Soil Contamination Assessment: Paardevlei BESS Project

Report Prepared for

JG Afrika

Report Number 600617/01

Report Prepared by

srk consulting

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JG Afrika

SRK Consulting (South Africa) (Pty) Ltd.
The Administrative Building
Albion Spring
[redacted]
Cape Town
South Africa

Tel: [redacted]
Fax: [redacted]

e-mail: [redacted]
website: www.srk.co.za

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Compiled by:

Richard O'Brien
Principal Environmental Geochemist

Email: [redacted]

Peer Reviewed by:

Lindsay Shand
Associate Partner

Authors:

Richard O'Brien

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Disclaimer

The opinions expressed in this Report have been based on the information supplied to SRK Consulting (South Africa) (Pty) Ltd (SRK) by JG Africa (JGA). The opinions in this Report are provided in response to a specific request from JGA to do so. SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

List of Abbreviations

ACM	asbestos containing materials
AECI	African Explosives and Chemical Industries
BESS	Battery Energy Storage System
CoCT	City of Cape Town
CoPC	contaminant of potential concern
CSM	Conceptual Site Model
EIA	Environmental Impact Assessment
ERM	Environmental Resources Managment
Ha	hectare
JGA	JG Africa
m	meters
mamsl	meters above mean sea level
mbgl	meters below ground level
MWp	Megawatt peak
NDA	Northern Development Area
NEM:WA	National Environmental Management: Waste Act (Act 59 of 2008)
Norms and Standards	National Norms and Standards for the Remediation of Contaminated Land and Soil Quality GN331 Government Gazette 37603, May 2014
PV	Photo Voltaic
RDM	Rheinmetall Denel Munitions
SAP	sampling and analyses plan
S-P-R	source-pathway-receptor
SRK	SRK Consulting (South Africa) (Pty) Ltd
The Framework	The National Framework for the Management of Contaminated Land
USEPA	United States Environmental Protection Agency

1 Introduction and Scope of Report

SRK Consulting (South Africa) (Pty) Ltd (SRK) was requested by JG Africa (JGA) to submit a proposal for the Environmental Site Assessment of portions of the former AECI Somerset West property which is proposed to be redeveloped into a solar park for the City of Cape Town (CoCT).

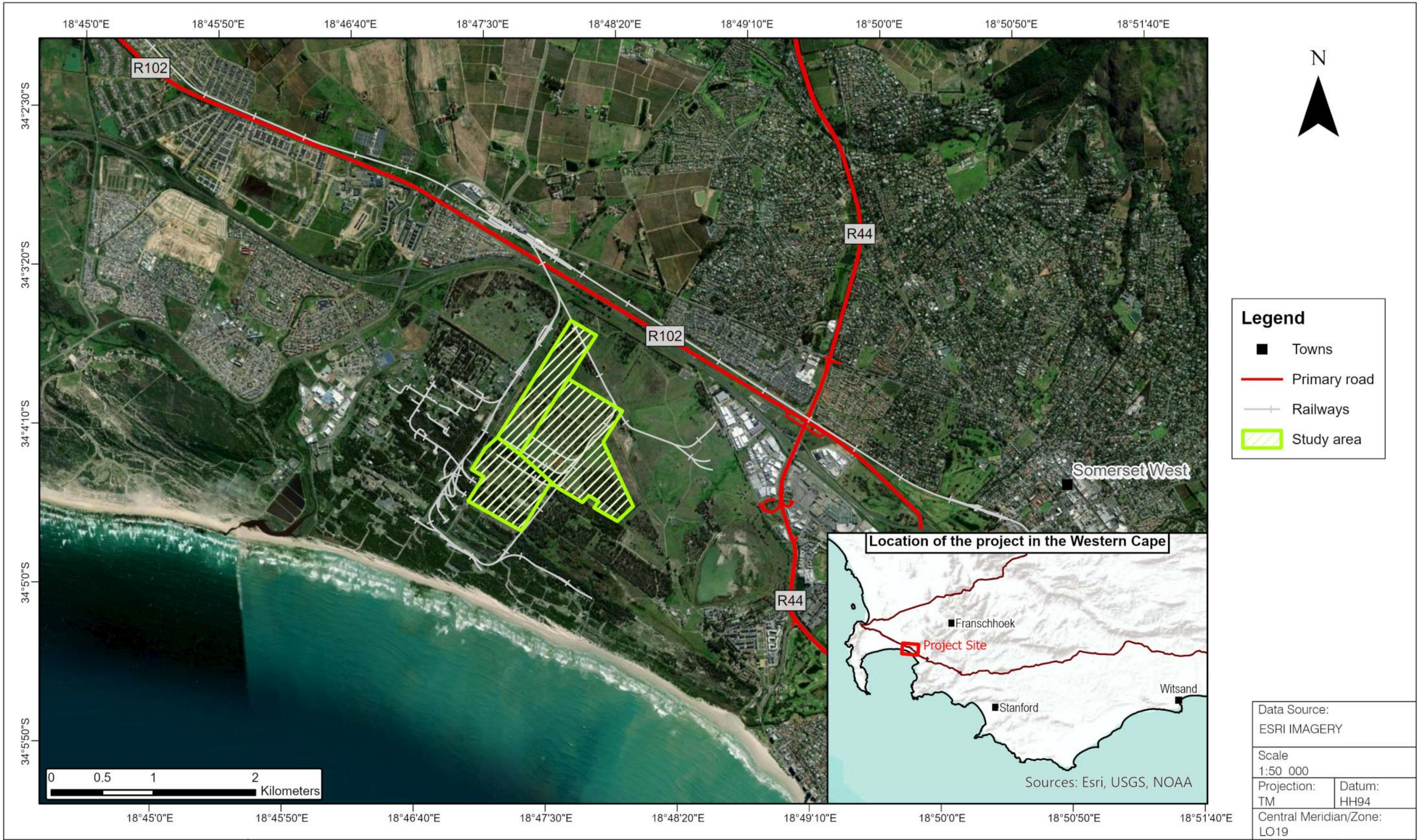
The proposed Paardevlei Solar PV and Battery Energy Storage System (BESS) project will be a 30 to 60 MWp facility connected directly to the CoCT's electrical grid network. Construction is expected for the first quarter of 2026. The proposed development site is located within Somerset West, on a vacant portion of land (approximately 400 ha in extent) known as Paardevlei (formerly AECI Somerset West). The study area (the Site) is shown in Figure 2-1.

2 Scope of Work

2.1 Nature of the brief

The required Scope of Work, as stipulated by JGA is as follows:

- Site visit.
- Land Contamination Assessment of the site.
- Compile a Land Contamination Assessment Report to form part of the Scoping and EIA Assessment Process which should include the following:
  - The Land Contamination Assessment must be compiled in terms of Appendix 6 of the Environmental Impact Assessment Regulations, as amended, promulgated under Section 24(5) and 44 of the National Environmental Management Act (No, 107 of 1998), as amended.
  - Assessment of the No-go alternative. The No-go alternative is the option of not fulfilling the proposed project. This alternative would result in no negative environmental impacts from the proposed project on the site or surrounding local area. The No-go alternative would prevent the development from positively contributing to the environmental, social and economic benefits associated with the development of the renewables sector. It provides the baseline against which other alternatives are compared and shall be considered throughout the report.
  - Impacts during the construction, operational and decommissioning phase, assessed using an impact rating methodology (methodology to be included in report). The significance of cumulative impacts must be assessed prior to and post mitigation.
  - Provide mitigation measures to reduce any negative impacts associated with the proposed development.
- Input into the Environmental Management Programme. •
- Input on comments received from Interested and Affected Parties, if required.



