be an option.
- 8.5 Polokwane and Ladanna – visible contamination such as asbestos cement waste, Chrysotile loose fibres, bandage and rope was observed to be present. Inspections revealed that this yard is occupied especially near the Good Shed. This station is located within a populated area i.e. industrial and residential. It has been observed that a significant amount of asbestos rope waste had been left under the Northern Good Shed building. It has been reported that TFR employees repair and remove asbestos rope from wagons/locos and no disposal plans have been implemented for the asbestos waste. Therefore, the implementation for risk reduction strategies could be regarded as a high priority i.e. TFR employees, contractors and/or public is at risk during operations **(See Figures 15-19).**

Risk reduction strategies revolve around **preventing** all TFR employees from handling any asbestos or asbestos containing materials and only utilising the services of a Registered Asbestos Contractor and AIA, for all work involving asbestos.

During remediation work, areas where contaminated soil is being handled can be wet using water trucks and hose pipes to prevent the generation of dust during handling. In addition work can be temporarily ceased during dusty dry condition where the wind speeds exceed 20 knots.

- 8.6 Nsese Yard, KwaZulu-Natal – no visible asbestos contamination and/or waste was observed during the site inspection. No risk reduction strategies therefore required.

OCCUPATIONAL & ENVIRONMENTAL ASBESTOS RISK ASSESSMENT
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Figure 1: Nelspruit – Mixed asbestos waste



Figure 2: Nelspruit – Asbestos Cement Pipes



Figure 3: Nelspruit – Loose Asbestos Fibres (Chrysotile)



Figure 4: Nelspruit – Broken Asbestos Cement Sheets



Figure 5: Nelspruit – Asbestos Containing Brake Blocks



Figure 6: Nelspruit – Loose Asbestos Fibres (Chrysotile)



Figure 7: Komatipoort – Mixed Asbestos Waste



Figure 8: Komatiepoort – Asbestos Containing Brake Blocks



Figure 9: Komatiepoort – Mixed Asbestos Waste



Figure 10: Komatiepoort – Loose Asbestos Fibres (Chrysotile)



Figure 11: Komatiepoort – Broken Asbestos Cement Waste



Figure 12: Barberton – Broken Asbestos Cement Waste



Figure 13: Barberton – Asbestos Cement Pipe from demolished building



Figure 14: Barberton – Mixed Asbestos Waste



Figure 15: Ladanna – Loose Asbestos Fibres (Chrysotile)



Figure 16: Ladanna – Good Shed Yard



Figure 17: Ladanna – Asbestos Rope (Chrysotile)



Figure 18: Ladanna – Asbestos Rope on Steam Pipes

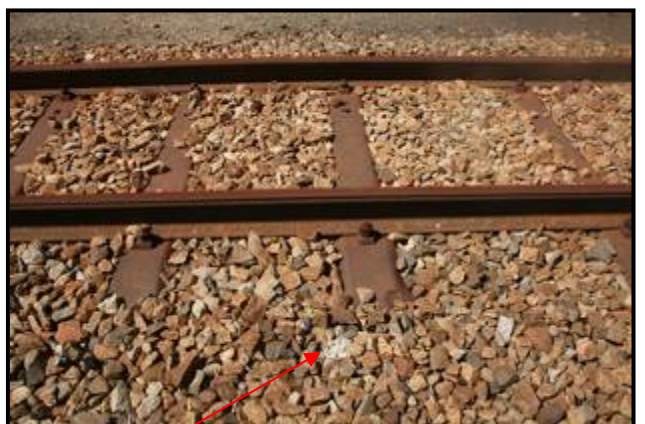


Figure 19: Ladanna – Loose Asbestos Fibres (Chrysotile)

9. IMPACT ASSESSMENT TABLES

Table 2: Nelspruit Station, Mpumalanga

Nature: Risk to human health during remediation work		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Very Short (1)
Magnitude	Moderate (6)	Minor to Low (3)
Probability	Highly Probable (4)	Improbable (2)
Significance	Medium (48)	Low (10)
Status (positive or negative)	Negative	Positive
Reversibility	Reversible	-
Irreplaceable loss of resources?	No	-
Can impacts be mitigated?	Yes (ref: paragraph 10 below)	-

Table 3: Komatiepoot Railway Station, Mpumalanga

Nature: Visible contamination such as asbestos cement waste and a small amount of Chrysotile loose fibres were observed to be present. No asbestos containing brake blocks' were observed.		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Very Short (1)
Magnitude	Low (4)	Minor to Low (3)
Probability	Probable (3)	Improbable (2)
Significance	Medium (30)	Low (10)
Status (positive or negative)	Negative	Positive
Reversibility	Reversible	-
Irreplaceable loss of resources?	No	-
Can impacts be mitigated?	Yes (ref: paragraph 10 below)	-