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PAARDEVLEI SOLAR PROJECT

LOCALITY MAP

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2.2 Assessment Methodology

The National Environmental Management: Waste Act (Act 59 of 2008) (NEM:WA) provides a legislative mechanism for the management of contaminated land in South Africa. The National Framework for the Management of Contaminated Land (The Framework) was published by the Department of Environmental Affairs in May 2010 and provides decision-support guidance for the management of contaminated land in South Africa and for the practical implementation of remediation activities in compliance with Section 7 (2) (d) of the NEM:WA.

The Framework sets out a tiered, risk-based approach for the assessment and management of contaminated land that is based on international best practice. The tiered, risk-based methodology is based on a simple conceptual model that defines the contaminant linkage to the potential receptor. The concept is referred to as the source-pathway-receptor model (S–P–R), where:

- The source contains a concentration of a contaminant(s).
- The pathway is the route or means that controls the release and migration of a contaminant to environmental media; and
- The receptor in general terms is something that can be adversely affected by exposure to the contaminants.

Each of these three elements can exist independently of one another however a risk only exists when the S-P–R linkage is complete, and receptors are exposed to the contaminants.

The approach followed in this contaminated land assessment is illustrated in Figure 2-2. This approach is in accordance with the “Norms and Standards for the assessment and remediation of Contaminated Land” as envisioned in Part 8 of the NWM:WA, and by reviewing international best practices. The principles and guidelines of the international best practices have been adapted, where required, to suit South African conditions.

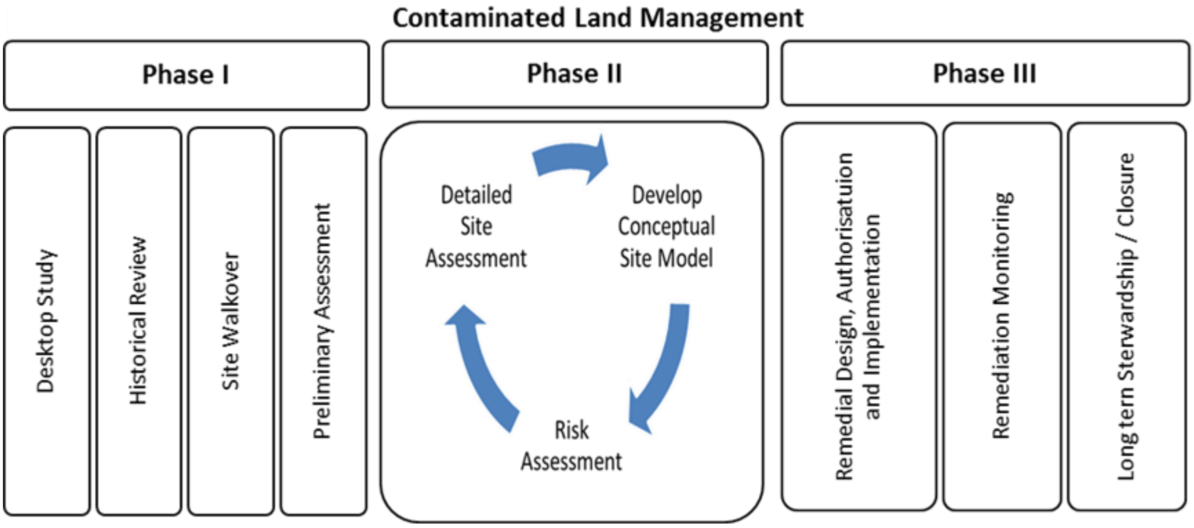

Figure 2-2 : Generic Contaminated Land Management Process

Sections 2.1 and 2.2 provide further information relating to the objective, execution and intended outcome of the Phase I and II Investigations.

2.3 Phase I: Desktop Study and Site Visit

The objective of the desktop study is to review and collate available public information regarding the site (e.g. geological maps, geohydrological maps, topographic maps) to get a better understanding of the site with regards to its history, possible contaminant locations and the environmental setting. Typically, following the desktop study, a site walkover and historic review will be conducted to ascertain the historical land use and operational areas at the site to identify areas where contaminants of potential concern (CoPC) are/were stockpiled, stored, used and disposed of and to prioritise the site into areas of high, medium and low risk.

The information obtained in the Phase I will be used to develop a preliminary site conceptual model to identify areas which may require further in-depth investigation to be targeted for Phase II.

2.4 Phase II Investigation

Based on the interpretation of the data collected during the Phase I assessment, a detailed site assessment strategy was developed which identified and quantified the linkages between the source – pathway – and receptors.

The provisional Phase II site assessment was comprised of a judgemental sampling strategy targeting areas of suspected historical impact and recent site activities, with additional soil samples to be collected from a pre-determined pseudo-grid to establish soil background concentrations of the potential key contaminants anticipated to be associated with the BESS operations.

- A total of 45 shallow soil samples were proposed to be collected by means of hand auger. The soil samples were combined to form nine composite soil samples representative of proposed BESS project area. Two of the samples represent areas of potential impact arising from historical operations (sulfur treatment area – 1 sample, and asbestos areas – 2 samples). No provision was made to assess soils that were beneath roads and hardstanding surfaces.

All samples were submitted to a SANAS accredited laboratory for the following analyses:

- pH_{water}
- Electrical Conductivity
- Soluble anions: for NO_3 (degradation product of explosive products), SO_4 (oxidation product of sulfur degradation), F (impacts from former upgradient fertiliser factory), Cl (general salt accumulation).
- Asbestos screening (presence or absence) in selected areas adjacent to the known asbestos contamination.

The final sampling design was, however, adapted based on the on-site walkover to accommodate the presence of any recent activities and information gathered during the literature review. No provision was made to assess soils that are beneath roads and hardstanding surfaces.

- Soil samples were collected over the entire upper 0.5 m of the soil profile, with the soil profile logged according to the Guidelines for Soil and Rock Loggin in South Africa.

Conceptual Site Model

A Conceptual Site Model (CSM) is a qualitative written and/or illustrative narrative of site conditions, summarising what is known or suspected about the site. It is an essential building block of the site investigation process and is used to identify potential sources, pathways and receptors for CoPC. It can help in understanding the relationship between actual and perceived risks and establish an appropriate and effective response plan. This is because a CSM combines site data with sound scientific principles and enables assessors to apply relevant fate and transport mechanisms to site specific conditions.

The level of detail in a CSM is dictated by the complexity of a site and available information. Central to all CSMs are the three components of environmental risk assessment: sources, receptors and pathways for migration and potential exposure. All three must be present and in operation for a risk to be possible. If there is a source of contamination that can reach a receptor via an exposure pathway, there is a S-P-R linkage. In such a case the potential for exposure should be quantified by collection of data for risk assessment.

The available site information and soil results were compiled into a CSM to describe the possible S-P-R linkages at the site, to inform the risk assessment and potential remedial actions.

Risk Assessment

South African regulatory guideline values for the assessment of contaminated land were promulgated in May 2014, known as the National Norms and Standards (Norms and Standards) for the Remediation of Contaminated Land and Soil Quality GN331 Government Gazette 37603, May 2014.

Based on the CSM developed for the site, SRK has assessed the potential source areas identified relative to the specific S-P-R linkages identified in the CSM. Based on the outcome of the CSM a risk assessment was conducted to identify and prioritize the environmental risks. Should an unacceptable environmental risk be identified, the need for remedial action was assessed.