Table 4: Barberton Railway Station, Mpumalanga

Nature: Visible contamination such as asbestos cement waste was observed to be present.		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Very Short (1)
Magnitude	Minor (2)	Minor to Low (3)
Probability	Improbable (2)	Improbable (2)
Significance	Medium (16)	Low (10)
Status (positive or negative)	Negative	Positive
Reversibility	Reversible	-
Irreplaceable loss of resources?	No	-
Can impacts be mitigated?	Yes (ref: paragraph 10 below)	-

Table 5: Apiesdoring Railway Station, Limpopo

Nature: No visible contamination was observed on this station.		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Very Short (1)	Very Short (1)
Magnitude	Minor to Low (3)	Minor to Low (3)
Probability	Improbable (2)	Improbable (2)
Significance	Low (10)	Low (10)
Status (positive or negative)	Negative	Positive
Reversibility	Reversible	-
Irreplaceable loss of resources?	No	-
Can impacts be mitigated?	Yes (ref: paragraph 10 below)	-

Table 6: Polokwane and Ladanna Yard, Polokwane

Nature: Visible contamination such as asbestos cement waste, Chrysotile loose fibres, bandage and rope was observed to be present. Inspections revealed that this yard is occupied especially near the Good Shed.		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Very Short (1)
Magnitude	Moderate to High (7)	Minor to Low (3)
Probability	Highly Probable (4)	Improbable (2)
Significance	Medium (52)	Low (10)
Status (positive or negative)	Negative	Positive
Reversibility	Reversible	-
Irreplaceable loss of resources?	No	-
Can impacts be mitigated?	Yes (ref: paragraph 10 below)	-

Table 7: Nsese Yard, KwaZulu-Natal

Nature: No visible asbestos contamination and/or waste was observed during the site inspection.		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Very Short (1)	Very Short (1)
Magnitude	Minor to Low (3)	Minor to Low (3)
Probability	Improbable (2)	Improbable (2)
Significance	Low (10)	Low (10)
Status (positive or negative)	Negative	Positive
Reversibility	Reversible	-
Irreplaceable loss of resources?	No	-
Can impacts be mitigated?	Yes (ref: paragraph 10 below)	-

10. IMPORTANT MITIGATION CONSIDERATIONS

- 1) The extent (quantities of asbestos and asbestos contaminated soil / articles) of the Clean-up to be undertaken by Registered Asbestos Contractors for each site will need to be determined more thoroughly by the contracted AIA.
- 2) It is extremely important that any asbestos or asbestos contaminated soil, ballast, aggregates or even vegetation, must not be removed from the TFR sites (owned land), unless authorised by the contractor designated with the responsibility for the safe and environmentally appropriate manner of disposal.
- 3) An Approved Inspection Authority (AIA) and Registered Asbestos Contractor must be utilised for and be present at all times during the Clean-up phase. The AIA will be responsible for the approval of the Plan of Work for each site, as well as the submission thereof to the provincial office of the Department of Labour. The AIA will also submit the final air monitoring and clearance reports to the client.
- 4) For certain sites the appointed Registered Asbestos Contractor must have the capability / infrastructure to dig up and haul relatively large quantities of contaminated soil if requires, e.g. TLBs, Bobcats and tipper trucks with sealed bins.
- 5) The sites where asbestos disposal is to occur should possess the relevant legal permits / licences to accept asbestos contaminated soil.
- 6) Although the off-site impacts (health risks) of airborne asbestos fibres on surrounding residential areas is considered to be low, as a precautionary measure, the implementation of the following controls will assist in keeping airborne fibre levels to a minimum:
 - areas where contaminated soil is being handled can be kept wet using water trucks and hose pipes to prevent the generation of dust during handling.
 - Work can be temporarily ceased during dry dusty conditions where wind speeds exceed 20 knots.
 - Contaminated soil should be handled in a slow and careful manner preventing any unnecessary generation of dust.

11. MITIGATION MEASURES

Table 8: Asbestos Management Plan (AMP)

ASBESTOS MANAGEMENT PLAN:	Time-frame	Responsibility
<p>The Asbestos Management Plan is intended to impose strict controls on work practices undertaken within each site where either all asbestos cannot be reasonably removed i.e Environmental Covenant Sites, or sites regarded as Low Level Contamination Sites.</p> <p>Environmental Covenant Sites:</p> <p>An environmental covenant is an administrative device that restricts tenants, contractors or any other persons activities on sites where some asbestos contaminated soil remains in place i.e. cannot be reasonably rehabilitated. It is intended to limit potential future liability for residual asbestos contaminated soil by ensuring that:</p> <ol style="list-style-type: none"> 1. The existence of asbestos-contaminated soil is fully disclosed. 2. It is not inadvertently disturbed. 3. Any engineering controls such as caps are maintained. 4. Any future soil disturbing activities are undertaken in accordance with specific health and environmental controls. <p>While the general goal of most asbestos clean-ups is to return a site to a condition where it can be safely used for any purpose (rehabilitation), this is not always technically possible or economically practicable. Restrictions limit use to safe use. These restrictions are necessary to protect human health and the environment from the potential of inadvertent exposures to residual contamination while encouraging economic development.</p> <p>Low level Contamination Sites.</p> <p>All of the sites inspected by Apex were considered Low Level Contamination Sites. The following mitigation measure are therefore presented:</p>		Savannah

Table 9: Mitigation Measures

Item N°:	Action/control	Time-frame	Legal Ref:	Responsibility
1	Appointment of an Approved Inspection Authority AIA (To provide guidance on legal requirements and the requirements of this AMP).	Before starting the contract	Asbestos Regulations, 2001. Regulation No 21 and 16.	TFR
2	Appointment of a Registered Asbestos Contractor (registered with DoL and capable of handling large volumes of asbestos contaminated soil.	Before starting the contract	Asbestos Regulations, 2001. Regulation No 21 and 16.	TFR
3	Identify suitable asbestos disposal sites, i.e. sites possessing the relevant legal permits / licences to accept asbestos contaminated soil.	Before starting the contract	Asbestos Regulations, 2001. Regulation No 16. Environment Conservation Act, 1989 and National Environmental Management Act, 1998.	TFR or Reg. Asb. Contractor
4	The Approved Inspection Authority to draw up and Approve the Plan of Work and forward a copy to the Department of Labour – Provincial Director).	Before starting the contract	Asbestos Regulations, 2001. Regulation No 21 and 16.	AIA
5	Proof of the Registered Asbestos Contractors employees having been provided with Training and Information (Asbestos) e.g. certificates.	Before starting the contract	Asbestos Regulations, 2001. Regulation No 5 and 16.	Reg. Asb. Contractor
6	Proof of the Registered Asbestos Contractors employees having undergone Medical Surveillance, both lung function and x-rays. (for all employees working on an asbestos contaminated site-site)	Before starting the contract	Asbestos Regulations, 2001. Regulation No 9 and 16.	Reg. Asb. Contractor
7	Provide reports on air monitoring results (asbestos), whilst undertaking work on a contaminated site.	During and upon termination of the contract.	Asbestos Regulations, 2001. Regulation No 8. and 16.	AIA
8	Where applicable, provide all Certificates of Safe Disposal and / or Waste Manifest documentation for any asbestos or asbestos contaminated soil / items removed from a contaminated site.	During and upon termination of the contract.	TFR requirement.	Reg. Asb. Contractor
9	Where applicable, provide details e.g. a register or inventory of quantities and locations (GPS co-ordinates of the removal and final storage sites) of any asbestos contaminated soil / items removed from any TFR owned site.	During and upon termination of the contract.	TFR requirement.	Reg. Asb. Contractor
10	Letter from TFR HSE Department stating the site has been adequately capped or otherwise rendered in an acceptable condition regarding asbestos contaminated soil.	Upon termination of the contract.	TFR requirement.	TFR

12. RECOMMENDATIONS

12.1 Interim Recommendations

12.1.1 An attempt should be made to prevent unauthorised site access, for instance barricading the enclosed work area. Appropriate asbestos warning signs should be provided to these stations and made clearly visible at all times.

12.1.2 It is recommended that during the normal TFR line maintenance and repair activities, dust suppression by water be implemented to reduce the amounts of dust that can be generated e.g. during ballast removal and cleaning operations. Suitable Personal Protective Equipment (PPE) will need to be used by TFR employees in order to minimise the asbestos health risks.

12.2 Remediation Recommendations

12.2.1 It is important that TFR management retain the services of an independent environmental consultant (such as Savannah Environmental), an Approved Asbestos Inspection Authority (such as Apex) and a Registered Asbestos Contractor. As specialists they can provide direction and guidance on all legal, environmental and health issues encountered for this particular challenge with which TFR is faced. Daily air and soil monitoring data will prove to be essential for maintaining a record of Transnet and contractor exposures to asbestos as a result of working in these areas.

Due consideration will need to be paid by TFR management, to the capability of the appointed Registered Asbestos Contractor (RAC). The RAC will need to be able to bulk load and transport large volumes of asbestos contaminated soil for disposal.

12.2.2 All excavations, grading, front end loading and manual digging of soil anywhere on these sites or anywhere there is a potential for soil contamination needs to be carefully considered. Air monitoring will need to be undertaken during any soil disturbing activities. As a precautionary measure, the wetting of soil may be an option to suppress fibre containing dust however this option may not be necessary for all soil handling activities.