3 Physical Setting, Geology and Hydrogeology

3.1 Physical Setting

The Study Area comprises an area of approximately 150 has of the 400 ha Paardevlei site and is bounded by the N2 to the northeast, Rheinmetall Denel Munitions (RDM) to the northwest, the coastal dune belt and False Bay to the southwest and vacant land of the former AECI Somerset West factory to the southeast.

The site has a general slope of approximately 1:150 towards False Bay to the south-southwest. Surface elevations along the northern site boundary range from 24 – 25 m above mean sea level (mamsl) decreasing regularly to approximately 9 - 11 mamsl along the southern boundary of the Study Area.

The Study Area is located in a topographically flat area, at elevations of between 8 and 15 mamsl, situated within the coastal plain area.

No natural rivers occur on the site, although several storm water drains exist. These drains collect surface run-off from the site and discharge the water via the Langvlei and Main Drain into the Lourens River mouth.

3.2 Geology

The regional geology of the Somerset West area comprises of a number of geological formations. The Helderberg Mountains inland are formed of resistant Table Mountain Group sandstones. These are underlain by the Malmesbury Group meta sediments (shales, sandstones and hornfels) which form the foothills. The Kuils River-Helderberg granite pluton has intruded into these rocks causing some local thermal alteration of the rocks.

The Site is located on the coastal plain and is underlain by Malmesbury Group meta sediments forming a gentle slope from the foothills to the False Bay coast. These formations, comprise of dark green-grey shales, hornfels and quartzite which are generally highly fractured. These fractures, particularly in the vadose zone, are generally filled with very stiff, dark green-grey clay.

The soil cover overlying the fractured Malmesbury formations comprises a mixture of residual and transported soils. In the northern part of the study area, the soil profile is dominated by weathered Malmesbury Group with minor transported sand and hill wash, which transitions through the central portion of the study area with greater aeolian sand contribution to predominantly aeolian sand and calcrete in the southern portion.

3.3 Hydrogeology

The local hydrogeological conditions have been described by ERM (2004)[1]. A brief summary of the site hydrogeology is given below, with the groundwater on site existing in two zones:

Malmesbury aquitard: constitutes residual clays (completely weathered Malmesbury bedrock) and has a very low permeability but relatively high specific yield (up to 40%). The Malmesbury aquitard is found at surface in places but generally 1.5 m below ground level (mbgl) and is generally 3 to 4 m thick but can be 12 m thick in places. This aquitard is recharged from above by rainfall recharge. Groundwater flow is unconfined and the groundwater flow contours mimic the topography.

Malmesbury fractured aquifer: The Malmesbury Group bedrock forms a secondary aquifer and is recharged by leakage from the overlying aquitard and throughflow from the north. Groundwater typically occurs in discreet zones of high permeability fractures within otherwise impermeable bedrock and groundwater flow is semi-confined. Regionally the fractured Malmesbury aquifer has been classified as a major aquifer. Locally the aquifer has been classified as a **minor aquifer** due to the naturally high salinity of the groundwater.

4 Historical Review

Following a decision by the AECI board in 1995 to cease operational at the Somerset West Factory, a process was initiated to assess the historical impacts arising from the past operations and to remediate the site. The remediation process followed for the entire AECI Somerset West site was based on the USEPA, Risk Assessment Guidance for Superfund, Volume 1 (EPA/540/1-89/002), which is similar to the process outlined in The Framework.

The initial characterisation of the greater AECI site entailed a historical review, site walkovers, installation of monitoring wells and soil and groundwater sampling. Following the initial assessments, the greater AECI Somerset West site was subdivided into smaller areas based on past production activities, which were then characterised individually. The former operational areas, which form part of the CoCT PV study area, are shown in Figure 4-1.

This historical review is based on the historical reports compiled by a number of organisations and by AECI in-house, which document the site characterisation, decommissioning and remediation actions between 1995 and 2008, when the CoCT purchased the land holding from AECI Limited.

The Study Area comprises portions of the following former AECI operational areas:

- Field magazines.
- Sulfur Stockpile; and
- Northern Development Area (NDA).

[1] ERM Report 050-004. Final Report: Hydrogeological Conceptual Model: Fertiliser Area AECI, Somerset West. April 2006

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HISTORICAL AECI OPERATIONAL AREAS

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4.1.1 Northern Development Area (Farm Lands)

The northern portion of the study area (NDA) was bounded by the former Kynoch fertiliser plant to the east, explosive field magazines to the south, RDM to the west and vacant land / residential areas to the north. This portion of the study area was not part of the former AECI operational areas and was vacant / farm land for the duration of the AECI operations.

A site assessment was conducted of this portion of the AECI site in 2002 (SRK, 2002)[2], as part of an EIA for the potential development of the site. This report concluded that the site was not contaminated.

4.1.2 Sulfur Stockpile (Dump)

The Sulfur Stockpile Area is the footprint of a former strategic sulfur stockpile established in 1967. Following a fire in 1995, the bulk of the sulfur was removed and the residual soil treated with lime in 1999. In 2010, the area was covered with *c.*300 mm of calcareous dune sand to facilitate the establishment of vegetation.

Several trials have been undertaken to assess the efficacy of remedial technologies. The ex-situ mixing of the soil with lime to neutralise any remaining acidity and incorporate sufficient lime to neutralise potential acidity was trialled in the Sulfur Windrow area (in the field magazine area). This trial yielded poor results and was not considered a viable remediation technique. The windrows are still present and are generally devoid of any vegetation.

Although the actual footprint of the Sulfur Stockpile is not within the boundary of the study area, there is an area immediately adjacent to the sulfur stockpile that falls within the study area and is potentially impacted by the historical sulfur stockpiles and the sulfur windrow area is located within the study area.

The sulfur impacted soil is not considered a human health risk. The soil is, however, considered to present a potential geotechnical risk to the integrity of concrete foundations due to the low pH (<4) and elevated sulfate concentration. Furthermore, the soil pH is too acidic for the establishment of vegetation, as evidenced by the absence of vegetation on the majority of the sulfur windrow area.

4.1.3 Field Magazines

In the Field Magazine Area, the buildings were used to store materials packaged in cartons or drums and no manufacturing occurred. The magazines were linked with a railway line to the production areas and the platform (U1) from where products were loaded for transport by rail off-site.

As no manufacturing was conducted in this area, the site assessment was undertaken with a primary focus to ensure that these areas were free of explosive residues. This involved the decontamination of the buildings with respect to explosive material residues. The procedure followed involved the washing down of the building with an alcoholic potassium hydroxide solution, following which the structures were burnt. However, the remediation of these areas did not investigate the potential for asbestos contamination. The safety mounds surrounding the building were then demolished, crushed on-site and sold as aggregate.

Following the demolition and decommissioning of all structures, the documentation was reviewed by Mr Herman van Dijk (undated), retired Deputy Chief Inspector of Explosives.

During the demolition of the former AECI operations, a crusher plant was commissioned within the field Magazine area to crush demolished buildings. Demolished buildings were crushed and sold as aggregate. There are several stockpiles of crushed material of various sources within the Field

[2] SRK Report 302292. Land Release Investigation: Portion 37 of Farm No 794 and Portion 11 of Farm No. 787, Stellenbosch

Magazine area located around the former crusher plant (Appendix A). The location of the various explosive operations is shown in **Error! Reference source not found.**.