12.2.3 All employees present or working in areas where excavations, grading, front end loading and manual digging of soil is undertaken, must wear the appropriate PPE at all times and undergo periodic (as determined by an Occupational Medicine Practitioner) medical surveillance in the form of chest x-rays.

12.2.4 Information and Training must be provided to all potentially exposed employees, contractors or persons by somebody who has adequate personal practical experience and theoretical knowledge on all aspects of the work being carried out (as per Asbestos Regulations, 2001). Apex can provide assistance in this regard.

12.2.5 An Approved Inspection Authority (AIA) will need to develop, approve and implement a Plan of Work (copies to the Department of Labour- provincial office) for each site where asbestos work is to be undertaken. The Plan of Work will be designed to protect the health of Transnet employees, contractors whilst onsite as well as the public in general where applicable.

Any work involving the potential inhalation of asbestos fibres will require the services of an AIA who will draw up and approve a Plan of Work (as mentioned above). Approved Plans of Work are designed to ensure that anyone involved or potentially exposed to asbestos (including members of the public) will be adequately protected. Depending upon the nature of the work to be done, the Plan of Work will detail the type of PPE required, decontamination unit requirements, work procedures to be adopted and disposal requirements. The roles and responsibilities of contractors, clients and landowners are also included.

12.2.6 It is also recommended that no soil, ballast, spoil or potentially contaminated vegetation leave TFR property / sites unless it is being transported to an approved disposal site (for asbestos and asbestos contaminated soil) or if the soil, ballast, spoil or vegetation has been cleared as asbestos free by TFR and the AIA.

13. CONCLUSION

Risk reduction strategies against airborne asbestos for residential areas surrounding these sites **were not deemed necessary** although, as a precautionary measure, water may be used by the Registered Asbestos Contractor to suppress the unnecessary generation of dust. Specific occupational risk reduction strategies were however recommended for work involving potential asbestos exposures undertaken by TFR employees e.g. line maintenance and the repair and removal of asbestos rope from wagons/locos at the Ladanna site.

In principle, Apex supports the recommendations outlined in the CSS (countrywide) report, which meets the requirements of South African occupational and environmental legal requirements. Prior to commencement of any remediation work, the AIA and independent environmental consultant will need to inspect each site in order to calculate the site's specific remediation requirements.

All personnel who are involved in the remediation, inspection, removal, disposal and maintenance on these above mentioned yards should be certified, qualified, and trained regarding the dangers of asbestos exposure and safe handling techniques.

14. LIMITATIONS

In view of the potential prohibitive costs in definitively identifying all on-site asbestos containing materials i.e. sampling and analysing (by PLM) of all suspect materials, and considering such an exercise has been undertaken by CSS in a countrywide risk assessment on behalf of TFR, this survey was conducted using visual inspection by a suitably experienced Asbestos Technician. Where any suspect material of significant quantity was found and could not be determined without a sufficient degree of certainty, recommendations for bulk sample analysis by PLM, will be requested from the client. As a precautionary measure, suspect materials should be considered as containing asbestos.

Due to time constraints, air monitoring was limited to personal samples taken on the Asbestos Technician whilst undertaking the risk assessment within each yard.

15. DESCRIPTION OF THE TEST ENVIRONMENT

The test environment comprised of various TFR Railway Stations located within Mpumalanga, Limpopo and KwaZulu-Natal.

16. CALIBRATION OF EQUIPMENT

All sampling media was used before the prescribed expiry date.

17. HAZARDS MONITORED

Regulated asbestos fibres.

18. TEST METHODS USED

MDHS 39/4 (HSE-UK).

19. CERTIFICATION STATEMENT

This is to certify that the attached report has been compiled and issued under the authority, direction and the responsibility of an Apex Occupational Hygienist.

20. REPRODUCTION OF REPORTS

This report may not be reproduced, except in full, without the written approval of an Apex Occupational Hygienist.

21. REFERENCE LIST

1. U.S. Agency for Toxic Substances and Disease Registry (ATSDR)
2. MDHS 39/4. Asbestos fibres in air. Sampling and evaluation by phase contrast microscopy (PCM) under the Control of Asbestos at Work Regulations
3. Conservation Support Services – Assessment of Environmental Contamination from Asbestos Waste
4. Background Information Document – Savannah Environmental (PTY) Ltd
5. Asbestos Regulations, 2001.
6. Atmospheric Pollution Prevention Act, 1989 (Act. No. 73 of 1989), the National Water Act, 1998 (Act No. 36 of 1998) and the National Environmental Management Act, 1998 (Act. No.107 of 1998)