Sportfield Assessment

The area to the north of the field magazine was vacant land, although still located within the explosives area. A review of aerial photographs (dated 1938, 1955, 1973, 1977 and 2000) was conducted to supplement the historical review prior to the development of the De Beers Football Club. The assessment focused on areas with scarred or disturbed vegetation, buildings and structures which could indicate historical activities. All areas identified during this assessment were subsequently inspected during the site walkover and fieldwork phases of the investigation. The investigation findings were used for locating appropriate test pits for the intrusive site investigations. The historical aerial photographs of the site indicated that the area that was used as a loading area for explosives. No production activities were visible on the aerial photographs reviewed.

No production or storage of explosives is recorded to have taken place within the sportsfield boundaries. The area was used as a staging/loading area for explosives trains. The physical infrastructure associated with these activities included a single building (U1), a railway siding and a road. A storm water drain ran adjacent to the building (U1) and a fire break extended from the drain to the nearby eucalyptus plantation. An open field grading to another eucalyptus plantation was located to the south of the U1 building. These eucalyptus trees have been dying over the past few years and the area is commonly referred to as the “Dead Tree Area”. Although the “Dead Tree Area” has been investigated in the past, (S. Doel, 1998)[3], the cause of the die back was not established. The soil and groundwater in the area was found to be saline.

No effluent was generated in the area and no specific CoPC were identified during the historic review.

4.2 Contaminants of Potential Concern

Based on a review of the available information regarding historical operations in the study area, the following CoPC were identified.

- pH (acidic or low pH soil) and soluble sulfate (SO_4) in the sulfur stockpile area and treatment windrows;
- Soluble fluoride (F) from the adjacent phosphate fertiliser operations;
- Nitrate from the explosive residues
- Chloride (Cl) and EC as general indicators of soil quality;
- Asbestos in the area adjacent to the former Blasting Explosives area where asbestos lagging was used to insulate steam pipes.

5 Field Activities

Based on the historical review and identified CoPC detailed above a sampling and analyses plan (SAP) was developed.

The SAP comprised a judgemental sampling strategy in the two areas identified as having the potential to be contaminated by (adjacent) site activities, including the sulfur windrow area and the asbestos area. In these areas soil samples were collected from the contaminated soil. In both of these areas four soil samples were collected from the auger cuttings representing the upper 0.5 m of the soil profile.

[3] S. Doel, 1998, unpubl. M.Sc Thesis, UCT

The composite soil sample C1 was collected from the soil adjacent to the roadway separating the study area from the former explosives manufacturing area where asbestos lagging is known to have been used.

Composite sample C2 was collected from the residual soil from the sulfur remediation trials in the windrows.

Based on the information available for the site, three areas have provisionally been identified which have potentially been impacted by past site activities. The primary CoPC at this stage are elemental sulfur (and associated low soil pH and elevated salts) and asbestos. As the bulk of the study area was not part of any chemical manufacturing area, the CoPC are limited.

In the remainder of the area samples were collected on a pseudo-grid to establish a soil background concentration of the potential key contaminants, and serve as reference for the BESS operations. The location of the soil sampling positions is shown in Figure 5-1.

All soil samples were collected from the upper 0.5m of the soil profile. The samples were combined to form nine composite samples representative of the proposed BESS project area. Two of these samples represent areas of potential impact arising from historical operations (sulfur treatment area – 1 sample, and asbestos areas – 1 sample).

All samples were submitted to a SANAS accredited laboratory for the following analyses:

- pH (water @ 1:2.5 soil: liquid ratio)
- Electrical Conductivity (@ 1:5 soil: liquid ratio)
- Soluble anions: Soluble Ion analysis using Discrete Analyser following a modified US EPA methods comparable to BS ISO 15923-1: 2013l. Sample extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker.
- One soil sample was analyses for asbestos screening (presence or absence) in the area adjacent to the known asbestos contamination.
- No provision was made to assess soils that are located beneath roads and hardstanding surfaces.

5.1 Soil Sampling

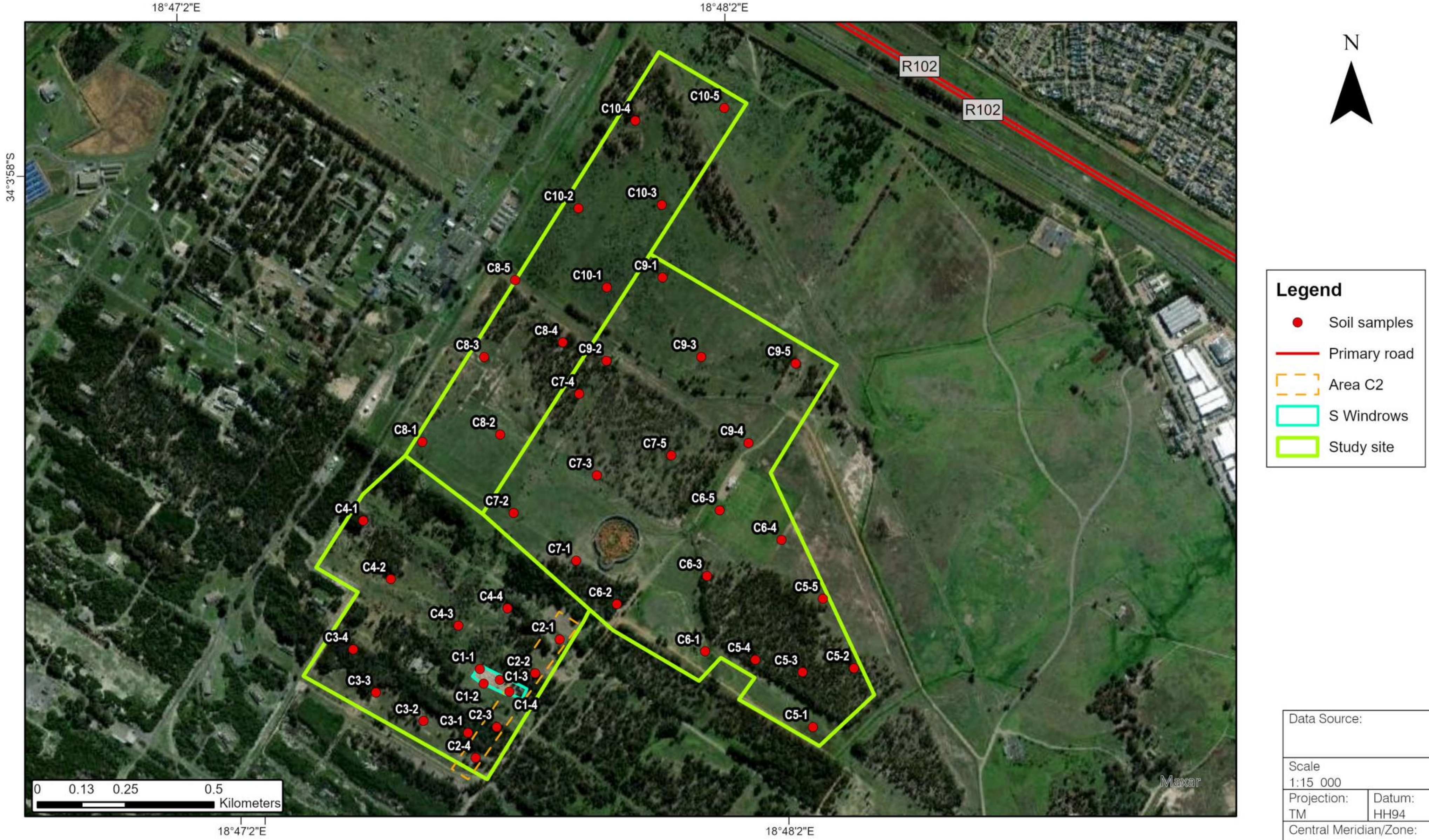
Soil samples were collected by SRK on the 18 and 19 October 2023. Soil samples were collected by hand auger to a depth of 0.5 m below ground level. The soil sample was collected to represent the entire soil profile intersected.

The soil profile varies across the site, generally comprising dry to slightly moist clayey sand overlying moist stiff sandy clay at depth. In the northern part of the study area, the underlying clay is typically dark grey and mottles comprising weathered Malmesbury shale. A coarse red quartzitic sand (Hillwash) is poorly developed in this area, while often being present.

Further south in the central portion of the study area, the underlying clay is light grey and occasionally contains hillwash sand confirming the reworked transported origin of the clays. In the southern portion of the study area, the depth of the underlying clay is often not observed within the upper 0.5 m and the auger refuses on shallow calcrete.

Several of the roads/railway lines, constructed in the study area to provide access to the field magazines, are built on coarse boiler ash from the former AECI power station. In the area between sample locations C2-1 and C2-2, a crusher plant was operated during the demolition of the former AECI plant, and several stockpiles of surplus soil and crushed material are present in this area.

The individual samples combined to make up the composite samples in Table 5-1 and the results of the soil analyses are presented in Table 5-2. The chain of custody forms and certificates of analyses are given in Appendix B.



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SOIL SAMPLE LOCATIONS

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Table 5-1: Consolidated Soil logs for Each Composite Sample

Location ID	Sample ID	Consolidated log
C1-1	C1	0,0-0,2m dry to slightly moist light grey-brown, loose, silty sand with sulfur flakes
C1-2		
C1-3		0,2-0,5 slightly moist, grey-brown, loose, siltly clay sand, with sulfur flakes
C1-4		
C2-1	C2	0,0-0,2m dry, light grey, loose, fine silty sand
C2-2		
C2-3		0,2-0.5m slightly moist, light grey to grey brown, loose, fine silty sand with occasion rubble fragments
C2-4		
C3-1	C3	0,0-0,2m dry, light grey-brown, loose, fine silty sand
C3-2		
C3-3		0,3-0.5m slightly moist, grey brown, loose, fine silty sand with occasion calcrete fragments
C3-4		
C3-5		
C4-1	C4	0,0-0,1m dry, light grey-brown, loose fine siklty sand with coarse calcrete and shell fragments
C4-2		
C4-3		0,1-0,5m slightly moist, light yellow-grey, medium dense, clayey sand with calcrete fragments or refusal on shallower calcrete
C4-4		
C4-5		

Location ID	Sample ID	Consolidated log
C5-1	C5	0,0-0,1m dry, light brown, loose, silty sand
C5-2		0,1-0,3m slightly moist, light brown grading to brown, medium dense, silty sand
C5-3		
C5-4		0,3-0,5m moist, light grey, stiff, sandy clay
C5-5		
C6-1	C6	0,0-0,2m Dry, light brown, loose, fine sand
C6-2		0,2-0.3m slightly moist, brown, loose, clayey sand
C6-3		
C6-4		0,3-0,5m moist, light brown mottled orange, medium dense sandy clay
C6-5		
C7-1	C7	0,0-0,1m dry-slightly moist, dark brown, medium dense, fine silty
C7-2		0,1-0,4m slightly moist-moist, light brown, stiff sandy clay
C7-3		
C7-4		0,4-0,5m slightly moist-moist, light brown, stiff sandy clay with coarse red hillwash
C7-5		

Location ID	Sample ID	Consolidated log
C8-1	C8	0,0-0,2m Dry, light grey-brown, loose, fine sand
C8-2		0,2-0,4m moist, orange-brown, medium dense, silty sand
C8-3		
C8-4		0,4-0,5m Moist, light yellow-grey mottled orange, stiff, clay
C8-5		
C9-1	C9	0,0-0,4m Moist, light grey-brown, loose, slightly clayey fine sand, minor surface Hillwash on surface locally present
C9-2		
C9-3		0,4-0,5m Moist, yellow brown, medium dense, clayey sand
C9-4		
C9-5		
C10-1	C10	0,0-0,2m Slightly moist, light brown-dark brown, medium dense, silty sand with gravel
C10-2		
C10-3		0,2-0,5m Slightly moist, yellow brown, firm to stiff, sandy silty clay
C10-4		
C10-5		

Table 5-2: Results of the Soil Analyses

Sample ID		**SSV1**	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	C-9	C-10
Depth			0 -0.5	0 -0.5	0 -0.5	0 -0.5	0 -0.5	0 -0.5	0 -0.5	0 -0.5	0 -0.5	0 -0.5
Sampled Date			18/10/2023	18/10/2023	18/10/2023	18/10/2023	19/10/2023	19/10/2023	19/10/2023	19/10/2023	19/10/2023	19/10/2023
pH		GN635=	4.06*	8.12	8.69	8.79	8.97	8.91	8.6	8.64	8.12	7.87
EC	mS/m	=	251.3	69.8	19.2	15.2	96.3	60.3	56.9	104.3	64.3	15.2
Chloride	mg/kg	12 000	40	8	28	9	946	940	517	1 258	415	118
Fluoride	mg/kg	30	27.6	4.7	1.2	0.6	5.8	6.1	13.6	6.0	6.6	<0.3
NO_3-N	mg/kg	120	81.9	<2.5	<2.5	<2.5	<2.5	12.4	<2.5	<2.5	<2.5	<2.5
SO_4	mg/kg	4 000	3 453	1 564	<3	<3	316	190	96	136	551	93
<u>Asbestos Screen & Identification</u>												
Asbestos Fibres #			-	Fibre Bundles	-	-	-	-	-	-	-	-
Asbestos ACM #			-	NAD#	-	-	-	-	-	-	-	-
Asbestos Type #			-	Chrysotile, Amosite, Crocidolite	-	-	-	-	-	-	-	-

* the Norms and Standard do not prescribe a pH value for contaminated soil, while GN636 does prohibit the disposal of soil with a pH below 6.0.

NAD: No Asbestos Detected

6 Discussion of Results

Sample C1, which represents the soil of the sulfur windrows has an acidic pH. Although the concentrations of the soluble anions are elevated in this sample relative to the rest of the results, they are all below the SSV1 for the protection of groundwater resources. No human health screening values for direct soil ingestions have been promulgated for these determinands due to their low toxicity to humans.

Sample C2 was collected along the boundary of the southern most portion of the study area, adjacent to an area suspected of being contaminated with friable asbestos. Asbestos fibre bundles of chrysotile, amosite and crocidolite were identified in the sample. No asbestos containing materials (ACM)[4] were identified in this sample or observed in the study area during the soil sampling. As the analytical method used was a screening method to identify the presence or absence of asbestos, the actual risks associated with the asbestos cannot be quantified.

The results of the soil analyses from the remainder of the study area do not indicate pervasive contamination of the soil due to historical operations conducted by AECI in the study area. The soils are characterised by moderately alkaline pH, expected in the back-dune environment with underlying calcrete and aeolian marine sands contributing to the upper topsoil horizon. The EC are moderate to low, with a general trend of increasing EC to the north in the soil with a greater proportion of weathered Malmesbury shale in the upper soil profile and lower EC values to the south where the profile is more sandy and aeolian in origin.

7 Remedial Options

Based on the findings of the site assessment the following is remedial options are available to manage and mitigate the impacted soils identified within the study area.

Sulfur Windrows

The residual soil in the sulfur windrows are acidic, and although they do not represent an unacceptable human health risk, they are unlikely to be suitable for revegetation and will be an ongoing source of dust. The remedial options for this soil are listed below:

- **Off site disposal:** the soil is disposed of to an appropriately licenced landfill. Given the low pH, liming of the soil will be required prior to disposal. The elevated SO_4 content and presence of elemental sulfur may result in the generation of H_2S if disposed of with putrescible waste and will require assessment by the landfill operator.
- **Liming and on-site reuse:** The liming of the sulfur impacted soil will require the addition of lime to neutralise the existing acidity in the soil and the potential acidity present in the form of elemental sulfur which may still be oxidised by bacterial action in the future. Once limed the soil could be reused on site, but it’s placement needs to be carefully considered as the soil EC will remain relative high hindering revegetation. Burial of the treated soil as backfill may be an option, depending on the geotechnical properties required of such fill material.

[4] Asbestos containing material (ACM) refers to products that contain asbestos fibers within a bound matrix (tiles, sheeting etc).

Asbestos contaminated soil

The soil samples taken along the southern boundary of the Study Area have asbestos fibres present in the samples. The presence of asbestos fibres represents an unacceptable human health risk, with the resultant remedial options for this soil listed below:

- **Off site disposal:** The asbestos contaminated soil needs to be delineated, excavated and disposed of to a licenced hazardous waste landfill. This option is likely to be the most expensive, but could be implemented in a relatively short timeframe.
- **No-Go option:** The asbestos contaminated soil needs to be delineated, and excluded from the project area. The potential impact that the contaminated soil may pose to workers (construction and operational) phase in the adjacent BESS project would require assessment and possible mitigation measures to limit dust generation and restrict access.

8 Conclusions and Recommendations

Based on the above the following is concluded:

- Two areas have been identified as being contaminated by previous operations at the site:
    - The Sulfur Windrows: these windrows of sulfur contaminated soils do not present an unacceptable human health impact per-se, but are acidic soil which may present geotechnical risks to structures and inhibit revegetation of their footprint.
    - The area represented by sample C2 is contaminated with asbestos fibre bundles. The extent and severity of the asbestos contamination is undefined.
- There is no evidence of any pervasive soil contamination arising from past industrial operations in the remaining area of the site, which is considered suitable for the proposed redevelopment with respect to soil quality.

Based on the above it is recommended that:

- **The extent of the asbestos area be delineated and remediated prior to this area being included in the proposed development. Alternatively, the impacted area must be delineated and excluded from the proposed development with the EMPR including access restrictions to the area to protect workers from fugitive dusts containing asbestos fibres.**

Prepared by

SRK Consulting - Certified Electronic Signature

[redacted]

Richard O'Brien *M.Sc. Pr.Sci.Nat*

Principal Environmental Geochemist / Partner

Reviewed by

SRK Consulting - Certified Electronic Signature

[redacted]

Lindsay Shand *Pr.Sci.Nat*

Principal Environmental Geologist/ Assoc. Partner

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

Appendices

Appendix A: Soil Stockpile in Crusher Area


Plant Uncrushed Material - AECI
Vynide Uncrushed Material - AECI
Granite Chips - AECI
Calcrete - AECI
Vynide Gravel - AECI
Crushed Ballast - Rall
Levelled out Ramp - AECI
Coarse Material - Power - CoCT Sewer
Fine Material - Power - CoCT Sewer
Screened Ballast - Rall
Ballast Fines - Rall
Screened Ballast - Rall
Unscreened Ballast - Rall
Sulphur Soil Wind Rows - AECI
Crushed and Limed Sulphur Soil - AECI
Screened Sulphur Soil - AECI
Crushed Sulphur Soil - AECI
Old Gypsum Ramp - AECI
Sulphur Soil Sample Heaps - AECI
Crushed Sulphur Soil - AECI
Image © 2015 DigitalGlobe
© 2015 Google
© 2015 AfriGIS (Pty) Ltd.
Google earth
2005
Imagery Date: 1/14/2015 34° 4.745' S 18° 47.569' E elev 9 m eye alt 501 m

Stockpiles on site in February 2015

Stockpiles on Site on 25 February 2015	
Area	**Est M3**
Coarse material - Power - CoCT Sewer	8800
Fine material - Power - CoCT Sewer	4000
Screened Ballast - Rall	530
Ballast Fines - Rall	1600
Unscreened Ballast - Rall	760
Levelled out ramp - AECI	980
Crushed Ballast - Rall	280
Old Gypsum Ramp - AECI	180
Plant Uncrushed Material - AECI	5000
Vynide Uncrushed Material - AECI	600
Calcrete - AECI	130
Granite chips - AECI	10
Vynide Gravel - AECI	60
Potch Sulphur Soil for Pilot Plant- AECI	30
Sulphur Soil from Stockpile for Trial - AECI	60
Sulphur Soil Stockpile Area	3900

Appendix B: Laboratory Certificates and Chain of Custody

CHAIN OF CUSTODY

CLIENT: SRK Consulting (South Africa) (Pty) Ltd

ADDRESS: [redacted]

PROJECT MANAGER (PM): Richard O'Brien

MOBILE: [redacted]

PROJECT ID: 600528

SITE: Paardevlei

If Electronic File Required please select file format below

EQUIS	
CROSSTAB	
CLIENT	
AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)	

SAMPLER: R O'Brien

MOBILE: 0722453184

EMAIL REPORT TO: [redacted]

cc REPORT TO: [redacted]

INVOICE TO: (if different to report) [redacted]

QUOTE NUMBER: P.O No:

Chain of Custody sheet page .... of ....

TURNAROUND - please tick

10 DAY	X	4 DAY		Other	
5 DAY		3 DAY			

All waters - tick for samples to be tested shaken or settled

FOR LABORATORY USE ONLY

AVERAGE COOL BOX TEMP.(if required):

SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

ANALYSIS REQUIRED including SUITE names

Sample ID	AGS SAMP TYPE	AGS SAMP REF			S/GW/SW/ L/E/OW/P	Date	Time	Depth in Metres	Preservation	Asbestos risk: High	Asbestos risk: Medium	Asbestos risk: Low	pH, EC (1:2.5 soil water)	Soluble anions (1:2 aqueos extract) Cl, SO4, NO3, F	Asbestos screening
C-1					S	18/10/2023		0.50					X	X	
C-2					S	18/10/2023		0.50				X	X	X	X
C-3					S	18/10/2023		0.50					X	X	
C-4					S	18/10/2023		0.50					X	X	
C-5					S	19/10/2023		0.50					X	X	
C-6					S	19/10/2023		0.50					X	X	
C-7					S	19/10/2023		0.50					X	X	
C-8					S	19/10/2023		0.50					X	X	
C-9					S	19/10/2023		0.50					X	X	
C-10					S	19/10/2023		0.50					X	X	

WATERS - we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see accreditation schedule). Please tick whether analysis is required on settled or shaken samples

RELINQUISHED BY:

Name: Richard O'Brien Date: 20/10/23

Of: SRK Time: 08h45

RECEIVED BY:

Name: Date:

Of: Time:

METHOD of SHIPMENT

Consignment note No:

Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, high PAHs expected, provide PID readings if available

Element Materials Technology South Africa (Pty) Ltd

element

Element Materials Technology [redacted]
[redacted]

SRK Consulting
[redacted]

Attention :	Richard O'Brien
Date :	2nd November, 2023
Your reference :	600528
Our reference :	Test Report 23/17669 Batch 1
Location :	Paardeviel
Date samples received :	24th October, 2023
Status :	Final Report
Issue :	1

Ten samples were received for analysis on 24th October, 2023 of which ten were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Analysis was undertaken at either Element Materials Technology UK, which is ISO 17025 accredited under UKAS (4225) or Element Materials Technology (SA) which is ISO 17025 accredited under SANAS (T0729) or a subcontract laboratory where specified.

NOTE: Under International Laboratory Accreditation Cooperation (ILAC), ISO 17025 (UKAS) accreditation is recognised as equivalent to SANAS (South Africa) accreditation.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 15.566 kg of CO2

Authorised By:

[redacted]

Paul Boden BSc

Senior Project Manager

Element Materials Technology Environmental UK Limited
Registered in England and Wales
Registered Office: [redacted]
Company Registration No: 11371415

Element Materials Technology

Client Name:	SRK Consulting	**Report :**	**Solid**
Reference:	600528		
Location:	Paardeviel	**Solids:** V=60g VOC jar, J=250g glass jar, T=plastic tub	
Contact:	Richard O'Brien		
EMT Job No:	23/17669		

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1	2	3	4	5	6	7	8	9	10			
Sample ID	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	C-9	C-10			
Depth	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50			
COC No / misc													
Containers	B	B	B	B	B	B	B	B	B	B			
Sample Date	18/10/2023	18/10/2023	18/10/2023	18/10/2023	19/10/2023	19/10/2023	19/10/2023	19/10/2023	19/10/2023	19/10/2023			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1	LOD/LOR	Units	Method No.
Date of Receipt	24/10/2023	24/10/2023	24/10/2023	24/10/2023	24/10/2023	24/10/2023	24/10/2023	24/10/2023	24/10/2023	24/10/2023			
Natural Moisture Content	9.1	5.2	3.8	8.0	13.9	9.1	10.8	10.2	11.5	11.5	<0.1	%	PM4/PM0
Chloride #	40	8	28	9	946	940	517	1258	415	118	<2	mg/kg	TM38/PM20
Fluoride	27.6	4.7	1.2	0.6	5.8	6.1	13.6	6.0	6.6	<0.3	<0.3	mg/kg	TM173/PM20
Nitrate as NO3	81.9	<2.5	<2.5	<2.5	<2.5	12.4	<2.5	<2.5	<2.5	<2.5	<2.5	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	3453	1564	<3	<3	316	190	96	136	551	93	<3	mg/kg	TM38/PM20
Electrical Conductivity @25C (5:1 ext)	2513	698	192	152	963	603	569	1043	643	152	<100	uS/cm	TM76/PM58
pH #	4.06	8.12	8.69	8.79	8.97	8.91	8.60	8.64	8.12	7.87	<0.01	pH units	TM73/PM11

Client Name: SRK Consulting
Reference: 600528
Location: Paardeviel
Contact: Richard O'Brien

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos sub-samples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
23/17669	1	C-2	0.50	2	Anthony Carman	01/11/2023	**General Description (Bulk Analysis)**	Sand/Stones
					Anthony Carman	01/11/2023	**Asbestos Fibres**	Fibre Bundles
					Anthony Carman	01/11/2023	**Asbestos Fibres (2)**	Fibre Bundles
					Anthony Carman	01/11/2023	**Asbestos Fibres (3)**	Fibre Bundles
					Anthony Carman	01/11/2023	**Asbestos ACM**	NAD
					Anthony Carman	01/11/2023	**Asbestos ACM (2)**	NAD
					Anthony Carman	01/11/2023	**Asbestos ACM (3)**	NAD
					Anthony Carman	01/11/2023	**Asbestos Type**	Chrysotile
					Anthony Carman	01/11/2023	**Asbestos Type (2)**	Amosite
					Anthony Carman	01/11/2023	**Asbestos Type (3)**	Crocidolite

Element Materials Technology

Notification of Deviating Samples

Client Name: SRK Consulting
Reference: 600528
Location: Paardeviel
Contact: Richard O'Brien

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 23/17669						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

EMT Job No.: 23/17669

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 23/17669

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013l	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM76	Modified US EPA method 120.1 (1982). Determination of Specific Conductance by Metrohm automated probe analyser.	PM58	Dried and ground solid samples are extracted with water in a 5:1 water to solid ratio, the samples are shaken on an orbital shaker.			AD	Yes
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 9214 - 340.2 (EPA 1998)	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.			AR	Yes

Appendix C: Impact Assessment

9 Impact Assessment

The Land Contamination Assessment is required to include an impact assessment in terms of Appendix 6 of the Environmental Impact Assessment Regulations, as amended, promulgated under Section 24(5) and 44 of the National Environmental Management Act (No, 107 of 1998), as amended. The assessment is required to include the following:

- The No-go alternative. The No-go alternative is the option of not fulfilling the proposed project. This alternative would result in no negative environmental impacts from the proposed project on the site or surrounding local area. The No-go alternative would prevent the development from positively contributing to the environmental, social and eco-nomic benefits associated with the development of the renewables sector. It provides the baseline against which other alternatives are compared and shall be considered throughout the report.
- Impacts during the construction, operational and decommissioning phase to be assessed using an impact rating methodology (methodology to be included in report). The significance of cumulative impacts must be assessed prior to and post mitigation.

The impact assessment should focus on the identified issues, impacts and risks that influenced the identification of the alternatives. This includes how aspects of the receiving environment have influenced the selection.

9.1 Impact Rating Methodology

The assessment of impacts was based on specialists' expertise, SRK's professional judgement, field observations and desk-top analysis.

The significance of potential impacts that may result from the proposed project was determined to assist decision-makers. The **significance** of an impact is defined as a combination of the **consequence** of the impact occurring and the **probability** that the impact will occur. The criteria used to determine impact consequence are presented in the table below.

Table 9-1: Criteria used to determine the Consequence of the Impact

Rating	Definition of Rating	Score
A. *Extent*– *the area over which the impact will be experienced*		
Local	Confined to project or study area or part thereof (e.g. the site and adjacent watercourses)	1
Regional	The region, e.g. The catchment or metropolitan area	2
(Inter) national	Western Cape and beyond	3
B. ***Intensity***– *the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources*		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
C. ***Duration***– *the timeframe over which the impact will be experienced and its reversibility*		
Short-term	Up to 2 years	1
Medium-term	2 to 15 years	2
Long-term	More than 15 years	3

The combined score of these three criteria corresponds to a **Consequence Rating**, as follows:

Table 9-2: Method used to determine the Consequence Score

***Combined Score* (A+B+C)**	3 – 4	5	6	7	8 – 9
Consequence Rating	Very low	Low	Medium	High	Very high

Once the consequence was derived, the probability of the impact occurring was considered, using the probability classifications presented in the table below.

Table 9-3: Probability Classification

Probability*– the likelihood of the impact occurring*	
Improbable	< 40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

The overall **significance** of impacts was determined by considering consequence and probability using the rating system prescribed in the table below.

Table 9-4: Impact significance ratings

		Probability			
		Improbable	Possible	Probable	Definite
Consequence	Very Low	**INSIGNIFICANT**	**INSIGNIFICANT**	**VERY LOW**	**VERY LOW**
	Low	**VERY LOW**	**VERY LOW**	**LOW**	**LOW**
	Medium	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**
	High	**MEDIUM**	**MEDIUM**	**HIGH**	**HIGH**
	Very High	**HIGH**	**HIGH**	**VERY HIGH**	**VERY HIGH**

Finally, the impacts were also considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The prescribed system for considering impacts status and confidence (in assessment) is laid out in the table below.

Table 9-5: Impact status and confidence classification

Status of impact	
Indication whether the impact is adverse (negative) or beneficial (positive).	+ ve (positive – a 'benefit')
	– ve (negative – a 'cost')
Confidence of assessment	
The degree of confidence in predictions based on available information, SRK's judgment and/or specialist knowledge.	Low
	Medium
	High

- **INSIGNIFICANT**: the potential impact is negligible and **will not** have an influence on the decision regarding the proposed activity/development.
- **VERY LOW**: the potential impact is very small and **should not** have any meaningful influence on the decision regarding the proposed activity/development.
- **LOW**: the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity/development.
- **MEDIUM**: the potential impact **should** influence the decision regarding the proposed activity/development.

- **HIGH**: the potential impact **will** affect the decision regarding the proposed activity/development.
- **VERY HIGH**: The proposed activity should only be approved under special circumstances.

Practicable mitigation and optimisation measures are recommended and impacts rated in the prescribed way both without and with the assumed effective implementation of essential mitigation and optimisation measures.

Negative impacts (with mitigation) rated high or very high are shaded in red, while positive impacts (with optimisation) rated high or very high are shaded green.

In order to be concise, only **key** (i.e. non-standard essential) mitigation measures are presented in impact rating tables (later in this section), with a collective summary of all recommended mitigation measures presented at the end.

9.2 Potential Soil Impact

This assessment is based on the findings of the Soil Contamination Assessment undertaken by SRK and described in this report. The purpose of the study was to assess the potential residual soil contamination arising from past activities and their impact on the proposed development, and recommend practicable mitigation measures to minimise potential impacts. The sections below describe the potential impacts that the proposed development of Paardevlei Solar PV and Battery Energy Storage System (BESS) project may have on the soil..

9.2.1 Assessment of Impacts: Construction Phase

One potential direct construction phase impact on soil chemistry was identified:

- Soil contamination and impact to soil quality.

Potential Impact: Soil Contamination

Construction activities will involve vehicles and machinery to transport and move equipment to and around the site, to enable workers access to the site as well as the delivery of equipment and construction materials.

Aspects of construction could impact soil quality in the following ways:

- Contamination from hazardous substances (for example, hydrocarbon spills and cleaning wash down water); and
- Pollution from construction waste materials / litter.

The impact is assessed to be of ***very low*** significance with and without the implementation of mitigation (Table 9-6).

Table 9-6: Significance of soil contamination

<table>
<tr><th></th><th>Extent</th><th>Intensity</th><th>Duration</th><th>Consequence</th><th>Probability</th><th>Significance</th><th>Status</th><th>Confidence</th></tr>
<tr><td colspan="9">Both Alternatives</td></tr>
<tr><td>Without mitigation</td><td>Local
1</td><td>Medium
1</td><td>Med-term
2</td><td>Low
5</td><td>Definite</td><td>VERY LOW</td><td>-ve</td><td>High</td></tr>
<tr><td colspan="9">Essential mitigation measures:
• Limit footprint of construction activities to what is absolutely essential.
• Control and manage vehicle movements on site.
• Chemicals used on site to be undertaken in designated areas with appropriate drip trays and management measures to minimize the impact on the soils.
• Management of cement slops/waste to prevent :
o the formation of hardened soil crusts inhibiting water infiltration and seed germination;
o and raising soil pH;
o ensure no construction debris/waste is buried on-site
• Litter prevention training, waste collection and management to mitigate litter /waste generation.</td></tr>
<tr><td>With mitigation</td><td>Local
1</td><td>Low
1</td><td>Short-term
1</td><td>Low
5</td><td>Probable</td><td>VERY LOW</td><td>-ve</td><td>High</td></tr>
</table>

This impact can be managed to a *limited* degree, and is *reversible*.

No-Go Alternative

In the case of the No-Go Alternative, the site soils will undisturbed, while historical contamination will remain present in the soils, and the benefits of rehabilitation would be forgone.

9.2.2 Assessment of Impacts: Operational Phase

One potential direct operational phase impact on soil quality were identified:

- Change in soil chemistry due to cleaning and maintenance of site infrastructure.

Potential Impact: Soil Contamination

Operational activities will involve vehicles to transport and operate and maintain the equipment on site.

Aspects of operations could impact soil quality in the following ways:

- Contamination from hazardous substances (for example, hydrocarbon spills, cleaning fluids); and
- Pollution from litter.

The impact is assessed to be of ***very low*** significance with and without the implementation of mitigation (Table 9-6).

Table 9-7: Significance of soil contamination

<table>
<tr><th></th><th>Extent</th><th>Intensity</th><th>Duration</th><th>Consequence</th><th>Probability</th><th>Significance</th><th>Status</th><th>Confidence</th></tr>
<tr><td colspan="9">Both Alternatives</td></tr>
<tr><td>Without mitigation</td><td>Local
1</td><td>Medium
1</td><td>Med-term
2</td><td>Low
5</td><td>Definite</td><td>VERY LOW</td><td>-ve</td><td>High</td></tr>
<tr><td colspan="9">The Essential mitigation measures:
• Control and manage vehicle movements on site.
• Biodegradable chemicals are to be used, if possible, for cleaning and maintenance activities, and usage is to be managed to minimize the impact on the soils.
• Litter prevention training, waste collection and management is required to mitigate litter.</td></tr>
<tr><td>With mitigation</td><td>Local
1</td><td>Low
1</td><td>Short-term
1</td><td>Low
5</td><td>Probable</td><td>VERY LOW</td><td>-ve</td><td>High</td></tr>
</table>

This impact can be managed to a *limited* degree and is *reversible*.

No-Go Alternative

In the case of the No-Go Alternative, the site soils will undisturbed and the benefits of rehabilitation would be forgone.

9.2.3 Mitigation Measures: Soil Contamination Impacts

Essential soil contamination mitigation measures during **design** are as follows[5]:

- Design construction activities to avoid existing contaminated areas identified during the site assessment, including sulfur windrows and asbestos contaminated areas. **Note: The Asbestos contaminated area requires complete delineation prior to the finalisation of the proposed development area, as this study did not fully delineate the impacted area.**
- Plan vehicle movement, and construction vehicle parking /servicing areas to limit unintended chemical spills and leaks to ground.
- Plan waste management to prevent excess waste accumulation and litter generation.

Essential soil contamination mitigation measures during **construction** are as follows

- Manage vehicle movement, and construction vehicle parking areas to limit unintended chemical spills and leaks to ground.
- Arrange dustbins and waste disposal with regular collections to prevent excess waste accumulation and litter generation.

Essential soil contamination mitigation measures during operations are as follows:

- All chemical storage to be contained within a bund, labelled with associated handling and disposal procedures identified based on the MSDS requirements.
- Biodegradable chemicals are to be used, if possible, for cleaning and maintenance activities, and usage is to be managed to minimize the impact on the soils.
- Arrange dustbins and waste disposal with regular collections to prevent excess waste accumulation and litter generation.

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